PROJECT

STORMWATER MANAGEMENT PLAN STAGE 1, KINGS FOREST NEW SOUTH WALES

PREPARED FOR

PROJECT 28 PTY LTD

DATE

OCTOBER 2020

GILBERT SUTHERLAND

DOCUMENT CONTROL

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CLIENT Project 28 Pty Ltd
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CLIENT REFERENCE –

SYNOPSIS This management plan supports the Integrated Water Cycle Management Strategy for the Kings Forest Stage 1 P area, with a particular focus on the Precinct 5 detailed development. It establishes responsibilities and procedures for the management of erosion, sediment and stormwater during the construction, on-maintenance and operational phases of the project with respect to the sites water sensitive urban design components.

REVISION HISTORY

REVISION #	DATE	EDITION BY	APPROVED BY	FILE NAME
1	12/09	A. Genn	N. Zurig & N. Sutherland	GJ0873-1_SMP_RAG2D
2	02/11	N. Gifford	N. Zurig & N. Sutherland	10468_SWMP_RAG1F
3	06/11	M. Hancock	N. Zurig & N. Sutherland	10468_SWMP_RAG2F
4	07/12	M. Foster	N. Zurig & N. Sutherland	10927 SWMP RAG1F
5	02/18	G. Cowie	E. Holton & N. Sutherland	11301 SWMP RGC1F
6	04/20	E. Holton	C. Anderson	12066 SWMP REH1F
7	10/20	E. Holton	E. Holton	12066 SWMP REH2F

DISTRIBUTION

	REVISION NUMBER									
Distribution	1	2	3	4	5	6	7	8	9	10
Project 28 Pty Ltd	3	1	1	1	1	1	1			
JBA Planning	-	1	1	-	-					
Darryl Anderson Consulting Pty Ltd	-	-	-	1	1	1	1			
Private Certifying Authority (PCA)		-	-	-	-	1	1			
G&S file	1	1	1	1	1	1	1			

SUMMARY

Project 28 Pty Ltd commissioned Gilbert & Sutherland Pty Ltd (G&S) to update the Kings Forest Stage 1 Stormwater Management Plan (SWMP) originally contained in the Darryl Anderson Consulting Pty Ltd Preferred Project Report dated 2012. Updates to the SWMP are required to ensure it meets the requirements of Condition 21 of Major Project Approval No. MP08_0194, Kings Forest Stage 1 (and associated Modifications) as repeated below in italic text:

Stormwater Management

21.

1) *An all weather maintenance access track shall be provided alongside the Kings Forest biofiltration swale to ensure maintenance activities can occur without disruption to road users. This track must be retained until such time that Kings Forest Parkway is upgraded to a 4 lane layout.*
2) *All plantings in biofiltration areas must be included in detailed landscaping plans, with requirements relating to bushfire protection taking precedence where they are located within APZs.*
3) *The interim water quality criteria / discharge criteria for aluminium be revised downward to reflect the ANZECC guideline method.*
4) *The maximum concentration of suspended solids that may be discharged under controlled conditions from the site in stormwater during construction and operational phases shall be derived in accordance with the ANZECC method of determination.*
5) *Water quality at proposed surface water quality monitoring sites SW1 - SW7 is to be monitored and reported on in accordance with water quality objectives set for the Tweed Catchment by the NSW Office of Environment and Heritage as follows:*

Parameter	***Unit***	***Objective as per NSW Office Environment and Heritage***
pH	*pH units*	*Freshwater 6.5 - 8.5* *Estuary 7 - 8.5*
Dissolved oxygen	*mg/L*	*80 - 100% saturation*
Turbidity	*NTU*	*0.5 - 10 NTU*

Parameter	*Unit*	*Objective as per NSW Office Environment and Heritage*
Total phosphorous	*mg/L*	*0.03 mg/L*
Total nitrogen	*mg/L*	*0.3mg/L*
Chlorophyll a	*ug/L*	*<4*

In accordance with the Kings Forest Stage 1 Project Application No. MP 08_0194 the project contains the following key elements:

Kings Forest Residential Subdivision Stage 1 Bulk Earthworks, Roadworks and Subdivision of Precinct 5, including:

- *Subdivision of the site into ten development lots in 4 stages; Bulk earthworks across the site;*
- *Roadworks comprising:*
  - *construction of the entrance road and associated intersection works with Tweed Coast Road;*
  - *construction of the Kings Forest Parkway from Tweed Coast Road via Precincts 4 and 5 through to the western site precincts; and*
  - *construction of two roads providing access to the southern site precincts;*
- *Plan of Development for Precinct 5;*
- *Development of 998 sqm of floorspace for a service station and food and drink premises and access arrangements to Precinct 1;*
- *Construction of subdivision and infrastructure works along Kings Forest Parkway and within Precincts 1 and 5;*
- *Subdivision of Precinct 5 into 376 residential lots comprising:*
  - *one townhouse lot (7,860 sqm)*
  - *37 terrace house lots (minimum lot size 150 sqm)*
  - *25 duplexes (minimum lot size 450 sqm)*
  - *192 zero lot dwellings (minimum lot size 24 0sqm)*
  - *121 traditional detached dwellings (minimum lot size 400 sqm)*

This Stormwater Management Plan provides procedures aimed at achieving site-specific stormwater quality objectives during the construction, on-maintenance and operational phases. It should be included in the contract documents for the earthworks, roadworks and drainage construction works in this project.

CONTENTS

LIST OF DRAWINGS

DRAWING NO.	DESCRIPTION
12017_01	Surface water monitoring locations

1 SWMP structure

1.1 Objectives

The principal objective of this SWMP is to provide mitigation measures to minimise the potential impacts of the development.

Additionally, the SWMP provides information on specific site management issues relating to potential environmental impacts from the development during the construction and operational phases.

The control measures detailed in this SWMP have been developed to minimise impacts on the environment and achieve the following objectives:

- appropriate stewardship of natural resources;
- protection of downstream flora and fauna habitats;
- confirmation of the success of impact control measures by the means of monitoring during the construction of each stage;
- compliance with statutory requirements; and
- preservation of the existing groundwater conditions.

1.2 Implementation

The management plan requires the Proponent to mitigate the potential environmental impacts associated with the construction of the subdivision works.

It is intended that the SWMP will provide a set of performance criteria and guiding principles with which the engineering designs for the development will comply. The plans and specifications forming part of the construction contract for each stage will also include these performance criteria.

1.3 SWMP structure

This SWMP acknowledges the environmental impacts associated with the development and details strategies to mitigate them.

Each control strategy is based upon proven environmental management methods and is presented as a commitment.

1.4 Site-specific objectives

The stormwater quality objectives and environmental management strategies detailed in this SWMP are designed to comply with relevant laws and regulations while acknowledging the specific characteristics and localised environmental context of the site. The application of relevant legislation, guidelines and standards may necessitate specific consideration of unique or unusual natural and/or human factors in the local environment. Where necessary, variations to the relevant guidelines can be sought and, where approved, included in this SWMP.

This SWMP includes tables detailing objectives and management strategies for the construction, on-maintenance and the operational phases of the Kings Forest Stage 1 development. The party responsible for the implementation of the measures detailed is written on the table itself. The tables

then detail the issue, the performance criteria, the implementation strategy, monitoring, auditing, reporting, failure identification and the corrective action. The detachable pages within each section detail the provisions of the SWMP. The format is presented below for reference purposes.

#.# Title

Applies to	The relevant construction stages to which the issue detailed on this page applies.
Person responsible	This is the person or party who has accepted the responsibility of implementing the SWMP provisions detailed on this page.

