

FLOOD IMPACT ASSESSMENT FOR POWERLINK REDLYNCH SITE

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PREPARED FOR

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1 INTRODUCTION

1.1 BACKGROUND

The following report presents the Flood Impact Assessment (FIA) for the proposed filling on land described as Lot 2 SP279529 in Redlynch, Cairns within the Cairns Regional Council (herein referred to as the subject site). The proposed filling is associated with a new electrical transmission tower proposed on the site. Due to the location of the filling within the floodplains of Freshwater Creek, the overall objective of this FIA is to identify the flood impact of the proposed works and provide any recommendations to reduce the impact (if needed).

1.2 SCOPE OF PROJECT

To achieve the project objective, the following scope of works was undertaken:

- Obtain base data from Cairns Regional Council and QSpatial. Base data will include aerial survey captured in 2021, stream gauge data and aerial photography.
- Develop a hydrologic model of the Freshwater Creek catchment to develop critical storm hydrographs for the 50, 20, 10, 5, 2 1 and 0.5 % Annual Exceedance Probability (AEP) events.
- Validate the hydrologic model against available stream gauge data and other studies within the catchment.
- Develop a 2D hydraulic model that covers the subject site to adequately determine the flood behaviour.
- Input the hydrologic model flows into the hydraulic model to determine existing case flood levels in the 50, 20, 10, 5, 21 and 0.5 % AEP events.
- Add the extent of earthworks to the hydraulic model to determine the developed case flood levels in the 50, 20, 10, 5, 21 and 0.5 % AEP events.
- Produce afflux maps (change in flood levels post development) and provide high level advice for potential mitigation options if the proposed works adversely impact flood behaviour elsewhere.
- Produce mapping for peak flood depth, velocity, water surface level and afflux maps for the pre- and post-development conditions.

1.3 SITE SPECIFIC DATA

Data obtained and how it was used in this project is detailed in **Table 1-1**.

Table 1-1 Site Specific Data

Data Category	Data	Source	Use in Project	
	Cadastre		Mapping and assessment of offsite impacts	
	Road corridor	QSpatial	Mapping	
GIS Layers	Road centrelines		Delineation of materials	
	Watercourse centrelines		Mapping and delineation of materials	
	Building footprints	Bing Maps	Mapping and delineation of materials	
Topography 2021 LiDAR		Cairns Regional Council	Base terrain for the hydraulic model development	
Previous Copperlode Dam Emergency Action Plan (2023)		Cairns Regional Council	Used to extract flows and validate hydrologic model.	



Data Category	Data	Source	Use in Project
	Independent Assessment Report Rainfall and Flooding Event of 26 March 2018 (BMT, 2018)	Cairns Regional Council	Used to extract flows and validate hydrologic model.

1.4 STUDY AREA

The subject site is located on land described Lot 1 SP279529 in Redlynch, Cairns. The site is bordered by the Cairns Western Arterial Road to the north, Redlynch Connector Road to the west and Freshwater Creek to the east as shown in **Figure 1-1**. The location of the proposed filling within the subject site is also highlighted.

The subject site is located within the Freshwater Creek floodplain, an area that regularly inundates due to the presence of the Cairns Western Arterial Road and its low-lying nature. There is minimal development nearby, with the subject site surrounded by predominately sugar cane farms or densely vegetated natural areas.





Figure 1-1 Locality Plan and Key Features



2 EXISTING CASE

A local, site-specific flood model within Freshwater Creek was developed by WMS Engineering for this FIA in accordance with Australian Rainfall and Runoff (ARR) 2019 guidelines. The flood model consisted of a RORB hydrologic model combined with a TUFLOW hydraulic model. A summary of the model development is provided below.

2.1 HYDROLOGIC MODELLING

RORB was the hydrologic modelling software selected for use in this assessment. RORB is an event based hydrologic model and calculates flood hydrographs from storm rainfall hyetographs. It can be used for modelling natural, partly urbanised and fully urbanised catchments. RORB is an industry standard modelling package that is widely used in hydrological studies across Australia.

2.1.1 Catchment Delineation

Catchment delineation was predominately undertaken using 1 second (~30 m resolution) Shuttle Radar Topography Mission (SRTM) digital elevation model (DEM) data sourced from Geoscience Australia. The adopted DEM is a hydrologically enforced version which captures flow paths based on SRTM elevations and mapped streamlines. The resulting catchment delineation was refined for areas where 5 m LiDAR from Geoscience Australia is available.

A total of 36 sub-catchments were delineated throughout the study area, with a total catchment area of approximately 102.6 km^2 . By way of validation, the Freshwater Creek at Redlynch Estate stream gauge (#110104A) is documented as having a total catchment area of 70 km^2 and is located $\sim 5 \text{ km}$ upstream of the subject site. To this location, this study estimated a total catchment area of 69.3 km^2 , confirming the accuracy of the catchment delineation undertaken. The delineated sub-catchments are illustrated in **Figure 2-1**.

2.1.2 Design Rainfall

The latest 2016 Intensity-Frequency-Duration (IFD) rainfall depths were obtained from the Design Rainfall Data System (BoM 2016) at the centroid of the wider Barron River catchment (-17.0268, 145.5329). The IFD values at this location correlated well with the weighted average catchment rainfall depths used to inform the areal spatial pattern of rainfall. The adopted IFD depths in the hydrologic model are presented in **Table 2-1**.



Table 2-1 BoM IFD Table

Duration	Rainfall Depth (mm) per AEP						
(hrs)	50%	20%	10%	5%	2%	1%	0.5%
1	40.1	53.3	61.8	69.7	79.7	87	99.6
1.5	46.5	61.9	71.8	81.1	92.9	101	116
2	51.4	68.5	79.6	90	103	113	130
3	58.9	79	92.1	104	120	132	152
4.5	67.5	91.4	107	122	142	157	180
6	74.6	102	120	138	161	179	205
9	86.5	120	143	166	196	219	250
12	96.7	136	163	191	227	256	293
18	114	163	199	235	284	323	369
24	128	186	229	274	334	383	439
30	141	207	256	308	379	438	492
36	152	225	280	339	420	488	545
48	172	256	320	391	490	574	648
72	201	301	380	467	592	700	815
96	221	331	419	516	657	780	927
120	235	351	443	545	694	824	992
144	244	364	457	560	711	843	1020
168	250	371	464	564	713	844	1020

2.1.3 Fraction Impervious

The spatial distribution of fraction impervious (FI) was determined based on aerial imagery and the local land zoning. The fraction impervious varied by sub-catchment depending on the extent of development. The total catchment area had a fraction impervious of approximately 15%.

2.1.4 Catchment Parameters

RORB has two key catchment parameters; Kc and m. While the value of m is recommended to be set to 0.8, the value of Kc varies depending on the state the site is located in. For Queensland, the following equation by Weeks (1986) is recommended:

 $Kc = 0.88A^{0.53}$, where A is the total catchment area (in km²).

Based on the above, a Kc value of 10.5 has been used for this project.



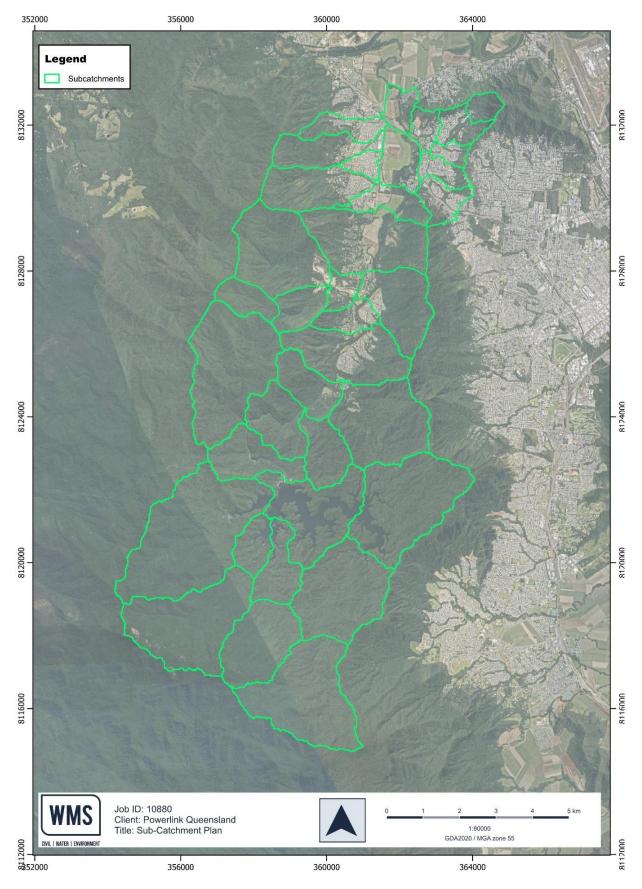


Figure 2-1 Sub-catchment Plan



2.1.5 Temporal Patterns

The site is situated in the Wet Tropics temporal pattern region as defined in ARR 2019 (refer **Figure 2-2**). The temporal patterns for this region were extracted using the ARR Data Hub website. Standard frequent, intermediate, and rare point temporal patterns were used for durations up to 9 hours. Areal temporal patterns were used for durations of 12 hours and longer given the total area of the catchment exceeds 75 km² (as recommended in ARR2019).

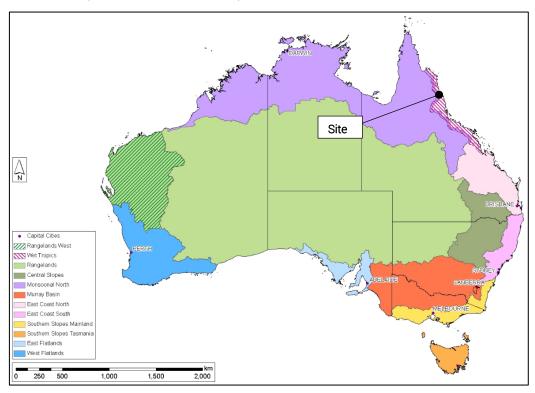


Figure 2-2 Temporal Pattern Regions (ARR 2019)

2.1.6 Rainfall Losses

Initial Loss and Continuing Loss values were extracted from the ARR Data Hub at the centroid of the Freshwater Creek catchment (-16.96, 145.681) for use in the hydrologic model. The adopted loss values are summarised in **Table 2-2**. The Burst Losses were calculated based on the Initial Loss minus the pre-burst depth for each storm as recommended in ARR 2019. Constant loss values were assumed across all AEPs and durations (i.e., no loss factors applied).

Table 2-2 Adopted Rainfall Losses

Initial Loss (mm)	Continuing Loss (mm/h)	
32	5.1	

2.1.7 Areal Reduction Factors

The areal reduction factor (ARF) reduces the total rainfall to account for spatial variance of a storm over a given catchment area. ARF values are calculated using several region-specific parameters and the catchment area. A larger catchment will have a lower ARF to account for a lower likelihood of a storm occurring over all parts of the catchment at the same time. This will in turn reduce the flood magnitude at the area of interest. For the Freshwater Creek model, an ARF area of 95 km² has been selected. This area approximates the total catchment area upstream of the Redlynch site. ARF parameters for the Wet Tropics region were adopted from the ARR Data Hub values for both long (between 24 and 168 hours) and short (less than 12 hours) durations.



2.1.8 Critical Storm Selection

The nominated design events were run in RORB for all durations between 1 hour to 168 hours and associated temporal patterns (TPs) in accordance with ARR 2019. For each storm duration, the critical TP was identified as the median outflow from each subcatchment. The peak outflow was then calculated as a maximum of the critical TPs, thus producing the critical duration in line with ARR 2019 guidelines.

The critical durations at the sub-catchments in the immediate vicinity of the site were simulated in the hydraulic model to determine the critical storms at the site. The durations either side of the critical were also taken forward for hydraulic modelling in TUFLOW as the critical duration can vary between hydrologic and hydraulic results. The critical storms extracted from the RORB model and used in the Tuflow model are summarised in **Table 2-3**.

Table 2-3 Selected Critical Storms at the Site

Event	Critical Storms
50% AEP	60 min TP09, 120 min TP08, 180 min TP07, 360 min TP09, 540 min TP01, 720 min TP09, 1080 min TP08
20% AEP	60 min TP08, 120 min TP09, 180 min TP04, 360 min TP04, 540 min TP01, 720 min TP09, 1080 min TP03
10% AEP	60 min TP07, 120 min TP03, 180 min TP08, 360 min TP07, 540 min TP06, 720 min TP09, 1080 min TP08
5% AEP	60 min TP07, 120 min TP07, 180 min TP04, 360 min TP07, 540 min TP06, 720 min TP09, 1080 min TP07
2% AEP	60 min TP09, 120 min TP07, 180 min TP08, 360 min TP02, 540 min TP02, 720 min TP09, 1080 min TP07
1% AEP	60 min TP09, 120 min TP08, 180 min TP02, 360 min TP07, 540 min TP02, 720 min TP09, 1080 min TP07
0.5% AEP	60 min TP09, 120 min TP05, 180 min TP10, 360 min TP07, 540 min TP02, 720 min TP09, 1080 min TP07

2.1.9 RORB Model Validation

The 50, 20, 10, 5, 2 1 and 0.5% AEP event peak flows from the RORB model at the outlet of the Freshwater Creek catchment (downstream of the subject site) were validated against peak flow estimates based on the following methods:

- Regional Flood Frequency Estimation (RFFE) Model: The technique is based on data from 853 gauged catchments. For application, Australia is divided into six data-rich regions, two data-poor/arid regions and six fringe zones. A region-of-influence (ROI) approach was used to form sub-regions within the data-rich regions. In these sub-regions, a Bayesian generalised least squares regression was adopted to regionalise the three parameters of the LP3 distribution. In the data-poor/arid regions an index method was applied, using the 10% AEP flood quantile as the index variable. An interpolation procedure is used to derive flood estimates for sites located in fringe zones (Limits of Applicability | Regional Flood Frequency Estimation Model (arr-software.org)). Note RFFE Model estimates have lower accuracy for urban catchments (more than 1 in 10% AEP of the catchment affected by residential or urban development) and catchments where the construction of a dam or weir significantly alters rainfall-runoff behaviour (e.g. Copperlode Dam).
- *Previous Hydrologic Modelling:* Previous hydrologic modelling for the area, specifically that developed for the Forensic Review of the March 2018 flood event in Freshwater Creek by BMT WBM, has been used to compare the results of this study.

The results of the comparison are illustrated in **Table 2-4**. The RORB derived peak flow was found to correlate well with the other validation methods and was therefore considered appropriate for hydraulic modelling purposes. It should be noted however that the hydrologic model critical duration was found to be shorter than the hydraulic model critical duration due to the storage effects near the subject site.



Table 2-4 Peak Flow Validation Summary (at Outlet of Freshwater Creek Catchment)

Event (AEP)	RORB Peak Flow for Adopted Critical Storm (m³/s)	RFFE Model 2016 v1 Peak Flow (m³/s)	RFFE Model 2021a Peak Flow (m³/s)	Forensic Review of March 2018 Flood Event (BMT, 2018) (m³/s)	Review of Barron River Delta Flood Model (Connell Wagner, 2007)
50% AEP	434	190	240	-	
20% AEP	666	360	421	-	426
10% AEP	777	499	542	556	504
5% AEP	950	650	654	672	607
2% AEP	1,030	872	791	760	726
1% AEP	1,113	1,060	889	883	820
0.5% AEP	1,298	-	-	-	-

2.2 HYDRAULIC MODELLING

2.2.1 Modelling Software

A 2D TUFLOW hydraulic model was developed to determine the flood behaviour at and around the site. TUFLOW is widely used in Australia for flooding and drainage studies. The recent TUFLOW version (2023-03-AE) was adopted for this study. The latest versions of TUFLOW incorporate the HPC (Heavily Parallelised Compute) model run engine. TUFLOW HPC is an explicit solver for the full 2D Shallow Water Equations, including a sub-grid scale eddy viscosity model. HPC can be used in GPU (Graphics Processing Unit) mode to reduce simulation times. TUFLOW HPC GPU was used for this assessment.

2.2.2 Model Resolution, Extent and Topography

A grid cell size of 5 m was selected for the assessment. This grid size allows for an appropriate representation of the key flow paths within the model area, particularly the Freshwater Creek channel, without resulting in excessive run times. This resolution was deemed appropriate based on the size of the area to be modelled and considering the key hydraulic features that needed to be represented.

The model extent was delineated to capture all points of interest, namely the subject site and the Cairns Western Arterial Road, and to ensure inflow and outflow boundaries were placed sufficiently far from the locations of interest as to not significantly influence flood behaviour.

A DEM was developed based on 50 cm resolution LiDAR data (sourced from Cairns Regional Council, flown in 2021) and used to establish the base model topography. The following model topography modifications were then applied to improve terrain representation:

 Road crest levels in the Cairns Western Arterial Road were enforced to their LiDAR-captured heights to ensure crest levels were appropriately represented.

The TUFLOW model layout is illustrated in Figure 2-4.



2.2.3 Boundary Conditions

2.2.3.1 Inflow Boundaries

The hydrographs extracted from the RORB model were applied to the TUFLOW model as 2D boundary conditions. Two types of inflow boundaries were used:

'2d_bc' Lines:

'2d_bc' lines were used to apply the hydrographs for the sub-catchments located outside the model extent. These inflows were applied to the model edges and include total flow hydrographs.

'2d_sa' Polygons:

'2d_sa' polygons were used to apply the local hydrographs for the sub-catchments located within the model extent.

The model inflow boundaries are illustrated in Figure 2-4.

2.2.3.2 Outflow Boundaries

An outflow boundary condition was applied to the TUFLOW model to allow flow to exit the study area. The outflow boundary was based on a water profile slope and was placed approximately 2 km downstream of Subject Site. A slope value of 0.0025 m/m was found to produce the most appropriate water profile and velocity results at the boundary location through sensitivity analysis.

For determining fill pad levels, a 1% AEP coincidental flood within the downstream Barron River was assumed. Based on existing studies provided by Cairns Regional Council, this level was found to be 8.8m AHD.

The model outflow boundary is illustrated in Figure 2-4.

2.2.4 Materials

The hydraulic roughness (Manning's 'n') values used in the TUFLOW model were in line with the range of values outlined in Book 6 of ARR 2019. The roughness for each land use is listed in **Table 2-5**, and the spatial distribution of roughness for existing conditions is illustrated in **Figure 2-5**.

Table 2-5 Land Use Roughness

Material ID	Land Use Description	Manning's 'n'
1	Residential: Urban (Higher Density)	0.3
2	Empty Farm Areas/Pasture	0.045
3	Watercourses	0.03
4	Waterbodies / Lakes: No Emergent Vegetation	0.025
5	Sealed Roads/ Car Park / Pavement / Driveway / Road	0.02
6	Unsealed Roads	0.025
7	Railway Line	0.04
8	Open Pervious Areas: Minimal Vegetation (Grassed)	0.035
9	Sugarcane Farms/Paddocks	0.12
10	Open Pervious Areas: Dense Vegetation (Bushes with Trees)	0.12
11	Creek Bank: Dense Vegetation	0.06



2.2.5 Hydraulic Structures – Cairns Western Arterial Road

The main hydraulic structures within the study area were located under the Cairns Western Arterial Road. At this location, there is the main bridge (Bill Fulton Bride) and three sets of high flow culverts, with the inclusion of a railway bridge underpass that would also act as a culvert. A summary of the model parameters used to represent these structures is provided in **Table 2-6**. Other structures were visually inspected and included in the hydraulic model as needed, however they would not have a notable impact on the flood behaviour at the subject site.

Table 2-6 Key Hydraulic Structures at Cairns Western Arterial Road

Structure ID	Description
CUL_RLC_010	7 x 2.4m high x 3.6m wide
CUL_RLC_011	9 x 2.4m high x 3.6m wide
CUL_RLC_012	7 x 2.4m high x 3.6m wide
CUL_RLC_013	1 x 3.5m high x 4.0m wide
BG_RLC_001	Bridge deck soffit elevation: 6.7 – 6.9 mAHD Bridge deck thickness: 1 m Number of spans: 3, 10 m Pier width: 700 mm Pier FLC: 0.18 Guardrails: 1.2 m Superstructure FLC: 0.35
BG_RLC_005	Bridge deck soffit elevation: 9.1 mAHD Bridge deck thickness: 1 m Number of spans: 6 Pier width: 700 mm Pier FLC: 0.13 Guardrails: 1.2 m Superstructure FLC: 0.28
BG_RLC_006	Bridge deck soffit elevation: 9.0 mAHD Bridge deck thickness: 1 m Number of spans: 6 Pier width: 700 mm Pier FLC: 0.13 Guardrails: 1.2 m Superstructure FLC: 0.28
BG_RLC_007	Bridge deck soffit elevation: 5.0 – 5.2 mAHD Bridge deck thickness: 0.4 m Number of spans: 2 Pier width: none Pier FLC: none Guardrails: 1.4 m Superstructure FLC: 0.58



2.2.6 TUFLOW Model Validation

Validation of the hydraulic model results was undertaken by comparing the 1% AEP flood level results from this study to another study undertaken in the catchment, namely the Forensic Review of March 2018 Flood Event (BMT, 2018). A comparison between the two studies from approximately 1000 m upstream of the Cairns Western Arterial Road to the Cairns (Cairns Western Arterial Road being chainage 1,000m) is shown in **Figure 2-3**. It can be seen that the results of this study correlate well with a previous study of the area, with the minor differences likely due to the change in methodology (previous study used superseded Australian Rainfall and Runoff 1987 methodologies) and differing roughness coefficients.

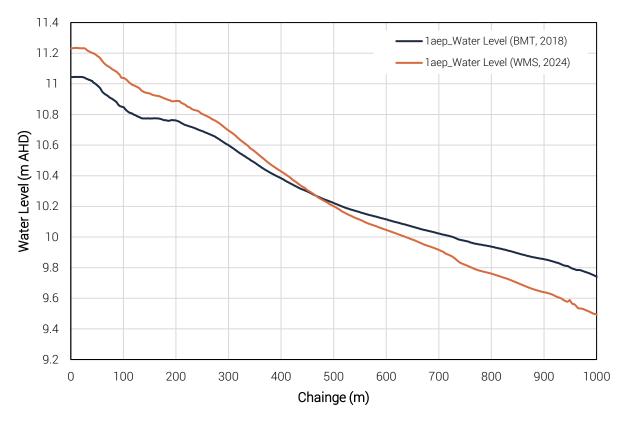


Figure 2-3 Validation of the 1% AEP Hydraulic Model Result Upstream of Cairns Western Arterial Road (Chainage 1,000)

2.3 FLOOD MAPS

The existing case flood maps, including depth with water level contours, velocity and hazard, are presented in **Appendix A.** The existing case nature of flooding can be described as follows:

- In a 1 in 50% AEP flood event, low level inundation of the subject site begins. Velocities in the area will be very low (~0.25 m/s). Access to the site will be limited.
- In more extreme events, the flood depth continues to rise, with depths in excess of 1.5 m expected around the site in a 1% AEP flood event. Velocities will generally increase; however remain relatively low at <1 m/s.



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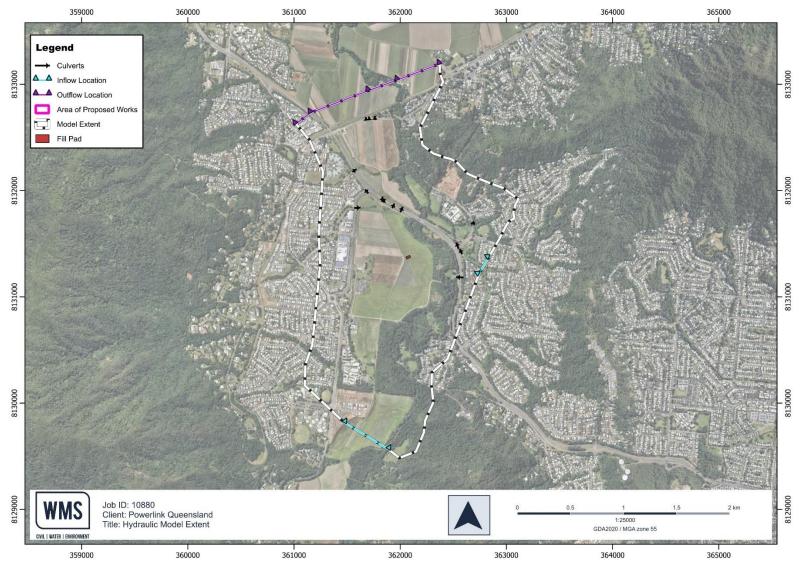


Figure 2-4 TUFLOW Model Layout

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Figure 2-5 TUFLOW Model Roughness Distribution

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3 DEVELOPED CASE

3.1 MODEL REVISIONS

The hydrologic model developed as part of the existing case was left unchanged as there is not expected to be any changes in the catchment that would influence the hydrology of the catchment.

The hydraulic model was revised to include the proposed fill pad provided by Powerlink Queensland (File 20240624_UGOH_TransitionPad.shp). Based on the details provided, the extent of fill pad was raised to ensure it would above the 0.5% AEP event.

The topographical changes resulting from the above are shown in **Figure 3-1**. Developed case flood maps are presented in **Appendix B**.

3.2 AFFLUX

Due to the extent of filling required for the project, minor afflux is expected immediately south of the fill pad. The afflux and the distance it extends upstream is summarised in **Table 3-1** with key points summarised below:

- 1. The peak afflux upstream of the fill pad is approximately 100 mm in a 20% event. This peak afflux is contained within the subject site.
- 2. Afflux up to 40 mm is likely to extend into neighbouring lot (Lot 1 SP279529) for a distance of up to 30 m to the west of the fill pad. This amount of afflux is considered insignificant in an area currently used for growing sugar cane and is therefore not considered to create an actionable nuisance for the current uses on the subject site itself.
- 3. The area of afflux is expected to be inundated in relatively frequent flood events by depths >200 mm. This further justifies the insignificant impact of the proposed filling, as the areas impacted will already be inundated.
- 4. Afflux >10 mm is not anticipated to extend to any habitable dwellings.

Afflux maps for all events are presented in Appendix C.

Table 3-1 Afflux Summary

Event (AEP)	Peak Afflux Immediately Upstream within Subject Site (mm)	Total Upstream Distance of Afflux >20mm (m)	Does Afflux Extend into Neighbouring Lot?
50% AEP	70	20	Yes - 20m
20% AEP	100	50	Yes – 30m
10% AEP	90	50	Yes - 30m
5% AEP	90	50	Yes - 30m
2% AEP	90	50	Yes - 30m
1% AEP	80	50	Yes - 20m
0.5% AEP	70	50	Yes – 20m

3.3 FILL PAD LEVEL

Based on the assessment undertaken, the 0.5% AEP flood level immediately upstream of the fill pad was found to be 10.4 mAHD (Refer Appendix B-23). It is therefore recommended that a fill pad level of 10.9 mAHD be adopted, as it allows for 500 mm of freeboard which would overcome any uncertainty in the modelling, while also allowing for medium term impacts of climate change on rainfall intensity.

Alternatively, if the 1% AEP flood level was adopted, a fill pad level of 10.6 mAHD is recommended (allowing for 500 mm freeboard).



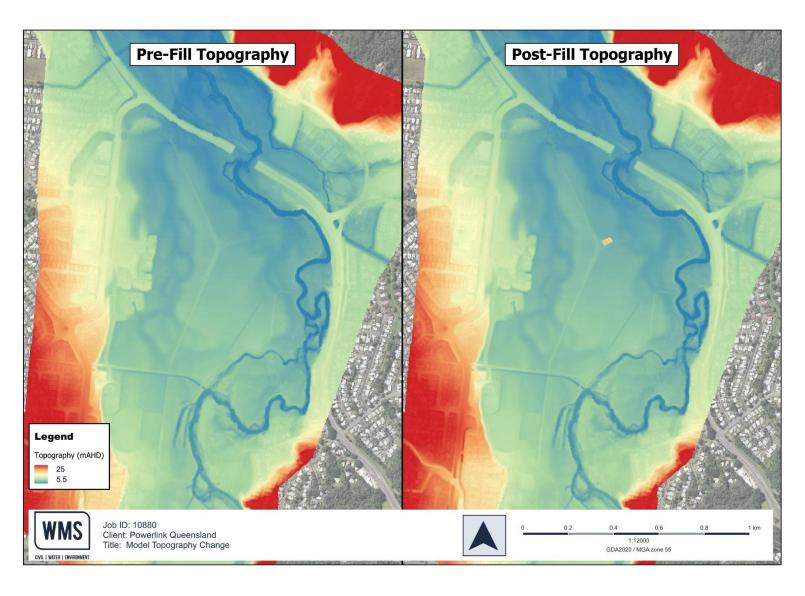


Figure 3-1 TUFLOW Model Terrain Comparison – Existing Case vs Upgrade Case

4 CONCLUSION

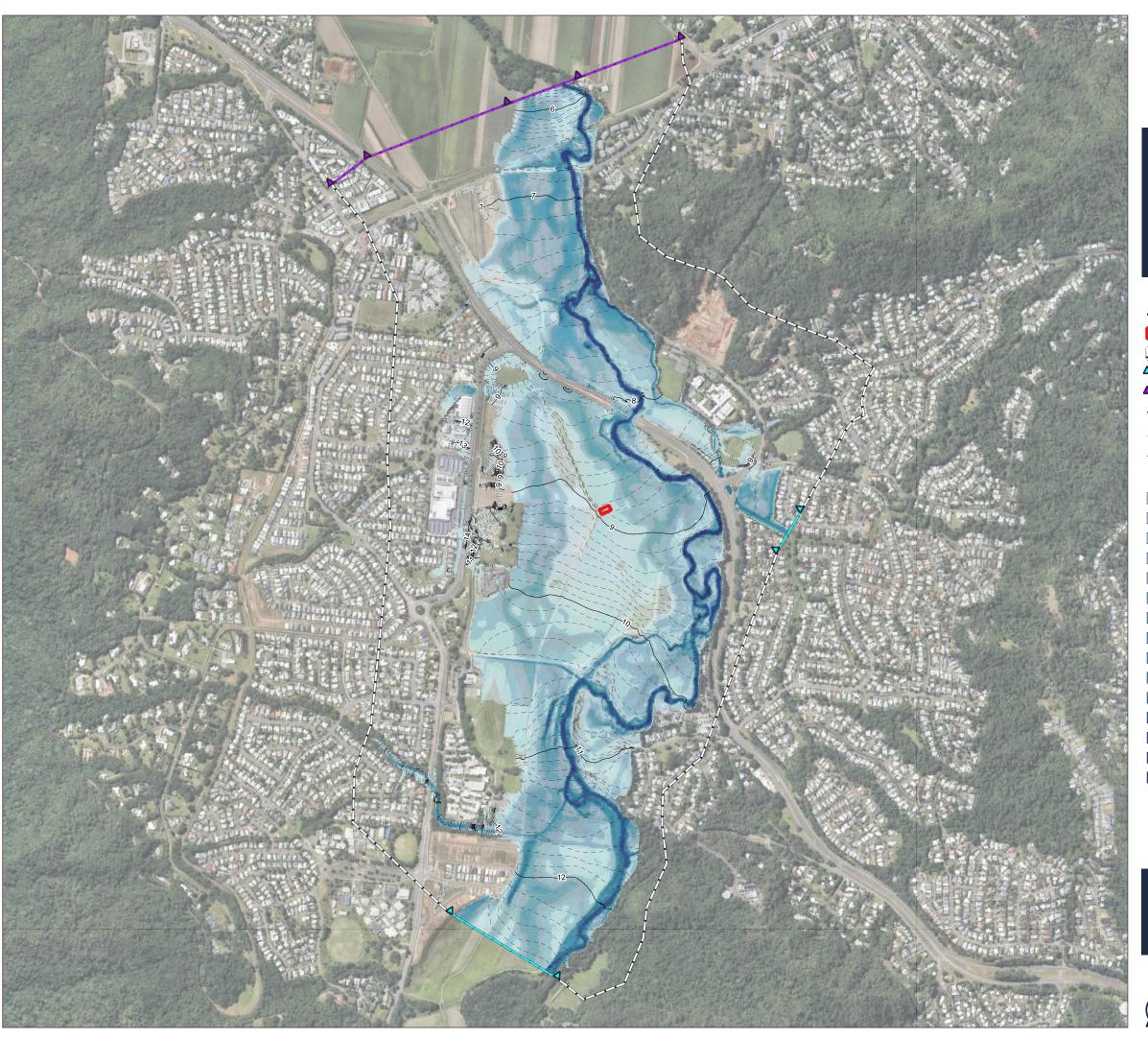
The existing case flood modelling of the subject site has identified that low level inundation is expected in events as frequent as a 50% AEP event. As a result, a flood impact assessment of the proposed filling within the subject site was undertaken to determine the extent and magnitude of afflux.

Based on the assessment undertaken, the following conclusions can be made:

- 1. Afflux up to 40 mm is likely to extend up to 30 m into the neighbouring lot (Lot 1 SP279529). As the land being impacted by this afflux is used for growing sugar cane and will already be inundated during frequent flood events, there is no actionable nuisance being created by the flood impact;
- 2. Afflux >10 mm is not anticipated to extend to any habitable dwellings; and
- 3. To achieve the desired 0.5% AEP flood immunity, a fill pad level of 10.9 mAHD is recommended. If the flood immunity was reduced to the 1% AEP flood event, a fill pad level of 10.6 mAHD is recommended.

It is recommended that the flood impact assessment be revisited if the extent of filling is likely to differ to that presented in this report.

APPENDIX A EXISTING CASE FLOOD MAPS





Pre-Development
Peak Depth and Water Level
Contours
50% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Water Level Contours (mAHD)

---- Minor (0.10m)

— Major (1.0m)

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

.

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

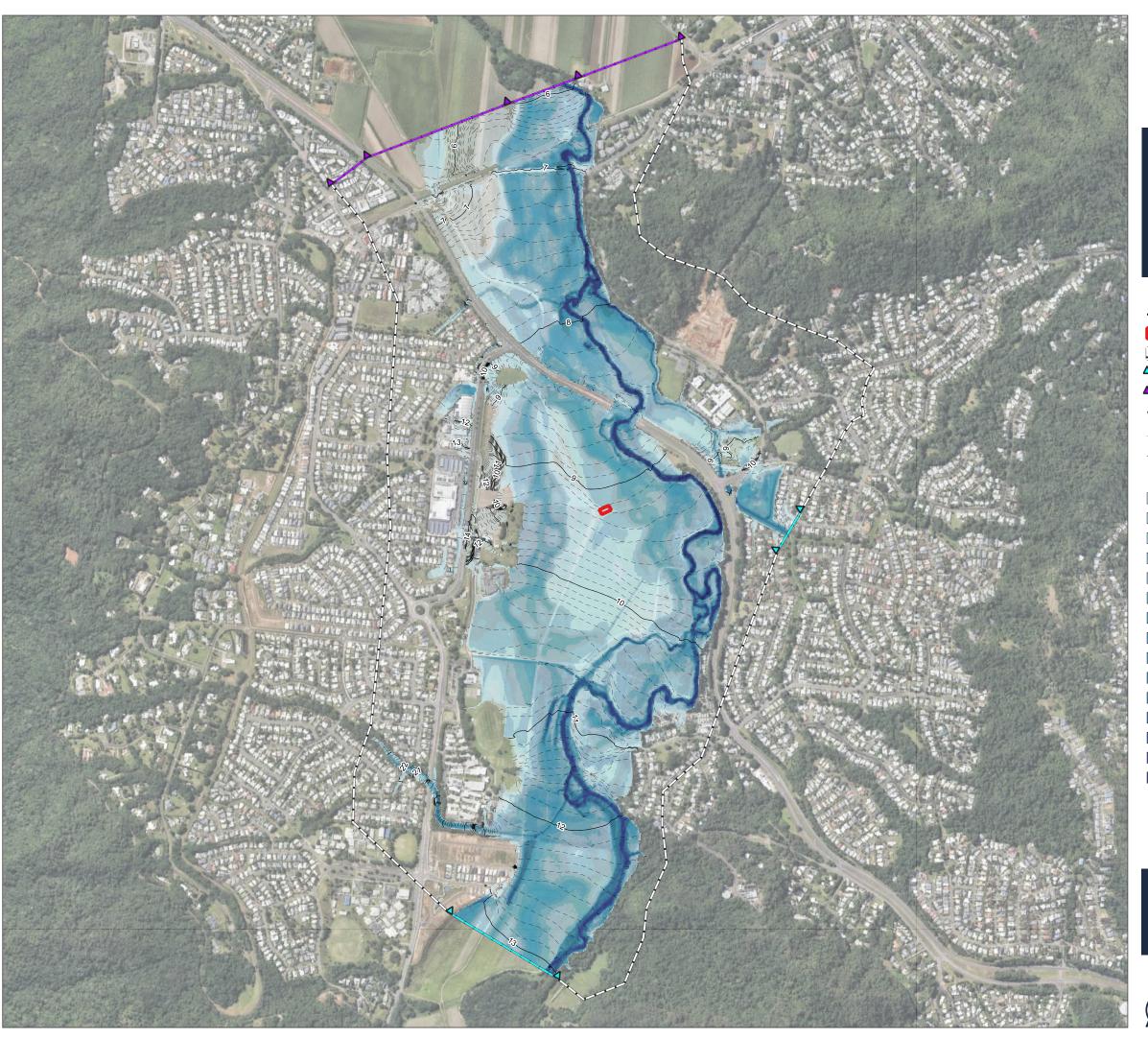
4.5 - 5.0

> 5.0

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development
Peak Depth and Water Level
Contours
20% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

Outflow Boundary

Water Level Contours (mAHD)

---- Minor (0.10m)

—— Major (1.0m)

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

_ 0.0 0.0

3.5 - 4.0

4.0 - 4.5

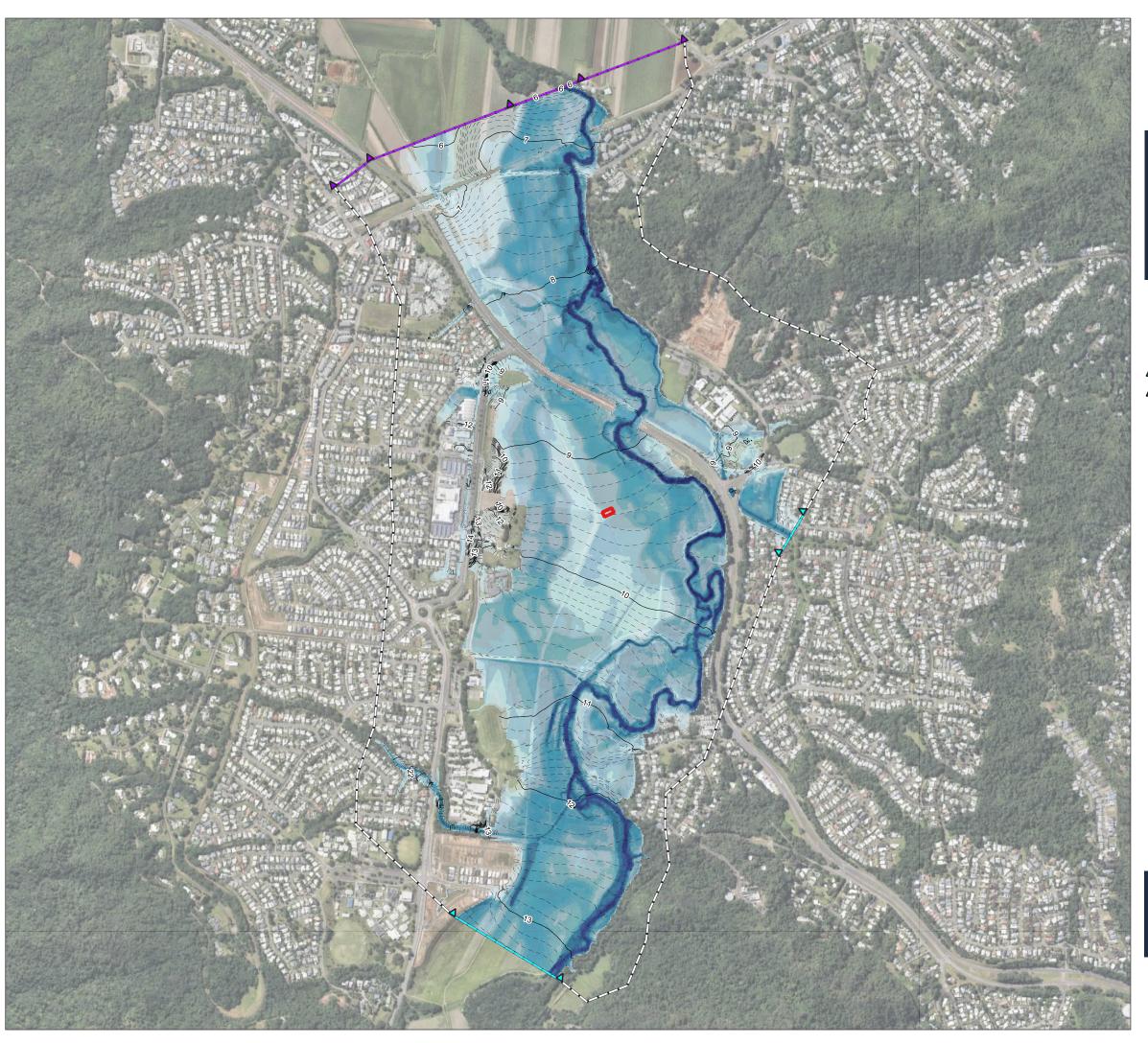
4.5 - 5.0

> 5.0

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development Peak Depth and Water Level Contours 10% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Water Level Contours (mAHD)

Minor (0.10m)

Major (1.0m)

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

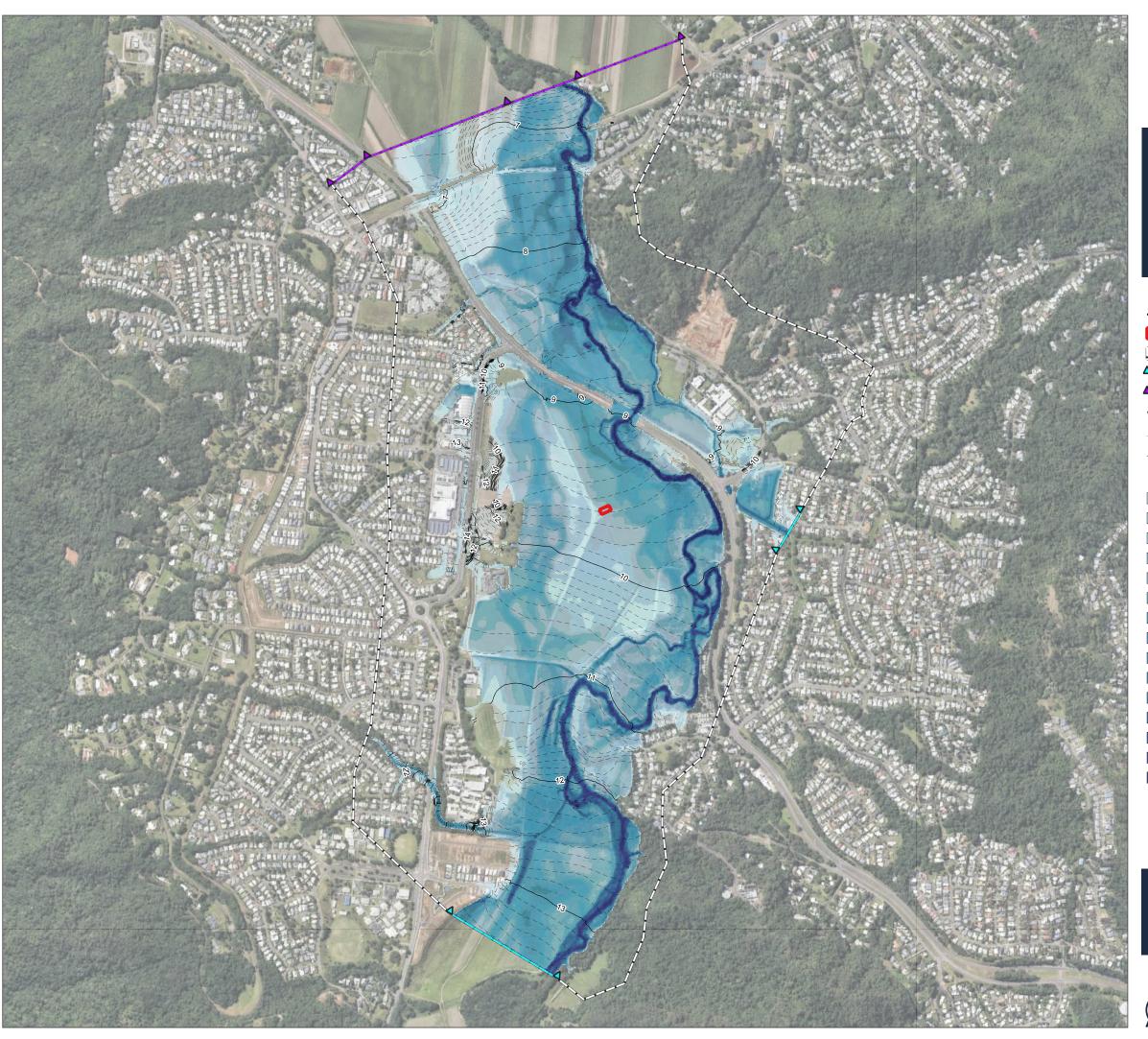
4.0 - 4.5

4.5 - 5.0

> 5.0

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55 Job No: 10880 Date: 25/10/2024





IVIL | WATEN | ENVINONMENT

Appendix A-4

Pre-Development
Peak Depth and Water Level
Contours
5% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Water Level Contours (mAHD)

---- Minor (0.10m)

— Major (1.0m)

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

.

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

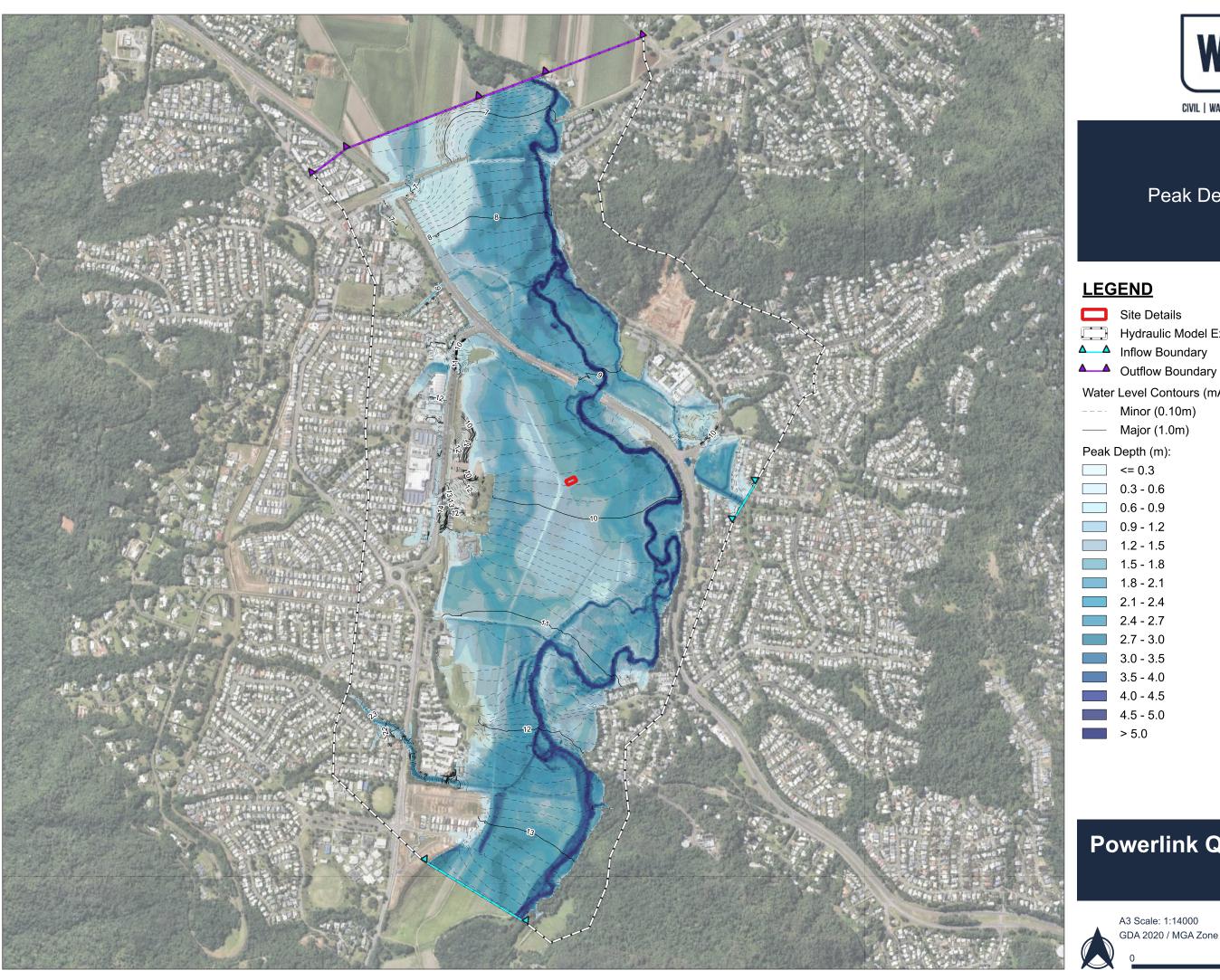
4.5 - 5.0

> 5.0

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development Peak Depth and Water Level Contours 2% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

Water Level Contours (mAHD)

Minor (0.10m)

Major (1.0m)

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

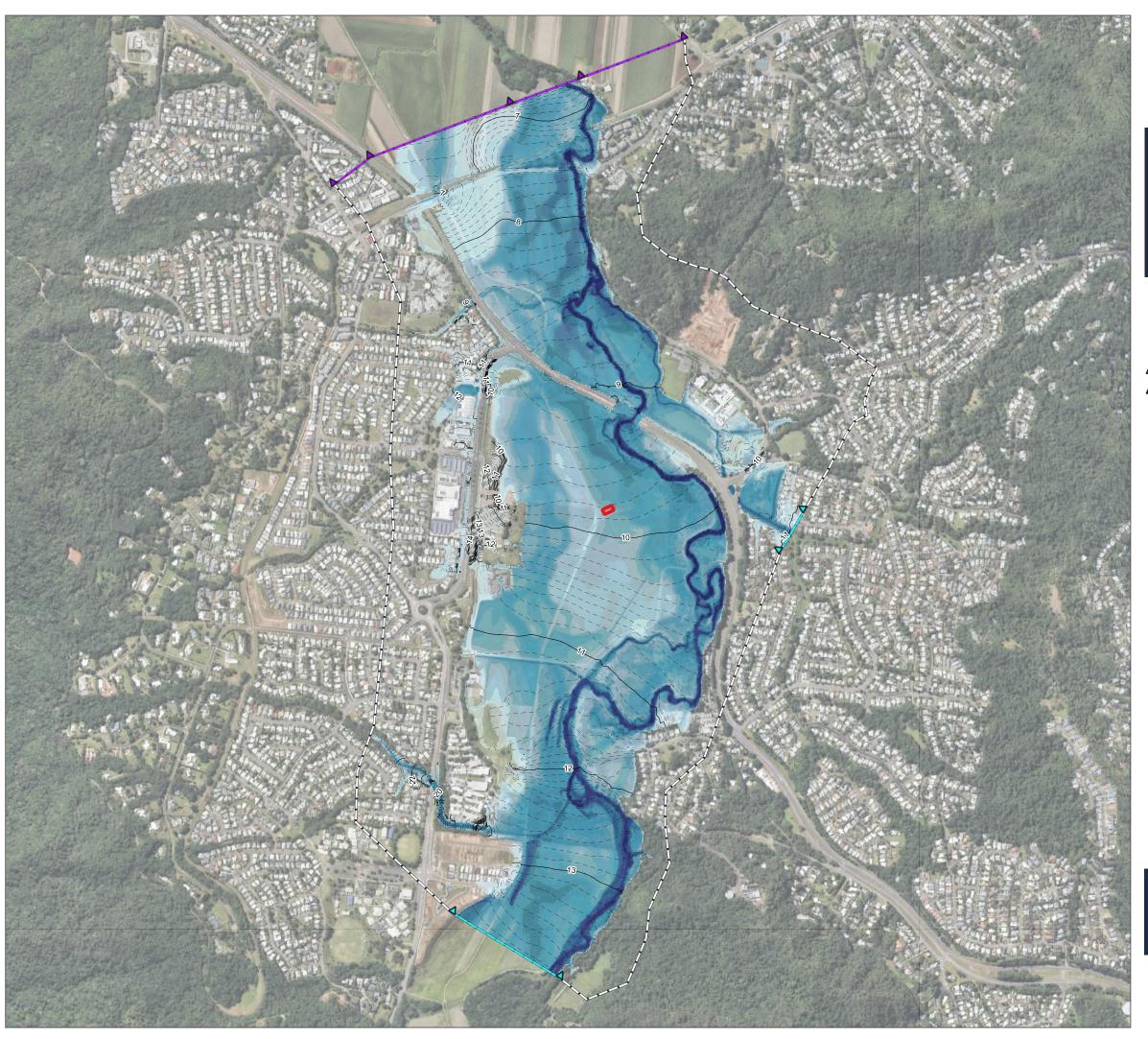
4.5 - 5.0

> 5.0

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development
Peak Depth and Water Level
Contours
1% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Water Level Contours (mAHD)

---- Minor (0.10m)

— Major (1.0m)

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

> 5.0

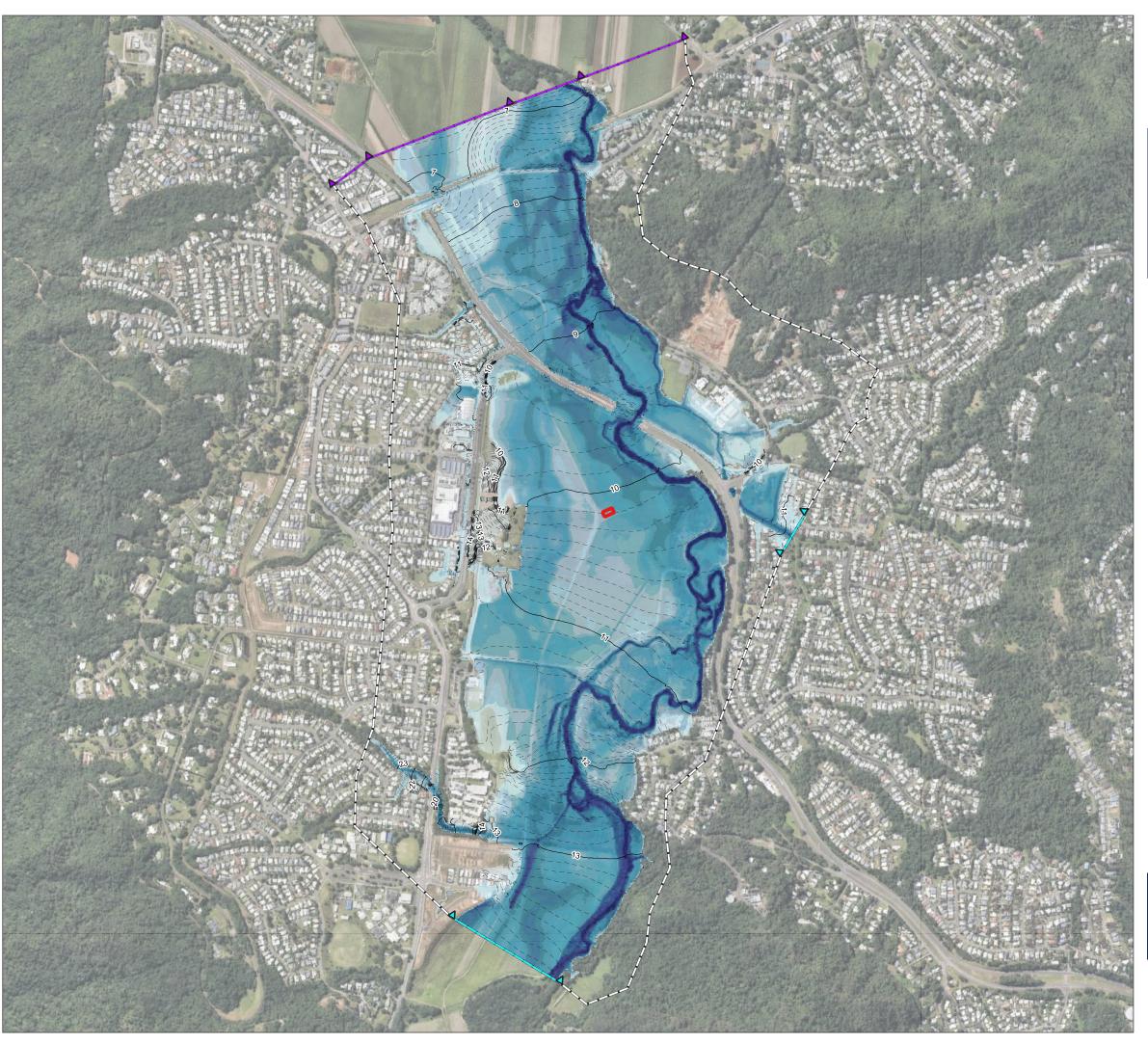
Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024

1,000 m

500





Pre-Development
Peak Depth and Water Level
Contours
0.5% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Water Level Contours (mAHD)

---- Minor (0.10m)

— Major (1.0m)

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

.

