

# STORMWATER MANAGEMENT PLAN

5575 SOUTH GIPPSLAND HIGHWAY, LANG LANG  
25/03/2022

PREPARED FOR AURORA CONSTRUCTION MATERIALS

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This report has been prepared by the office of Spiire  
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## 1. INTRODUCTION

Spiire was engaged by Aurora Construction Materials (ACM) to undertake a flood risk assessment and stormwater management plan for the property at 5575 South Gippsland Highway, Lang Lang (the site).

The site is proposed to be a sand quarry involving dry extraction to 8m below the ground surface followed by wet extraction to approximately 30m below ground surface. The proposed site (Work Authority WA7541) will be in the name of Lang Lang Sand Resources Pty Ltd (wholly owned by ACM).

As part of the construction of the sand quarry, a waterway diversion is proposed along the northern boundary of the site. The purpose of this diversion is to ensure stormwater reaching the site from the upstream catchment to the east, is discharged from the site at pre-development rates. This is to ensure there is minimal impact of the proposed works on the existing flow regime within the catchment.

The flood assessment and waterway concept design has been undertaken in response to an initial letter from Melbourne Water on 21 October in relation to the proposed development at the site (Melbourne Water reference - MWA-1187325). The letter has been provided in Appendix 3. Following on from this letter Spiire have worked in consultation with Melbourne Water to produce a waterway concept design for the site.

This report summarises the hydrological and hydraulic analysis undertaken to assess and compare the existing and proposed flood conditions, and details of the proposed waterway concept design.

In regard to water management within the quarry extent, during operation, there is no intention to discharge water from the extraction area, and rehabilitation is proposed to be a water filled void within the area of extraction.

### 1.1 LOCATION

The site is located within the Cardinia Local Government Area. It is bounded by South Gippsland Highway to the south-west, Beach Energy properties to the east and north-east, including a Gas Plant, and a Huxable property to the north. The proposed site location is shown in Figure 1.



Figure 1: Site Location (Adapted from Melways 2021)



## 2. BACKGROUND

There are a number of documents and information that form background to this water management plan. Key information is listed below:

- ▶ *Ecological Features and Constraints Report (Norris and Schoeffel Ecological Services, October 2020)*
- ▶ *Hydrogeological assessment – Proposed Sand and Gravel Quarry at 5575 South Gippsland Highway, Lang Lang (Nolan Consulting Pty Ltd, December 2020)*
- ▶ Vicmap LiDAR (2018) – Lang Lang VIC
- ▶ RORB model provided by Melbourne Water (May 2021)

### 2.1 PLANNING

The site is located within a Green Wedge Zone (GWZ) as shown in Figure 2. There is also a water course north of the site which is subject to a Land Subject to Inundation (LSIO) overlay, as shown in Figure 3. However, the existing LSIO does not extend into the site.

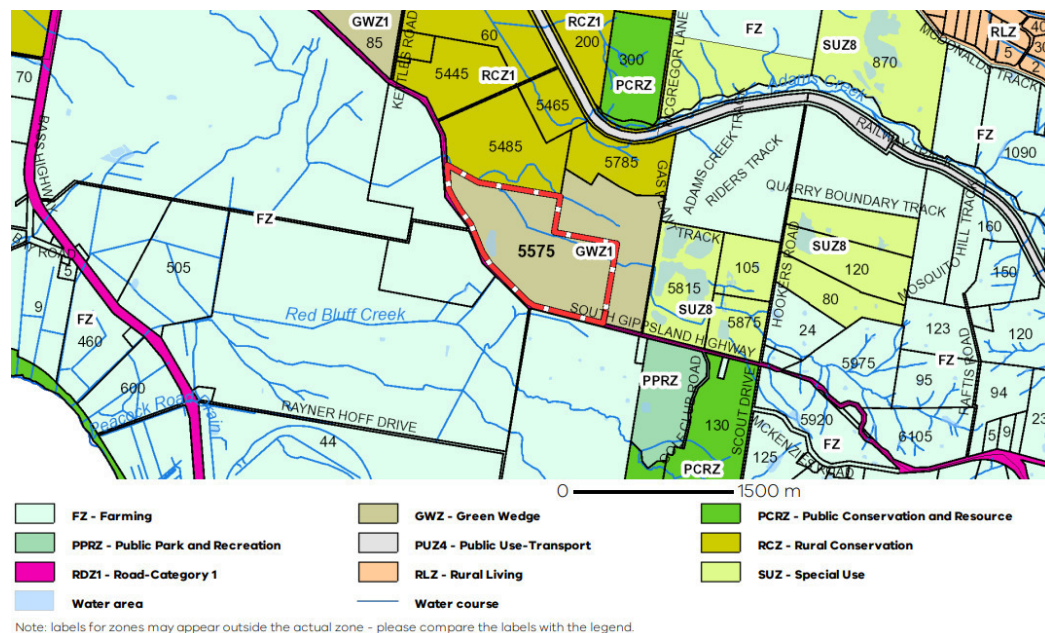
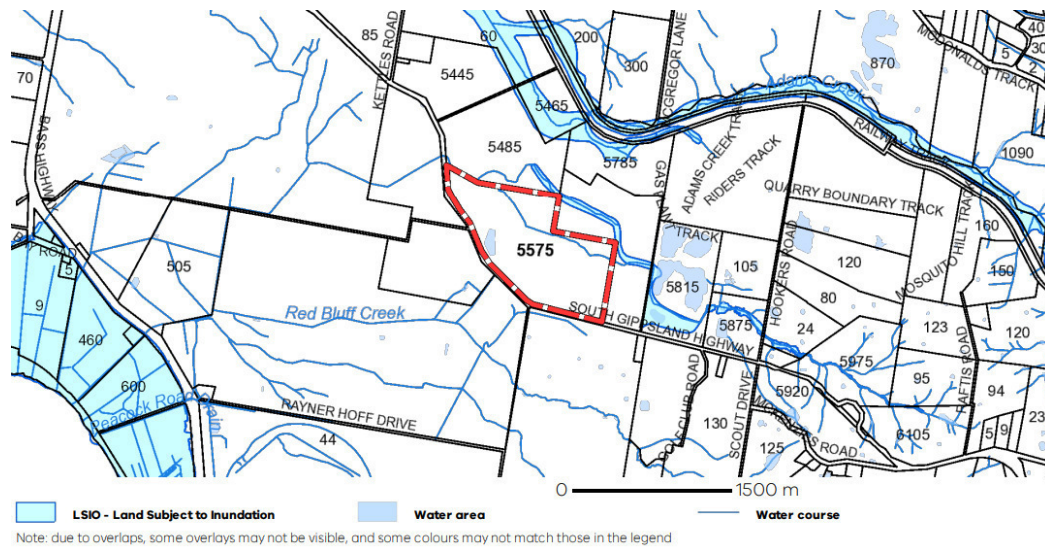


Figure 2: Green Wedge Zone Overlay – Planning Property Report (State Government of Victoria, 2021)

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**Figure 3: Land Subject to Inundation Overlay – Planning Property Report (State Government of Victoria, 2021)**

## 2.2 MELBOURNE WATER

### 2.2.1 HEALTHY WATERWAYS STRATEGY

The site is located within the Co-Designed Catchment Program for the Westernport and Mornington Peninsula Region, under the Melbourne Water Healthy Waterways Strategy (Melbourne Water Corporation, 2018). As shown in Figure 4, the site is located outside the 'Stormwater priority area'. The waterway along the northern boundary of the site, which is subject to work as part of the proposed waterway diversion, has a 'Veg. buffer to establish' overlay (shown in dark pink), therefore a vegetation buffer is proposed as part of the waterway design.

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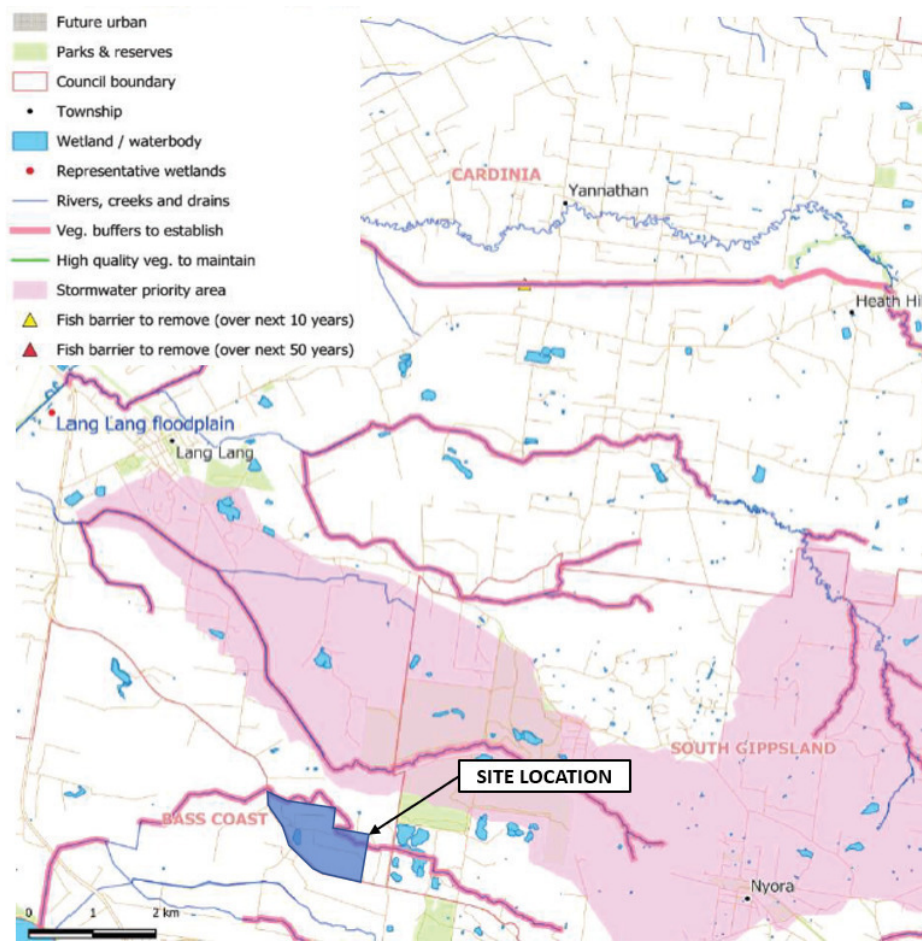


Figure 4: Site location within Lang Lang Floodplain Wetlands - Healthy Waterways Strategy (Adapted from Melbourne Water Corporation, 2018)

## 2.3 ECOLOGICAL INVESTIGATIONS

An Ecological Features and Constraints Report has been completed by Norris and Schoeffel Ecological Services (October 2020) for the site. No EPBC (Environment Protection and Biodiversity Conservation Act) or FFG (Flora & Fauna Guarantee Act 1988) listed fauna has been identified during field observations. A pair of Mush Duck *Biziura lobata*, which are considered vulnerable on the Victorian Advisory List were observed on the existing artificial dam on the site, however no native vegetation was found within or on the existing dam.