Issue	The issue with which the table deals.
Operational policy	The operational policy or management objective that applies to the element.
Performance criteria	Performance criteria (outcomes) for each element of the operation.
Implementation strategy	The strategies or tasks (to nominated operational design standards) that will be implemented to achieve the performance criteria.
Monitoring	The monitoring requirements which will measure actual performance (i.e. specified limits to pre-selected indicators of change).
Auditing	The auditing requirements, which will verify implementation of, agreed construction and operation phase environmental management strategies and compliance with agreed performance criteria.
Reporting	Content, timing and responsibility for reporting and auditing of monitoring results.
Identification of incident or failure	The circumstances under which the agreed performance criteria are unlikely to be met and environmental harm is likely to result.
Corrective action	The action to be implemented in case a performance requirement is not reached and the company(s) responsible for action.

Commitment

What the management has committed the company to.

An objective of the tabular format is to allow for change and allow the SWMP to be a working document. If items need altering, changes can be made to the individual tables after appropriate consultation with the statutory authorities.

1.5 General commitments

Commitment 1

The Proponent undertakes to comply with the environmental implementation strategy as contained within the approved SWMP on a stage-by-stage basis.

Commitment 2

The Proponent undertakes to fulfil all commitments made in this SWMP and to carry out their activities at the project site in accordance with relevant current statutory requirements and approved amendments.

Compliance with the provisions of this SWMP requires the objectives and management strategies contained herein to be both reasonable and achievable within the context of the approval(s) to which they relate. Incidents and/or failures that involve factors beyond the control of the responsible party(s) and the response and/or corrective actions taken by the responsible party(s) will be considered in assessing compliance with this SWMP.

1.6 Definitions

In this SWMP these terms have the following meanings;

- BCD means the Department of Planning Industry and Environment's Biodiversity and Conservation Division (formerly the NSW Office of Environment and Heritage.
- DPIE means the Department of Planning Industry and Environment.
- SWMP means the approved Stormwater Management Plan and includes any amendments that may be approved from time to time.
- Development means the development of the site in accordance with the Kings Forest Stage 1 Project Application.
- TSC means Tweed Shire Council.
- Proponent means the person undertaking the construction of the proposed Kings Forest Stage 1 development and includes the person nominated by the Proponent as having the responsibility for implementing the provisions of the SWMP.
- POEO Act means the NSW *Protection of the Environment Operations Act 1997*.

1.7 Complaints procedure

The following Complaints Procedure as contained in Condition 75 of the Project Approval (MP08_0194) shall be followed at the site.

At the commencement of construction the Proponent shall ensure that the following are available for community complaints during construction:

- A 24 hour telephone number on which complaints about construction activities at the site can be registered.
- A postal address to which written complaints can be sent.

- An email address to which electronic complaints can be transmitted.
- Name, address, contractor licence number and telephone number of the principal contractor, including a telephone number at which the person can be contacted outside working hours.
- Name, address and telephone number of the Project Manager and PCA
- The telephone number, the postal address, email address, the name of the site/project manager and the approved hours of work, shall be displayed on a sign near the entrance to the site, in a position that is clearly visible to the public.

The Proponent shall record details of all complaints received through the means listed above in an up-to-date Complaints Register.

The Proponent shall provide an initial response to any complaints made in relation to the project during construction within 48 hours of the complaint being made. The response and any subsequent action taken shall be recorded in the Complaints Register.

1.8 Contact details

The following persons are responsible for implementation of the management measures described in the individual tables of the SWMP.

Contractor's Site Manager

The name and address of the Contractor and its representative will be notified to Council by the Consulting Engineer prior to the commencement of each contract/stage of the project.

Consulting Engineer

Unless advised otherwise the Consulting Engineer is:

Company: TBA

Address:

Contact Details:

Phone:

Facsimile:

Environmental Consultant

Unless advised otherwise the Environmental Consultant is:

Company TBA

Address:

Contact Details:

Phone:

Facsimile:

2 Baseline data collection phase

2.1 Summary

This part of the OWMP details the requirements for baseline data collection to establish site specific water quality criteria for the Kings Forest development.

The baseline data collection program was completed from May to October 2019 with full details provided in the Gilbert & Sutherland Baseline Water Quality Criteria Report, Kings Forest Stage 1, New South Wales, March 2020.

Baseline water quality monitoring was conducted at selected groundwater bores and surface water locations across the development site. The following parameters were monitored over an eight round monitoring program:

- pH (field measurement);
- electrical conductivity (EC) (field measurement);
- turbidity (field measurement);*
- dissolved oxygen (DO) (field measurement);*
- temperature (field measurement);
- redox potential (mV);
- suspended solids (SS) (mg L^{-1});*
- total nitrogen (TN), soluble nitrogen, nitrogen oxide (NO_x), total kjeldahl nitrogen (TKN), nitrite (NO_2) & nitrate (NO_3) (mg L^{-1});
- total phosphorus (TP) & soluble phosphorous (mg L^{-1});
- oil and grease (visual inspection);*
- calcium (Ca);
- magnesium (Mg);
- sodium (Na);
- potassium bicarbonate (K/HCO_3);
- bicarbonate (HCO_3);
- carbonate (CO_3);
- total & dissolved iron (Fe);
- total & dissolved aluminium (Al);
- dissolved manganese (Mn);
- chloride (Cl);
- sulfate (SO_4);
- ammonium (NH_4);
- colour;
- total acidity (titratable);
- total alkalinity;
- arsenic (As);
- cadmium (Cd);
- copper (Cu);
- lead (Pb);
- nickel (Ni);
- zinc (Zn);
- chlorophyll-a;*
- faecal coliforms;
- total algal cell count; and*
- blue green algae.*

*Surface water only

Following completion of the monitoring program the data was analysed and site specific water quality criteria were established in accordance with the recommendations of the ANZECC Guidelines. The water quality criteria as established in that report are provided in Table 2.1.1 and Table 2.1.2 below.

Table 2.1.1 Surface water quality criteria

Parameter	Saline (SW1, SW2, SW6, and SW9)	Brackish (SW5)	Fresh (SW3, SW4, SW7, SW8 and SW10)
pH	5.66-6.3	5.34-6.14	5.23-6.66
Electrical Conductivity	<38700 µs/cm	<4008.6 µs/cm	<230.4 µs/cm
Dissolved Oxygen	>7.10 mg/L	>4.87 mg/L	>2.91 mg/L
Turbidity	<3.1 mg/L	<23.76 mg/L	<32.54 mg/L
Total Nitrogen	<0.5 mg/L	<1 mg/L	<1.46 mg/L
Total Phosphorus	<0.03 mg/L	<0.04 mg/L	<0.14 mg/L
Iron (total)	<0.41 mg/L	<4.40 mg/L	<6.57 mg/L
Aluminium (total)	<0.22 mg/L	<0.36 mg/L	<0.68 mg/L
Chlorophyll-a	<6 µg/L	<6 µg/L	<6 µg/L
Litter and gross pollutants	No man made material <5mm in any dimension	No man made material <5mm in any dimension	No man made material <5mm in any dimension
Oil and/or grease	No visible film, no detectable odour	No visible film, no detectable odour	No visible film, no detectable odour

*Note: pH must be consistent with receiving water quality. Consideration must be given to the preferred water quality conditions of WSF communities when interpreting pH results against the site-specific water quality criteria. If receiving waters are estuarine, pH can range from 5.5 -7.5; if receiving waters are fresh, pH can range from 4.2 – 6.7 in accordance with the *Threatened Species Management Plans* (JWA, 20120a-c) for habitat requirements for Wallum Froglet (*Crinia signifera*) and the *Wallum Sedge Frog Management Plan* (JWA 2020g) for habitat requirements for the Wallum sedge Frog (*Litoria olongburensis*).

