
Torres Strait Island Regional Council

Saibai Sewage Treatment Plant

Part 1: Condition Assessment

Part 2: Upgrade Options Study Report

Part 3: Environmental Evaluation

Revision B

November 2017



GANDEN Project No. 0615

Executive Summary

Torres Strait Island Regional Council (TSIRC) have been experiencing operational issues with the Saibai Island Sewage Treatment Plant (STP) resulting in numerous breaches of the Environmental License conditions. The Department of Environment and Heritage Protection (DEHP) issued a “Notice to conduct or commission an environmental evaluation” to TSIRC on the 5th of June 2017 following several environmental non-compliances with the Environmental Authority (EA) EPPR00713013 for ERA 16-A(b)(ii).

The grounds on which the notice was issued was:-

“An activity or proposed activity is causing or is likely to cause environmental harm”

The non-compliances noted are summarised as: -

1. Exceedances of effluent water quality parameters (numerous between November 2016 and January 2017);
2. Overflow of effluent from final effluent tank causing release of effluent into the coastal waters; and
3. Release of poorly treated effluent from the Saibai Island STP with the potential to cause environmental harm;

TSIRC has engaged GANDEN Engineers and Project Managers to undertake a condition assessment, environmental evaluation and options analysis for the upgrade of the Saibai Sewage Treatment Plant.

This document provides details on the Environmental Values (EV's) and Water Quality Objectives (WQO's) that are potentially affected by the treatment plant.

The conclusion is that the current criteria associated with Environmental Authority (EA) EPPR00713013 meet the management intent to maintain WQO's or improve current WQO's.

Part 1 Condition Assessment and Part 2-Upgrade Options Study report provide further information on the condition of the current Saibai Island treatment plant and the options that are available for improvement.

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Glossary of Terms

Abbreviations	
ANZECC	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
CHL-a	chlorophyll-a
DEHP	Department of Environment and Heritage Protection
DO	Dissolved oxygen
EA	Environmental Authority
EV	Environmental Values
ERA	Environmental Relevant Authority
EPP Water	Environmental Protection Policy (Water)
FRP	Filterable reactive phosphorus
GRMPA	Great Barrier Reef Marine Park Authority
TSIRC	Torres Strait Island Regional Council
TSS	Total Suspended Solids
STP	Sewage Treatment Plant
WQO	Water Quality Objectives
QWQG	Queensland Water Quality Guidelines

1. Background

Torres Strait Island Regional Council (TSIRC) have been experiencing operational issues with the Saibai Island Sewage Treatment Plant (STP) resulting in numerous breaches of the Environmental License conditions. The Department of Environment and Heritage Protection (DEHP) issued a “*Notice to conduct or commission an environmental evaluation*” to TSIRC on the 5th June 2017 following several environmental non-compliances with the Environmental Authority (EA) EPPR00713013 for ERA 16-A(b)(ii).

The non-compliances noted are summarised as: -

1. Exceedances of effluent water quality parameters (numerous between November 2016 and January 2017);
2. Overflow of effluent from final effluent tank causing release of effluent into the coastal waters; and
3. Release of poorly treated effluent from the Saibai Island STP with the potential to cause environmental harm;

1.1 Notice to Commission Environmental Evaluation

Refer to Appendix A - for the DEHP “Notice to conduct or commission an environmental evaluation”.

As a result of the non-conformances, DEHP have requested that TSIRC undertake an environmental investigation addressing the following: -

1. Environmental Assessment including: -
 - a. Identify the Environmental Values (EVs) and Water Quality Objectives (WQOs) relevant to releases from the Saibai Island STP;
 - b. Provide a description of the default EV/WQOs, characteristics and resilience of the receiving environment;
 - c. Determine the quality that must be achieved for effluent release to protect or enhance EVs and achieve the WQOs.
2. Assessment and projection of sewage flow loadings into the Saibai STP for a 20-year planning horizon and be developed with the Department of Energy and Water Supply ‘*Planning Guidelines for Water Supply and Sewerage, April 2010*’.
3. Detail the capacity of existing sewage infrastructure to meet current and future service demands and environmental standards and identify options for achieving release quality that must be achieved to protect or enhance EVs and achieve the WQOs including, but not limited to:
 - a. A statement of the current performance of the plant in respect to effluent release;
 - b. Details of all options available and a detailed evaluation of potential options to improve and maintain suitable quality of effluent releases;
 - c. Details of technology considerations and their suitability for use in relation to the locality and skill level of operators;
 - d. Review of similar technology and applications in similar environments; and
 - e. Details of cost considerations that include installation/augmentation, commissioning and maintenance.
4. Report on the analysis of options considered, which must: -
 - a. Determine an evaluation criterion linked to quantified service objectives, and which must include consideration of service standards, regulatory compliance, operational and performance efficiency as well as social, environmental and financial objectives;