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

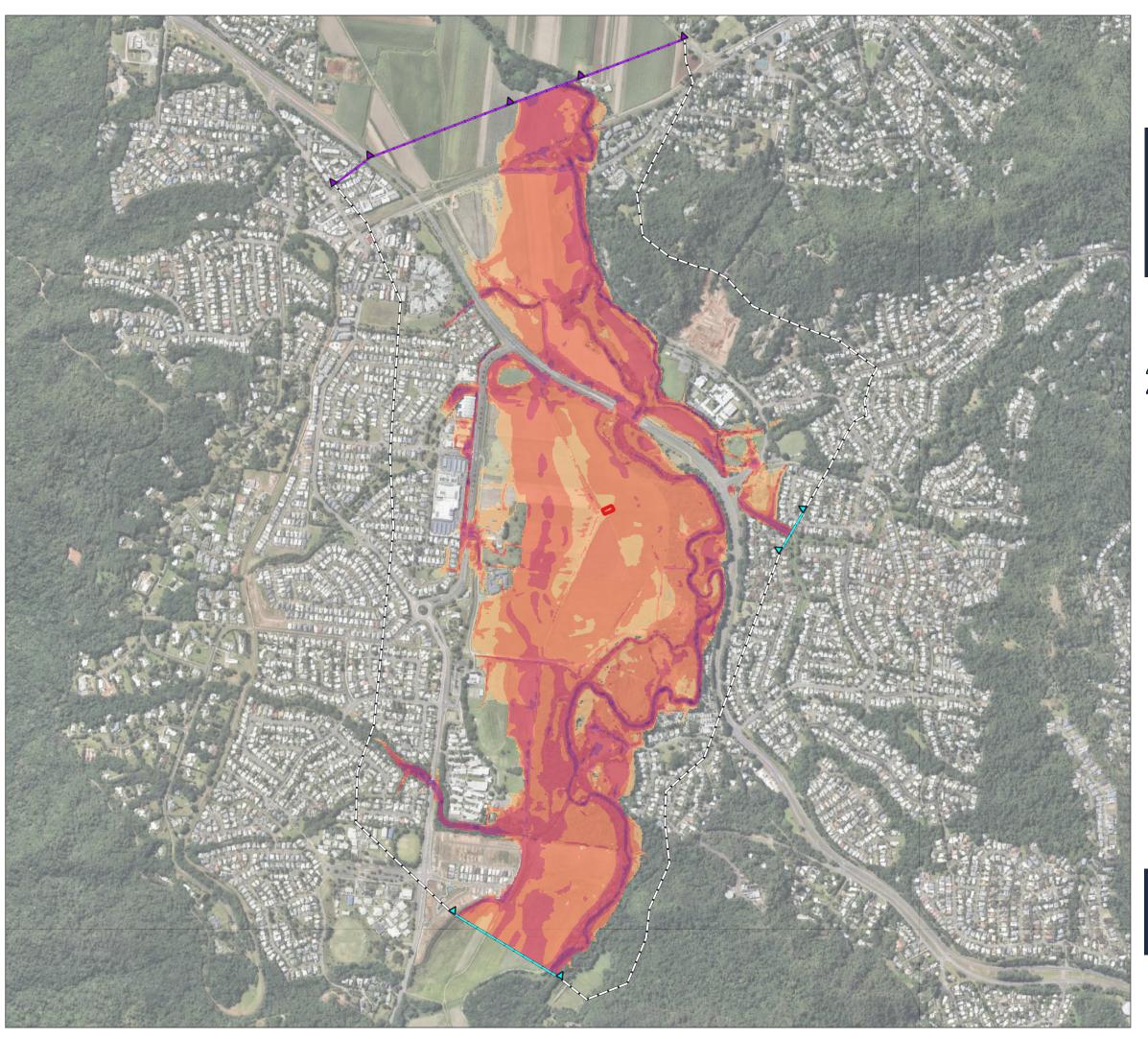
4.5 - 5.0

> 5.0

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development
Peak Velocity
50% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

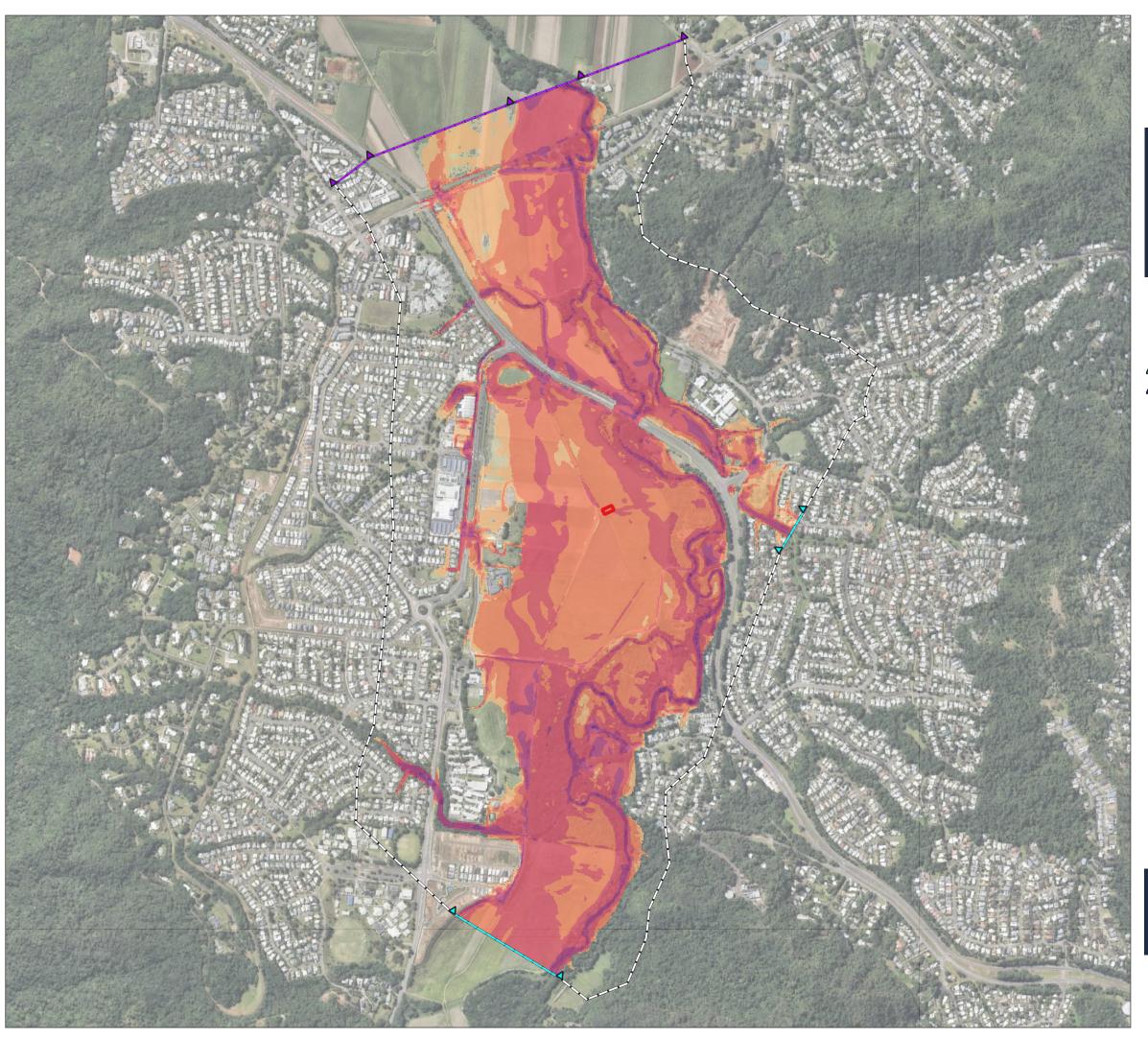
4.00 - 5.00

5.00 - 6.00 > 6.00

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development
Peak Velocity
20% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50 0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

4.00 - 5.00

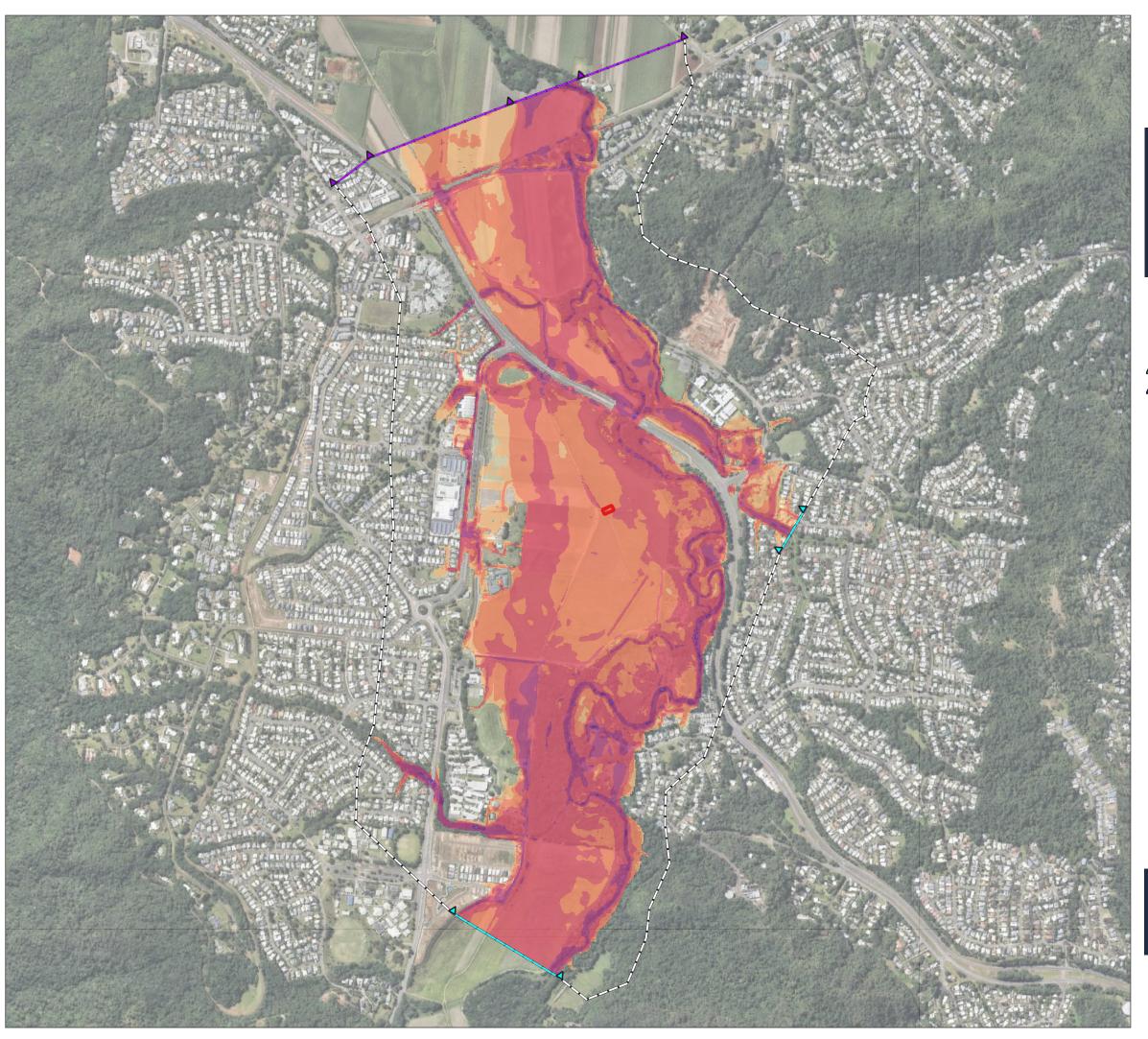
5.00 - 6.00

> 6.00

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development
Peak Velocity
10% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Velocity (m/s):

<= 0.05

0.00

0.05 - 0.25

0.25 - 0.50 0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

4.00 - 5.00

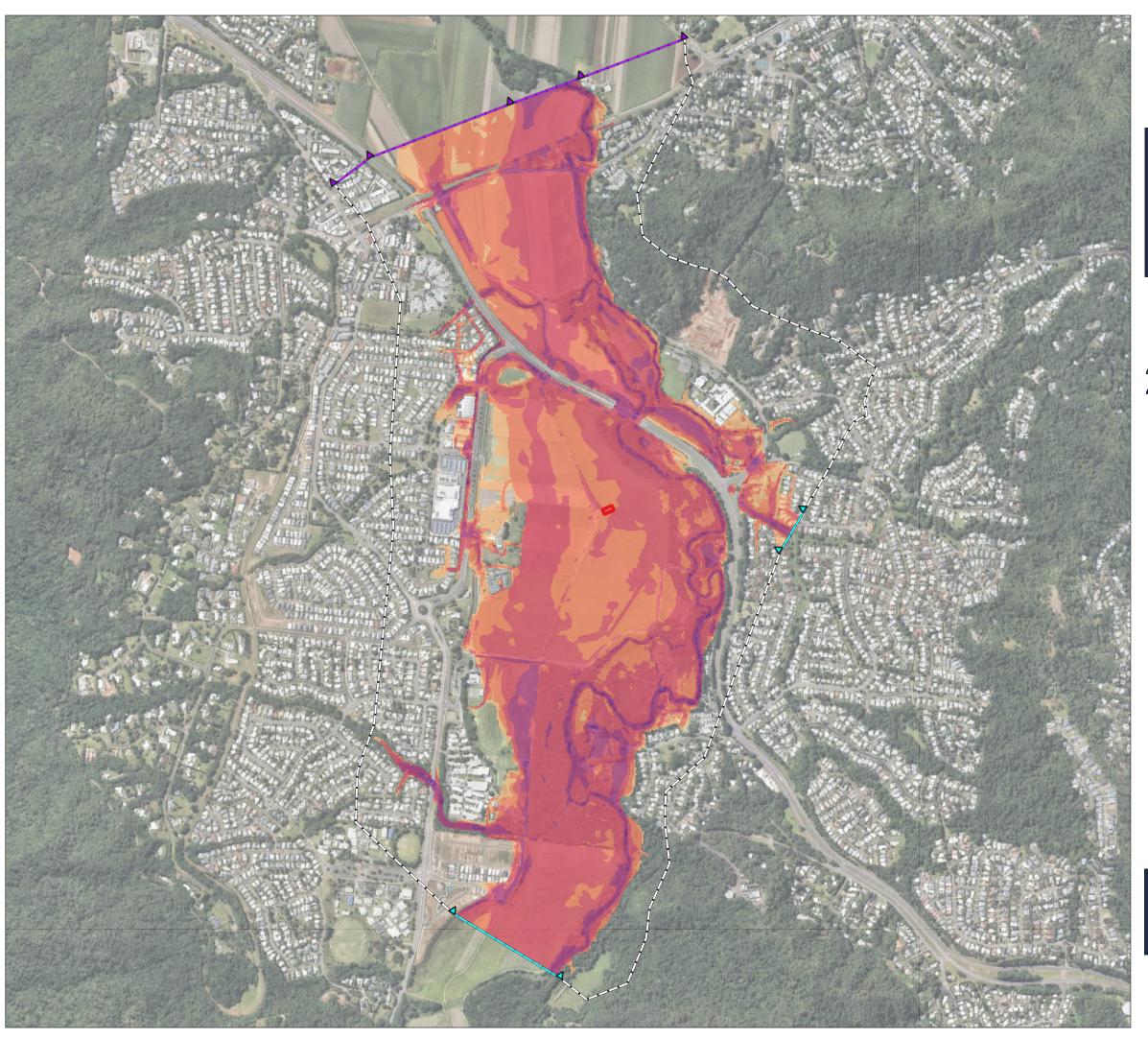
5.00 - 6.00

> 6.00

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development
Peak Velocity
5% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary △ △ Outflow Boundary

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

4.00 - 5.00

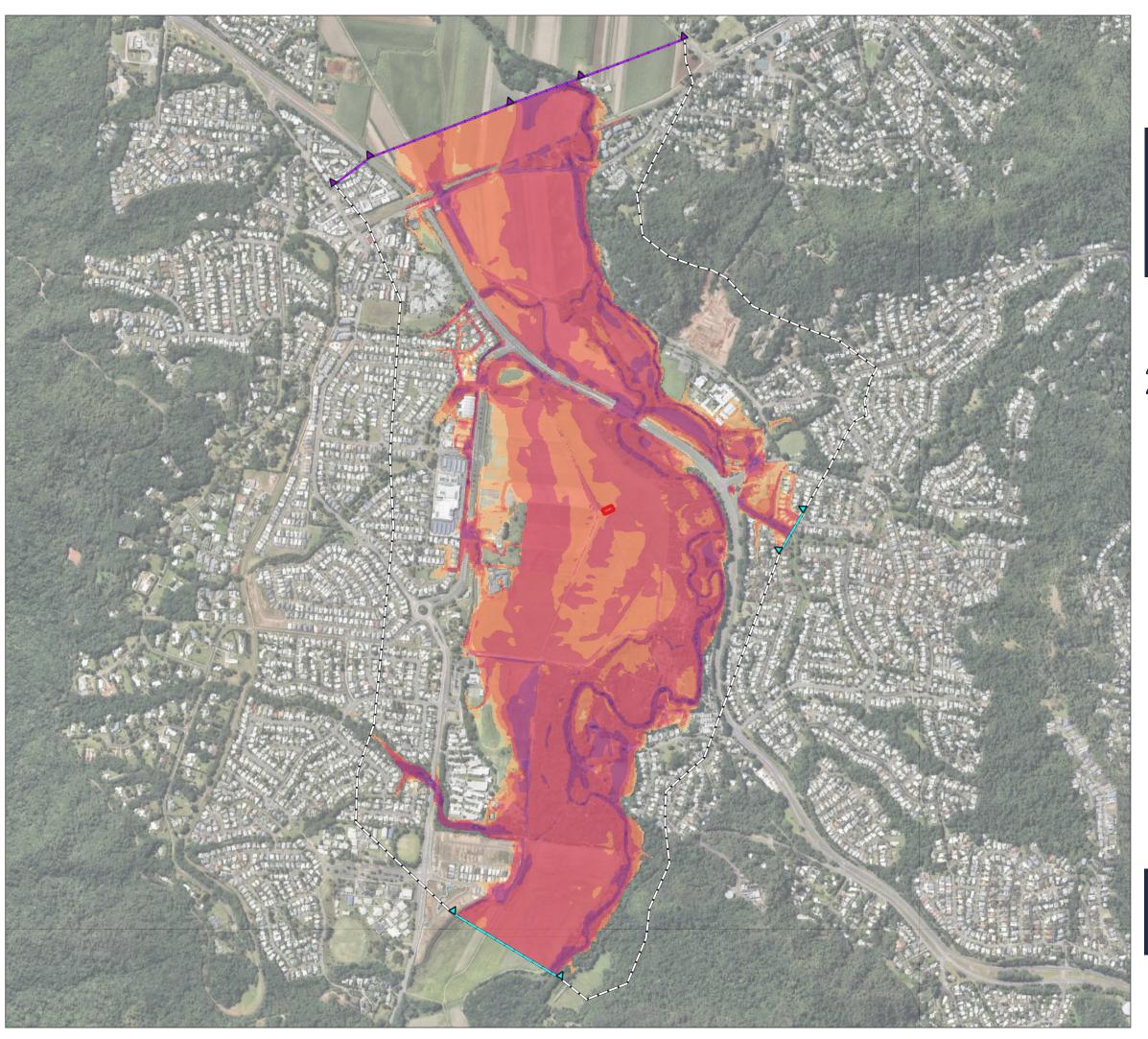
5.00 - 6.00

> 6.00

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development
Peak Velocity
2% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary△ △ Outflow Boundary

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

4.00 - 5.00

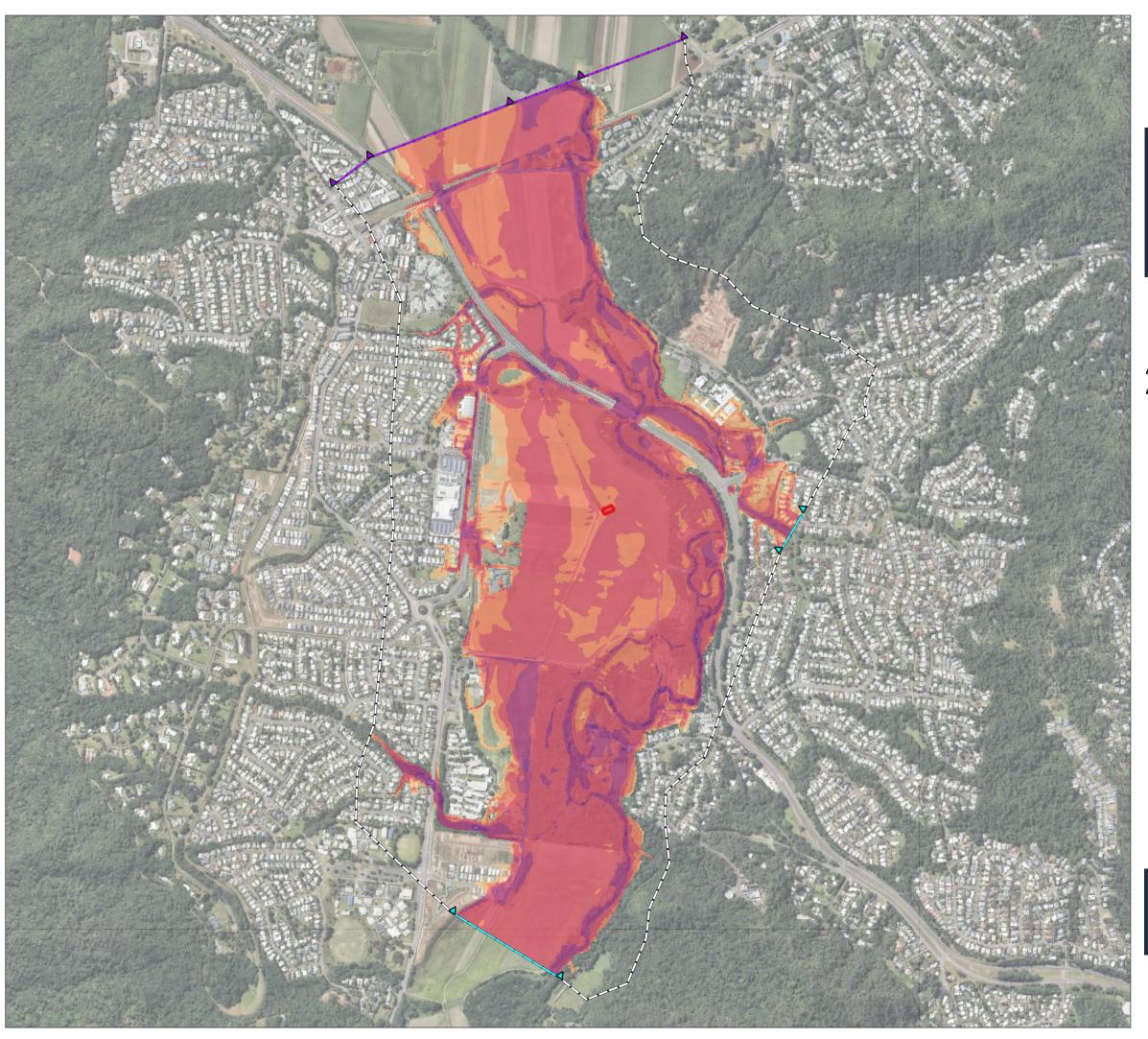
5.00 - 6.00

> 6.00

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development
Peak Velocity
1% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

4.00 - 5.00

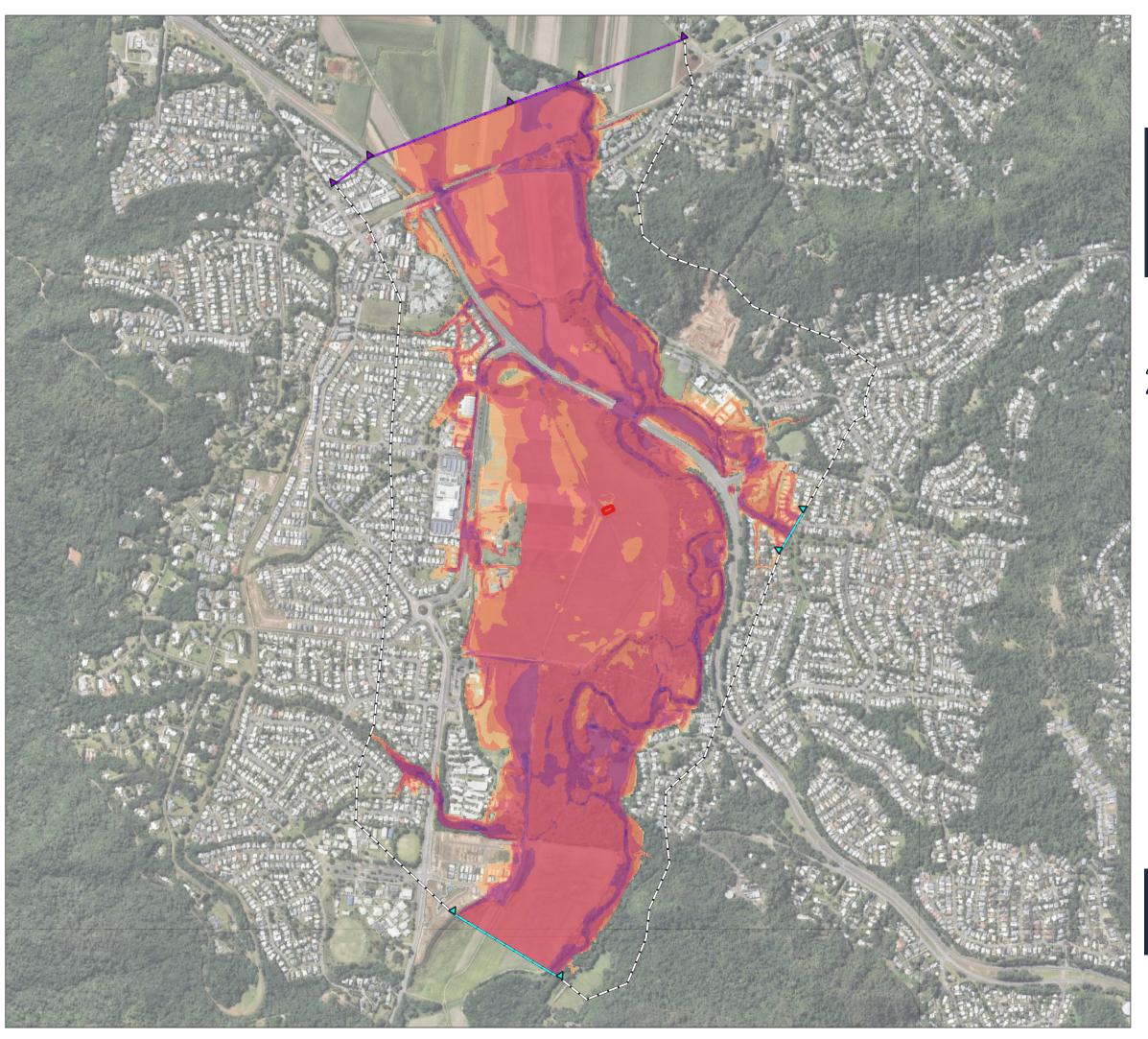
5.00 - 6.00

> 6.00

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development Peak Velocity 0.5% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50 0.50 - 1.00

1.00 - 2.00

2.00 - 3.00 3.00 - 4.00

4.00 - 5.00

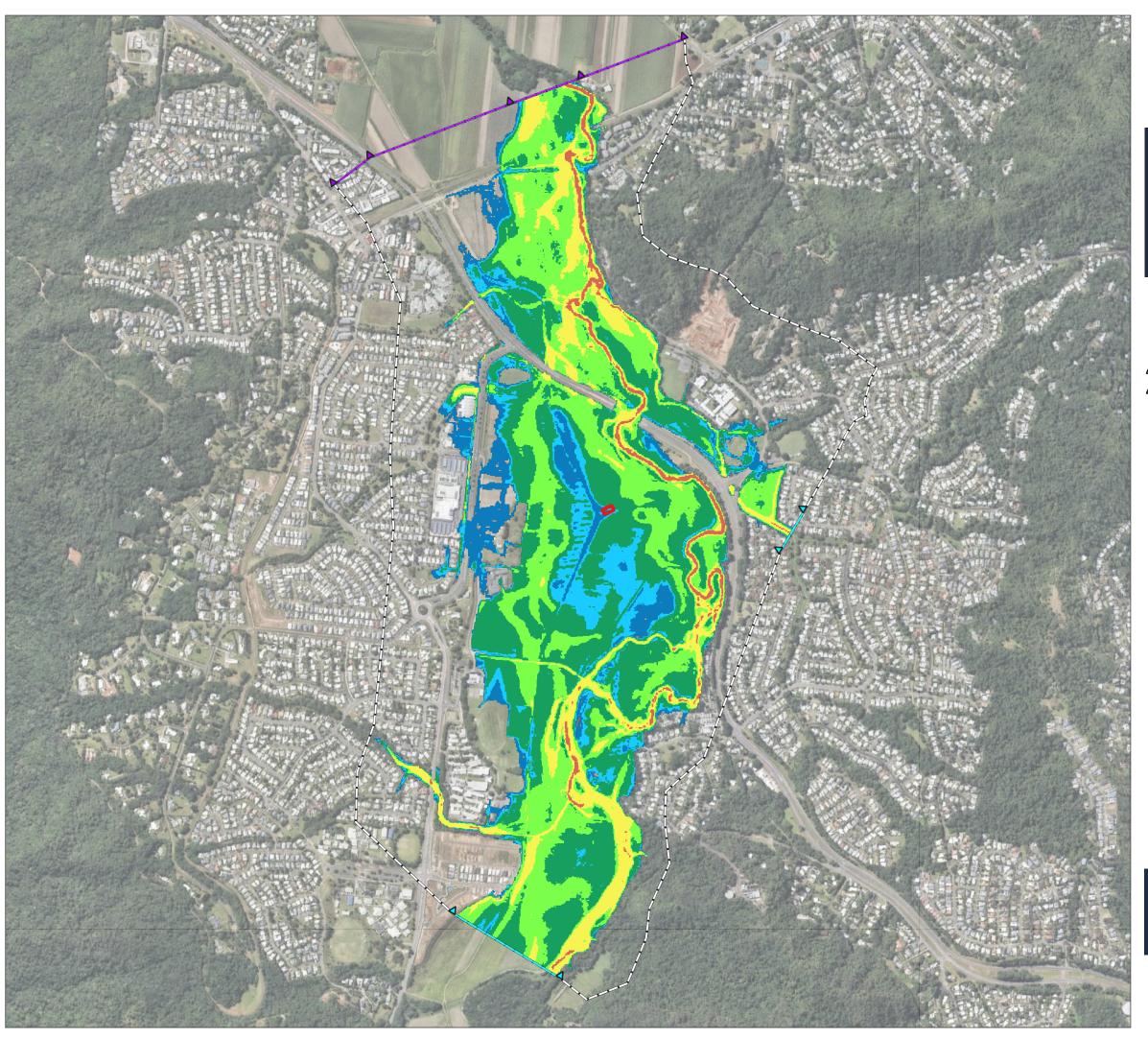
5.00 - 6.00

> 6.00

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development Peak Hazard 50% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Hazard (ZAEM1):

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

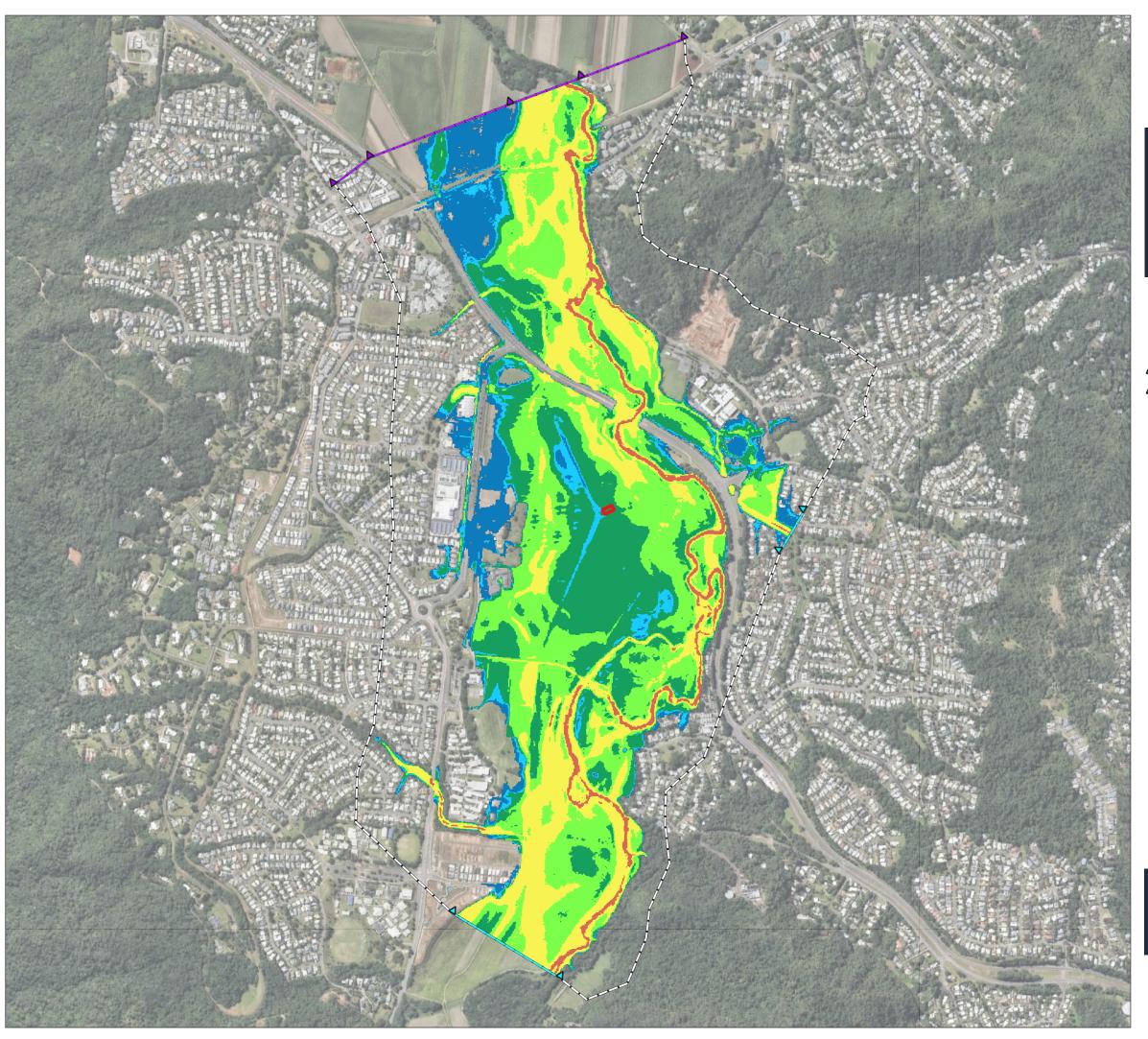
H5 - Unsafe for People & Vehicles (Buildings Require

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development Peak Hazard 20% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Hazard (ZAEM1):

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles (Buildings Require

H6 - Not Suitable for People, Vehicles or Buildings

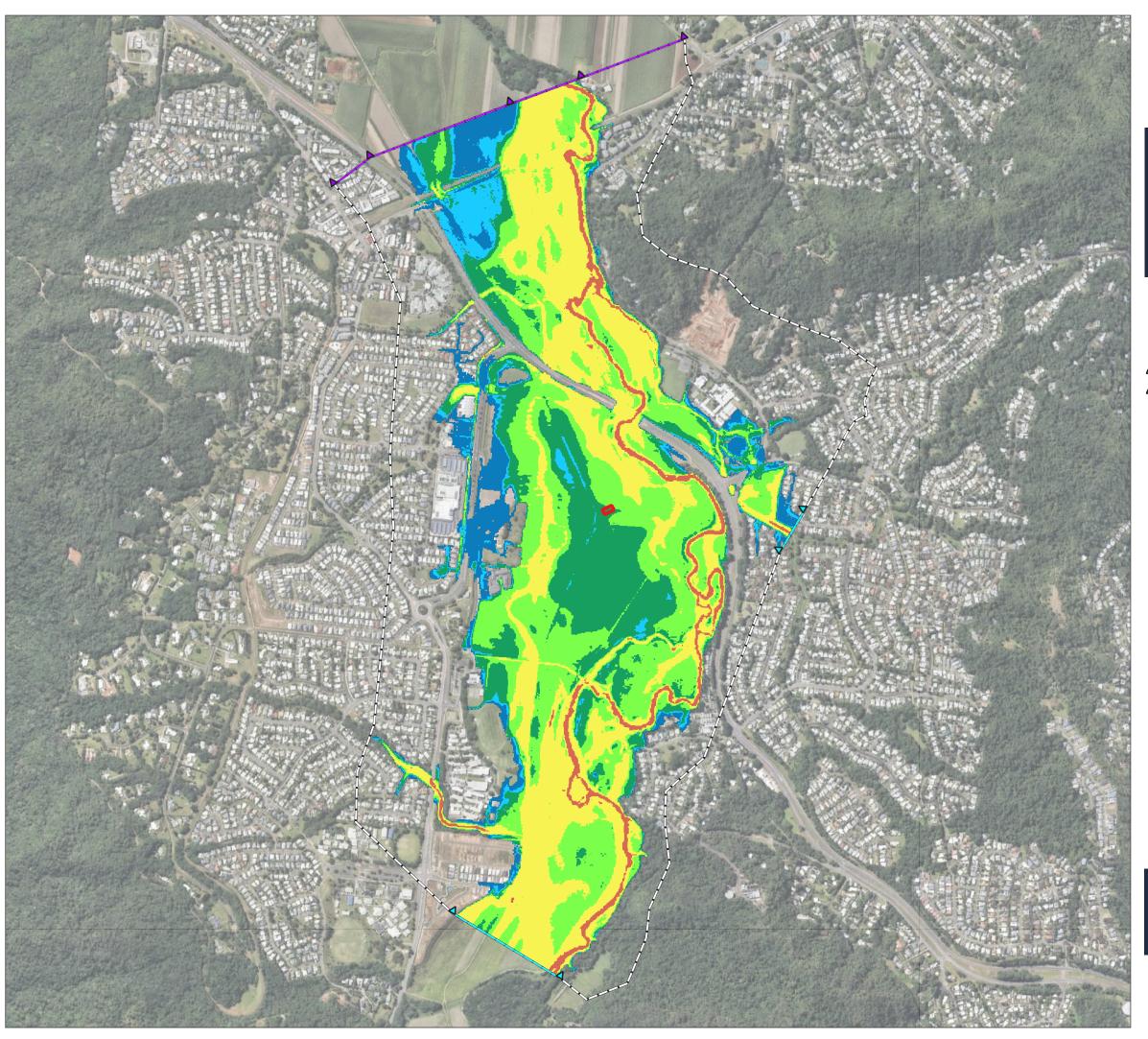
Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024

1,000 m

500





Pre-Development Peak Hazard 10% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Hazard (ZAEM1):

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

114 - Offsale for Feople & Verlicles

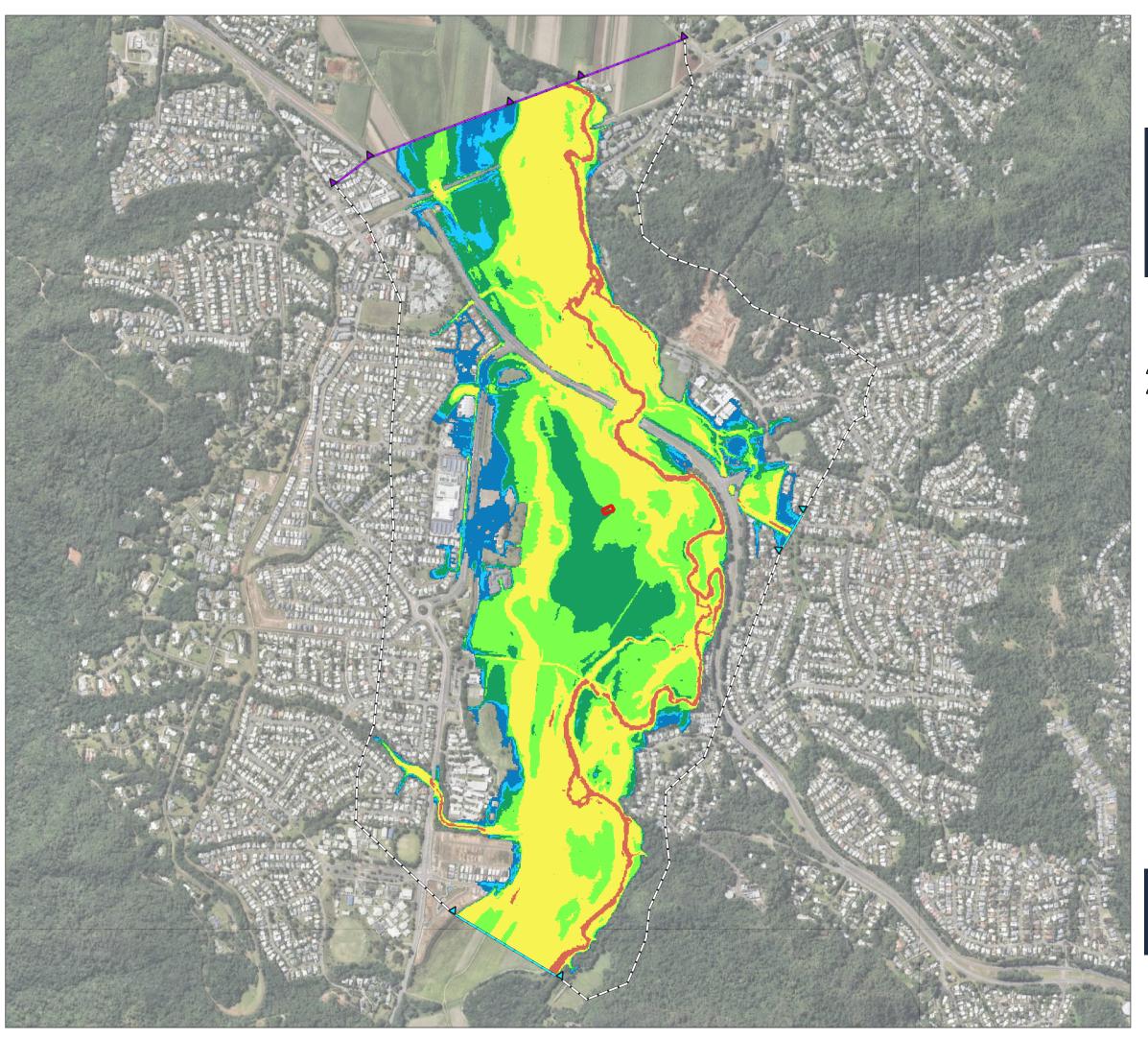
H5 - Unsafe for People & Vehicles (Buildings Require

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development Peak Hazard 5% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Hazard (ZAEM1):

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

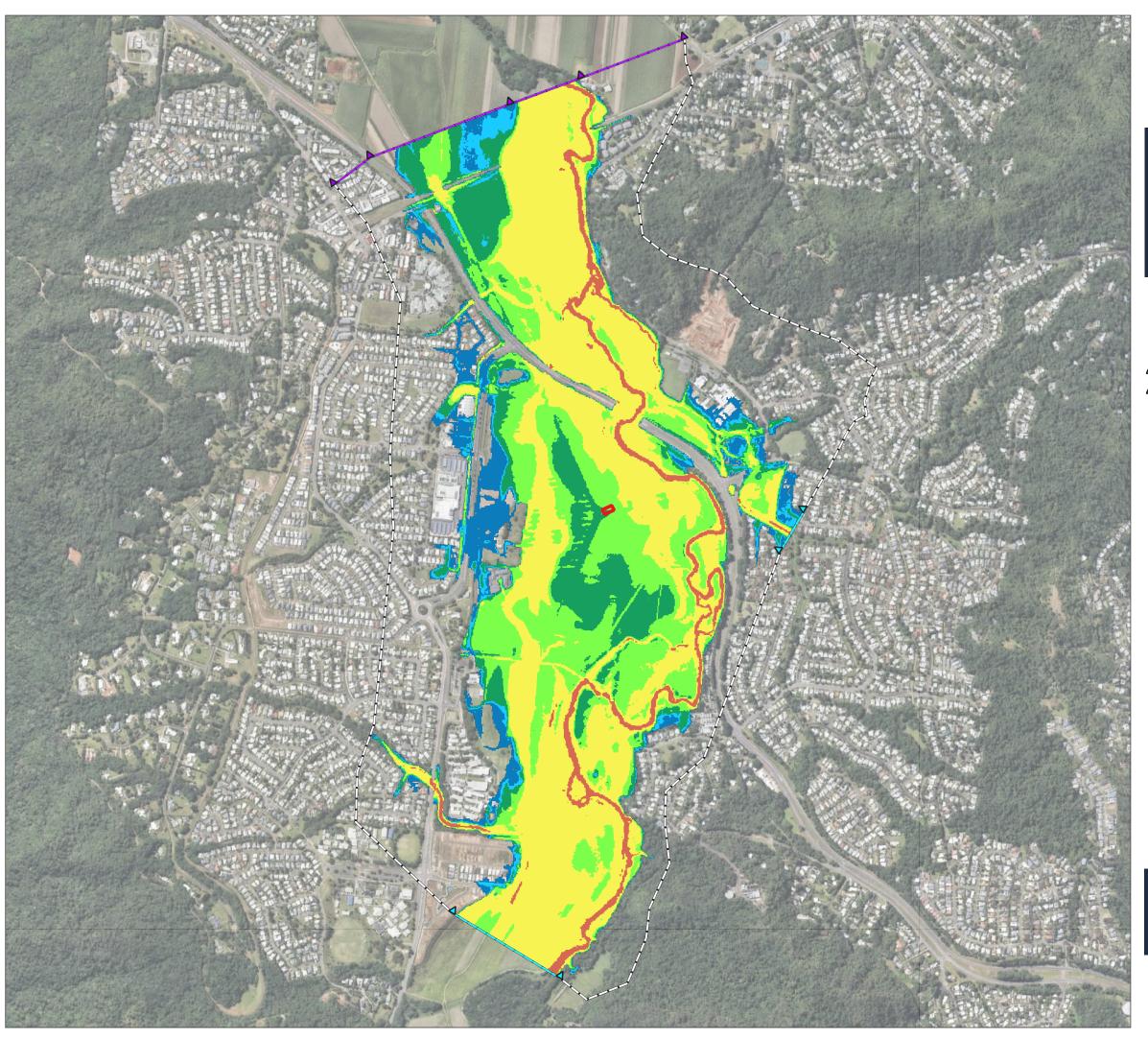
H5 - Unsafe for People & Vehicles (Buildings Require

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development Peak Hazard 2% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Hazard (ZAEM1):

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

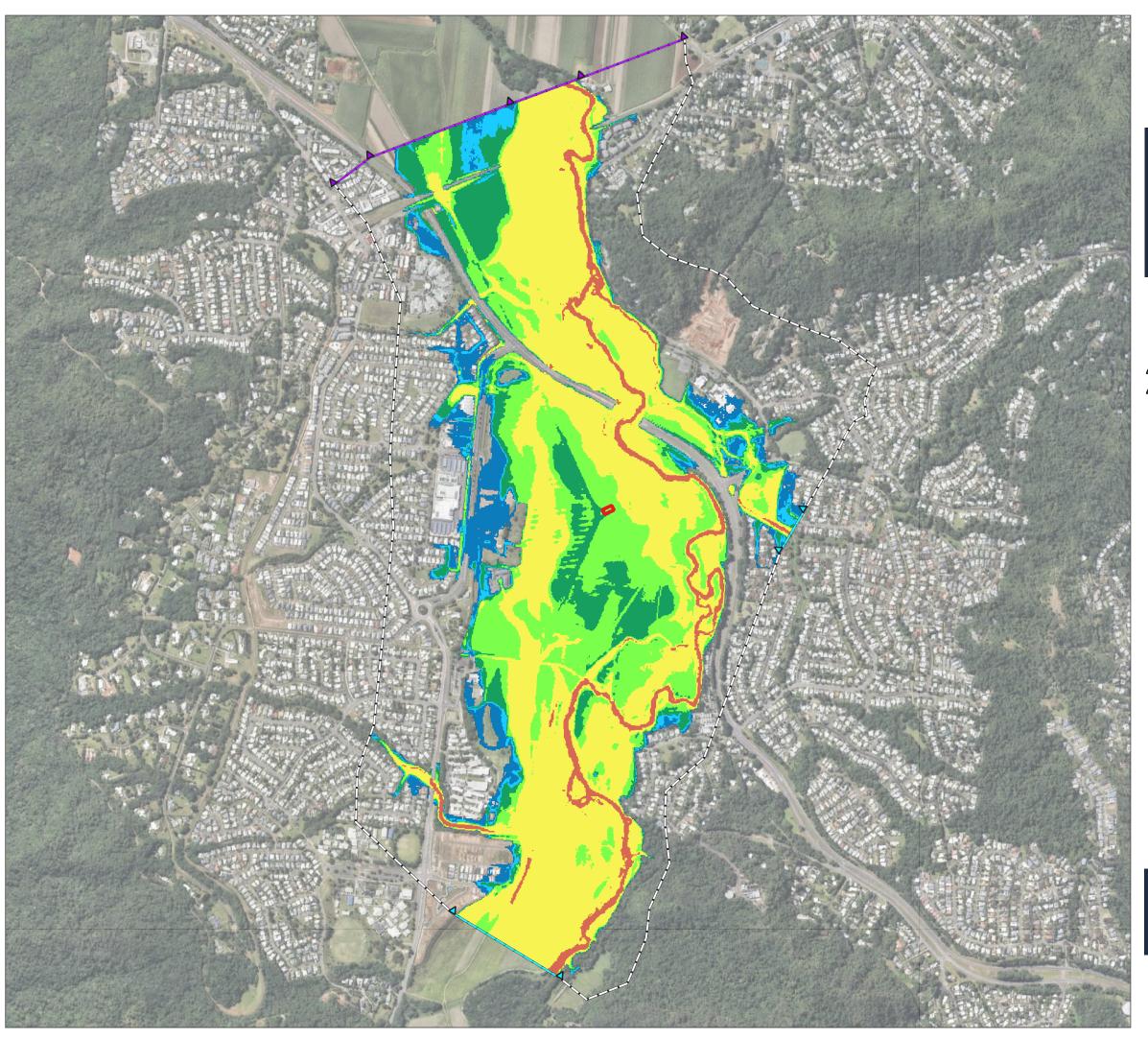
H5 - Unsafe for People & Vehicles (Buildings Require

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development Peak Hazard 1% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Hazard (ZAEM1):

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

114 - Offsale for Feople & Verlicles

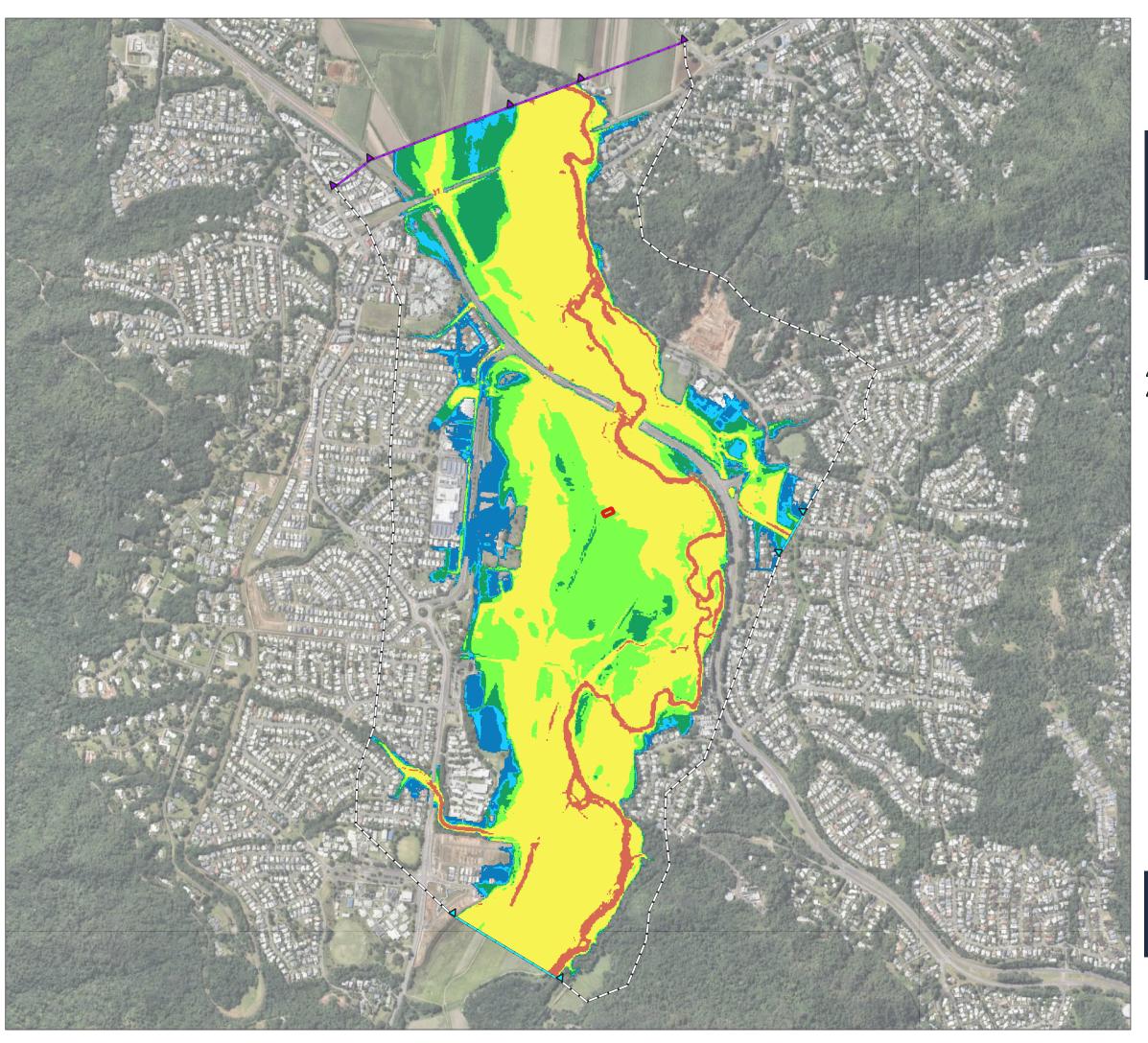
 $\ensuremath{\mathsf{H5}}$ - Unsafe for People & Vehicles (Buildings Require

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Pre-Development Peak Hazard 0.5% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Hazard (ZAEM1):