Table 2.1.2 Groundwater quality criteria

Parameter	*Precinct 1*	*Precinct 5*
pH	3.5-4.33	3.59-4.47
Electrical Conductivity	<339.4 µs/cm	<131 µs/cm
Total Nitrogen	<3 mg/L	<1.3 mg/L
Total Phosphorus	<0.34 mg/L	<0.05 mg/L
Iron (total)	<1.02 mg/L	<0.45 mg/L
Aluminium (total)	<1.89 mg/L	<0.52 mg/L

3 Bulk earthworks and civil construction phases

The SWMP requires the Proponent to mitigate the potential environmental impacts associated with the construction of the subdivision works.

Prior to commencement of construction in any stage, detailed erosion and sediment control plans (ESCP) will be prepared, based on the requirements of this SWMP and the NSW Landcom, *Managing Urban Stormwater Soils and Construction*,[1] and submitted to and approved by Council. With respect to ESC the site will be managed in accordance with the approved ESCP.

Although no MUSIC modelling has been completed for the earthworks and construction phases, it is evident that temporary sedimentation ponds and other sediment control measures should be installed during this phase.

Prior to commencement of earthworks in any stage, temporary sedimentation ponds will be installed. The exact number, location and size will be in accordance with the approved detailed ESCP. All runoff from disturbed areas is to be collected by means of surface drains and diverted to a sedimentation pond. Where practicable, runoff from undisturbed areas will be diverted around disturbed areas and away from the sedimentation pond. The temporary sedimentation ponds can be removed when the site has been adequately stabilised in accordance with the ESCP.

Other control measures such as (but not limited to) temporary sedimentation traps, silt fences and contour drains will be installed and maintained in accordance with the recommendations contained in the NSW Landcom, *Managing Urban Stormwater Soils and Construction* and the site's approved ESCP.

Erosion and sediment control measures must be installed in disturbed areas during the building construction phase in accordance with the requirements of Council's *Sediment and Erosion and Control Guidelines for Builders and Developers*. These measures will be maintained until landscaping has been completed and becomes established.

The soils identified on the site are assessed as low to very low fertility soils. Nevertheless, it is considered that nutrient transport from the site during the construction phase will be minimised by implementation of appropriate sediment control measures.

All construction staff engaged in undertaking initial soil disturbance will undergo a Cultural Heritage finds induction by the Tweed Byron Local Aboriginal Land Council (TBLALC) as required by the Aboriginal Cultural Heritage Management Plan (ACHMP) prior to working on site. Construction staff shall be trained in the 'stop work requirements' of the ACHMP.

The following detachable pages detail the provisions of this SWMP for the construction phase.

[1] Landcom, 2004, 'Managing Urban Stormwater, Soils and Construction' 4th Edition, March 2004.

3.1 Dust management

Applies to	Bulk earthworks and civil construction phases of Stage 1 Precinct 5
Person responsible	Contractor's site manager

Issue	Minimisation of movement of dust offsite
Operational policy	To achieve acceptable air quality standards through the control of the movement of dust offsite from site works
Performance criteria	The target level for complaints by nearby residents is no more than one in any seven-day period. Ambient air quality will not deteriorate by more than 30% over a period of seven consecutive days. Dust deposition at any nearby residence will not exceed 120 mg/m^2/month.
Implementation strategy	The minimisation of the movement of dust offsite will be achieved through the following onsite practices in accordance with the approved ESCP. Where any inconsistency exists between this plan and the approved ESCP, the approved ESCP shall prevail: • Construction works shall be staged to limit the areas exposed at any one time. • All permanent bunds and reshaped areas will be revegetated within 10 days after completion of earthworks (including excavation and backfilling of services trenches). • Stockpiling onsite will be minimised where possible. • Ground surfaces will be kept damp (not wet). • Surfaces shall be left in a rough cloddy condition to increase roughness and slow surface wind speed. • An on-site water cart will be available at all times. • All work to cease if wind speed exceeds 10m/sec (36 km/hr). • Contractors staff to be trained to implement dust minimisation measures. • Protective ground covers shall be provided, including mulches, vegetation, organic binders or dust retardants. • Traffic movement on any disturbed areas shall be minimised.
Monitoring	Daily inspections will be carried out to verify that dust mitigation measures are being implemented. Dust monitoring will be conducted upon receipt of complaints by residents. If dust monitoring is to take place, the following will occur: • temporary dust deposition gauges will monitor the movement of dust offsite at; – the residence/s from which the compliant has been received, – at the boundary of the construction site, in line with the residence/s (ideal in the predominant wind directions); and – at a suitable 'regional background' location which is not be affected by construction dust, to provide background context for analysis and interpretation. • monitoring will be undertaken in accordance with AS 3580.10.1(2016).

Auditing	Management to examine the complaints register weekly and review corrective action taken.
Reporting	Within 24 hours of detecting any incidents during construction that causes (or may cause) significant harm to the environment, the Proponent shall notify the Council and other relevant agencies of the incident and identify the following: • Describe the date, time, and nature of the incident. • Identify the cause (or likely case) of the incident. • Describe what action has been taken to date. • Describe any proposed measures to address the incident. A record of Complaints received shall be maintained in a Complaints Register and kept onsite for inspection by statutory authorities upon request.
Identification of incident or failure	Any verified dust-related complaints by residents will indicate a failure of the dust control measures.
Corrective action	Locate the source of the dust and implement the following measures: • Apply water sprays to vegetation. • Cover or water exposed areas of soil. • Monitor and log the wind direction and speed. • If dust persists, cease the dust creating activities. • All dust complaints to be addressed in consultation with council officers. Upon receipt of a complaint follow the Complaints Procedure provided in Section 1.7.

Commitment 3

Dust generated during the construction of the subdivision works will be managed to ensure that dust movement offsite is controlled.

3.2 Sediment and erosion controls

Applies to	Bulk earthworks and civil construction phases of Stage 1 Precinct 5
Person responsible	Contractor's site manager

Issue	Sediment and Erosion Controls
Operational policy	To prevent the displacement of sediment and soil across and offsite in accordance with the approved ESCP. Where any inconsistency exists between this plan and the approved ESCP, the approved ESCP shall prevail.
Performance criteria	No visual indication of erosion on stages under construction, including evidence of rilling (an indicator of sheet erosion).
Implementation strategy	Erosion and sediment control devices shall be installed prior to commencement of work in accordance with the approved ESCP. Where possible, the construction program shall be scheduled to minimise the potential for soil loss to occur. Where construction activities cannot be altered, additional controls shall be implemented in the areas of high erosion potential. Runoff and erosion controls shall be installed prior to clearing and include: • Diversion of upslope runoff around cleared and/or disturbed areas in a way that minimises erosion, minimises the upslope catchment and diverts waters to a legal point of discharge. • Sediment control fences and/or other measures shall be installed at the downslope perimeter of cleared and/or disturbed areas. • Maintenance of all erosion control measures at operational capacity until land is effectively rehabilitated. Temporary erosion measures (e.g. straw bales, straw fences) are to be employed onsite during construction where reasonably deemed necessary by TSC from an assessment of slope and soil type. Such measures shall be maintained at, or above their design capacity. Such measures will be in accordance with the recommendations in Council's '*Code of Practice for Soil and Water Management on Construction Works – Annexure A of Development Design Specification D7 – Stormwater Quality'* and "*Managing Urban Stormwater: Soils and Construction*" March 2004 by Landcom, Australia. In areas where more than 1,000m^2 are to be disturbed, runoff controls are also to include measures such as, but not limited to: • Sediment basins • The use of barrier fencing, • The utilisation of exclusions zones, and • Minimising slope lengths of disturbed, uncontrolled areas. Stripped topsoil shall be separated from subsoil materials and shall only be stripped from the areas designated on the appropriate plans.

