# NORTH HARBOUR PDA - PRECINCT 1

## STORMWATER QUALITY MANAGEMENT PLAN

## VERSION 1

**DesignFlow**

Prepared for North Harbour

January 2026

## Document Control Sheet

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## Disclaimer



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# 1 INTRODUCTION

This report has been prepared to support the Reconfiguring a Lot (RAL) development application for the North Harbour PDA – Precinct 1.

The Precinct 1 development is a greenfield development site located within the recently released North Harbour PDA. The development will involve the creation of residential land use set amongst recreational and open space precincts. A tributary of Raff Creek lies to the west of the development and will accept treatment stormwater from the development.

The report focuses on stormwater quality management only. Flood / stormwater quantity management is presented in other reports.

# 2 SITE CHARACTERISTICS

## 2.1 SITE LOCATION

The proposed Precinct 1 development is located adjacent to an unnamed tributary of Raff Creek, which drains into the Caboolture River and lies within the proposed North Harbour Neighbourhood Development Plan (SNDP). Figure 1 shows the location of the site.

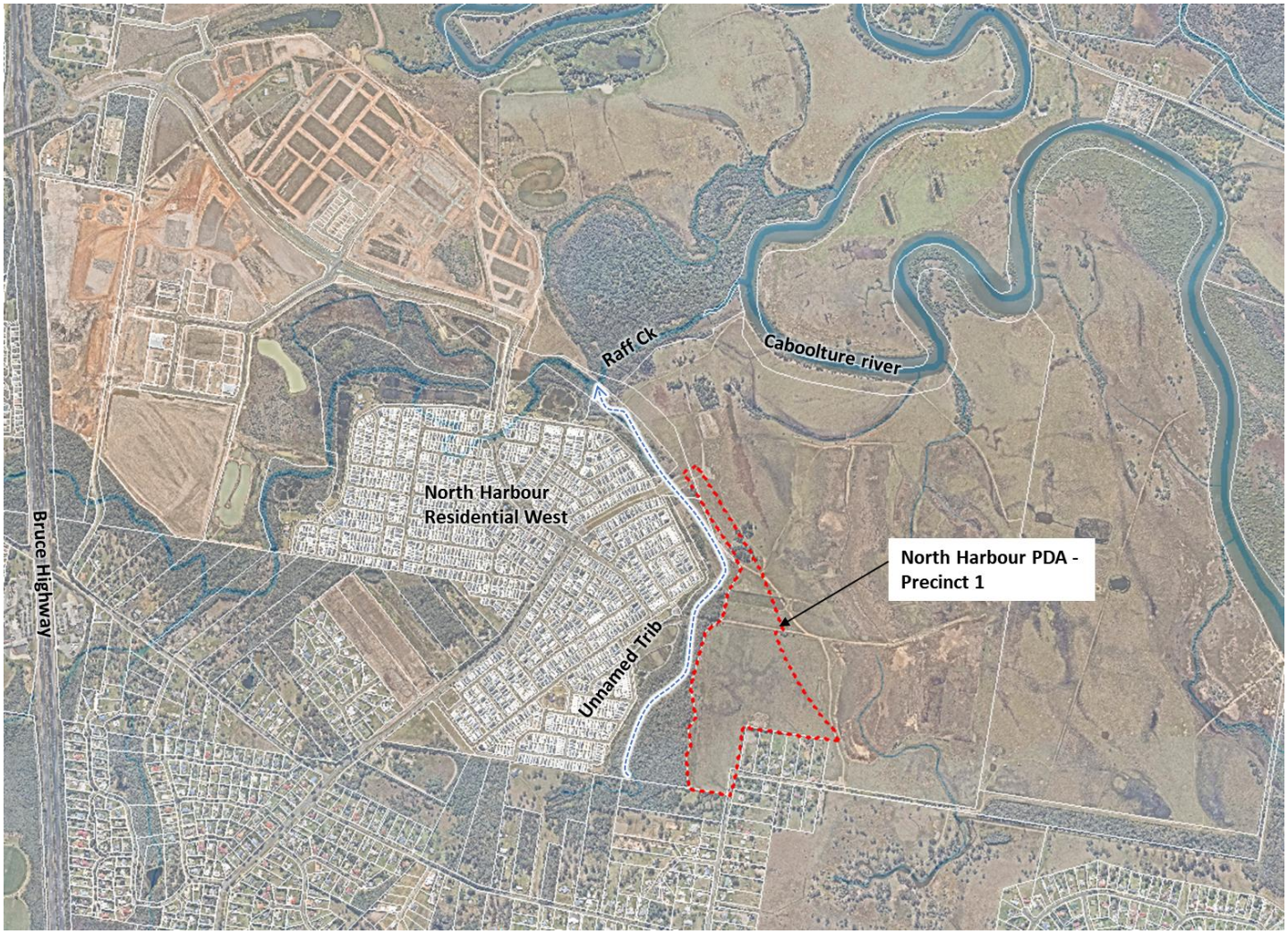



**Figure 1. Locality plan - North Harbour Precinct 1**

## 2.2 CLIMATE

Figure 2 provides a summary of the monthly rainfall and evaporation based on climate statistics for Dayboro Post Office (station No 40584).

The annual average rainfall is 1,245mm, whilst annual evaporation is approximately 1,500mm. The figure clearly indicates the seasonal nature of rainfall and evaporation with lower rainfall and evaporation periods during the winter months.