- b. Determine options which include existing, non-asset and new asset options; and
 - c. Undertake the options analysis, which must include whether the option is technically feasible; considers the physical and operational capacity of the infrastructure including infrastructure appropriateness, condition and limitations; a financial analysis to determine financial viability including financial constraints of each option over the whole lifecycle of the sewage treatment plant and associated infrastructure; analysis of environmental impacts; and a risk assessment of each chosen option.
5. Outline a proposed implementation strategy based on the option/s identified through Requirement 4, which must:
- a. Determine the preferred project delivery option; and
 - b. Develop an implementation program with consideration of funding sources and allocation.

This report seeks to satisfy the requirements of item 1 Environmental Assessment, refer to Part 1: Condition Assessment and/or Upgrade Options Study Report for further details on the other requirements.

2. Environmental Assessment

2.1 Saibai Island

Saibai Island is a flat, mud island with large interior swamps filled with brackish water. Its origins stem from the presence of the Fly River that discharges vast quantities of silt and sediment into nearby coastal waters. Covering an area of 10,400 hectares, it is one of the largest islands in the Torres Strait. Dominant habitat types include mangroves, sand and mudflats, savannah grassland and salt pans. Sand and mudflat habitats provide a 'stepping stone' for wading birds as they migrate through the region. Native flora and fauna that have been identified on Saibai Island include the false water rat, foreshore skink and emerald monitor. As Saibai has large inundated areas that are tidally influenced, the island has limited waterway values other than those associated with marine drainage paths from mangroves and other inland areas. The extensive wetlands and other mangrove areas are environmentally and recreationally significant.

The Saibai Island STP is located on the western edge of the community. The effluent outfall is via a marine pipeline which discharges to the north of the STP.



Figure 1 - Saibai Island, blue dot indicates the approximate location of the community and treatment plant (source Google).



Figure 2 - Saibai STP Locality Plan (source Google)

2.2 Identification of Environmental Values and Water Quality Objectives

Environmental Values (EV's) and Water Quality Objectives (WQO's) are defined for Queensland Waters by the Queensland Government. This data is available on the spatial database "Qspatial". At this stage, the Torres Strait Islands, including Saibai Island, are not defined. An update provided on the 29th of October identifies these areas as "future programs" the Queensland Water Quality Guidelines (QWQG), and where appropriate, the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC) have been used to determine appropriate EV's and WQO's.

2.2.1 Definitions

Environmental Values associated with the receiving environment are defined as: -

"particular values or uses of the environment that are important for a healthy ecosystem or for public benefit, welfare, safety or health and which require protection from the effects of pollution, waste discharges and deposits. (ANZECC 2000)

Or as:-

- a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety; or
- another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation.

Water Quality Objectives are identified as: -

"A water quality objective is a numerical concentration limit or descriptive statement to be measured and reported back on"

2.2.2 Environmental Values

An overview of Environmental Values is listed below in Table 1, inclusive of an assessment of the relevance of the release of effluent from the Saibai Island STP (relevant EV's are marked in orange).

Table 1 List of Environmental values considered in EV's

Environmental value	Definition	Relevance in regards to Saibai Island STP receiving environment
Aquatic Ecosystem	'A community of organisms living within or adjacent to water, including riparian or foreshore area'. (EPP Water, Schedule 2) The intrinsic value of aquatic ecosystems, habitat and wildlife in waterways and riparian areas, for example, biodiversity, ecological interactions, plants, animals, key species (such as turtles, platypus, seagrass and dugongs) and their habitat, food and drinking water. Waterways include perennial and intermittent surface waters, groundwaters, tidal and non-tidal waters, lakes, storages, reservoirs, dams, wetlands, swamps, marshes, lagoons, canals, natural and artificial channels and the bed and banks of waterways.	Effluent discharge will have a potential effect on the receiving environment. The aquatic ecosystem around the effluent discharge area can be described as tidal mudflats (the actual release location of the outfall pipeline is unknown as the pipeline has been cut at an unknown location, refer to the report 0615- SAIBAI STP Condition Assessment Report Rev B for further details).
High Ecological /conservation value waters	'Waters in which the biological integrity of the water is effectively unmodified or highly valued.' (EPP Water, Schedule 2).	This is not applicable to the Saibai Island STP receiving environment
Slightly disturbed waters	'Waters that have the biological integrity of high ecological value waters with slightly modified physical or chemical indicators but effectively unmodified biological indicators' (EPP Water, Schedule 2).	This is not applicable to the Saibai Island STP receiving environment
Moderately disturbed waters	'Waters in which the biological integrity of the water is adversely affected by human activity to a relatively small but measurable degree.' (EPP Water, Schedule 2)	This describes the waters around the Saibai Island STP receiving environment best. Management intent: Maintain WQO's or improve current WQO's
Highly disturbed waters	'Waters that are significantly degraded by human activity and have lower ecological value than high ecological value waters or slightly or moderately disturbed waters.' (EPP Water, Schedule 2).	This is not applicable to the Saibai Island STP receiving environment
Irrigation	Suitability of water supply for irrigation, for example, irrigation of crops, pastures, parks, gardens and recreational areas.	The Saibai Island STP Effluent does not have an effect on the suitability of any water supply for irrigation.
Farm water supply/use:	Suitability of domestic farm water supply, other than drinking water. For example, water used for laundry and produce preparation.	The Saibai Island STP Effluent does not have an effect on the suitability of domestic farm water supply other than drinking water.
Stock watering	Suitability of water supply for production of healthy livestock.	The Saibai Island STP Effluent does not have an effect on the suitability of water supply for production of healthy livestock.