	Stockpiled soil will be stored taking into account the following considerations: • They are not to be located on public footpaths, nature strips, roads, road shoulders or any other public land. • They are to be located at least 2 m away from any hazard areas. • They are to be protected from upslope surface flows, and • They are to be provided with sediment filters downslope. Fill batters shall be located to avoid established trees. Unless otherwise specified, trenches must be backfilled and compacted to 95% standard compaction and capped with topsoil. Excess spoil can be retained onsite provided the stockpile area is prepared by stripping topsoil from beneath the fill site for further use in revegetation. Outside the construction area of Stage 1, existing surface water conditions will be maintained wherever possible. All stockpiles, including preload, will be seeded within a fortnight of final forming with an appropriate mix. Sediment basins and clean-water diversion channels shall be constructed prior to earthworks in accordance with the drawings detailed in the ESCP. Sediment shall be cleaned out of sediment basins when accumulated sediment volume reaches 70%. Removed materials must be disposed of in a manner that does not cause pollution. Sediment basins shall be dosed with gypsum at a rate of 32kg/100m^3 of water when required to ensure that discharge water quality meets required limits. Level markers shall be installed within all sediment ponds to monitor sediment accumulation. All weather access tracks shall be constructed to all internal water bodies, trash racks and gross pollutant traps. Where increased stormwater runoff is likely to accelerate erosion of any downstream watercourse, the necessary remedial work shall be undertaken. All immediate downstream drainage inlets shall have appropriate controls installed. Outside the construction area of Stage 1 existing surface water conditions will be maintained wherever possible.
Monitoring	• Carry out visual inspections weekly and after rainfall events to ensure that erosion measures are in place and operational to suit the activities taking place at the time. • Surface water quality to be monitored (refer to the Section titled ‘Surface Water Monitoring’ which details monitoring of surface water and stormwater quality).
Auditing	Regular self audits shall be carried out in accordance with the above monitoring requirements. Additional visual inspections to be carried out monthly and after rainfall events to verify that control measures are in place and properly maintained.

Reporting	Signed, completed self audits, original test results, rainfall-event and other result sheets shall be kept on site and made available on request to TSC officers and other relevant statutory authorities. Within 24 hours of detecting any incidents during construction that causes (or may cause) significant harm to the environment, the Proponent shall notify the Council and other relevant agencies of the incident and identify the following: • Describe the date, time, and nature of the incident. • Identify the cause (or likely case) of the incident. • Describe what action has been taken to date. • Describe any proposed measures to address the incident. A record of Complaints received shall be maintained in a Complaints Register and kept onsite for inspection by statutory authorities upon request.
Identification of incident or failure	• Signs of erosion on site. • Damaged or failed erosion and sediment control devices. • Falling stormwater quality as identified by Environmental Consultant. • Build-up of sediment in receiving environment.
Corrective action	Apply remedial measures to improve sediment and erosion measures, for example: silt fences, shake down areas. Upon receipt of a complaint follow the Complaints Procedure provided in Section 1.7.

Commitment 4

Best management practices will be implemented into work practices throughout the construction of the subdivision works to minimise erosion and sediment transport offsite.

3.3 Surface water monitoring on site

Applies to:	Bulk earthworks phase and civil construction phase of Stage 1, Precinct 5
Person responsible:	Contractor's Site Manager; Environmental Consultant

Issue	Surface water controls.
Operational policy	To maintain the water quality conditions of the receiving waters during the construction phase of the development.
Performance criteria	Surface water monitoring will be conducted monthly and following the first monthly rainfall event (defined as >25mm in 24 hours) at the locations shown on Drawing No. 12017_001 for the parameters listed in Section 2.1. Results shall be compared with the surface water quality criteria (indicator parameters only) detailed below;

Surface water quality criteria			
Parameter	Saline (SW1, SW2, SW6, and SW9)	Brackish (SW5)	Fresh (SW3, SW4, SW7, SW8 and SW10)
pH	5.66-6.3	5.34-6.14	5.23-6.66
Electrical Conductivity	<38700 µs/cm	<4008.6 µs/cm	<230.4 µs/cm
Dissolved Oxygen	>7.10 mg/L	>4.87 mg/L	>2.91 mg/L
Turbidity	<3.1 mg/L	<23.76 mg/L	<32.54 mg/L
Total Nitrogen	<0.5 mg/L	<1 mg/L	<1.46 mg/L
Total Phosphorus	<0.03 mg/L	<0.04 mg/L	<0.14 mg/L
Iron (total)	<0.41 mg/L	<4.40 mg/L	<6.57 mg/L
Aluminium (total)	<0.22 mg/L	<0.36 mg/L	<0.68 mg/L
Chlorophyll-a	<6 µg/L	<6 µg/L	<6 µg/L
Litter and gross pollutants	No man made material <5 mm in any dimension	No man made material <5 mm in any dimension	No man made material <5 mm in any dimension
Oil and/or grease	No visible film, no detectable odour	No visible film, no detectable odour	No visible film, no detectable odour

*Note: pH must be consistent with receiving water quality. Consideration must be given to the preferred water quality conditions of WSF communities when interpreting pH results against the site-specific water quality criteria. If receiving waters are estuarine, pH can range from 5.5 -7.5; if receiving waters are fresh, pH can range from 4.2 – 6.7 in accordance with the *Threatened Species Management Plans* (JWA, 20120a-c) for habitat requirements for Wallum Froglet (*Crinia signifera*) and the *Wallum Sedge Frog Management Plan* (JWA 2020g) for habitat requirements for the Wallum sedge Frog (*Litoria olongburensis*).

<table>
<tr><td></td><td>Results of monitoring will also be compared to the Tweed Catchment Water Quality Objectives[2] (in accordance with the Project Approval Condition 21[5]) as below;
<table>
<tr><th>Parameter</th><th>Unit</th><th>Objective</th></tr>
<tr><td>pH</td><td>pH units</td><td>Freshwater 6.5 - 8.5
Estuary 7 - 8.5</td></tr>
<tr><td>Dissolved oxygen</td><td>mg/L</td><td>80 - 100% saturation</td></tr>
<tr><td>Turbidity</td><td>NTU</td><td>0.5 - 10 NTU</td></tr>
<tr><td>Total phosphorous</td><td>mg/L</td><td>0.03 mg/L</td></tr>
<tr><td>Total nitrogen</td><td>mg/L</td><td>0.3mg/L</td></tr>
<tr><td>Chlorophyll a</td><td>ug/L</td><td><4</td></tr>
</table>
Note: These objectives are included for comparison only and do not constitute compliance criteria for the site. In many instances, baseline site water quality does not meet these objectives.</td></tr>
<tr><td>Implementation strategy</td><td>Construction of temporary sediment detention basins, clean-water diversion channels, swales and vegetated filter strips will be constructed prior to the commencement of earthworks in accordance with the approved Erosion and Sediment Control Plan (ESCP).

Stormwater control will be achieved by directing as much runoff from disturbed areas as practicable to the sediment detention basins.

Clean water diversion channels will be used to divert clean water from construction areas.

Monitoring of the sediment detention basins prior to controlled release shall occur in accordance with the approved ESCP. Monitoring shall be undertaken for pH, turbidity and suspended solids to ensure compliance with background conditions (as relevant to the discharge location).

Water that exhibits a suspended solids concentration greater than 50 mg L^{-1} can be discharged from the site providing the concentration in the discharge is 10% less than the concentration exhibited in the receiving water.

Where water quality fails to meet the established criteria, corrective measures will be undertaken (e.g. if sediment problems are identified, settling in the sediment detention ponds shall be aided by dosing with flocculation agents) to achieve compliance with the water quality release criteria. Treated water is to be re-tested prior to release to establish the effectiveness of treatment measures.

Landscaping activities and revegetation will occur progressively as soon as possible after areas reach final grade.