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles (Buildings Require

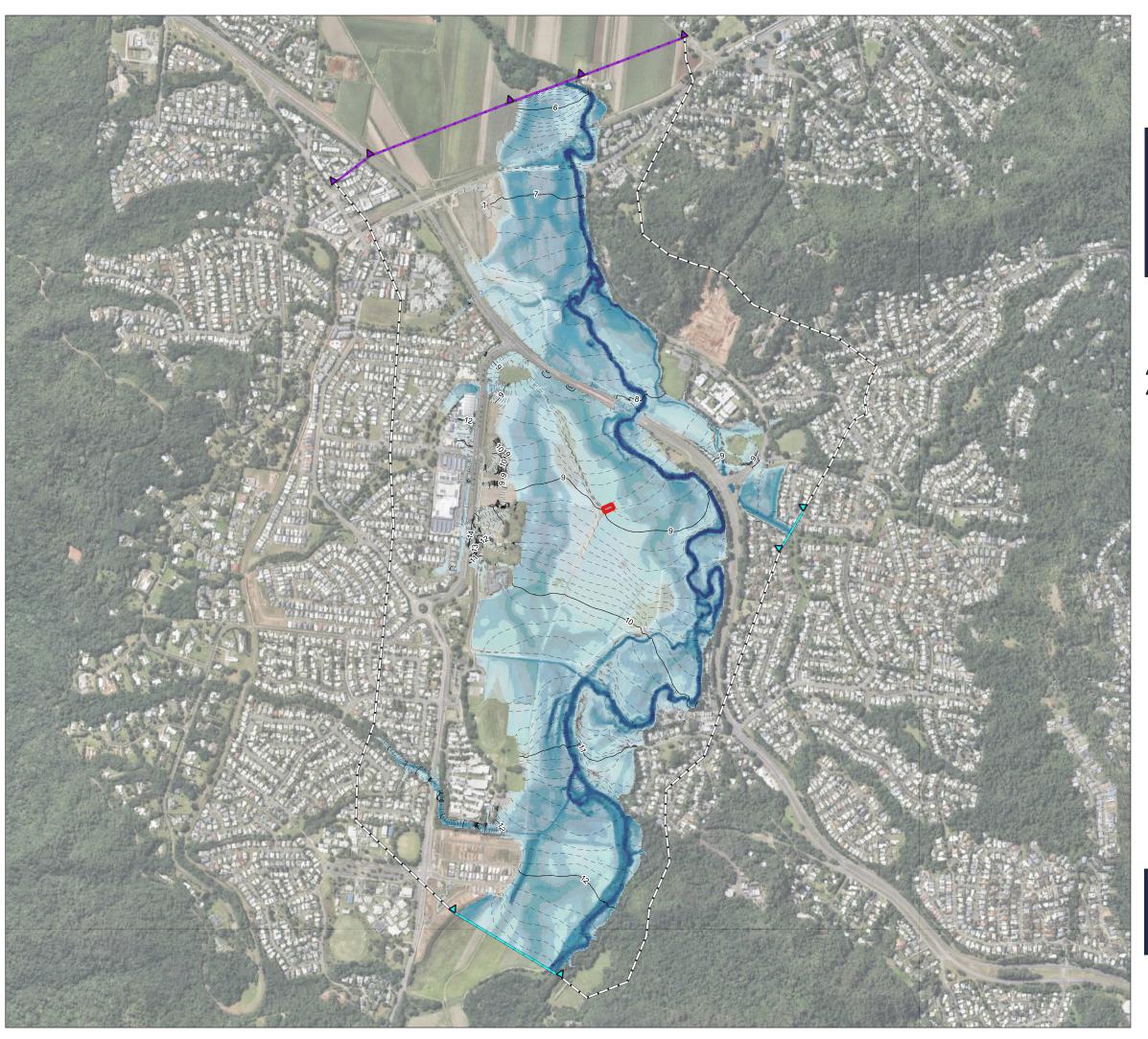
H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Redlynch Site

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024

APPENDIX B DEVELOPED CASE FLOOD MAPS





Post-Development Peak Depth and Water Level Contours 50% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

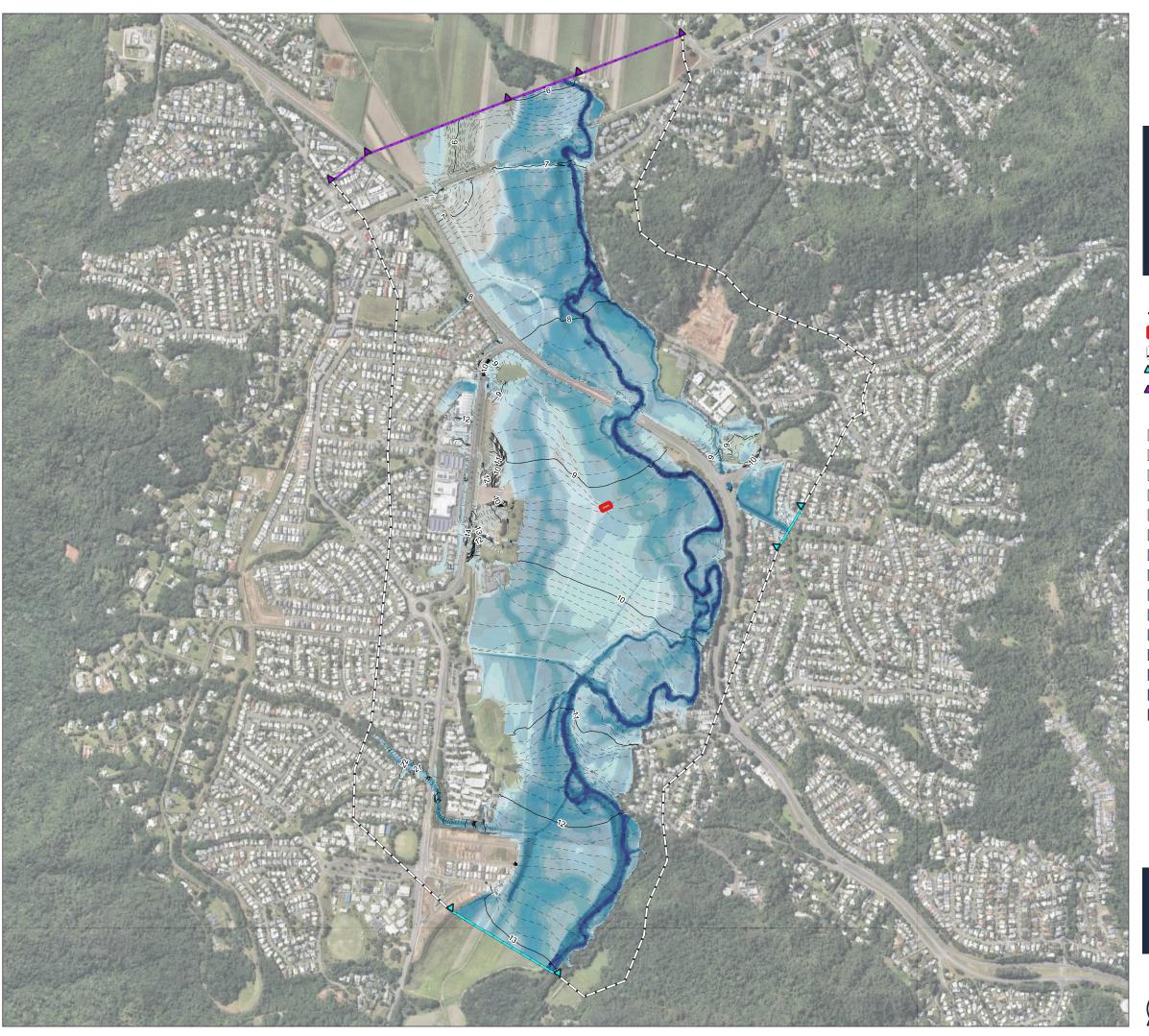
> 5.0

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55

Job No: 10880 Date: 31/01/2025





Post-Development Peak Depth and Water Level Contours 20% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

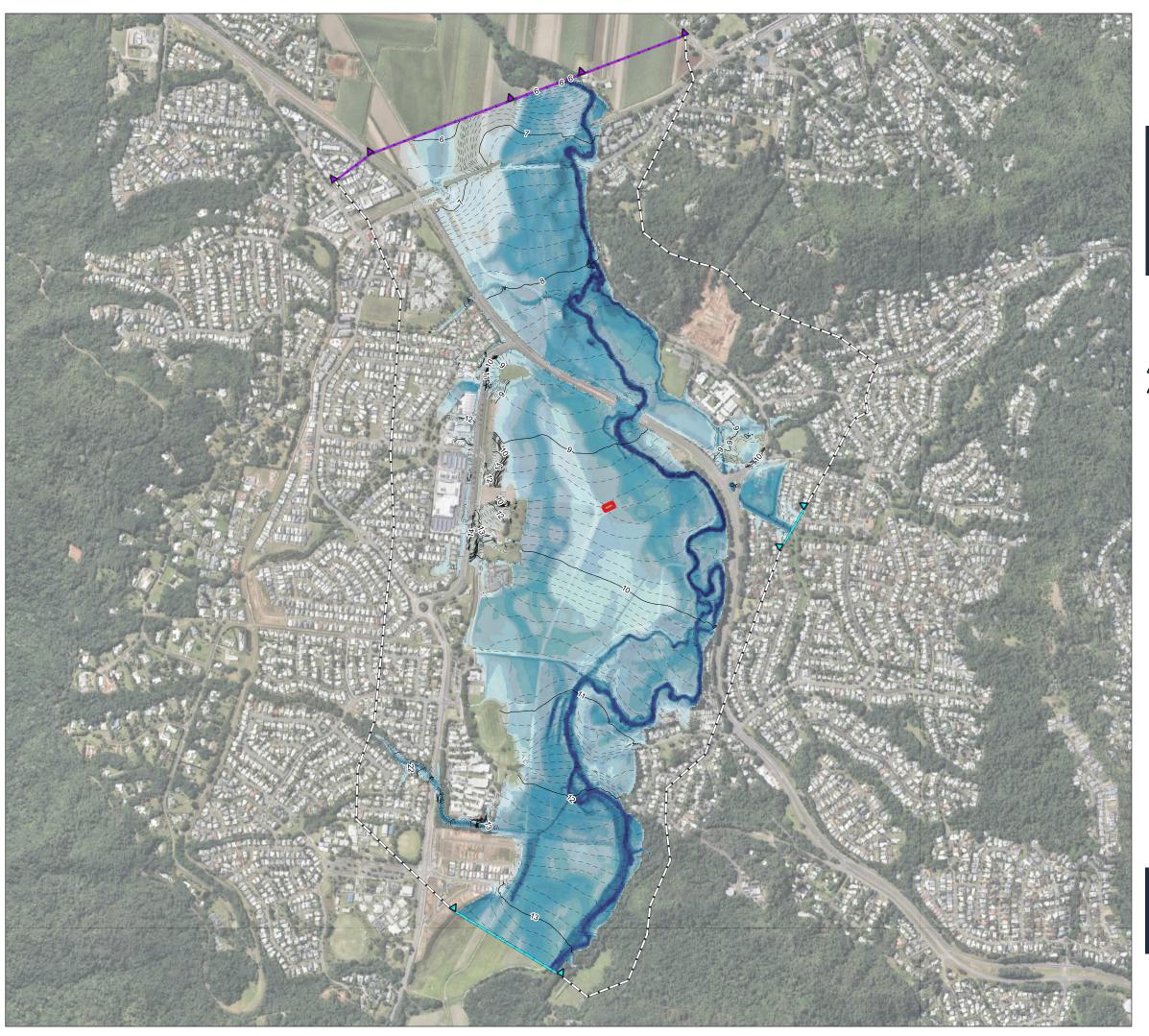
4.5 - 5.0 > 5.0

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55

Job No: 10880 Date: 31/01/2025





Post-Development Peak Depth and Water Level Contours 10% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

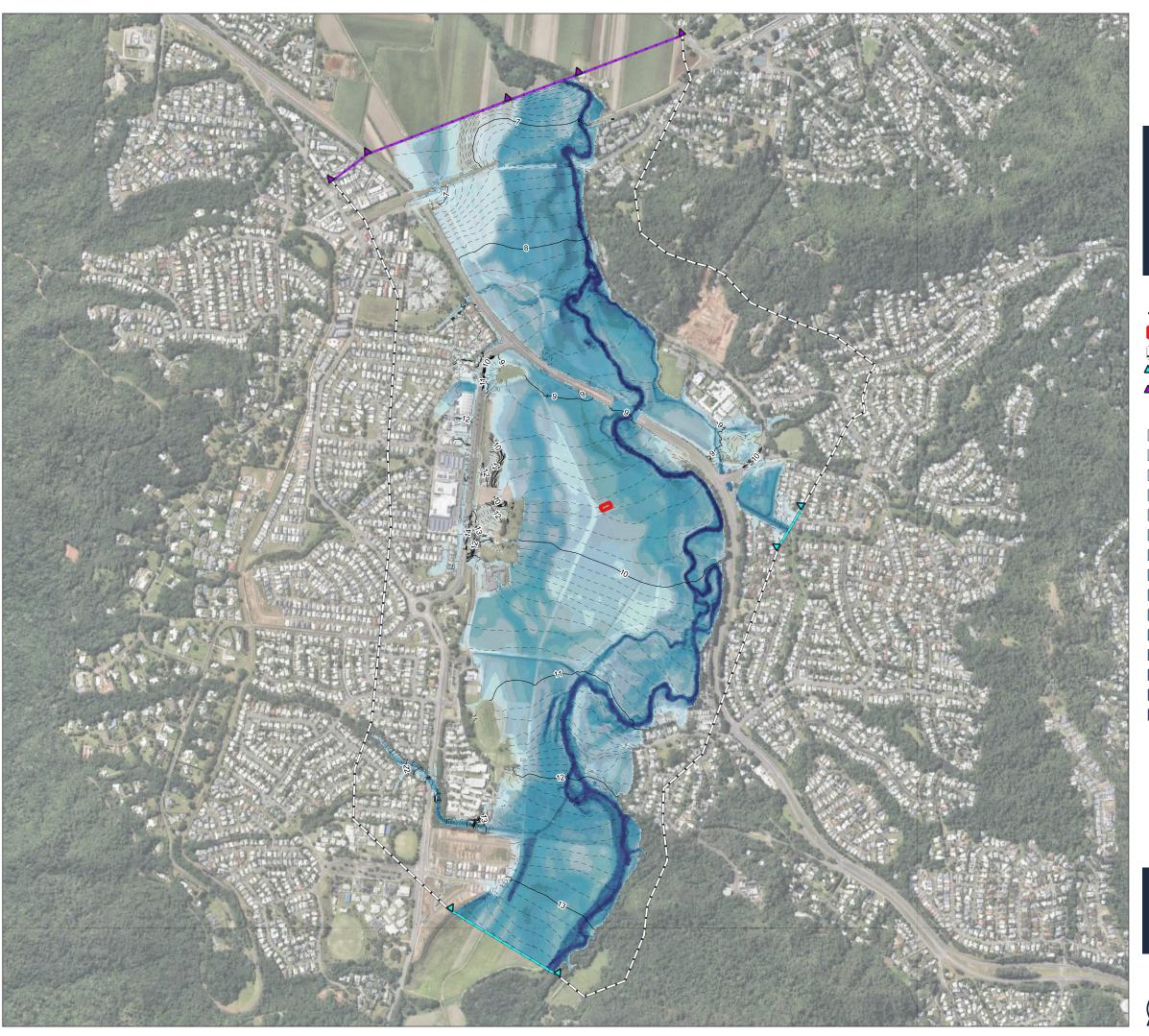
> 5.0

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55

Job No: 10880 Date: 31/01/2025





Post-Development Peak Depth and Water Level Contours 5% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

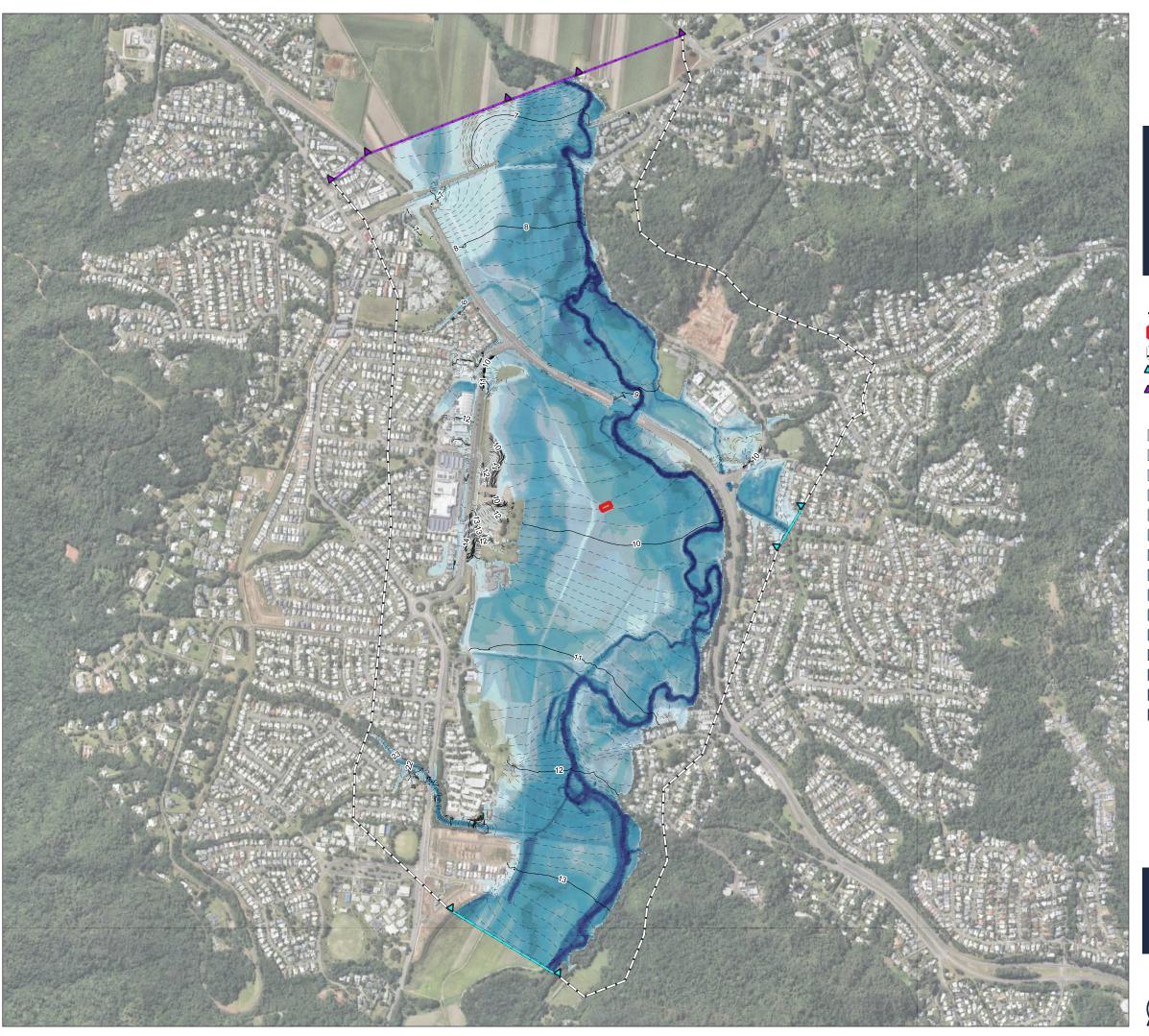
> 5.0

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55

Job No: 10880 Date: 31/01/2025





Post-Development Peak Depth and Water Level Contours 2% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

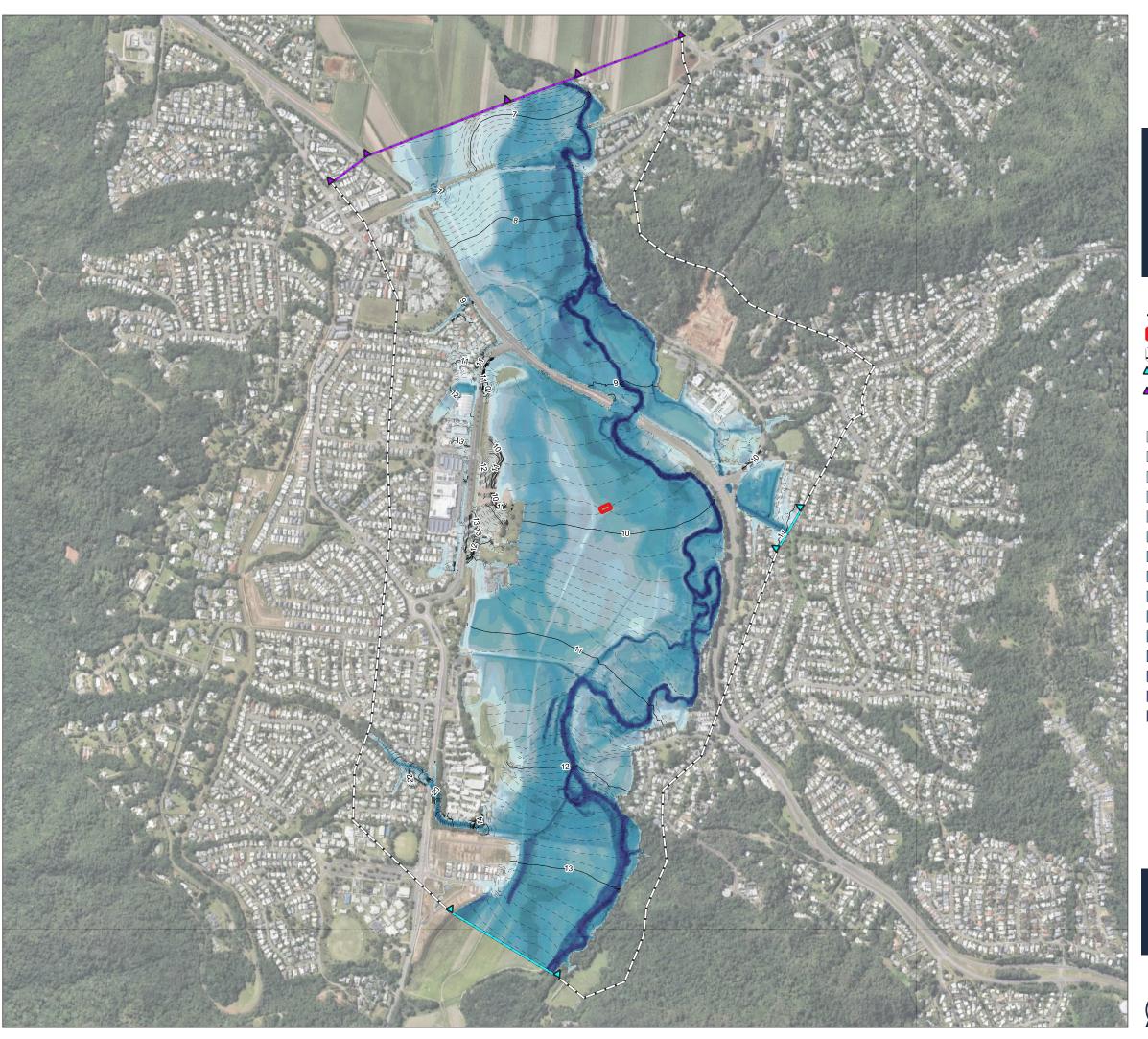
> 5.0

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55

Job No: 10880 Date: 31/01/2025





Post-Development Peak Depth and Water Level Contours 1% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

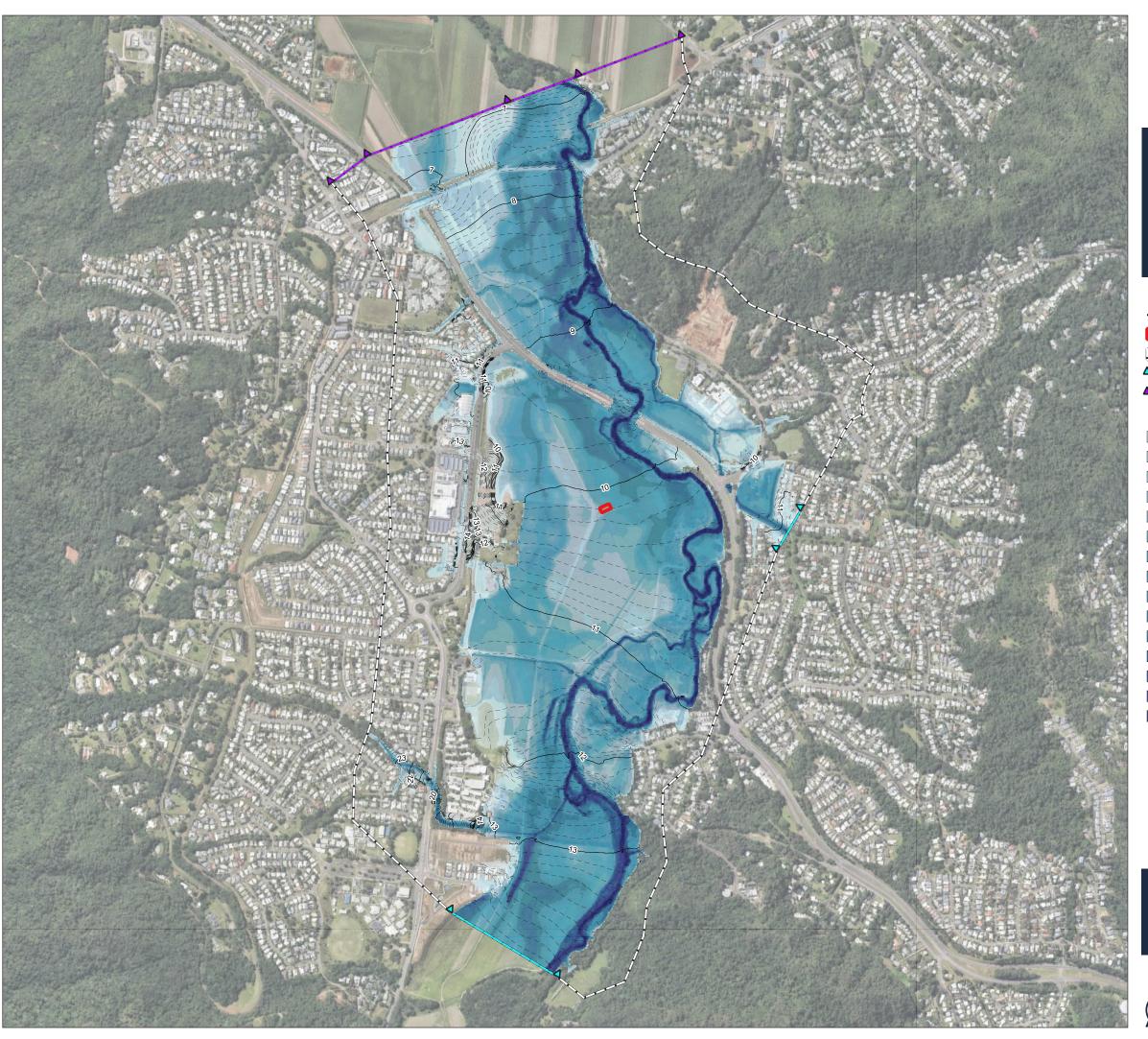
4.5 - 5.0

> 5.0

Powerlink Qld Development Redlynch

A3 Scale: 1:14000 GDA Zone / MGA Zone 55

Job No: 10880 Date: 31/01/2025





Post-Development Peak Depth and Water Level Contours 0.5% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

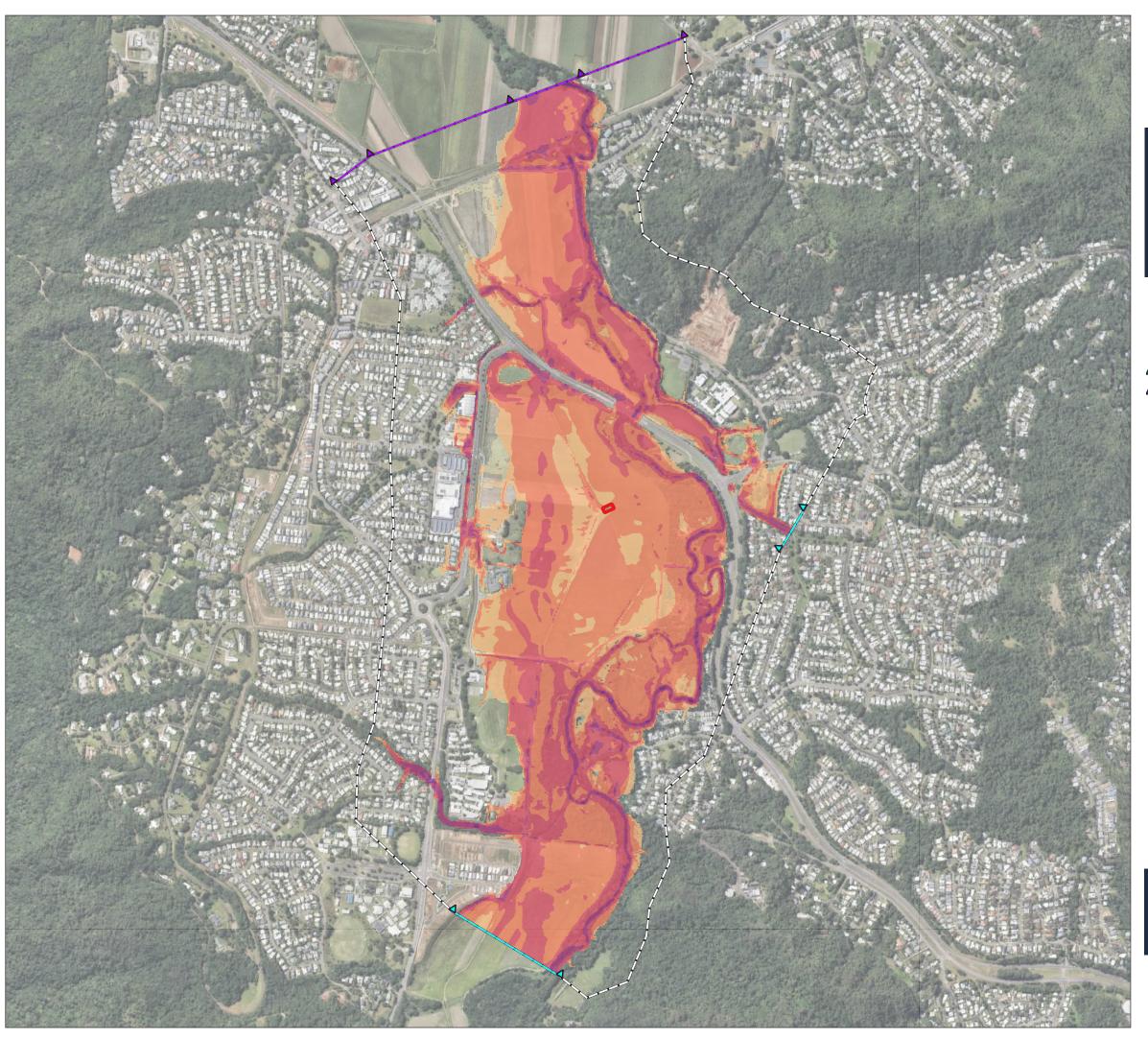
> 5.0

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55

Job No: 10880 Date: 31/01/2025





Post-Development
Peak Depth and Water Level
Contours 50% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

4.00 - 5.00

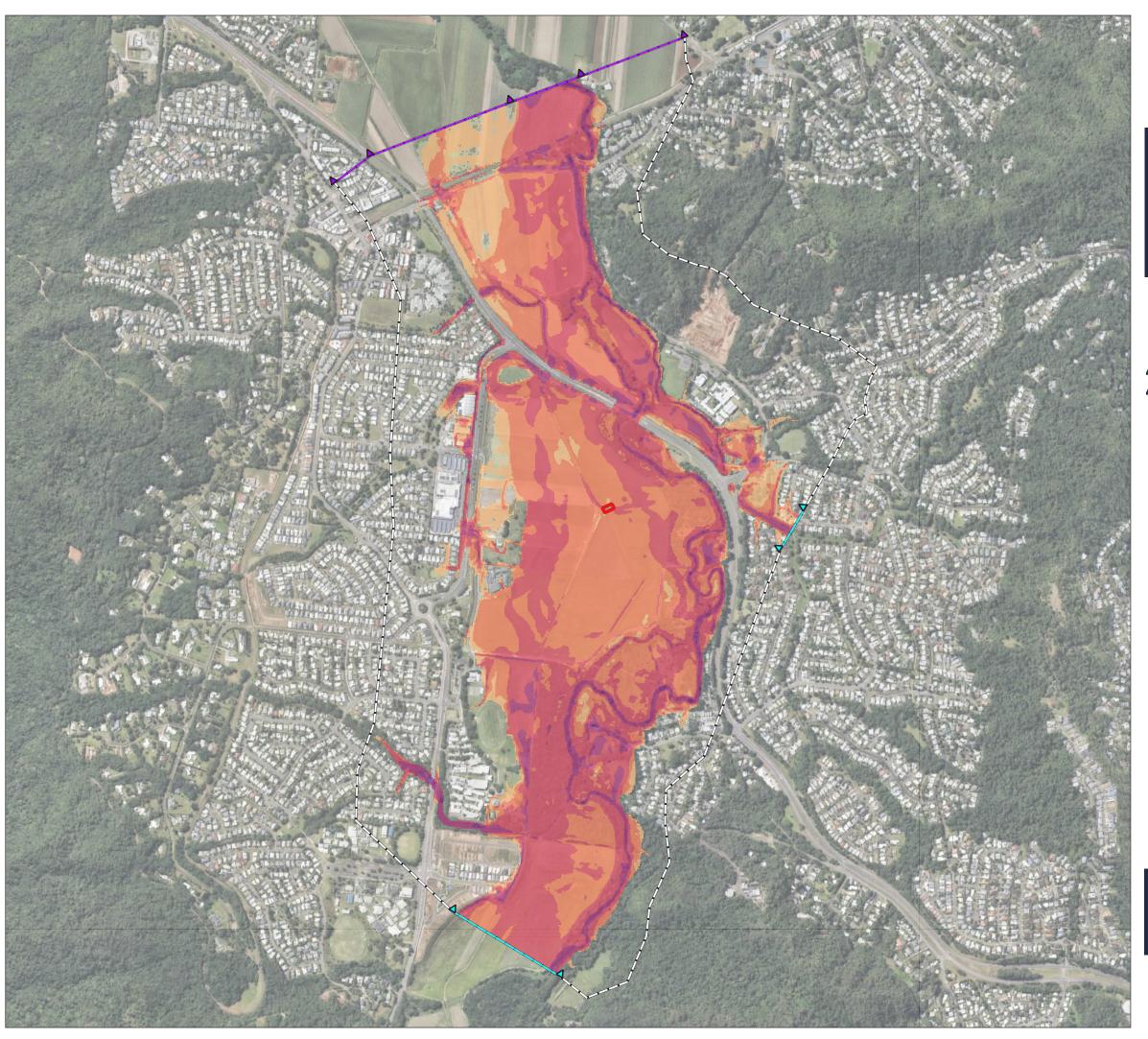
5.00 - 6.00

> 6.00

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

Job No: 10880 Date: 31/01/2025 GDA Zone / MGA Zone 55





Post-Development
Peak Depth and Water Level
Contours 20% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

4.00 - 5.00

5.00 - 6.00

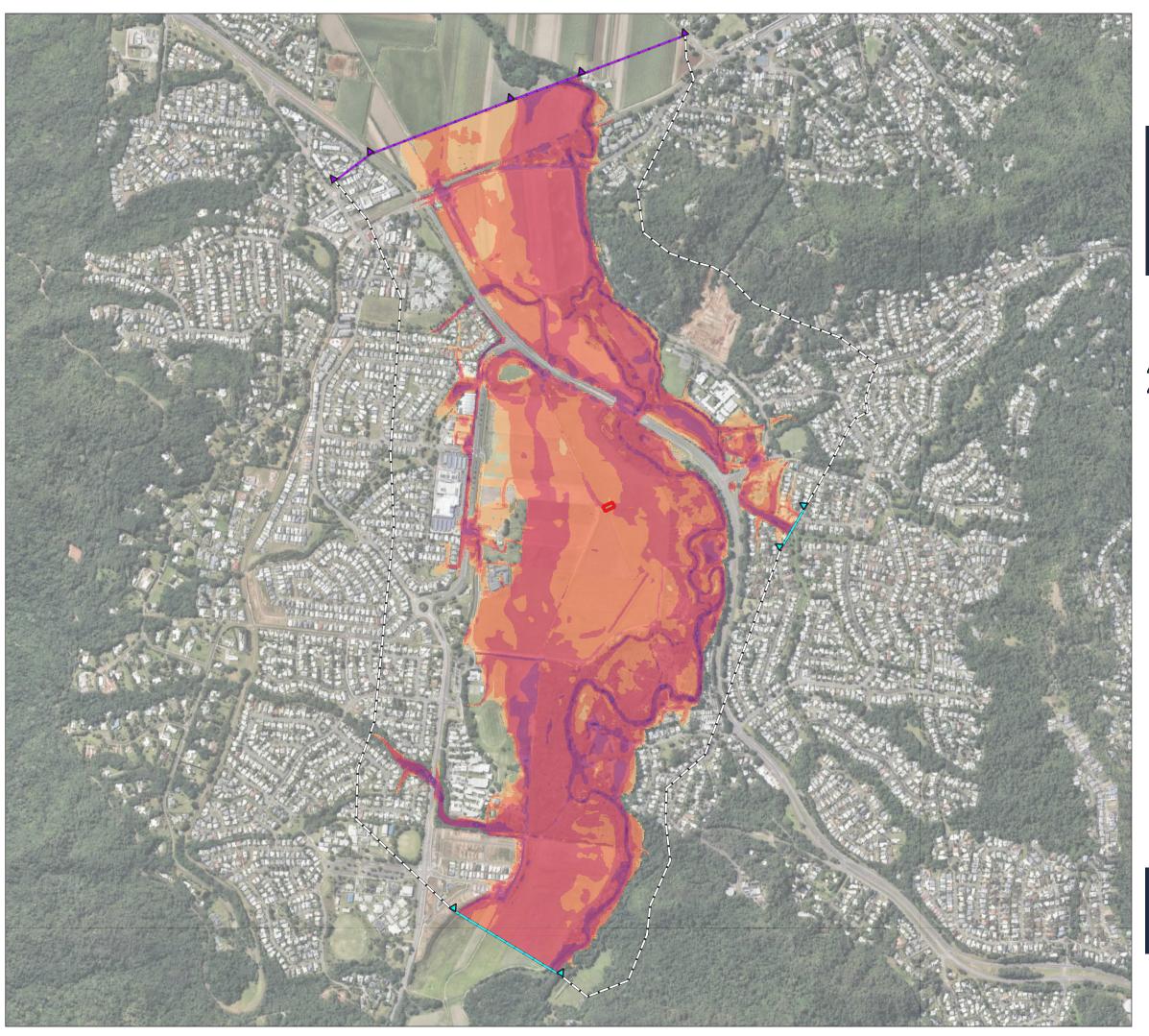
> 6.00

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55

Job No: 10880 Date: 31/01/2025





Post-Development Peak Velocity 10% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

4.00 - 5.00

5.00 - 6.00

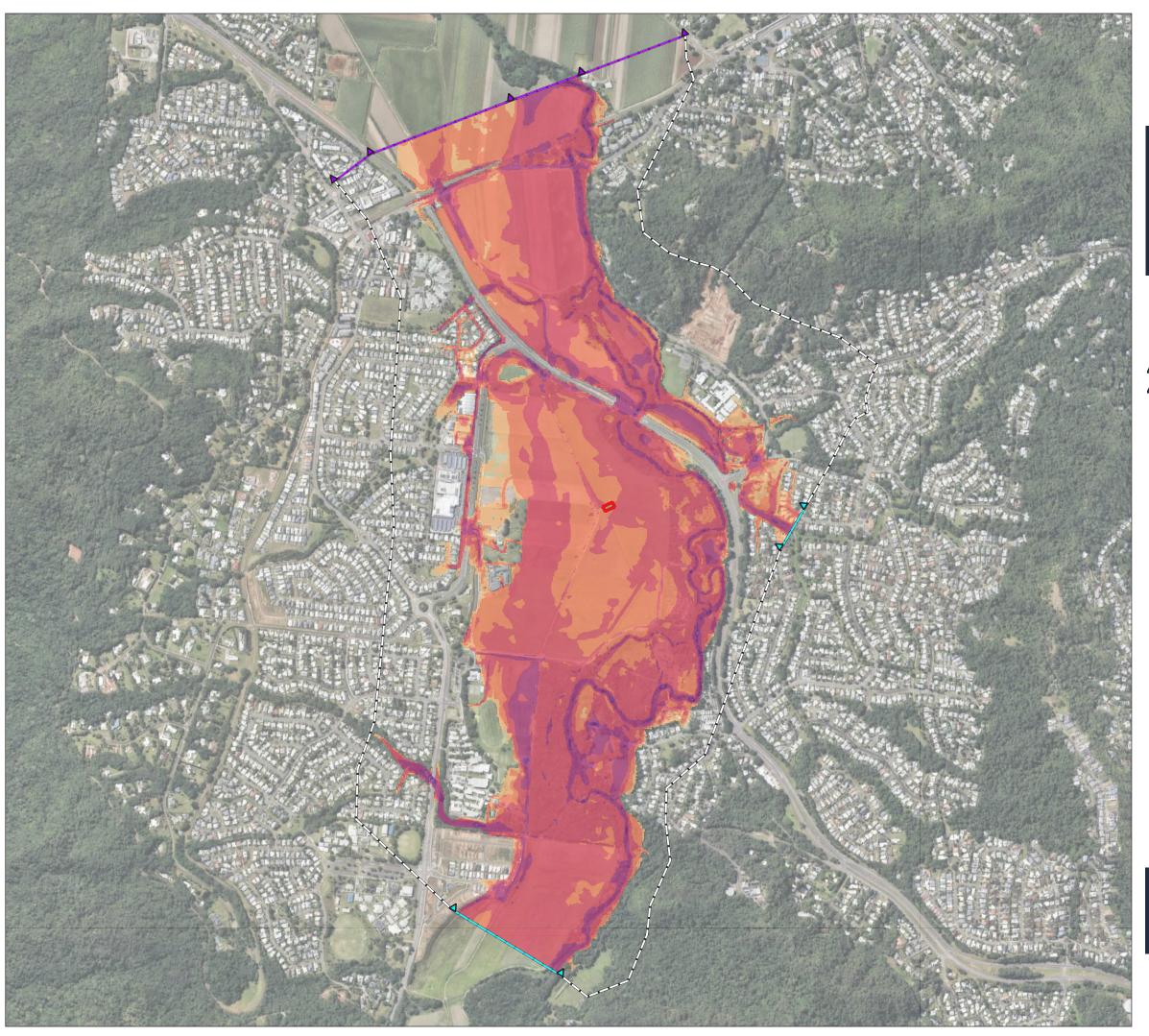
> 6.00

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55

Job No: 10880 Date: 31/01/2025





Post-Development Peak Velocity 5% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Velocity (m/s):

<= 0.05

_ 0.00

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00 3.00 - 4.00

4.00 - 5.00 5.00 - 6.00

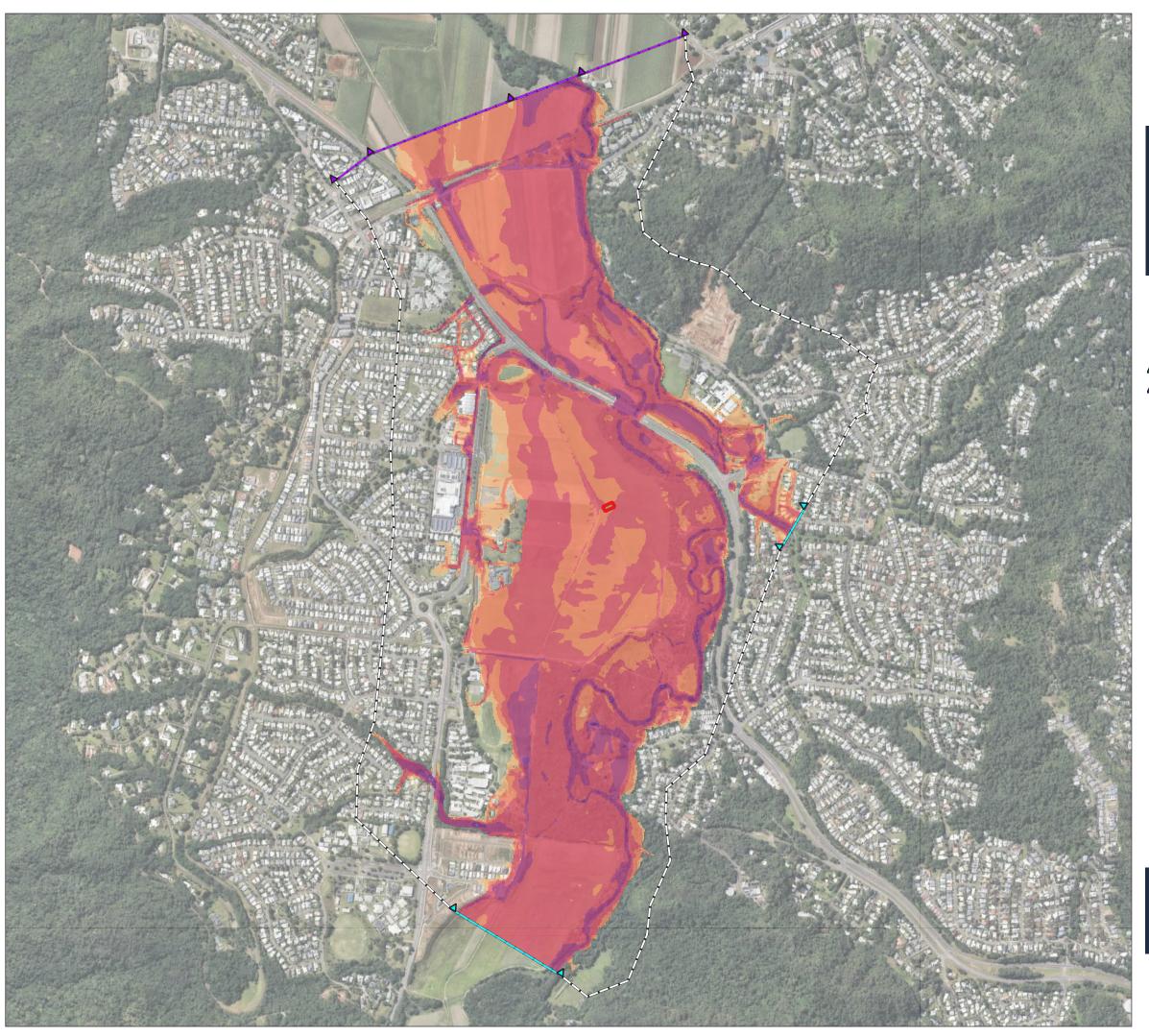
> 6.00

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55

Job No: 10880 Date: 31/01/2025





Post-Development Peak Velocity 2% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary △ △ Outflow Boundary

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

4.00 - 5.00

5.00 - 6.00

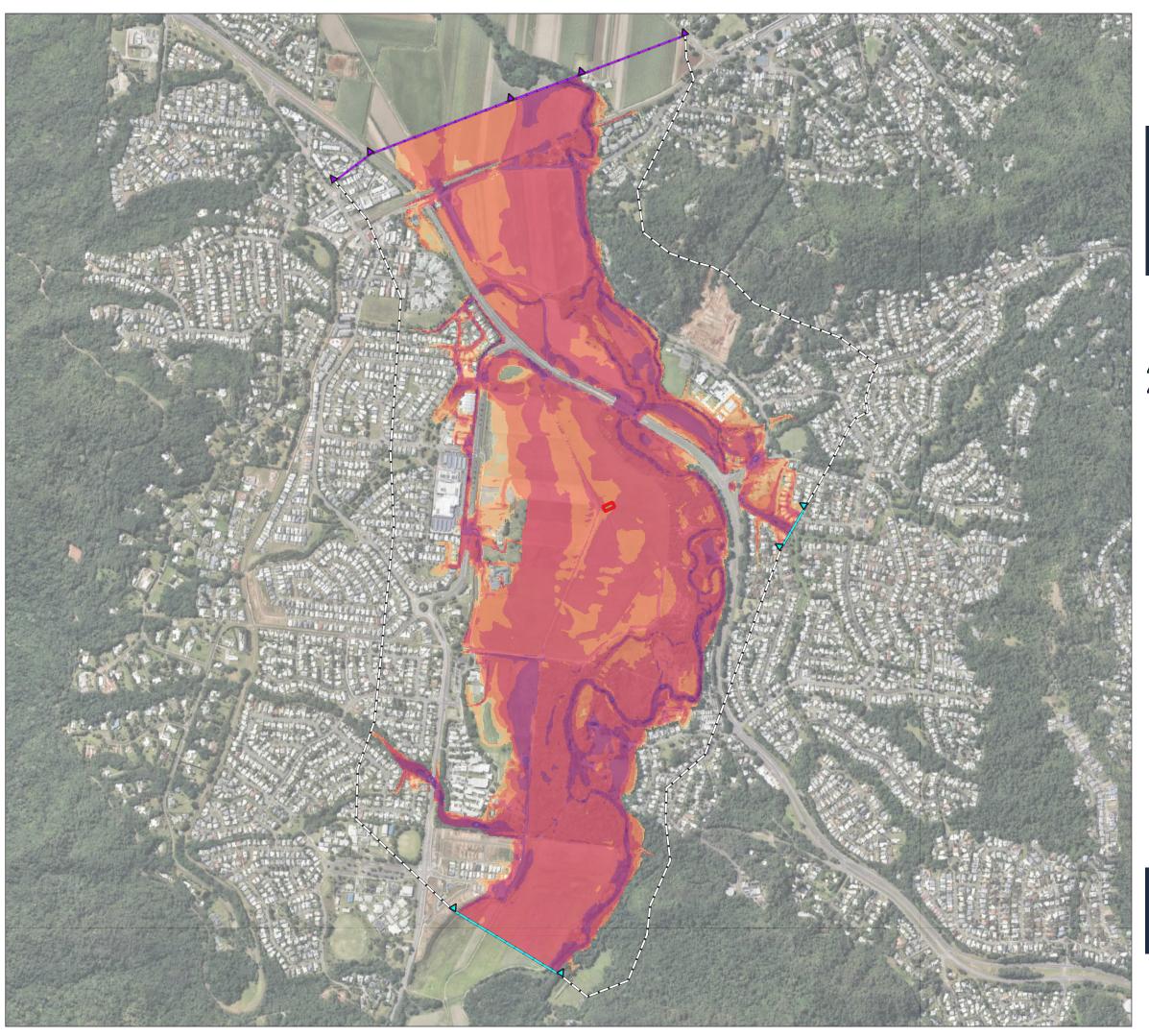
> 6.00

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55

Job No: 10880 Date: 31/01/2025





Post-Development Peak Velocity 1% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

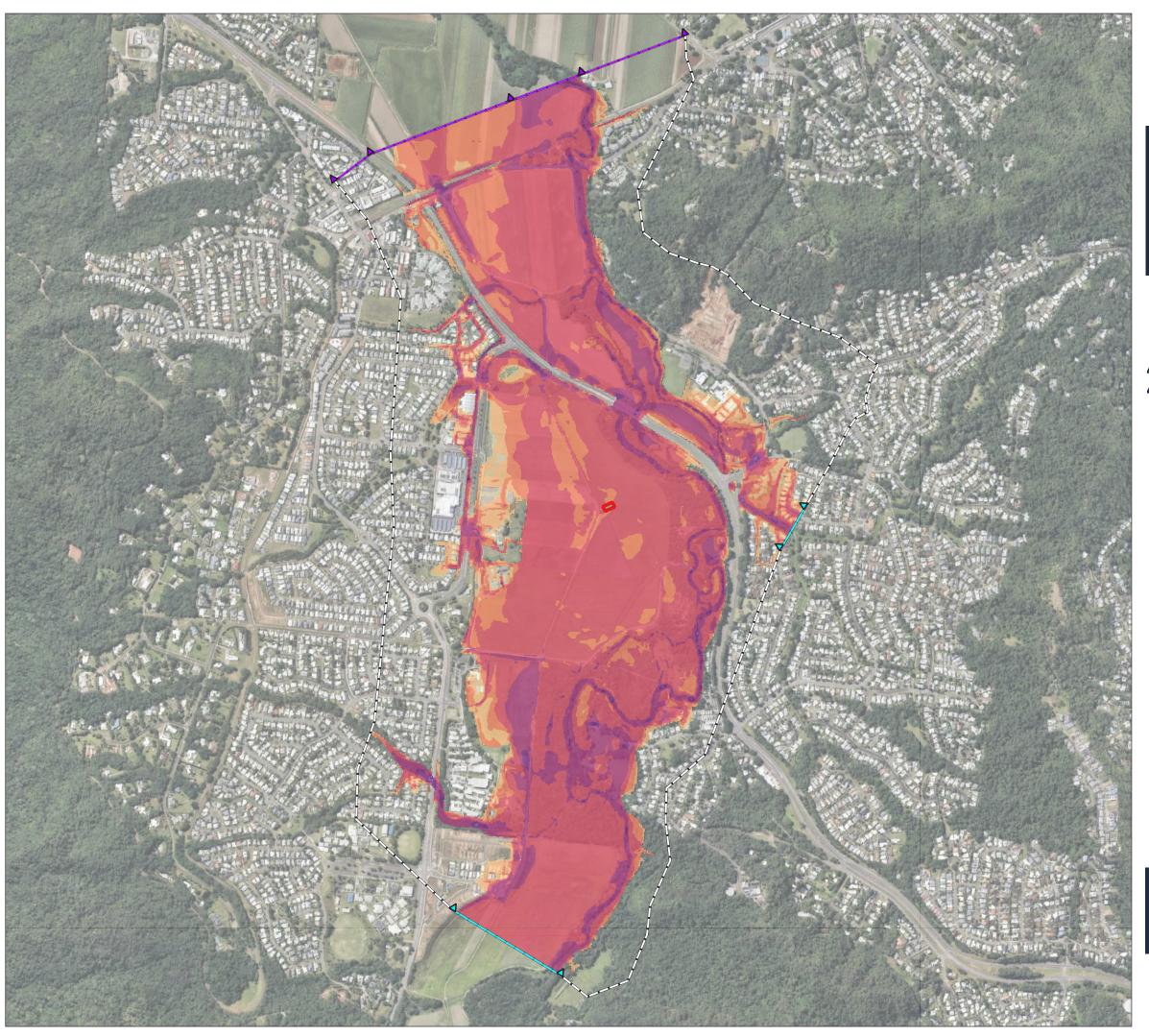
4.00 - 5.00 5.00 - 6.00

> 6.00

Powerlink Qld Development Redlynch

A3 Scale: 1:14000 GDA Zone / MGA Zone 55

Job No: 10880 Date: 31/01/2025





Post-Development Peak Velocity 0.5% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

4.00 - 5.00

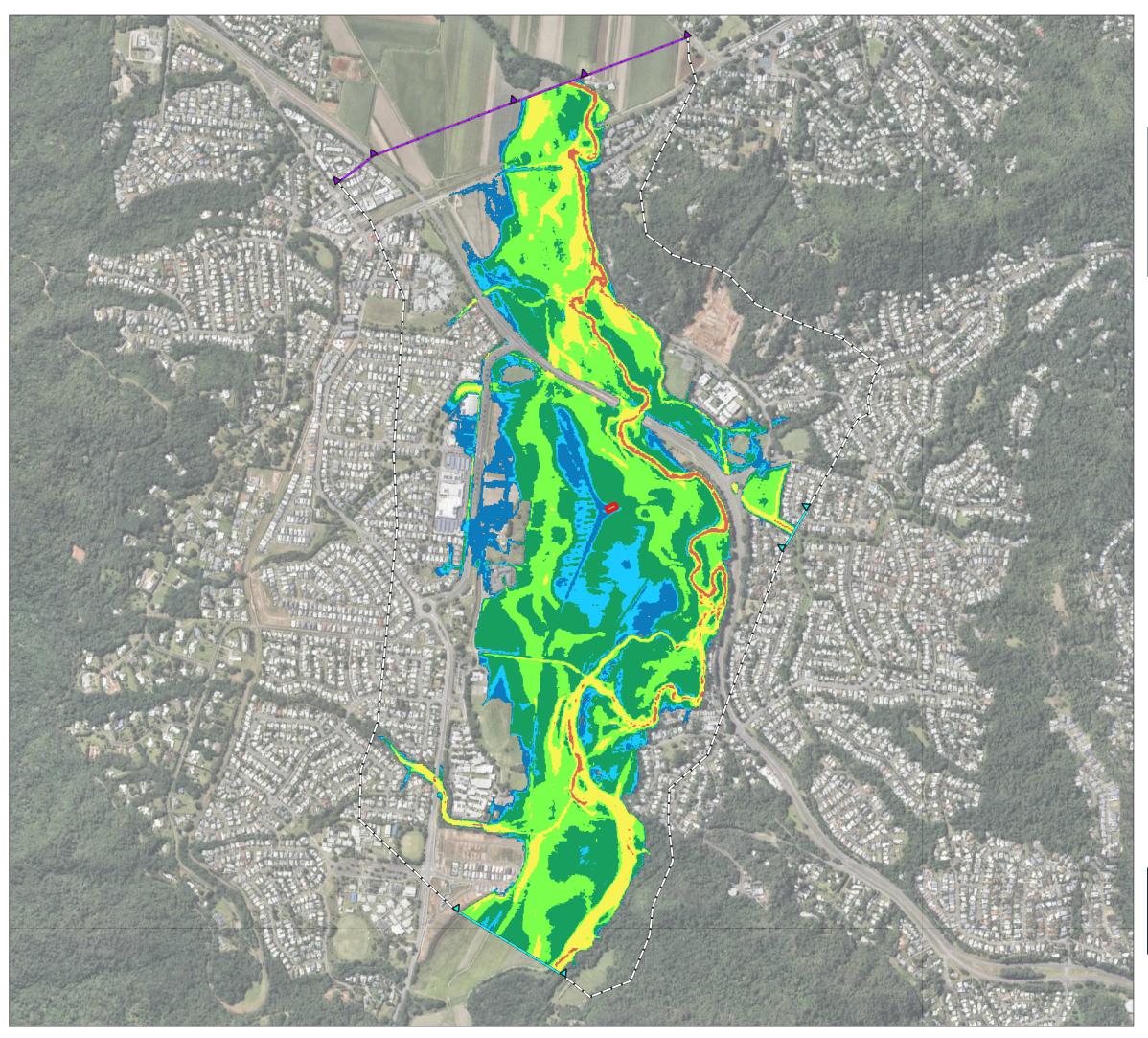
5.00 - 6.00

> 6.00

Powerlink Qld Development Redlynch

A3 Scale: 1:14000 GDA Zone / MGA Zone 55

Job No: 10880 Date: 31/01/2025





Post-Development Peak Hazard 50% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary △ △ Outflow Boundary