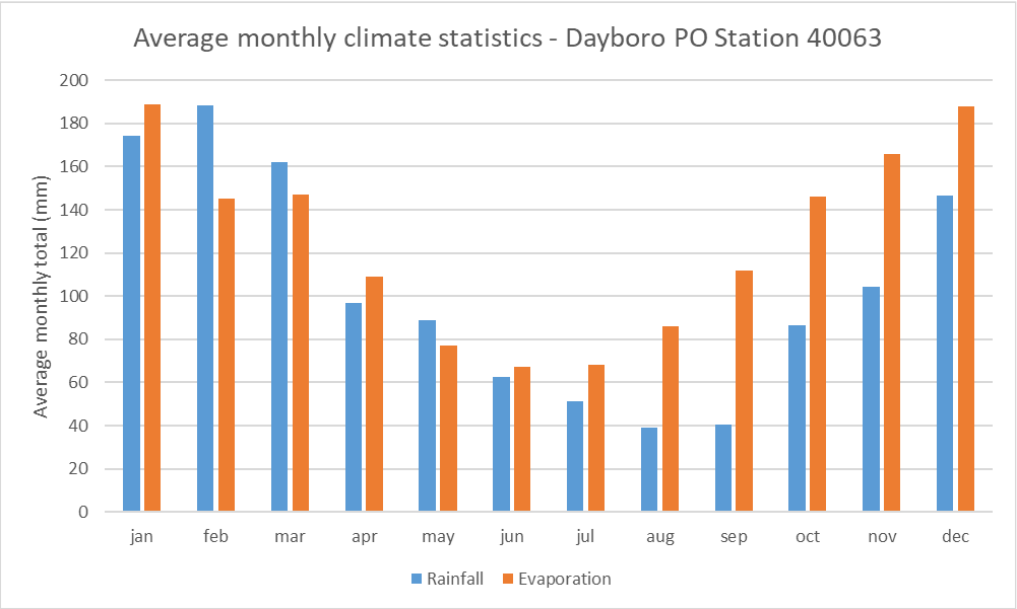



**Figure 2. Average monthly climate statistics.**

## 2.3 TOPOGRAPHY, CATCHMENTS AND DRAINAGE

The site generally grades from ease to west, with ground levels range from approximately RL3 along the eastern boundary to RL1.5 along the western discharge to the unnamed waterway (refer Figure 3). Slopes are gentle across the site. The developable land sits above the waterway drains in a northerly direction towards Raff Creek.

The topography of the site supports end of pipe stormwater treatment systems in some locations prior to discharge to the waterway. Where this was not feasible small areas have been treated via at-source bioretention systems or left untreated (overtreatment in other systems). Careful selection of treatment sites and types has occurred to integrate with site topography.

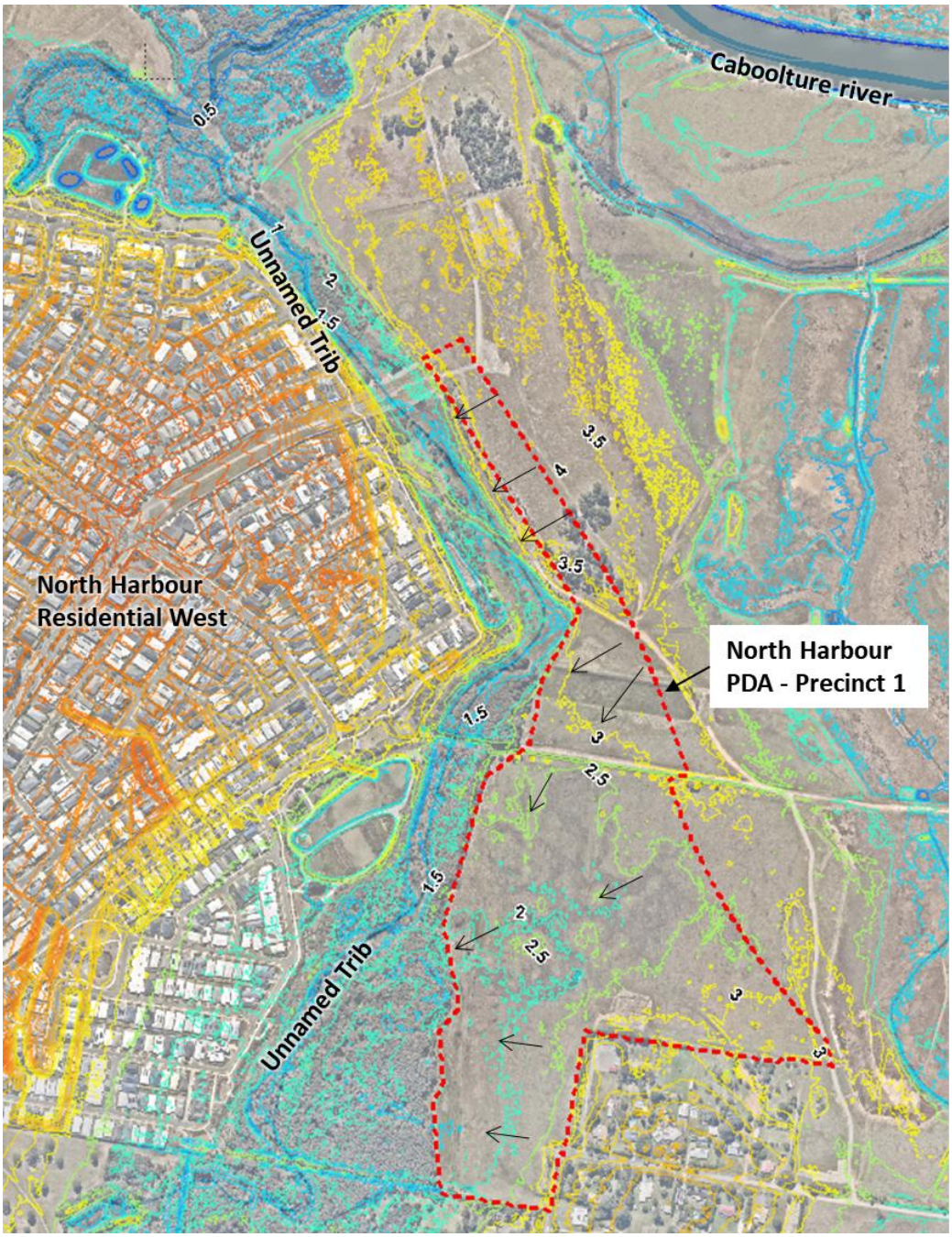



**Figure 3.Topography, catchments and drainage**

## 2.4 PROPOSED DEVELOPMENT

The Precinct 1 development layout is provided in Figure 4 and consists of the following:

- Residential land use and roads (comprising 250 lots at ~17.5 dwellings per hectare)
- Neighborhood Recreation Park
- Linear Open Space (vegetated zones, drainage reserves)
- Entry road (connection from Residential West development)

This SQMP focuses on managing stormwater runoff from the urban areas (residential land use and roads, future retirement facility and local parks) in accordance with the State Planning Policy.