Only appropriate herbicides and fertilisers are to be used in accordance with TSC specifications.</td></tr>
<tr><td>Monitoring</td><td>Surface water monitoring will be conducted monthly and following the first monthly rainfall event (defined as >25mm in 24 hours) at the locations shown on Drawing No. 12017_01 for the parameters listed above.</td></tr>
</table>

[2] https://www.environment.nsw.gov.au/ieo/Tweed/report-02.htm

	Surface water and groundwater quality monitoring are to be conducted simultaneously to allow temporal comparisons between the systems. Sample recovery and in situ analysis will be performed by trained onsite staff and, when required, samples will be forwarded to a NATA-accredited laboratory. Sediment and erosion control measures will be inspected regularly in accordance with the approved ESCP.
Auditing	Environmental consultant to audit water quality results to ensure all discharges from sediment basins comply with the performance criteria as relevant at the discharge location. Environmental consultant to audit monthly and rainfall event water quality results against the site specific water quality criteria.
Reporting	Result sheets to be compiled for monitoring results relating to water quality of water bodies. These results to be kept onsite for inspection by local and state government officers. Monthly reports to be submitted to TSC until completion of works. These reports will be submitted to TSC within 30 working days upon receipt of the laboratory results. The water quality reports will be prepared by a suitably qualified and experienced Environmental Consultant. These reports will detail: • The results for each of the environmental indicators monitored. • An assessment of the monitoring results against the criteria. • Consideration must be given to the preferred water quality conditions of WSF communities when interpreting pH results against the site-specific water quality criteria. • When interpreting compliance with the adopted water quality criteria, it is essential to acknowledge that the values of water quality indicators vary naturally and that not all of this variation is ecologically important[3]. • An evaluation, if applicable, of the environmental conditions if monitoring results fall outside the limits of the release criteria. • Recommendations that are relevant to ensuring a high level of water quality is maintained. • Each report will include previous water quality results in tabular format for comparative purposes and trend graphs will be provided. Laboratory certificates will be provided. Within 24 hours of detecting any incidents during construction that causes (or may cause) significant harm to the environment, the Proponent shall notify the Council and other relevant agencies of the incident and identify the following: • Describe the date, time, and nature of the incident. • Identify the cause (or likely case) of the incident. • Describe what action has been taken to date. • Describe any proposed measures to address the incident.

[3] Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1, 2000, Section 3.1, Page 21.

	A record of Complaints received shall be maintained in a Complaints Register and kept onsite for inspection by statutory authorities upon request.
Identification of incident or failure	The values of water quality indicators will vary naturally and not all of this variation is ecologically important. The site-specific criteria are based on the 80th percentile of the baseline data set and thus the probability of a single observation exceeding the 80th percentile is 20%. The probability of a Type 1 error (or the risk of triggering a false alarm) is 20%. The recording of a single result that exceeds the criteria will be used to trigger additional investigations including an increase to fortnightly monitoring of the parameter(s) in question. Results will be used to ascertain whether an adverse trend may be emerging and if so, allow early detection of the cause of the trend. The findings of such site investigations will be used to determine whether a non-compliance has occurred.
Corrective action	All development activities taking place at the time of incident/failure shall be reviewed to verify compliance with the SWMP provisions and, if necessary, construction methods and procedures shall be adjusted. Specific strategies to be implemented in consultation with the Environmental Consultant can include the following. **pH** In the event that the pH of waters falls outside of the critical limits, such waters will be contained and the pH adjusted to within the target range prior to release. **Electrical conductivity** If electrical conductivity exceeds the relevant background criteria, the waters will be contained onsite until adequate EC levels are reached. Further monitoring of upstream waters will be conducted to assess the impact of the development on the absolute change to water quality. Rainfall data will also be assessed at such times to determine the impact that rainfall has had on the water quality of the site and discharging waters. **Suspended solids and turbidity** If total suspended solids exceed the relevant background criteria the waters will be contained onsite for a period sufficient to allow suspended solids to settle out prior to release, or treated with a flocculent. After gypsum has been applied, the stored waters will be retested immediately prior to discharge. Erosion control devices will be immediately inspected and cleaned if necessary. Additional devices will be installed if a need is detected to prevent future breaches of the suspended solids criteria. The placement of stockpiles and management of disturbed areas will be reviewed with respect to the approved ESCP. **Dissolved oxygen** In the event that dissolved oxygen levels drop below the relevant background criteria, the waters will not be released until visual inspections for algae have been carried out. If algae are present, further laboratory tests will be carried out to determine the type of algae in the waters.

	A general investigation will be carried out of the flow conditions of the affected waters, to assess the flow rates and volume of water passing through the monitoring locations and suitability for release. **Litter and gross pollutants** In the event that litter and gross pollutants with a dimension greater than 5mm are observed, this material will be clean up and appropriately disposed of as soon as practicable. The contractor shall inform staff of the appropriate waste disposal procedures and reiterate the importance and sensitivity of the surrounding ecosystems. **Oil and grease** In the event that oil and grease are visible and/or an odour is detected within a waterbody, management strategies will be implemented. Specifically, the waters shall be contained and the oil and grease isolated through the use of booms, containments bunds or other appropriate measures. Remediation works shall be implemented in consultation with the environmental consultant and DPIE. Upon receipt of a complaint follow the Complaints Procedure provided in Section 1.7.

Commitment 5

The Proponent will take all reasonable steps to ensure that all waters discharged from the site during the construction phase meet the performance criteria set out above.

3.4 Surface water monitoring – permanent treatment measures

Applies to	Completed permanent stormwater treatment measures in Stage 1 Precinct 5
Person responsible	Contractor's Site Manager, Consulting Engineer, Environmental Consultant

Issue	Surface water controls, permanent treatment measures.
Operational policy	To maintain the water quality conditions of receiving waters during the bulk earthworks and civil construction phases.
Performance criteria	All water discharged from the permanent treatment measures will comply with the following criteria;

Surface water quality criteria			
Parameter	Saline (SW1, SW2, SW6, and SW9)	Brackish (SW5)	Fresh (SW3, SW4, SW7, SW8 and SW10)
pH	5.66-6.3	5.34-6.14	5.23-6.66
Electrical Conductivity	<38700 µs/cm	<4008.6 µs/cm	<230.4 µs/cm
Dissolved Oxygen	>7.10 mg/L	>4.87 mg/L	>2.91 mg/L
Turbidity	<3.1 mg/L	<23.76 mg/L	<32.54 mg/L
Total Nitrogen	<0.5 mg/L	<1 mg/L	<1.46 mg/L
Total Phosphorus	<0.03 mg/L	<0.04 mg/L	<0.14 mg/L
Iron (total)	<0.41 mg/L	<4.40 mg/L	<6.57 mg/L
Aluminium (total)	<0.22 mg/L	<0.36 mg/L	<0.68 mg/L
Chlorophyll-a	<6 µg/L	<6 µg/L	<6 µg/L
Litter and gross pollutants	No man made material <5 mm in any dimension	No man made material <5 mm in any dimension	No man made material <5 mm in any dimension
Oil and/or grease	No visible film, no detectable odour	No visible film, no detectable odour	No visible film, no detectable odour

*Note: pH must be consistent with receiving water quality. Consideration must be given to the preferred water quality conditions of WSF communities when interpreting pH results against the site-specific water quality criteria. If receiving waters are estuarine, pH can range from 5.5 -7.5; if receiving waters are fresh, pH can range from 4.2 – 6.7 in accordance with the *Threatened Species Management Plans* (JWA, 20120a-c) for habitat requirements for Wallum Froglet (*Crinia signifera*) and the *Wallum Sedge Frog Management Plan* (JWA 2020g) for habitat requirements for the Wallum sedge Frog (*Litoria olongburensis*).