Peak Hazard (ZAEM1):

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

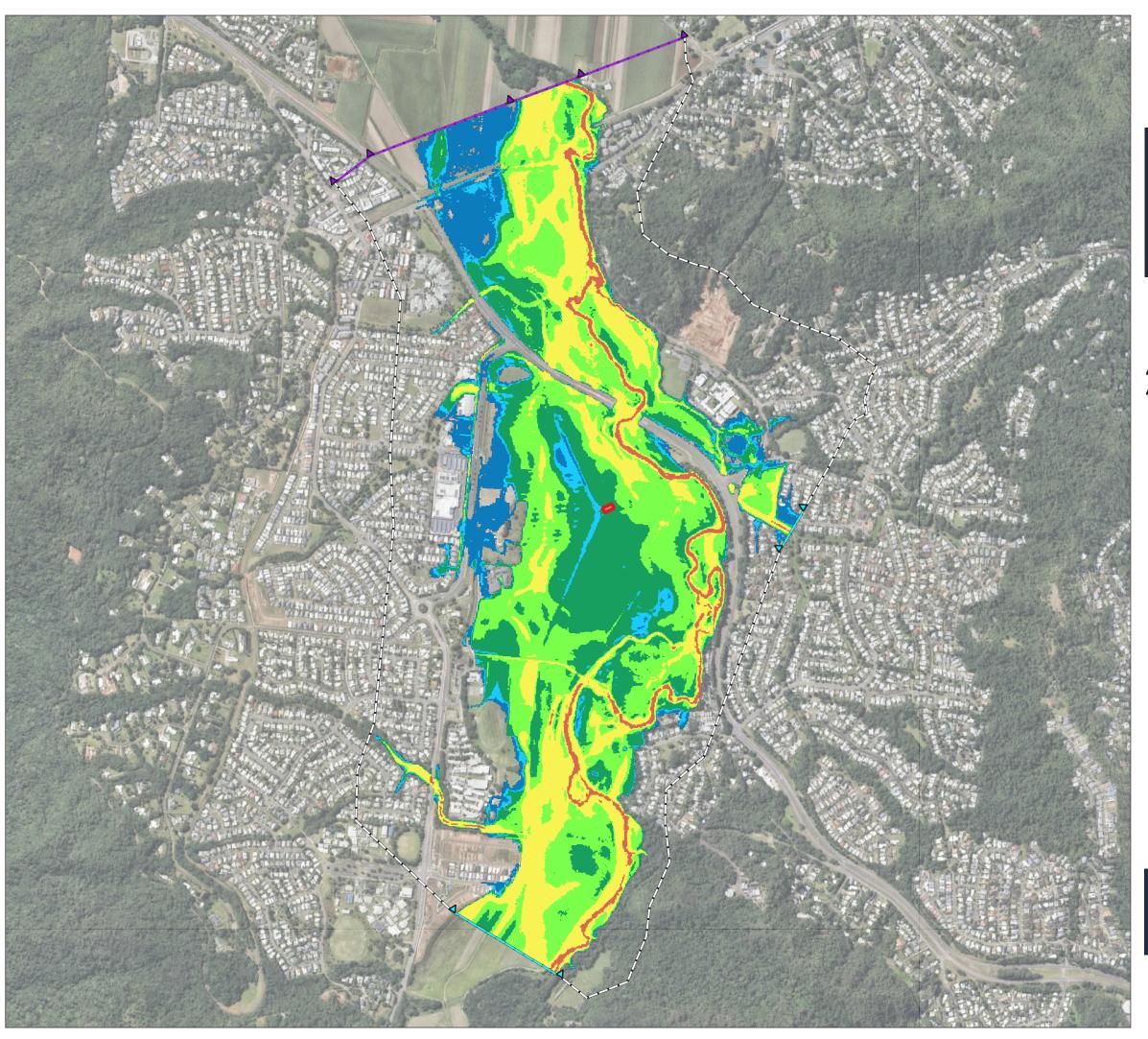
H5 - Unsafe for People & Vehicles (Buildings Require

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55





Post-Development Peak Hazard 20% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Hazard (ZAEM1):

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

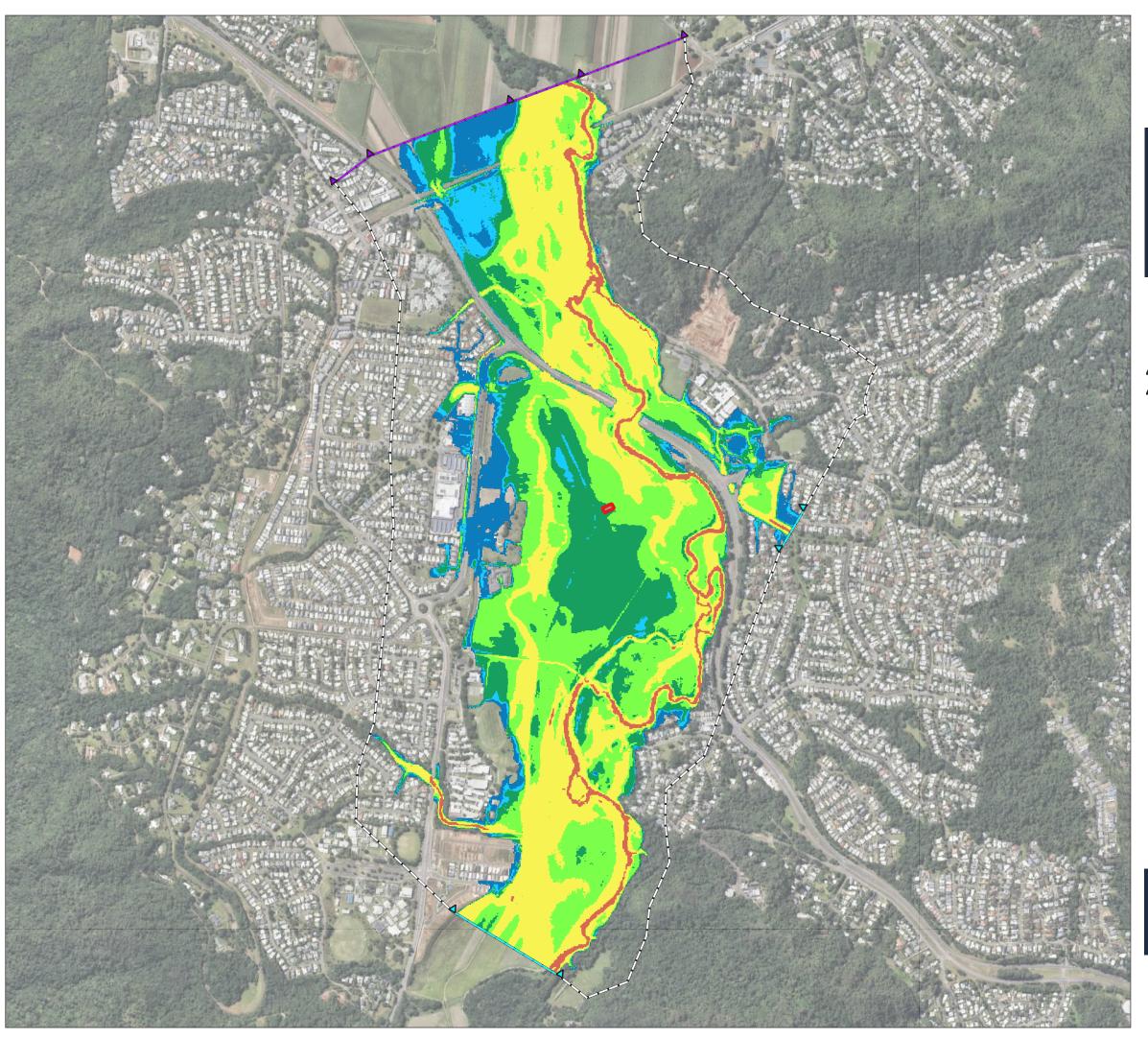
H5 - Unsafe for People & Vehicles (Buildings Require

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55





Post-Development Peak Hazard 10% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Hazard (ZAEM1):

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

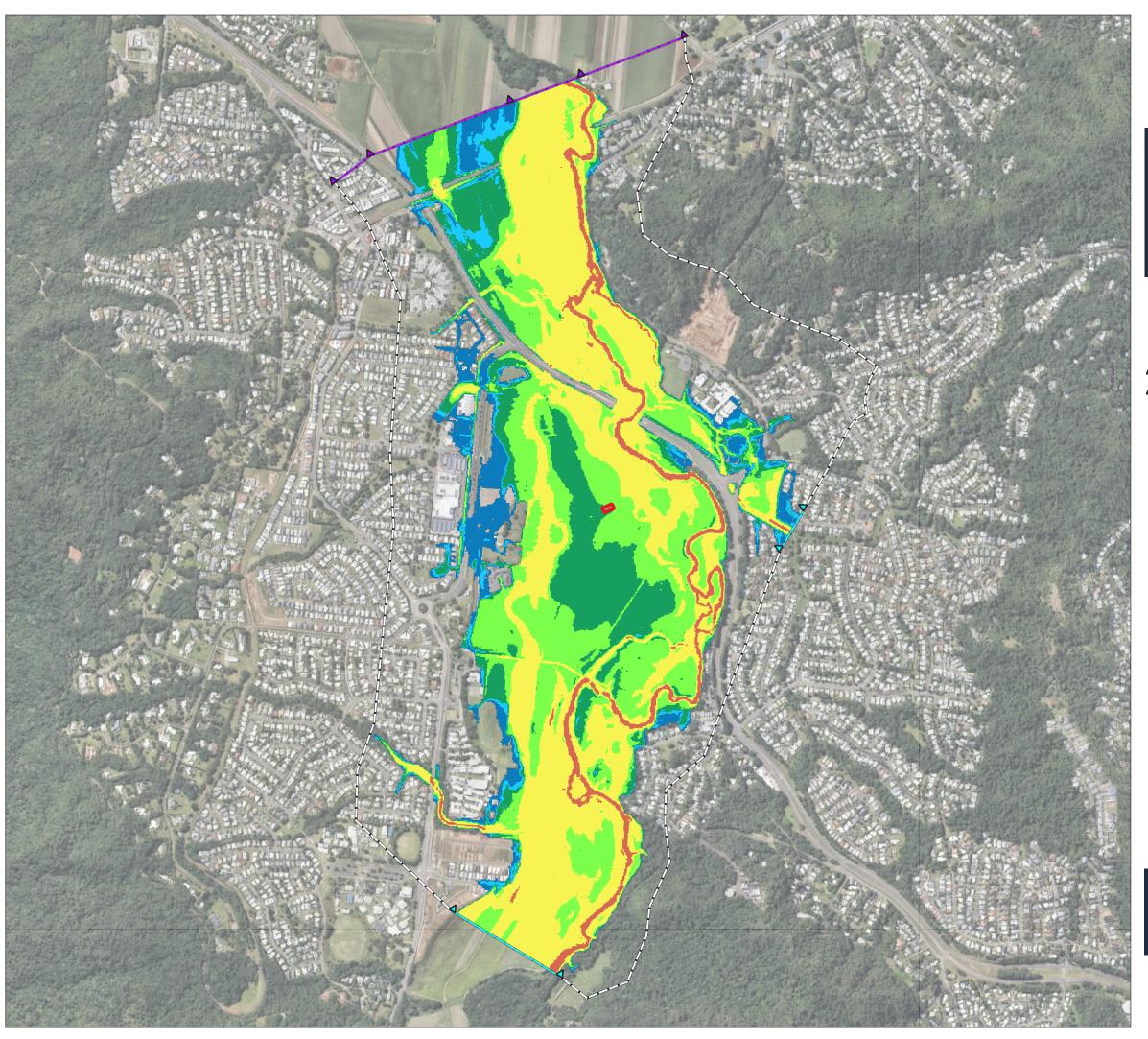
H5 - Unsafe for People & Vehicles (Buildings Require

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55





Post-Development Peak Hazard 5% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Hazard (ZAEM1):

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

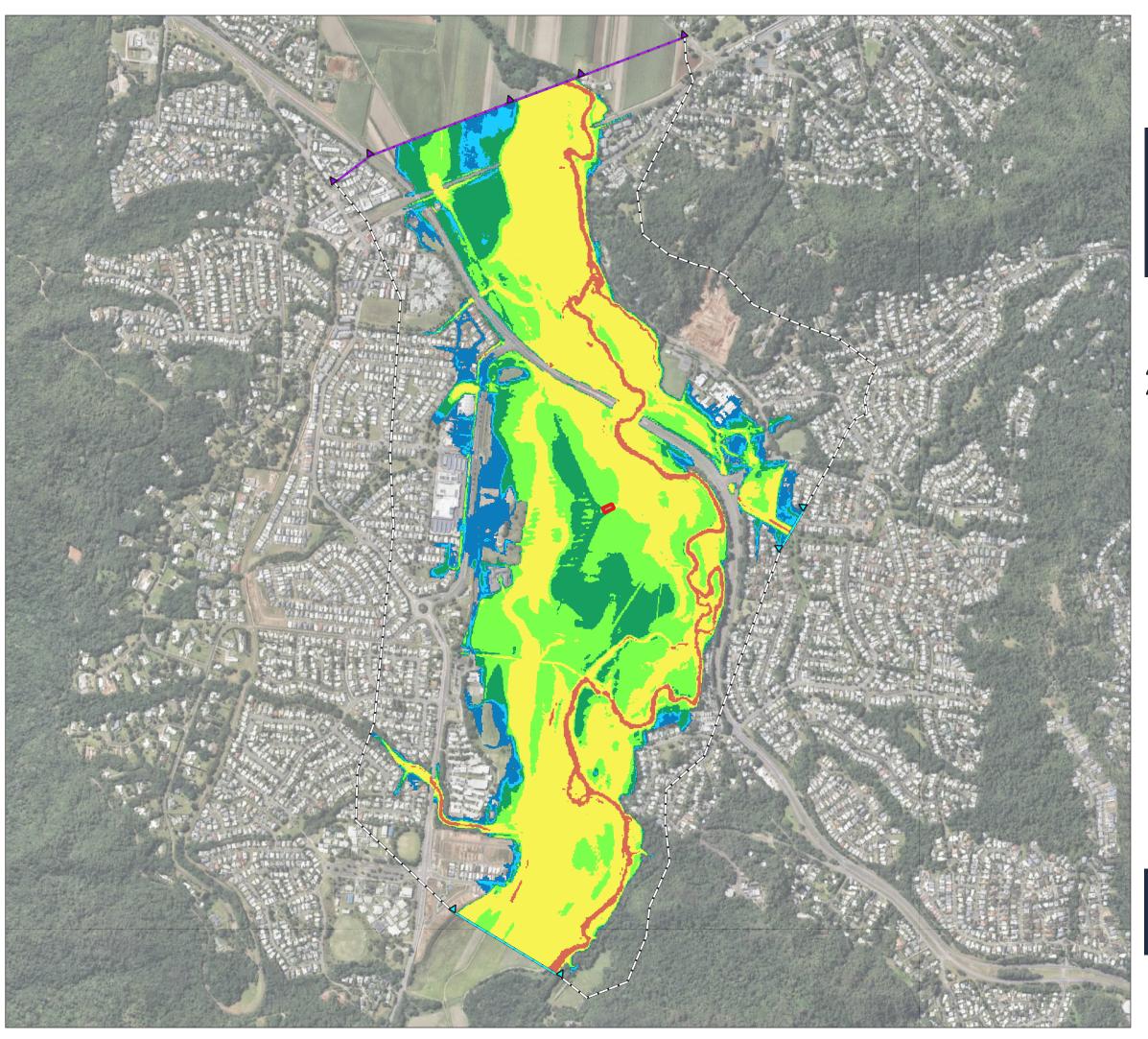
H5 - Unsafe for People & Vehicles (Buildings Require

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55





Post-Development Peak Hazard 2% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary △ △ Outflow Boundary

Peak Hazard (ZAEM1):

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

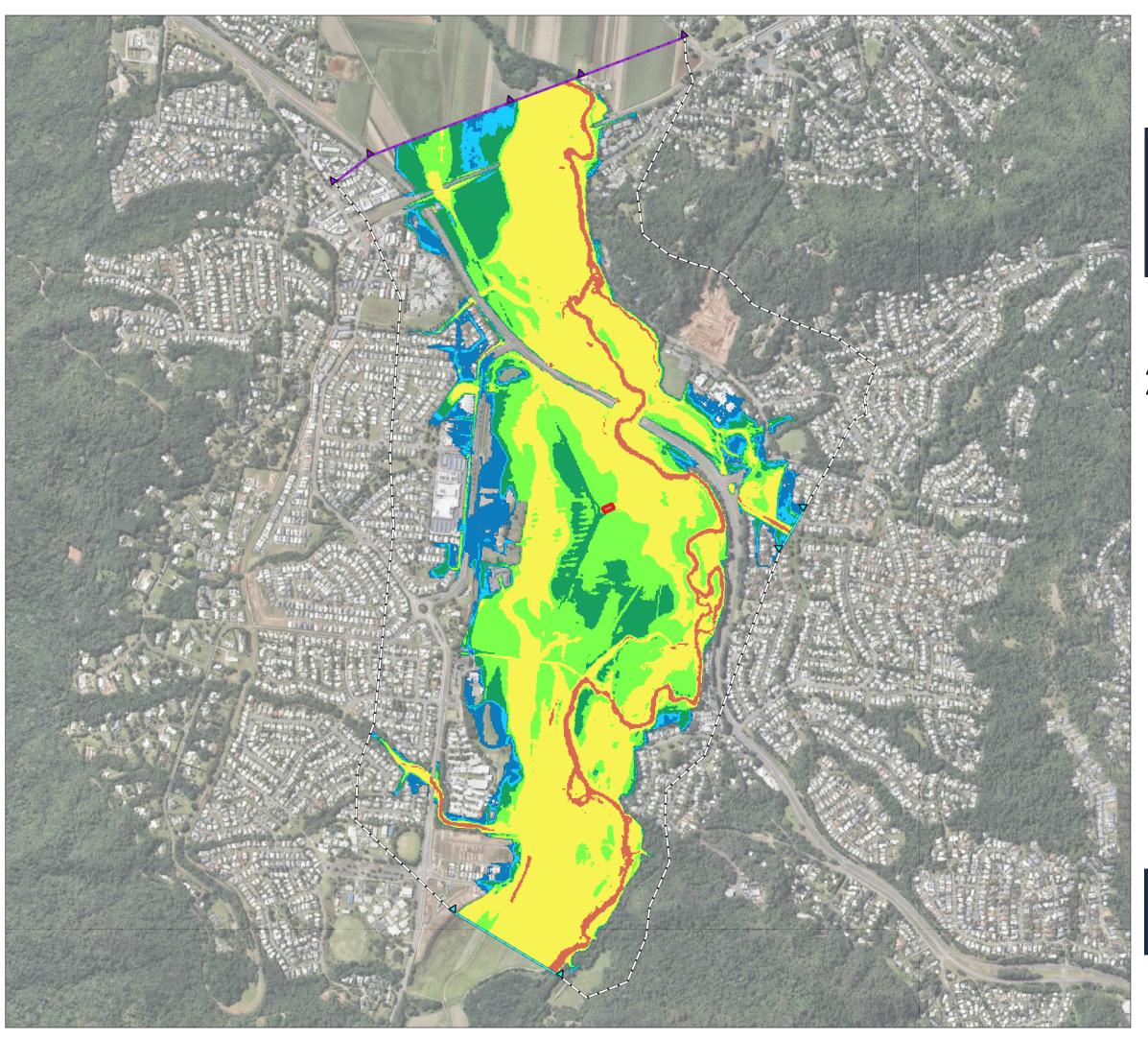
H5 - Unsafe for People & Vehicles (Buildings Require

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55





Post-Development Peak Hazard 1% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Hazard (ZAEM1):

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

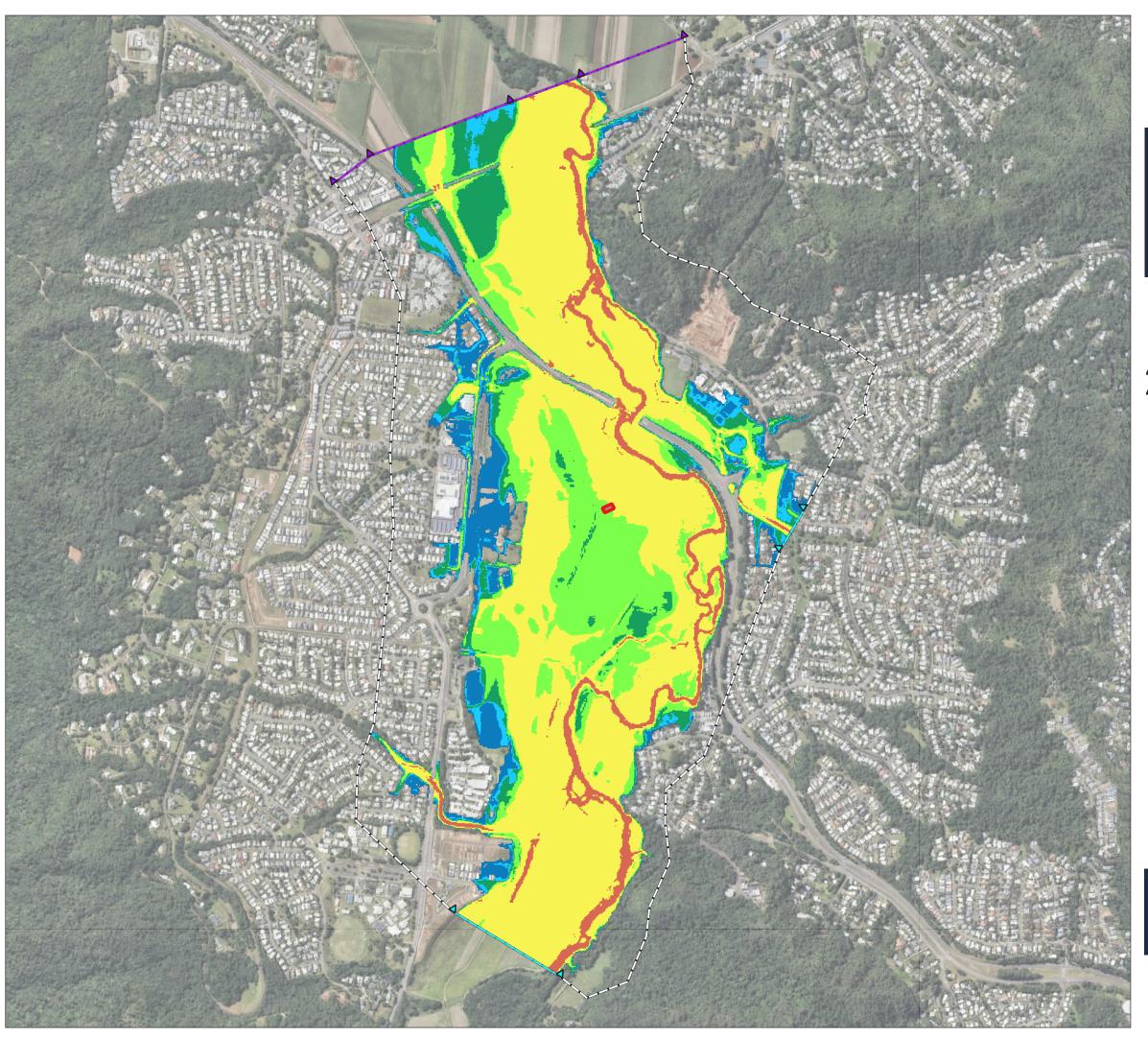
H5 - Unsafe for People & Vehicles (Buildings Require

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55





Post-Development Peak Hazard 0.5% AEP Event

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Hazard (ZAEM1):

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

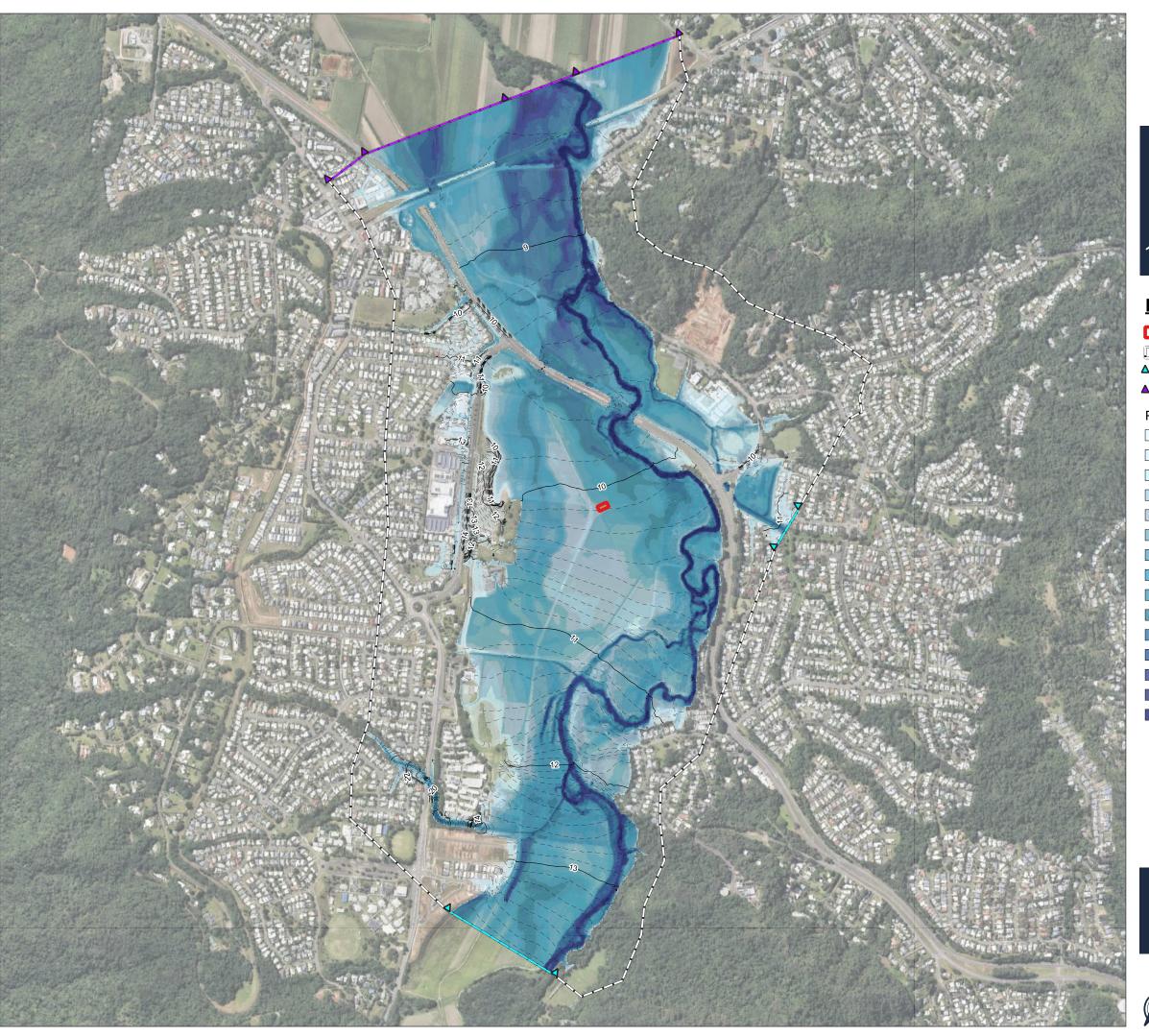
H5 - Unsafe for People & Vehicles (Buildings Require

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55





Post-Development Peak Depth and Water Level Contours 1% AEP Event - 8.8 mAHD Tailwater

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

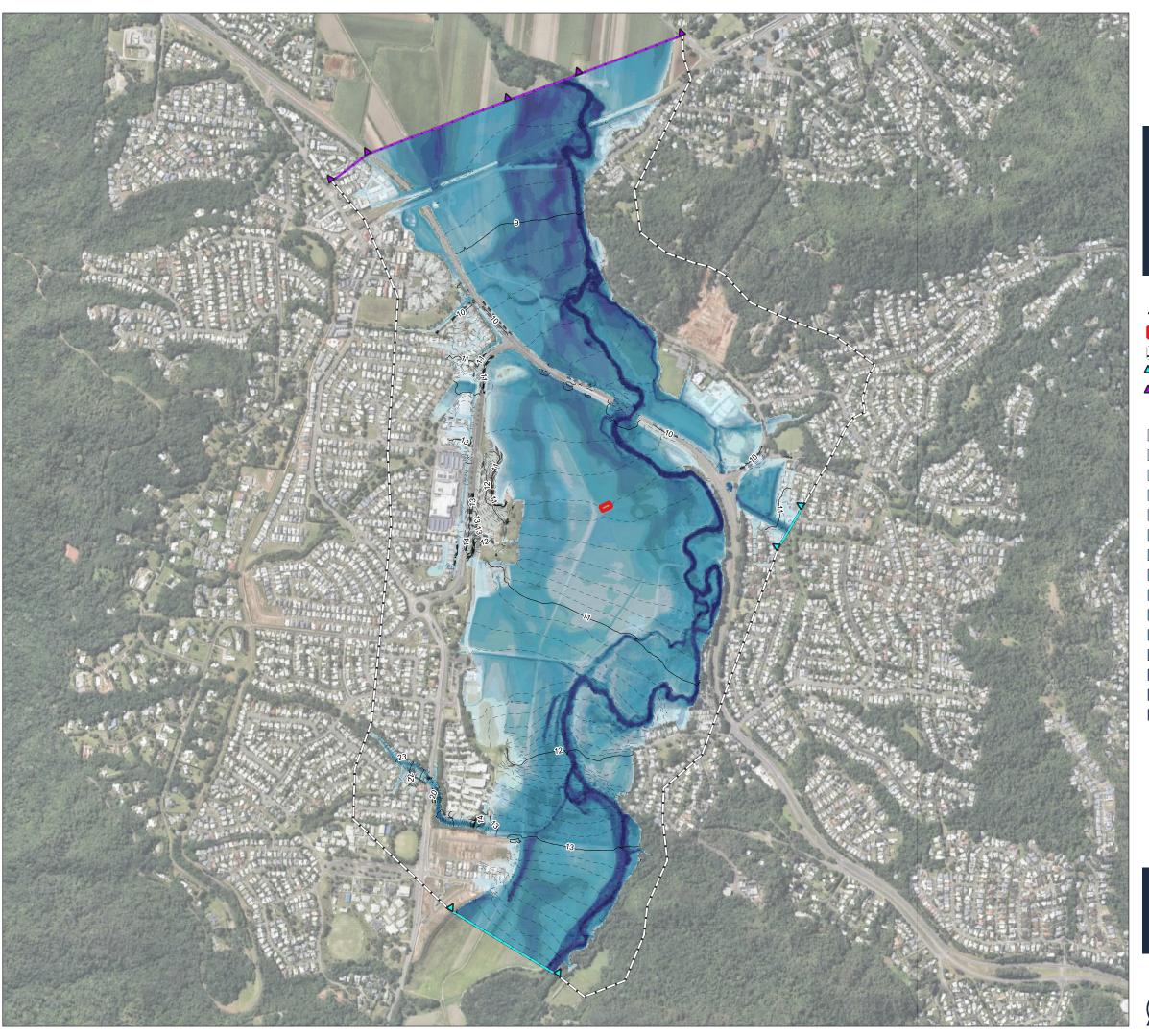
> 5.0

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55

Job No: 10880 Date: 31/01/2025





CIVIL | WATER | ENVIRONMENT

Appendix B-23
Post-Development
Peak Depth and Water Level Contours 0.5% AEP Event - 8.8 mAHD Tailwater

LEGEND

Site Details

Hydraulic Model Extent

△ △ Inflow Boundary

△ △ Outflow Boundary

Peak Depth (m):

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1 2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

> 5.0

Powerlink Qld Development Redlynch

A3 Scale: 1:14000

GDA Zone / MGA Zone 55

APPENDIX C AFFLUX MAPS





Post-Development -Pre-Development Afflux 50% AEP Event

LEGEND

Site Details △ △ Inflows

△ Outflows

Model Extent

Afflux (m)

<= -0.40

-0.40 - -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 - 0.40

> 0.40

Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Redlynch

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Post-Development -Pre-Development Afflux 20% AEP Event

LEGEND

Site Details

A A Inflows

△ Outflows

Model Extent

Afflux (m)

<= -0.40

-0.40 - -0.20

-0.20 - -0.10 -0.10 - -0.05

-0.10 - -0.0

-0.05 - -0.02

-0.02 - 0.02 0.02 - 0.05

0.02 - 0.00

0.05 - 0.10 0.10 - 0.20

0.20 - 0.40

> 0.40

Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Redlynch

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Post-Development -Pre-Development Afflux 10% AEP Event

LEGEND

Site Details

A A Inflows

△ Outflows

Model Extent

Afflux (m)

<= -0.40

-0.40 - -0.20

-0.20 - -0.10 -0.10 - -0.05

-0.16 - -0.03

-0.02 - 0.02

0.02 - 0.05

0.02 - 0.00

0.05 - 0.10

0.10 - 0.20

0.20 - 0.40

> 0.40

Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Redlynch

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Post-Development -Pre-Development Afflux 5% AEP Event

LEGEND

Site Details

A A Inflows

△ Outflows

Model Extent

Afflux (m)

<= -0.40

-0.40 - -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 - 0.40

> 0.40

Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Redlynch

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024





Appendix C-5

Post-Development -Pre-Development Afflux 2% AEP Event

LEGEND

Site Details

A A Inflows

△ Outflows

Model Extent

Afflux (m)

<= -0.40

-0.40 - -0.20

-0.20 - -0.10 -0.10 - -0.05

-0.16 - -0.03

_ -0.02 - 0.02

0.02 - 0.05

0.05 - 0.10

0.10 - 0.20

0.20 - 0.40

> 0.40

Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Redlynch

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024

500 1,000 m





Appendix C-6

Post-Development Pre-Development
Afflux
1% AEP Event

LEGEND

Site Details

A A Inflows

△ Outflows

Model Extent

Afflux (m)

<= -0.40

-0.40 - -0.20

-0.20 - -0.10

-0.10 - -0.05

-0.05 - -0.02

-0.02 - 0.02 0.02 - 0.05

0.02 - 0.00

0.05 - 0.10

0.10 - 0.20

0.20 - 0.40

> 0.40

Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Redlynch

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024

500 1,000 m





Appendix C-7

Post-Development -Pre-Development Afflux 0.5% AEP Event

LEGEND

Site Details

A A Inflows

△ Outflows

Model Extent

Afflux (m)

<= -0.40

-0.40 - -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 - 0.40

> 0.40

Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Redlynch

A3 Scale: 1:14000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 25/10/2024

500 1,000 m



FLOOD IMPACT ASSESSMENT FOR POWERLINK STEWARTS ROAD SITE

FEBRUARY 2025

PREPARED FOR

Powerlink Queensland



Project Details	
Title	Flood Impact Assessment for Powerlink Stewarts Road Site
Prepared for	Powerlink Queensland
Document Name	10880-R01-0

Document Control					
Revision	Author	Reviewer		Approved for Issue	
nevision	Author	neviewei	Name	Signature	Report Date
0	IBR	MBA	M. Balicki	M.Bor-	07/02/2025

Revision Status			
Revision	Description		
0	For Client Comment		
1	Final Issue		

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1 INTRODUCTION

1.1 BACKGROUND

The following report presents the Flood Impact Assessment (FIA) for the proposed filling across land described as Lot 1 RP716266 and Lot 3 SP173007 in Kamerunga, Cairns within the Cairns Regional Council (herein referred to as the subject site). The proposed filling is associated with a new substation proposed on the site. Due to the location of the filling within the floodplains of the Barron River, the overall objective of this FIA is to identify the flood impact of the proposed works and provide any recommendations to reduce the impact (if needed).

1.2 SCOPE OF PROJECT

To achieve the project objective, the following scope of works was undertaken:

- Obtain base data from Cairns Regional Council and QSpatial. Base data included aerial survey captured in 2021, stream gauge data and aerial photography.
- Develop a hydrologic model of the Barron River catchment to develop critical storm hydrographs for the 50, 20, 10, 5, 21 and 0.5 % Annual Exceedance Probability (AEP) events.
- Validate the hydrologic model against available stream gauge data and other studies within the catchment.
- Develop a 2D hydraulic model that covers the subject site to adequately determine the flood behaviour.
- Input the hydrologic model flows into the hydraulic model to determine existing case flood levels in the 50, 20, 10, 5, 21 and 0.5 % AEP events.
- Add the extent of earthworks to the hydraulic model to determine the developed case flood levels in the 50, 20, 10, 5, 21 and 0.5 % AEP events.
- Produce afflux maps (change in flood levels post development) and provide high level advice for potential mitigation options if the proposed works adversely impact flood behaviour elsewhere.
- Produce mapping for peak flood depth, velocity, water surface level, and hazards for the pre- and post-development conditions.

1.3 SITE SPECIFIC DATA

Data obtained and how it was used in this project is detailed in **Table 1-1**.

Table 1-1 Site Specific Data

Data Category	Data	Source	Use in Project	
	Cadastre		Mapping and assessment of offsite impacts	
	Road corridor	OSpatial	Mapping	
GIS Layers	Road centrelines	QSpatial Delineation of materials		
	Watercourse centrelines		Mapping and delineation of materials	
	Building footprints	Bing Maps	Mapping and delineation of materials	
Topography 2021 LiDAR		Cairns Regional Council	Base terrain for the hydraulic model development	
Previous Studies	Copperlode Dam Emergency Action Plan (2023) Tinaroo Dam Emergency Action Plan (2023)	Cairns Regional Council SunWater	Used to extract the storage/discharge relationship for Copperlode Dam. Used to extract the storage/discharge relationship for Tinaroo Dam.	



Data Category	Data	Source	Use in Project
	Review of Barron River Delta Flood Model (Connell Wagner, 2007)	Cairns Regional Council	Used to validate hydrologic and hydraulic models.

1.4 STUDY AREA

The subject site is located across land described as Lot 1 RP716266 and Lot 3 SP173007 in Kamerunga, Cairns. The site is bordered by the Cairns Western Arterial Road (also known as Kamerunga Road) to the north, Stewarts Road to the east, and the Barron River to the south as shown in **Figure 1-1**. The location of the proposed filling within the subject site is also highlighted.

The subject site is located within the Barron River floodplain; however, it is only impacted by flooding when the Barron River breaks its banks, estimated to equate to a 5% AEP flood event. There are areas of development to the north of the site, as well as active sand quarries immediately west, south and east.



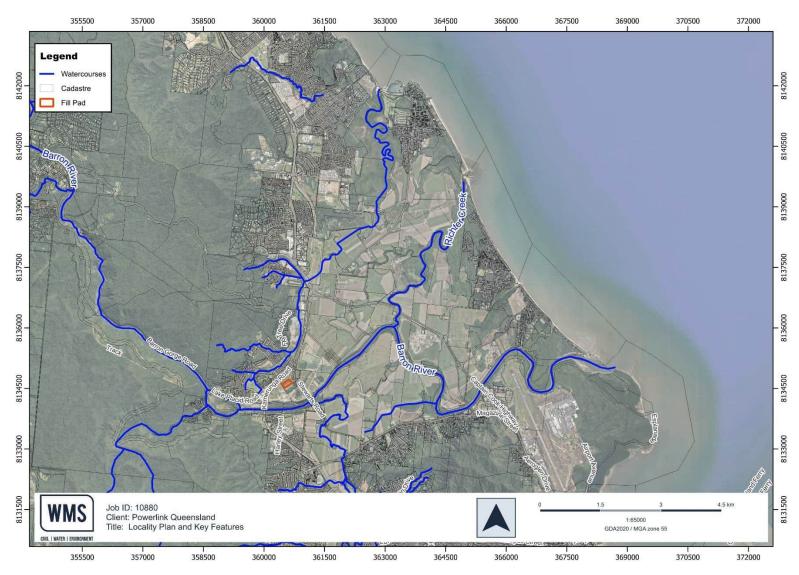


Figure 1-1 Locality Plan and Key Features

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2 EXISTING CASE

A regional flood model within the Barron River was developed by WMS Engineering for this FIA in accordance with Australian Rainfall and Runoff (ARR) 2019 guidelines. The flood model consisted of a RORB hydrologic model combined with a TUFLOW hydraulic model. A summary of the model development is provided below.

2.1 HYDROLOGIC MODELLING

RORB was the hydrologic modelling software selected for use in this assessment. RORB is an event based hydrologic model and calculates flood hydrographs from storm rainfall hyetographs. It can be used for modelling natural, partly urbanised and fully urbanised catchments. RORB is an industry standard modelling package that is widely used in hydrological studies across Australia.

2.1.1 Catchment Delineation

Catchment delineation was predominately undertaken using 1 second (~30 m resolution) Shuttle Radar Topography Mission (SRTM) digital elevation model (DEM) data sourced from Geoscience Australia. The adopted DEM is a hydrologically enforced version which captures flow paths based on SRTM elevations and mapped streamlines. The resulting catchment delineation was refined for areas where 5 m LiDAR from Geoscience Australia is available.

A total of 461 sub-catchments were delineated throughout the study area, with a total catchment area of approximately $2,190 \text{ km}^2$. By way of validation, the Barron River at Myola stream gauge (#110001D) is documented as having a total catchment area of $1,945 \text{ km}^2$ and is located ~15 km upstream of the subject site. To this location, this study estimated a total catchment area of $1,945.4 \text{ km}^2$, confirming the accuracy of the catchment delineation undertaken. The delineated sub-catchments are illustrated in **Figure 2-1**.

2.1.2 Design Rainfall

The latest 2016 Intensity-Frequency-Duration (IFD) rainfall depths were obtained from the Design Rainfall Data System (BoM 2016) at the centroid of the wider Barron River catchment (-17.0268, 145.5329). The IFD values at this location correlated well with the weighted average catchment rainfall depths used to inform the areal spatial pattern of rainfall. The adopted IFD depths in the hydrologic model are presented in **Table 2-1**.



Table 2-1 BoM IFD Table

Duration	Rainfall Depth (mm) per AEP and Duration						
(hrs)	50%	20%	10%	5%	2%	1%	0.5%
1	40.1	53.3	61.8	69.7	79.7	87	99.6
1.5	46.5	61.9	71.8	81.1	92.9	101	116
2	51.4	68.5	79.6	90	103	113	130
3	58.9	79	92.1	104	120	132	152
4.5	67.5	91.4	107	122	142	157	180
6	74.6	102	120	138	161	179	205
9	86.5	120	143	166	196	219	250
12	96.7	136	163	191	227	256	293
18	114	163	199	235	284	323	369
24	128	186	229	274	334	383	439
30	141	207	256	308	379	438	492
36	152	225	280	339	420	488	545
48	172	256	320	391	490	574	648
72	201	301	380	467	592	700	815
96	221	331	419	516	657	780	927
120	235	351	443	545	694	824	992
144	244	364	457	560	711	843	1020

2.1.3 Fraction Impervious

The spatial distribution of fraction impervious (FI) was determined based on aerial imagery and the local land zoning. The fraction impervious varied by sub-catchment depending on the extent of development. The total catchment area had a very low fraction impervious of less than 5%.

2.1.4 Catchment Parameters

RORB has two key catchment parameters; Kc and m. While the value of m is recommended to be set to 0.8, the value of Kc varies depending on the state the site is located in. For Queensland, the following equation by Weeks (1986) is recommended:

 $Kc = 0.88A^{0.53}$, where A is the total catchment area (in km²).

Based on the above, a Kc value of 52 has been used for this project.

As no hydrologic model calibration was undertaken as part of this study, it should be noted that the results are highlight sensitive to the adopted Kc value. Previous hydrologic models of the Barron River catchment (Connell Wager, 2007) have adopted higher Kc values determined through calibration of historical flood events. It is noted in previous reports however that a multiplier has been used to increase the peak discharge in both the 2% and 1% AEP flood events. It is therefore unclear from the previous studies what impact adopting a lower Kc value would have had.



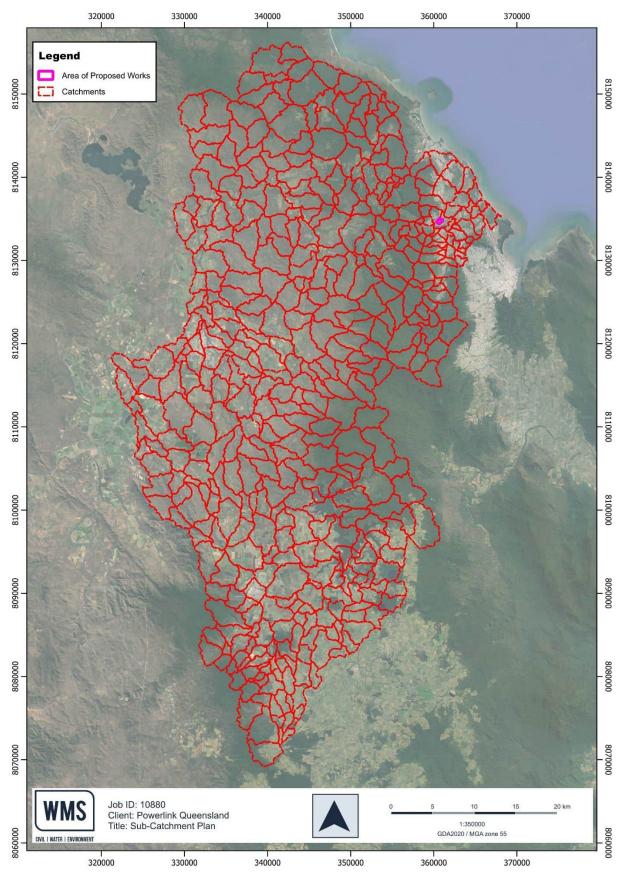


Figure 2-1 Sub-catchment Plan



2.1.5 Temporal Patterns

The site is situated in the Wet Tropics temporal pattern region as defined in ARR 2019 (refer **Figure 2-2**). The temporal patterns for this region were extracted using the ARR Data Hub website. Standard frequent, intermediate, and rare point temporal patterns were used for durations up to 9 hours. Areal temporal patterns were used for durations of 12 hours and longer given the total area of the catchment exceeds 75 km² (as recommended in ARR2019).

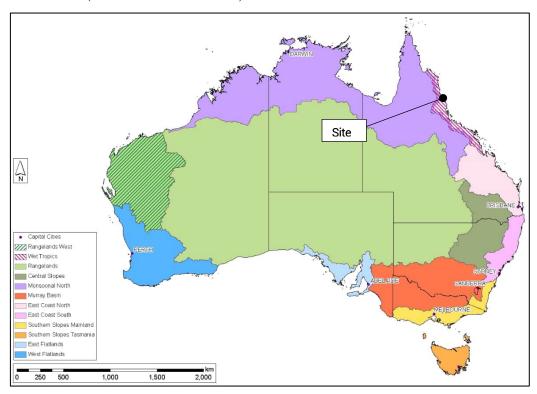


Figure 2-2 Temporal Pattern Regions (ARR 2019)

2.1.6 Rainfall Losses

Initial and continuing loss values were extracted from the ARR Data Hub at the centroid of the Barron River catchment for use in the hydrologic model. The adopted loss values are summarised in **Table 2-2**. The burst losses were calculated based on the initial loss minus the pre-burst depth for each storm as recommended in ARR 2019. Constant loss values were assumed across all AEPs and durations (i.e., no loss factors applied).

Table 2-2 Adopted Rainfall Losses

Initial Loss (mm)	Continuing Loss (mm/h)
41	4

2.1.7 Areal Reduction Factors

The areal reduction factor (ARF) reduces the total rainfall to account for spatial variance of a storm over a given catchment area. ARF values are calculated using several region-specific parameters and the catchment area. A larger catchment will have a lower ARF to account for a lower likelihood of a storm occurring over all parts of the catchment at the same time. This will in turn reduce the flood magnitude at the area of interest. For the Barron River model, an ARF area of 2,190 km² has been selected. This area approximates the total catchment area upstream of the Stewarts Road site. ARF parameters for the Wet Tropics region were adopted from the ARR Data Hub values for both long (between 24 and 168 hours) and short (less than 12 hours) durations.



2.1.8 Critical Storm Selection

The nominated design events were run in RORB for all durations between 1 hour to 168 hours and associated temporal patterns (TPs) in accordance with ARR 2019. For each storm duration, the critical TP was identified as the median outflow from each subcatchment. The peak outflow was then calculated as a maximum of the critical TPs, thus producing the critical duration in line with ARR 2019 guidelines.

As a majority of the Barron River catchment arrives at a singular location within the Barron River upstream of the subject site, only one median critical duration and temporal pattern in the immediate vicinity of the subject site was simulated in the hydraulic model. The critical storms extracted from the RORB model and used in the TUFLOW model are summarised in **Table 2-3**.

Table 2-3 Selected Critical Storms at the Subject Site

Event (AEP)	Critical Storm
50% AEP	72 hours, TP10
20% AEP	18 hours, TP05
10% AEP	18 hours, TP10
5% AEP	18 hours, TP10
2% AEP	120 hours, TP02
1% AEP	96 hours, TP10
0.5% AEP	18 hours, TP05

2.1.9 RORB Model Validation

The 50, 20, 10, 5, 21 and 0.5% AEP event peak flows from the RORB model at the outlet of the Barron River at the upstream extent of the hydraulic model (approximately 3 km upstream of the subject site) were validated against peak flow estimates based on the following methods:

- Previous Hydrologic Modelling: Previous hydrologic modelling for the area, specifically that developed for the Review of Barron River Delta Flood Model (Connell Wagner, 2007), has been used to compare the results of this study.
- Flood Frequency Analysis: A flood frequency analysis of the Barron River at Myola stream gauge (#110001D) was undertaken, incorporating annual flood maximums from the current and historical gauges at this location. A Log Pearson III probability model was used to fit ~100 years of gauge records. The bottom 10th percentile of flows was removed for this analysis.

The results of the comparison are illustrated in **Table 2-4**. The RORB derived peak flow was found to correlate well with the other validation methods and was therefore considered appropriate for hydraulic modelling purposes. As mentioned however, no calibration was undertaken as part of this project, and the hydrologic results were found to be sensitive to the adopted parameters. The results should therefore be considered with a high degree of uncertainty.

Table 2-4 Peak Flow Validation Summary at Upstream Extent of Hydraulic Model

	Peak Flow (m³/s)				
Event (AEP)	RORB Peak Flow for Adopted Critical Storm	Review of Barron River Delta Flood Model (Connell Wagner, 2007)	Flood Frequency Analysis of Barron River at Myola Stream Gauge (#110001D)		
50% AEP	1,460	NA	990		
20% AEP	2,750	1,771	1,800		
10% AEP	3,745	2,553	2,570		
5% AEP	4,530	3,351	3,500		
2% AEP	5,780	4,800*	5,070		



	Peak Flow (m³/s)			
Event (AEP)	RORB Peak Flow for Adopted Critical Storm	Review of Barron River Delta Flood Model (Connell Wagner, 2007)	Flood Frequency Analysis of Barron River at Myola Stream Gauge (#110001D)	
1% AEP	6,510	6,300*	6,580	
0.5% AEP	7,201	NA	8,420	

^{*} Flow rates adjusted as discussed in Section 2.1.4

2.2 HYDRAULIC MODELLING

2.2.1 Modelling Software

A 2D TUFLOW hydraulic model was developed to determine the flood behaviour at and around the site. TUFLOW is widely used in Australia for flooding and drainage studies. The recent TUFLOW version (2023-03-AE) was adopted for this study. The latest versions of TUFLOW incorporate the HPC (Heavily Parallelised Compute) model run engine. TUFLOW HPC is an explicit solver for the full 2D Shallow Water Equations, including a sub-grid scale eddy viscosity model. HPC can be used in GPU (Graphics Processing Unit) mode to reduce simulation times. TUFLOW HPC GPU was used for this assessment.

2.2.2 Model Resolution, Extent and Topography

A grid cell size of 10 m was selected for the assessment. This grid size allows for an appropriate representation of the key flow paths within the model area, particularly the Barron River channel, without resulting in excessive run times. This resolution was deemed appropriate based on the size of the area to be modelled and considering the key hydraulic features that needed to be represented.

- The model extent was delineated to capture all points of interest, namely the subject site and the surrounding roads/hydraulic structures, and to ensure inflow and outflow boundaries were placed sufficiently far from the locations of interest as to not significantly influence flood behaviour.
- A DEM was developed based on 50 cm resolution LiDAR data (sourced from Cairns Regional Council, flown in 2021) and used to establish the base model topography. The following model topography modifications were then applied to improve terrain representation:
- Road crest levels in the Cairns Western Arterial Road were enforced to their LiDAR-captured heights to ensure crest levels were appropriately represented.
- The TUFLOW model layout is illustrated in Figure 2-4.

2.2.3 Boundary Conditions

2.2.3.1 Inflow Boundaries

The hydrographs extracted from the RORB model were applied to the TUFLOW model as 2D boundary conditions. Two types of inflow boundaries were used:

- '2d_bc' Lines:
 - '2d_bc' lines were used to apply the hydrographs for the sub-catchments located outside the model extent. These
 inflows were applied to the model edges and include total flow hydrographs. Both the Barron River and Freshwater
 Creek were applied using this method.
- '2d_sa' Polygons:
 - '2d_sa' polygons were used to apply the local hydrographs for the sub-catchments located within the model extent.

The model inflow boundaries are illustrated in Figure 2-4.



2.2.3.2 Outflow Boundaries

An outflow boundary condition was applied to the TUFLOW model to allow flow to exit the study area. The outflow boundary was located within the ocean to the east of the Barron River, with a Highest Astronomical Tide (HAT) level 1.927m AHD. The downstream boundary is located over 6 km east of the subject site and sufficiently downstream such that boundary assumptions do not influence flow characteristics at the site. The model outflow boundary is illustrated in **Figure 2-4**.

2.2.4 Hydraulic Roughness

The hydraulic roughness (Manning's 'n') values used in the TUFLOW model were in line with the range of values outlined in Book 6 of ARR 2019. The roughness values for each land use are listed in **Table 2-5**, and the spatial distribution of roughness for existing conditions is illustrated in **Figure 2-5**.

Table 2-5 Land Use Roughness

Material ID	Land Use Description	Manning's 'n'
1	Residential: Urban (Higher Density)	0.3
2	Empty Farm Areas/Pasture	0.045
3	Watercourses	0.03
4	Waterbodies / Lakes: No Emergent Vegetation	0.025
5	Sealed Roads/ Car Park / Pavement / Driveway / Road	0.02
6	Unsealed Roads	0.025
7	Railway Line	0.04
8	Open Pervious Areas: Minimal Vegetation (Grassed)	0.035
9	Sugarcane Farms/Paddocks	0.12
10	Open Pervious Areas: Dense Vegetation (Bushes with Trees)	0.12
11	Creek Bank: Dense Vegetation	0.06

2.2.5 Hydraulic Structures – Cairns Western Arterial Road

The main hydraulic structure near the subject site were located under and upstream of the Cairns Western Arterial Road. At these locations, there is the main bridge (Kamerunga Bridge) and a low-level cycle bridge. The railway bridge over the Barron River immediately south of the subject site was washed away during flooding in December 2023 so was therefore not included in the hydraulic model. A summary of the model parameters used to represent these structures is provided in **Table 2-6**. Other structures were visually inspected and included in the hydraulic model as needed; however, they would not have a notable impact on the flood behaviour at the subject site. Other hydraulic structures under the Captain Cook Highway were included; however, they are significantly downstream of the subject site.