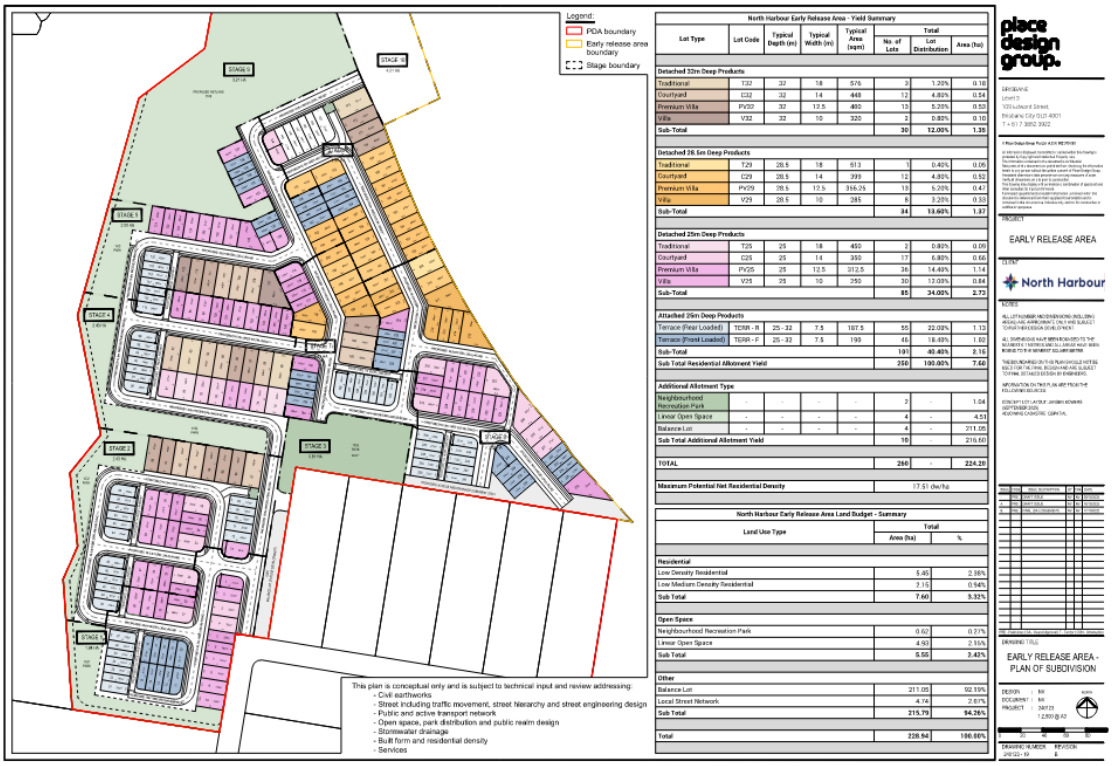



**Figure 4. North Harbour PDA Precinct 1 layout (source: Place)**

## 2.5 PROPOSED DEVELOPED CATCHMENTS

The project civil engineers (Egis) have completed functional engineering design for the development earthworks grading and stormwater drainage. Table 1 and Figure 5 presents details of the developed stormwater catchments.

**Table 1. Proposed developed stormwater catchment areas.**

| Catchment | Catch Area (ha) |
|---|---|
| A | 7.307 |
| B | 0.516 |
| C | 0.272 |
| D | 0.207 |
| E | 0.582 |
| F | 0.383 |
| G | 0.25 |
| H | 2.183 |
| I | 1.387 |
| J | 0.455 |
| K | 1.992 |