<table>
<tr><td></td><td>Results of monitoring will also be compared to the Tweed Catchment Water Quality Objectives[4] (in accordance with the Project Approval Condition 21[5]) as below;
<table>
<tr><th>Parameter</th><th>Unit</th><th>Objective</th></tr>
<tr><td>pH</td><td>pH units</td><td>Freshwater 6.5 - 8.5
Estuary 7 - 8.5</td></tr>
<tr><td>Dissolved oxygen</td><td>mg/L</td><td>80 - 100% saturation</td></tr>
<tr><td>Turbidity</td><td>NTU</td><td>0.5 - 10 NTU</td></tr>
<tr><td>Total phosphorous</td><td>mg/L</td><td>0.03 mg/L</td></tr>
<tr><td>Total nitrogen</td><td>mg/L</td><td>0.3mg/L</td></tr>
<tr><td>Chlorophyll a</td><td>ug/L</td><td><4</td></tr>
</table>
Note: These objectives are included for comparison only and do not constitute compliance criteria for the site. In many instances, baseline site water quality does not meet these objectives.</td></tr>
<tr><td>Implementation strategy</td><td>• Maintenance of internal bioretention and filter basins, waterbodies, swales and vegetated filter strips as specified at detailed design and approved by TSC.
• Surface water monitoring will be conducted monthly and following the first monthly rainfall event (defined as >25mm in 24 hours) at the locations shown on Drawing No. 12017_01 for the parameters listed in Section 2.1 and analysed at a NATA-accredited laboratory.
• Where water quality fails to meet the established criteria, corrective measures will be undertaken to achieve compliance with the water quality release criteria. Treated water is to be re-tested prior to release to establish the effectiveness of treatment measures.
• Only appropriate herbicides and fertilisers are to be used in accordance with TSC specifications.
• Inspection and maintenance of GPT’s on a quarterly basis or after significant rainfall events.</td></tr>
<tr><td>Monitoring</td><td>Surface water monitoring will be conducted monthly and following the first monthly rainfall event (defined as >25mm in 24 hours) at the locations shown on Drawing No. 12017_01 for the parameters listed above and analysed at a NATA-accredited laboratory.</td></tr>
<tr><td>Auditing</td><td>Environmental consultant to audit monthly and rainfall event water quality results against the site specific water quality criteria.</td></tr>
<tr><td>Reporting</td><td>Result sheets to be compiled for monitoring results relating to water quality of water bodies. These results to be kept onsite for inspection by local and state government officers.</td></tr>
</table>

[4] https://www.environment.nsw.gov.au/ieo/Tweed/report-02.htm

	Monthly reports to be submitted to TSC until completion of works. These reports will be submitted to TSC within 30 working days upon receipt of the laboratory results. The water quality reports will be prepared by a suitably qualified and experienced Environmental Consultant. These reports will detail: • The results for each of the environmental indicators monitored. • An assessment of the monitoring results against the criteria. • Consideration must be given to the preferred water quality conditions of WSF communities when interpreting pH results against the site-specific water quality criteria. • When interpreting compliance with the adopted water quality criteria, it is essential to acknowledge that the values of water quality indicators vary naturally and that not all of this variation is ecologically important[5]. • An evaluation, if applicable, of the environmental conditions if monitoring results fall outside the limits of the release criteria. • Recommendations that are relevant to ensuring a high level of water quality is maintained. • Each report will include previous water quality results in tabular format for comparative purposes and trend graphs will be provided. Laboratory certificates will be provided. Within 24 hours of detecting any incidents during construction that causes (or may cause) significant harm to the environment, the Proponent shall notify the Council and other relevant agencies of the incident and identify the following: • Describe the date, time, and nature of the incident. • Identify the cause (or likely case) of the incident. • Describe what action has been taken to date. • Describe any proposed measures to address the incident. A record of Complaints received shall be maintained in a Complaints Register and kept onsite for inspection by statutory authorities upon request.
Identification of incident or failure	The values of water quality indicators will vary naturally and not all of this variation is ecologically important. The site-specific criteria are based on the 80th percentile of the baseline data set and thus the probability of a single observation exceeding the 80th percentile is 20%. The probability of a Type 1 error (or the risk of triggering a false alarm) is 20%. The recording of a single result that exceeds the criteria will be used to trigger additional investigations including an increase to fortnightly monitoring of the parameter(s) in question. Results will be used to ascertain whether an adverse trend may be emerging and if so, allow early detection of the cause of the trend. The findings of such site investigations will be used to determine whether a non-compliance has occurred.

[5] Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1, 2000, Section 3.1, Page 21.

Corrective action	Locate the source of the contaminant. Take all possible actions to contain and control the contaminant. Investigate the cause of the contamination and take action to prevent a recurrence. If the test result for any parameter fails to meet the performance criteria, then weekly monitoring shall commence and continue until the recorded value/s meets the performance criteria. For example: • If total suspended solids exceed the water quality criteria for this parameter, then water will need to be contained on site for a period sufficient to allow suspended solids to settle out prior to release, or settling shall be aided by dosing with flocculation agents at the rate recommended by the manufacturer. Erosion control devices will be immediately inspected and cleaned if necessary. Additional site stabilisation will be undertaken if a need is detected to prevent future breaches of the suspended solids criteria. • If Total N levels are high, check upstream water quality. Check fertiliser application rates on landscaping work and adjust as required. • If Total P levels are high, check effluent disposal practices upstream. Check fertiliser rates on landscaping work on site and adjust as required. • If Oil and Grease levels are high, locate the source of the contamination and clean up source and contaminated waters in consultation with Council officers.

Commitment 6

Surface water quality discharging from the permanent treatment measures and within the receiving environment will be monitored to ensure devices are functioning as designed.

3.5 Contractor management

Applies to	Bulk earthworks and civil construction phases of Stage 1 Precinct 5.
Person responsible	Consulting Engineer.

Issue	Contractor management.
Operational policy	To ensure the proponent's duty of care is met by ensuring the Contractor is aware of his responsibilities under the terms of the SWMP and the POEO ACT.
Performance criteria	Contractor is fully aware of their responsibilities under the terms of the SWMP.
Implementation strategy	• Review of the SWMP and the construction phase contracts by the proponent. • Periodic checks to be made by an independent Environmental Consultant. • Training for construction staff in implementation of SWMP provisions.
Monitoring	Weekly site inspections to be carried out.
Auditing	Inspections will be carried out monthly during the construction phase by an Environmental Consultant for every stage of development.
Reporting	Full details to be available to the contractor together with suggested corrective actions if required.
Corrective action	To be detailed at the time.

Commitment 7

A proactive program of contractor management will be implemented.

4 Management of potential impacts – on maintenance phase

4.1 Intent

This part of the SWMP specifies those matters which must be complied with by the Proponent during the 6 months 'on-maintenance period', being the period after construction but before TSC assumes responsibility for the subdivision works. The Proponents' obligations in this Section of the SWMP conclude at the end of the maintenance period for each stage.

4.2 Implementation

At the completion of the construction of the development's civil works, the permanent stormwater treatment devices will be cleaned out to become part of the permanent stormwater quality control treatment train.

4.3 Sediment and erosion controls

Applies to	On-maintenance phase of Stage 1 Precinct 5.
Person responsible	Contractor's site manager, Consulting Engineer.

Issue	Sediment and erosion controls.
Operational policy	To prevent the displacement of sediment and soil across and offsite.
Performance criteria	ESC devices installed and maintained in accordance with the on-maintenance phase controls of the approved ESCP.
Implementation strategy	Any remaining temporary erosion and sediment control devices shall be maintained in an operational state during the maintenance period in accordance with the approved ESCP.
Monitoring	Any remaining sediment and erosion control measures will be inspected daily by the site manager during periods of rainfall. Permanent stormwater quality control structures (GPTs, bioretention basins, wetlands etc.) are to be inspected monthly and after rainfall events.
Auditing	Quarterly audits to be carried out by an independent Environmental Consultant.
Reporting	Reporting only required in the event of declining water quality in the receiving environment that is a result of the site.
Identification of incident or failure	• Signs of erosion on site. • Build-up of sediment. • Falling stormwater quality.
Corrective action	Repair temporary sediment and erosion control measures. Check permanent measures for build-up of sediment and clean out as necessary.