In regard to native vegetation present, no “Patches” of native vegetation are present within the proposed Work Authority. One “Large Tree” exists which is a specimen of Swamp Gum *Eucalyptus ovata*. The proposed extraction area is to avoid this tree which is to remain on site.

## 2.4 HYDROGEOLOGICAL INVESTIGATIONS

A Hydrogeological Assessment has been undertaken for the proposed sand and gravel quarry at 5575 South Gippsland Highway by Nolan Consulting Pty Ltd (December 2020) for Lang Lang Sand Resources Pty Ltd.

Based on 26 air cored (AC) resource investigation holes across the property, undertaken in 2013, and two groundwater observation bores undertaken in 2019, the minimum depth to groundwater is 6m.

The transmissivity below groundwater from a pump test undertaken at the site in 2019 was 96 m<sup>2</sup>/day. This is equivalent to 2.5m/s, assuming a saturated thickness of 40m.

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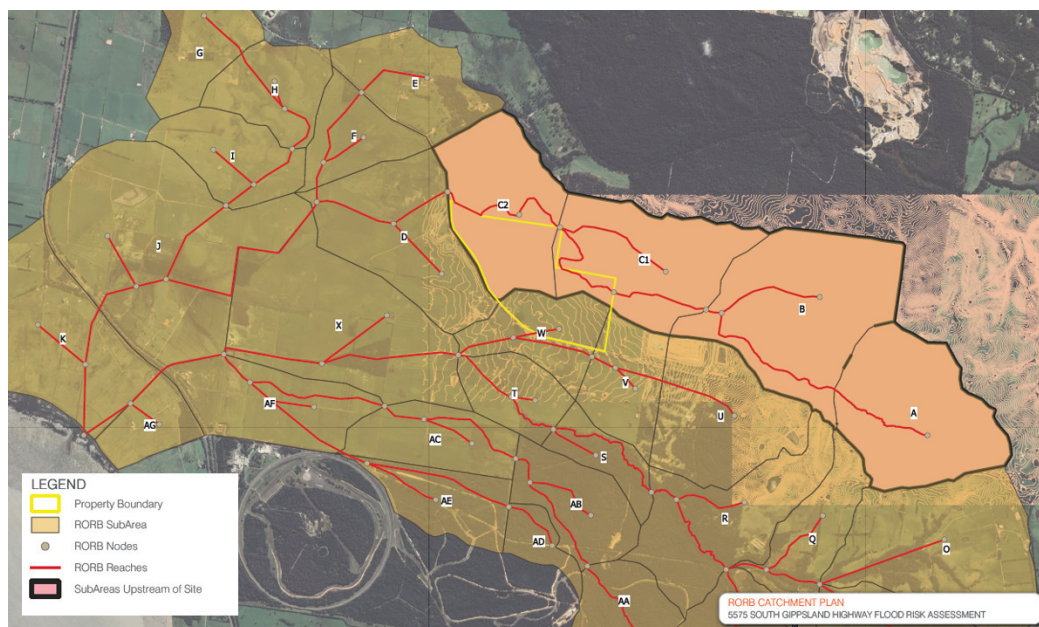


## 3. HYDROLOGICAL MODELLING

Hydrological modelling for the site has been completed using the runoff routing software RORB. This model was adapted from a RORB model supplied by Melbourne Water (supplied May 2021). This model is an initial loss/runoff coefficient model, and is based on Australian Rainfall and Runoff 1987 (ARR87) guidelines. This approach has been endorsed by Melbourne Water, because it has already been the basis of design for existing constructed assets within the catchment.

### 3.1 EXISTING

Catchment delineation as part of the RORB modelling is shown in Figure 5 and provided in Appendix 1.



**Figure 5: RORB Catchment Plan (adapted from model supplied by Melbourne Water)**

The existing RORB model was adapted from the model provided by Melbourne Water to better reflect flows entering the site, and those being diverted north around the site.

As part of the hydrological modelling, an investigation was undertaken to determine the proportion of flow entering the site from the upstream catchment, which includes a large open water extraction area within the adjacent Nyora Quarry site to the east owned by Railway Sands. Following discussions with Railway Sands it was established that approximately 10m<sup>3</sup>/s bypasses around the Nyora Quarry extraction area, via a channel with approximately a 20% AEP flow capacity, and enters the subject site. All flows greater than the 20% AEP flow spill into the upstream quarry extraction area. It was also established that the upstream quarry site will not be filled as part of its rehabilitation due to the excessive cut that was created during operation. This information has been discussed and approved by Melbourne Water.

RORB model parameters, including the  $D_{ave}$ , and  $K_c$  have been modified as part of the RORB model update, to ensure the model calibration is consistent with the previous modelling. Melbourne Water supplied, and Spiire modified RORB model parameters are summarised in Table 1.

**Table 1: RORB Parameters Adopted**

Parameter	Value (MW supplied)	Value (Spiire modification)
Rainfall data	Lang Lang	Lang Lang
Initial loss	15.0 mm	15.0 mm
Runoff Coefficient	0.6	0.6
D_ave	6.66 km	6.90 km
Kc	10.03	10.39
Temporal Pattern	Filtered	Filtered
Areal Reduction Factor Details	Siriwardena and Weinmann	Siriwardena and Weinmann
m	0.80	0.80

The critical storm event for the 1% AEP event within the site was determined to be the 9-hour event duration, which correlates to a peak flow of just under 16m<sup>3</sup>/s. Note, this flow was read at the print node downstream of sub-catchment C1.

Hydrological modelling has been submitted to Melbourne Water. Melbourne Water sent an email on 11 June 2021 stating '*1% AEP flood flow adopted 16 cumecs into the model is acceptable*' (provided in Appendix 3). As such, the hydrograph associated with this storm event was applied directly into the hydraulic model, and provided the basis of the proposed waterway diversion within the subject site.

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## 4. HYDRAULIC MODELLING

Hydraulic modelling was undertaken using 2D modelling software TUFLOW. Models were developed for the subject site to analyse both existing and proposed flow conditions and corresponding flood extents. The 1% AEP rainfall event was assessed, and flood results mapping has been provided in Appendix 2.

### 4.1 MODEL SETUP

#### 4.1.1 EXISTING MODEL SETUP

The following key inputs into the existing model are summarised below:

- ▶ Existing surface/terrain model derived from LiDAR
- ▶ External inflow hydrograph for eastern upstream catchment – Applied directly downstream of existing Nyora Quarry at eastern boundary of the site.
- ▶ A Manning's roughness (n) value of 0.06 was adopted for majority of the catchment, which is representative of 'moderate vegetation'. A Manning's n value of 0.02 was adopted for the open water areas within the site including the existing dams.
- ▶ All dams have been assumed to be full
- ▶ Downstream box culverts under the South Gippsland Highway, located north west of the site.

#### 4.1.2 PROPOSED MODEL SETUP

The proposed model has been adapted from the existing model, and includes the proposed extraction area, and the waterway concept design along the northern boundary of the extraction area.

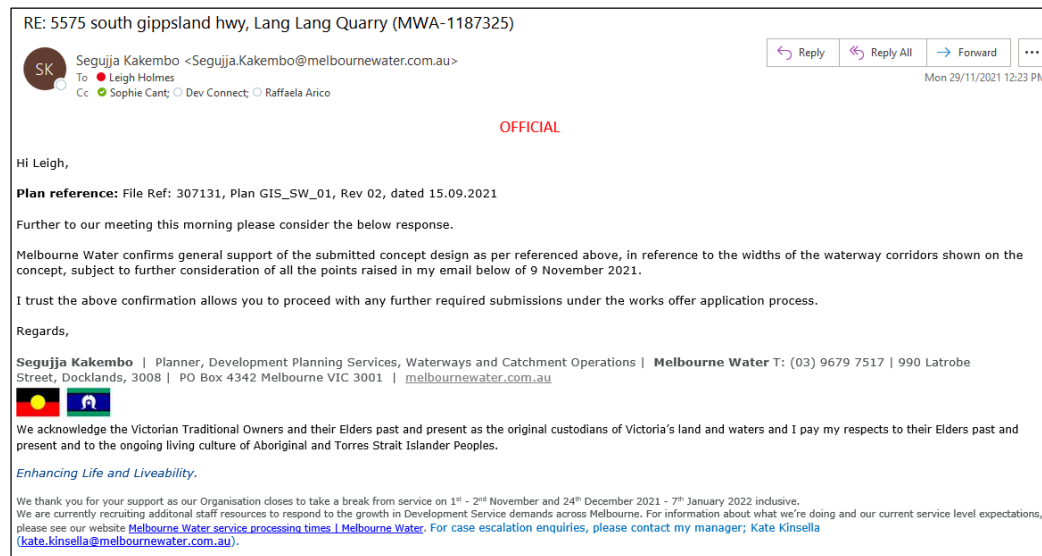
##### 4.1.2.1 Proposed Waterway Concept Design

Numerous iterations to the waterway concept design have been undertaken in consultation with Melbourne Water. Key information taken into consideration includes the following:

- ▶ Ensuring there is a 40m vegetated buffer zone either side of the proposed waterway
- ▶ No reliance on the formal retarding basin structure, whilst also minimising flood afflux downstream of the site.
- ▶ Designed in accordance with Melbourne Water Constructed Waterway Design Manual (Melbourne Water 2019).

The final revised concept incorporates all comments received from Melbourne Water throughout the consultation process to date. Melbourne Water have provided in principle support for the proposed concept, with conditions. Details of this approval are shown in Figure 6 and associated conditions are provided in Appendix 3.