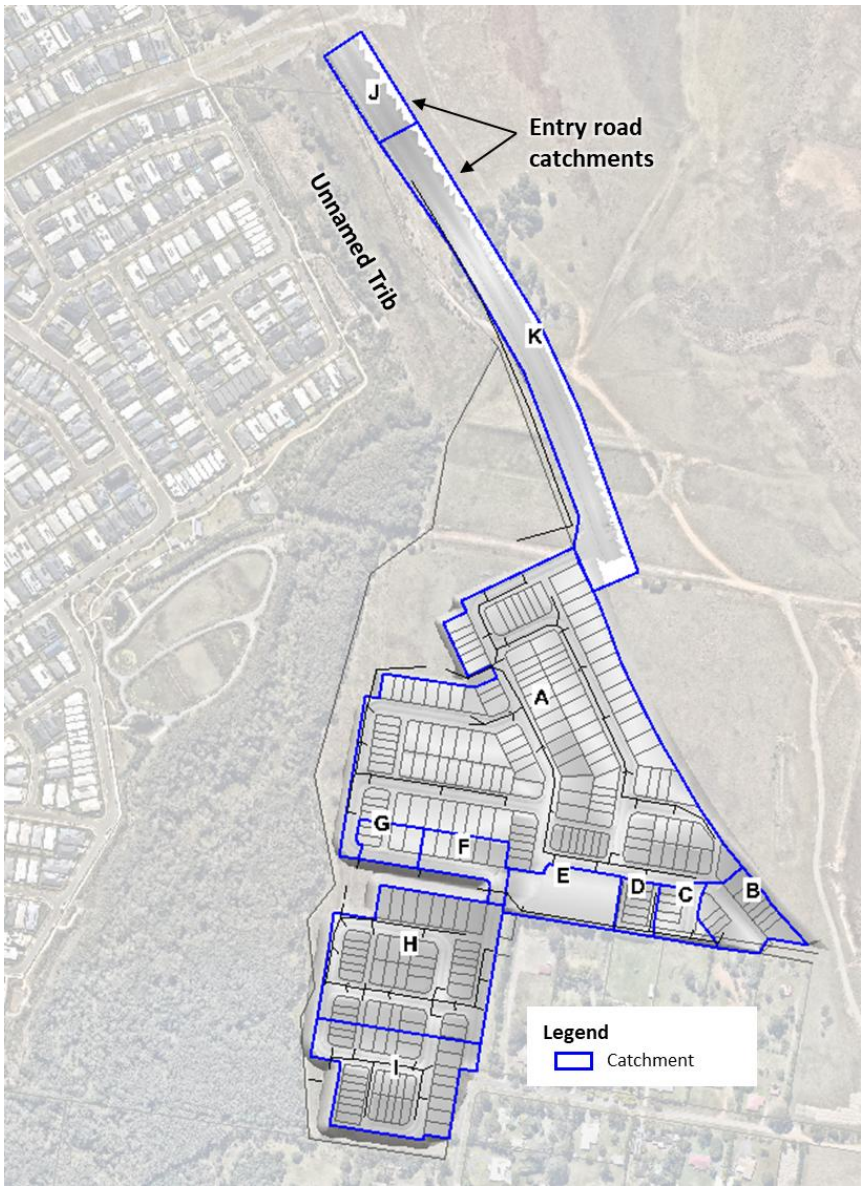



**Figure 5. Proposed development catchments.**

# 3 DESIGN OBJECTIVES

To protect receiving waterways, relevant state and local planning policies are applied to the development and require water sensitive urban design (WSUD) to comply. These are described in more detail in the following sections.

## 3.1 CONSTRUCTION PHASE WATER QUALITY

The primary focus of stormwater management during the construction phase is erosion and sediment control. The stormwater management objectives for the construction phase take the form of best-practice concentration-based discharge standards. The performance criteria are limited to those parameters that are directly linked to construction site activities. As the criteria are discharge standards, they apply to runoff events or pumped discharges (during dewatering of siltation basins) from the development site.

The design objectives for stormwater discharged from the site during the construction phase are listed in Table 2 reproduced from Appendix 2 Table A of the State Planning Policy (DILGP, 2017).

Construction phase stormwater management measures will be designed and documented as part of the operational works design or prior to commencement of works on the site.

**Table 2. Construction phase stormwater management design objectives**

| Issue | Desired outcomes |
|---|---|
| Drainage control | 1. Manage stormwater flows around or through areas of exposed soil to avoid contamination.<br>2. Manage sheet flows in order to avoid or minimise the generation of rill or gully erosion.<br>3. Provide stable concentrated flow paths to achieve the construction phase stormwater management design objectives for temporary drainage works (part 2).<br>4. Provide emergency spillways for sediment basins to achieve the construction phase stormwater management design objectives for emergency spillways on temporary sediment basins (part 3). |
| Erosion control | 1. Stage clearing and construction works to minimise the area of exposed soil at any one time.<br>2. Effectively cover or stabilise exposed soils prior to predicted rainfall.<br>3. Prior to completion of works for the development, and prior to removal of sediment controls, all site surfaces must be effectively stabilised[13] using methods which will achieve effective short-term stabilisation. |
| Sediment control | 1. Direct runoff from exposed site soils to sediment controls that are appropriate to the extent of disturbance and level of erosion risk.<br>2. All exposed areas greater than 2500 metres$^2$ must be provided with sediment controls which are designed, implemented and maintained to a standard which would achieve at least 80% of the average annual runoff volume of the contributing catchment treated (i.e. 80% hydrological effectiveness) to 50mg/L Total Suspended Solids (TSS) or less, and pH in the range (6.5–8.5). |
| Litter, hydrocarbons and other contaminants | 1. Remove gross pollutants and litter.<br>2. Avoid the release of oil or visible sheen to released waters.<br>3. Dispose of waste containing contaminants at authorised facilities. |
| Waterway stability and flood flow management | 1. Where measures are required to meet post-construction waterway stability objectives (specified in table B), these are either installed prior to land disturbance and are integrated with erosion and sediment controls, or equivalent alternative measures are implemented during construction.<br>2. Earthworks and the implementation of erosion and sediment controls are undertaken in ways which ensure flooding characteristics (including stormwater quantity characteristics) external to the development site are not worsened during construction for all events up to and including the 1 in 100 year ARI (1% AEP). |

## 3.2 OPERATIONAL PHASE WATER QUALITY

The stormwater quality management objectives that apply to the operational phase of the development (refer Table 2) have been established considering the State Planning Policy (DILGP, 2017) and Council policy.

**Table 3. Operational phase stormwater quality objectives.**

| Constituent | Discharge criteria |
|---|---|
| Total suspended solids (TSS) | 80% reduction in post developed mean annual load |
| Total phosphorous (TP) | 60% reduction in post developed mean annual load |
| Total nitrogen (TN) | 45% reduction in post developed mean annual load |
| Gross pollutants | 90% reduction in post developed mean annual load |

## 3.3 WATERWAY STABILITY OBJECTIVE DISCUSSION

The waterway stability objective within the current State Planning Policy (SPP) 2017 aims to prevent instream erosion downstream of urban development by controlling the rate (or magnitude) and duration of sediment transporting flows. The objective applies if development drains to an unlined waterway within or downstream of the site where an increased risk of erosion exists due to changes in hydrology. The waterway stability objective in Table B (Appendix 2) of the State Planning Policy 2017 requires development to "limit the peak 1-year ARI event discharge within the receiving waterway to the pre-development peak 1-year ARI discharge."

