

# AURA PRECINCT 13

## STORMWATER MANAGEMENT PLAN

Prepared for **Stockland Development Pty Ltd**



## Document information

### GENERAL INFORMATION

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# 1 INTRODUCTION

The Aura development is a major master planned community located on the Sunshine Coast, Queensland. Stormwater management investigations and planning for the broader Aura development has been undertaken progressively over a number of years to support staged development across the precincts. The protection of adjacent and downstream environmental receiving nodes, including Bells Creek and Pumicestone Passage is the driving factor behind these works.

Previous stormwater quality investigations undertaken for the Aura development has established a broader water management strategy incorporating stormwater quality treatment, integrated water cycle management principles, and environmental protection measures associated with sensitive ecological areas and waterways. These investigations identify the need for enhanced stormwater quality treatment objectives due to the environmental significance of the downstream receiving waters.

Egis Consulting has been commissioned by Stockland Development Pty Ltd to prepare this Stormwater Management Plan (SMP) for Aura Precinct 13 to support the Development Application over the northwestern portion of the subject site, known as Aura Precinct 13. The report documents the stormwater quality management strategy adopted for the site, including the proposed treatment train approach, MUSIC modelling methodology, conceptual treatment measures, and stormwater quality performance outcomes associated with the proposed development.

The proposed strategy has been developed having regard to the broader Aura Water Management Strategy, the Aura Development Stormwater Management Plan prepared by DesignFlow & BMT (2019), relevant environmental constraints, surrounding infrastructure interfaces, and current conceptual civil design information. Flood planning levels and regional flooding constraints adopted for the conceptual design have been established generally in accordance with the BMT regional flood modelling and associated flood raster data applicable to the Aura development.

This report also considers the integration of stormwater treatment measures with environmental protection requirements associated with riparian corridors, frog habitat areas, adjacent waterway buffers, and the broader regional drainage framework.

The proposed development layout and site location for Precinct 13 is shown in **Appendix A**.

## 1.1 Background

### 1.1.1 Aura Development, Stormwater Management Plan (Design Flow & BMT, 2019)

Stormwater management investigations and analysis have been progressively undertaken for the broader Aura development to support staged development across the precincts and protect the environmental values of downstream receiving waters associated with Bells Creek and Pumicestone Passage. Staged investigations have been undertaken to achieve the objectives set out in the report '*Aura Development, Stormwater Management Plan*' (Design Flow & BMT, 2019).

As part of this report's development, waterway modelling and catchment analysis was undertaken to establish design objectives that when delivered achieves all objectives for the downstream receiving waterway. Precincts discharging to Bells Creek are required to achieve significantly higher water quality objectives from that identified within the Queensland State Planning Policy. The operational design objectives identified for Precinct 13 include:

- Minimum reduction in mean annual load from unmitigated development for the following pollutants discharging to Bells Creek:
  - Total Suspended Solids – 95%
  - Total Phosphorus – 89%
  - Total Nitrogen – 68%
  - Gross Pollutants – 90%
- Rainwater tank requirements for Commercial and Industrial land uses:
  - 1.0kL per toilet/urinal or 25kL/ha
  - Minimum 5kL tank per lot

The 'Aura Development, Stormwater Management Plan' (Design Flow & BMT, 2019) also includes information on potential 'typical' design solutions which could be incorporated. Importantly however, the adoption of these design solutions is not required, with the report clearly identifying that alternative water quality treatment trains can be adopted. In short, the inclusion of a constructed wetland into all WSUD areas is not required. Furthermore, it identifies that so long as the operational phase design objectives are achieved, a non-worsening to the downstream environment is considered to have been achieved.

### 1.1.2 Aura Flood Risk Management Report (BMT, 2026)

Regional flood behaviour and flood planning affecting the development of Precinct 13 have been investigated by BMT and documented in their report 'R.003060.002.01 Aura Flood Risk Management Report 2026'.

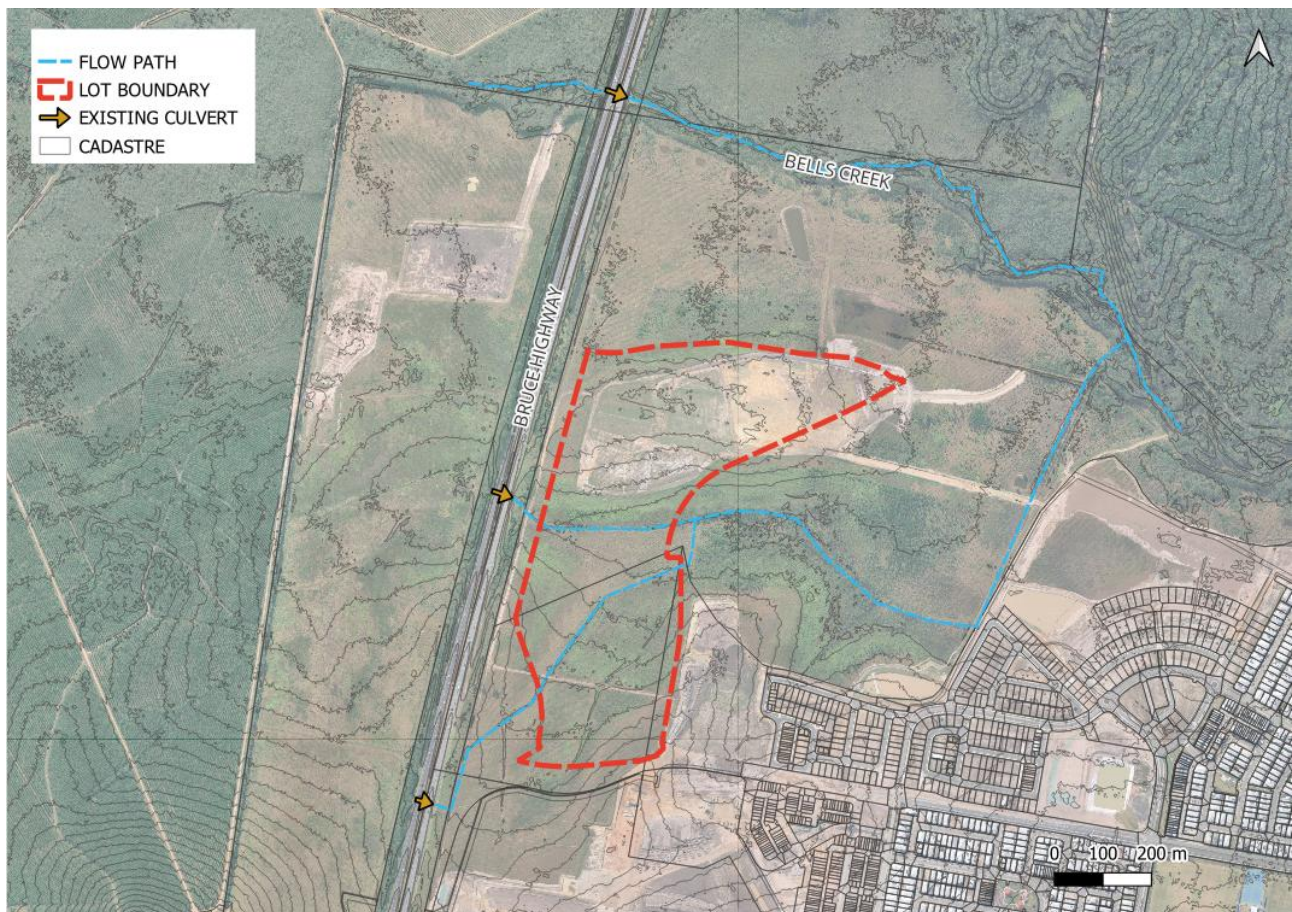
This report and resulting design objectives are discussed further in **Section 3**.

Modelling undertaken by BMT has confirmed the concept channel located between the Bruce Highway and Precinct 13 (within the highway buffer) is appropriately sized. Instead of flowing like a regular channel, this channel instead acts as a balance pipe, connecting the 'upstream' Bruce Highway culverts directly to the Bells Creek floodplain. As the channel sizing is not governed by upstream flow conveyance and is instead controlled by Bells Creek flood levels, sizing was validated within the regional flood modelling.

## 1.2 Existing Topography

The site generally drains from south to north towards Bells Creek North through a combination of existing drainage corridors and overland flow paths. External catchment flows associated with the Bruce Highway drainage network also discharge into Precinct 13 from the west and south-west.

Existing site conditions include disturbed grassed areas, existing drainage infrastructure, and the interim peak flow mitigation basin located over the northern portion of Precinct 13. Existing drainage conditions and regional flood behaviour affecting the site have been established generally in accordance with the BMT regional flood modelling and associated flood raster information applicable to the Aura development. Refer to **Figure 1-1** below.



**FIGURE 1-1 EXISTING TOPOGRAPHY**

### 1.3 Proposed Development

The proposed development for Aura Precinct 13 comprises commercial and industrial allotments, internal road infrastructure, stormwater management infrastructure, and associated open space areas.