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**Figure 6: In principal support of submitted concept design (Melbourne Water, 2021)**

The proposed concept includes a waterway with a varying width. It includes three distinct sections, with varying characteristics. These sections are as follows:

- ▶ All waterway corridors will have a 40m offset to the proposed quarry, thus the sections below state only the waterway widths and hence should add the stated offset to be considered as the whole reservation width for drainage purposes. The total reservations allowed for vary from 75m –105m.
- ▶ Section 1 – a 50m wide corridor; inclusive of a 14m wide low flow channel (top width) and 18m (min) vegetated buffers on either side
- ▶ Section 2 – a 65m (min) corridor width; inclusive of a 37m wide low flow channel (top width) and 18m (min) vegetated buffers on the western edge and a 10m (min) buffer on the eastern side (i.e. adjacent to the property boundary)
- ▶ Section 3 – a 35m (min) waterway corridor; inclusive of a 10m wide low flow channel (top width), and a vegetated buffer
- ▶ A flume/choke point between sections 2 and 3 will be required to create a flood plain and restrict downstream flow rates (ensuring minimal afflux downstream)

The proposed waterway concept layout is shown in Figure 7. The layout and corresponding waterway sections have been provided in Appendix 2.

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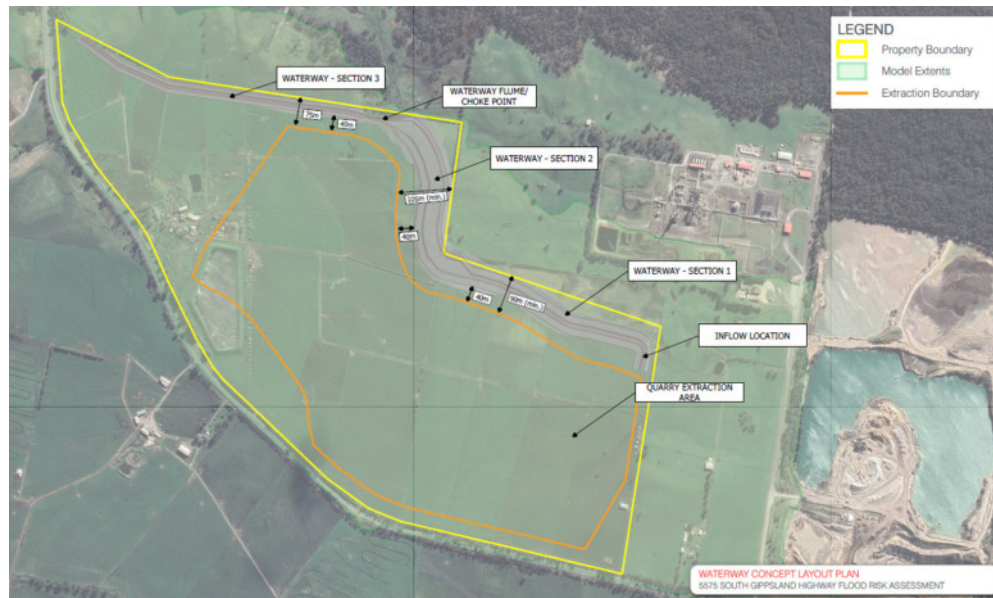


Figure 7: Proposed Waterway Concept Layout

## 4.2 RESULTS

Results of the existing and proposed hydraulic model are detailed below. The 1% AEP Existing Conditions Flood Depth results are shown in Figure 8. The 1% AEP Proposed Conditions Flood Depth results, which include the proposed waterway diversion along the northern boundary of the site, are shown in Figure 9. As shown, the proposed concept design contains 1% AEP flood extent within the allocated corridor.

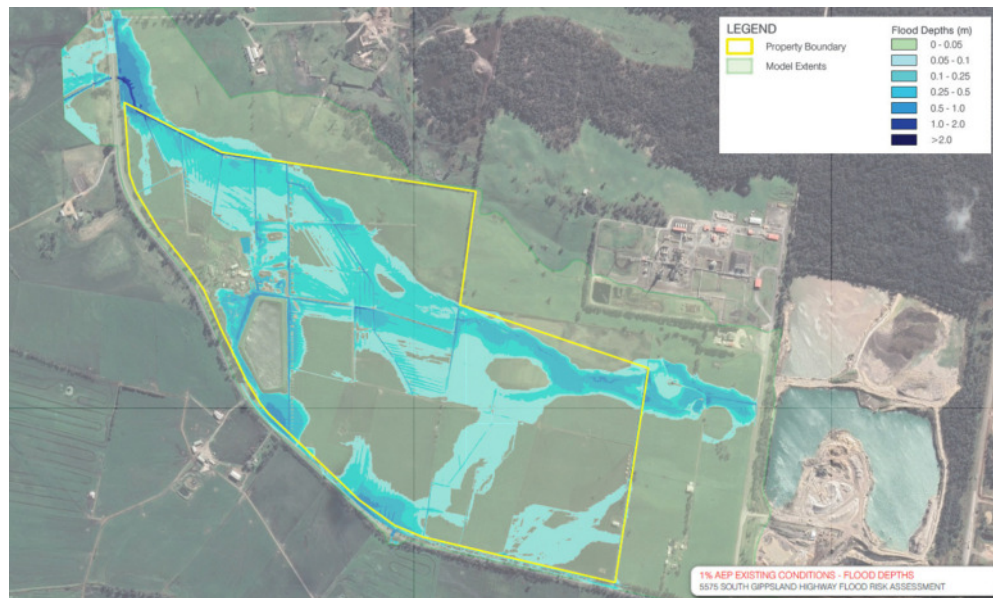


Figure 8: 1% AEP Existing Conditions Flood Depths



Figure 9: 1% AEP Proposed Conditions - Flood Depths

## 4.2.1 AFFLUX

1% AEP flood afflux results are shown in Figure 10. As shown, a minor afflux exists downstream of the site, which is estimated to be 20-40mm. This afflux, however, is local and contained and does not impact the downstream waterway, or adjacent properties. Overall, this afflux occurs entirely within the existing overland flow path and shows minimal impact on the overall flood extent.

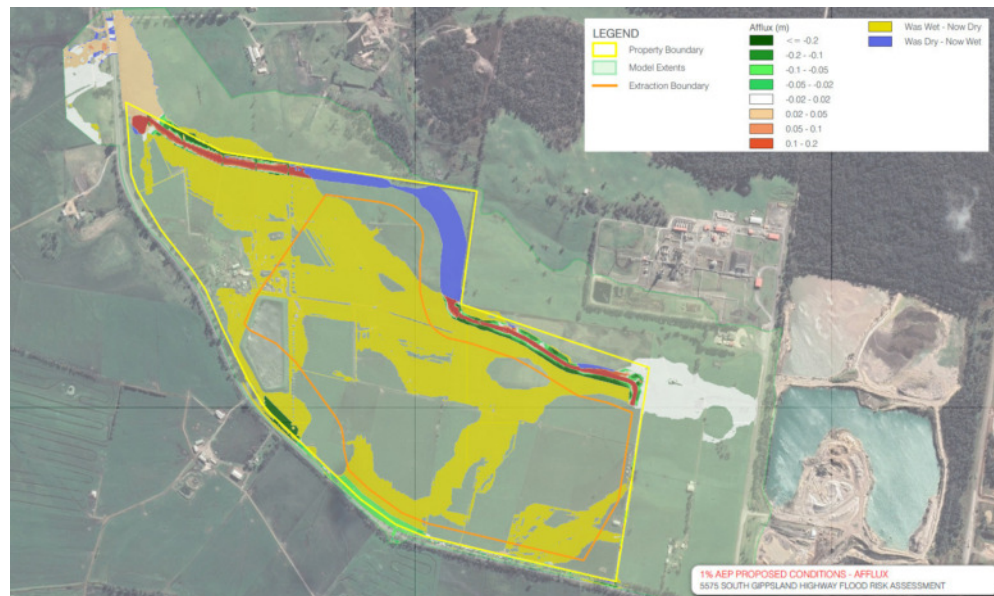


Figure 10: 1% AEP Proposed Conditions – Afflux

## 5. SUMMARY AND RECOMMENDATIONS

This document provides an overview of the Stormwater Management Plan for the proposed Sand Quarry at 5575 South Gippsland Highway Lang Lang, By Aurora Construction Materials (ACM). The proposed site is to include an extraction area, with a waterway along the northern boundary of the site to divert flood water from the upstream eastern catchment.

The proposed concept includes a waterway, flowing from the north eastern corner of the site, along the northern boundary, to existing culverts under the South Gippsland Highway. It is considered a practical and natural stormwater flow and flood storage solution, in the absence of a formalised retarding basin, that allows for flood conveyance through the site and optimises waterway health.

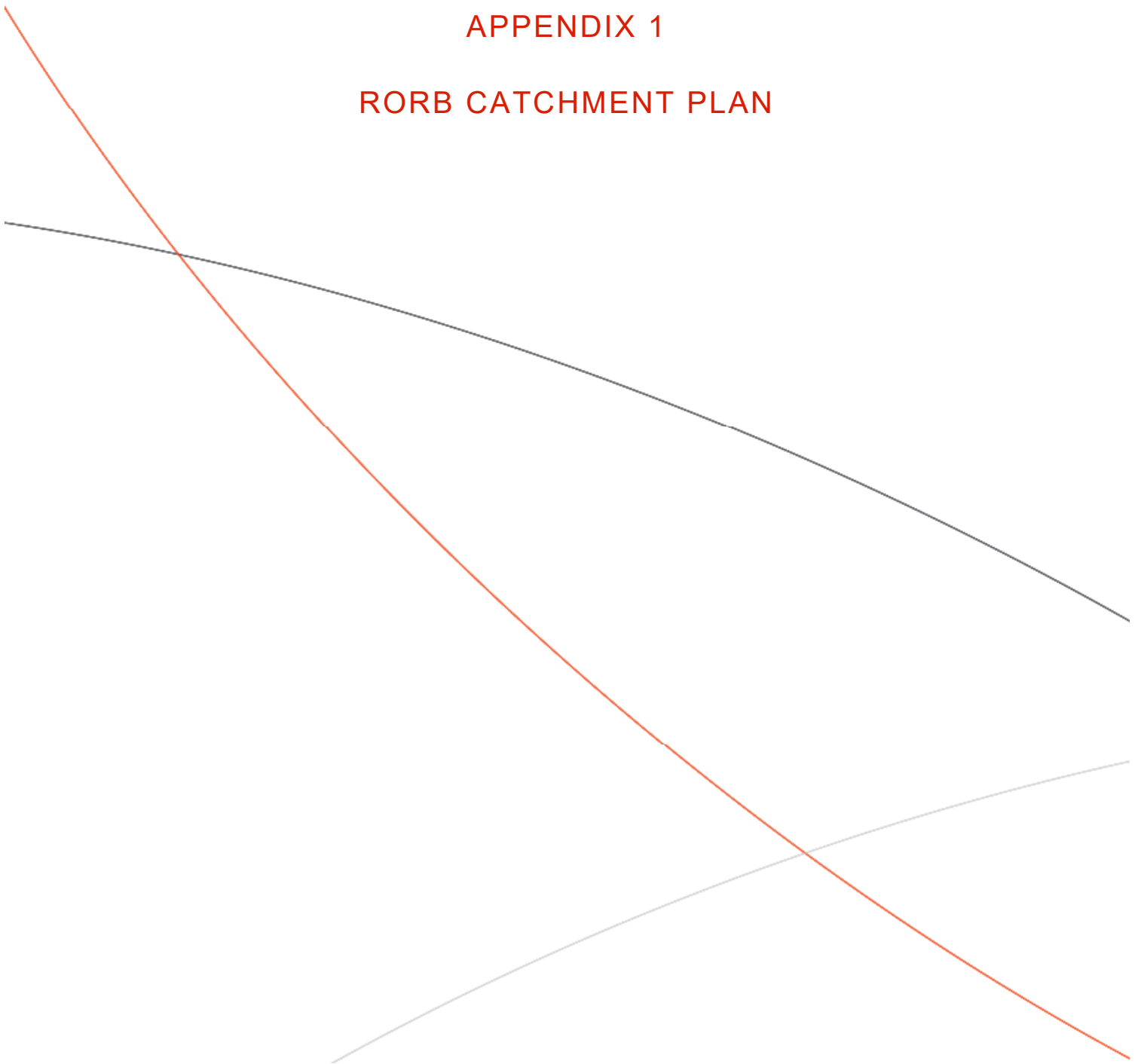
Melbourne Water have provided in principal support for the proposed concept, with conditions. Spiire will work with Melbourne Water to ensure all conditions are taken into consideration throughout the functional and detailed design of the proposed waterway.