Environmental value	Definition	Relevance in regards to Saibai Island STP receiving environment
Aquaculture	Health of aquaculture species and humans consuming aquatic foods (such as fish, molluscs and crustaceans) from commercial ventures	It is understood that no commercial aquaculture ventures are currently in place however the Saibai Effluent has potential to influence this if such activities are undertaken and should be carefully considered.
Human consumers of aquatic foods	Health of humans consuming aquatic foods, such as fish, crustaceans and shellfish from natural waterways. Note that in some areas oystering is a more specific goal identified under the human consumer EV (see below).	The Saibai Island STP Effluent has the potential to influence human health when consuming aquatic foods, the primary concern is with the potential bacterial and or viral contamination as a result of the discharge effluent effecting shellfish that are consumed raw without flushing.
Primary recreation	Health of humans during recreation which involves direct contact and a high probability of water being swallowed, for example, swimming, surfing, windsurfing, diving and water-skiing. Primary recreational use of water means full body contact with the water, for example, diving, swimming, surfing, waterskiing and windsurfing. (EPP Water, s. 6).	It is understood that these activities do not occur within the receiving environment
Secondary recreation	Health of humans during recreation which involves indirect contact and a low probability of water being swallowed, for example, wading, boating, rowing and fishing. Secondary recreational use, of water, means contact other than full body contact with the water, for example, boating and fishing. (EPP Water, s. 6).	It is understood that this type of contact may occur when landing and launching boats, the risks associated with this activity is associated with the exposure to waters that are potentially bacterially or virally contaminated. Basic hygiene (washing of hands) will provide adequate protection.
Visual recreation	Amenity of waterways for recreation which does not involve any contact with water—for example, walking and picnicking adjacent to a waterway. Visual recreational use of water means viewing the water without contact with it. (EPP Water, s. 6).	The Saibai Island STP Effluent does not have an effect on the visual amenity.
Drinking water supply	Suitability of raw drinking water supply. This assumes minimal treatment of water is required, for example, coarse screening and/or disinfection.	The Saibai Island STP Effluent does not have an effect on the drinking water supply.
Industrial use	Suitability of water supply for industrial use, for example, food, beverage, paper, petroleum and power industries, mining and minerals refining/processing. Industries usually treat water supplies to meet their needs.	The Saibai Island STP Effluent does not have an effect on the water supply for industrial use.

Environmental value	Definition	Relevance in regards to Saibai Island STP receiving environment
Cultural and spiritual values	Indigenous and non-indigenous cultural heritage, for example: • custodial, spiritual, cultural and traditional heritage, hunting, gathering and ritual responsibilities • symbols, landmarks and icons (such as waterways, turtles and frogs) • lifestyles (such as agriculture and fishing). Cultural and spiritual values, of water, means its aesthetic, historical, scientific, social or other significance, to the present generation or past or future generations. (EPP Water, s. 6).	The Saibai Island STP Effluent has not been identified as having impact on cultural and spiritual values.

2.2.3 Relationship of ANZECC 2000 Guidelines and QWQG to Environmental Protection (Water) Policy 2009

Water quality guidelines can be developed at different spatial scales (e.g. national, state, local). The Environmental Protection (Water) Policy 2009 outlines the process for determining which water quality guidelines (e.g. national, state, local) to use in water quality planning and decision making. In summary, where there is more than one set of applicable guidelines, the most locally accredited guideline information shall take precedence over broader guidelines. Thus, where the QWQG provides water quality guideline values for Queensland waters that are more localised than the ANZECC 2000 guidelines, the QWQG takes precedence over the (broader) ANZECC 2000 guidelines. However, for a number of indicators, notably toxicants, there is little or no local information. For these indicators the ANZECC 2000 Guidelines will remain the principal source of information.