Table 2-6 Key Hydraulic Structures at Cairns Western Arterial Road

Structure ID	Description
BG_CVN_001 (Kamerunga Cycle Bridge)	Bridge deck soffit elevation: 1.36 mAHD
	Bridge deck thickness: 0.8 m, 100% Blockage
	Pier Blockage: 6.67%
	Pier FLC: 0.18
	Guardrails: None
	Superstructure FLC: 0.29



Structure ID	Description
BG_CVN_002 (Kamerunga Bridge)	Bridge deck soffit elevation: 9.78 mAHD
	Bridge deck thickness: 1.4 m, 100% Blockage
	Pier Blockage: 9%
	Pier FLC: 0.118
	Guardrails: 1m, 90% Blockage
	Superstructure FLC: 0.24

2.2.6 TUFLOW Model Validation

Validation of the hydraulic model results was undertaken by comparing the 1% AEP flood level results from this study to another study undertaken in the catchment, namely the *Review of Barron River Delta Flood Model* (Connell Wagner, 2007). A comparison between the two studies from approximately 5,000 m along the Barron River is shown in **Figure 2-3**. Results of this study correlate well in some areas; however, from chainage 1,000 m to 4,000 m there is a significant deviation in flood levels. From reviewing the previous study, the following justifications can be provided:

- The previous study coincided the Freshwater Creek peak flood with the Barron River peak flood. Given the significant size differences between the two catchments, this study did not adopt this approach.
- The previous study has areas of sugar cane (very high roughness) between changes 1,000 m and 4,000 m that no longer exist. These areas are now either used for cattle or are active sand quarries.

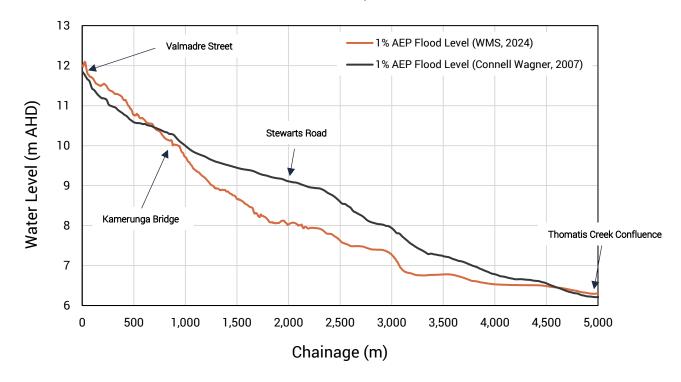


Figure 2-3 Validation of 1% AEP Hydraulic Model Result within the Barron River

2.3 FLOOD MAPS

The existing case flood maps, including depth with water level contours, velocity and hazard, are presented in **Appendix A.** The existing case nature of flooding can be summarised as follows:

• The subject site remains unaffected by Barron River flooding until flood levels exceed a 10% AEP flood event. This is generally consistent with other flood mapping of the area.



- In a 5% AEP flood event, the Barron River breaks out through Caravonica and areas south of the subject site. Within the subject site, this breakout flow is generally contained within the natural low flow paths within the subject site.
- During events greater than a 5% AEP flood event, increased breakout flow from the Barron River inundates the subject site.



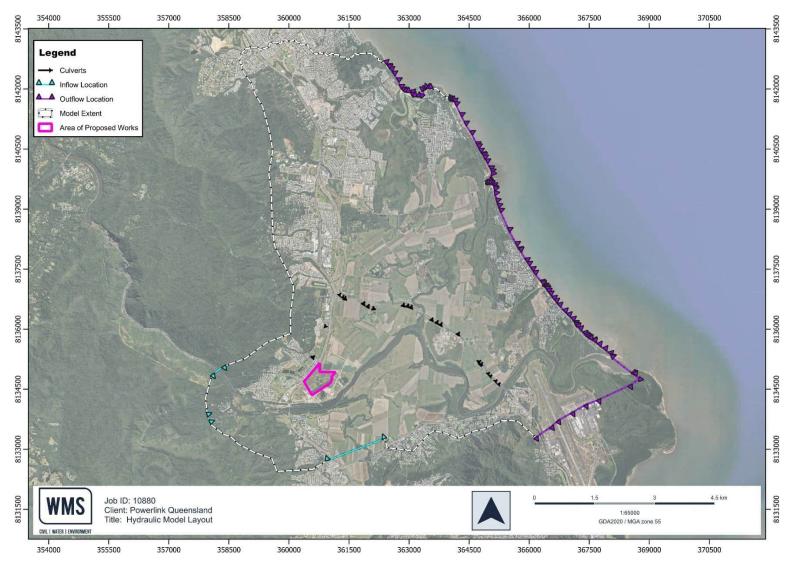


Figure 2-4 TUFLOW Model Layout

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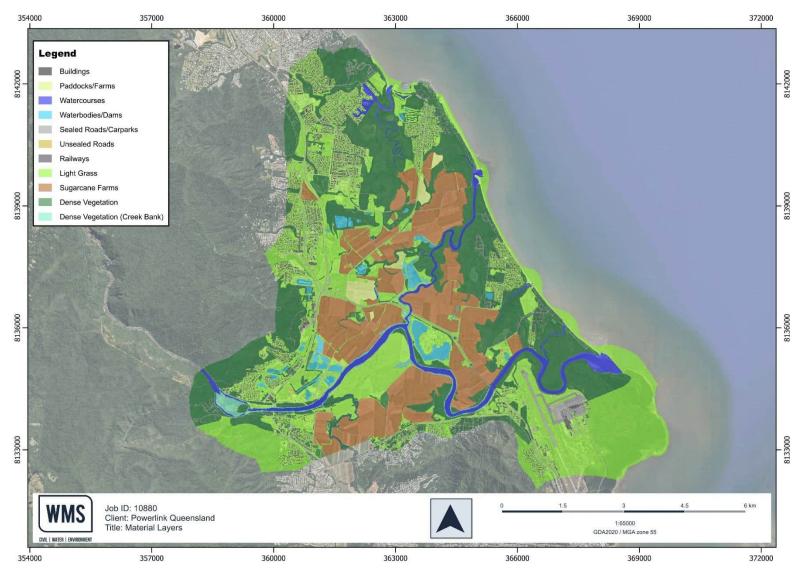


Figure 2-5 TUFLOW Model Roughness Distribution

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3 DEVELOPED CASE

3.1 MODEL REVISIONS

The hydrologic model developed as part of the existing case remained unchanged. There is not expected to be any changes in the catchment that would influence the hydrology of the catchment.

The hydraulic model was revised to include the proposed fill pad provided by Powerlink Queensland (*File 20240624_T274_SubPlatform.shp*). Based on the details provided, the extent of fill pad was raised to ensure it would above the 0.5% AEP event.

The topographical changes resulting from the above are shown in **Figure 3-1**. Developed case flood maps are presented in **Appendix B**.

3.2 AFFLUX

Due to the extent of filling required for the project, significant afflux is expected immediately west and north of the fill pad in Barron River flood events that exceed a 10% AEP. Afflux maps for all events are presented in **Appendix C**.

Commentary on the afflux can be summarised as follows:

- 1. In a 5% AEP flood event, breakout flow from the south/southwest is impeded by the fill pad, forcing floodwater to be diverted north before it can continue downstream (north east). This impediment results in up to 600 mm of afflux immediately west (still within the subject site), with broad areas of up to 20 mm of afflux experienced within the property to the west. Isolated areas of 50 mm of afflux are also noted.
- 2. For events greater than a 5% AEP flood event, increased breakout flow from the south/southwest and the west (overtopping Cairns Western Arterial Road) are impeded to a greater extent by the fill pad. In these events, maximum depth of afflux is reduced (up to 200 mm occurs to the north); however, the extent of afflux grows significantly. In the 0.5% AEP flood event, afflux exceeding 100 mm occurs within the Cairns Western Arterial Road corridor immediately north of the fill pad.

Based on the above results, flood mitigation works are recommended to offset the flood impacts. Preliminary flood mitigation options are discussed in **Section 4**.

3.3 FILL PAD LEVEL

Based on the assessment undertaken, the 0.5% AEP flood level immediately upstream of the fill pad was found to be 9.1 mAHD. It is therefore recommended that a fill pad level of 9.6 mAHD be adopted, as it allows for 500 mm of freeboard which would account any uncertainty in the modelling, while also allowing for medium term impacts of climate change on rainfall intensity.



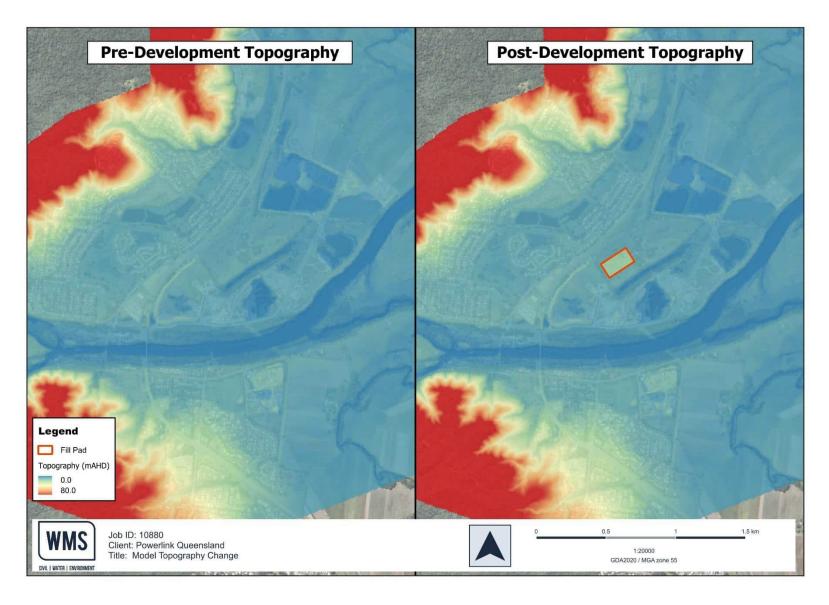


Figure 3-1 TUFLOW Model Terrain Comparison – Existing Case vs Developed Case

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4 FLOOD MITIGATION

As discussed in Section 3.2 and shown in **Appendix C**, significant afflux is expected to occur due to the location and filling required for the fill pad. To reduce the impact, a preliminary assessment of two mitigation options have been undertaken:

- 1. **Mitigation Option 1** compensatory earthworks to the west and north of the proposed fill pad. These earthworks would allow flow from the west/north to be more efficiently diverted around the fill pad.
- 2. **Mitigation Option 2** relocation of the proposed fill pad to the south/east, plus compensatory earthworks to the west and north of the proposed fill pad.
- 3. The topography of the two mitigations options assessed is shown in **Figure 4-1**.

4.1 MITIGATION OPTION 1

Mitigation Option 1 was assessed for flood events greater than the 10% AEP flood event. Afflux maps for these events are presented in **Appendix D**.

Commentary on the afflux can be summarised as follows:

- 1. In a 5% AEP flood event, afflux is reduced significantly, resulting in no offsite impacts.
- 2. In events greater than the 5% AEP flood event, afflux to the north and west is expected to continue, however to a lesser degree. Afflux on the property to the west ranges from 30 mm to 100mm in most events. Afflux exceeding 10mm is only likely to extend to the Cairns Western Arterial Road corridor in events greater than a 1% AEP flood.

Based on the above results, alternative flood mitigation options should be considered.

4.2 MITIGATION OPTION 2

Mitigation Option 2 was assessed for flood events greater than the 10% AEP flood event. Afflux maps for these events are presented in **Appendix E**.

Commentary on the afflux can be summarised as follows:

- 1. In events up to a 1% AEP flood event, afflux is reduced significantly, resulting in no offsite impacts.
- 2. Afflux greater than 10 mm is only likely to extend to the Cairns Western Arterial Road corridor in events greater than a 1% AFP flood.

Based on the above results, relocation of the fill pad to the south/east in addition to compensatory earthworks should be considered.

Further analysis will be required during the next stage of design to confirm the extent of compensatory earthworks required.



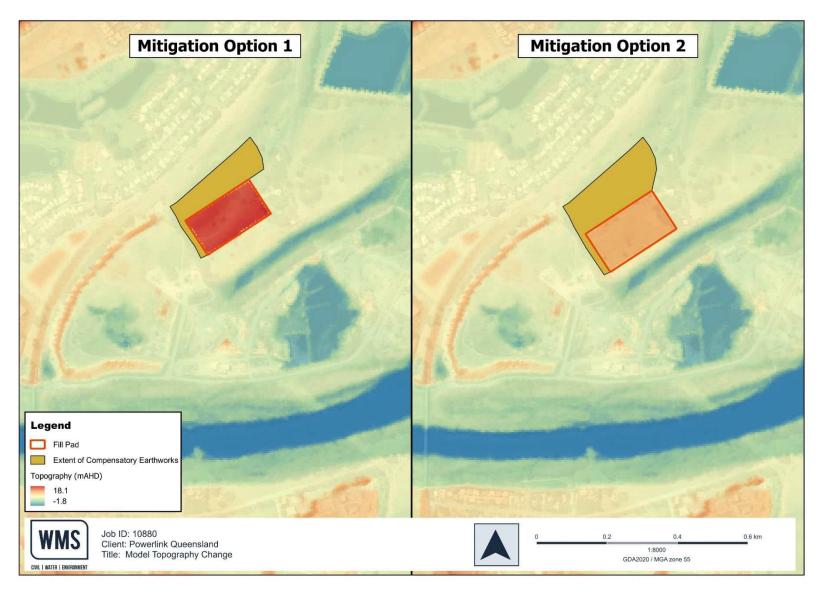


Figure 4-1 Mitigation Option Topography Change

5 KEY LIMITATIONS

Limitations applicable to the data used for the investigation, modelling results and mapping deliverables are listed in the following. The modelling results should therefore be viewed in light of these limitations.

- 1. A significant flood event, assessed to be approaching a 1% AEP event, occurred in December 2023. Debris survey from this event, in addition to anecdotal evidence, suggests that most of the subject site was unaffected by flooding. This outcome differs significantly from the results of this flood study (and previous studies at the same location), suggesting that the flood study is overestimating the flood levels in this area. Calibration of the hydraulic modelling is therefore recommended.
- Significant scouring of the Barron River appears to have occurred as a result of the December 2023 flood event. It is possible
 that new survey/LiDAR-derived topographic data may have a significant impact on the flood results compared to the 2021
 LiDAR data used. Updating the base LiDAR to 2024 LiDAR (expected to be provided by Cairns Regional Council by the end of
 2024) is therefore recommended.
- 3. Other topography changes are likely to occur near the subject site. These include an extensive levee bank between the subject site and the Cairns Western Arterial Road (as part of the neighbouring sand quarry), as well as proposed widening of the Cairns Western Arterial Road. Neither of these changes have been considered in this study.
- 4. The fill pad assumed vertical batters and no other ramps/access roads. Further hydraulic modelling is recommended in the next stage of design as civil works commence.
- 5. No impact of climate change has been considered.

6 CONCLUSION

The existing case flood modelling of the subject site has identified that flooding from breakout flow from the Barron River is expected in events in excess of a 10% AEP event. As a result, a flood impact assessment of the proposed filling within the subject site was undertaken to determine the extent and magnitude of afflux.

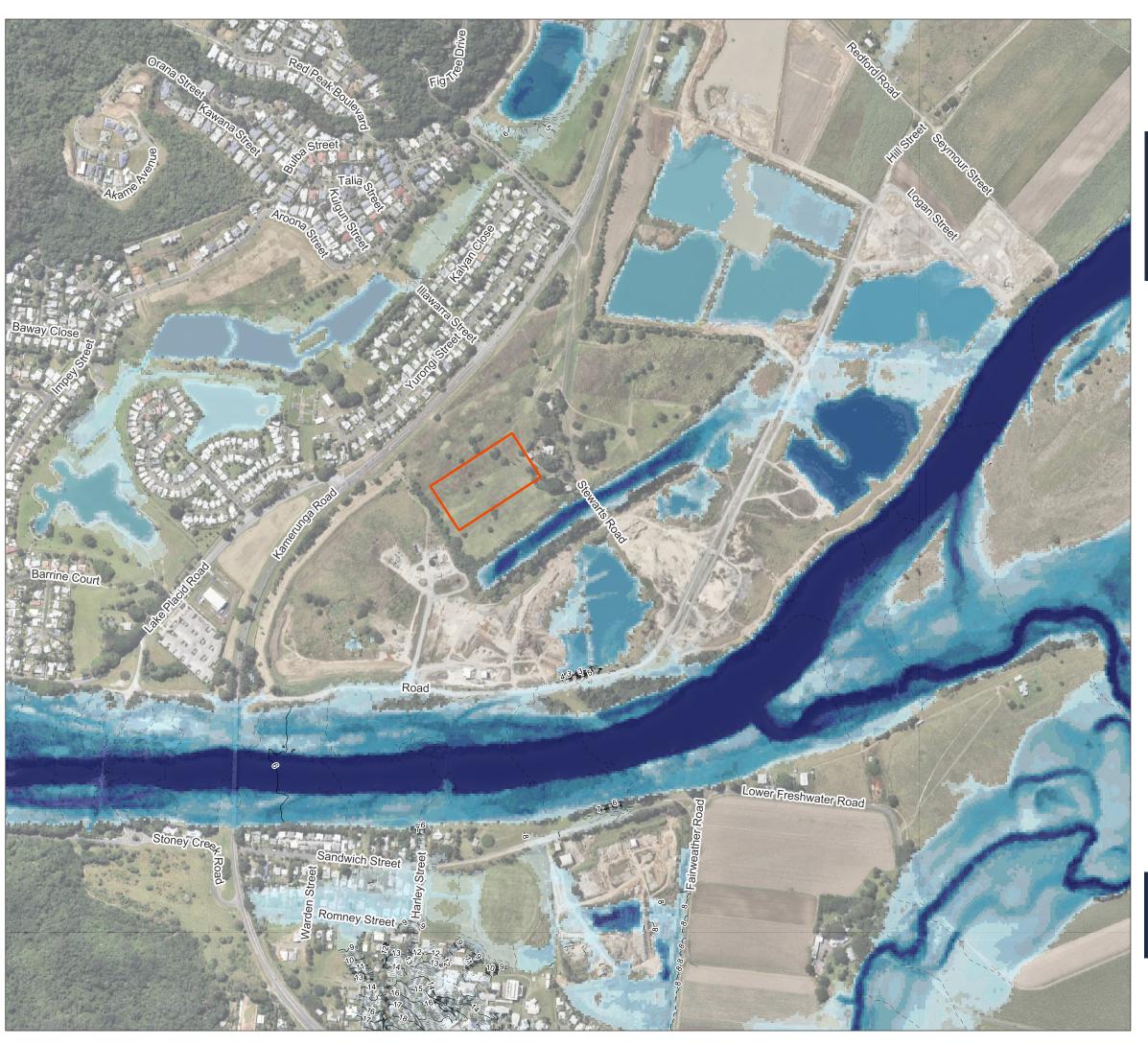
Based on the assessment undertaken, the following can be concluded:

- 1. Significant afflux is expected to occur west and north of the subject site due to the extent of filling proposed. Flood mitigation works will be required to offset this.
- 2. Initial investigations of compensatory earthworks to the west and north of the fill pad has shown a reduction in some flood events; however, moderate afflux will likely still occur on the property to the west.
- 3. Relocation of the fill pad to the south/east plus compensatory earthworks appear to reduce the offsite afflux in most flood events.
- 4. Further modelling of flood mitigation options will be required once civil design works commences.
- 5. To achieve the desired 0.5% AEP flood immunity, a fill pad level of 9.6 mAHD is recommended.

It is recommended that the flood impact assessment be revisited in the next stage of design to confirm the extent of compensatory earthworks required. In addition, it is expected that access ramps and battering will be required to achieve the fill level required. These items have not been considered in this flood impact assessment.

As the next stage of design is likely to commence post-completion of aerial survey by Cairns Regional Council, we would also recommend updating the base flood model with the new aerial survey.

APPENDIX A PRE-DEVELOPMENT FLOOD MAPS





CIVIL | WATER | ENVIRONMENT

Appendix A-1

Pre-Development
Peak Depth and Water Level
Contours
50% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

--- Minor (0.10m)

Major (1.0m)

Peak Depth (m)

<= 0.3

____ _ 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

] 1.2 - 1.5

1.5 - 1.8

1.8 - 2.1 2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

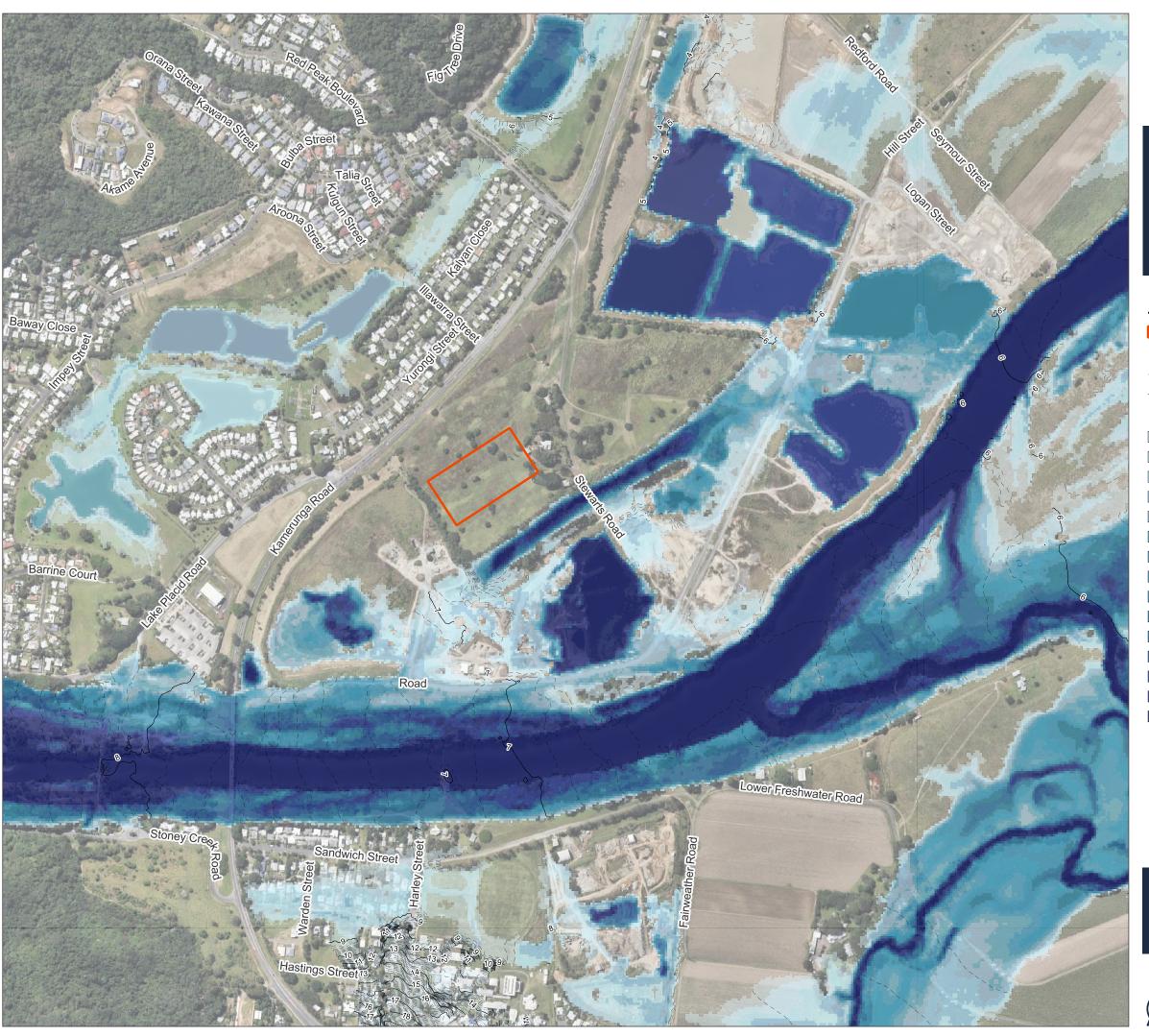
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Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024

200 400 60





Appendix A-2

Pre-Development
Peak Depth and Water Level
Contours
20% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

-- Minor (0.10m)

– Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

> 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024

200 400 60





Appendix A-3

Pre-Development
Peak Depth and Water Level
Contours 10% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

Minor (0.10m)

Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

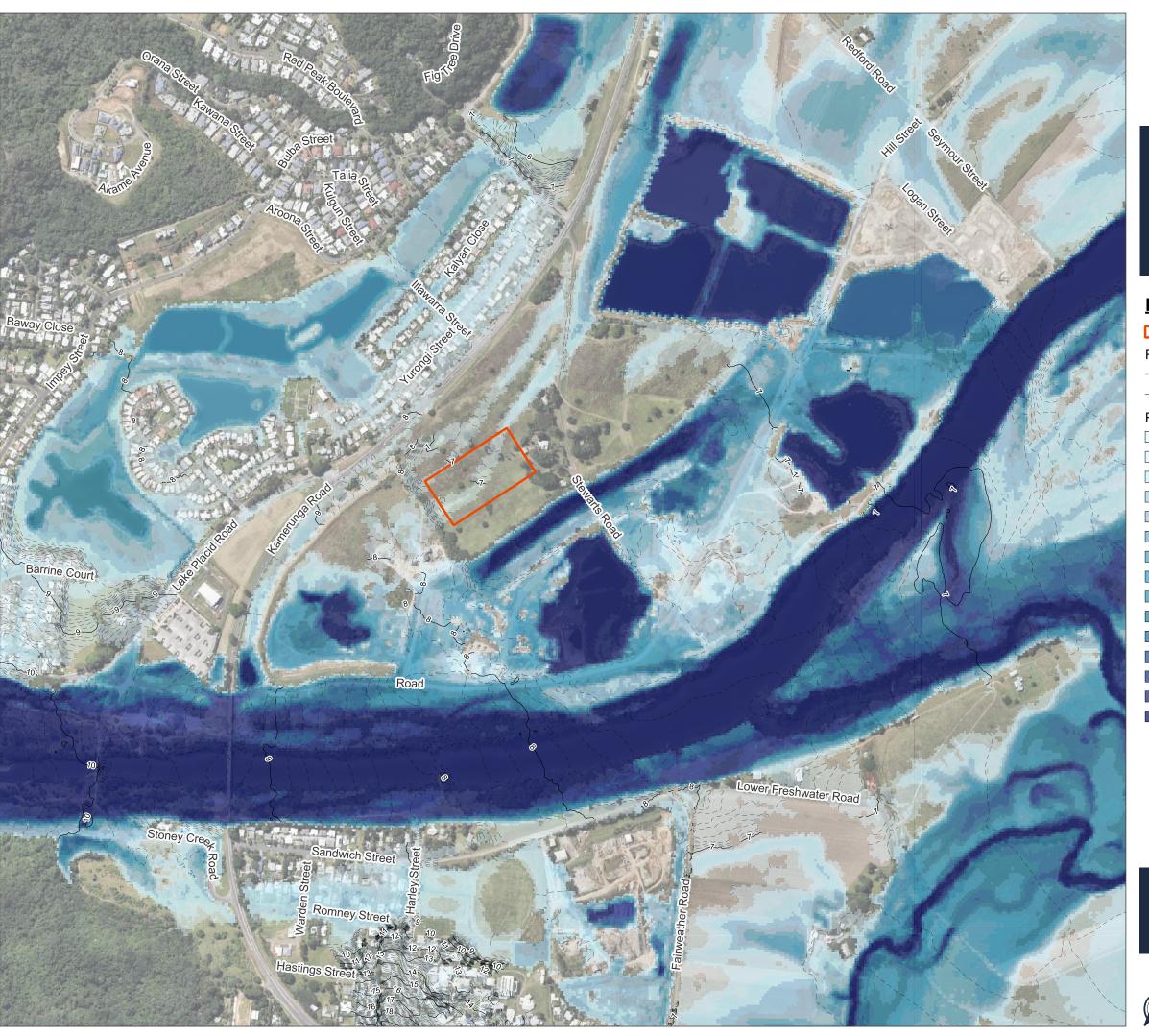
4.5 - 5.0

> 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





CIVIL | WATER | ENVIRONMENT

Appendix A-4

Pre-Development
Peak Depth and Water Level
Contours
5% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

-- Minor (0.10m)

Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

> 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024

200 400 60





CIVIL | WATER | ENVIRONMENT

Appendix A-5

Pre-Development
Peak Depth and Water Level
Contours
2% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

-- Minor (0.10m)

Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

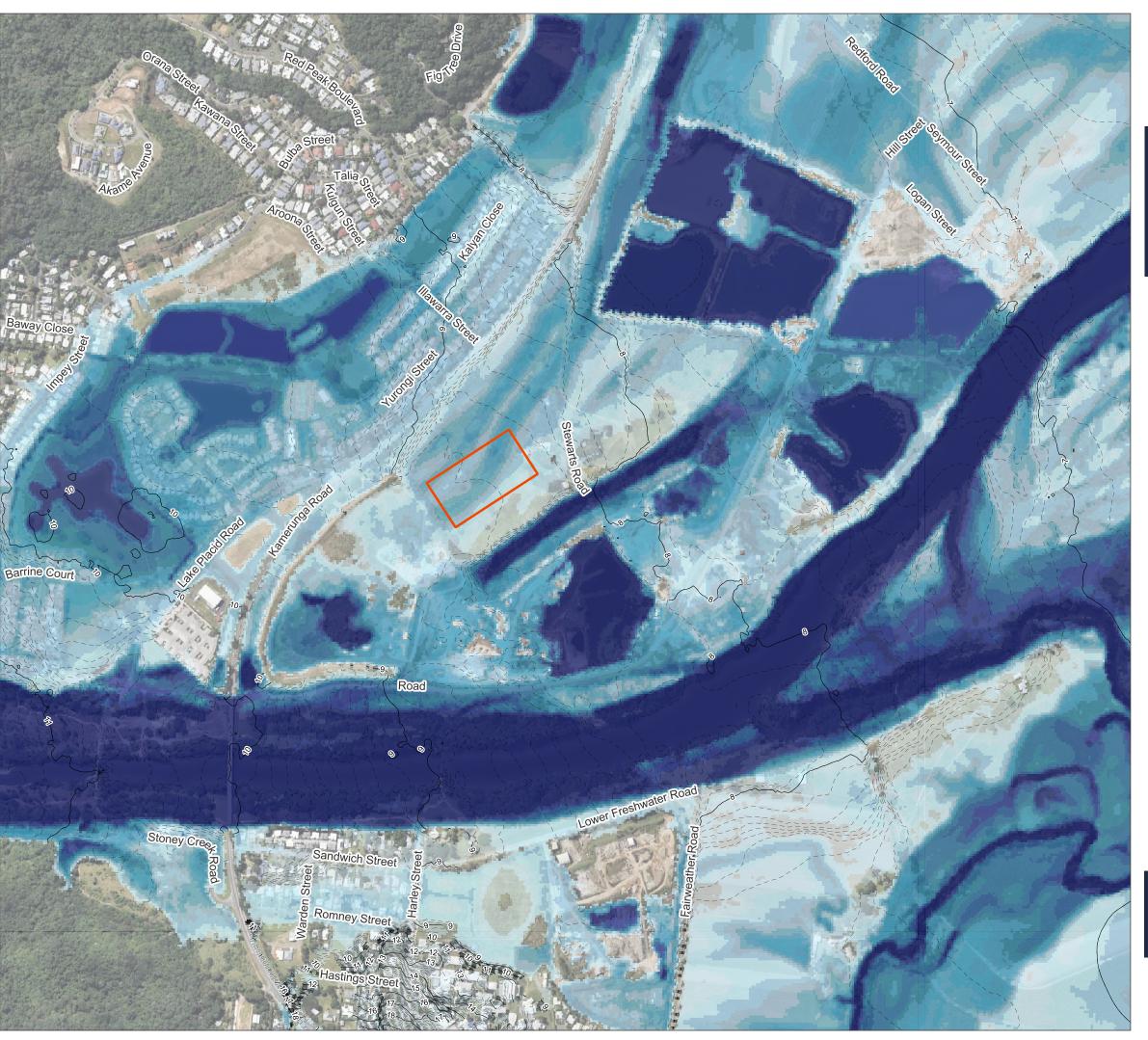
4.5 - 5.0

> 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55 Job No: 10880 Date: 21/11/2024

200 400 600





Appendix A-6

Pre-Development
Peak Depth and Water Level
Contours
1% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

-- Minor (0.10m)

Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

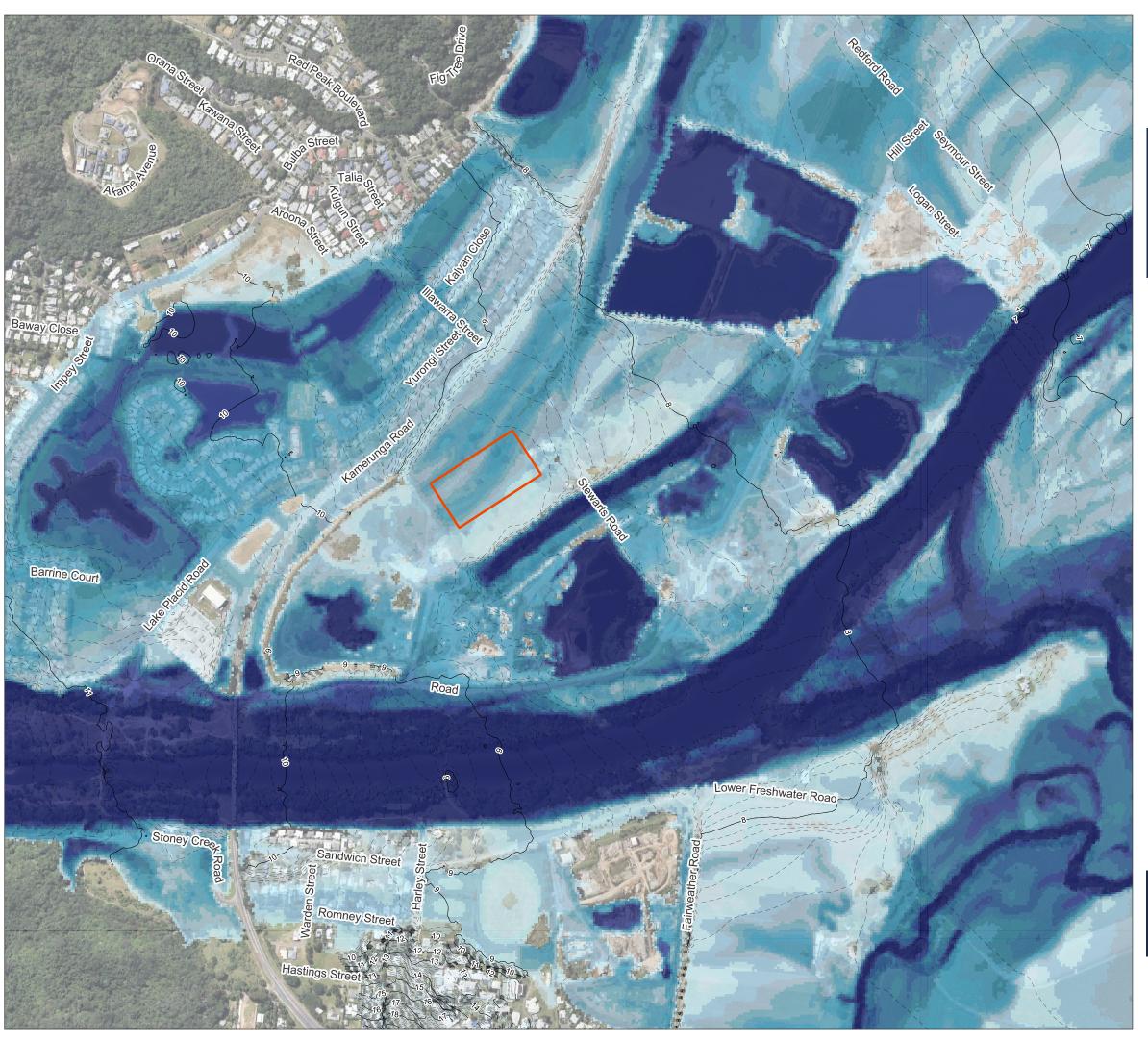
> 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024

200 400





Appendix A-7

Pre-Development Peak Depth and Water Level Contours 0.5% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

Minor (0.10m)

Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

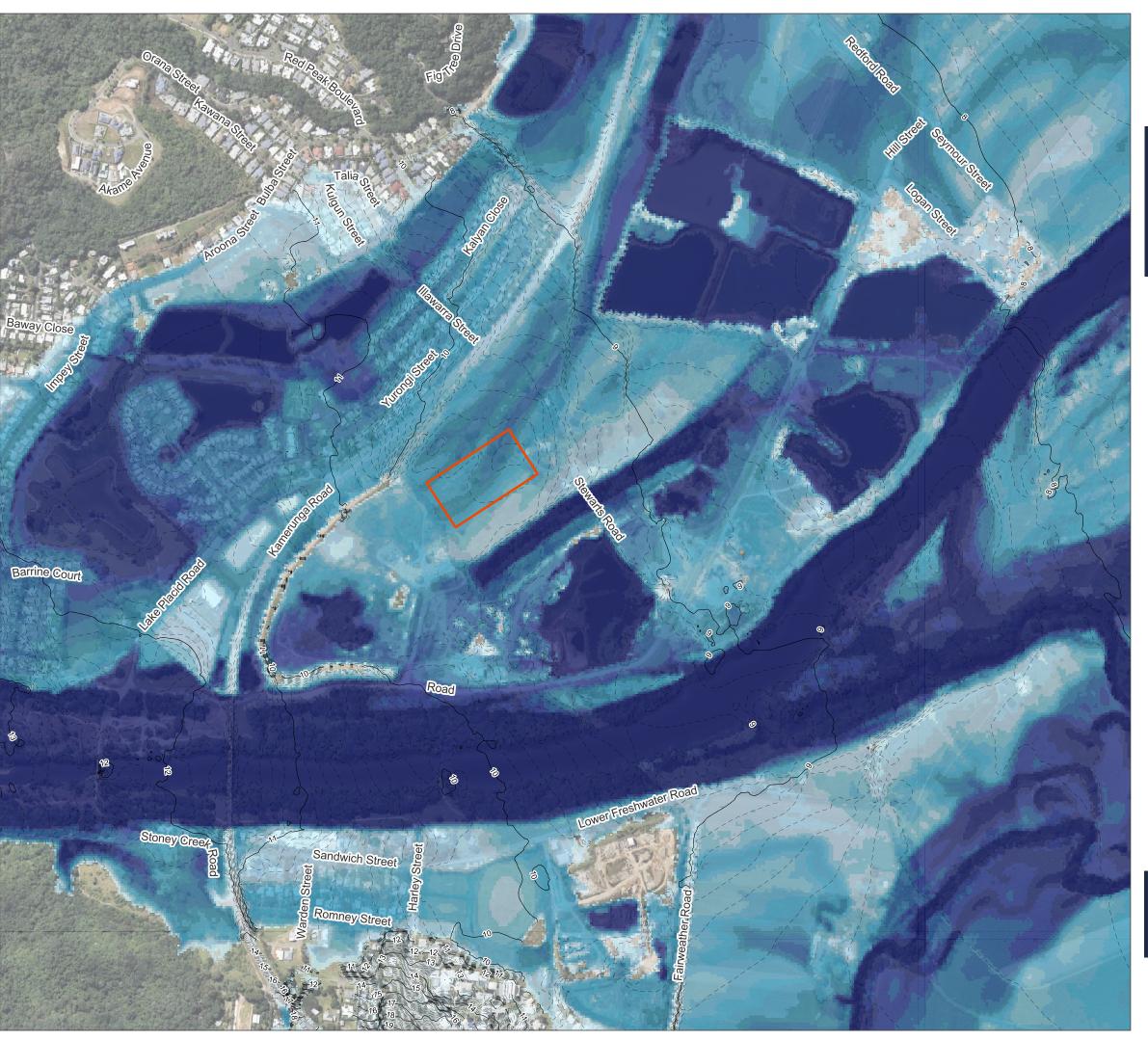
4.5 - 5.0

> 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





CIVIL | WATER | ENVIRONMENT

Appendix A-8

Pre-Development
Peak Depth and Water Level
Contours
0.05% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

-- Minor (0.10m)

Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

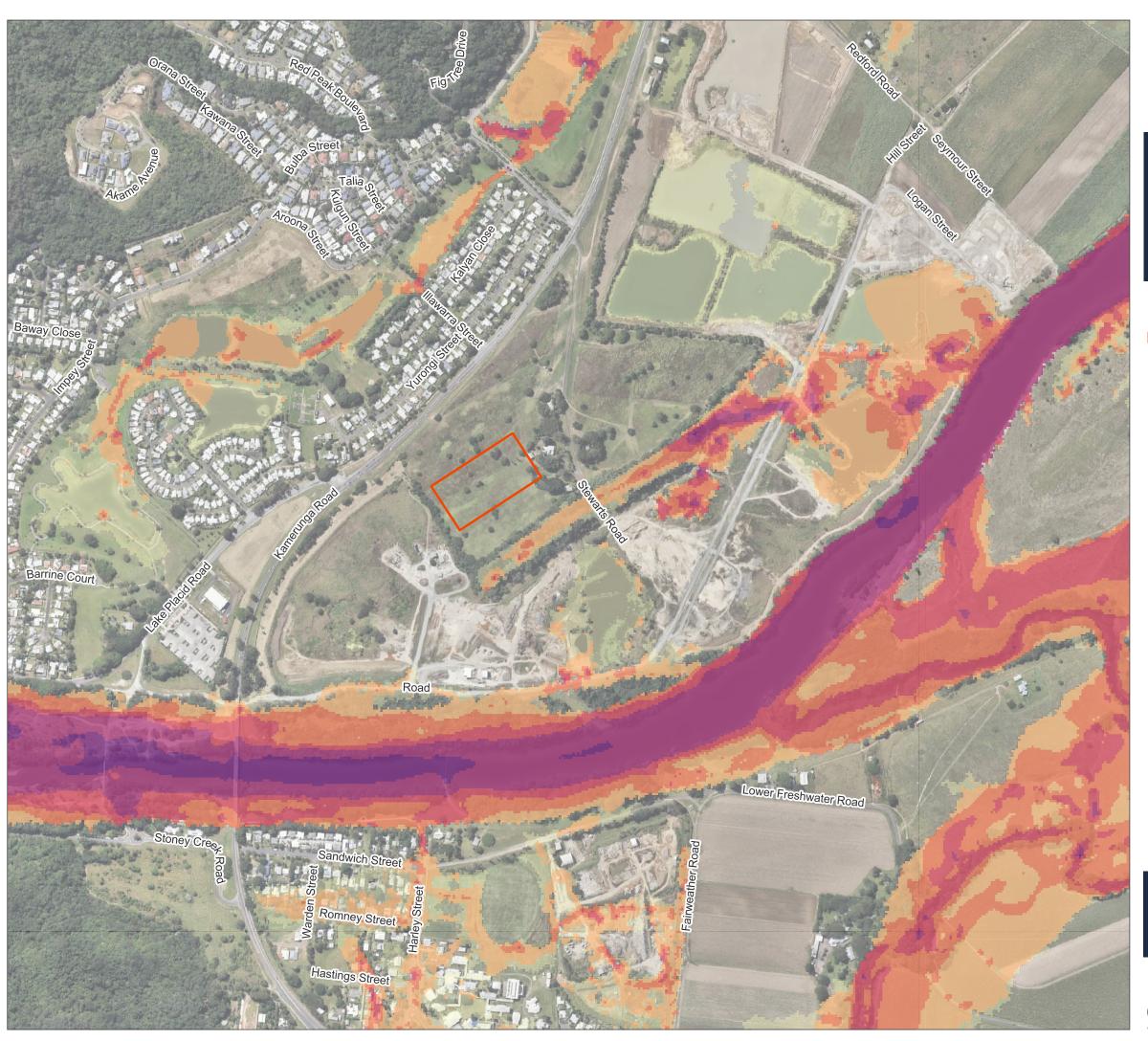
> 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024

200 400 6





Pre-Development
Peak Velocity
50% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

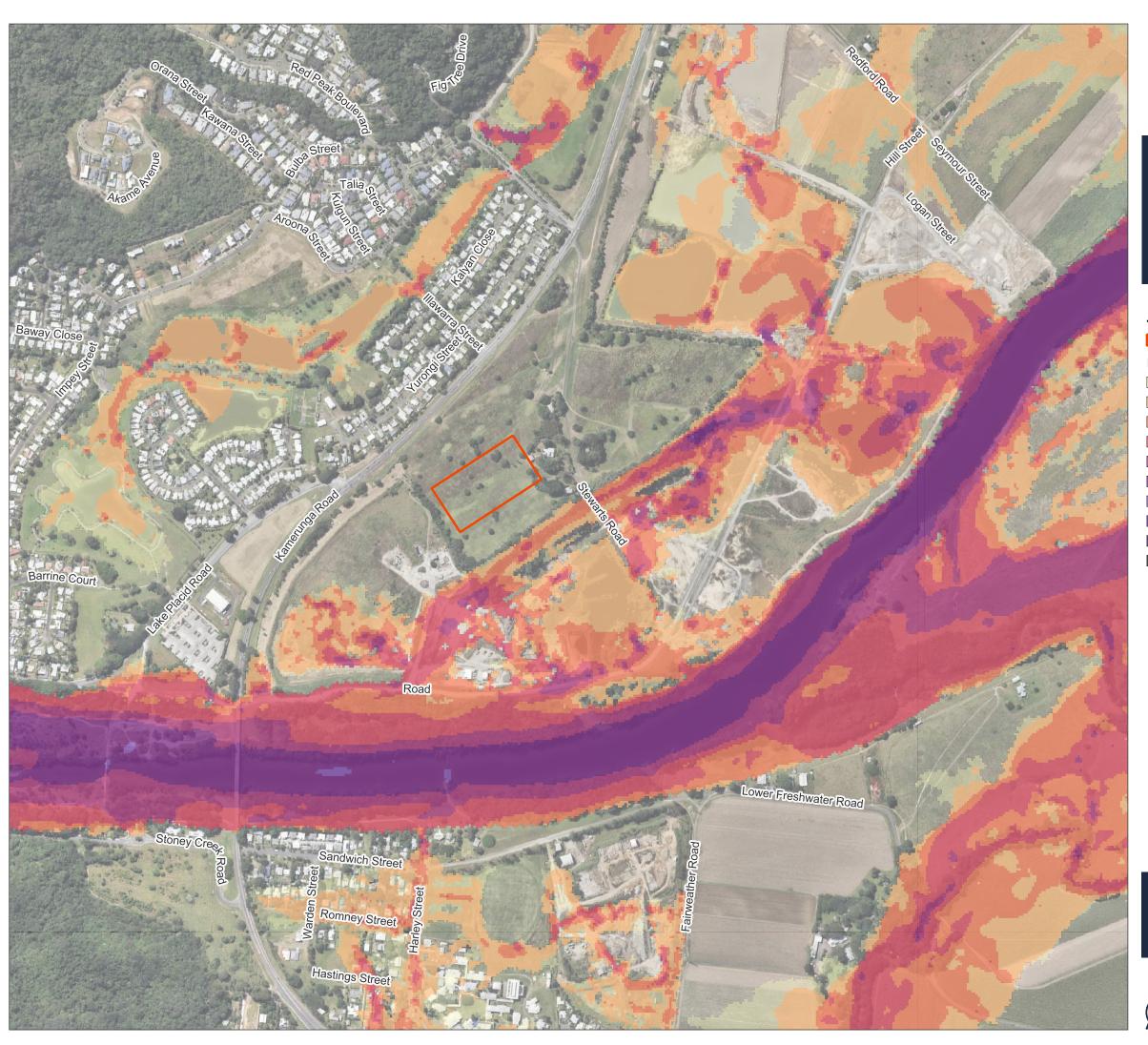
4.00 - 5.00

5.00 - 6.00 > 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Pre-Development
Peak Velocity
20% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

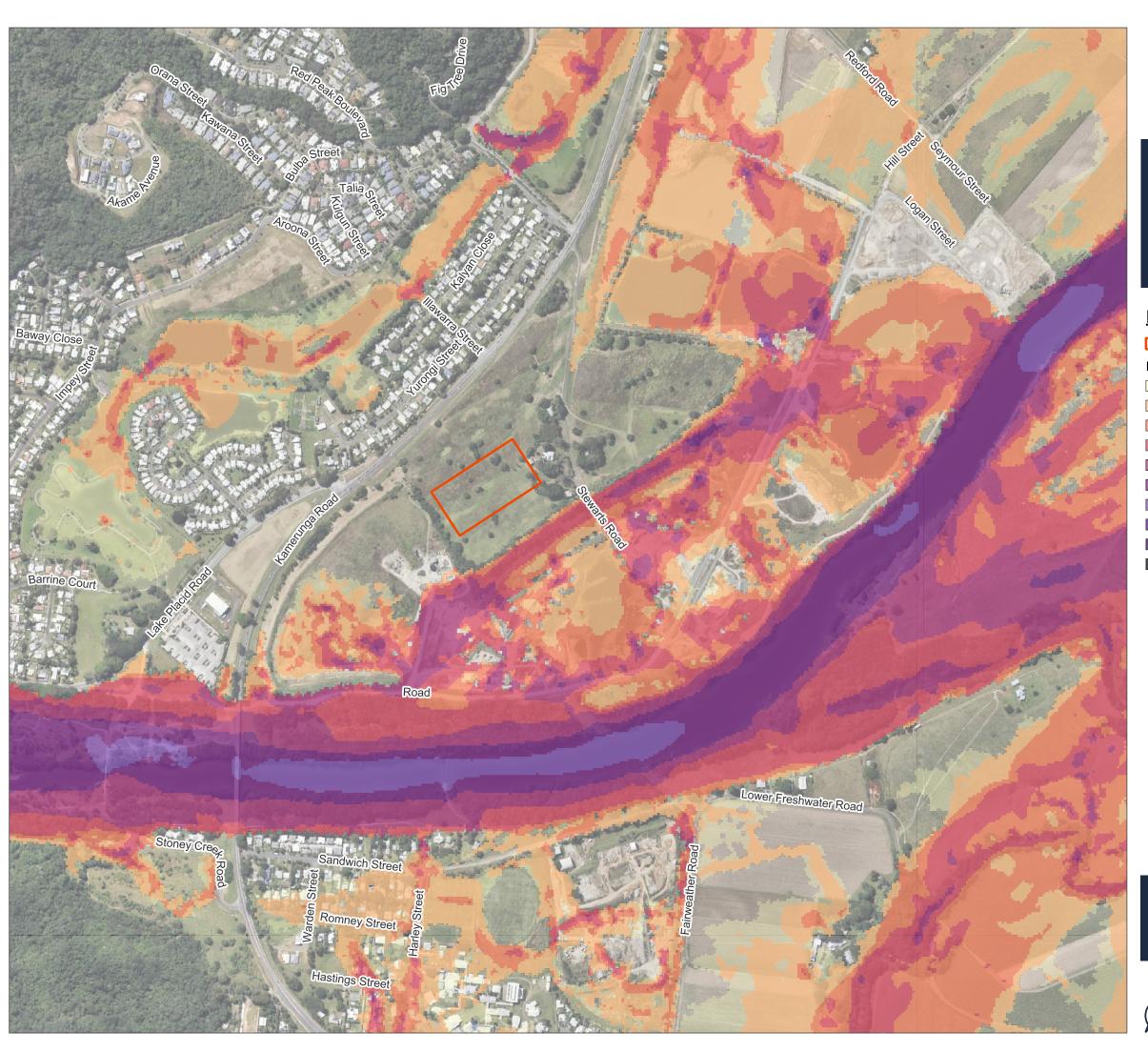
4.00 - 5.00

5.00 - 6.00 > 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Pre-Development
Peak Velocity
10% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00 3.00 - 4.00

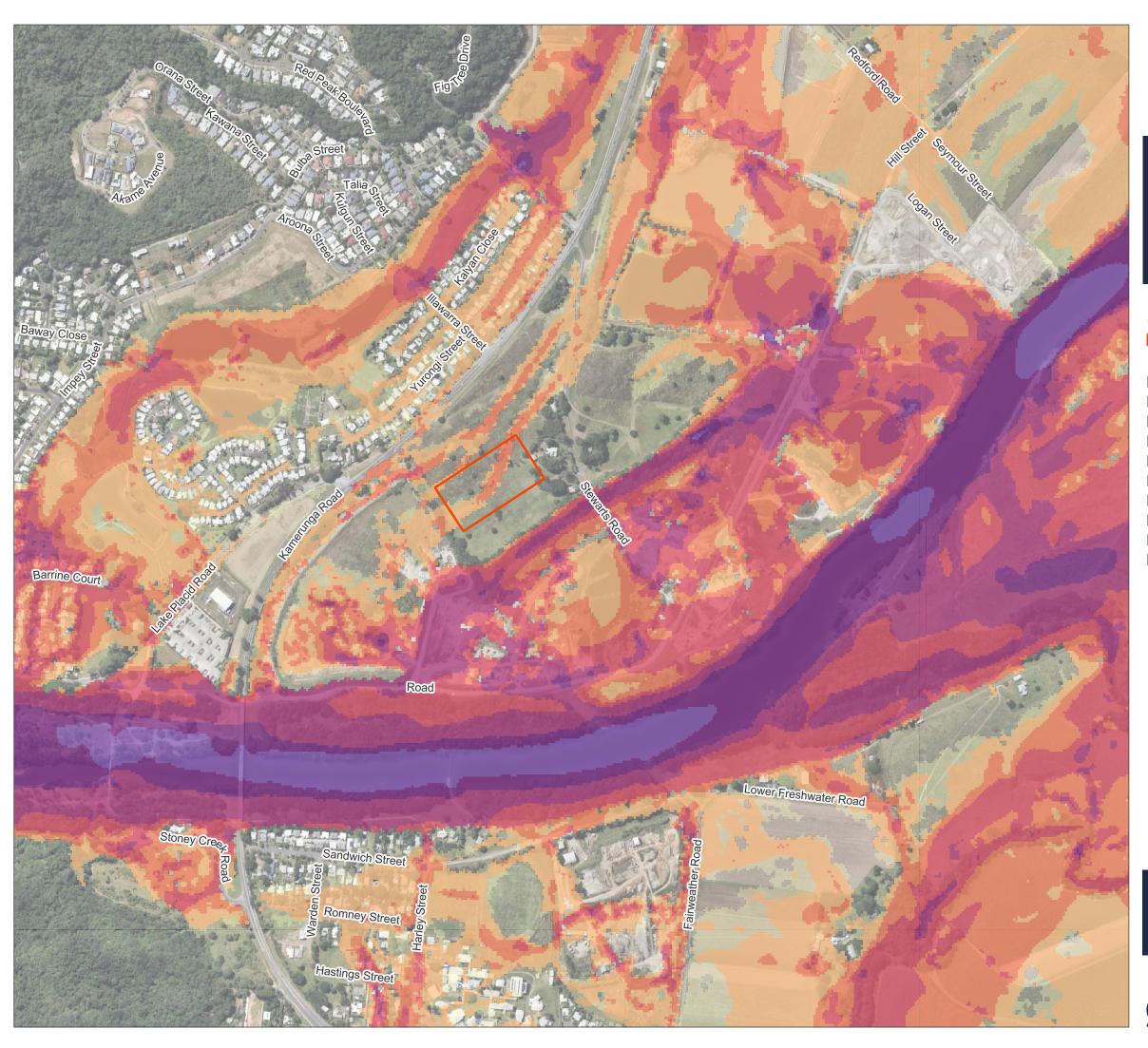
4.00 - 5.00

5.00 - 6.00

> 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55





Pre-Development
Peak Velocity
5% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

4.00 - 5.00

5.00 - 6.00

> 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Pre-Development
Peak Velocity
2% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