The SPP guidance material (Water Quality, July 2017) clarifies this objective applies "if development drains to an unlined waterway within or downstream of the site where an increased risk of erosion exists due to changes in hydrology."

**Application to Project Site**

The waterway stability management measures are not applicable to this development for the following reasons:

- **Backwatering Effects:** The project site is located at the lower extent of the catchment, immediately upstream of tidal influence. The receiving waterway is subject to regional floodplain backwater effects that dominate the hydraulic regime. During rainfall events, water levels and velocities in the receiving waterway are primarily controlled by regional floodplain dynamics rather than local catchment hydrology, meaning there is no increased risk of erosion from changes to the site's discharge characteristics.
- **Catchment Peak Flow Timing:** The project site is located at the lower extent of the catchment, immediately upstream of tidal influence. The receiving waterway is subject to regional floodplain backwater effects that dominate the hydraulic regime. During rainfall events, water levels and velocities in the receiving waterway are primarily controlled by regional floodplain dynamics rather than

local catchment hydrology, meaning there is no increased risk of erosion from changes to the site's discharge characteristics.

- **Precedent:** Adjacent development approvals for the North Harbour Residential West project have been granted exemption from the waterway stability objective on the same technical basis.

For the above reasons, the receiving waterway is not subject to increased erosion risk from changes in site hydrology, and the waterway stability objective has not been applied to the North Harbour PDA Precinct 1 development area.

# 4 STORMWATER QUALITY MANAGEMENT STRATEGY

A stormwater quality management strategy has been developed for North Harbour PDA Precinct 1 considering site constraints/opportunities, catchments and topography and integration with the development layout. The proposed strategy has been developed in collaboration with the design team including Egis (civil engineers) to ensure the proposed strategy is well integrated with the design.

When developing the strategy a number of guiding principles were considered:

- achieve obligations under Council conditions and SPP
- ensure treatments chosen are functionally feasible within the constraints of development and drainage levels
- avoid numerous small treatments
- integrate with landscape outcomes particularly how treatments integrate with waterways and the Green Infrastructure Network (GIN)
- avoid impacts on mapped vegetation areas

Table 4 and Figure 6 show the stormwater treatment strategy for Precinct 1. Performance assessments of the proposed treatment strategy are presented in Section 4.1.

**Table 4. Treatment strategy Precinct 1.**

| Catchment / Treatment ID | Catchment Area (ha) | Treatment Type | Treatment location | Treatment Area ($m^2$)[1] |
|---|---|---|---|---|
| **A** | 7.307 | Wetland | End-of-pipe | 6000 |
| **B** | 0.516 | Bioretention | At-source | 50 |
| **C** | 0.272 | Bioretention | At-source | 30 |
| **D** | 0.207 | Untreated | Untreated | - |
| **E** | 0.582 | Bioretention | At-source | 60 |
| **F** | 0.383 | Bioretention | At-source | 40 |
| **G** | 0.25 | Bioretention | At-source | 25 |
| **H** | 2.183 | Bioretention | End-of-pipe | 215 |
| **I** | 1.387 | Bioretention | End-of-pipe | 140 |
| **J** | 0.455 | Untreated | Untreated | - |
| **K** | 1.992 | Wetland | End-of-pipe | Refer note 2 |