Stormwater runoff from the proposed development will be collected within the internal drainage network and conveyed north towards Bells Creek North via the proposed sediment basins, bioretention systems, and downstream drainage infrastructure. External catchment flows associated with the Bruce Highway drainage network will also be conveyed north through the proposed highway buffer located along the western portion of Precinct 13.

The proposed development layout has been developed to integrate with the broader Aura regional drainage framework and surrounding infrastructure, including the proposed Bruce Highway Interchange works.

The proposed development layout is shown in **Figure 1-2** below. Refer **Section 2.4.3** for details of development areas included within this analysis.

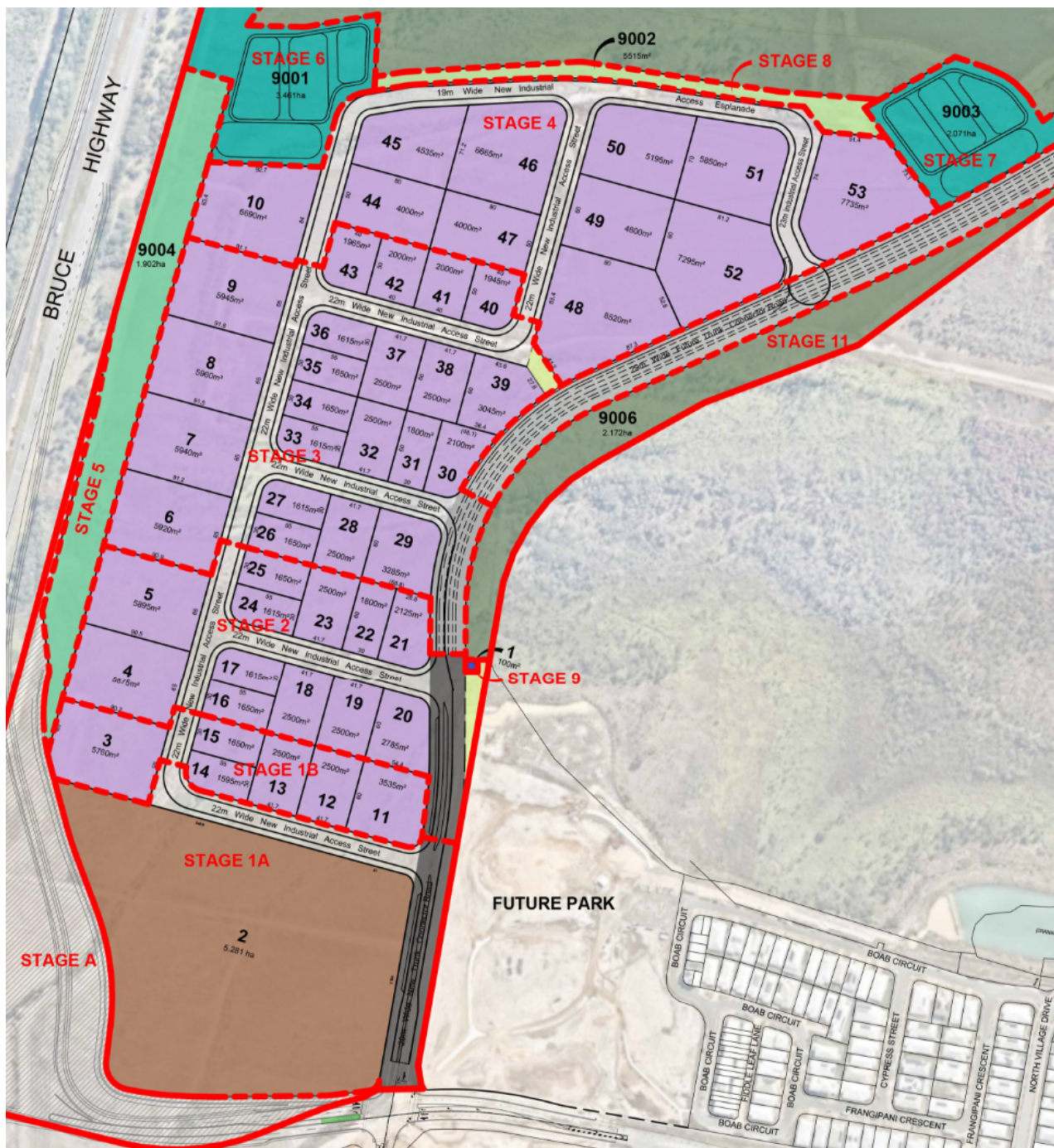


FIGURE 1-2: AURA PRECINCT 13 CONCEPT PLAN

## 2 STORMWATER QUALITY MANAGEMENT

The proposed stormwater quality management strategy for Aura Precinct 13 adopts an end-of-line treatment approach incorporating sediment basins and bioretention systems to treat runoff generated from the proposed development prior to discharge into the downstream receiving waterway (Bells Creek North). The proposed strategy has been developed in accordance with the broader *Aura Development Stormwater Management Plan* (DesignFlow & BMT 2019) and adopts the operational phase stormwater quality objectives applicable to the Bells Creek catchment.

The proposed stormwater quality treatment devices are located along the northern boundary of Precinct 13, with devices separated into east and west, sized to treat their respective contributing catchment.

The strategy has considered the proposed development layout, surrounding drainage infrastructure, regional flood behaviour, external catchment flows associated with the Bruce Highway drainage network, and environmental constraints applicable to the site.

This section discusses:

- The identification of key stormwater pollutants associated with the proposed development.
- The Water Quality Objectives (WQO's) identified for the catchment.
- Proposed measures to mitigate the increase in pollutant export.
- Modelling of the proposed measures and comparison to the identified WQO's.

### 2.1 Pollutants of Concern

Typical key pollutants expected to be generated during the operational (post-construction) phase of the planned development are listed as follows, with those presented in capitals being the key pollutants to be targeted for treatment:

- |                                                  |                                                 |
|--------------------------------------------------|-------------------------------------------------|
| ■ LITTER                                         | ■ Heavy metals (associated with fine sediments) |
| ■ SEDIMENT                                       | ■ Surfactants                                   |
| ■ Oxygen demanding substances (possibly present) | ■ Organochlorines & organophosphates            |
| ■ NUTRIENTS (N & P)                              | ■ Thermal pollution                             |
| ■ Pathogens / Faecal coliforms                   | ■ pH altering substances                        |
| ■ Hydrocarbons                                   |                                                 |

Only the key pollutants will be further addressed in this report; however, the treatment train developed will provide a level of mitigation to other pollutant loads. As heavy metals will predominantly be associated with fine sediment, controls proposed to reduce total suspended solids will also reduce loads of heavy metals.

### 2.2 Water Quality Objectives

The stormwater quality design objectives (or WQO's) adopted for Aura Precinct 13 have been sourced from the *Aura Development Stormwater Management Plan* (DesignFlow & BMT, 2019). The adopted operational phase stormwater quality objectives are applicable to the Bells Creek catchment and were developed to protect the environmental values of downstream receiving waters associated with Bells Creek and Pumicestone Passage.

Pumicestone Passage and the estuarine sections of Bells Creek have significant environmental value and are identified as environmentally sensitive receiving environments. As part of the broader Aura stormwater management investigations, enhanced stormwater quality objectives were developed to achieve a "no worsening" stormwater quality outcome for downstream receiving waters.

The adopted stormwater quality objectives exceed the standard post-construction stormwater management design objectives typically adopted for urban development and have been developed specifically for the broader Aura development in response to the environmental significance of the receiving environment. The pollutant load reduction WQO's are stated in **TABLE 2-1** below.

**TABLE 2-1 WATER QUALITY OBJECTIVES (FROM UNMITIGATED DEVELOPMENT)**

| POLLUTANT             | TOTAL SUSPENDED<br>SOLIDS (TSS) | TOTAL<br>PHOSPHORUS (TP) | TOTAL NITROGEN<br>(TN) | GROSS POLLUTANTS<br>(GP) |
|-----------------------|---------------------------------|--------------------------|------------------------|--------------------------|
| <b>Load Reduction</b> | 95%                             | 89%                      | 68%                    | 90%                      |

## 2.3 Stormwater Quality Management Strategy

A stormwater quality management strategy employing Stormwater Quality Improvement Devices (SQID's) has been formulated to capture and mitigate the expected increase in pollutant loads in runoff generated from the development. To achieve the adopted Operational Phase Stormwater Quality Objectives (WQO's) applicable to the Bells Creek catchment, the proposed treatment train incorporates western and eastern sediment basins and downstream end-of-line bioretention systems to treat runoff generated from the site prior to discharge into Bells Creek North.

Details of the proposed stormwater treatment systems adopted within the stormwater quality management strategy are provided in the following sections.

### 2.3.1 Rainwater Tanks

Rainwater tanks are required for all Commercial and Industrial lots in accordance with the broader *Aura Development Water Management Plan* (DesignFlow & BMT 2019). Specific requirements for each lot include providing rainwater tanks at a minimum rate of 1.0kL per toilet/urinal or 25kL/ha, with a minimum tank size of 5kL. Rainwater tanks are required to be plumbed in for reuse in non-potable applications such as toilet flushing and outdoor irrigation.