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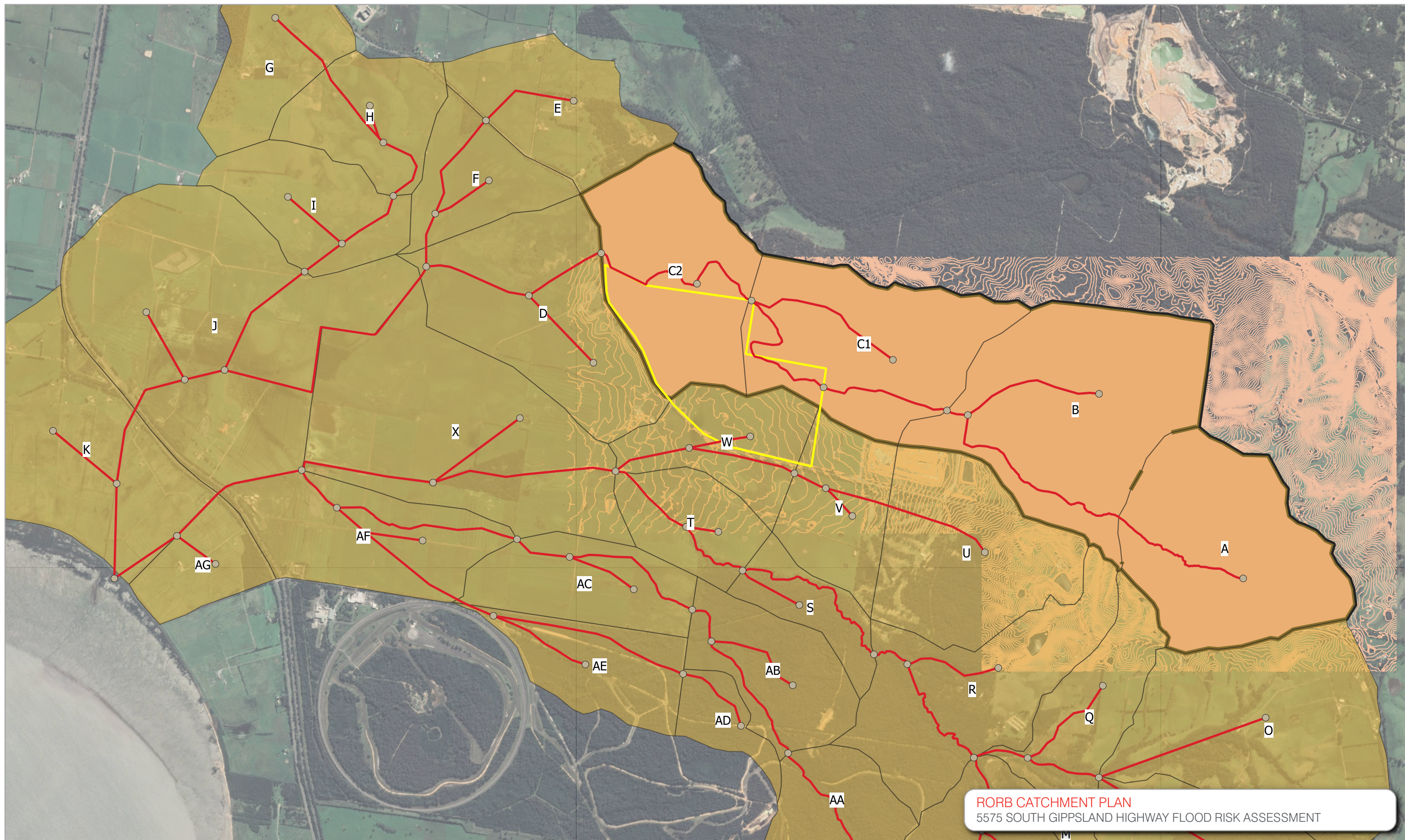
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## APPENDIX 1

### RORB CATCHMENT PLAN












## NOTATIONS

File Ref: 308642  
Plan: GIS\_SW\_01  
Rev: 01  
Date: 21.05.2021

Designed: B. Nevill  
Checked: S. Cant  
Authorised: L. Holmes

Flood Results:  
Data:

### LEGEND

-  Property Boundary
-  RORB SubArea
-  RORB Nodes
-  RORB Reaches
-  SubAreas Upstream of Site

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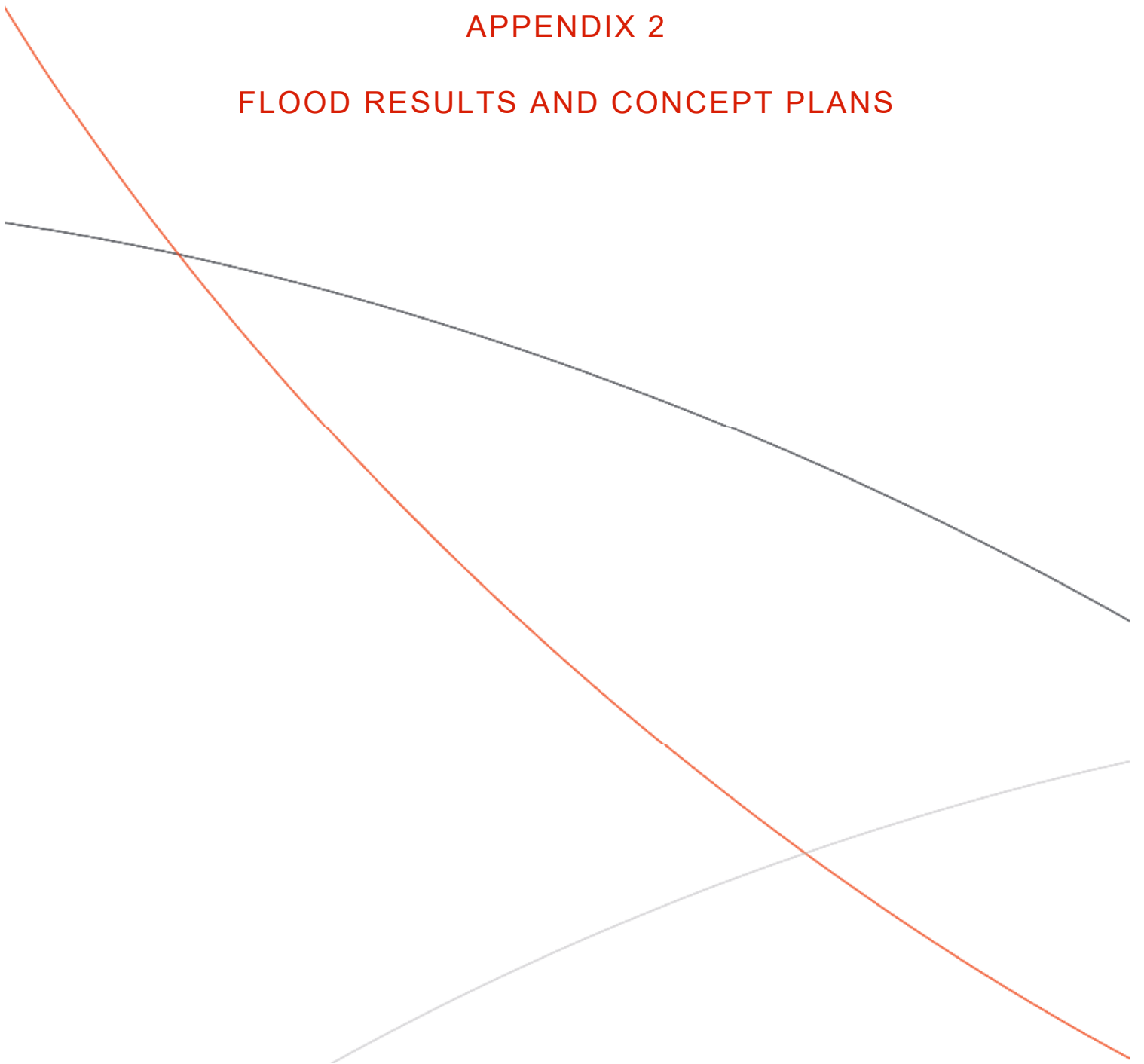
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## APPENDIX 2

### FLOOD RESULTS AND CONCEPT PLANS







1% AEP EXISTING CONDITIONS - FLOOD DEPTHS  
5575 SOUTH GIPPSLAND HIGHWAY FLOOD RISK ASSESSMENT

NOTATIONS

File Ref: 307131  
Plan: GfS\_SW\_02  
Rev: 03  
Date: 25.03.2022

Designed:  
Checked:  
Authorised:

Flood Results:  
Data:

LEGEND

- Property Boundary
- Model Extents

Flood Depths (m)

- 0 - 0.05
- 0.05 - 0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- >2.0

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1% AEP PROPOSED CONDITIONS - FLOOD DEPTHS  
5575 SOUTH GIPPSLAND HIGHWAY FLOOD RISK ASSESSMENT