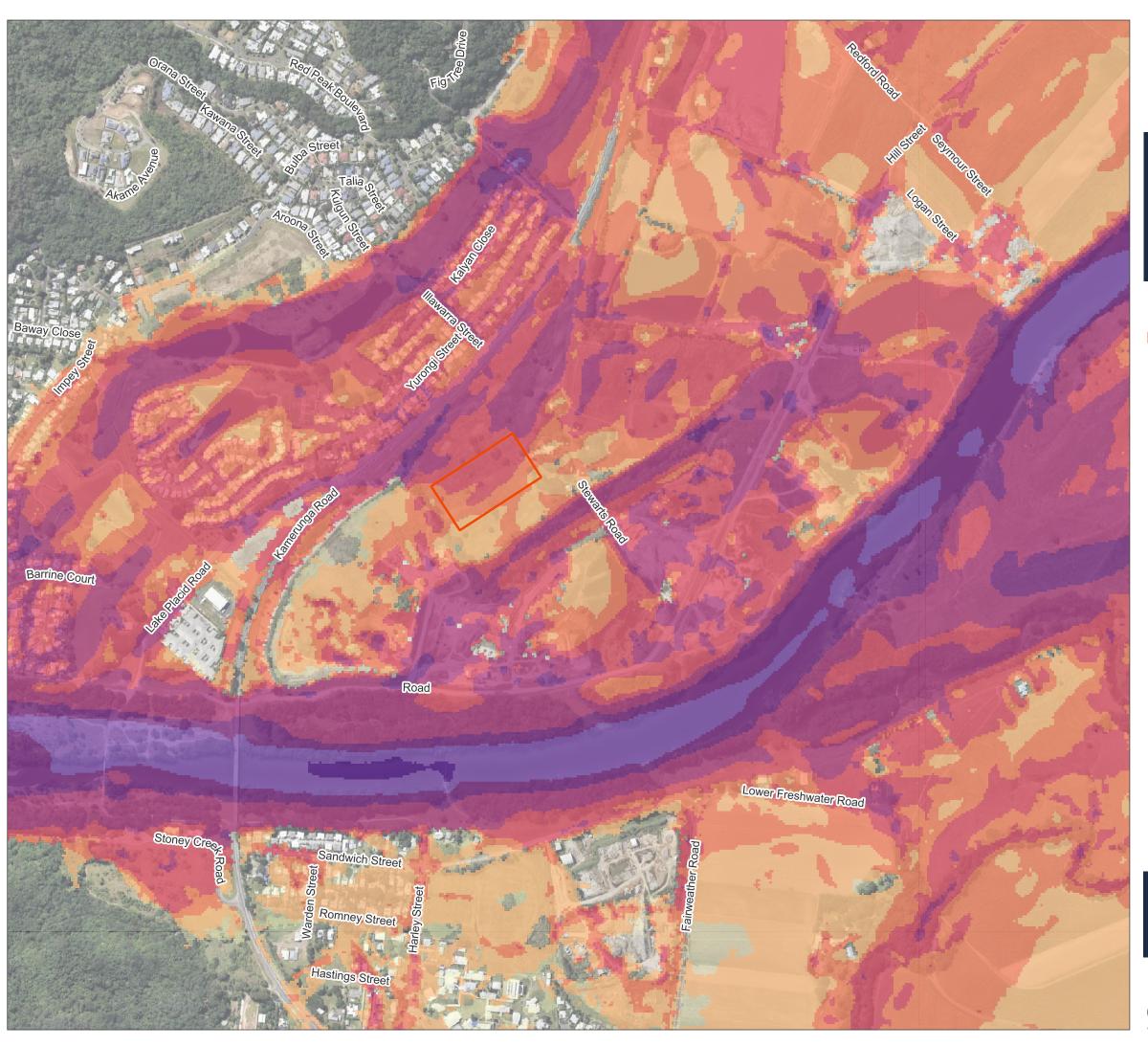
4.00 - 5.00

5.00 - 6.00 > 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Pre-Development Peak Velocity 1% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

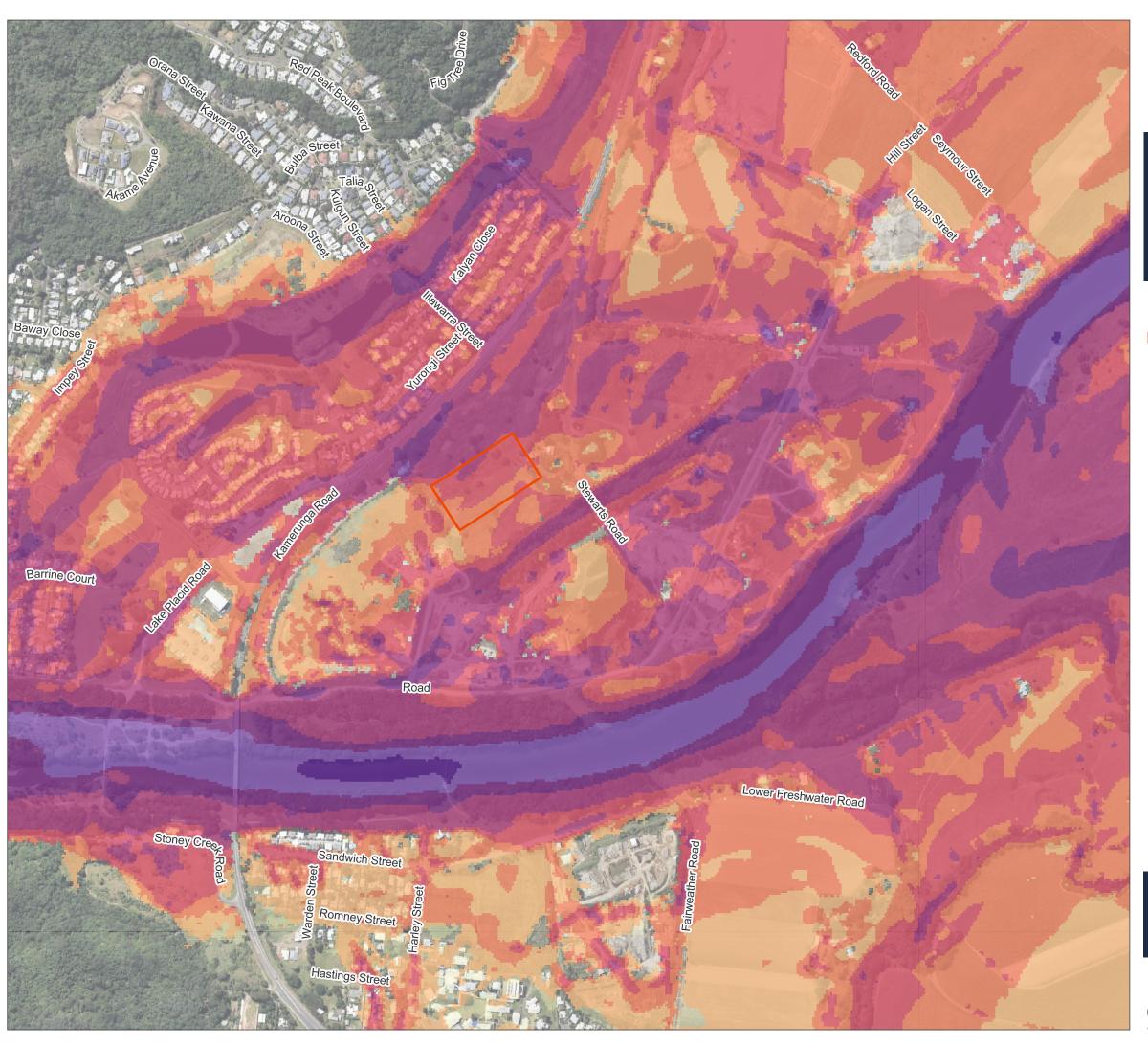
3.00 - 4.00

4.00 - 5.00

5.00 - 6.00 > 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55





Pre-Development Peak Velocity 0.5% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

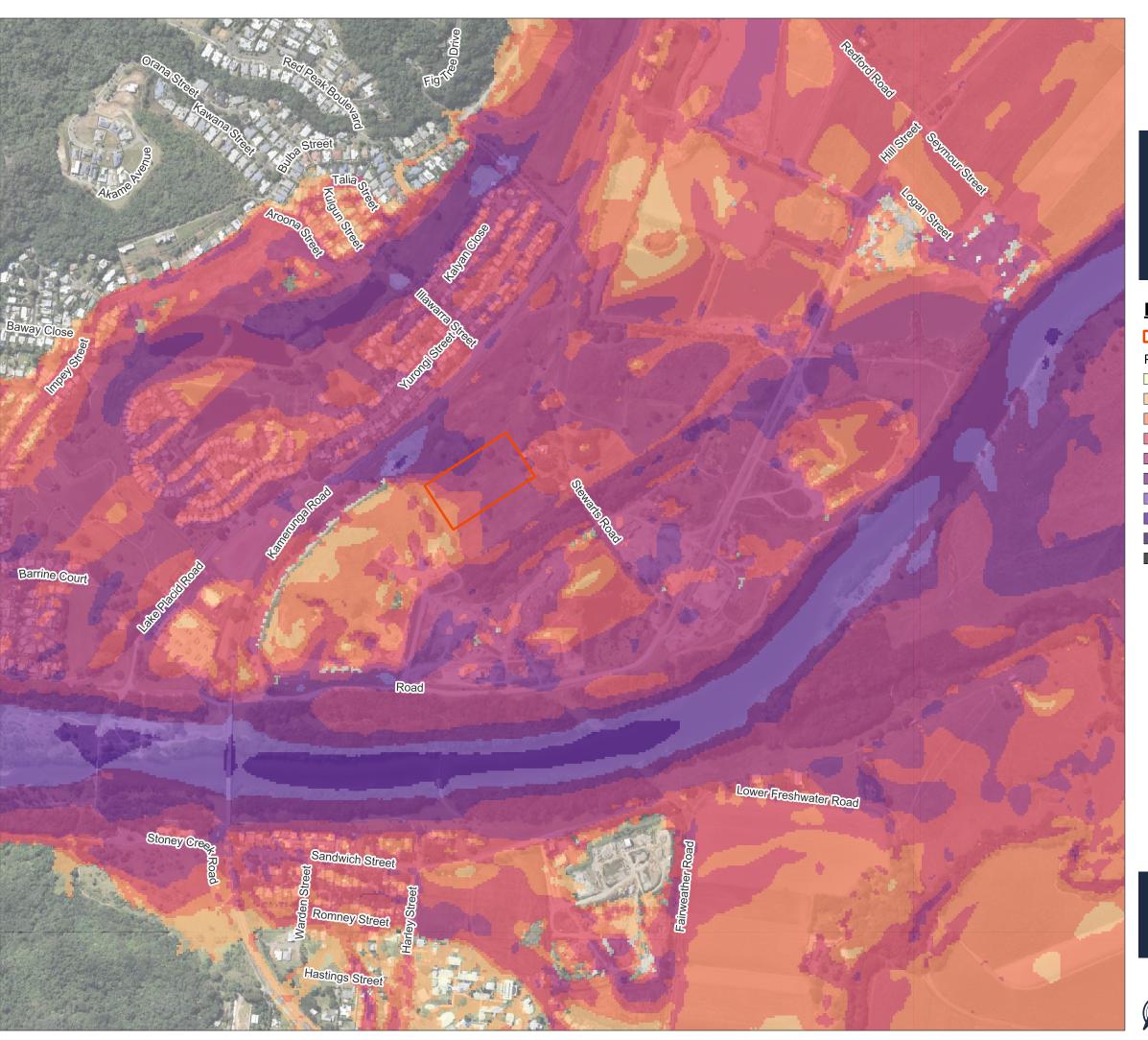
3.00 - 4.00

4.00 - 5.00

5.00 - 6.00 > 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55





Pre-Development Peak Velocity 0.05% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00 3.00 - 4.00

4.00 - 5.00

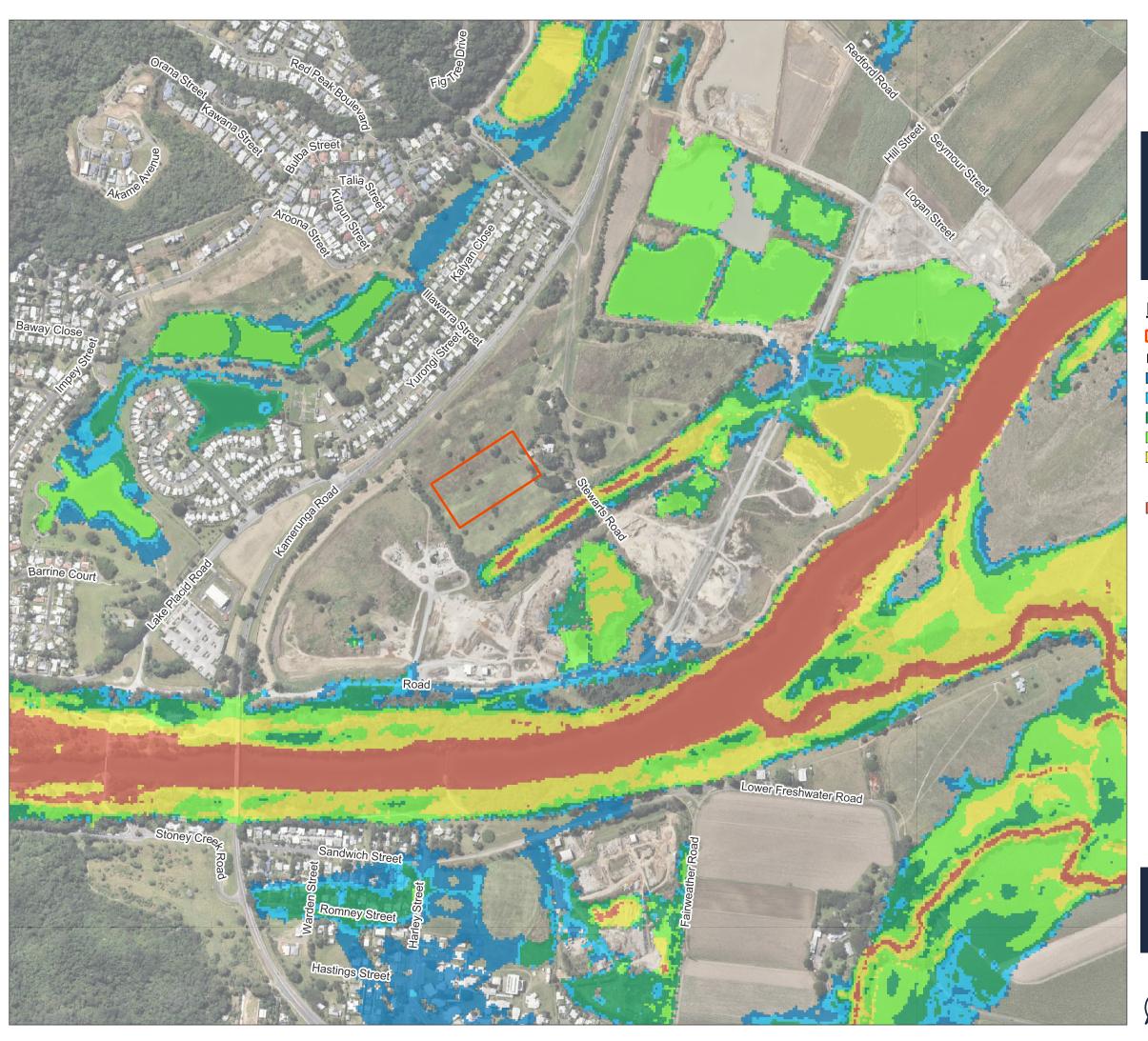
5.00 - 6.00

> 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Appendix A-17

Pre-Development Peak Hazard 50% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles (Buildings Require Special Engineering

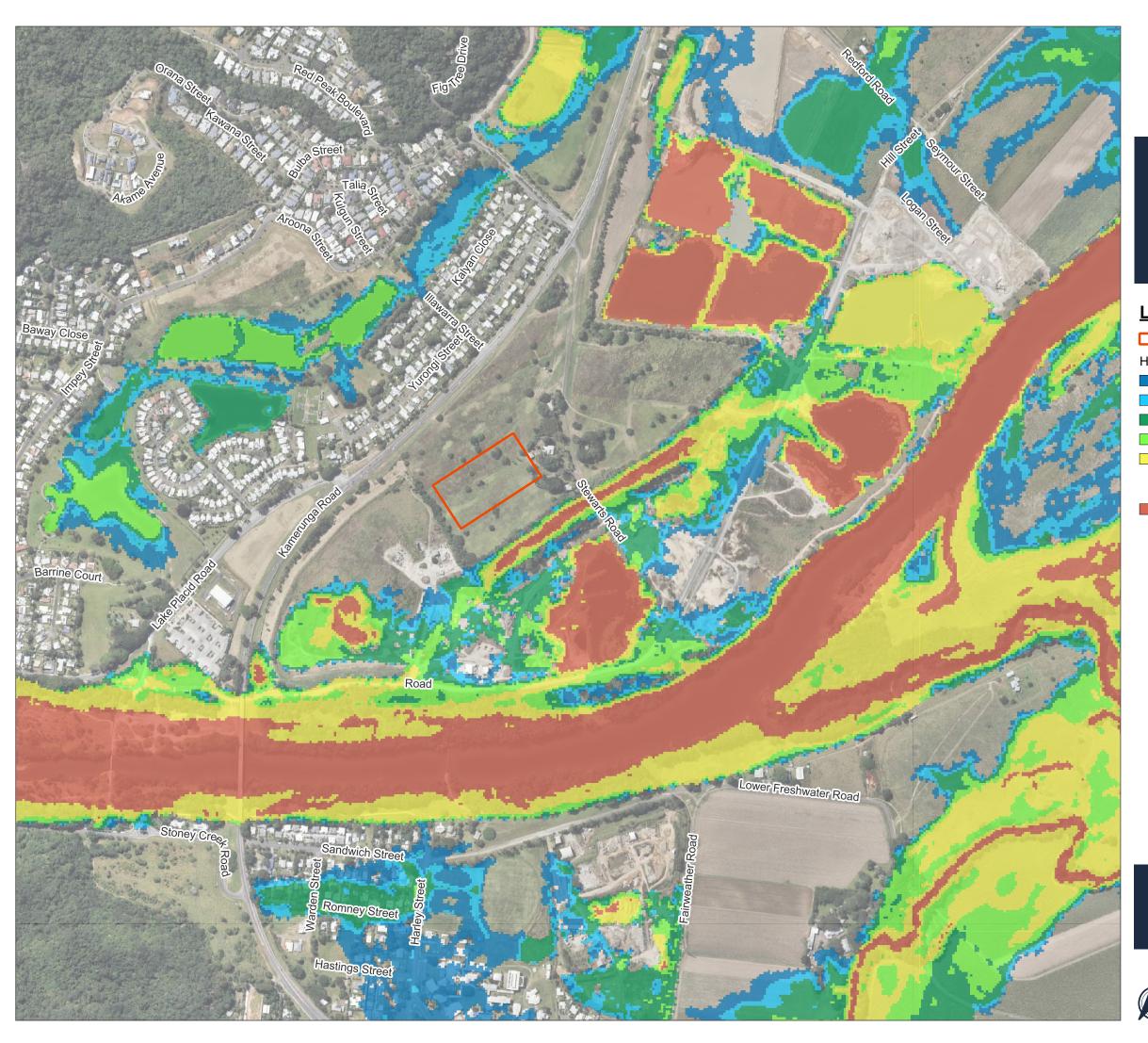
Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Pre-Development Peak Hazard 20% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles (Buildings Require Special Engineering

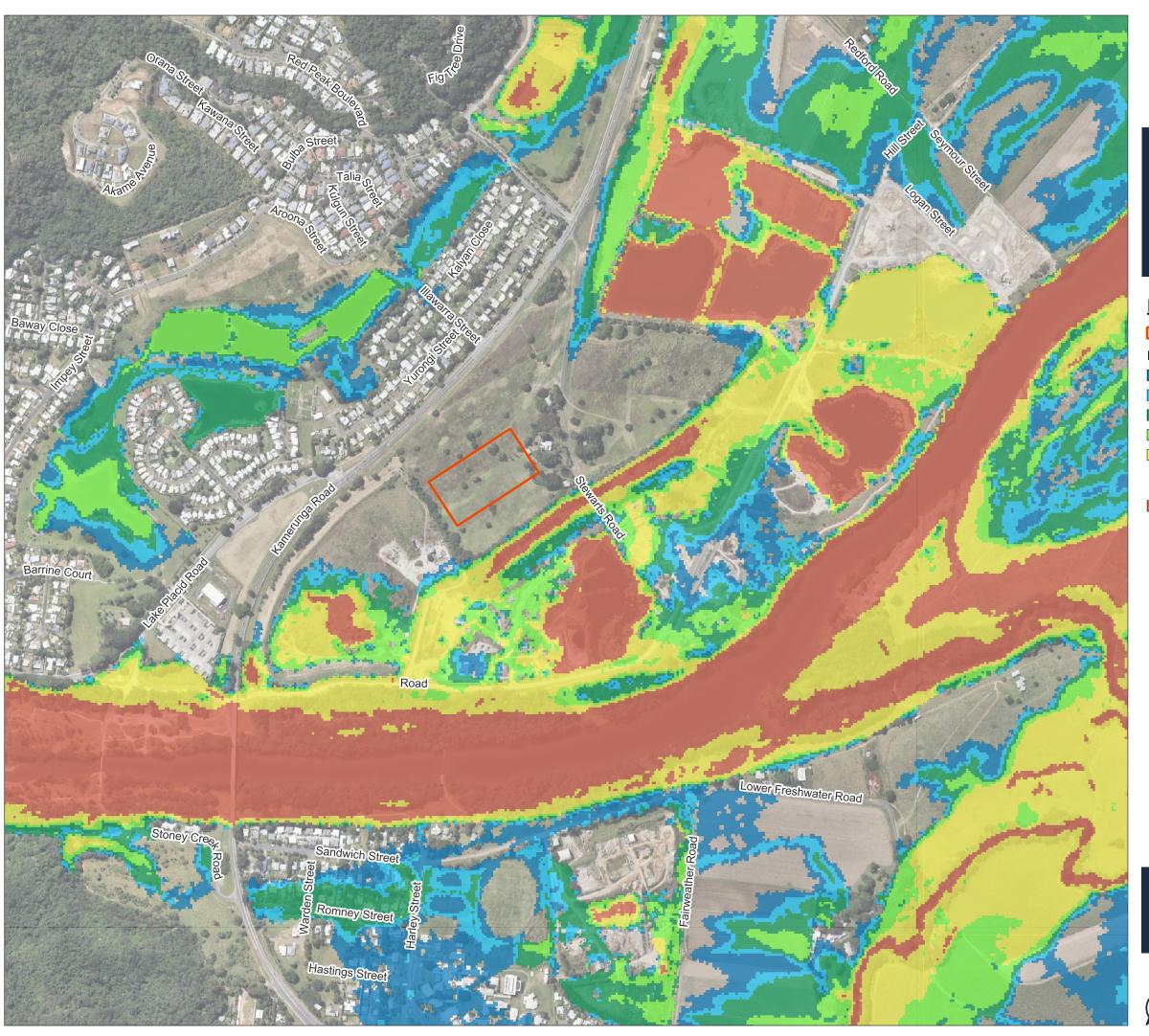
Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Pre-Development Peak Hazard 10% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles (Buildings Require Special Engineering

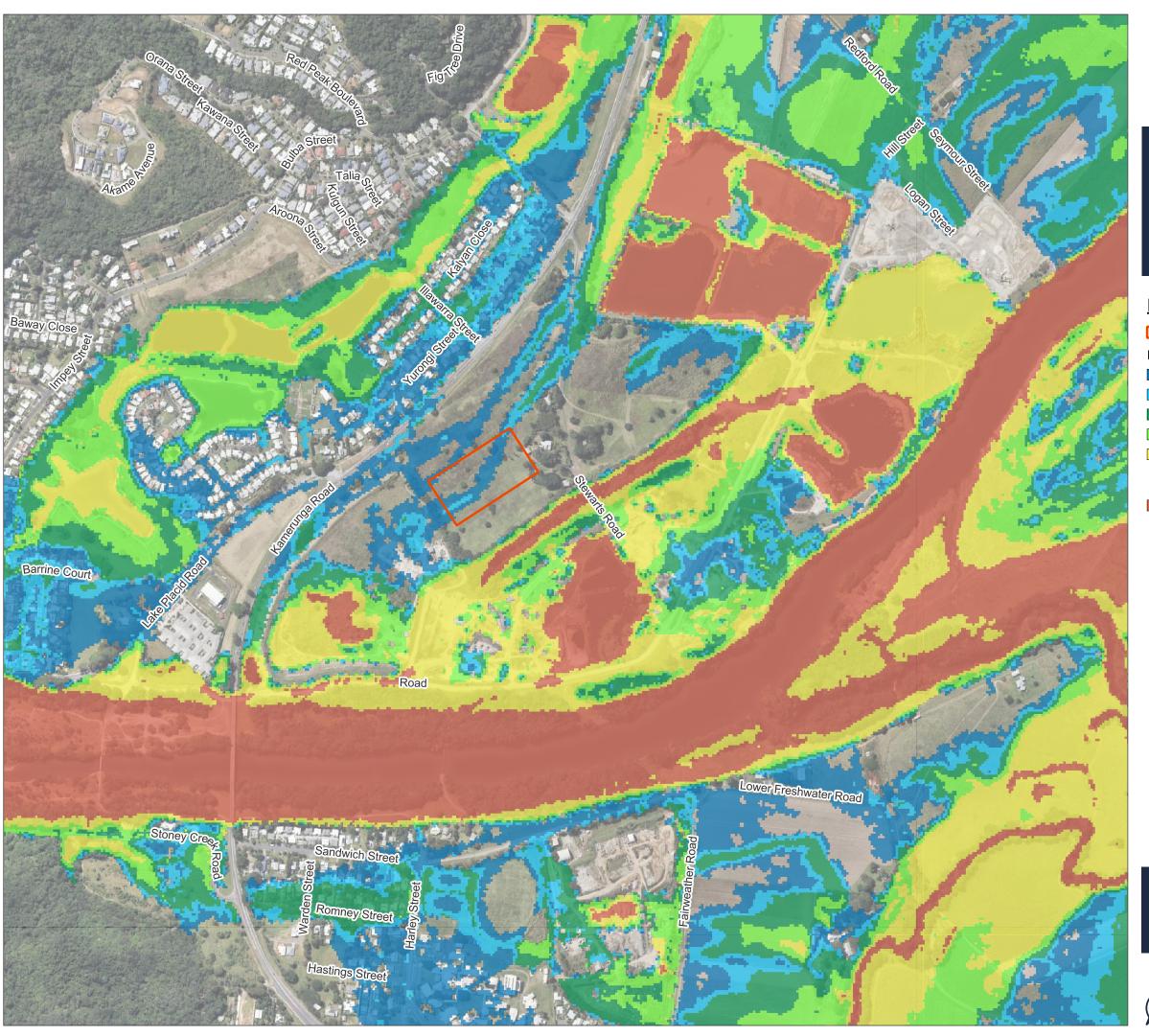
Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Appendix A-20

Pre-Development Peak Hazard 5% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles (Buildings Require Special Engineering

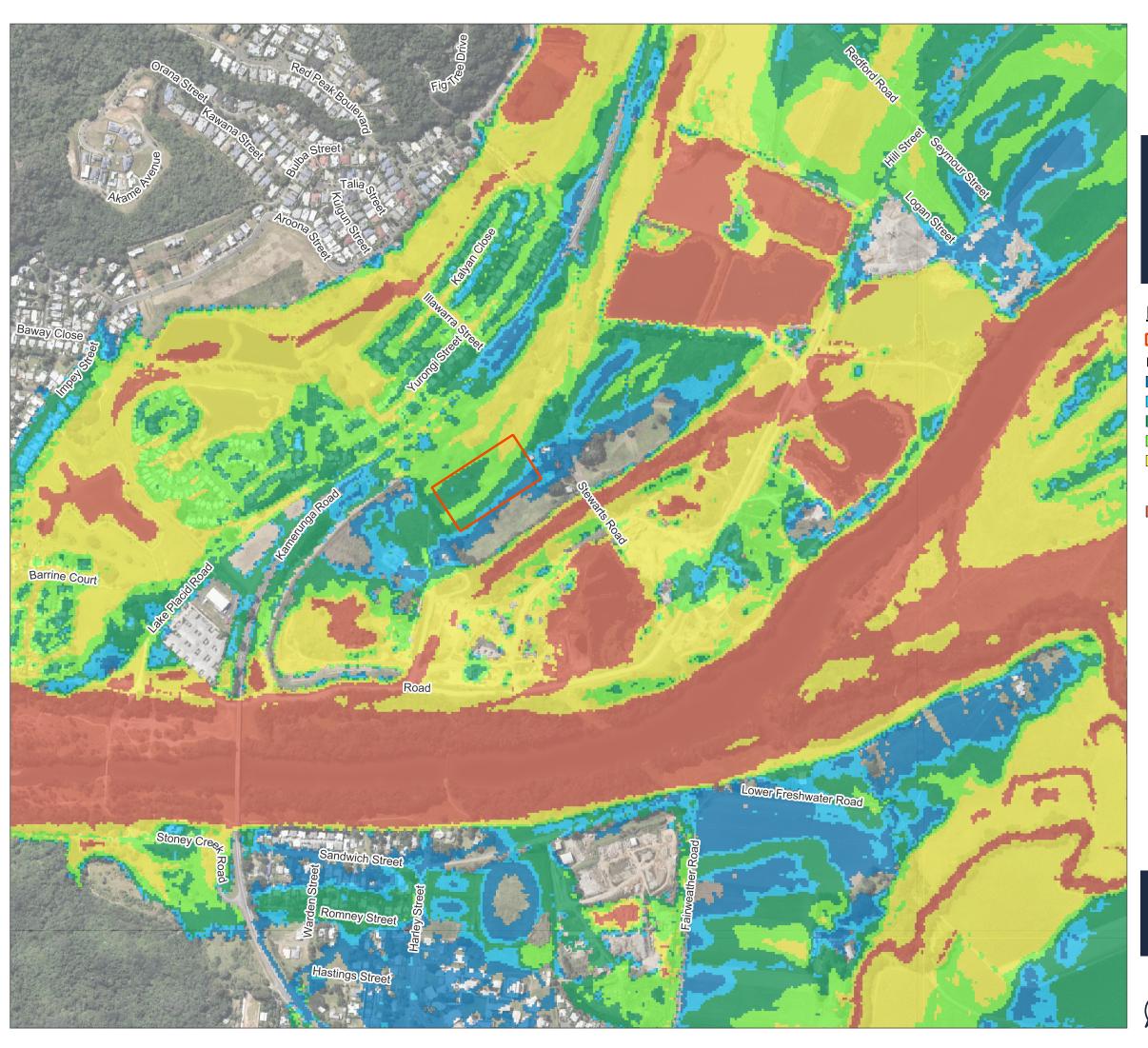
Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Pre-Development Peak Hazard 2% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering

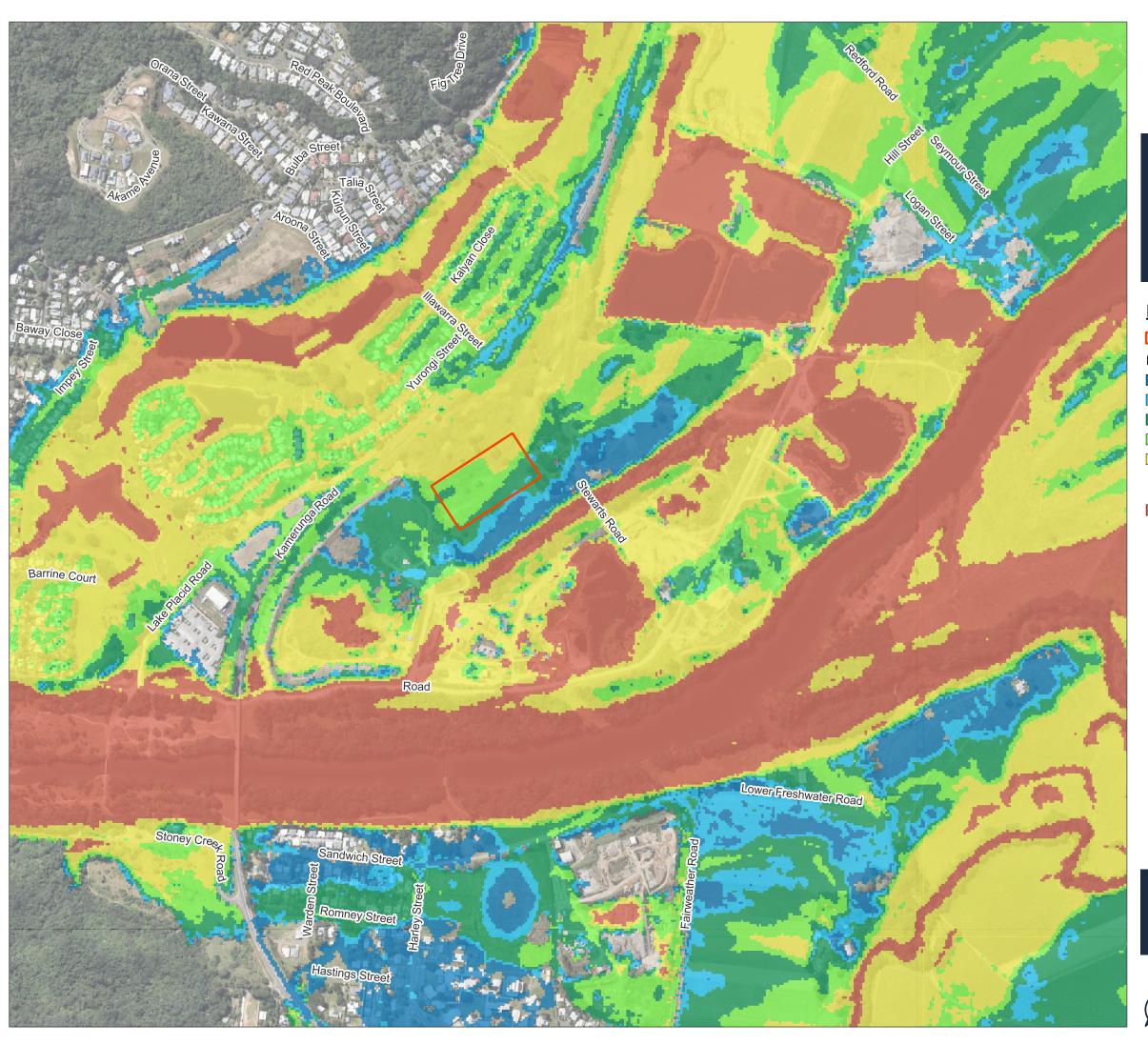
Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





| WATER | ENVIRONMENT

Appendix A-22

Pre-Development Peak Hazard 1% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering

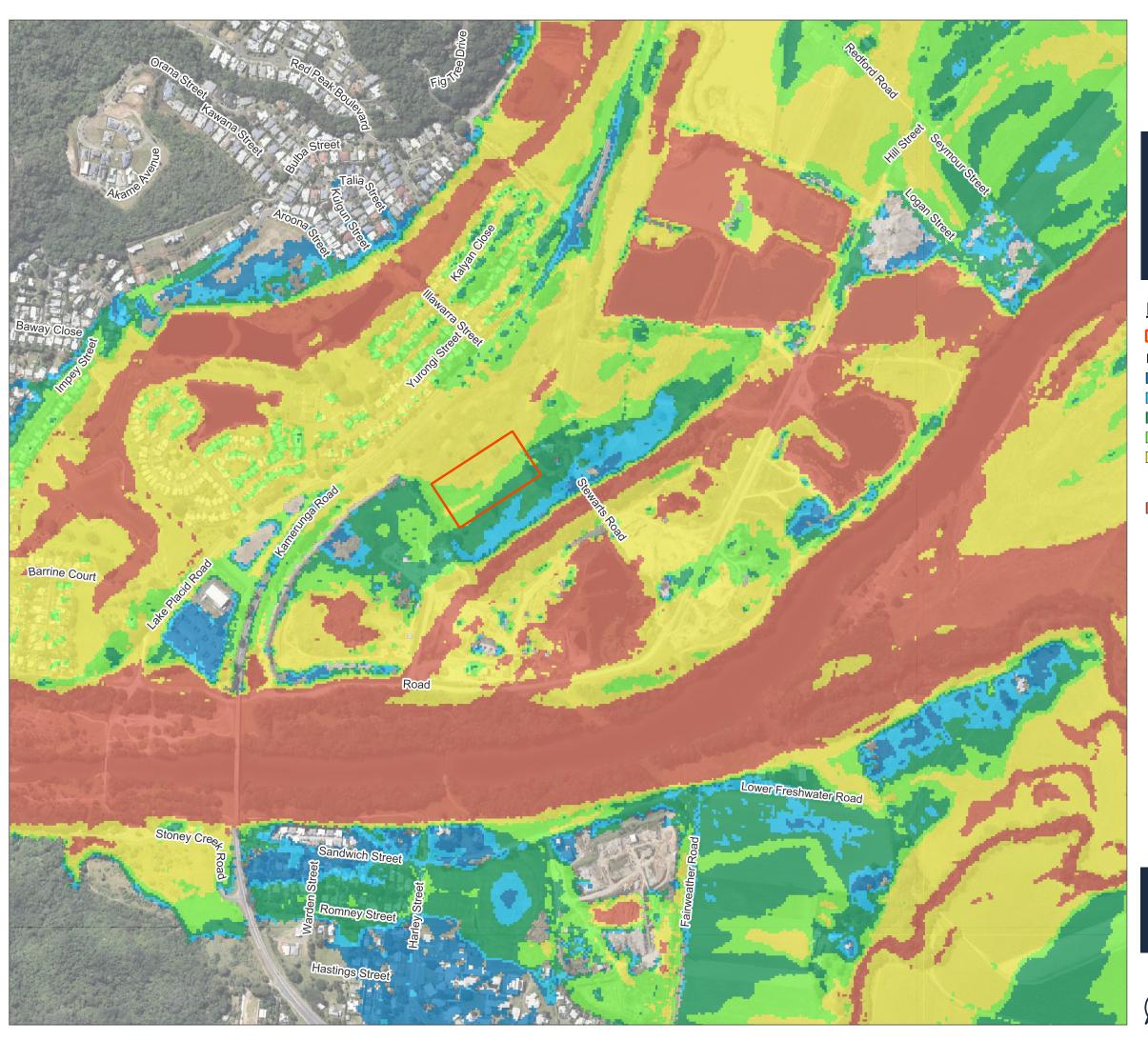
Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Pre-Development Peak Hazard 0.5% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles
(Buildings Require Special Engineering

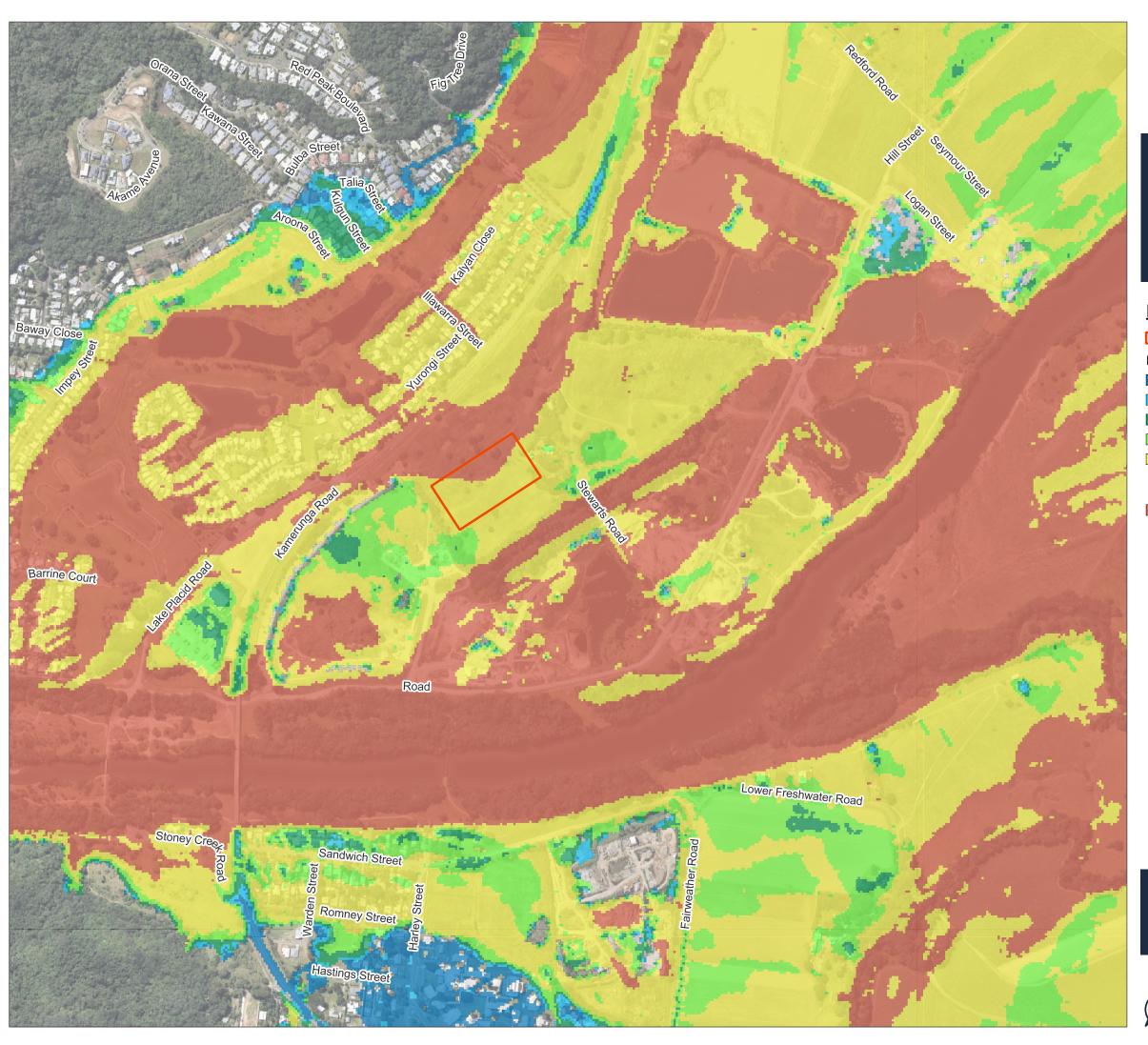
Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Pre-Development Peak Hazard 0.05% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles (Buildings Require Special Engineering

Design and Construction)

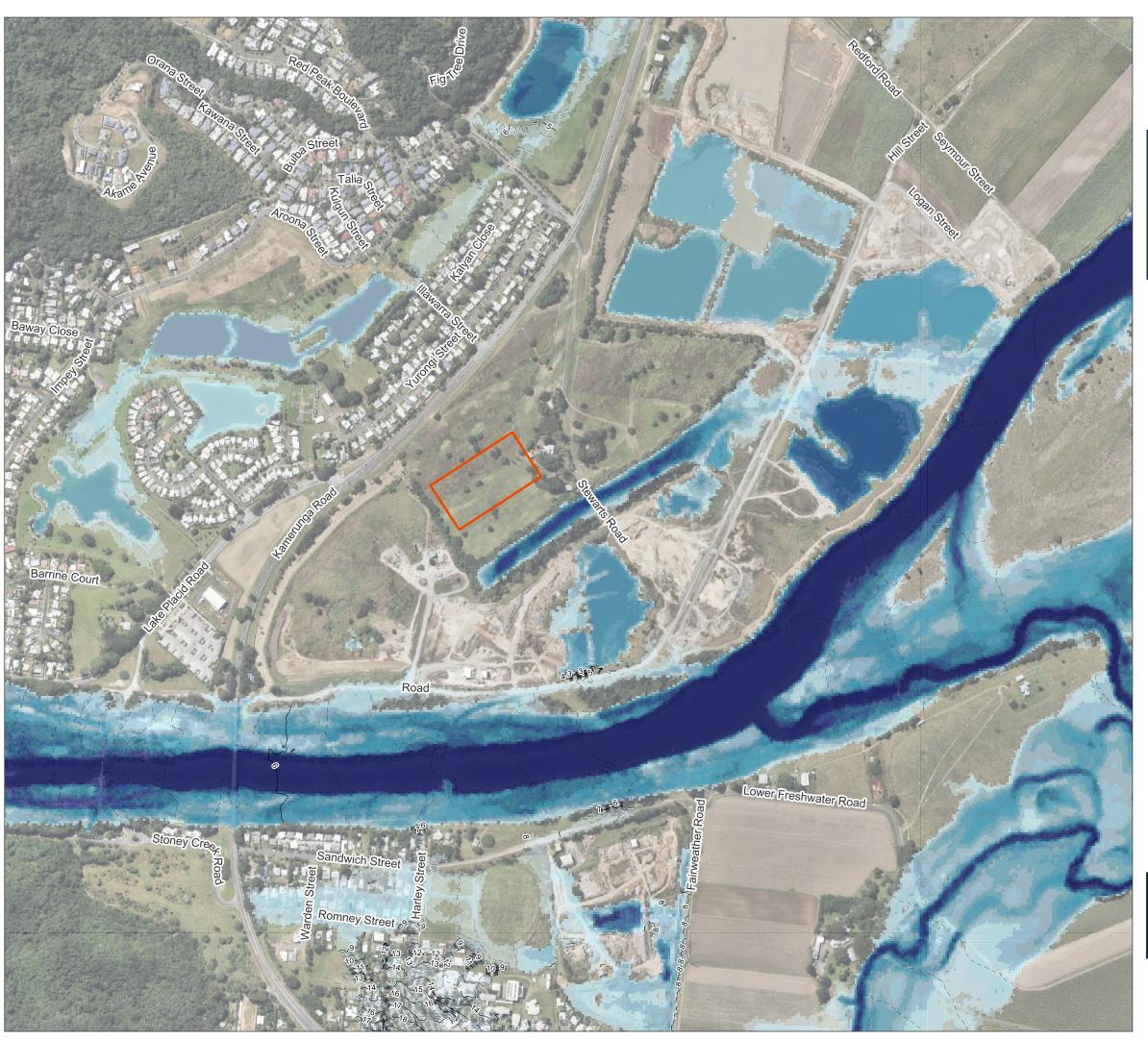
H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024

APPENDIX B POST DEVELOPMENT FLOOD MAPS





Appendix B-1

Post-Development
Peak Depth and Water Level
Contours
50% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

-- Minor (0.10m)

Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

> 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development
Peak Depth and Water Level
Contours
20% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

-- Minor (0.10m)

Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

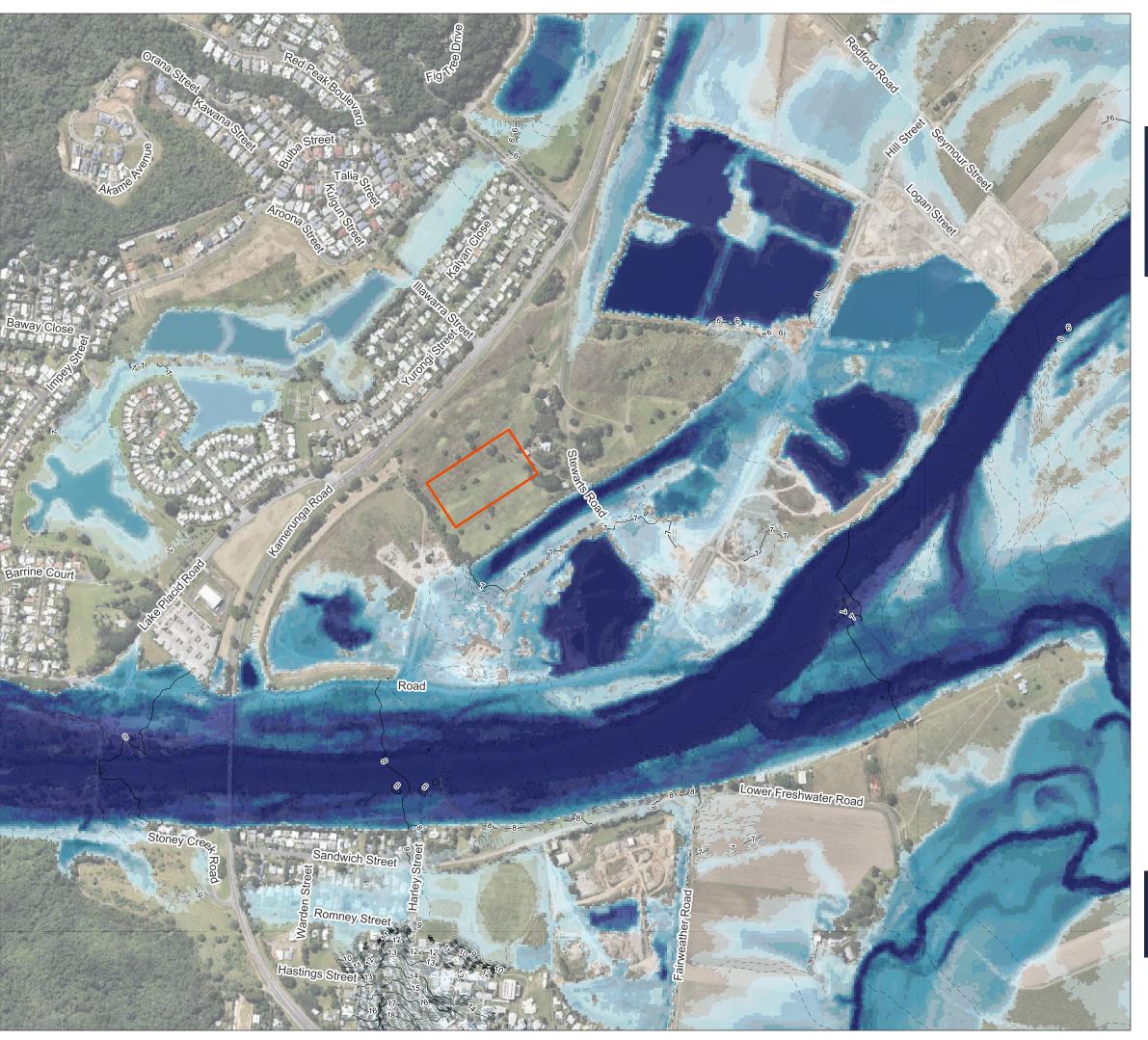
4.5 - 5.0

> 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Appendix B-3

Post-Development
Peak Depth and Water Level
Contours
10% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

--- Minor (0.10m)

Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

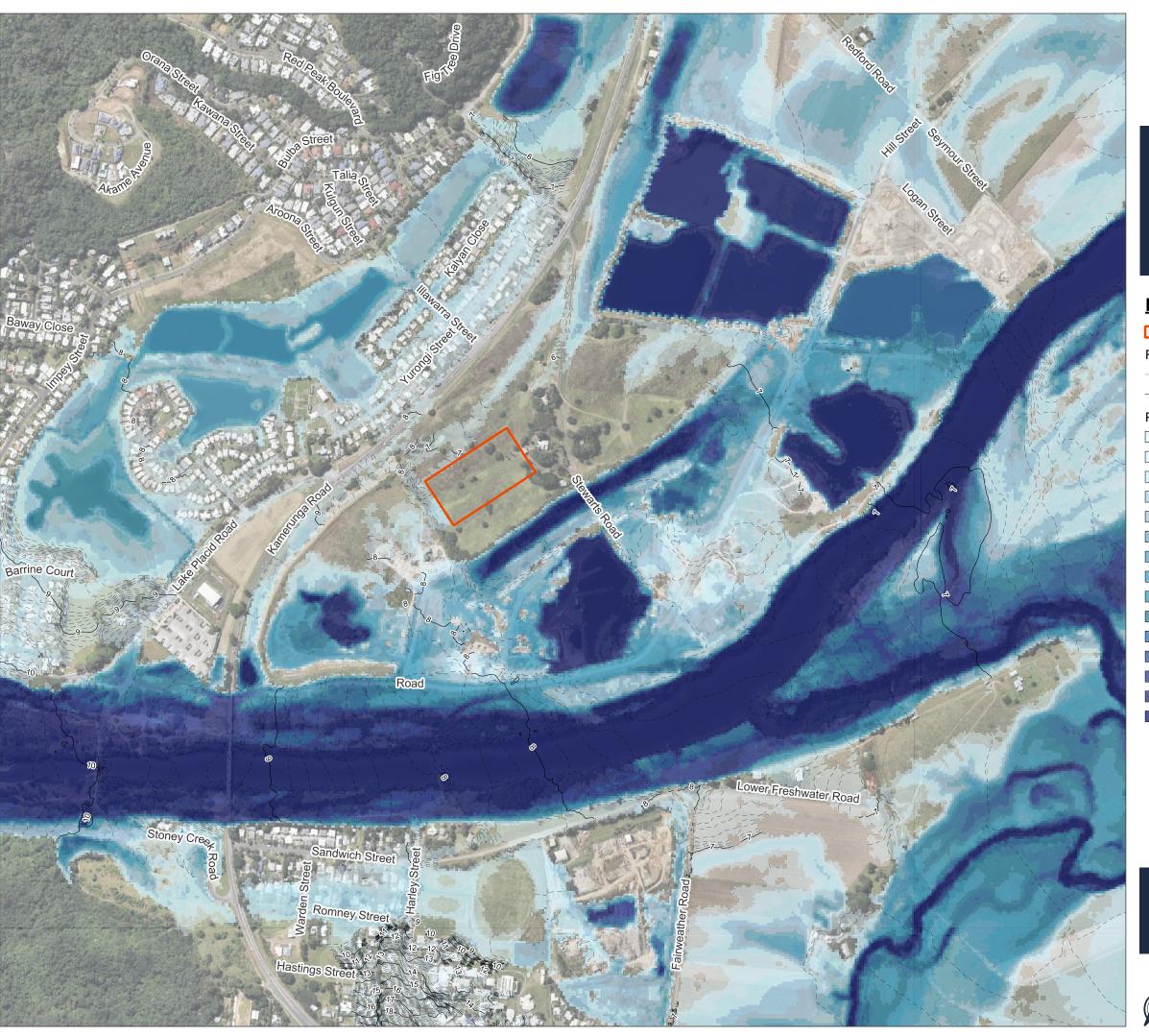
4.5 - 5.0

> 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Appendix B-4

Post-Development
Peak Depth and Water Level
Contours
5% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

--- Minor (0.10m)

Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

> 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Appendix B-5

Post-Development
Peak Depth and Water Level
Contours
2% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

--- Minor (0.10m)

Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

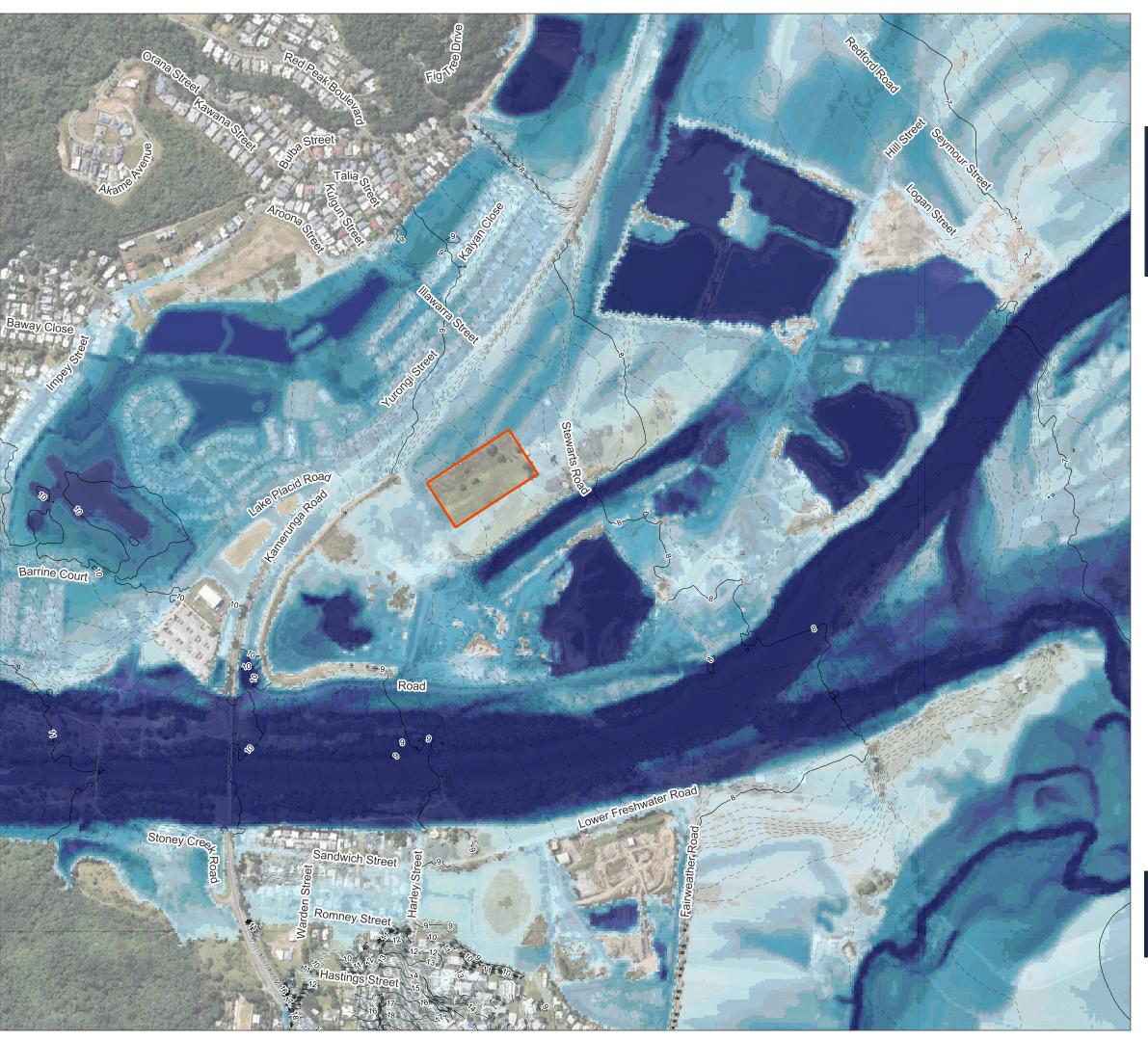
4.5 - 5.0

> 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development
Peak Depth and Water Level
Contours
1% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