### 2.3.2 Litter Baskets

Litter baskets are proposed to treat on-lot flows from all industrial lots. It has been assumed that each industrial lot will include a minimum of one (1) 900x900mm AtlanTrap (or approved equivalent).

Future detailed design of the lot may undertake amendments to this requirement (such as adopting an alternative style/brand of litter basket, or including multiple devices), provided it achieves a comparable level of treatment.

Litter baskets are not proposed to be required within the public roadways or commercial lots. All litter baskets are to be private infrastructure, owned and maintained by the property owner, such that there is no maintenance burden upon Council.

### 2.3.3 Sediment Basins

Sediment basins provide pre-treatment of stormwater runoff through the settlement of coarse sediment and associated pollutants prior to discharge into downstream stormwater treatment systems. Sediment basins assist in reducing sediment loading to downstream bioretention systems and improving the long-term operational performance of stormwater quality treatment infrastructure.

The key constraints to be considered for sediment basins include:

- Providing sufficient permanent pool volume and surface area to achieve effective coarse sediment settlement and pre-treatment.
- Incorporating high-flow bypass structures and overflow arrangements for major storm events.
- Achieving suitable hydraulic flow distribution into the downstream bioretention systems.
- Ensuring sufficient fall between inlet structures, permanent pool levels, outlet structures, and downstream drainage infrastructure.
- The overall basin footprint, including maintenance access requirements, batter slopes, inlet and outlet structures, and integration with surrounding earthworks levels.
- Providing adequate maintenance access for sediment removal and ongoing operational maintenance activities.

The final design of the sediment basins shall be generally in accordance with the relevant Water by Design guidelines.

### 2.3.4 Bioretention Systems

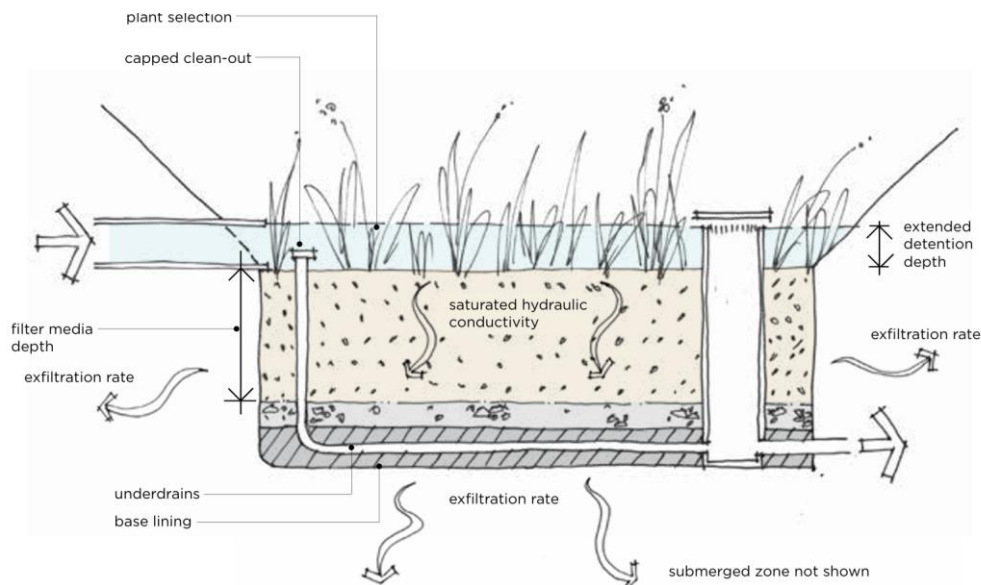
Bioretention systems utilise sandy loam soil-based media to filter runoff. Sediment particles and suspended solids are trapped within vegetation and on the surface of the filter media, while micro-organisms and vegetation remove dissolved nutrients (nitrogen and phosphorus) through biological uptake processes. Subsoil drainage provided below the filter media allows for the treated runoff to discharge from bioretention systems, where it is connected to local stormwater drainage swales.

The key constraints to be considered for end-of-line bioretention basins include:

- Incorporating either underground or surface features to enable high flow bypass around the basin (i.e. greater than the 1 year ARI design flow).
- The depth of the drainage network from the design surface, given the drainage network must outlet onto the surface of the bioretention system's filter media.
- Ensuring there is sufficient elevation difference between the surface of the filter media and the downstream outlet to incorporate the depth of the filter media and drainage layers.
- The overall basin footprint, considering the filter media area, allowance for pre-treatment of sediment (e.g. sediment pond), maximum allowable batter slope, retaining wall properties (if applicable), and the height difference between filter media surface and surrounding design surface; and
- Providing adequate maintenance access. The maximum allowable filter media area per bioretention system and the layout of access locations must be considered.
- Flow into the bioretention basins must be evenly dispersed as to not create dead zone where vegetation cannot be established.
- Include outlet control infrastructure to enable elevated saturated zone within basin during initial period of plant establishment.

The final design of the bioretention systems shall be generally in accordance with the latest version of Healthy Waterways Bioretention Technical Design Guidelines.

An example bioretention system configuration is provided in **Figure 2-1**.



**FIGURE 2-1 BIORETENTION FILTER CONFIGURATION (HEALTHY WATERWAYS)**

## 2.4 Stormwater Quality Modelling

Stormwater quality modelling of the proposed development has been undertaken using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Version 6.4.0, developed by the Cooperative Research Centre for Catchment Hydrology (CRCCH). MUSIC enables the conceptualisation of pollutant transfer through a stormwater drainage system and assists in quantifying the effectiveness of the proposed stormwater quality management strategy. MUSIC provides quantitative modelling for Total Suspended Solids (TSS), Total Phosphorus (TP), Total Nitrogen (TN), and Gross Pollutants (GP).

The MUSIC model was developed generally in accordance with the Healthy Land and Water MUSIC Modelling Guidelines (2018). The following sections discuss the model configuration adopted for the assessment.

### 2.4.1 MUSIC Modelling Methodology

The MUSIC model was setup generally in accordance with the Healthy Land and Water *MUSIC Modelling Guidelines* (2018) and the adopted rainfall and evaporation data utilised within the MUSIC model is consistent with the broader Aura stormwater quality investigations and regional assessments previously undertaken for the development. Subsequent sections discuss the model configuration adopted for the analysis. Refer to **Figure 2-2** below:

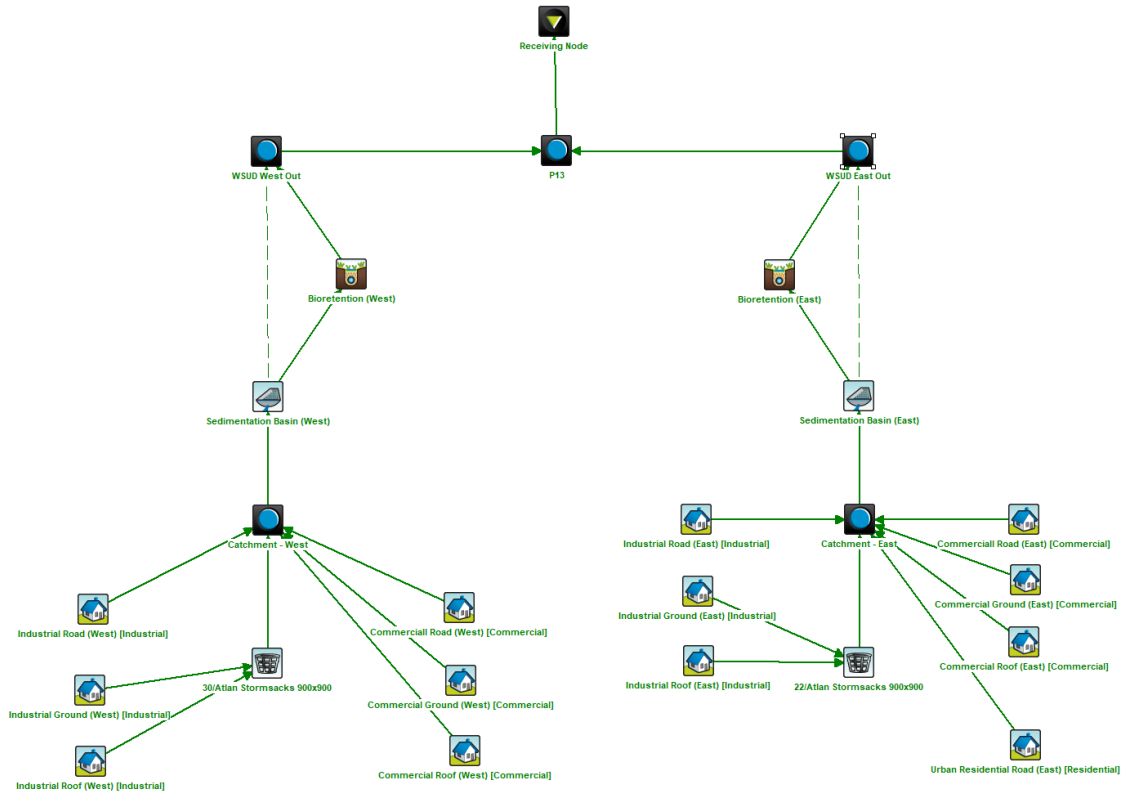


FIGURE 2-2 MUSIC MODEL CONFIGURATION

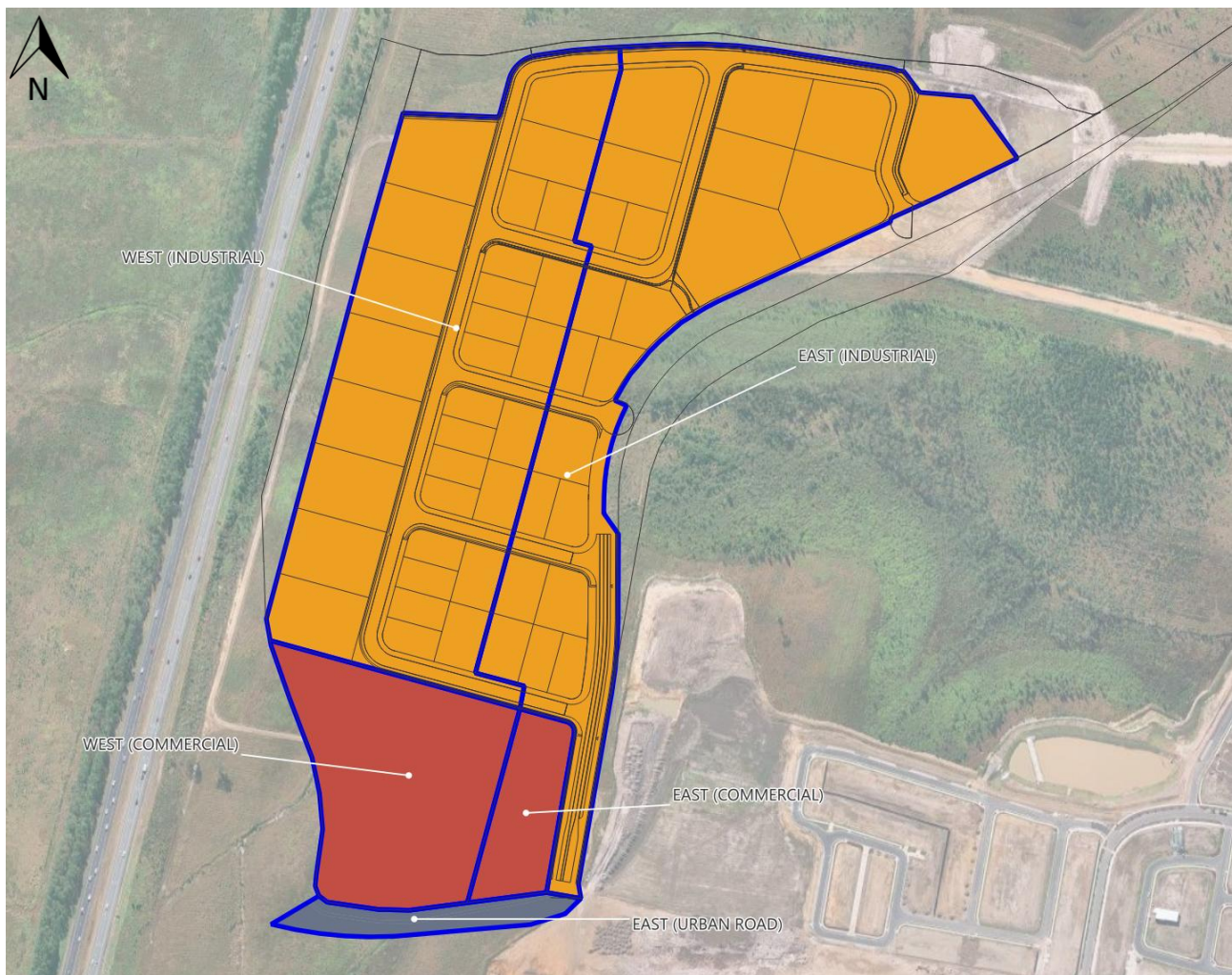
## 2.4.2 Meteorological Data

Six minutes pluviographic data was sourced from the Bureau of Meteorology (BOM) for the Caloundra WTP Station (No. 40496). In accordance with Table A1.1 from the MUSIC Modelling Guidelines (2018), the 10-year period from 1st January 1997 to 31st December 2006 was adopted for the rainfall duration. The mean annual rainfall for this period is 1,348mm. Monthly evapotranspiration data for the 10-year period was sourced from the MUSIC Modelling Guidelines (2018) and entered into the MUSIC Model. The mean annual potential evapotranspiration value adopted was 1,628mm.

## 2.4.3 Catchment Delineation and Land Uses Breakdown

The proposed development catchments adopted within the MUSIC modelling assessment have been delineated in accordance with the conceptual layout and proposed drainage network for Aura Precinct 13. Catchments were further broken down by land use (commercial, industrial and urban residential road) before being further broken down into source nodes for differing surface types (road, roof and ground), discussed further in **Section 2.4.4**.

Water quality catchments and proposed land uses are presented in **Figure 2-3** below.



**FIGURE 2-3 STORMWATER QUALITY – POLLUTANT SOURCE AREAS**

It is noted that the 'Urban Road' catchment is located outside of the Precinct 13 boundary. It has been included within this investigation as it contributes untreated runoff from the urban residential road reserve to the south. Latest design information from the Bruce Highway Interchange works were adopted in delineating this catchment area.

#### 2.4.4 Source Node Configuration

Within the MUSIC model, source nodes represent the catchments of the proposed development. Runoff and pollutants (contained within the runoff) are generated by the source nodes.

The split catchment source node approach has been adopted in accordance with Section 3.3.2 of the MUSIC Modelling Guidelines, which divides each catchment into different surface types for road, roof and ground.

The adopted source node configuration and surface-type breakdown were established in accordance with Table 3.4 and Table 3.6 of the MUSIC Modelling Guidelines (2018). The adopted land use classifications for the development includes Commercial, Industrial, and Urban Residential land uses.

The adopted split catchment surface type proportions are as follows:

- Road: 30%
- Roof: 50%
- Ground: 20%

The MUSIC model catchment delineation and surface types that has been adopted for configuring source nodes are presented in **Figure 2-3** and **Table 2-2**.

| TABLE 2-2                |                     | MUSIC SOURCE NODE AREAS |           |             |
|--------------------------|---------------------|-------------------------|-----------|-------------|
| CATCHMENT NAME           | CATCHMENT AREA (ha) | ROAD (ha)               | ROOF (ha) | GROUND (ha) |
| <b>West (Commercial)</b> | 4.005               | 1.202                   | 2.003     | 0.801       |
| <b>West (Industrial)</b> | 12.051              | 3.615                   | 6.025     | 2.410       |
| <b>East (Commercial)</b> | 1.146               | 0.344                   | 0.573     | 0.229       |
| <b>East (Industrial)</b> | 11.584              | 3.475                   | 5.792     | 2.317       |
| <b>East (Urban Road)</b> | 0.736               | 0.736                   | -         | -           |

Refer to **Appendix B** for the MUSIC catchment source node and landuses.

Fraction impervious values adopted for each surface type were configured in accordance with the MUSIC Modelling Guidelines (2018) and are summarised in **TABLE 2-3** below:

**TABLE 2-3 FRACTION IMPERVIOUS (TABLE 3.6) MUSIC GUIDELINES**

| SURFACE TYPE  | COMMERCIAL             | INDUSTRIAL             | URBAN RESIDENTIAL      |
|---------------|------------------------|------------------------|------------------------|
|               | PERCENT IMPERVIOUS (%) | PERCENT IMPERVIOUS (%) | PERCENT IMPERVIOUS (%) |
| <b>ROAD</b>   | 75                     | 75                     | 70                     |
| <b>ROOF</b>   | 100                    | 100                    | -                      |
| <b>GROUND</b> | 80                     | 60                     | -                      |

## 2.4.5 Drainage Link Configuration

No routing was adopted for drainage links within the MUSIC model. This assumes flows and associated pollutants from all parts of the catchment arrive at the treatment nodes at the same time. This is conservative as it means that MUSIC may overestimate the overflow volumes.

Primary and secondary drainage links were set for flows entering and exiting the sediment basins. Primary drainage links into the bioretention basins from the sediment basins set flows with a maximum flow rate equivalent to the 63% AEP (1yr ARI) flow. Flows in excess of the 63% AEP event bypass the bioretention basins through the adoption of a bypass weir within the sediment basin, represented using secondary drainage links.

## 2.4.6 Treatment Node Configuration

Treatment nodes have been configured generally in accordance with MUSIC Modelling Guidelines (2018). A summary of the configuration is provided in the following sections.

### 2.4.6.1 Rainwater Tanks

The beneficial effect of rainwater tanks and associated reuse has been excluded from MUSIC modelling. Tank volumes and reuse rates cannot be accurately determined at the concept design level, as they are dependent on final building design including number of toilets installed. This approach is in line with previously completed modelling undertaken for industrial and commercial areas elsewhere within the Aura development.