NOTATIONS

File Ref: 307131  
Plan: GIS\_SW\_02  
Rev: 03  
Date: 25.03.2022

Designed:  
Checked:  
Authorised:

Flood Results:  
Data:

LEGEND

- Property Boundary
- Model Extents
- Extraction Boundary

Flood Depths (m)

- 0 - 0.05
- 0.05 - 0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- >2.0

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1% AEP PROPOSED CONDITIONS - AFFLUX  
5575 SOUTH GIPPSLAND HIGHWAY FLOOD RISK ASSESSMENT

NOTATIONS

File Ref: 307131  
Plan: GtS\_SW\_02  
Rev: 03  
Date: 25.03.2022

Designed:  
Checked:  
Authorised:

Flood Results:  
Data:

LEGEND

- Property Boundary
- Model Extents
- Extraction Boundary

Afflux (m)

- $\leq -0.2$
- $-0.2 - -0.1$
- $-0.1 - -0.05$
- $-0.05 - -0.02$
- $-0.02 - 0.02$
- $0.02 - 0.05$
- $0.05 - 0.1$
- $0.1 - 0.2$

- $\leq 0.0000$
- Was Wet - Now Dry

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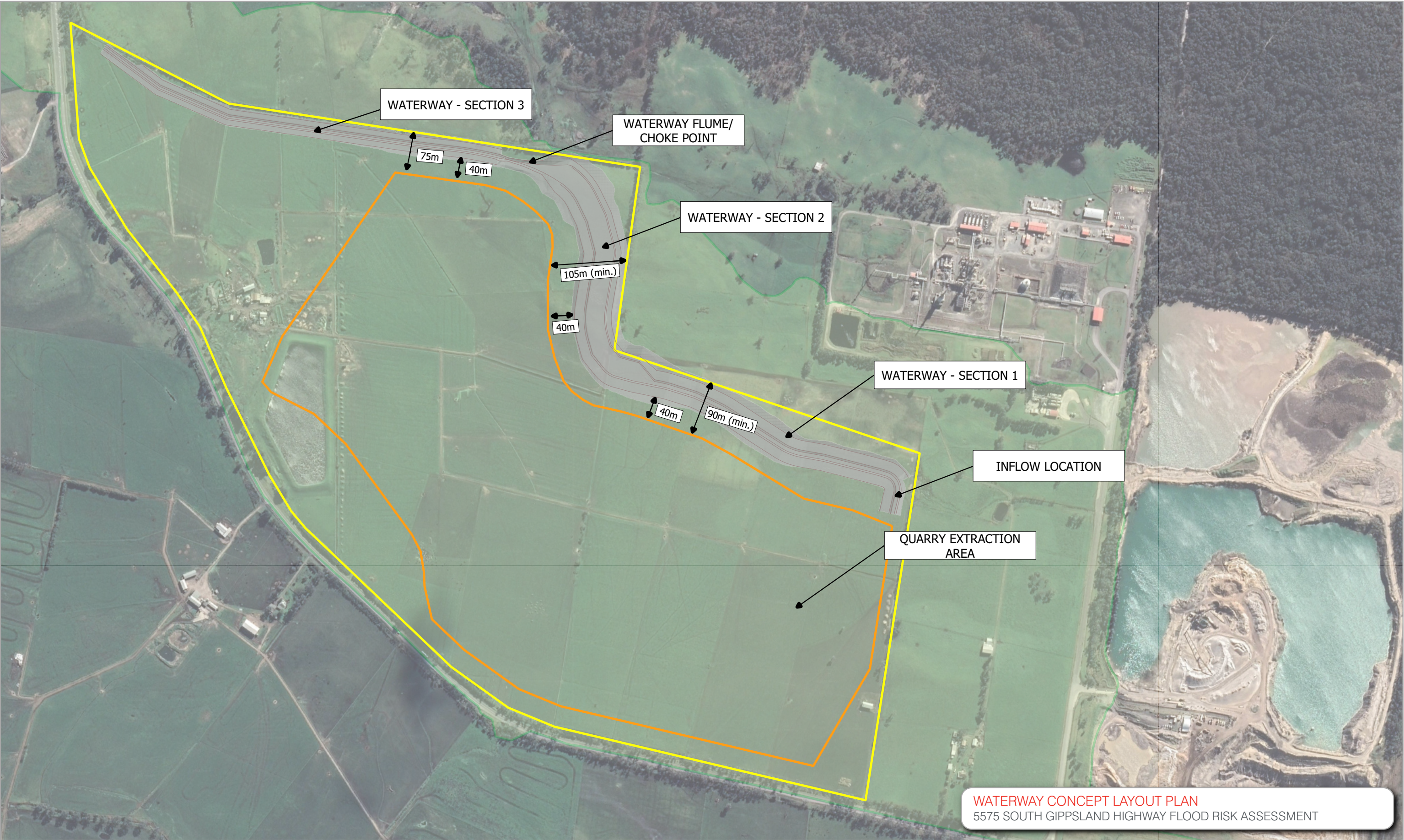


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**WATERWAY CONCEPT LAYOUT PLAN**  
5575 SOUTH GIPPSLAND HIGHWAY FLOOD RISK ASSESSMENT

**NOTATIONS**

File Ref: 307131  
Plan: GIS\_SW\_02  
Rev: 03  
Date: 25.03.2022

Designed:  
Checked:  
Authorised:

Flood Results:  
Data:

**LEGEND**

- Property Boundary
- Model Extents
- Extraction Boundary

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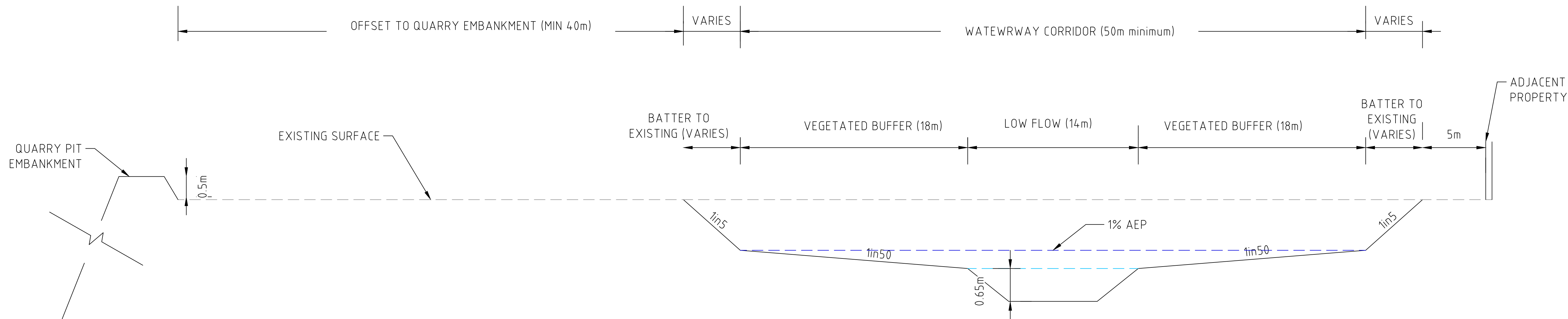
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WATERWAY TYPICAL SECTION - SECTION 1

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ACM LANG LANG SAND QUARRY  
WATERWAY CORRIDOR XS  
CONCEPT DESIGN  
CROSS SECTION ZONE 1  
5575 STH GIPPSLAND HWY

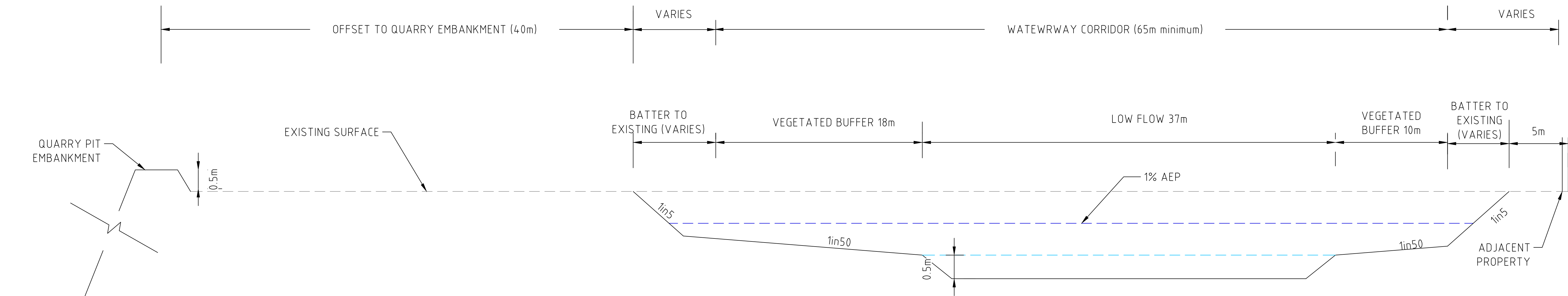
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**PRELIMINARY** Dwg No **308642WC200** Rev **-**

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file location \\spiire.com.au\\media\\data\\05\\sta 30\\308642\\water\\ACAD\\plot date 15/09/2021 12:19 PM Sheet 2 of 5 Sheets



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WATERWAY TYPICAL SECTION - SECTION 2

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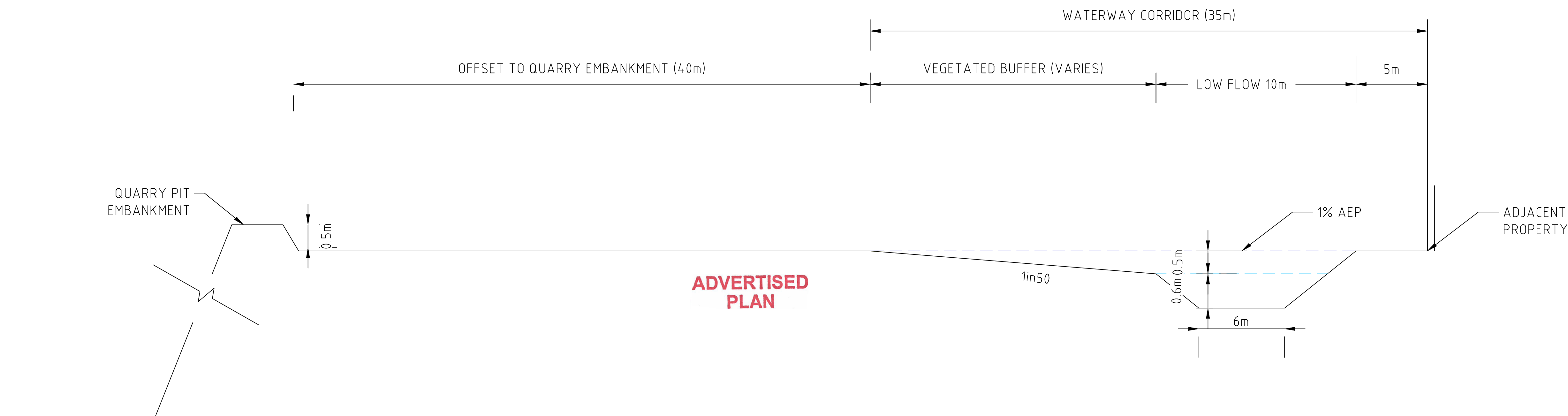
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**PRELIMINARY** 308642WC200