Commitment 8

Any remaining erosion and sediment control devices will be maintained during the on-maintenance period until the risk of soil erosion and sediment transport is considered negligible.

4.4 Surface water monitoring – permanent treatment devices

Applies to	On-maintenance phase
Person responsible	Contractor's Site Manager, Environmental Consultant

Issue	Surface water monitoring in new permanent treatment devices
Operational policy	To establish stable surface water conditions and verify that development management is appropriate.
Performance criteria	All water discharged from the controlled discharge points will comply with the water quality criteria in Table 2.4.
Implementation strategy	Maintenance of internal bioretention and filter basins, waterbodies, swales and vegetated filter strips as specified at detailed design. Surface water monitoring will be conducted quarterly and following the first quarterly rainfall event (defined as >25mm in 24 hours) at the locations shown on Drawing No. 12017_01 for the parameters listed in Section 2.1 and analysed at a NATA-accredited laboratory. Where water quality fails to meet the established criteria, corrective measures will be undertaken to achieve compliance with the water quality release criteria. Treated water is to be re-tested prior to release to establish the effectiveness of treatment measures. Only appropriate herbicides and fertilisers are to be used in accordance with TSC specifications. Clean-up of GPT's on a quarterly basis or after significant rainfall events.
Monitoring	Surface water monitoring will be conducted quarterly and following the first quarterly rainfall event (defined as >25mm in 24 hours) at the locations shown on Drawing No. 12017_01 for the parameters listed above and analysed at a NATA-accredited laboratory.
Auditing	Environmental consultant to audit water quality results quarterly to ensure all discharges comply with the performance criteria.
Reporting of monitoring results	Result sheets to be compiled for monitoring results relating to water quality of water bodies. These results to be kept onsite for inspection by local and state government officers. Quarterly report to be submitted to TSC. These reports will be submitted to TSC within 30 working days upon receipt of the final monthly set of laboratory results received for the biannual period. The water quality reports will be prepared by a suitably qualified and experienced Environmental Consultant. These reports will detail: • The results for each of the environmental indicators monitored. • An assessment of the monitoring results against the release criteria.

	• An evaluation, if applicable, of the environmental conditions if monitoring results fall outside the limits of the release criteria. • Recommendations that are relevant to ensuring a high level of water quality is maintained. • Each report will include the previous 6-month's water quality results in tabular format, along with historical monitoring results, for comparative purposes and trend graphs will be provided. Laboratory certificates will be provided.
Identification of incident or failure	The values of water quality indicators will vary naturally and not all of this variation is ecologically important[6]. The site-specific criteria are based on the 80th percentile of the baseline data set and thus the probability of a single observation exceeding the 80th percentile is 20%. The probability of a Type 1 error (or the risk of triggering a false alarm) is 20%. The recording of a single result that exceeds the criteria will be used to trigger additional investigations including an increase to fortnightly monitoring of the parameter(s) in question. Results will be used to ascertain whether an adverse trend may be emerging and if so, allow early detection of the cause of the trend. The findings of such site investigations will be used to determine whether a non-compliance has occurred.
Corrective action	To be determined in consultation with the environmental consultant.

Commitment 9

Subdivision works will be maintained during the maintenance period to ensure surface water quality complies with the water quality criteria detailed above.

[6] Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1, 2000, Section 3.1, Page 21.

4.5 Maintenance of treatment measures

Applies to	On-maintenance phase of Stage 1 Precinct 5
Person responsible	Contractor's Site Manager, Consulting Engineer

Issue	Maintenance of stormwater quality treatment devices
Operational policy	To ensure that the stormwater quality treatment devices are maintained at an appropriate operational standard.
Performance criteria	No significant change in the physical characteristics of treatment devices. No significant change in the physicochemical and/or biological characteristics of the treatment devices.
Implementation strategy	Routine visual inspections and monitoring and maintenance.
Monitoring	Routine monthly visual inspection of stormwater treatment devices and vegetated open space for: • litter; • erosion; • excessive sediment deposition; • clogging (bioretention); • vegetation damage (e.g. die off, weed growth); and • damaged or failed treatment devices. Change in physical characteristics: • water level; and • area, depth or bed profile of any bioretention basin, waterway and wetland system.
Auditing	Audit inspections are to be carried out on a quarterly basis to verify that the stormwater quality control structures are properly maintained by the contractor.
Reporting of monitoring results	A checklist is to be completed which assesses the strategies listed above and includes the following: • A record of inspection details and; • A record of details of all maintenance activities (including volume of silt removed from each GPT or other control structure). Results to made available to TSC at all times. A summary of the inspection checklist findings shall be included in the annual water quality monitoring report.

Identification of incident or failure	Non-compliance with the criteria will be identified by: • Blockage of stormwater system. • Build-up of sediment & litter or re-entrainment of trapped sediments. • Excessive erosion. • Vegetation damage. • Poorly maintained, damaged or failed control devices. • A change in the physical characteristics. • A change in the physicochemical and/or biological characteristics. • Impeded drainage of bioretention and filter basins. • Deterioration of water quality downstream of the control structure/s.
Corrective action	**Bioretention and filter basin maintenance** • Regular harvesting to ensure vegetation is maintained at acceptable levels. • Removal of a portion of vegetation to maintain nutrient and biomass balance. • Removed vegetation to be composted and reused on landscaping in other parts of development site. • Soil renovation (as required) to maintain permeability. • Removal of litter. **Gross pollutant traps** • Removal of trapped material in accordance with manufacturer's specifications. **Vegetated buffer** • Regular mowing and maintenance of buffer filter characteristic by mulching organic matter back into buffer soil profile • ensure vegetation is maintained at acceptable levels (minimum 85% foliage protective cover). • Removal of litter within the swale. • Waterway and wetland system will be managed as per weed management program.

Commitment 11

Stormwater quality control structures will be adequately maintained during the maintenance period to ensure continued performance.

5 Management of potential impacts – operational phase

5.1 Intent

This part of the SWMP specifies those matters that must be complied with by TSC after it assumes responsibility for the subdivision works.

5.2 Implementation

Permanent stormwater quality control structures are to be monitored and maintained as detailed in the following tables.

5.3 Surface water monitoring

Applies to:	Operational phase of Stage 1 Precinct 5.
Person responsible:	Tweed Shire Council

Issue	Surface water monitoring.
Operational policy	Any waters discharged from the site will meet the specified water quality objectives (WQOs). Water quality in the waterway and wetland system will remain at an acceptable level.
Performance criteria	All controlled water discharges from the site will comply with water quality criteria set by pre-construction background monitoring as referred to in Table 2.1.1.
Implementation strategy	Routine surface water quality monitoring to be undertaken.
Monitoring	**Frequency**: Routine biannual monitoring for two years following the completion of the on-maintenance period, with biannual rainfall event (>25mm/24hrs) monitoring campaigns. **Parameters**: Those listed in Table 3.3 in addition to: hydrocarbon (TPH); benzene, toluene, ethylbenzene and xylenes (BTEX); and enterococci. **Vertical Profiling**: Routine biannual monitoring of temperature, dissolved oxygen, pH, conductivity, salinity and turbidity at 0.5 m depths of all off-stream constructed deep water bodies (if present in the current stage of development). Sample recovery and in situ analysis will be performed by a qualified Environmental Scientist and, when required, samples will be forwarded to a NATA-accredited laboratory.
Auditing	Biannual audits to be undertaken.
Reporting	Annual Water quality report to be completed by TSC.
Identification of incident or failure	Surface water quality parameter monitoring identifying exceedance of WQOs.
Corrective action	If exceedance of WQOs continues to occur, inspect all treatment techniques, revise designs or review different alternatives and install if necessary.