### 2.4.6.2 Litter Baskets

All industrial lots have been modelled to include a minimum of one (1) 900x900mm AtlanTrap (formerly StormSack) litter basket within the individual allotment, treating all roof and ground water from the lot.

Litter baskets were modelled with the following parameters:

**TABLE 2-4 LITTER BASKET CONFIGURATION PARAMETERS**

| PARAMETER                                               | WESTERN CATCHMENT | EASTERN CATCHMENT |
|---------------------------------------------------------|-------------------|-------------------|
| <b>Number of Industrial Lots</b>                        | 30                | 22                |
| <b>High Flow Bypass (m<sup>3</sup>/s)<sup>1</sup></b>   | 1.17              | 0.858             |
| <b>TSS Reduction Efficiency<sup>2</sup></b>             |                   | 45%               |
| <b>TP Reduction Efficiency<sup>2</sup></b>              |                   | 47%               |
| <b>TN Reduction Efficiency<sup>2</sup></b>              |                   | 25%               |
| <b>Gross Pollutant Reduction Efficiency<sup>2</sup></b> |                   | 100%              |

1 – Based on 39L/s bypass flow for each 900x900mm pit.

2 – Reduction efficiencies applied to flows under high flow bypass flow only. Reduction efficiencies consistent with SQIDEP certification.

### 2.4.6.3 Sediment Basins

Sediment basins are proposed within the western and eastern portions of Aura Precinct 13 as part of the adopted end-of-line stormwater quality treatment strategy. The sediment basins provide pre-treatment of stormwater runoff prior to discharge into the downstream bioretention systems by facilitating settlement of coarse sediment and reducing sediment loading to the filter media areas. Additionally, the conceptual design of the sediment basins allows for even distributed flows into each bioretention basin. Future detailed design and construction tolerances must be tightly controlled to ensure all basins receive flow equally, ensuring long term plant health.

The proposed sediment basins have been designed to accept the 10% AEP event (SSP2-4.5 at year 2100 climate conditions). This is consistent with the minor design storm required for the pit and pipe drainage design of the precinct. Drainage design flows above the 10% AEP event are not proposed to enter the sediment basin. 63% AEP event (SSP2-4.5 at year 2100 climate conditions) drainage design flows will be allowed to enter the bioretention basin area. All remaining flows will exit the sediment basin via a highflow bypass weir.

The conceptual sediment basin design parameters adopted for the MUSIC modelling assessment are summarised in **Table 2-5** below.

**TABLE 2-5 SEDIMENT BASIN CONFIGURATION PARAMETERS**

| CATCHMENT NAME                                                    | WESTERN CATCHMENT<br>SEDIMENT BASIN | EASTERN CATCHMENT<br>SEDIMENT BASIN |
|-------------------------------------------------------------------|-------------------------------------|-------------------------------------|
| <b>Permanent Pool Surface Area (m<sup>2</sup>)</b>                | 1,280                               | 1,080                               |
| <b>Permanent Pool Depth (m)</b>                                   | 1.5                                 | 1.5                                 |
| <b>Permanent Pool Volume (m<sup>3</sup>)<sup>1</sup></b>          | 1,423                               | 1,168                               |
| <b>Sediment Basin Inflows<br/>(10% AEP – SSP2-4.5 @ 2100)</b>     | 6.5m <sup>3</sup> /s                | 5.5m <sup>3</sup> /s                |
| <b>Bioretention Basin Inflows<br/>(63% AEP – SSP2-4.5 @ 2100)</b> | 3.0 m <sup>3</sup> /s               | 2.5 m <sup>3</sup> /s               |

1 – Based on assumed 1 to 3 length to width ratio and 1in3 underwater batters.

#### 2.4.6.4 Bioretention Nodes

The breakdown of bioretention filter area for each bioretention basin are summarised **Table 2-6** below.

**TABLE 2-6 BIORETENTION BASIN FILTER DETAILS**

| CATCHMENT NAME                     | BIORETENTION FILTER AREA (m <sup>2</sup> ) |
|------------------------------------|--------------------------------------------|
| <b>Western Catchment Bio Basin</b> | 5,250                                      |
| <b>Eastern Catchment Bio Basin</b> | 4,350                                      |
| <b>TOTAL</b>                       | 9,600                                      |

Bioretention node configuration properties are presented below in **Table 2-7**.

**TABLE 2-7 BIORETENTION SYSTEM NODE CONFIGURATION DETAILS**

| PARAMETER                                     | ADOPTED VALUE<br>BIORETENTION SYSTEMS            | NOTES                             |
|-----------------------------------------------|--------------------------------------------------|-----------------------------------|
| <b>High Flow Bypass</b>                       | 63% AEP Event                                    | Refer to <b>Table 2-5</b>         |
| <b>Low Flow Bypass</b>                        | 0 m <sup>3</sup> /s                              | Default                           |
| <b>Extended Detention Depth</b>               | 300mm                                            |                                   |
| <b>Surface Area</b>                           | Variable                                         | Refer to <b>Table 2-6</b>         |
| <b>Unlined Filter Media</b>                   | 0.01                                             | Assumes filter is lined           |
| <b>Saturated Hydraulic Conductivity</b>       | 200 mm/hr                                        | As per MUSIC Modelling Guidelines |
| <b>Filter Depth</b>                           | 600 mm                                           | As per MUSIC Modelling Guidelines |
| <b>TN Content of Filter Media</b>             | 400 mg/kg                                        | As per MUSIC Modelling Guidelines |
| <b>Orthophosphate Content of Filter Media</b> | 30 mg/kg                                         | As per MUSIC Modelling Guidelines |
| <b>Exfiltration Rate</b>                      | 0 mm/hr                                          | Assumes no exfiltration           |
| <b>Based Lined</b>                            | Yes                                              | Assumes no exfiltration           |
| <b>Vegetation Properties</b>                  | Vegetated with Effective Nutrient Removal Plants |                                   |
| <b>Overflow Weir Width</b>                    | 100                                              |                                   |

## 2.5 Modelling Results

The results of the MUSIC model are summarised in below **Table 2-8**, **Table 2-9** and **Table 2-10**. Pollutant load reductions are from unmitigated development.

**TABLE 2-8 MUSIC MODELLING RESULTS - WEST**

| POLLUTANT                     | WQO<br>(Load Reduction) | SOURCE LOAD<br>(kg/year) | RESIDUAL LOAD<br>(kg/year) | POLLUTANT<br>REDUCTION (%) |
|-------------------------------|-------------------------|--------------------------|----------------------------|----------------------------|
| <b>Total Suspended Solids</b> | 95%                     | 31,500                   | 1,510                      | 95.2%                      |
| <b>Total Phosphorus</b>       | 89%                     | 70.1                     | 7.74                       | 89.0%                      |
| <b>Total Nitrogen</b>         | 68%                     | 469                      | 133                        | 71.6%                      |
| <b>Gross Pollutants</b>       | 90%                     | 4,340                    | 1.18                       | 100%                       |

**TABLE 2-9 MUSIC MODELLING RESULTS - EAST**

| POLLUTANT                     | WQO<br>(Load Reduction) | SOURCE LOAD<br>(kg/year) | RESIDUAL LOAD<br>(kg/year) | POLLUTANT<br>REDUCTION (%) |
|-------------------------------|-------------------------|--------------------------|----------------------------|----------------------------|
| <b>Total Suspended Solids</b> | 95%                     | 28,300                   | 1,420                      | 95.0%                      |
| <b>Total Phosphorus</b>       | 89%                     | 58.3                     | 6.2                        | 89.4%                      |
| <b>Total Nitrogen</b>         | 68%                     | 369                      | 109                        | 70.4%                      |
| <b>Gross Pollutants</b>       | 90%                     | 3,610                    | 0.833                      | 100%                       |

**TABLE 2-10 MUSIC MODELLING RESULTS – RECEIVING NODE**

| POLLUTANT                     | WQO<br>(Load Reduction) | SOURCE LOAD<br>(kg/year) | RESIDUAL LOAD<br>(kg/year) | POLLUTANT<br>REDUCTION (%) |
|-------------------------------|-------------------------|--------------------------|----------------------------|----------------------------|
| <b>Total Suspended Solids</b> | 95%                     | 59,800                   | 2,930                      | 95.1%                      |
| <b>Total Phosphorus</b>       | 89%                     | 128                      | 13.9                       | 89.1%                      |
| <b>Total Nitrogen</b>         | 68%                     | 838                      | 242                        | 71.1%                      |
| <b>Gross Pollutants</b>       | 90%                     | 7,950                    | 2.01                       | 100%                       |

The results confirm that the proposed stormwater quality management strategy achieves the required pollutant export reduction necessary to meet the Precinct 13 water quality objectives.

## 2.6 Concept Design

The conceptual stormwater quality management strategy for Aura Precinct 13 incorporates sediment basins, end-of-line bioretention systems and associated drainage infrastructure. Additionally, rainwater tank and litter basket requirements are also required to be integrated within the future on-lot development.

The proposed stormwater treatment systems have been conceptually located within the western and eastern portions of the site to provide treatment of runoff generated from the contributing development catchments prior to discharge into Bells Creek North.