Drwg No

Rev



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Designed	Checked
Authorised	Date

ACM LANG LANG SAND QUARRY  
WATERWAY CORRIDOR XS  
CONCEPT DESIGN  
CROSS SECTION ZONE 3  
5575 STH GIPPSLAND HWY

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**PRELIMINARY**

Dwg No

**308642WC200**

Rev

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# ADVERTISED PLAN

## APPENDIX 3

### MELBOURNE WATER CORRESPONDENCE AND IN PRINCIPLE SUPPORT

1. Letter from Melbourne Water (26 October 2020)
2. Email – Acceptance of hydrology inflows (11 June 2021)
3. Email – In principle support of waterway concept design, with conditions (20 November 2021)

21 October 2020

Colin Thornton  
BCA Consulting  
29/41 Norcal Road  
Nunawading VIC 3131

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Dear Colin,

**Proposal:** Construction of a sand extraction quarry  
**Site location:** 5575 South Gippsland Highway, Lang Lang

**Melbourne Water reference:** MWA-1187325

**Date referred:** 22/09/2020

Thank you for your application regarding the proposed development at the above property.

Further to the site meeting (virtual) of 20 October 2020, Melbourne Water provides the following advice and general preliminary requirements for your consideration:

### Hydraulic advice

Where any works proposed by the quarry may obstruct the passage of stormwater and/or reduce the naturally occurring floodplain storage, a hydrology and hydraulics report undertaken by a suitably qualified person must be submitted to Melbourne Water for assessment. The report must detail the impact of the proposed works, with or without mitigation works, will have on the passage of stormwater and/or floodplain storage.

Minor increases in flood levels up to and including the flood event which has a probability of occurrence of 1 per cent in any one year (ie 1 in 100 year ARI) may be permitted if it is demonstrated that the afflux does not cause any material damage to any other property.

Loss of floodplain storage ~~at least~~ 10% of the storage available on the property must be demonstrated to not cause any increase to flood levels.

Prior to further comments, the following information must be submitted to Melbourne Water for assessment:

- An overall development plan for the proposed works is to be submitted to Melbourne Water. Include rehabilitation plan for consideration of future impacts.
- To minimise any loss in floodplain storage, it is recommended that the quarrying works be staged. A report detailing the progress of works and computations demonstrating flood storage impacts is to be submitted to Melbourne Water for approval
- Software models and reports associated with the hydraulic and hydrological analysis of the Waterway 2504 floodplain. Upon receipt of the above information, Melbourne Water will determine a minimum setback from the banks of the waterways. Discussions with the Department of Earth Resources Extractive Industry representatives indicate that the area has

highly erosive soils with the potential to cause future instability issues for development. Software models and reports associated with the hydraulic and hydrological impact assessment of the proposed works are to be submitted. It should be noted that the proposed development must not have any adverse impact upon flood flows and flood levels.

## **Realignment of waterway/channel**

If waterways are proposed to be diverted within the quarry site these diversions must be included and outlined within the Work Authority and submitted to Melbourne Water for approval.

1. Any proposed realignment of the waterway must be submitted to Melbourne Water for approval at concept design, functional design and detailed design stages. Each submission must include the following information:

- a. The proposed centreline and alignment of the realigned section;
- b. A geotechnical/geomorphologic report by a suitably qualified professional identifying the geomorphic values of the existing waterway and providing assessment of the significance of those values within the local, regional and state context.
- c. A geotechnical/geomorphologic report by a suitably qualified professional addressing the feasibility of any proposed realignment, with reference to soil types, topography and any future possible channel movement. Within the report, the proponent must demonstrate the hydraulic function including:
  - i. channel capacity; (normally required to contain 100 year ARI flow plus freeboard, freeboard amount to be determined by risk assessment of the consequences of flows exceeding the channel capacity);
  - ii. stream velocities;
  - iii. shear stresses and stream powers at different flow rates likely to be experienced by the realigned section (according to the flow regime and proposed channel geometry) in order to determine the likely impact on channel stability.

2. The report must demonstrate that the hydraulic function of the realigned section:

- i. causes no significant change from base conditions (i.e. the current hydraulics of the existing channel), where the existing channel is in good geomorphic condition and not exhibiting unstable behaviour
- ii. that channel stability and in channel vegetation is not negatively impacted by the hydraulics of the realigned section
- iii. minimises the requirement for rock lining and scour protection
- iv. potential consequence of lengthening channel in relation to sediment accumulation.
- v. outlines the predicted rate of meander and impact on intended design and riparian reserve width;

d. Waterway corridor zones and/or design, including appropriate revegetation setbacks, revegetation treatment, exclusion zone and maintenance access on both sides of the waterway.

- The realigned waterway must have a minimum 70m revegetation zone (outwards from top of the bank/batter slope) reinstated on both sides of the waterway to provide waterway stabilisation and protection.
  - The realigned waterway must be re-vegetated with an appropriate indigenous Ecological Vegetation Class. Vegetation must be established and provide stability for the realigned waterway prior to the waterway's flows being redirected into the final waterway re-alignment.
  - An appropriate exclusion zone is required (*e.g. minimum 100m from the waterway (top of bank)*) to protect the waterway from any direct (*e.g. quarrying*) or indirect (*e.g. water quality*) impacts from extraction activities.
  - Maintenance access (vehicle) must be designated on both sides of the waterway (and within the proponent's property title) to ensure that any future waterway rectification or maintenance works can be safely undertaken.
- e. Detailed flora and fauna investigation of the affected areas will need to be undertaken by an



appropriately qualified consultant on behalf of the proponent and submitted to Melbourne Water for approval. These investigations must take into account the proposed subject site as well as the upstream, downstream and adjacent areas that may be affected. Appropriate measures to mitigate any potential impacts must be identified. Note that Melbourne Water reserves the right to ask for surveys to be repeated or targeted where required.

- f. The location and species of vegetation affected by any proposed realignment at the project site as well as upstream and downstream of the project site, and
- g. Provide details of sediment control elements (e.g. silt traps) that will be incorporated during the construction and establishment of the new waterway alignment to protect downstream water quality.

3. Melbourne Water recommends rehabilitation of the riparian corridor include fencing and revegetation with trees, shrubs and groundcover species. It is recommended that the waterway frontage be fenced at the required setback distance prior to works commencing to minimise damage to the waterway. A rehabilitation plan is to be forwarded to Melbourne Water for approval. Revegetation is to be undertaken with indigenous plant species.

#### **Waterway connections and crossing**

- All waterway crossings should be constructed according to Melbourne Water Guidelines and submitted to Melbourne Water for approval. Please see following link for further advice: <https://www.melbournewater.com.au/planning-and-building/apply-to-buildordevelop/construct-bridge-crossing-or-culvert>
- Any new or modified stormwater connection to Melbourne Water's waterways must obtain separate approval from Melbourne Water. Please see the following link for further advice: <https://www.melbournewater.com.au/planning-and-building/apply-to-build-ordevelop/stormwater-connection>

#### **Advice**

Upon submission of further additional information in response to the above requirements, Melbourne Water can provide further advice in regards to formal review process for proposed realignment of the waterway.

This advice is valid for a period of three months from the date of this letter.

The above information is only preliminary and forms no contractual agreement between your company and Melbourne Water. Melbourne Water reserves the right to alter any or all of this information at any time.

For enquiries in relation to this application please contact me via our Customer Service Centre on 131 722.

Regards,



Segujja Kakembo  
Development Planning Services

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# ADVERTISED PLAN

**Sophie Cant**

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**From:** Joe Pang <Joe.Pang@melbournewater.com.au>  
**Sent:** Friday, 11 June 2021 5:22 PM  
**To:** Sophie Cant  
**Cc:** Segujja Kakembo; Louise Kerferd; Leigh Holmes; Kelvin Sargent; Brent Nevill; BCA Consulting  
**Subject:** RE: 5575 South Gippsland Highway, Lang Lang – Water Management - Existing Conditions Hydrological and Hydraulic Modelling Report (MWA-1187325)

Hi Sophie,

Hope you are doing well. I've completed a preliminary hydrology and hydraulic reviews of the above quarry and is providing the following comments:

Hydrology (RORB):

- 1% AEP flood flow adopted 16 cumecs into the model is acceptable

Hydraulic (TUFLOW):

- Any bunding to protect the extraction site? There is no bunding included into the model?
- Setback requirements – there is overlapping the proposed waterways and extraction area?
- Floodwater will towards into proposing quarry along southern boundary in approx. 6 hour in proposed condition, it needs to be fixed
- Afflux plot need to be submitted for further assessment
- Afflux is increased 50mm-80mm downstream of the private property and 100mm downstream of South Gippsland Highway. Importantly there is increased flooding on South Gippsland Highway. Melbourne Water is not accepted any afflux to the private properties and road, therefore mitigation options will be required to demonstrate how can be bought it back to the pre-development condition.

Additional to this, our Waterways and Land officer would like to provide the following comments for your consideration, it may need to demonstrate in a model:

- Has the flood modelling taken into account the various stages of the quarry development? Is the bunding being located at different positions according to stages of the quarry? If so, there will be runoff not captured by the quarry during the early stages of development and it is also necessary to think about potential post development impacts.
- Does an element of flexibility need to be captured in the modelling to incorporate rehabilitation stages of Nyora Quarry upstream ? In case the passing flows increase once consultation with authorities has occurred regarding waterway rehabilitation, site rehabilitation plans & final use of the site is approved.
- A review of the flood modelling maps in the report highlights the mismatch between the 1%AEP design of the channel capacity with the upstream and downstream low capacity channels. A waterway with a capacity similar to or slightly larger than the natural channel upstream and downstream would allow a floodplain associated with the waterway. This would be a more desirable outcome from a channel stability & waterway health perspective. Although an exclusion zone has not been indicated in the flood modelling, an offset distance of 100m would result in an average corridor width of 200m, providing a floodplain and room for channel processes occurring on low gradient waterways. Long term management of the waterway is an important consideration in terms of proximity of extraction zone & stability. Corridor size should

accommodate waterway, floodplain, access, maintenance, revegetation design, post development uses eg potential passive recreation links etc.