The Queensland regions for water quality identified in the QWQG does not provide a specific region for the Torres Strait or Saibai Island.

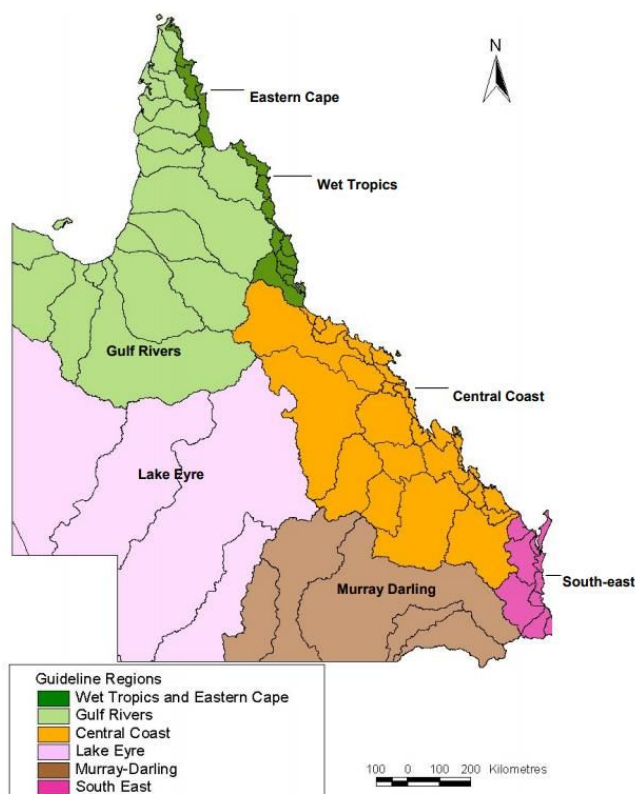


Figure 3 Regions adopted for the Queensland Water Quality Guidelines

Although not specifically identified the most appropriate region for Saibai Island is considered the “Wet Tropics and Eastern Cape”.

The water type associated with the receiving environment as adopted by the QWQG is the ANZECC Base water type Inshore Marine, the Queensland region water type is considered: Wet Tropics, Inshore Marine Enclosed coastal/lower estuary and open coastal. Refer to Figure 4 Water Types adopted by QWQG for Queensland regions for further details.

	Queensland region water types						
ANZECC base water types ¹	SE Qld	Central Qld	Wet Tropics	Eastern Cape York	Gulf	Lake Eyre	Murray Darling
Upland freshwater	A/EHMP	A	A	A	X	X	A
Lowland freshwater	A/EHMP	A	A	A	X	X	A
Lakes	A	A	A	A	X	X	A
Wetlands	A	A	A	A	X	X	A
Estuaries	Upper estuary	Upper estuary	n/a	A	A	n/a	n/a
	Mid-estuary	Mid-estuary	Mid-estuary				
Inshore marine	Enclosed coastal/ lower estuary	Enclosed coastal/ lower estuary	Enclosed coastal/ lower estuary	Enclosed coastal/ lower estuary	Enclosed coastal/ lower estuary	n/a	n/a
	Open Coastal	Open Coastal ³	Open Coastal ³	Open Coastal ³	Open Coastal		
Offshore marine	Note 2	Midshelf ³	Midshelf ³	Midshelf ³	Note 2	n/a	n/a
	Note 2	Offshore ³	Offshore ³	Offshore ³	Note 2	n/a	n/a
Note 1	A = adopt default ANZECC 2000 Guidelines water type X = no types defined n/a = not applicable						
Note 2	Offshore marine areas are outside the limit of Queensland waters (three nautical miles). Refer to ANZECC 2000 Guidelines.						
Note 3	Refer to GBRMP Guidelines for guideline values but see also tables 3.2.1b (Central Coast) and 3.3.1b (Wet Tropics). See section B.2.4.2 for detailed definition of water types within the GBR Marine Park.						

Figure 4 Water Types adopted by QWQG for Queensland regions

2.3 Water Quality Objectives

Based on the above the regional guideline values of physio chemical indicators, the receiving environment for the effluent at Saibai can be classified as Wet Tropics with open coastal, midshelf and offshore waters. These are identified in Figure 5 Regional Guideline Values for physio-chemical indicators – Wet Tropics region open coastal midshelf and offshore waters (based on GRMPA and QWQG guidelines) below.