The conceptual design has been developed having regard to the proposed development layout, regional flood behaviour, surrounding infrastructure interfaces, external catchment flows associated with the Bruce Highway drainage network, maintenance access requirements, and environmental constraints applicable to the site.

The conceptual arrangement of the proposed stormwater quality treatment infrastructure and contributing catchments is presented in **Appendix C**.

### 2.6.1 Bioretention Basin Sizing

Under the previous Bioretention Technical Design Guidelines, Version 1.1 (Healthy Land & Water 2014) the maximum cell size identified for bioretention filter area was 800m<sup>2</sup>. Previous guidelines were primarily driven by construction methodology, being that drainage, transition layer and filter media would be installed using extended reach excavators.

Since the 2014 release of the Bioretention Technical Design Guideline, construction methodologies have shifted within the industry towards the use of slinger trucks, which sling the required material into the bioretention basin from a further distance. Previous bioretention basin works onsite within the Aura development have proved this to be an effective construction technique.

In line with this industry shift, Healthy Land & Water has updated this requirement in the latest version of their Bioretention Technical Design Guidelines, Version 1.2 (dated April 2026). Under the latest version of the guidelines, the maximum bioretention cell size has been revised to be 3,000m<sup>2</sup>. This upper limit will be adopted within the Precinct 13 bioretention basin design.

With increased cell size of the bioretention basin, the distribution of flows within the cell becomes the new governing design constraints. The risk being that uneven distribution of flows within the basin can cause plant death insufficient surface flows are received. Section 3.5.7 of the revised design guidelines specifically addresses this concern and provides design guidelines to achieve acceptable outcomes. The guidelines identify that the adoption of a unsaturated Type 2 Sealed system (as proposed) requires the inclusion of flow distribution channels within the basin. Future detailed design shall be in accordance with Section 3.5.7 of the Bioretention Technical Design Guidelines (Version 1.2), ensuring appropriate flow distribution is provided.

In addition to the above measures, it is planned that the constructed bioretention basins will include all infrastructure necessary to convert the basin into a saturated system if needed in the future. This infrastructure will be provided to aid initial plant establishment following construction, however serves as a secondary risk management tool enabling enhanced control over outlet levels should plant die off within the basin be experienced.

### 2.6.2 General Constrains and Design Outcomes

A number of constraints and considerations influence the conceptual WSUD designs for Aura Precinct 13. These include:

- Bioretention Basins and Sediment Basins to be immune from inundation from the 63% AEP (1yr ARI) regional flood levels (regional flood modelling provided by BMT).
- Environmental constraints associated with adjacent waterway corridors and habitat areas.
- Maintenance access requirements for sediment basins, bioretention systems, and associated drainage infrastructure.

- Limiting design flows into sediment basins and bioretention basins to ensure the protection of vegetation and long term performance.

The final configuration and sizing of the proposed stormwater treatment systems will be confirmed during future detailed design and operational works stages. All works shall be in accordance with the relevant design guidelines.

### 3 REGIONAL FLOOD AND PEAK FLOW MANAGEMENT

At present, the northern extent of Precinct 13 includes an interim decanting basin, providing peak flow mitigation for Bells Creek North. Under the development of Precinct 13 this interim basin will be removed (filled). In accordance with BMT's Aura Flood Risk Management Report (2026), no ultimate peak flow mitigation is required to be provided within the Precinct 13 development extent.

To ensure a satisfactory level of peak flow mitigation is achieved for Bells Creek (North), the filling of Precinct 13 will be undertaken as part of a coordinated sequence of works associated with the Bruce Highway Interchange. Included within these works is the completion of the upstream Western Detention Basin (WDB). The WDB provides significant reductions in flood levels upstream (west) of the Bruce Highway, and enables the removal of the P13 interim basin, filling of P13 and filling of the remainder of Precinct 12. The completion of these works will be designed, documented and approved separately to this development application.

#### 3.1 Regional Flood Levels

The 2026 revision of the Flood Risk Management Report (BMT) includes updated Climate Change assumptions in accordance with Australian Rainfall and Runoff Version 4.2. The adoption of SSP3-7.0 (3.6 Degree of Warming) has been considered for the setting of minimum development levels, which is in accordance with the interim guidance provided by Sunshine Coast Council on ARR Climate Change Considerations (dated 21 May 2025).

Regional flood levels informing the concept bulk earthworks levels have been taken from the following BMT model scenario:

- BMT Post-Developed Flood Model, Version 353
- 1% AEP event with SSP3-7.0 climate change assumption at year 2100

## 4 CONCLUSION

Egis Consulting Pty Ltd has prepared this Stormwater Management Plan (SMP) in support of Development Application for Aura Precinct 13.

This report has:

- Identified the adopted Operational Phase Stormwater Quality Objectives (WQO's) applicable to the Bells Creek catchment from the Aura Development Stormwater Management Plan prepared by DesignFlow & BMT (2019).
- Proposed a stormwater quality management strategy utilising sediment basins and end-of-line bioretention systems to treat runoff generated from the proposed development prior to discharge into Bells Creek North.
- Presented the MUSIC modelling methodology, source node configuration, treatment node configuration, and adopted modelling assumptions in accordance with the Healthy Land and Water MUSIC Modelling Guidelines (2018).
- Identified the rainwater tank requirements applicable to future commercial and industrial development within Precinct 13 in accordance with the Aura Development Stormwater Management Plan.
- Demonstrated through MUSIC modelling that the proposed stormwater quality treatment strategy achieves the adopted WQO's for Total Suspended Solids (TSS), Total Phosphorus (TP), Total Nitrogen (TN), and Gross Pollutants (GP).
- Considered the broader regional flood management strategy and drainage framework applicable to Precinct 13, including external catchment flows associated with the Bruce Highway drainage network and regional flood behaviour established by the BMT flood investigations.
- Identified the conceptual configuration and key design considerations applicable to the proposed sediment basins and bioretention systems.

This report demonstrates that the proposed stormwater quality management strategy adequately mitigates pollutant export from the proposed development and achieves the adopted stormwater quality objectives applicable to the Bells Creek catchment.

Peak flow and regional flood management requirements have also been confirmed.

## 5 RECOMMENDATIONS

It is recommended that the stormwater management strategies proposed within this report are approved and adopted for detailed design phase of the development.

## 6 LIMITIATIONS

This report has been documented for the purposes of development approval and supporting future detailed design.

Construction stage water quality management is not included as part of this documentation. Water quality management during construction will be required as part of future construction works. This management strategy will be defined and documented by others during later phases of the project.

## 7 REFERENCES

Aura Development, Stormwater Management Plan, Design Flow & BMT 2019.

R.003060.002.01 Aura Flood Risk Management Report 2026, BMT 2026.

MUSIC Modelling Guidelines, Healthy Land and Water 2018.

Bioretention Technical Design Guidelines (Version 1.1), Healthy Land and Water 2014.

Bioretention Technical Design Guidelines (Version 1.2), Healthy Land and Water 2026.

# **APPENDIX A: LOT LAYOUT**



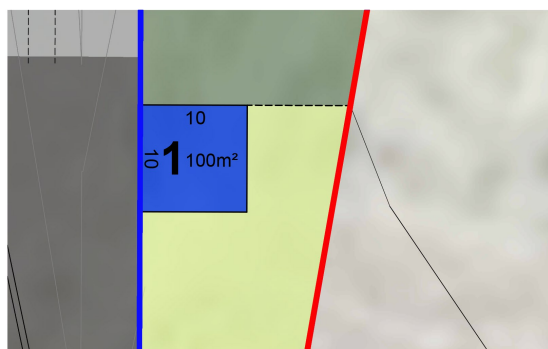
Note:  
All Lot Numbers, Dimensions and Areas are approximate only, and are subject to survey and Council approval.  
Dimensions have been rounded to the nearest 0.1 metres.  
Areas have been rounded down to the nearest 0.1m².  
The boundaries shown on this plan should not be used for final detailed engineers design.  
Source Information:  
Site boundaries: Registered Survey Plans.  
Adjoining Information: DCCB  
Contours: EGIS  
Aerial photography: NEAPMAP 2025  
Environment constraints: EGIS