- The existing waterway is indicated in the Healthy Waterways Strategy as having a high priority for establishing a continuous vegetation cover to a minimum level 3. Level 3 vegetation quality can be described as Upper and middle storey vegetation present and conveys the character of the EVC. Simplified species structure that maintains representative EVC species composition. The upper and mid-storey comprises species from a modified or representative EVC benchmark.

Revised modelling will be required to demonstrate how the above comments and consideration can be achieved.

Kind Regards,

**Joe Pang** | Development Investigations Engineer, Catchment Strategies and Services, Waterways and Catchment Operations | **Melbourne Water**

T: (03) 9679 7828 | 990 La Trobe Street Docklands | PO Box 4342 Melbourne VIC 3001 | [melbournewater.com.au](http://melbournewater.com.au)



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We acknowledge the Victorian Traditional Owners and their Elders past and present as the original custodians of Victoria's land and waters and I pay my respects to their Elders past and present and to the ongoing living culture of Aboriginal and Torres Strait Islander Peoples.

---

**From:** Joe Pang

**Sent:** Friday, 28 May 2021 1:48 PM

**To:** Sophie Cant <Sophie.Cant@spiire.com.au>

**Cc:** Segujja Kakembo <Segujja.Kakembo@melbournewater.com.au>; Keith Boniface

<keith.boniface@melbournewater.com.au>; Aijaz Memon <aijaz.memon@melbournewater.com.au>; Leigh Holmes <Leigh.Holmes@spiire.com.au>; Kelvin Sargent <kelvins@acm.com.au>; Brent Nevill <Brent.Nevill@spiire.com.au>; BCA Consulting <admin@bcaconsulting.com.au>

**Subject:** RE: 5575 South Gippsland Highway, Lang Lang – Water Management - Existing Conditions Hydrological and Hydraulic Modelling Report (MWA-1187325)

Hi Sophie,

Thanks for your email. I understand you guys are working within a very tight timeframe. To be honest we are under the pump at the moment and there is a lot of the priority works need to be completed before the assessment of the quarry.

The job is in my workbasket and in-queue, I might able to start the assessment in mid or end of next week and comments will be ready after the assessment.

Happy to discuss if you've any concerns.

Kind Regards,

**Joe Pang** | Development Investigations Engineer, Catchment Strategies and Services, Waterways and Catchment Operations | **Melbourne Water**

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## Sophie Cant

---

**From:** Segujja Kakembo <Segujja.Kakembo@melbournewater.com.au>  
**Sent:** Monday, 29 November 2021 12:23 PM  
**To:** Leigh Holmes  
**Cc:** Sophie Cant; Dev Connect; Raffaella Arico  
**Subject:** RE: 5575 south gippsland hwy, Lang Lang Quarry (MWA-1187325)

OFFICIAL

Hi Leigh,

**Plan reference:** File Ref: 307131, Plan GIS\_SW\_01, Rev 02, dated 15.09.2021

Further to our meeting this morning please consider the below response.

Melbourne Water confirms general support of the submitted concept design as per referenced above, in reference to the widths of the waterway corridors shown on the concept, subject to further consideration of all the points raised in my email below of 9 November 2021.

I trust the above confirmation allows you to proceed with any further required submissions under the works offer application process.

Regards,

**Segujja Kakembo** | Planner, Development Planning Services, Waterways and Catchment Operations  
| **Melbourne Water** T: (03) 9679 7517 | 990 Latrobe Street, Docklands, 3008 | PO Box 4342  
Melbourne VIC 3001 | [melbournewater.com.au](http://melbournewater.com.au)



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*Enhancing Life and Liveability.*

We thank you for your support as our Organisation closes to take a break from service on 1<sup>st</sup> - 2<sup>nd</sup> November and 24<sup>th</sup> December 2021 - 7<sup>th</sup> January 2022 inclusive.

We are currently recruiting additional staff resources to respond to the growth in Development Service demands across Melbourne. For information about what we're doing and our current service level expectations, please see our website [Melbourne Water service processing times | Melbourne Water](http://Melbourne Water service processing times | Melbourne Water). For case escalation enquiries, please contact my manager; Kate Kinsella ([kate.kinsella@melbournewater.com.au](mailto:kate.kinsella@melbournewater.com.au)).

---

**From:** Segujja Kakembo <[Segujja.Kakembo@melbournewater.com.au](mailto:Segujja.Kakembo@melbournewater.com.au)>  
**Sent:** Tuesday, 9 November 2021 2:31 PM  
**To:** Sophie Cant <[Sophie.Cant@spiire.com.au](mailto:Sophie.Cant@spiire.com.au)>  
**Cc:** Leigh Holmes <[Leigh.Holmes@spiire.com.au](mailto:Leigh.Holmes@spiire.com.au)>; Dev Connect <[DevConnect@melbournewater.com.au](mailto:DevConnect@melbournewater.com.au)>  
**Subject:** FW: 5575 south gippsland hwy, Lang Lang Quarry (MWA-1187325)

OFFICIAL

Hi Sophie,

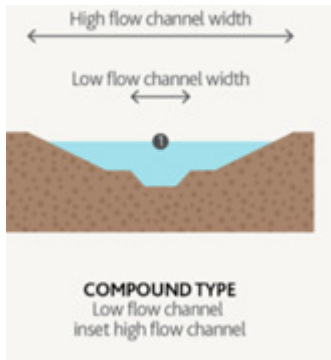
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Thank you for your email of 16 September 2021 and the accompanying concept plan. Upon review of the submitted documents, Melbourne Water provides the following preliminary comments, including issues for further consideration:

### **Waterway health/form requirements**

Waterway Form - Waterway Cross section geometry is outlined in section D2.2 of the constructed waterway Design Manual.

*The compound waterway consists of a high flow channel with a sinuous, inset low flow channel.*



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*Sinuosity is a very important variable in waterways. In natural waterways, channel sinuosity provides a longitudinal grade control function, helping to maintain hydraulic conditions within an acceptable range to ensure bed and bank stability are maintained at rates the channel can adjust to. Channel sinuosity also creates and sustains in-stream habitat features such as pools and riffles. Sinuosity helps achieve many of the Melbourne Water design objectives for waterways.*

- 1. Channel stability - Straight channels are inherently unstable and will usually adjust to reach a more stable form. One of the central design principles in this manual is that the waterway should be stable for all design flows. A waterway that is constructed with an appropriate degree of sinuosity is less likely to undergo major channel adjustment, and consequently will require less maintenance over the long-term (in the form of revegetation or bank stabilisation works);*
- 2. In-stream ecology - Sinuous waterways have a wider range of flow conditions (e.g. faster flows on the outside of bends, slower on the inside of bends). A diversity of flow conditions contributes to the range of habitats needed to support the target species of animals and plants;*

#### Section 1 –

Section 1 appears to show some opportunities for geometry & sinuosity as outlined above.

The location of the Inflow is indicated as being within the quarry setback distance. How will this connect with the upstream waterway section and how will flows enter the diverted waterway? Similar questions with the downstream end & its connection with the downstream waterway.

#### Section 2 –

The very wide channel section upstream of choke location could create issues with sedimentation as water is restricted & slows. Is this likely to be a maintenance issue long term?

Given the wide channel shape, will vegetation establishment in the long term be an issue on the wide channel during low flows and especially after dry conditions? Will channel erosion occur if vegetation is not present after dry conditions once flows return?

Choke section - how is this section constructed? There are likely to be significant flow velocities as water moves through the restriction so will some channel energy dissipation be required? Is this via a rock chute arrangement?

Does the design of this section align with objective 3 above, regarding safe, cost effective long term operation & maintenance?

### Section 3 –

The design of this section is relatively uniform in channel design & alignment. What are the likely impacts from increased velocity created by the upstream choke? How will increased velocity from the choke section be managed? Could improvements be made to its form by considering sinuosity & geometry? See MW guidance for benefits of sinuosity as outlined in the constructed waterway design manual.

Other comments:

- Ensure sufficient access and space for all required maintenance activities. Appropriate forms of access to the waterway must be provided, as well as room for maintenance vehicles and machinery to manoeuvre along the waterway outside of the core riparian zone.
- Provide safe environments for Melbourne Water officers and contractors to access and maintain. Maintenance requirements must be incorporated at the design stage to ensure Melbourne Water staff can maintain waterways in a safe and efficient manner.
- The creek 2504 is listed as a high priority waterway in the Healthy Waterway Strategy (HWS). Performance objectives relating to establishing a continuous riparian buffer along this waterway and mitigating threats to physical form apply to Creek 2504 and should be considered during the design process.

### **Hydraulic requirements**

- 1) Are any bunds provided around the extraction site? If so, are the bunds included into the model?
- 2) Based on the modelling result shows that the afflux is still increased by 20mm to 100mm downstream of the private properties and South Gippsland Highway. Melbourne Water does not accept any afflux on private properties and/or on the road.
- 3) Mitigation options are required to demonstrate there is no adverse impacts in comparing to the pre-development vs. post development condition.
- 4) Further information is required on the changing in flow under the South Gippsland Highway, therefore existing vs. proposing hydrograph will be requested to be submitted to Melbourne Water for further assessment.
- 5) Any low flow events (18.13% AEP and 10% AEP) included in the assessment? If not, Melbourne Water would like to understand what impacts to the downstream properties and road in a low flow event since the capacity of the waterways are very limited.

Please note, the above advice has been provided under the pre-development advice service. It is a non-statutory, free service which provides high level, preliminary advice prior to formal applications for planning, building and asset related approval.

### **Next step:**

The above waterway health requirements and hydraulic components (including flood modelling) will need to be addressed and resolved under the works offer process.