*Notes:*

*1. Filter area only. Space for batters and bunds allowed for in design.*

*2. Catchment K drains to Wetland*

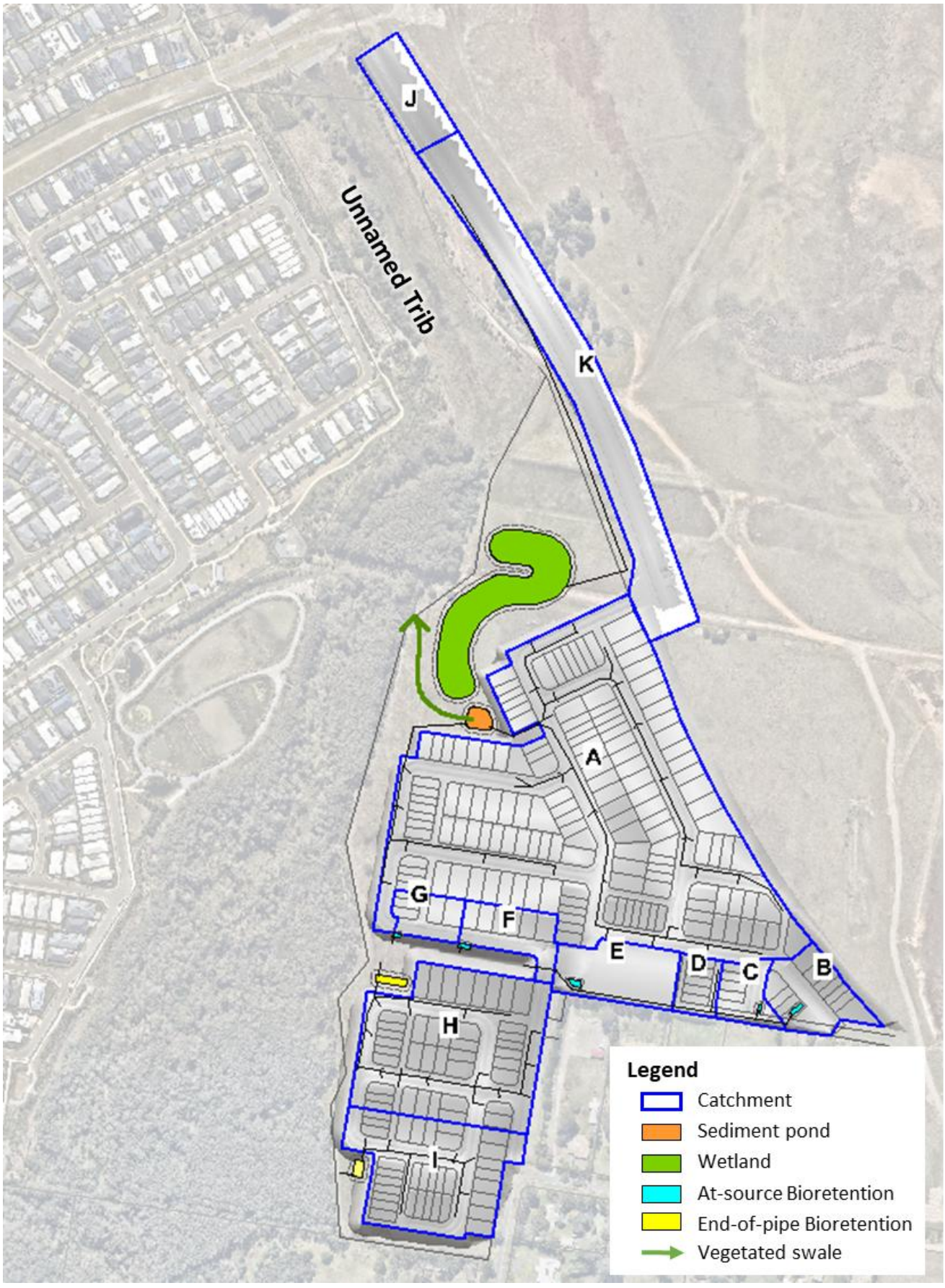



**Figure 6. Stormwater quality management strategy.**

## 4.1 DESIGN INTEGRATION

Preliminary assessment of the spatial requirements for each system has been completed to ensure sufficient space has been allocated for treatment systems including batters and bunds.

Table 5 provides preliminary operating levels for each treatment system type. These design levels are consistent with those adopted for wetlands and bioretention systems located within the North Harbour Residential West WSUD systems (located on the immediate opposite side of waterway).

Design levels are subject to detailed design and will be refined based on feature survey along the waterway interface and hydraulic design of the stormwater drainage network (by Egis).

**Table 5. WSUD system preliminary design levels.**

| System type | Typical design levels |
|---|---|
| Sediment pond and wetland | • NWL = 1. 7 mAHD<br>• Weir crest = 2.2 mAHD<br>• Bund = 2.7 mAHD |
| [1]At-source bioretention | • Filter surface level = Typically 0.2m below kerb invert<br>• Pit crest / Extended detention depth = 0.1m<br>• Total filter depth = 1m (filter media 0.6m, transition sand 0.2m, drainage gravel 0.2m) |
| [1]End-of-pipe bioretention | • Filter surface level = 2.9 mAHD<br>• Pit crest = 3.2 mAHD<br>• Extended detention depth = 0.3m<br>• Weir crest = 3.4 mAHD (subject to detailed design)<br>• Bund crest = 3.7 mAHD (subject to detailed)<br>• Total filter depth = 1m (filter media 0.6m, transition sand 0.2m, drainage gravel 0.2m) |

*Note 1: Typical cross sections for both at-source and end-of-pipe bioretention systems are included in the Egis DA plans submitted with this application.*

### Spatial allowance

Allowance for the spatial requirements for the WSUD systems has been considered as part of this application. A preliminary 3D earthworks design of the sediment pond and wetland has been completed (refer Appendix A). The spatial extent of the proposed bioretention systems have been shown indicatively within the Egis engineering plans submitted with this application.

The designs demonstrate the following:

- Sufficient space in the urban design for the stormwater treatment systems including associated bunds and batters.
- The proposed levels of the treatment systems and surrounding development ensure stormwater can drain into the systems and discharge to the receiving waterways under gravity
- Integration with the drainage network designed by Egis to ensure hydraulic connectivity and system functionality.

# 5 PERFORMANCE ASSESSMENT

To support the RAL application for Precinct1 development, MUSIC modelling was conducted to quantitatively assess the stormwater treatment performance of the proposed stormwater strategy. MUSIC version 6.3 was used for the assessment, and the parameters have been established in accordance with the MUSIC Modelling Guidelines for South-East Queensland (Water by Design, 2010).

Details of the modelling assumptions, parameters used and results are presented in the following sections.

## 5.1 MODEL STRUCTURE

The structure of the MUSIC model is shown in Figure 7 with the general data upon which the model is based provided in Table 6.

Catchment areas draining to each treatment element have been derived from the proposed urban layout for the development, considering the pipe drainage system that would apply (refer to Figure 6). Catchments contributing include the urban areas, roads, parks and the treatment area. A lumped catchment approach is used, consistent with the MUSIC Modelling Guidelines (HLW,2019, page 17) which states that splitting land use is only required when land use does not reflect a typical land use split or tanks are adopted. Tanks are not adopted and the land use proposed is typical of that proposed in the *MUSIC Modelling Guidelines* so the lumped approach is appropriate.