**Legend**

- Site Boundary
- Road Widening (Highway Interchange)
- Proposed Contours (0.2m interval)
- Left in and out access only
- PROPOSED ALLOTMENTS**
  - Bulky Goods and Retail
  - Light Industry/ Commercial
  - Proposed Telecommunications Lot
  - Potential Data Centre Use
- OPEN SPACE**
  - Conservation
  - Highway Buffer
  - Drainage (Stormwater Treatment)
  - Local Linear Park
- ROAD RESERVE**
  - Road Dedication Only
  - Extent of Constructed Road (Full Construction)
  - Extent of Constructed Road (Partial Construction)
  - Pedestrian Link
- CONNECTIVITY**
  - Veloway (3m Shared Path + 1.5m footpath)
  - 3m Temporary Shared Path
  - 3m Shared Path
  - 3m Maintenance Track/ Shared Path
  - 3m Gravel Maintenance Track
  - 2.5m Shared Footpath
  - 1.5m Footpath

| Land Budget                               |           |            |
|-------------------------------------------|-----------|------------|
| Land Use                                  | Area      | Percentage |
| Application Area                          | 80.889 ha | 100.0%     |
| Road Widening (Highway Interchange)       | 4.419 ha  | 5.5%       |
| Proposed Allotments                       |           |            |
| Light Industry/ Commercial                | 17.716 ha | 22.0%      |
| Large Format Retail - Home-ware           | 5.281 ha  | 6.5%       |
| Proposed Telecommunications Lot           | 0.001 ha  | 0.0%       |
| Total Area of Allotments                  | 22.997 ha | 28.5%      |
| Open Space                                |           |            |
| Conservation                              | 36.538 ha | 45.3%      |
| Highway Buffer                            | 1.904 ha  | 2.4%       |
| Drainage (Stormwater Treatment)           | 5.533 ha  | 6.9%       |
| Linear Park                               | 0.552 ha  | 0.7%       |
| Total Area of Open Space                  | 44.526 ha | 55.2%      |
| Road                                      |           |            |
| Trunk Connector Road (Proposed)           | 1.048 ha  | 1.3%       |
| Trunk Connector Road (Reserve Dedication) | 3.180 ha  | 3.9%       |
| Industrial Access Street                  | 4.380 ha  | 5.4%       |
| Pedestrian Link                           | 0.167 ha  | 0.2%       |
| Total Area of New Road                    | 8.755 ha  | 10.9%      |
| Yield Breakdown                           |           |            |
| Light Industry/ Commercial                | 51        | 96.2%      |
| Large Format Retail - Home-ware           | 1         | 1.9%       |
| Proposed Telecommunications Lot           | 1         | 1.9%       |
| Total Number of Allotments                | 53        | 100.0%     |



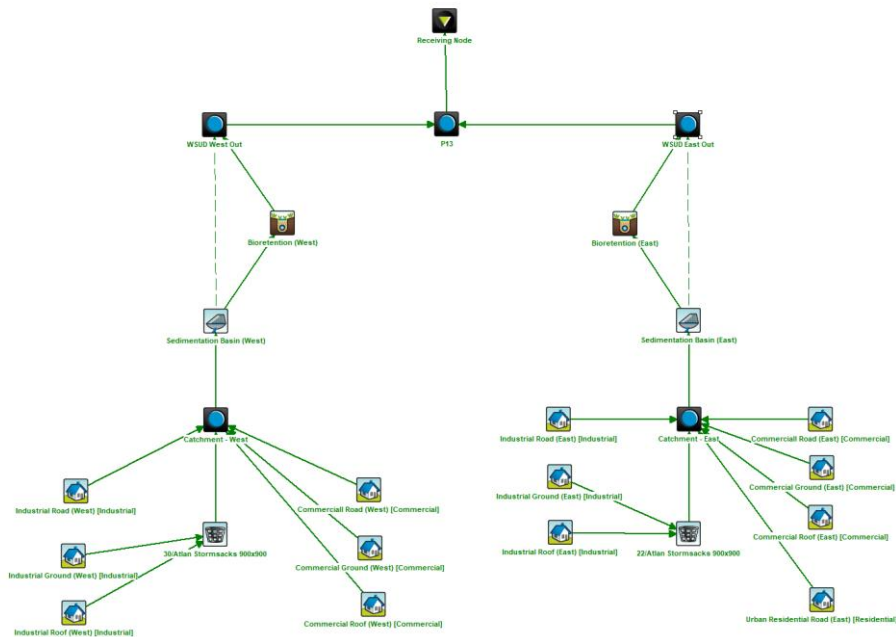
**INSET PLAN**

1:250 @ A1



## **APPENDIX B: MUSIC LAYOUT AND RESULTS**

## MUSIC MODEL CONFIGURAITON



## RESULTS

Treatment Train Effectiveness - WSD West Out

|                                | Sources | Residual Load | % Reduction |
|--------------------------------|---------|---------------|-------------|
| Flow (ML/yr)                   | 187     | 171           | 8.4         |
| Total Suspended Solids (kg/yr) | 31500   | 1510          | 95.2        |
| Total Phosphorus (kg/yr)       | 70.1    | 7.74          | 89          |
| Total Nitrogen (kg/yr)         | 469     | 133           | 71.6        |
| Gross Pollutants (kg/yr)       | 4340    | 1.18          | 100         |

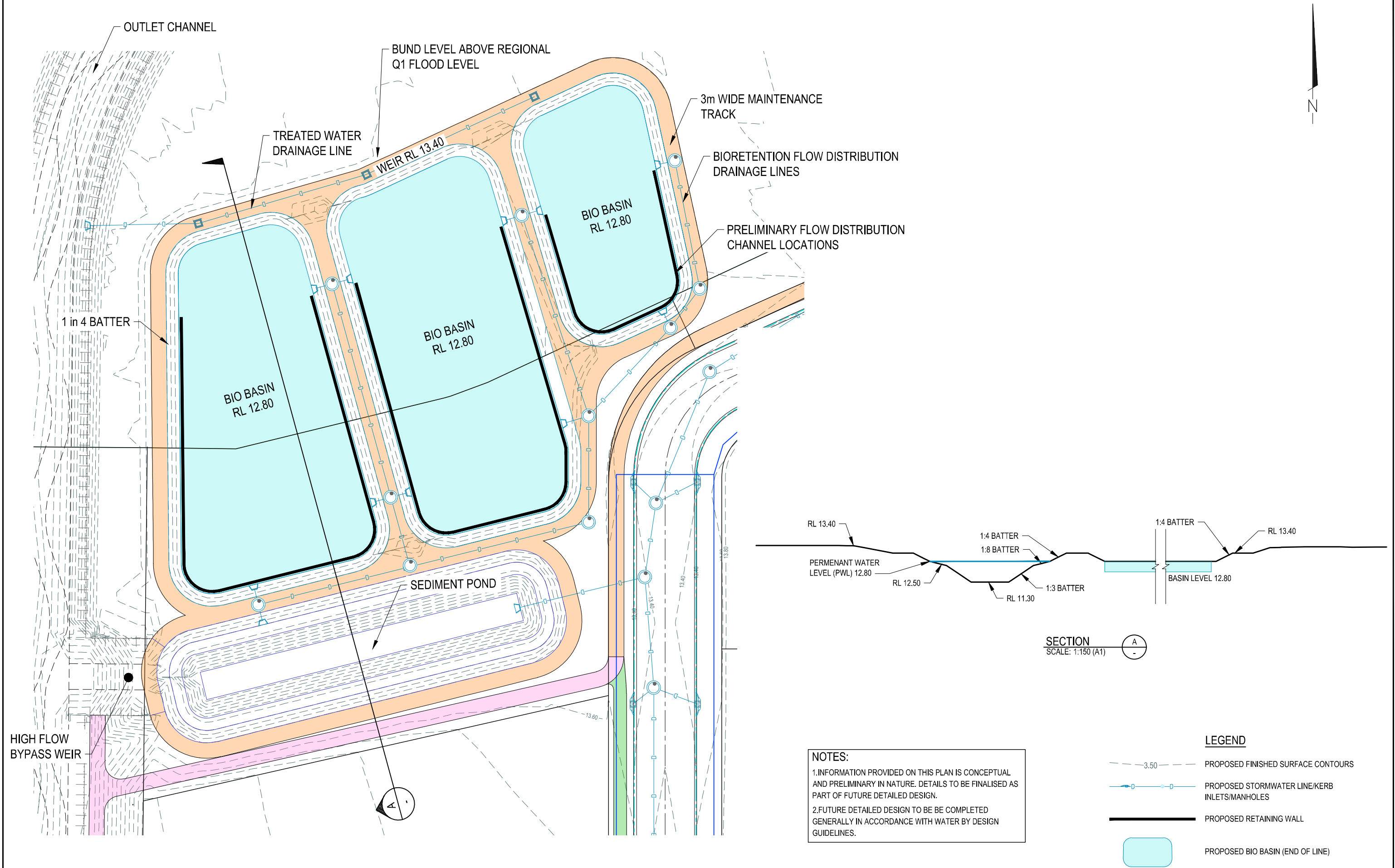
Treatment Train Effectiveness - WSD East Out

|                                | Sources | Residual Load | % Reduction |
|--------------------------------|---------|---------------|-------------|
| Flow (ML/yr)                   | 155     | 142           | 8.4         |
| Total Suspended Solids (kg/yr) | 28300   | 1420          | 95          |
| Total Phosphorus (kg/yr)       | 58.3    | 6.2           | 89.4        |
| Total Nitrogen (kg/yr)         | 369     | 109           | 70.4        |
| Gross Pollutants (kg/yr)       | 3610    | 0.833         | 100         |