In order to proceed with formal approval for the proposed waterway re-alignment, please apply for a works offer application via the following link:

<https://apply.melbournewater.com.au/develop/online.html?ApplicationType=OOCW>

Regards,

**Segujja Kakembo** | Planner, Development Planning Services, Waterways and Catchment Operations  
| **Melbourne Water** T: (03) 9679 7517 | 990 Latrobe Street, Docklands, 3008 | PO Box 4342  
Melbourne VIC 3001 | [melbournewater.com.au](http://melbournewater.com.au)



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---

**From:** Sophie Cant <[Sophie.Cant@spiire.com.au](mailto:Sophie.Cant@spiire.com.au)>

**Sent:** Thursday, 16 September 2021 3:45 PM

**To:** Segujja Kakembo <[Segujja.Kakembo@melbournewater.com.au](mailto:Segujja.Kakembo@melbournewater.com.au)>

**Cc:** Leigh Holmes <[Leigh.Holmes@spiire.com.au](mailto:Leigh.Holmes@spiire.com.au)>; Sarah Eggleton <[Sarah.Eggleton@melbournewater.com.au](mailto:Sarah.Eggleton@melbournewater.com.au)>; Louise Kerferd <[Louise.Kerferd@melbournewater.com.au](mailto:Louise.Kerferd@melbournewater.com.au)>; Joe Pang <[Joe.Pang@melbournewater.com.au](mailto:Joe.Pang@melbournewater.com.au)>; Dev Connect <[DevConnect@melbournewater.com.au](mailto:DevConnect@melbournewater.com.au)>; Kelvin Sargent <[kelvins@acm.com.au](mailto:kelvins@acm.com.au)>; BCA Consulting <[admin@bcaconsulting.com.au](mailto:admin@bcaconsulting.com.au)>; Brent Nevill <[Brent.Nevill@spiire.com.au](mailto:Brent.Nevill@spiire.com.au)>

**Subject:** RE: Lang Lang Quarry (MWA-1187325)

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Hi Segujja,

Hope you are well! Please see attached letter detailing the revised concept design that takes into consideration all recommendations outlined by Melbourne Water below, and in previous correspondence.

The purpose of this letter is to obtain acceptance of the proposed concept, and we would greatly appreciate a response as soon as possible. Following this we will produce a final report including the concept for approval.

Please let me know if you have any queries and look forward to hearing from you.

Kind regards,

**Sophie Cant**

Senior Professional  
Integrated Water



Level 2 | 10 Moorabool Street Geelong VIC 3220  
PO Box 4032 Geelong VIC 3220

t +61 3 5249 6831

[spiire.com.au](http://spiire.com.au)



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**From:** Segujja Kakembo <[Segujja.Kakembo@melbournewater.com.au](mailto:Segujja.Kakembo@melbournewater.com.au)>

**Sent:** Thursday, 19 August 2021 4:28 PM

**To:** Sophie Cant <[Sophie.Cant@spiire.com.au](mailto:Sophie.Cant@spiire.com.au)>

**Cc:** Leigh Holmes <[Leigh.Holmes@spiire.com.au](mailto:Leigh.Holmes@spiire.com.au)>; Sarah Eggleton <[Sarah.Eggleton@melbournewater.com.au](mailto:Sarah.Eggleton@melbournewater.com.au)>; Louise Kerferd <[Louise.Kerferd@melbournewater.com.au](mailto:Louise.Kerferd@melbournewater.com.au)>; Joe Pang <[Joe.Pang@melbournewater.com.au](mailto:Joe.Pang@melbournewater.com.au)>; Dev Connect <[DevConnect@melbournewater.com.au](mailto:DevConnect@melbournewater.com.au)>

**Subject:** RE: Lang Lang Quarry (MWA-1187325)

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Hi Sophie,

Following internal assessment of the submitted concept in the email of 30/07/2021, Melbourne Water provides the following response:

The revised concept, including the concept of a privately owned & managed RB was discussed with various internal groups within Regional Services. The risk involved with this solution was considered high with many unmanageable factors associated with the management of the RB & future risk to waterway condition & downstream assets into the future. The outcome of those discussions was that Spiire be asked to develop an option for the realignment which does not rely on the inclusion of an RB.

- Melbourne Water strongly recommends further options be considered and developed for the waterway realignment and submitted, which do not rely on an RB or an enlarged channel to contain floodwater.
- Undertake flood modelling including the vegetation buffer to show that flood waters can be contained within a corridor and satisfy Melbourne Water's flood mitigation requirements.

The above is Melbourne Water's preferred criteria for a design solution. However, if no other option is feasible other than the proposed RB proposal, evidence will need to be provided confirming as to why this approach is the singular option available.

Upon submission of an amended design further assessment will proceed by our Regional Services and Investigations team, prior to proceeding to the works offer stage.

Regards,

**Segujja Kakembo** | Planner, Development Planning Services, Waterways and Catchment Operations  
| **Melbourne Water** T: (03) 9679 7517 | 990 Latrobe Street, Docklands, 3008 | PO Box 4342  
Melbourne VIC 3001 | [melbournewater.com.au](http://melbournewater.com.au)



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We are currently undertaking resourcing and process improvements to respond to the growth in demand for our services. For information about what we're doing and our current service levels, click [here](#).

---

**From:** Sophie Cant <[Sophie.Cant@spiire.com.au](mailto:Sophie.Cant@spiire.com.au)>

**Sent:** Thursday, 19 August 2021 3:28 PM

**To:** Segujja Kakembo <[Segujja.Kakembo@melbournewater.com.au](mailto:Segujja.Kakembo@melbournewater.com.au)>

**Cc:** Leigh Holmes <[Leigh.Holmes@spiire.com.au](mailto:Leigh.Holmes@spiire.com.au)>; Sarah Eggleton <[Sarah.Eggleton@melbournewater.com.au](mailto:Sarah.Eggleton@melbournewater.com.au)>; Louise



Kerferd <[Louise.Kerferd@melbournewater.com.au](mailto:Louise.Kerferd@melbournewater.com.au)>

**Subject:** FW: Lang Lang Quarry (MWA-1187325)

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Hi Segujja,

Just following up on the review and feedback of our concept design that was submitted to Louise Kerford a couple of weeks ago, and reviewed by Sarah Eggleton last week. Sarah has noted below that you are coordinating the response from MW. Can you please provide feedback as soon as possible to enable us to progress.

I have also left a message and happy to discuss over the phone.

Kind regards,

**Sophie Cant**

Senior Professional  
Integrated Water



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**From:** Sarah Eggleton <[Sarah.Eggleton@melbournewater.com.au](mailto:Sarah.Eggleton@melbournewater.com.au)>

**Sent:** Thursday, 19 August 2021 3:18 PM

**To:** Sophie Cant <[Sophie.Cant@spiire.com.au](mailto:Sophie.Cant@spiire.com.au)>

**Subject:** RE: Lang Lang Quarry

**OFFICIAL**

Hi Sophie

Sorry I missed your call earlier. Feedback on the RB isn't something that sits with my team as it requires input from our Flood Services team. It is probably best to call Segijja Kakembo who is coordinating the referral response from across MW.

Thanks

**Sarah Eggleton** | Team Leader, South East Regional Services, Waterways and Catchment Operations| **Melbourne Water** T: (03) 9679 7039 | M: 0418 382 285 | 990 Latrobe Street, Docklands 3008 | PO Box 4342 Melbourne VIC 3001 | [melbournewater.com.au](http://melbournewater.com.au)

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**From:** Sophie Cant <[Sophie.Cant@spiire.com.au](mailto:Sophie.Cant@spiire.com.au)>  
**Sent:** Thursday, 19 August 2021 2:02 PM  
**To:** Sarah Eggleton <[Sarah.Eggleton@melbournewater.com.au](mailto:Sarah.Eggleton@melbournewater.com.au)>  
**Cc:** Leigh Holmes <[Leigh.Holmes@spiire.com.au](mailto:Leigh.Holmes@spiire.com.au)>; Brent Nevill <[Brent.Nevill@spiire.com.au](mailto:Brent.Nevill@spiire.com.au)>; Kelvin Sargent <[kelvins@acm.com.au](mailto:kelvins@acm.com.au)>; BCA Consulting <[admin@bcaconsulting.com.au](mailto:admin@bcaconsulting.com.au)>  
**Subject:** RE: Lang Lang Quarry

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Hi Sarah,

Just following up on your email below in relation to the concept proposed for the site at 5575 South Gippsland Highway Lang Lang. If you are able to provide feedback on the concept, including the RB, as soon as possible that would be appreciated. I have left a message with you as well so happy to discuss over the phone.

Look forward to hearing from you.

Kind regards,

**Sophie Cant**  
Senior Professional  
Integrated Water



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**From:** Leigh Holmes <[Leigh.Holmes@spiire.com.au](mailto:Leigh.Holmes@spiire.com.au)>  
**Sent:** Thursday, 12 August 2021 5:04 PM  
**To:** Sophie Cant <[Sophie.Cant@spiire.com.au](mailto:Sophie.Cant@spiire.com.au)>; Brent Nevill <[Brent.Nevill@spiire.com.au](mailto:Brent.Nevill@spiire.com.au)>; Kelvin Sargent <[kelvins@acm.com.au](mailto:kelvins@acm.com.au)>; BCA Consulting <[admin@bcaconsulting.com.au](mailto:admin@bcaconsulting.com.au)>  
**Subject:** FW: Lang Lang Quarry


FYI below.

**Leigh Holmes**  
Principal  
Integrated Water

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**From:** Sarah Eggleton <[Sarah.Eggleton@melbournewater.com.au](mailto:Sarah.Eggleton@melbournewater.com.au)>  
**Sent:** Thursday, 12 August 2021 4:29 PM  
**To:** Leigh Holmes <[Leigh.Holmes@spiire.com.au](mailto:Leigh.Holmes@spiire.com.au)>  
**Cc:** Louise Kerferd <[Louise.Kerferd@melbournewater.com.au](mailto:Louise.Kerferd@melbournewater.com.au)>  
**Subject:** Lang Lang Quarry

## OFFICIAL Sensitive

Hi Leigh

Thanks for your patience with this one. I had hoped to get back to you yesterday but was (and still am) waiting on some guidance re: the RB. A privately owned RB is not something MW comes across in development applications often so it's been challenging finding the right person to discuss this with. It's not something that my team has authority to provide agreement for. I'm on leave tomorrow so will get back to you Monday.

If the concept of an RB is ok to remain, the revised waterway corridor width of 75m will require flood modelling (including the vegetated buffer) to show that flood water is contained within the corridor. If not, further modifications will be required so that the 1 in 100 events are contained.

I hope this goes part way to clarifying our expectations, obviously the RB is a critical element to the concept and I will get back to you asap on this.  
Thanks

**Sarah Eggleton** | Team Leader, South East Regional Services, Waterways and Catchment Operations| **Melbourne Water** T: (03) 9679 7039 | M: 0418 382 285 | 990 Latrobe Street, Docklands 3008 | PO Box 4342 Melbourne VIC 3001 | [melbournewater.com.au](http://melbournewater.com.au)

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