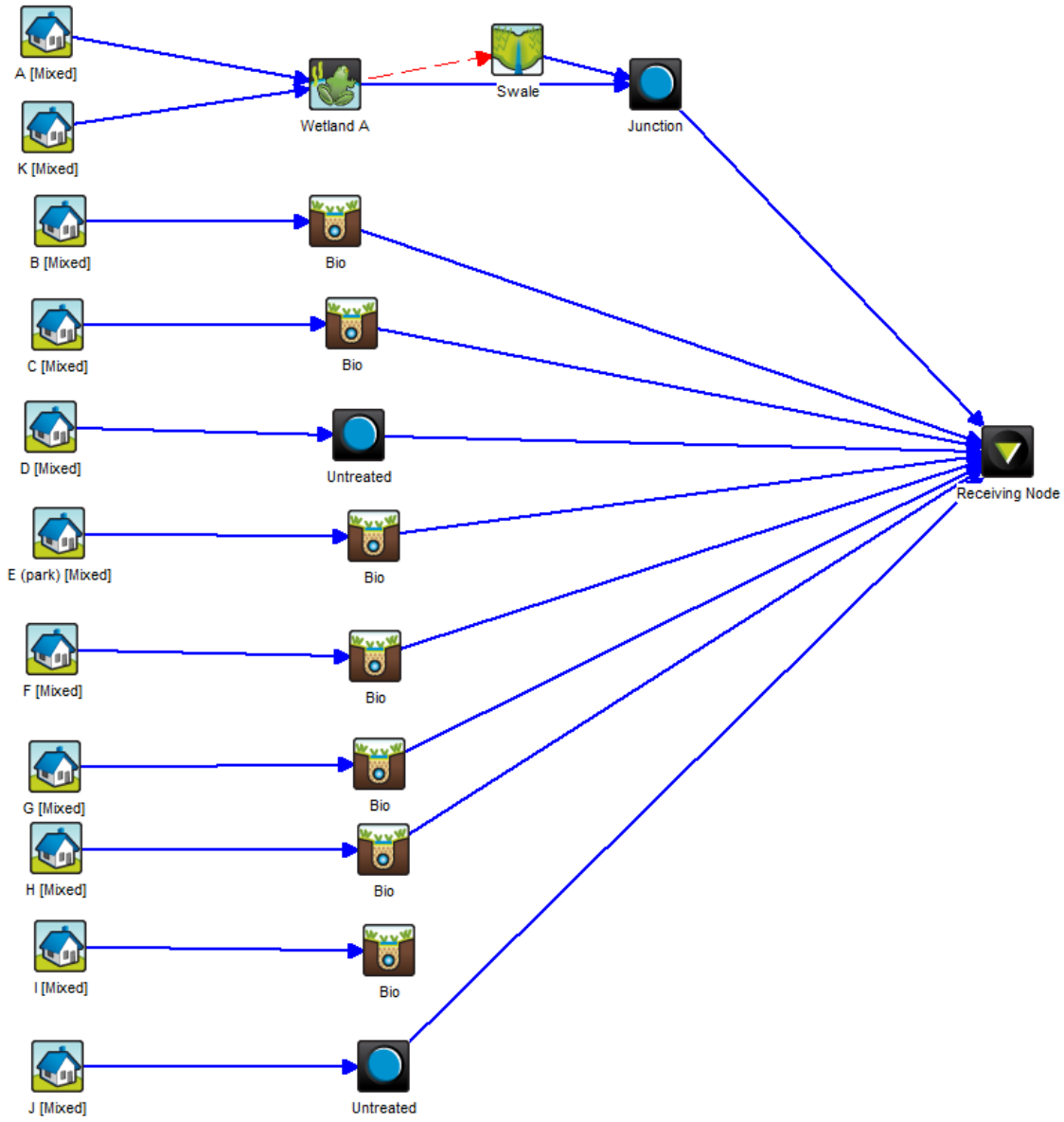



**Figure 7. MUSIC model layout.**

**Table 6. MUSIC model data summary.**

| Parameter | Value |
|---|---|
| **Source Data** | |
| Rainfall data set | 1980-1990 – Dayboro PO Station 40063 |
| Modelled time step | 6 minute |
| Mean annual rainfall 1980-1990 | 1,256 mm |
| Potential evapotranspiration | 1,502 mm |
| Soil properties (runoff generation parameters) | Table 3.7 Music Modelling Guidelines for SEQ (as appropriate depending on land use) |
| Pollutant export parameters | Tables 3.9 Music Modelling Guidelines for SEQ Urban residential |
| Percent impervious | Urban residential 60% (Catchment A-D & F-I)<br>Park 20% (Catchment E)<br>Roads 70% (Catchment J & K) |
| **Treatment Devices** | |
| Bioretention | Filter area – Refer Table 4 above<br>Surface area = Filter area<br>Filter media depth = 0.6 m<br>Extended detention depth = 0.3 m (end-of-pipe)<br>Extended detention depth = 0.1 m (at-source)<br>High flow bypass – 2-5$m^3/s$<br>Overflow weir – 5m<br>Seepage = 0 mm/hr<br>TN content 400 mg/kg<br>Orthophosphate content 30mg/kg |
| Wetland and Sediment Pond (single node) | High flow bypass – 100$m^3/s$<br>Inlet pond volume = 300$m^3$<br>Surface area = 6000$m^2$<br>Extended detention depth = 0.4 m<br>Permanent pool volume = 1800$m^2$<br>Equivalent pipe diameter = 97mm<br>Overflow weir – 15m<br>Notional detention time = 48.1 hrs |
| Vegetated Swale (high flow bypass only) | Low flow bypass = 0 $m^3/s$<br>Length = 80m<br>Bed slope = 0.25%<br>Base width = 3m<br>Top width = 11m<br>Depth = 1m<br>Vegetation height = 0.3m |

## 5.2 RESULTS

The results of the MUSIC modelling for each treatment zone are presented in Table 7. The results demonstrate that load-based objectives are achieved.

**Table 7. Summary of MUSIC modelling**

| Pollutant | Inflows (kg/yr) | Outflows (kg/yr) | Water quality objective | Reduction achieved (%) | Objective achieved? |
|---|---|---|---|---|---|
| TSS | 25300 | 5070 | 80 | 80.0 | Yes |
| TP | 50.2 | 15 | 60 | 70.1 | Yes |
| TN | 241 | 129 | 45 | 46.4 | Yes |
| GP | 2860 | 121 | 90 | 95.8 | Yes |

# 6 CONCLUSION

A stormwater treatment strategy has been developed to support the RAL application for Precincts 1. The preliminary strategy has been developed to meet the requirements of the State Planning Policy (SPP, 2017) and Council objectives for emerging community zones for stormwater quality management.