Treatment Train Effectiveness - Receiving Node

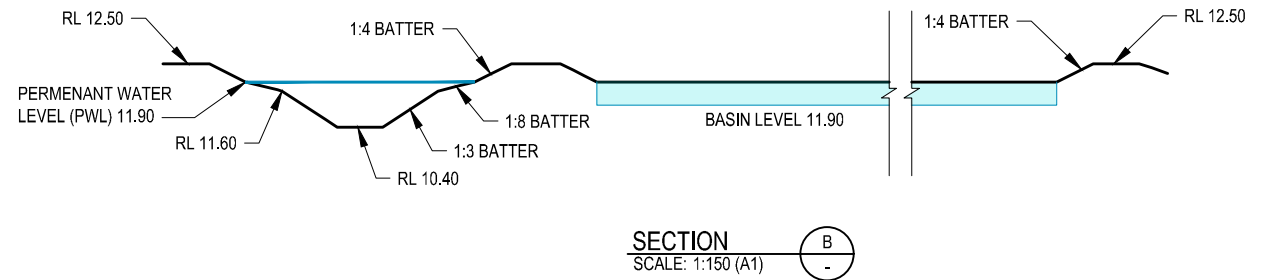
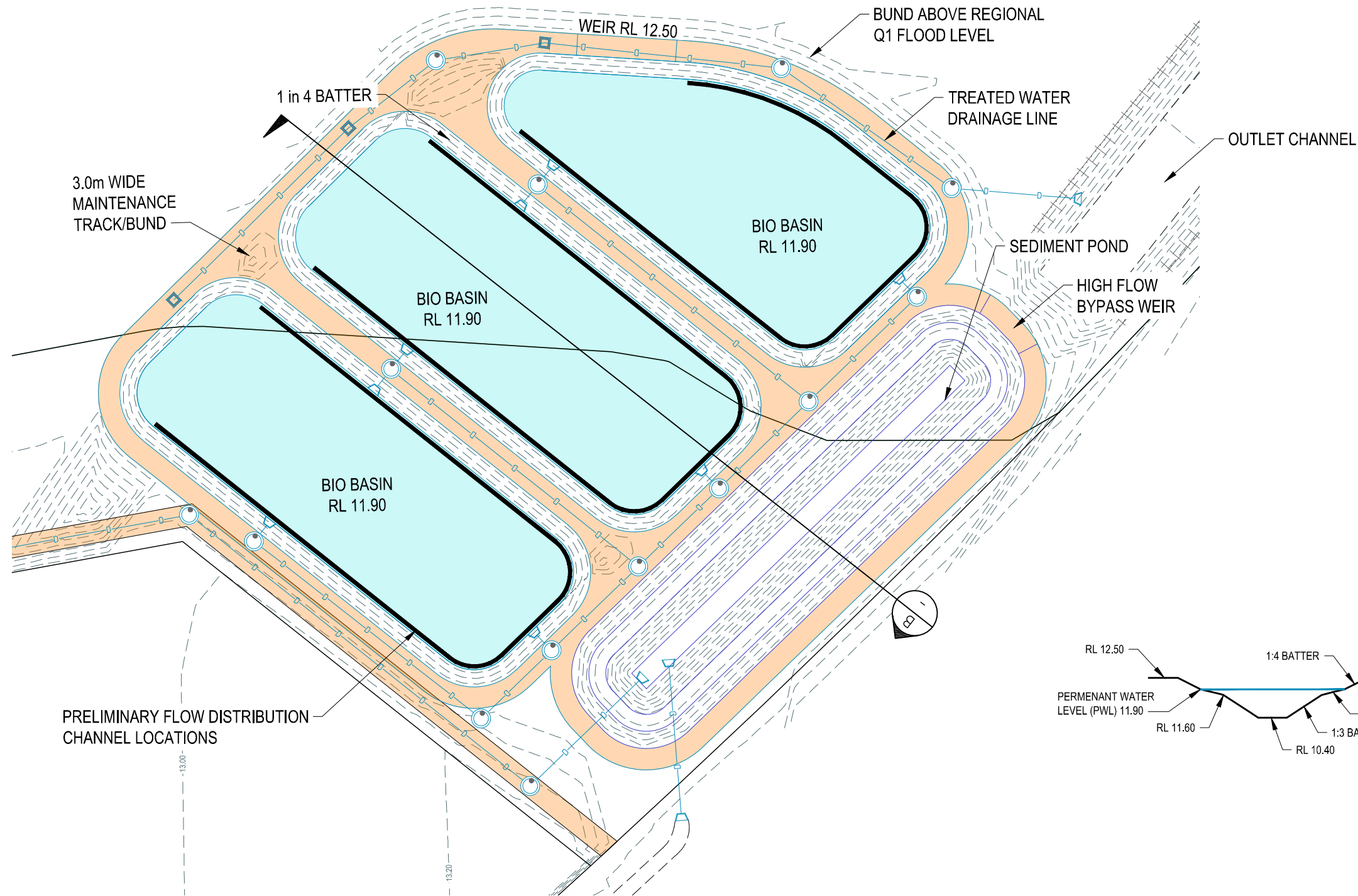
|                                | Sources | Residual Load | % Reduction |
|--------------------------------|---------|---------------|-------------|
| Flow (ML/yr)                   | 342     | 313           | 8.4         |
| Total Suspended Solids (kg/yr) | 59800   | 2930          | 95.1        |
| Total Phosphorus (kg/yr)       | 128     | 13.9          | 89.1        |
| Total Nitrogen (kg/yr)         | 838     | 242           | 71.1        |
| Gross Pollutants (kg/yr)       | 7950    | 2.01          | 100         |

# **APPENDIX C: CONCEPT WSUD DRAWINGS**



| AMENDMENT DETAILS |     |     |     |     |          | STATUS                             |  | SCALE                             |  | CLIENT                         |  | PROJECT                         |  | DRAWING TITLE                 |  |
|-------------------|-----|-----|-----|-----|----------|------------------------------------|--|-----------------------------------|--|--------------------------------|--|---------------------------------|--|-------------------------------|--|
| INITIAL           | DES | DRN | CHK | APP | DATE     | For Approval                       |  | 0 2.5 5 7.5 10 12.5 15 17.5 20    |  | STOCKLAND DEVELOPMENTS PTY LTD |  | AURA PRECINCT 13 DA APPLICATION |  | WSUD DETAIL PLAN SHEET 1 OF 2 |  |
| JW                | JH  | OH  | OH  | OH  | 03.08.26 | APPROVED                           |  | SCALE 1:250 (A1) SCALE 1:500 (A3) |  | © 2025 Egis Consulting Pty Ltd |  | AURA                            |  | PROJECT No. 17-000331         |  |
|                   |     |     |     |     |          | BY: OLIVER HARTIGAN RPEQ NO: 27508 |  | www.egis-group.com                |  | Stockland                      |  | DRAWING No. 3100-500            |  | REVISION                      |  |
|                   |     |     |     |     |          | SIGN: DATE: 03.08.26               |  |                                   |  | AURA                           |  |                                 |  | -                             |  |

DISCLAIMER: ALL DIMENSIONS TO BE CHECKED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION. USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.



**NOTES:**  
1. INFORMATION PROVIDED ON THIS PLAN IS CONCEPTUAL AND PRELIMINARY IN NATURE. DETAILS TO BE FINALISED AS PART OF FUTURE DETAILED DESIGN.  
2. FUTURE DETAILED DESIGN TO BE COMPLETED GENERALLY IN ACCORDANCE WITH WATER BY DESIGN GUIDELINES.

- LEGEND**
- PROPOSED FINISHED SURFACE CONTOURS
  - PROPOSED STORMWATER LINE/KERB INLETS/MANHOLES
  - PROPOSED RETAINING WALL
  - PROPOSED BIO BASIN (END OF LINE)

| AMENDMENT DETAILS |     |     |     |          |      | STATUS                             |  | SCALE                             |  | CLIENT                         |  | PROJECT                         |  | DRAWING TITLE                                         |  |
|-------------------|-----|-----|-----|----------|------|------------------------------------|--|-----------------------------------|--|--------------------------------|--|---------------------------------|--|-------------------------------------------------------|--|
| INITIAL           | DES | DRN | CHK | APP      | DATE | For Approval                       |  | 0 2.5 5 7.5 10 12.5 15 17.5 20    |  | STOCKLAND DEVELOPMENTS PTY LTD |  | AURA PRECINCT 13 DA APPLICATION |  | WSUD DETAIL PLAN SHEET 2 OF 2                         |  |
| JW                | JH  | OH  | OH  | 03.08.26 |      | APPROVED                           |  | SCALE 1:250 (A1) SCALE 1:500 (A3) |  | © 2025 Egis Consulting Pty Ltd |  | DA APPLICATION                  |  | PROJECT No. 17-000331 DRAWING No. 3100-501 REVISION - |  |
|                   |     |     |     |          |      | BY: OLIVER HARTIGAN RPEQ NO: 27508 |  | www.egis-group.com                |  | Stockland AURA                 |  |                                 |  |                                                       |  |
|                   |     |     |     |          |      | SIGN: DATE: 03.08.26               |  |                                   |  |                                |  |                                 |  |                                                       |  |

DISCLAIMER: ALL DIMENSIONS TO BE CHECKED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION. USE WRITTEN DIMENSIONS ONLY, DO NOT SCALE.