--- Minor (0.10m)

Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

4.5 - 5.0

> 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024

200





Appendix B-7

Post-Development Peak Depth and Water Level Contours 0.5% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

Minor (0.10m)

Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

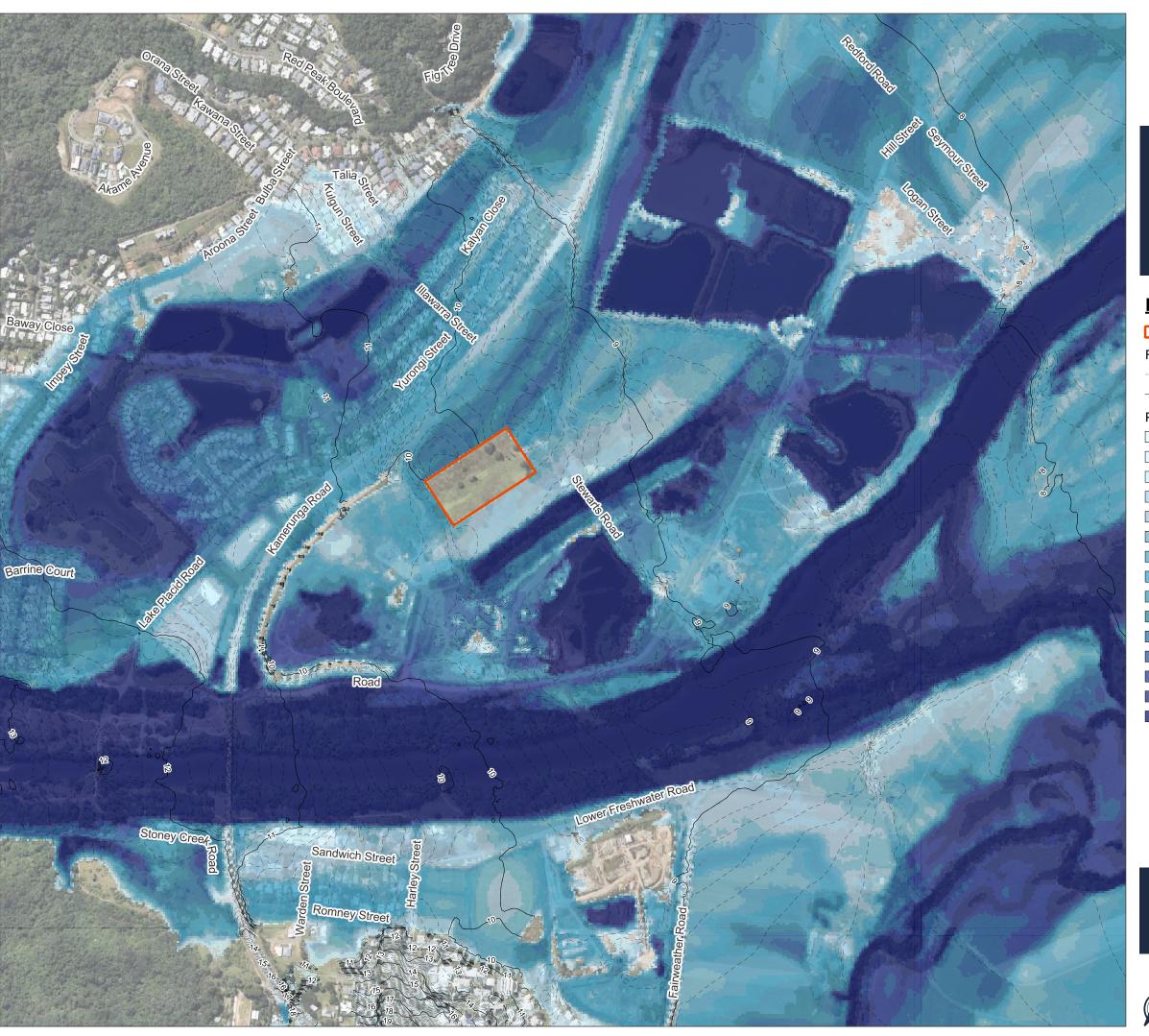
3.5 - 4.0

4.0 - 4.5

4.5 - 5.0 > 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55





Appendix B-8

Post-Development
Peak Depth and Water Level
Contours
0.05% AEP Event

LEGEND

Fill Pad

Flood Level Contours (mAHD)

--- Minor (0.10m)

– Major (1.0m)

Peak Depth (m)

<= 0.3

0.3 - 0.6

0.6 - 0.9

0.9 - 1.2

1.2 - 1.5

1.5 - 1.8

1.8 - 2.1

2.1 - 2.4

2.4 - 2.7

2.7 - 3.0

3.0 - 3.5

3.5 - 4.0

4.0 - 4.5

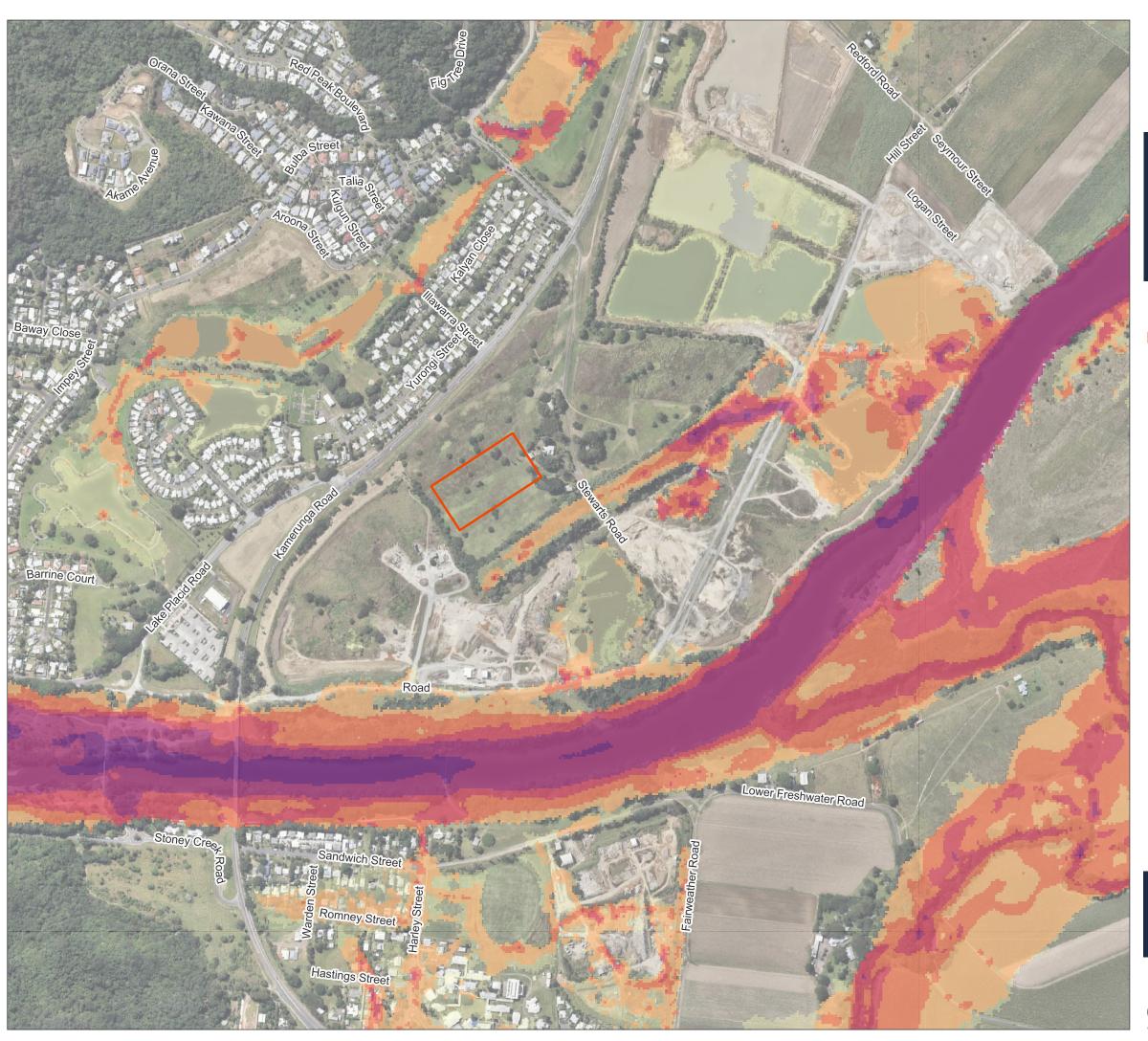
4.5 - 5.0

> 5.0

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development
Peak Velocity
50% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

4.00 - 5.00

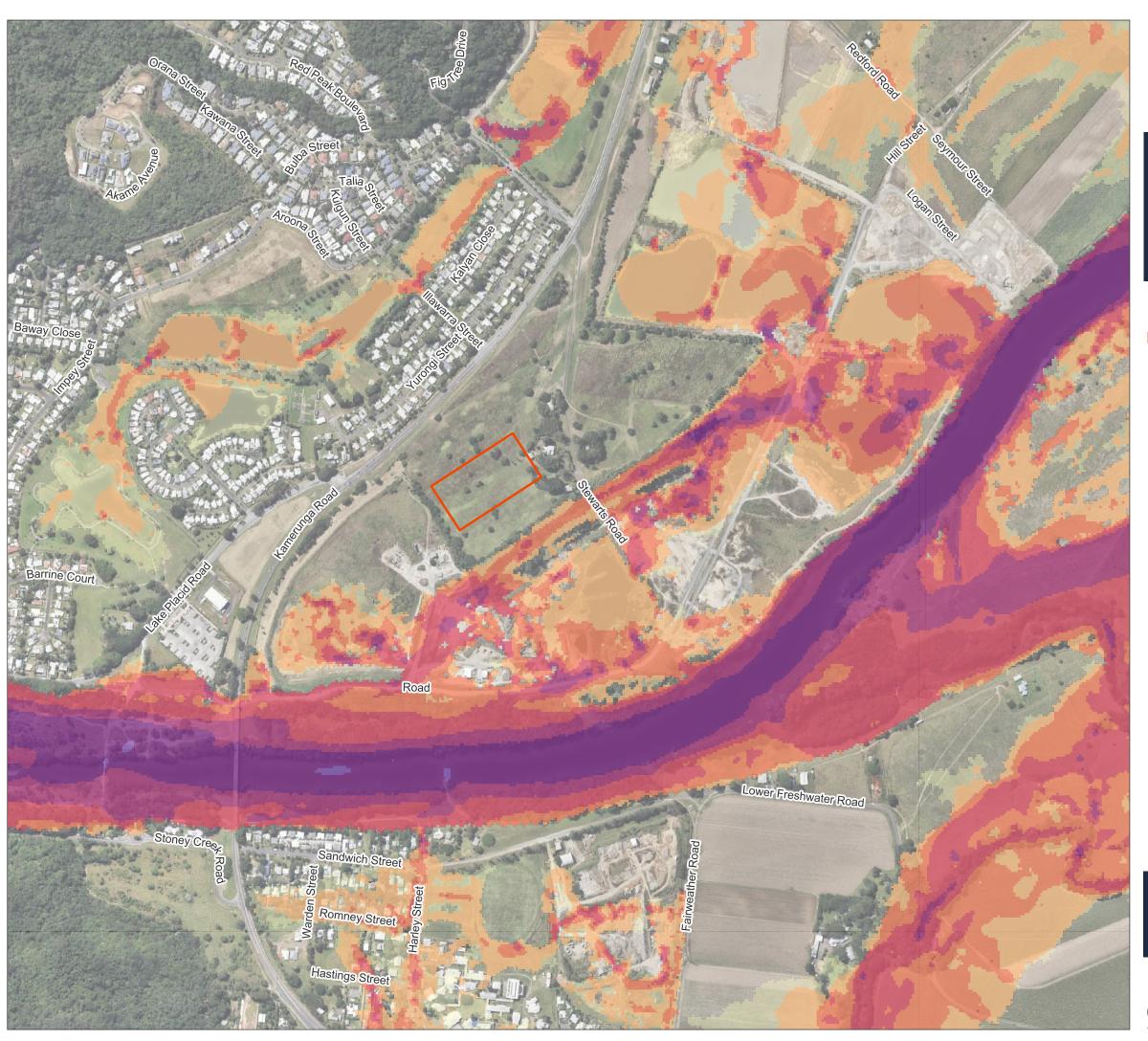
5.00 - 6.00

> 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development Peak Velocity 20% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

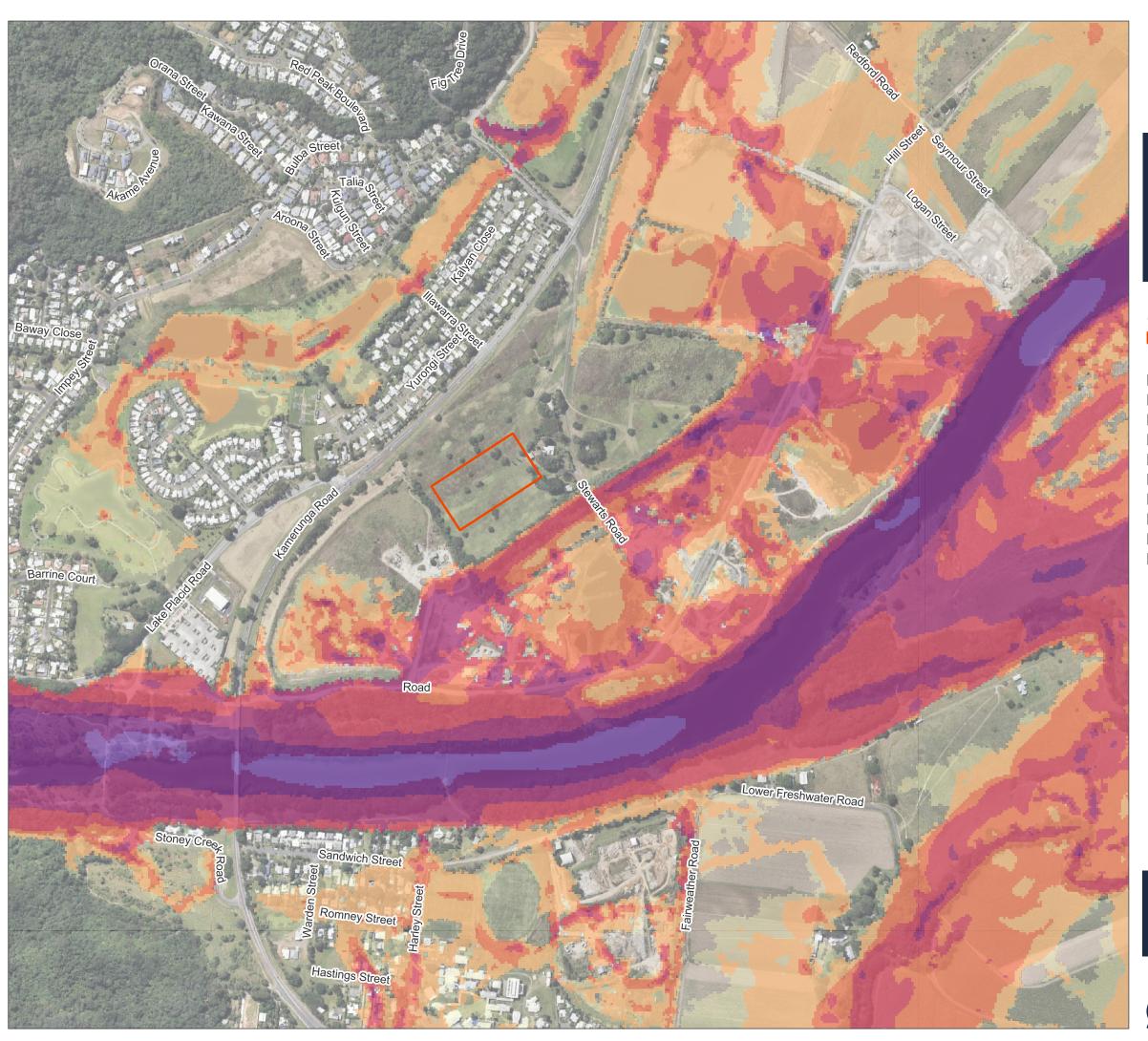
4.00 - 5.00

5.00 - 6.00

> 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55





Post-Development
Peak Velocity
10% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

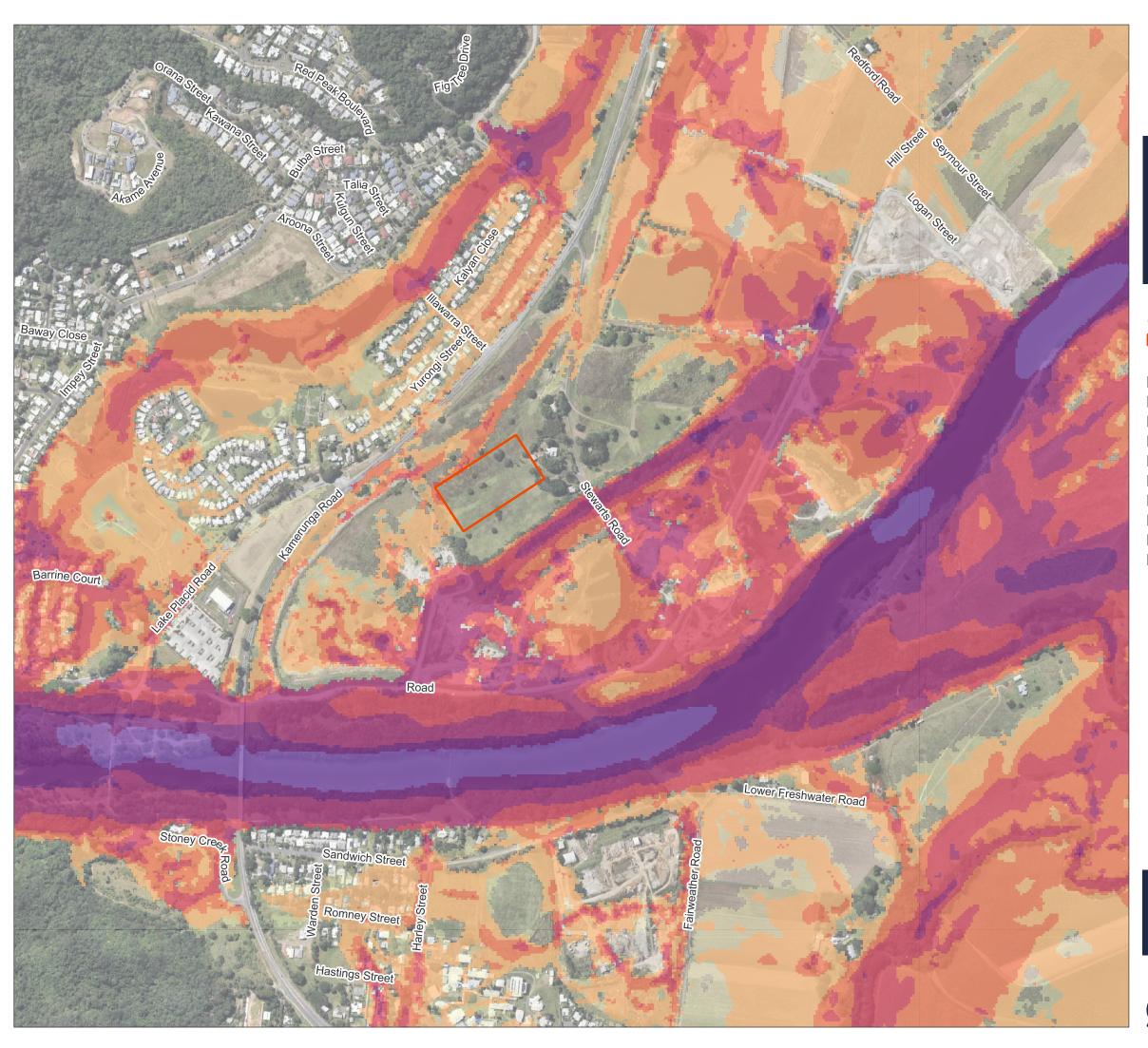
4.00 - 5.00

5.00 - 6.00

> 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55





Post-Development Peak Velocity 5% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

4.00 - 5.00

5.00 - 6.00 > 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55





Post-Development
Peak Velocity
2% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

4.00 - 5.00

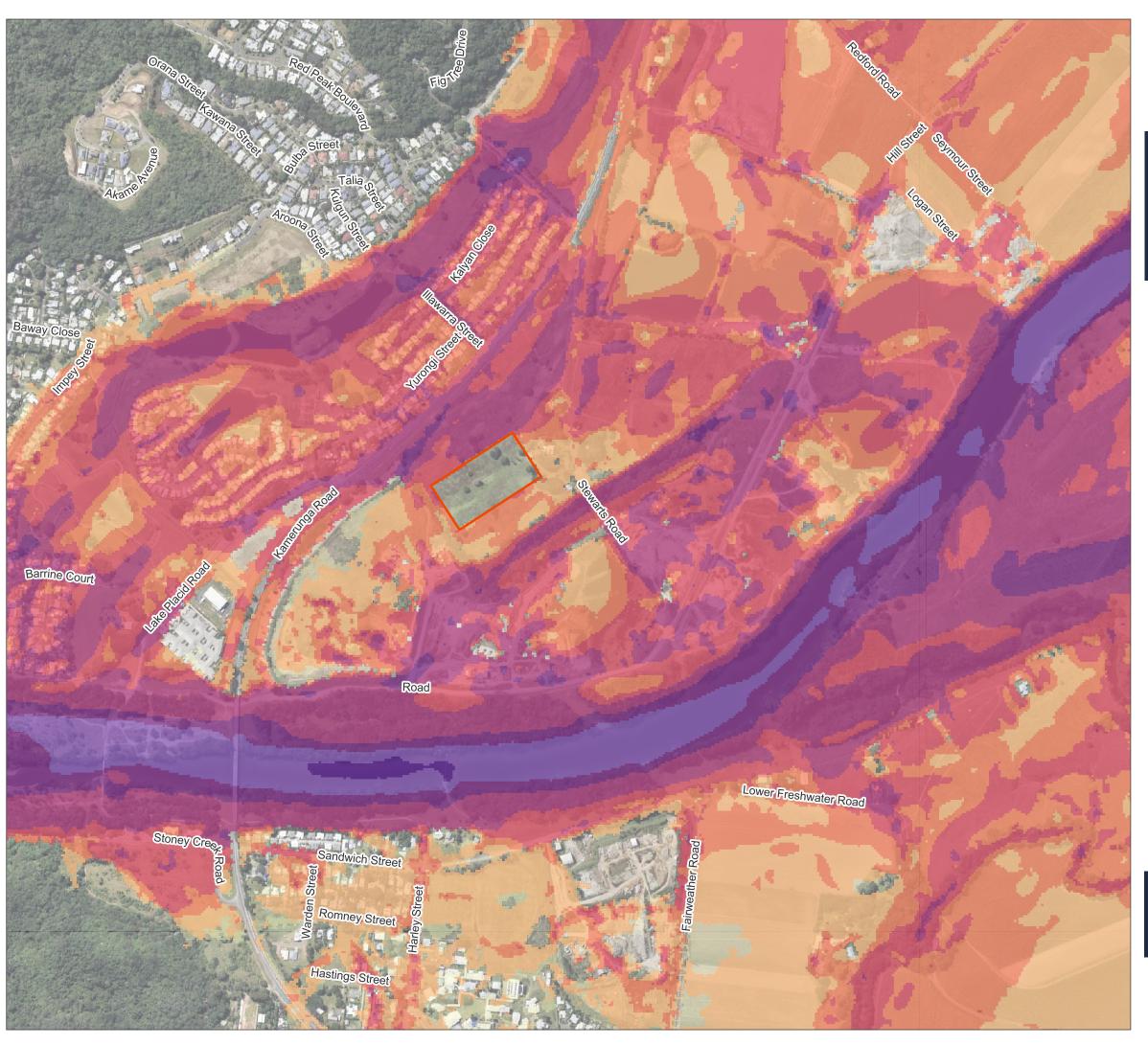
5.00 - 6.00

> 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development Peak Velocity 1% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

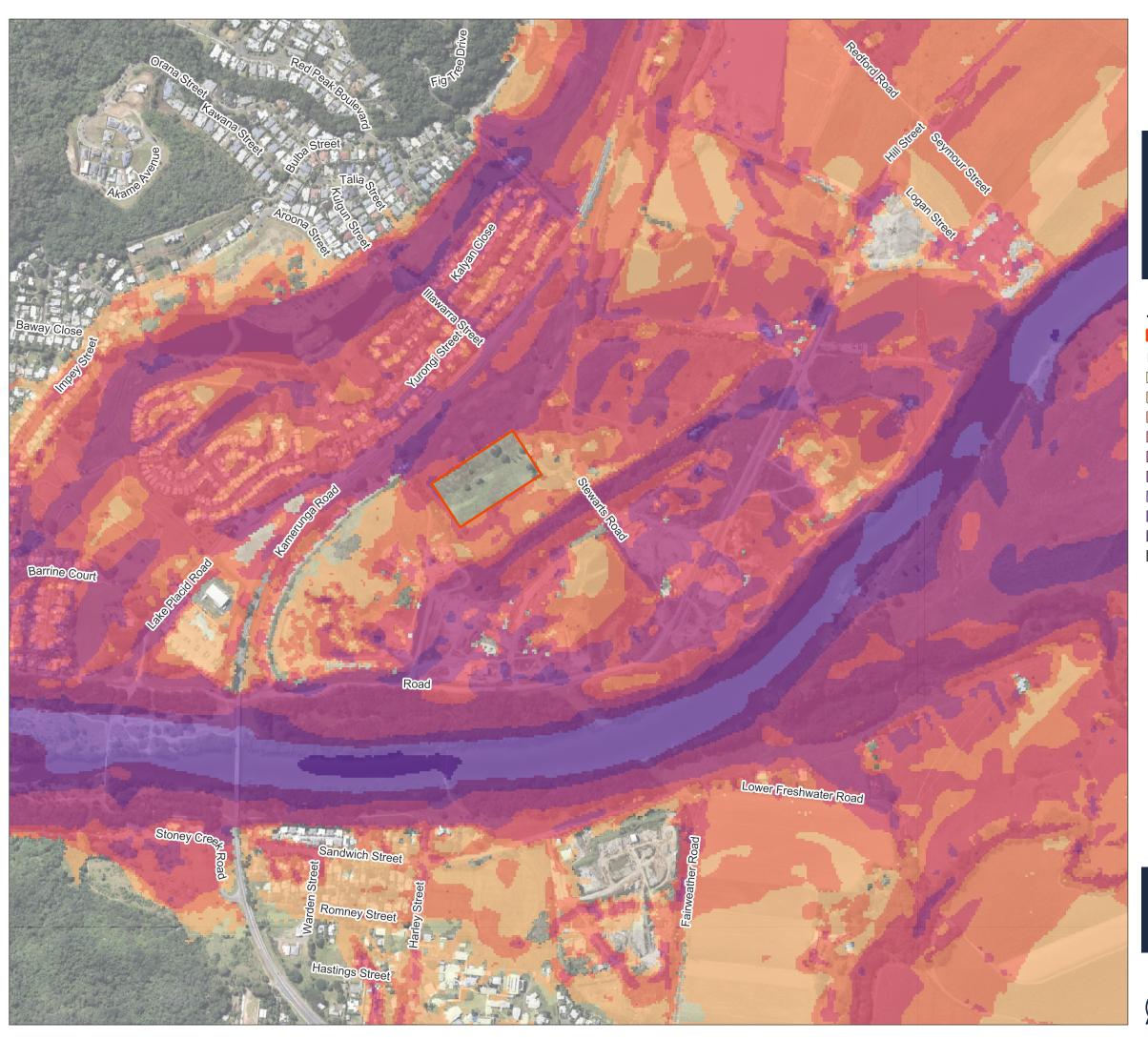
3.00 - 4.00

4.00 - 5.00

5.00 - 6.00 > 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55





Post-Development Peak Velocity 0.5% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00

3.00 - 4.00

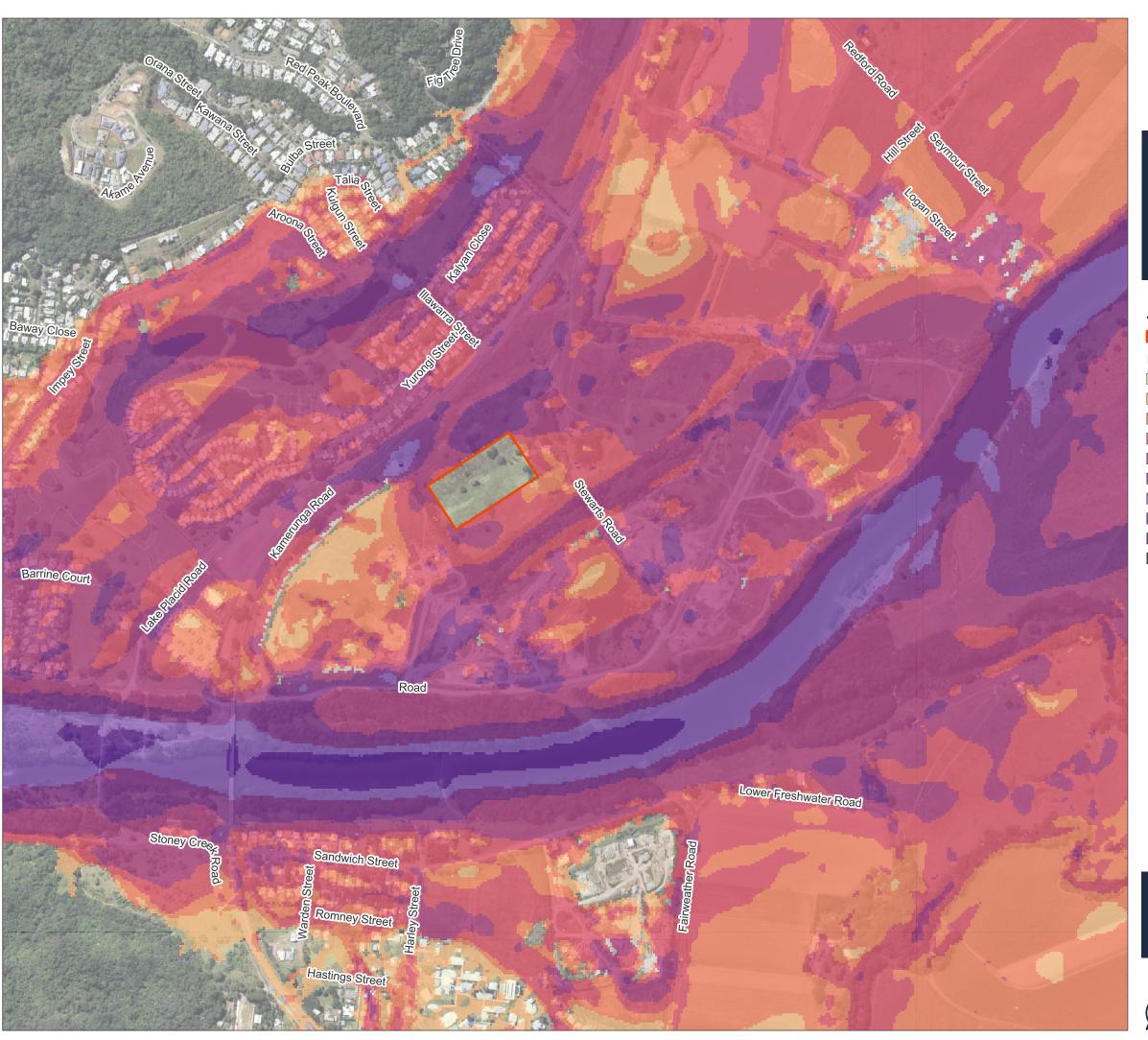
4.00 - 5.00

5.00 - 6.00 > 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development Peak Velocity 0.05% AEP Event

LEGEND

Fill Pad

Peak Velocity (m/s):

<= 0.05

0.05 - 0.25

0.25 - 0.50

0.50 - 1.00

1.00 - 2.00

2.00 - 3.00 3.00 - 4.00

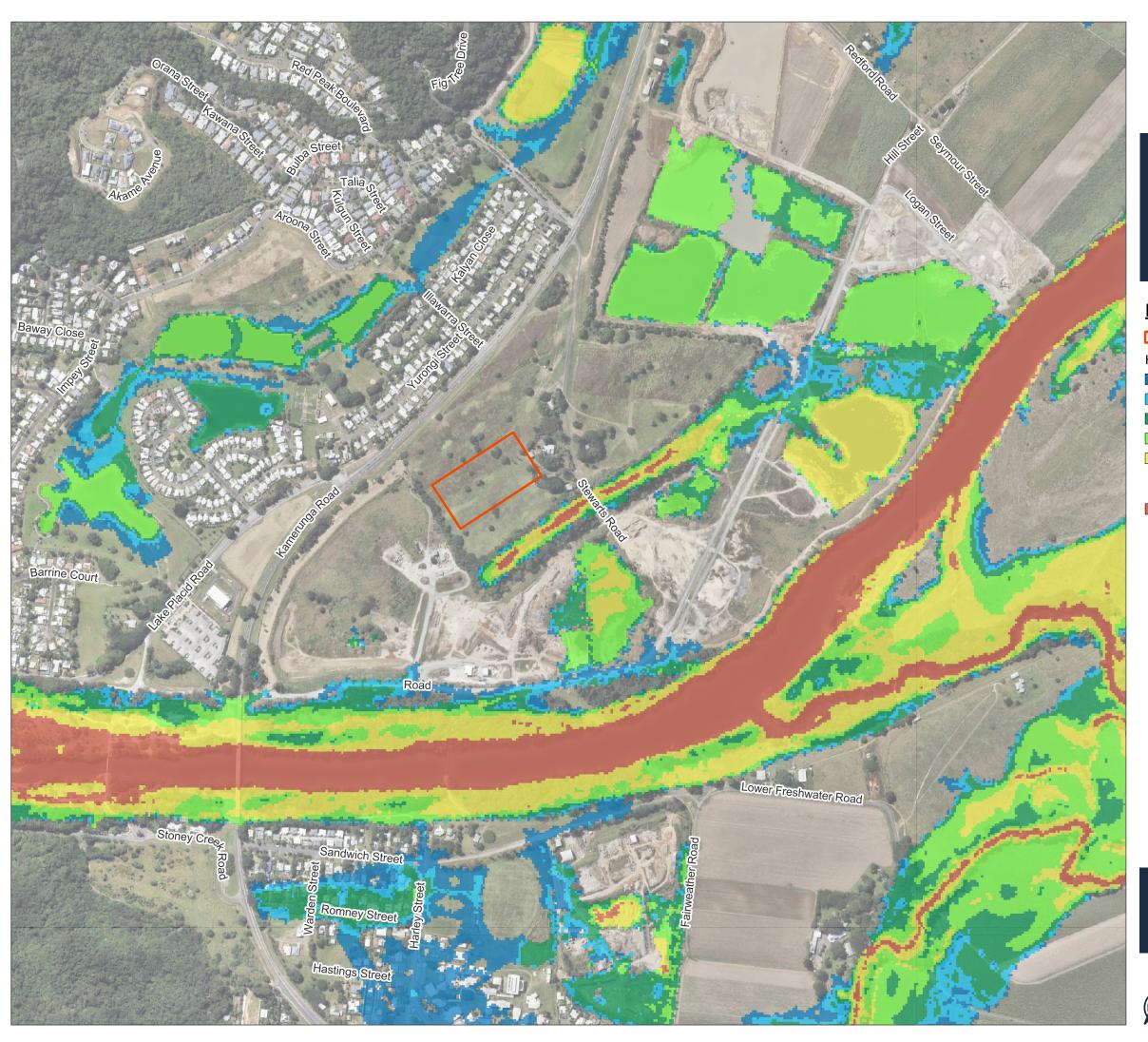
4.00 - 5.00

5.00 - 6.00

> 6.00

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55





Post-Development Peak Hazard 50% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles (Buildings Require Special Engineering

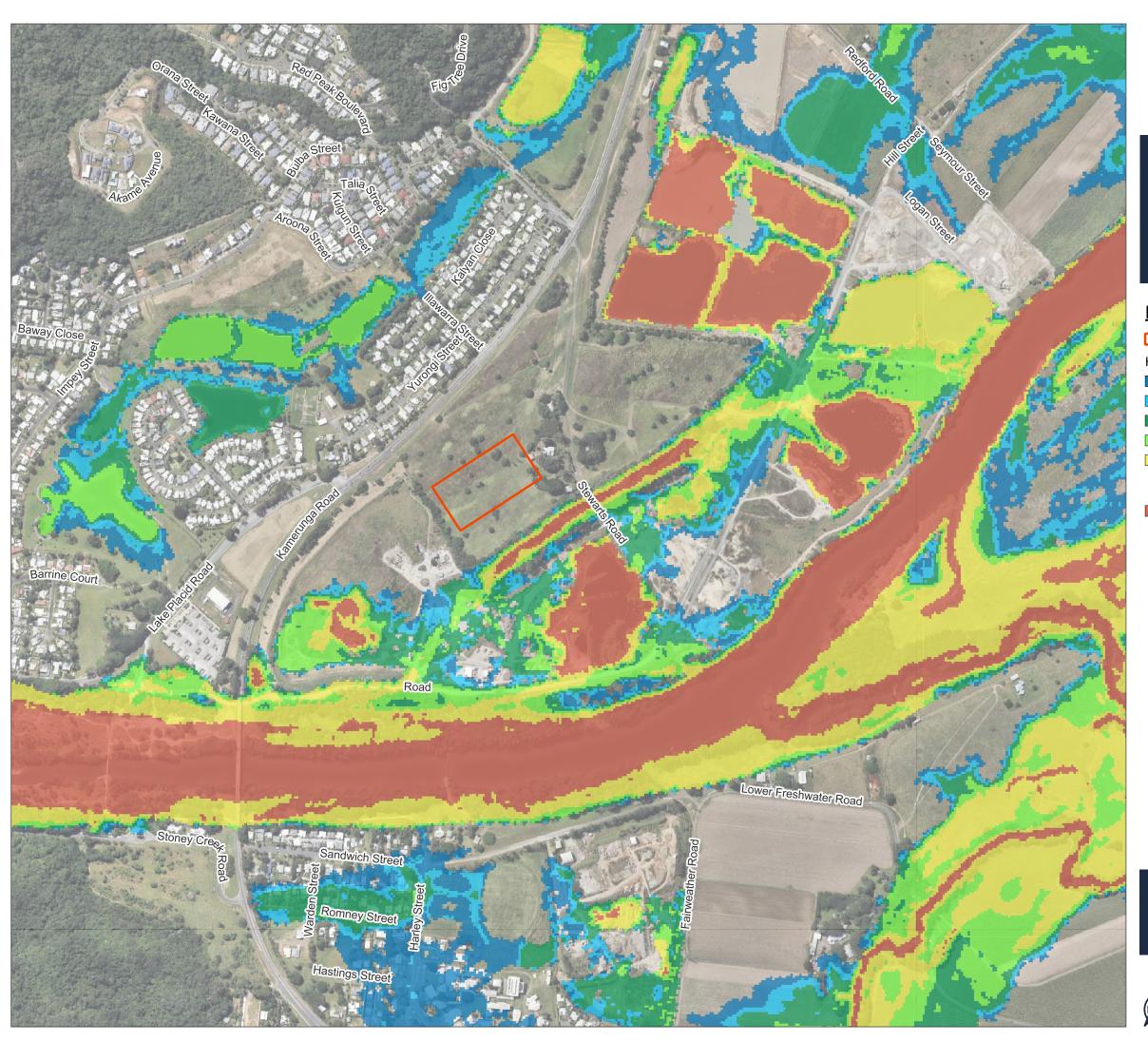
Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development Peak Hazard 20% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

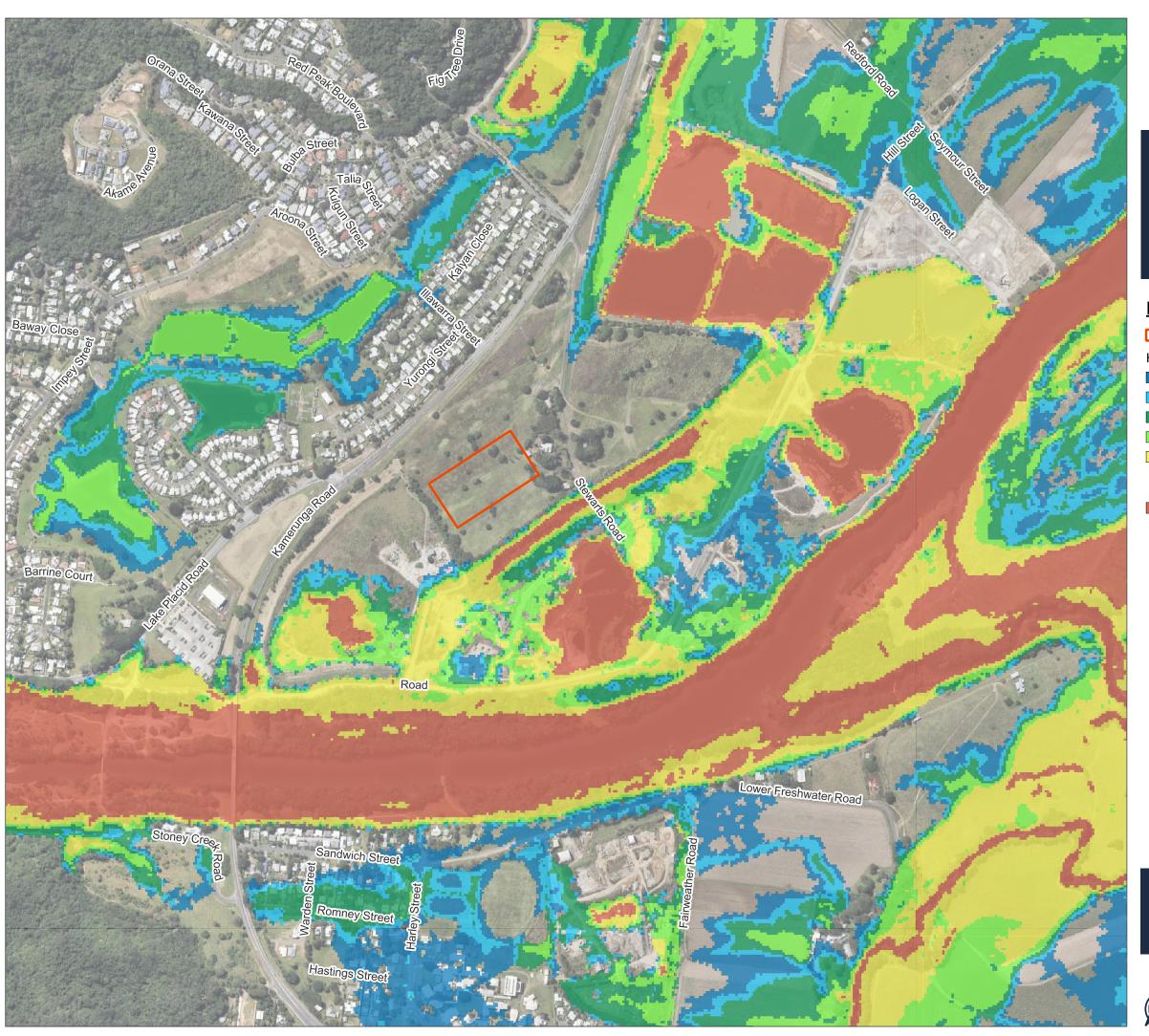
H5 - Unsafe for People & Vehicles (Buildings Require Special Engineering

Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55





Post-Development Peak Hazard 10% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles (Buildings Require Special Engineering

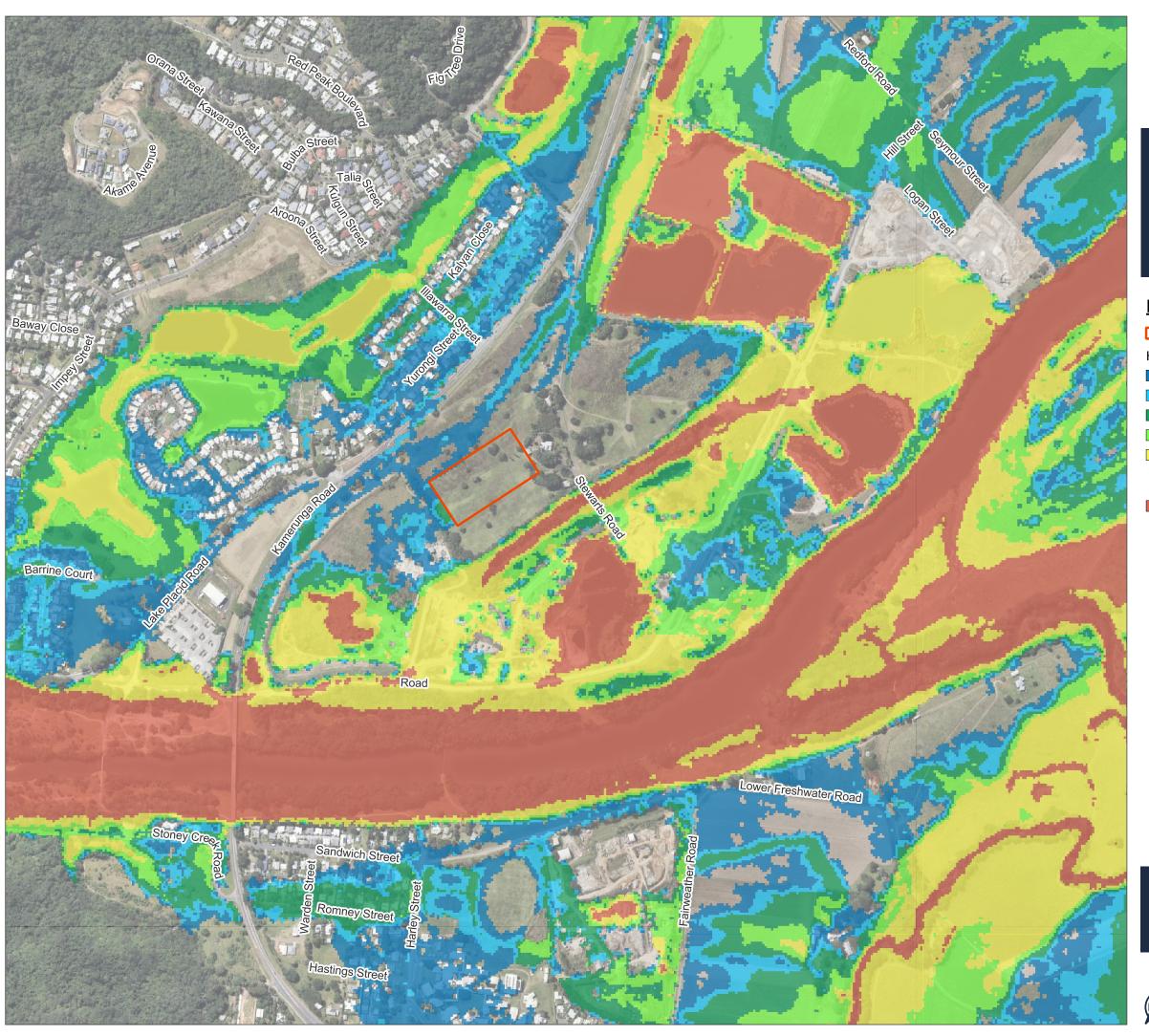
Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development Peak Hazard 5% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles (Buildings Require Special Engineering

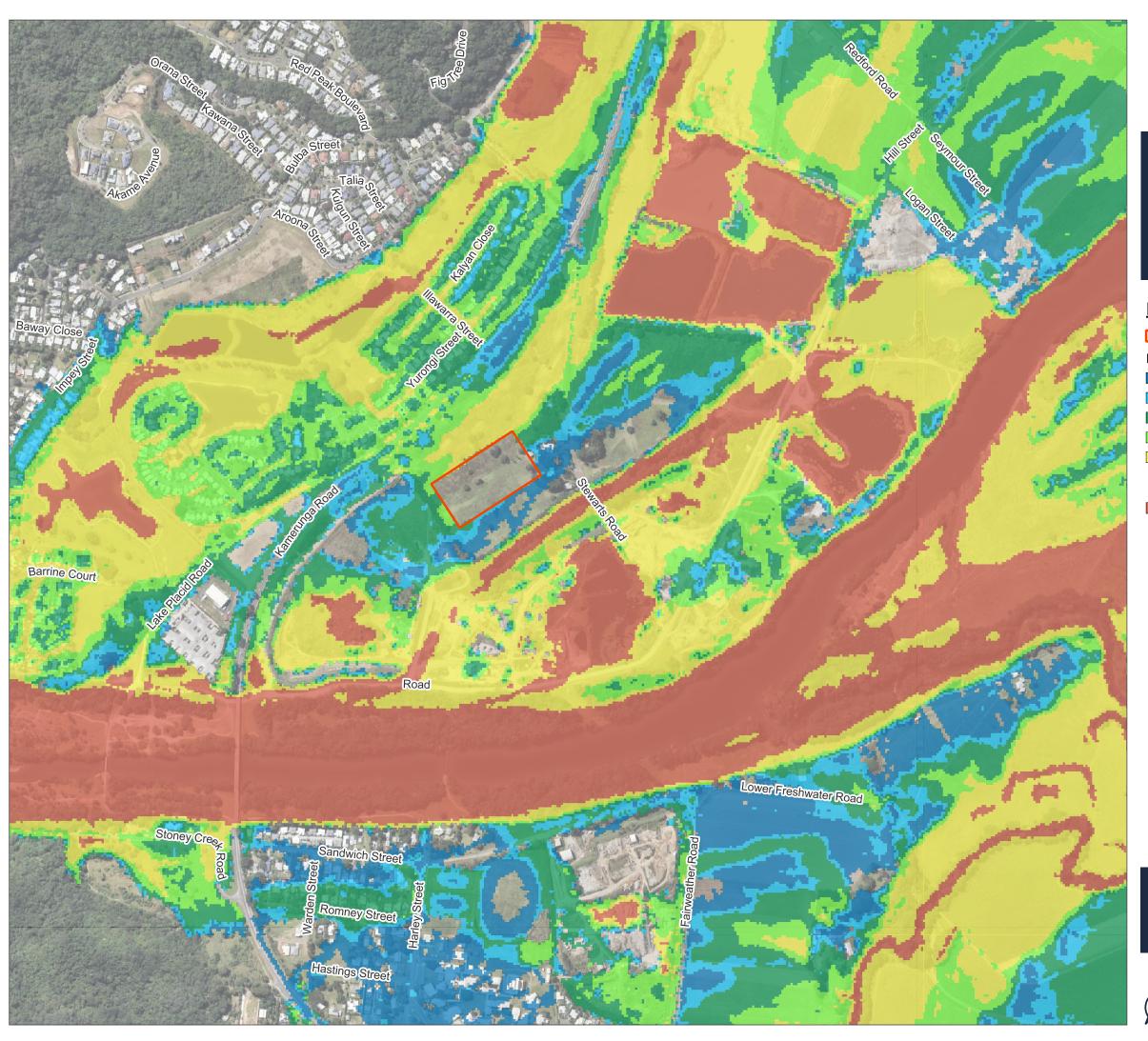
Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development Peak Hazard 2% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles (Buildings Require Special Engineering

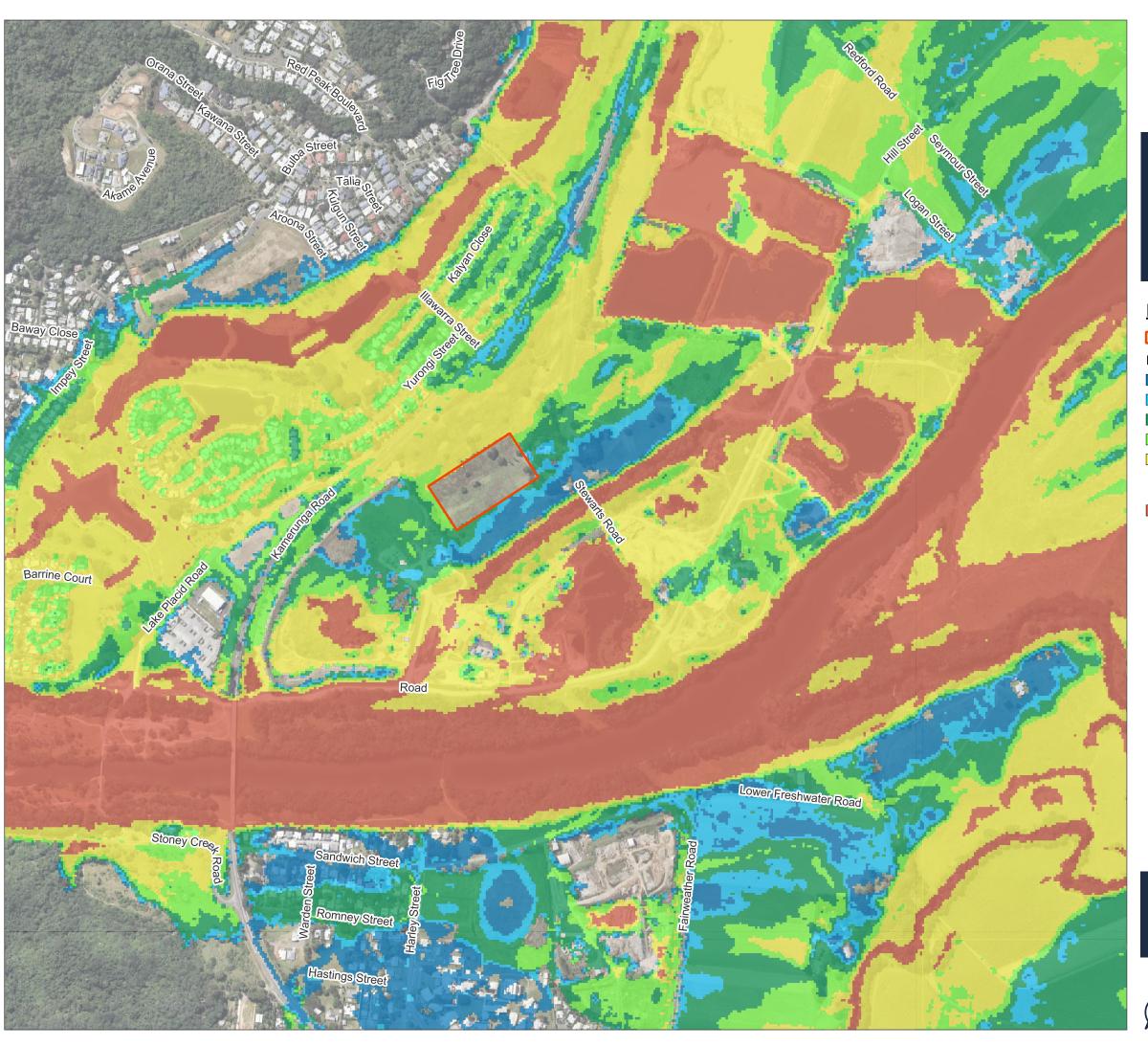
Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development
Peak Hazard
1% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles (Buildings Require Special Engineering