The strategy adopts a mix of constructed wetlands and bioretention systems. The site topography does not support end-of-pipe solutions in all locations. In these locations at-source bioretention has been adopted.

The above strategy provides an integrated best management approach to stormwater quality management and meets the requirements of the State Planning Policy and Council planning scheme.

Flood management and stormwater quantity management is dealt with in reporting by others.

# 7 REFERENCES

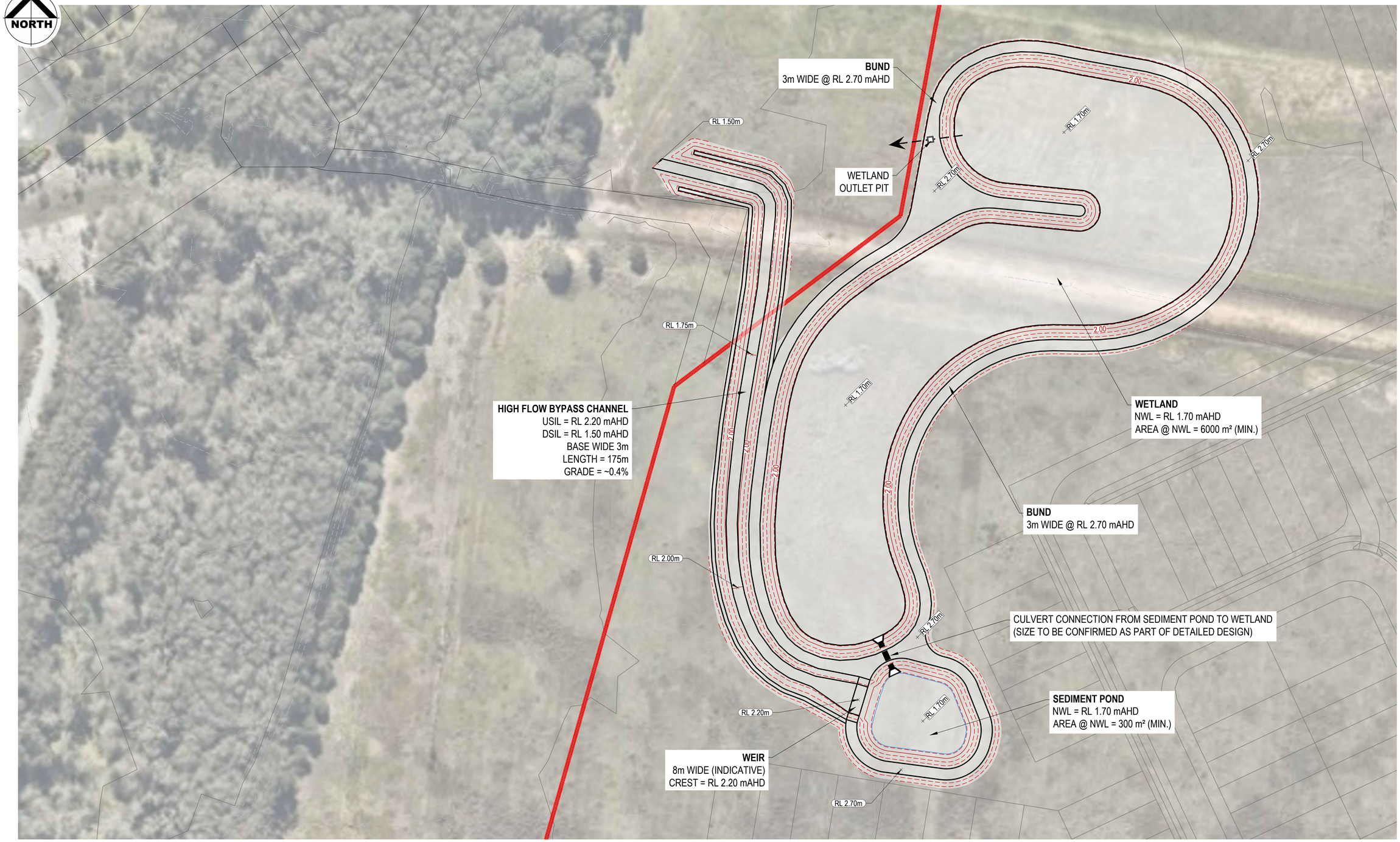
Australian Rainfall and Runoff, 1987. *A Guide to Flood Estimation*. Engineers Australia

DILGP (2017) *State Planning Policy*

Healthy Land and Water (2018) *MUSIC Modelling Guidelines Version 3*

QUDM, (2007). *Queensland Urban Drainage Manual*. Second Edition 2007. Department of Natural Resources and Water

# APPENDIX A. WETLAND CONCEPT DESIGN




## WETLAND DESIGN CONCPET PLAN

SCALE 1:500

SCALE 1:500 @ A1
(1:1000 @ A3)

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|---|---|---|---|---|---|
| D | | | | | |
| C | | | | | |
| B | | | | | |
| A | ISSUED ONLY FOR DISCUSSION - NOT FOR CONSTRUCTION | MJM | 21.01.26 | AC | 21.01.26 |

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Date 21.01.26

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| CLIENT | NORTH HARBOUR |
| DRAWN | MJM |
| DATE | 21.01.26 |
| DESIGNED | AC |
| DATE | 21.01.26 |
| SCALE | SCALE 1:500 |
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| PROJECT | NORTH HARBOUR PDA - PRECINCT 1 - STORMWATER QUALITY MANAGEMENT PLAN |
| DRAWING TITLE | WETLAND DESIGN CONCEPT PLAN |
| PROJECT No | 4500 |
| DRAWING No | SK-001 |
| REVISION | A |

XREF: XREF4500_NEARMAP_210803DTM, SURF4500_DESIGN, 210803DTM, XREF4270_X_23-000077.03_DA-BASE, XREF4500_X_23-000077.03_DA-BASE
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