5.4 Maintenance of treatment measures

Applies to	Operational phase of Stage 1 Precinct 5
Person responsible	Tweed Shire Council

Issue	Maintenance of stormwater quality treatment devices.
Operational policy	To ensure that the stormwater quality treatment devices are maintained at an appropriate operational standard.
Performance criteria	No significant change in the physical characteristics of treatment devices. No significant change in the physicochemical and/or biological characteristics of the treatment devices.
Implementation strategy	Routine visual inspections and monitoring and maintenance.
Monitoring	Routine quarterly visual inspection of treatment trains and vegetated open space for: • Litter. • Erosion. • Excessive sediment deposition. • Clogging (bioretention). • Vegetation damage (e.g. die off, weed growth). • Damaged or failed treatment devices: • Change in physical characteristics. • Water level. • Area, depth or bed profile of any bioretention basin, waterway and wetland system.
Auditing	Audits are to be carried out on an annual basis to assess the implementation strategy.
Reporting of monitoring results	A checklist is to be completed which assesses the strategies listed above.
Identification of incident or failure	• Non-compliance with the criteria will be identified by: • Blockage of stormwater system. • Build-up of sediment & litter or re-entrainment of trapped sediments. • Excessive erosion. • Vegetation damage. • Poorly maintained, damaged or failed control devices. • A change in the physical characteristics. • A change in the physicochemical and/or biological characteristics. • Impeded drainage of bioretention and filter basins. • Deterioration of water quality downstream of the control structure/s.

Corrective action	**Bioretention and filter basin maintenance** • Regular harvesting to ensure vegetation maintained at acceptable levels. • Removal of a portion of vegetation to maintain nutrient and biomass balance. • Removed vegetation to be composted and reused on landscaping in other parts of development site. • Soil renovation (as required) to maintain permeability. • Removal of litter. **Gross pollutant traps** • Removal of trapped material in accordance with manufacturer's specifications. **Vegetated buffer** • Regular mowing and maintenance of buffer filter characteristic by mulching organic matter back into buffer soil profile. • ensure vegetation is maintained at acceptable levels (minimum 85% foliage protective cover). • Removal of litter within the swale. **Waterway and wetland system** • As per weed management program **Sediment/sludge removal** Sludge and sediments are expected to settle in the inlet zones of the bioretention systems and other water bodies. In the operational state this is expected to be minor and de-silting will only be required on an infrequent basis. Prior to works the recommended best practice method of sediment/sludge removal of the time will be used.

6 Administration of the SWMP

6.1 Amendment of the SWMP

The proponent may make application to TSC to amend the provisions of this SWMP. The application shall:

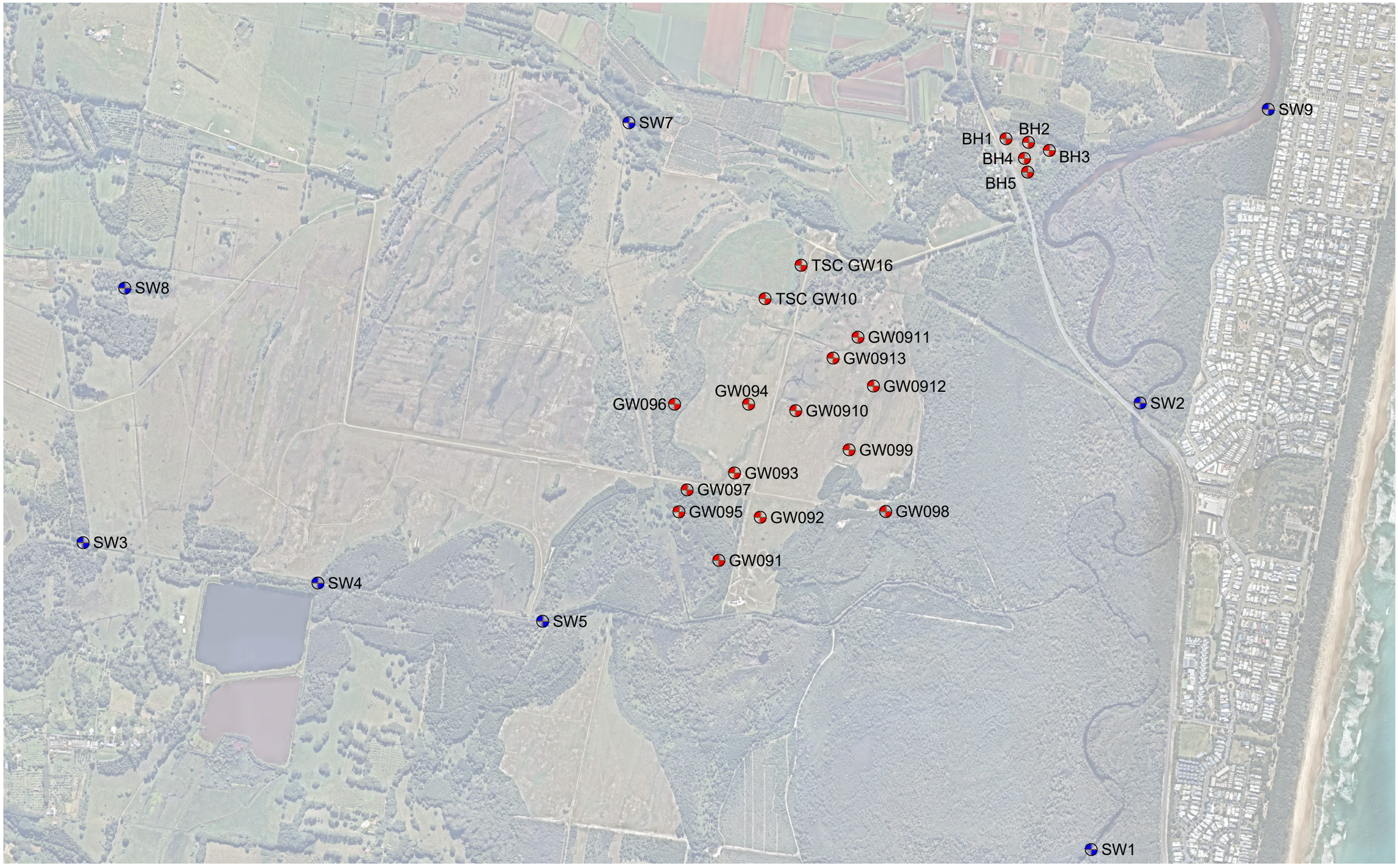
- be in writing;
- specify the provisions of the SWMP to which the application relates; and
- state how the proposed amendment(s) achieve the objectives of the provisions to which the amendment(s) relate.

TSC shall approve the amendment(s) where TSC is satisfied acting reasonably that the proposed amendment(s) achieve the objective of the provisions to which the amendment(s) relates.

6.2 Incident management

The Proponent and any person appointed by the Proponent as having responsibility for a control strategy set out in this SWMP have clearly defined responsibilities under the *Protection of the Environment Operations Act 1997* to report any incidents likely to cause material or serious environmental harm.

7 Attachment 1 – Drawings



ORIENTATION

SCALE 1:12 500

100 200 300 400 500 600
metres

ROBINA

PO Box 4115 Robina QLD4230 07 5578 9944
Email robina@access.gs **www.access.gs**

LEGEND

- Groundwater Bore
- Surface Water

SOURCES

Base Image: *Near Map, Image Date: 06/05/2019*

PROJECT	CLIENT	DRAWING
KINGS FOREST BASELINE MONITORING (PRECINCT 5)	PROJECT 28 PTY LTD	MONITORING LOCATIONS

SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:12500@A3	30/05/2019	RMB	SAM	12017	01	-

GILBERT SUTHERLAND