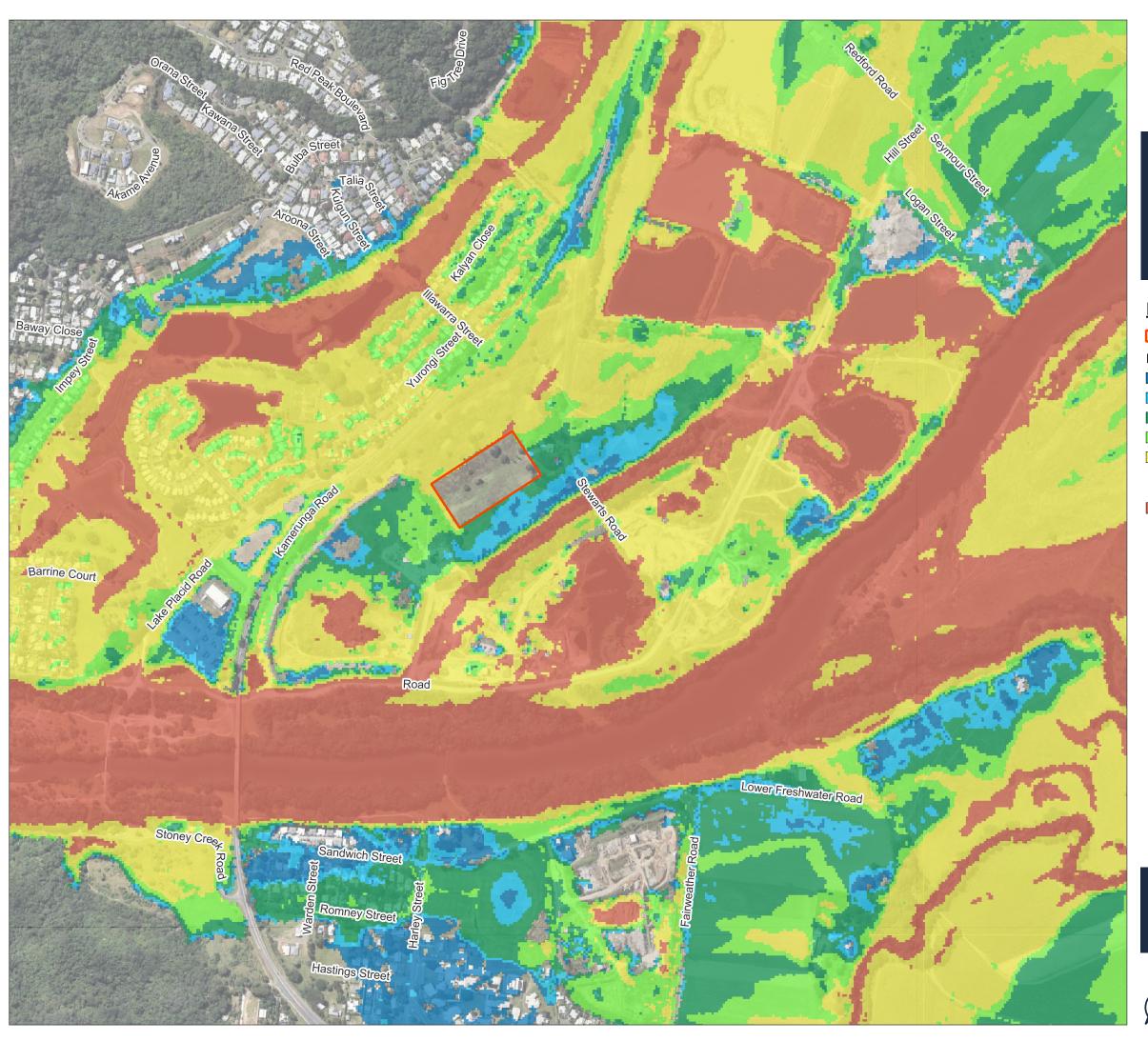
Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development Peak Hazard 0.5% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles (Buildings Require Special Engineering

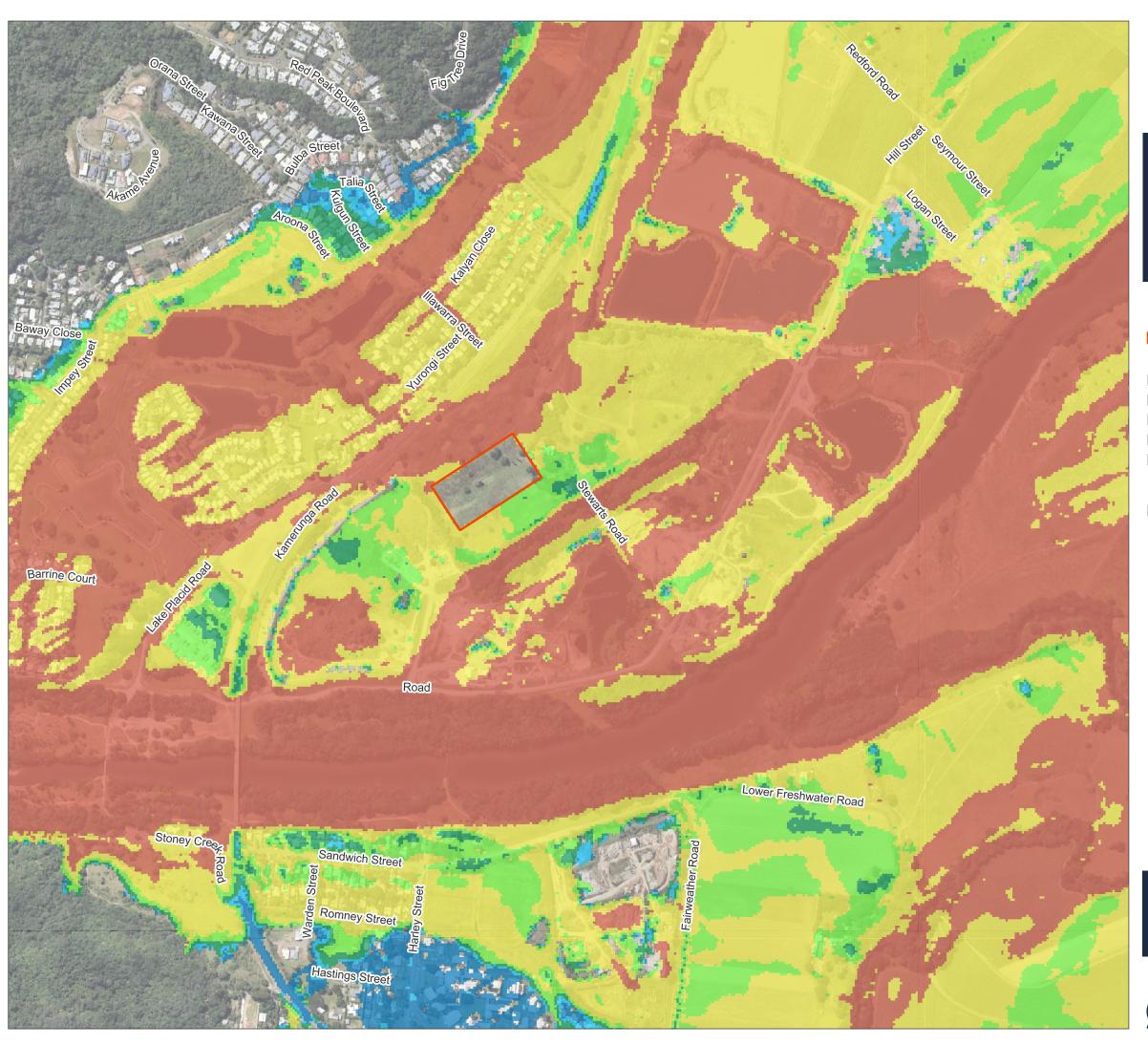
Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development Peak Hazard 0.05% AEP Event

LEGEND

Fill Pad

Hazard Categories

H1 - No Restrictions

H2 - Unsafe for Small Vehicles

H3 - Unsafe for Vehicles, Children & Elderly

H4 - Unsafe for People & Vehicles

H5 - Unsafe for People & Vehicles (Buildings Require Special Engineering

Design and Construction)

H6 - Not Suitable for People, Vehicles or Buildings

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024

APPENDIX C UNMITIGATED AFFLUX MAPS





Post-Development - Pre-Development Change in Water Level 50% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

_____-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

> 0.5

Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development - Pre-Development Change in Water Level 20% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

_____-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

> 0.5

Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development - Pre-Development Change in Water Level 10% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

_ -0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

> 0.5

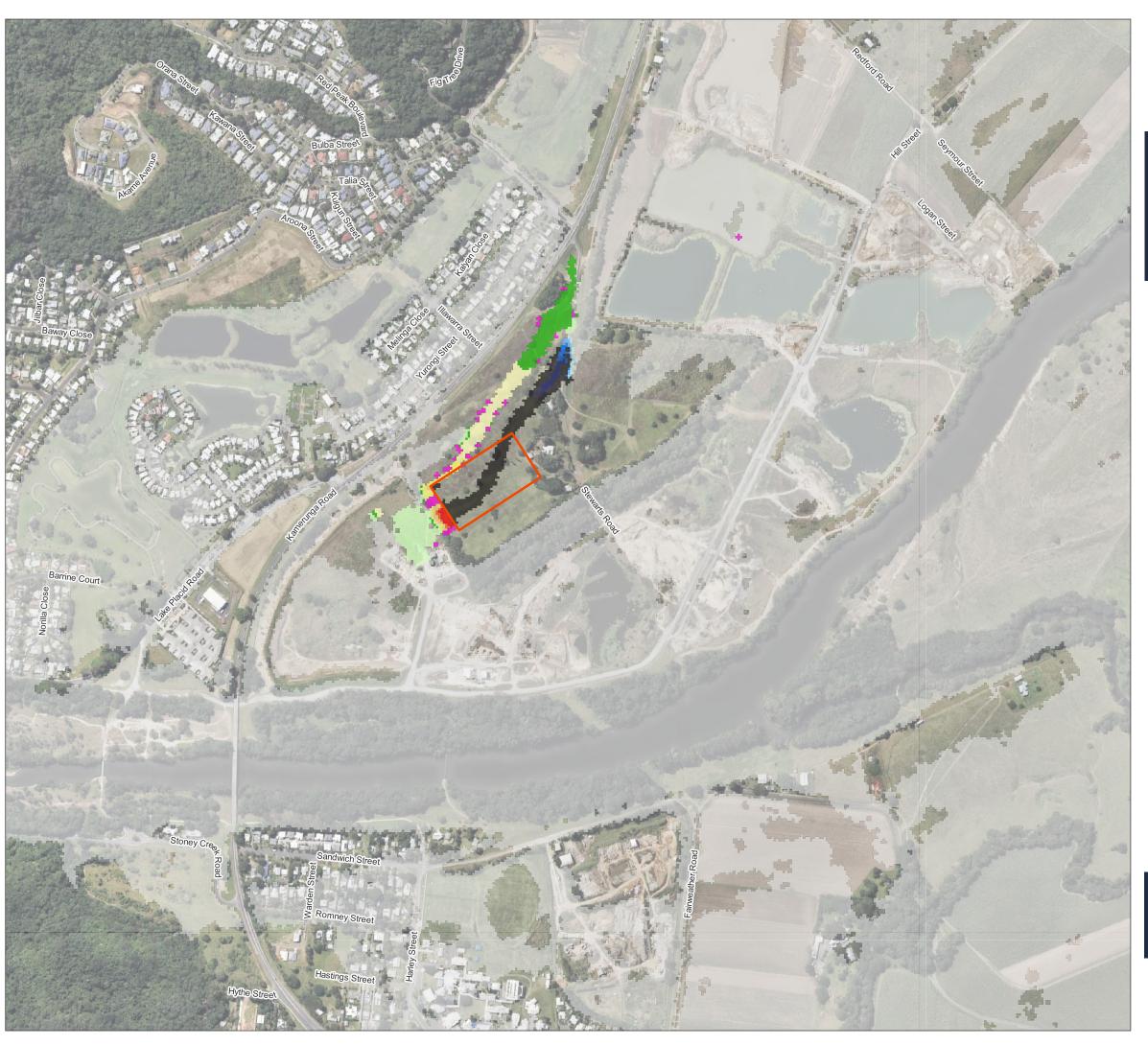
Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development - Pre-Development Change in Water Level 5% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

> 0.5

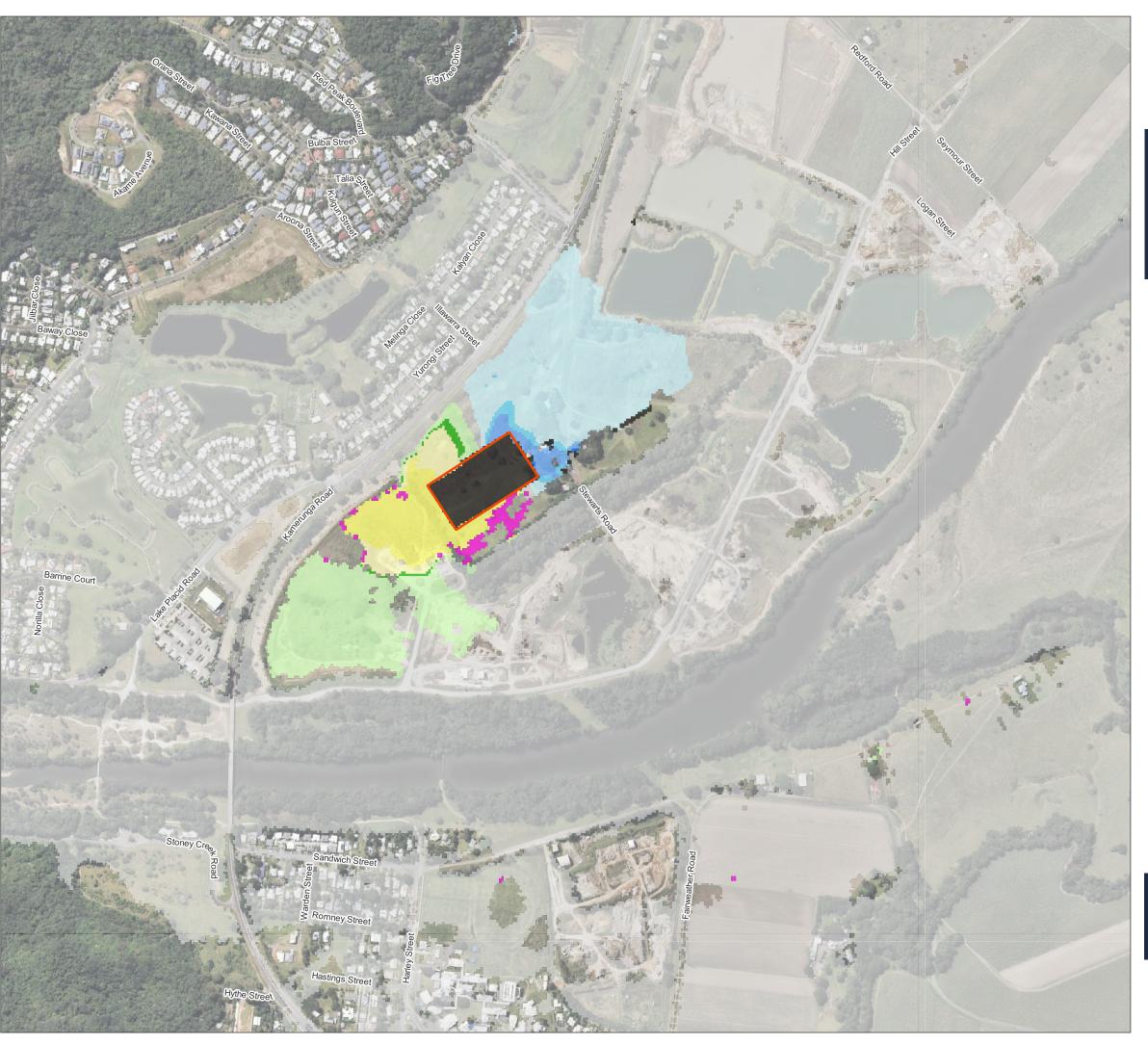
Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development - Pre-Development Change in Water Level 2% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

0.4 - 0.

> 0.5

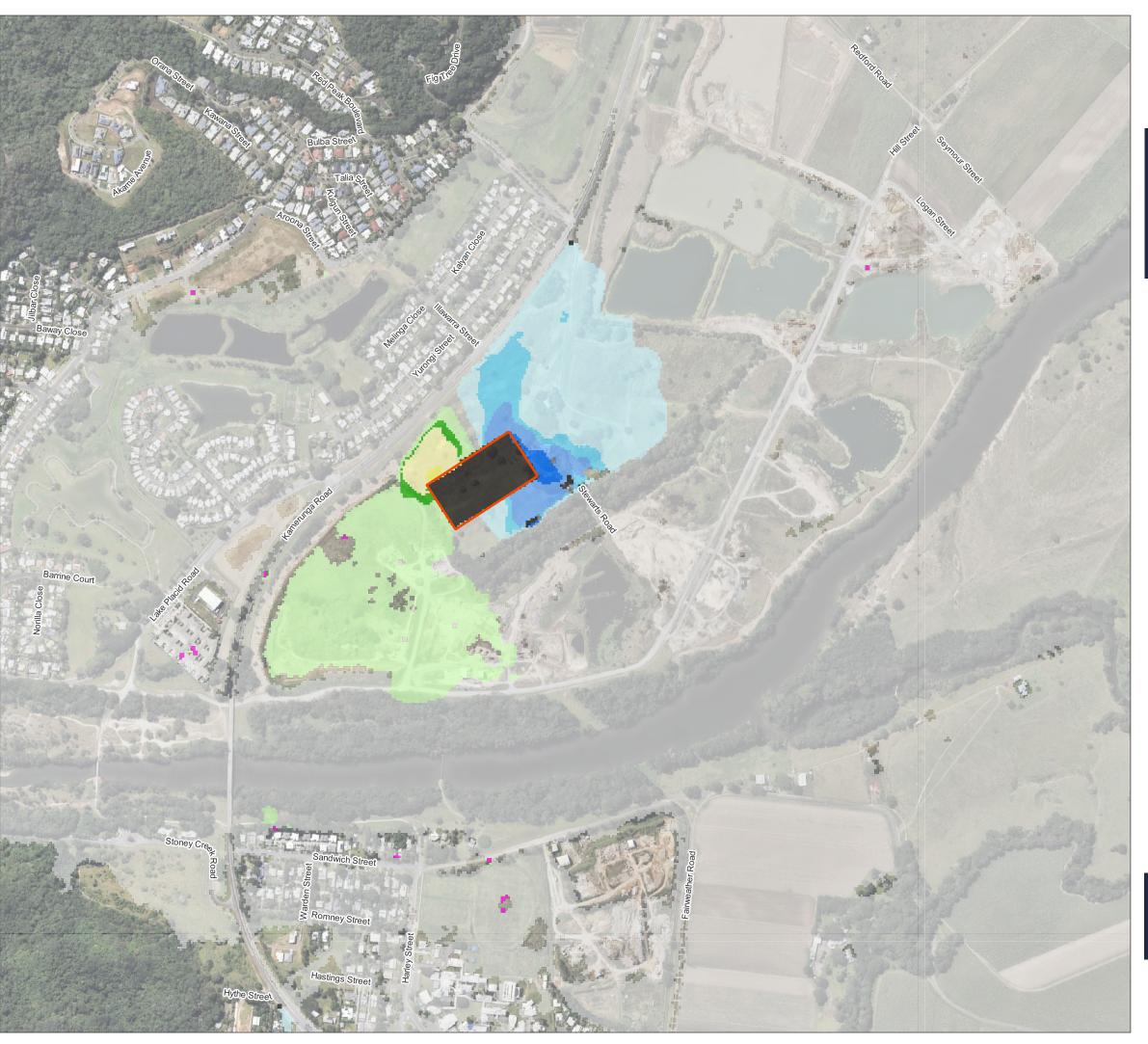
Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development - Pre-Development Change in Water Level 1% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

> 0.5

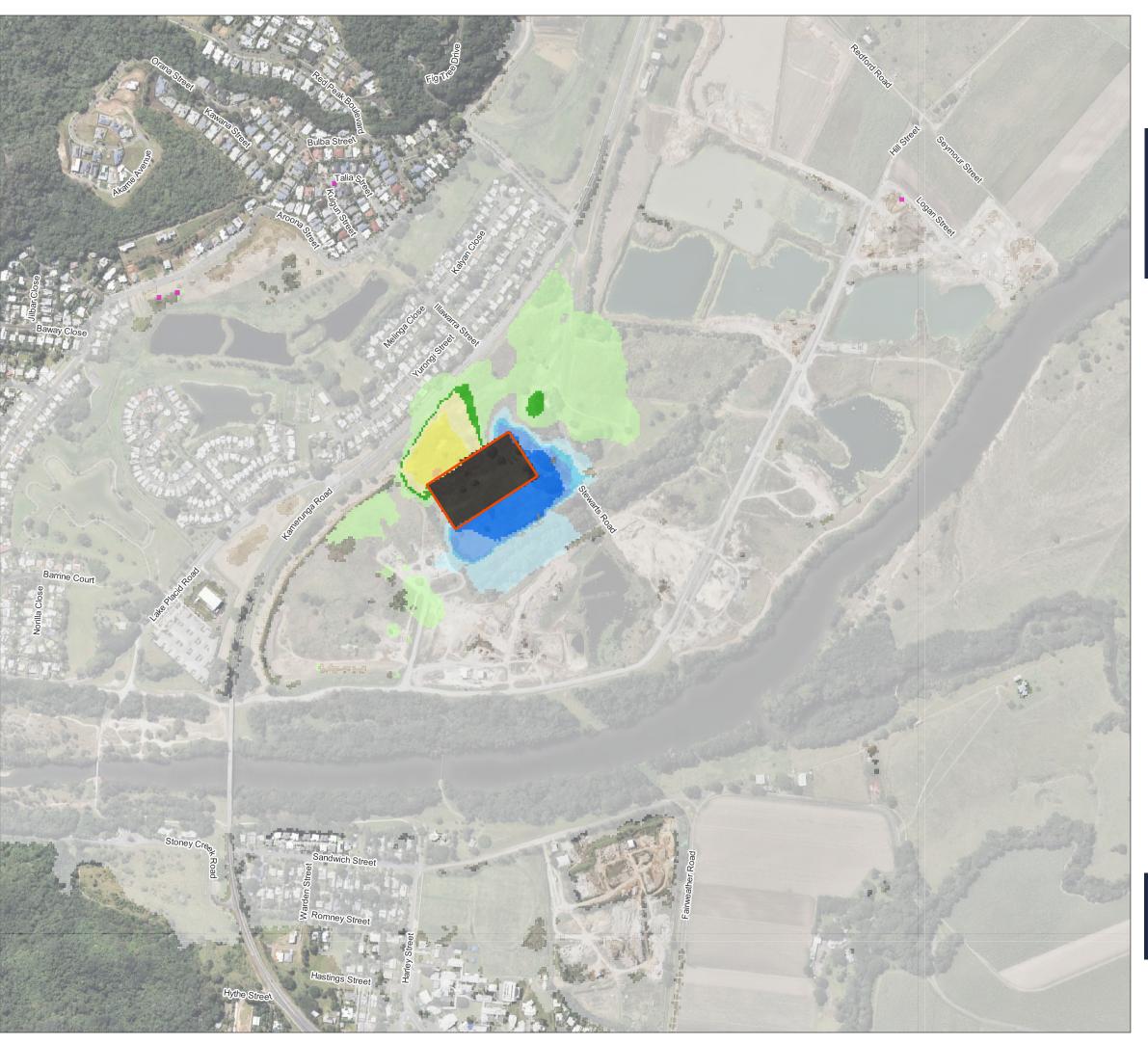
Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Post-Development - Pre-Development Change in Water Level 0.5% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

_____-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

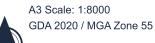
0.4 - 0.5

> 0.5

Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site



Job No: 10880 Date: 21/11/2024

200

APPENDIX D MITIGATION OPTION 1 AFFLUX MAPS





Mitigation 1 - Pre-Development Change in Water Level 50% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

> 0.5

Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Mitigation 1 - Pre-Development Change in Water Level 20% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

_____-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

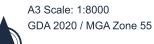
0.4 - 0.

> 0.5

Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site



Job No: 10880 Date: 21/11/2024

200





Mitigation 1 - Pre-Development Change in Water Level 10% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

_____-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

_ _ _

> 0.5

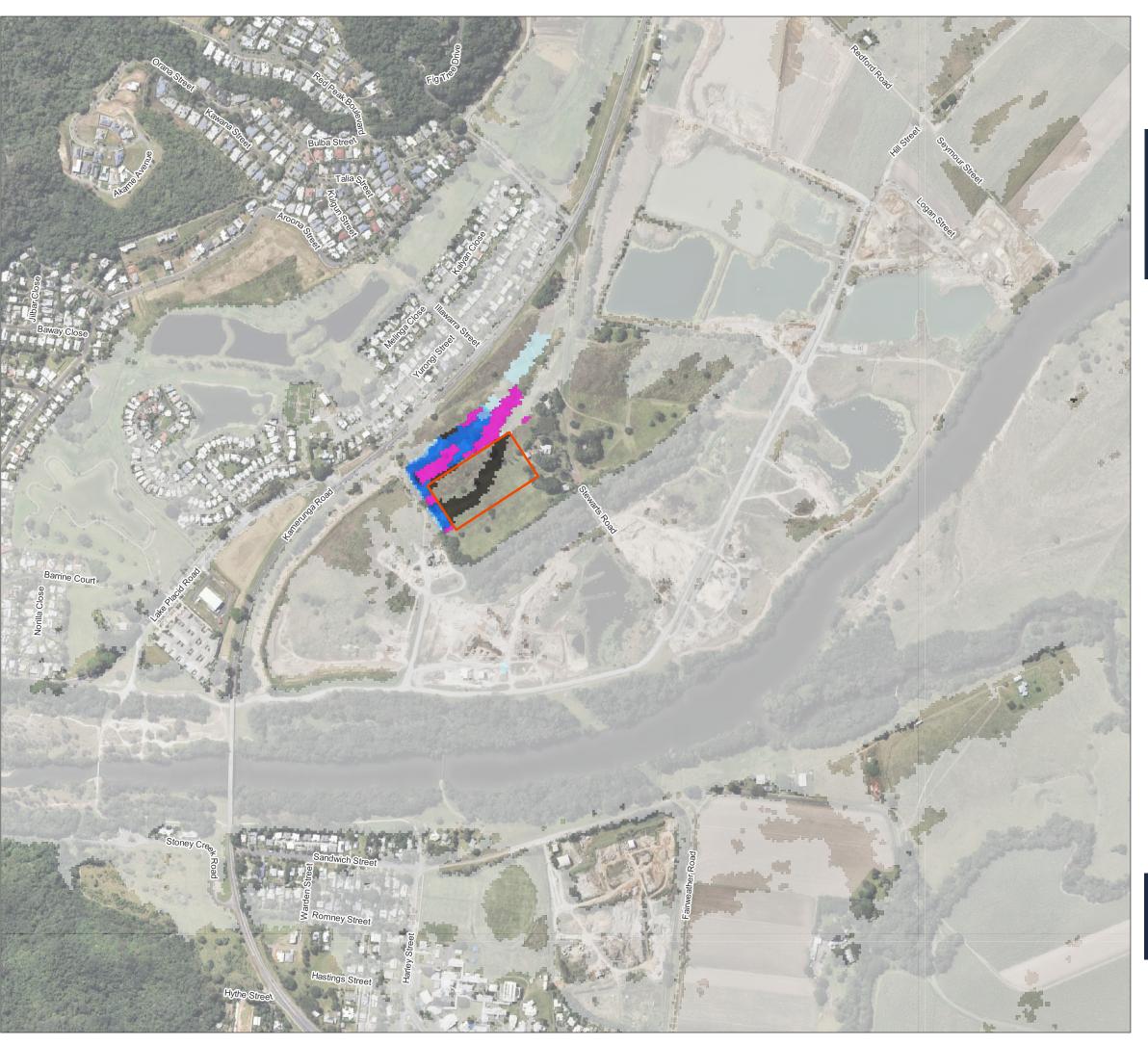
Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site



Job No: 10880 Date: 21/11/2024





Mitigation 1 - Pre-Development Change in Water Level 5% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

_____-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

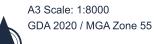
0.4-0.

> 0.5

Was Wet, Now Dry

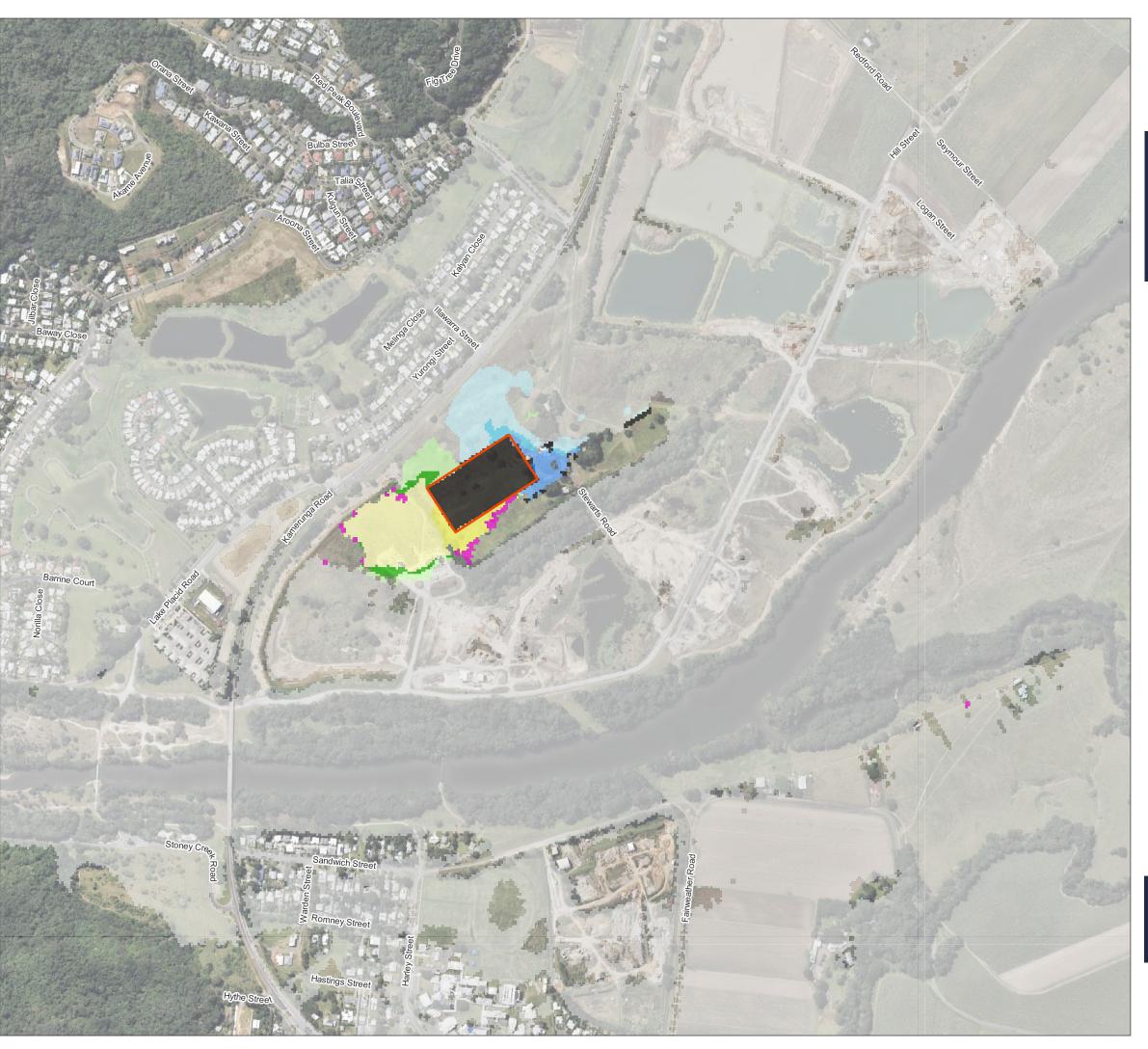
Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site



Job No: 10880 Date: 21/11/2024

200 4





Mitigation 1 - Pre-Development Change in Water Level 2% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

0.4 - 0.

> 0.5

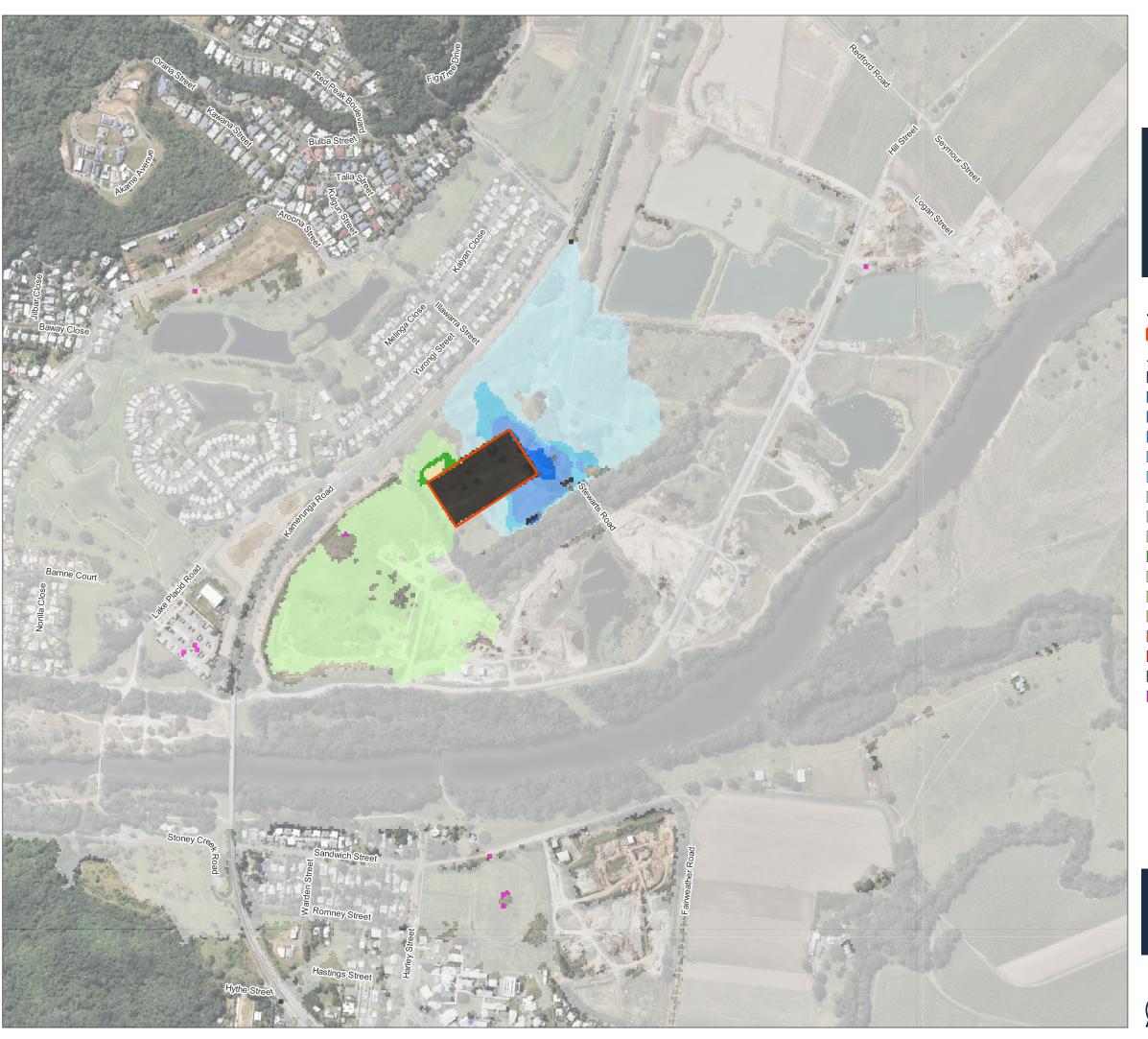
Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024





Mitigation 1 - Pre-Development Change in Water Level 1% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

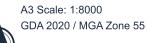
0.4 - 0.5

> 0.5

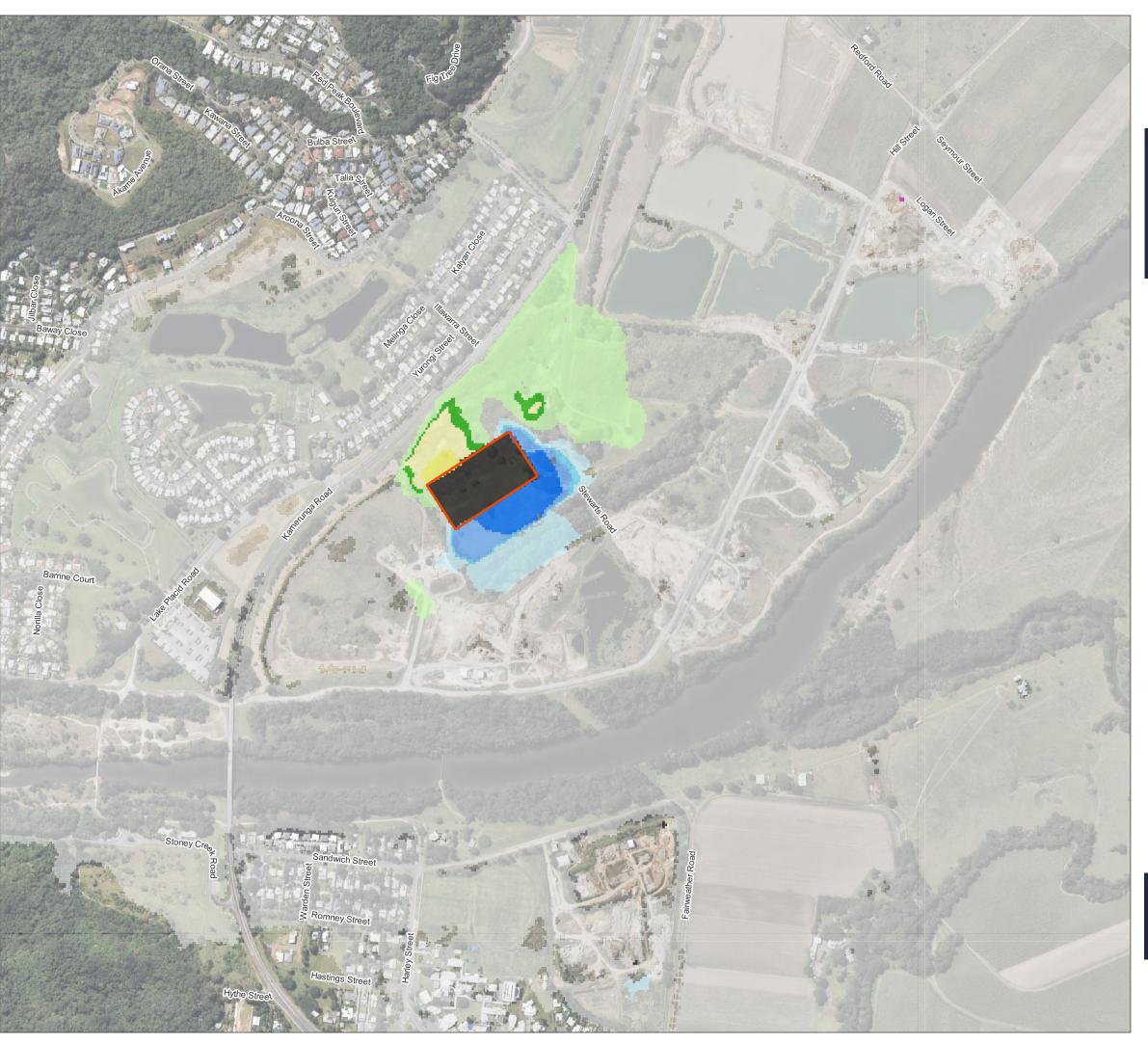
Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site



Job No: 10880 Date: 21/11/2024





Mitigation 1 - Pre-Development Change in Water Level 0.5% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

> 0.5

Was Wet, Now Dry

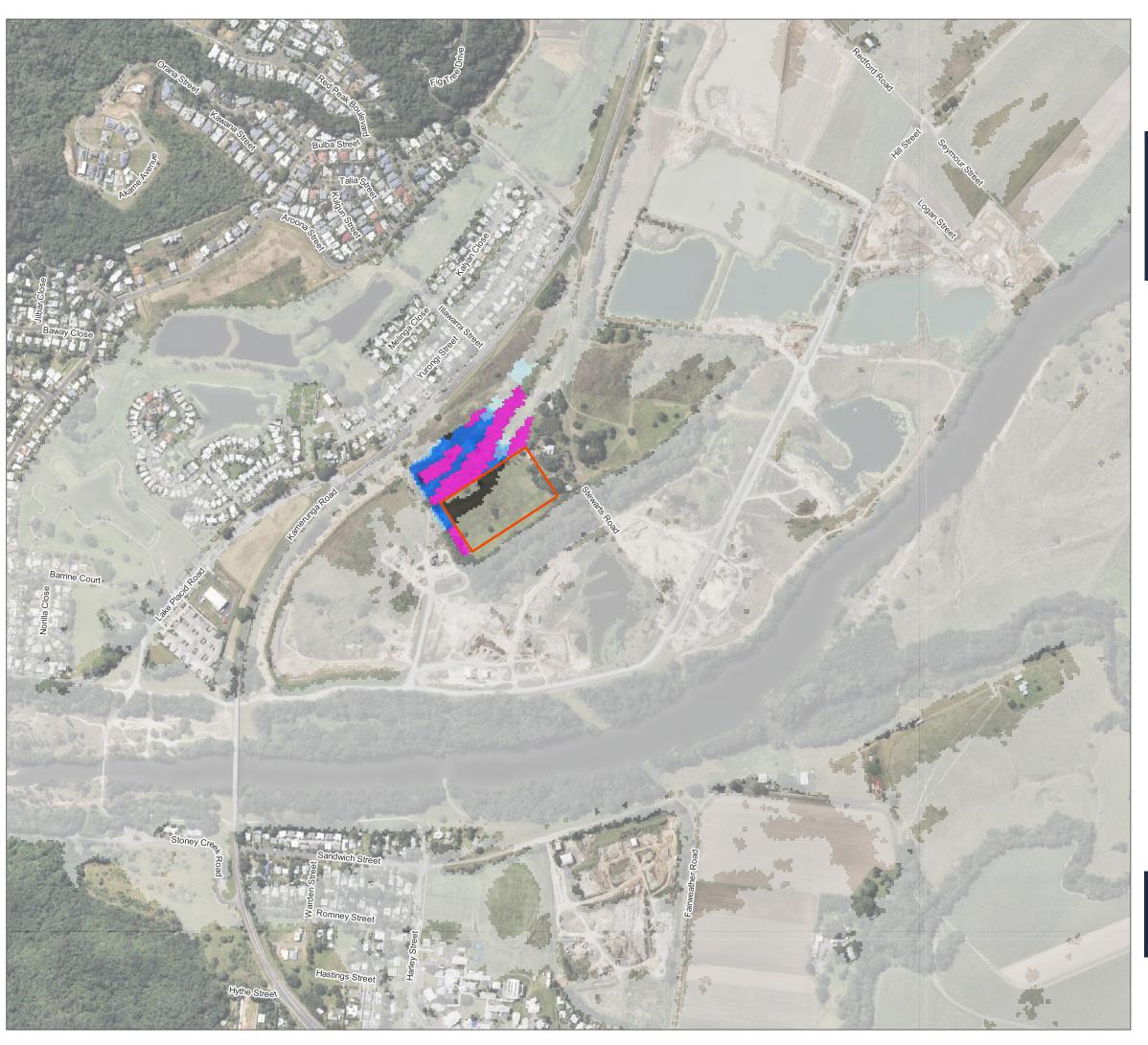
Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 21/11/2024

APPENDIX E MITIGATION OPTION 2 AFFLUX MAPS





Mitigation 2 - Pre-Development Change in Water Level 5% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

_____-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

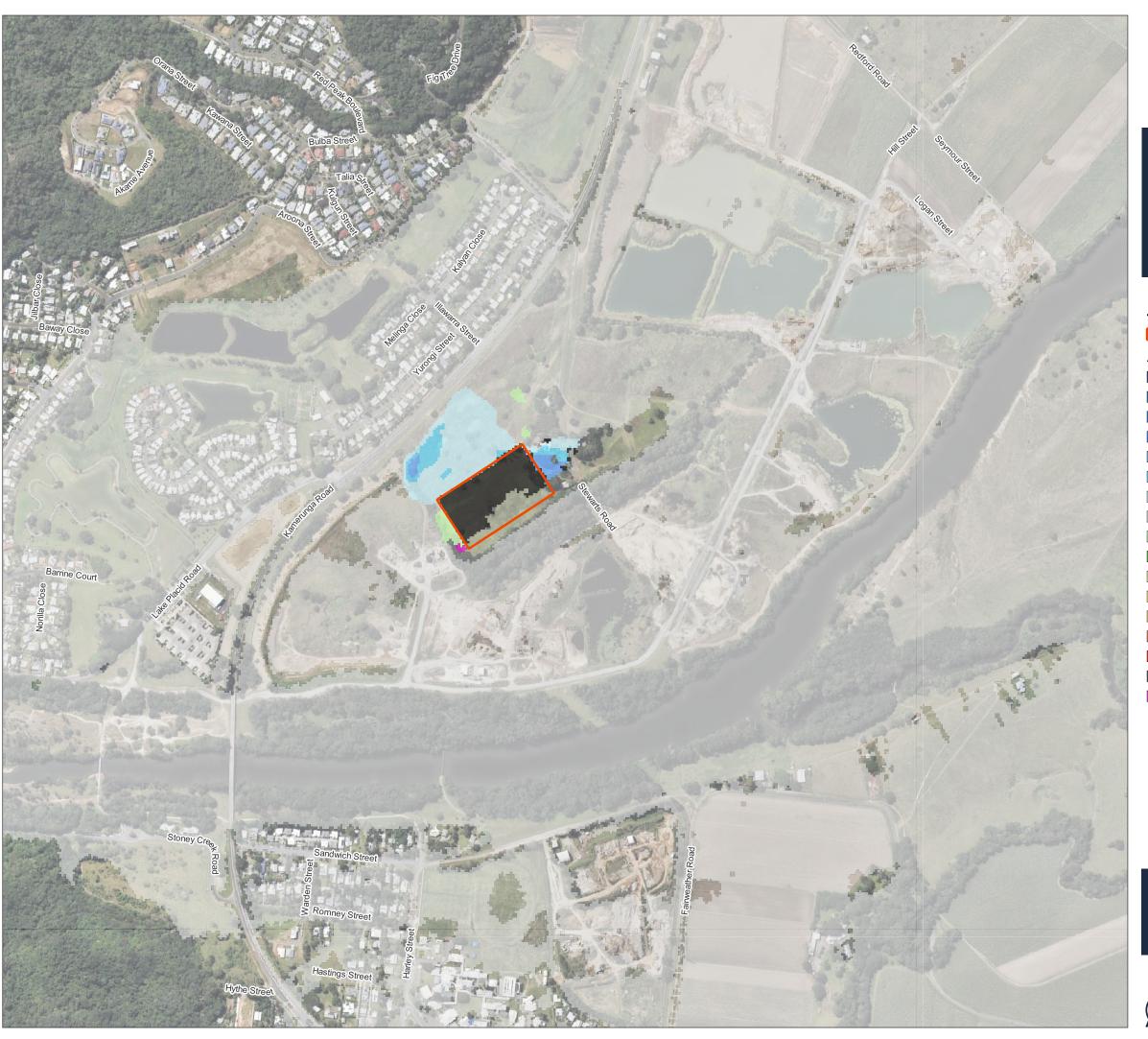
> 0.5

Was Wet, Now Dry
Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 27/11/2024





Mitigation 2 - Pre-Development Change in Water Level 2% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

> 0.5

Was Wet, Now Dry

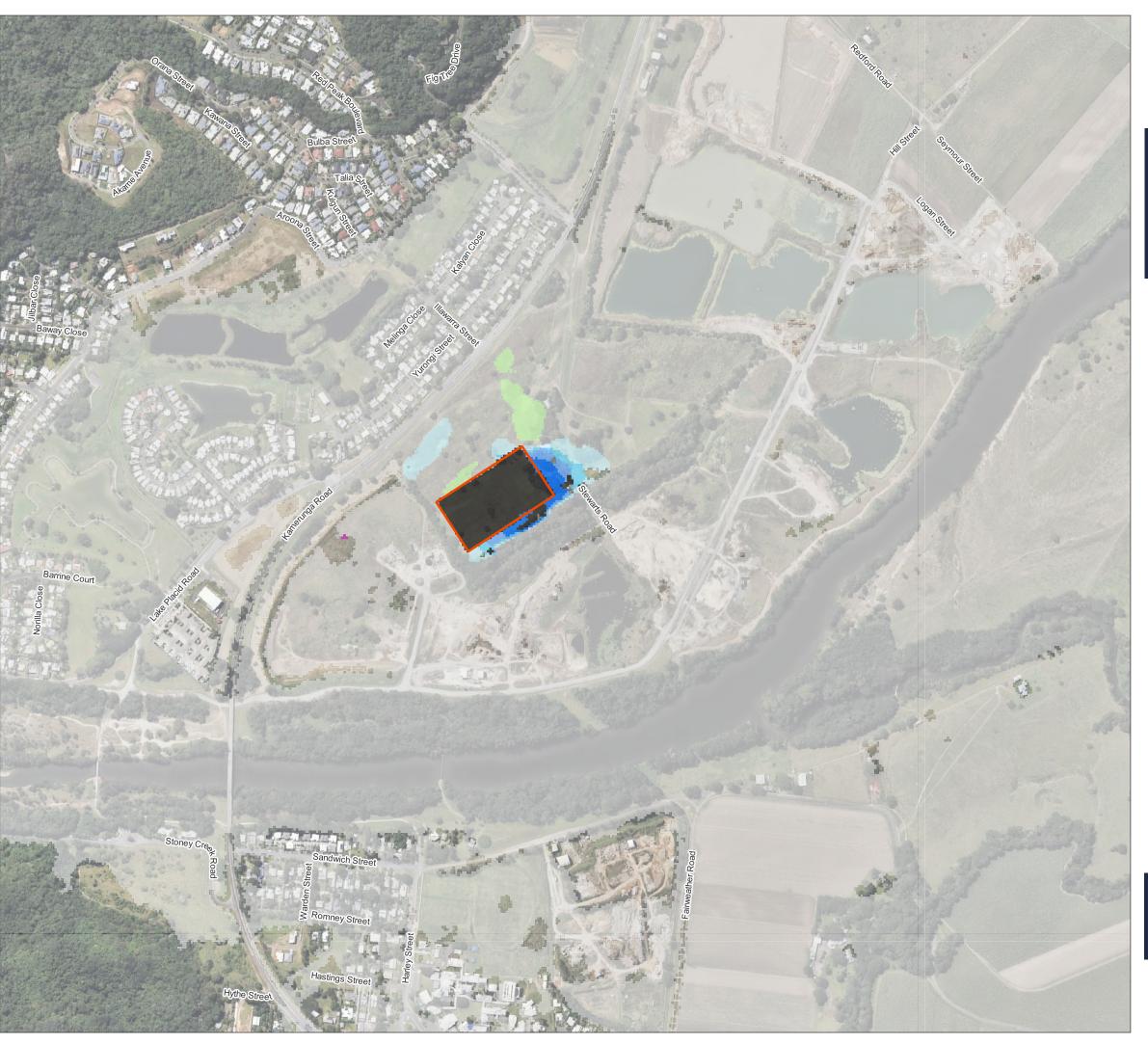
Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 27/11/2024

200





Mitigation 2 - Pre-Development Change in Water Level 1% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 0.5

0.4 - 0.0

> 0.5

Was Wet, Now Dry

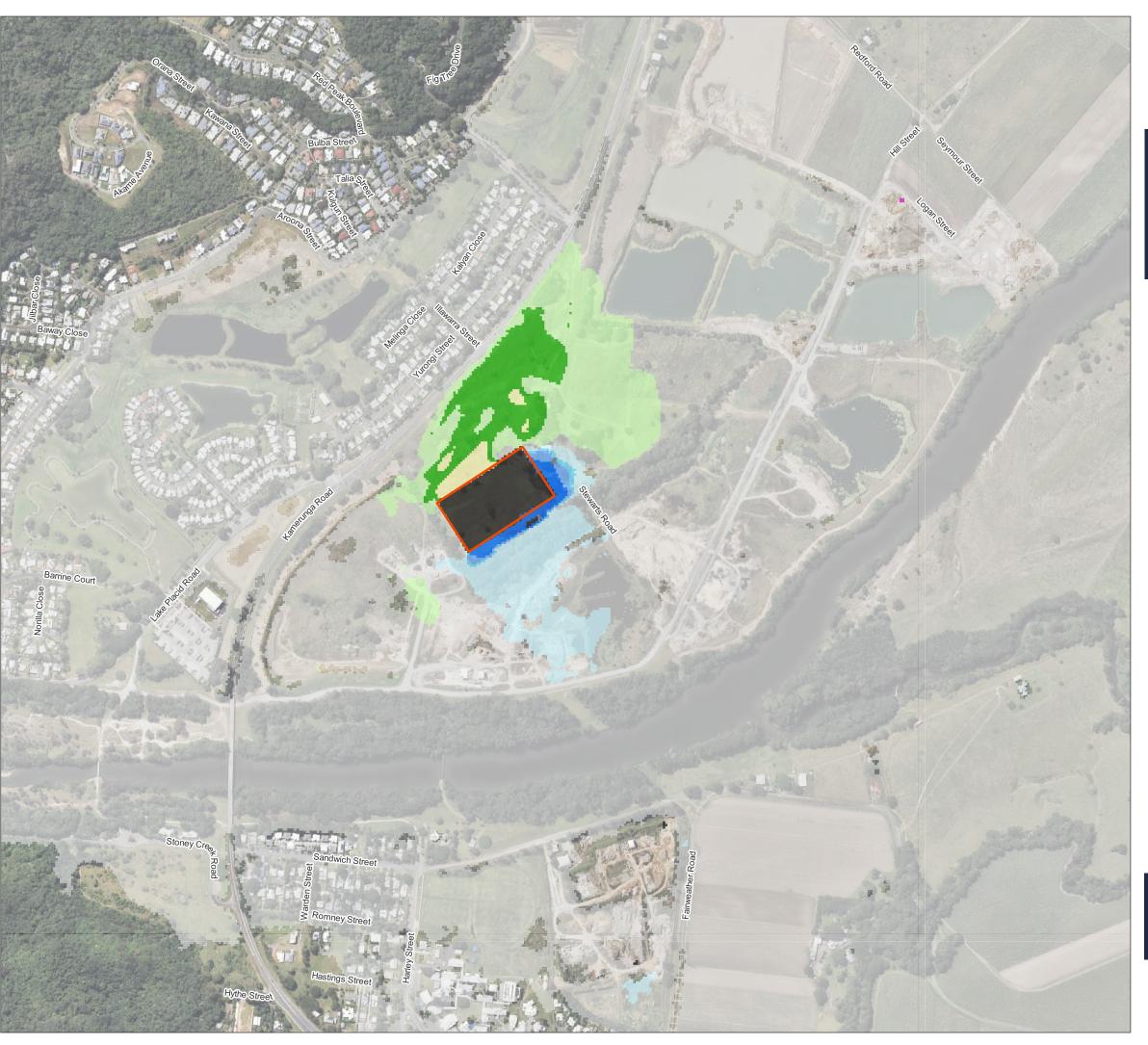
Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site

A3 Scale: 1:8000 GDA 2020 / MGA Zone 55

Job No: 10880 Date: 27/11/2024

200





Mitigation 2 - Pre-Development Change in Water Level 0.5% AEP Event

LEGEND

Fill Pad

Afflux (m)

<= -0.5

-0.5 - -0.4

-0.4 - -0.2

-0.2 - -0.1

-0.1 - -0.05

-0.05 - -0.035

-0.035 - -0.01

_____-0.01 - 0.01

0.01 - 0.035

0.035 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.4

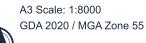
0.4 - 0.5

> 0.5

Was Wet, Now Dry

Was Dry, Now Wet

Powerlink Qld Development Stewarts Road Site



Job No: 10880 Date: 27/11/2024