Water type ⁵	Physico-chemical indicators (see Appendix E) and their guideline ¹ values (slightly to moderately disturbed systems)														
	Amm N	Oxid N	Particulate N ³	Total N	FiltR P	Particulate P ³	Total P	Chl-a ²	TSS ³	Turb	Secchi ⁴	pH		DO (% sat ²)	
	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)	(NTU)	(m)	lower	upper	lower	upper
Open Coastal	2	2	20	140	4	2.8	20	0.45	2	1	10	8.15	8.4	95	105
Midshelf	2	2	20	140	4	2.8	20	0.45	2	<1	10	8.15	8.4	95	105
Offshore	2	2	17	130	4	1.9	10	0.4	0.7	<1	17	8.15	8.4	95	105
Note 1	Guideline values for PN, PP, Chl-a, Secchi and TSS should be compared to mean values rather than median values (see GBRMPA Guidelines, accessible at the following web link: http://www.gbrmpa.gov.au/corp_site/key_issues/water_quality/draft_water_quality_guidelines).														
Note 2	Chlorophyll values are ~40% higher in summer (0.63µg/L) and ~30% lower in winter (0.32µg/L) than mean annual values. Both the annual mean and these seasonal mean values should be regarded equally as guideline values for assessment purposes.														
Note 3	Seasonal (winter/summer) adjustments for TSS, PN and PP guidelines are approximately ±20% of the annual mean values.														
Note 4	Guideline trigger values for water clarity need to be decreased by 20% for areas with greater than 5m tidal ranges.														
Note 5	Water types for the GBR Marine Park are described in Appendix B.														

Figure 5 Regional Guideline Values for physio-chemical indicators – Wet Tropics region open coastal midshelf and offshore waters (based on GRMPA and QWQG guidelines)

2.4 Description of the Default EV and WQO's

This section provides a description of the default EV/WQOs, characteristics and resilience of the receiving environment of the Saibai Island STP.

The applicable EV's for the Saibai STP effluent receiving environment are identified as: -

1. Aquatic Ecosystem,
2. Moderately disturbed waters,
3. Aquaculture (potential),
4. Human consumers of aquatic foods, and
5. Secondary recreation.

These have further detailed and summarised in the below Table 2

Table 2 Environmental values the tick means that the EV is selected for protection.

Saibai Island	Environmental Values											
	Aquatic Ecosystems	Irrigation	Farm Supply	Stock Watering	Aquaculture	Human Consumption	Primary Recreation	Secondary Recreation	Visual appreciation	Drinking water	Industrial use	Cultural and Spiritual
												
Receiving Environment Effluent	✓					✓		✓				✓

Water quality objectives for physio-chemical, nutrient, algal and water clarity indicators to protect ecosystems EV's under baseflow conditions are provided in Table 3 below. These are derived from the Regional Guideline Values for physico-chemical indicators – Wet Tropics region open coastal midshelf and offshore waters (based on GRMPA and QWQG guidelines).

Table 3 Water quality objectives

Level of Protection	Water type	Water quality objectives															
		Physio Chemical			Nutrients								Algal Growth	Water Clarity			
		DO	pH	Ammonia N	Oxidised N	Particulate N	Organic N	Total N	FRP	Particulate P	Total P	Chl-a	Turbidity	Secchi	TSS		
		% saturation	µg/L												NTU	m	mg/l
Table Notes		Water Quality Objectives shown as 20th, 50th and 80th percentiles (i.e. 3-4-5) or as a single value of median or 80th percentile (i.e. 15). DO and pH may be shown as a range of 20th and 80th percentiles (i.e. 85-105).															
Moderately disturbed waters	Open Coastal	95-105	8.115-8.4	2	2	20	Nd	140	Nd	2.8	20	0.45	1	10	2		
	Midshelf	95-105	8.115-8.4	2	2	20	Nd	140	Nd	2.8	20	0.45	<1	10	2		
	Offshore	95-105	8.115-8.4	2	2	17	Nd	140	Nd	1.9	10	0.4	<1	17	0.7		

DO: dissolved oxygen, FRP: filterable reactive phosphorus, Chl-a: chlorophyll-a, TSS: total suspended solids. nd: no (or insufficient) data. • Units % saturation: percent saturation, µg/L: micrograms per litre, NTU: nephelometric turbidity units, m: metres, mg/L: milligrams per litre.

2.5 Water quality objectives for human use environmental values.

This section outlines the WQOs to protect human use EV's e.g. recreation, stock watering aquaculture and crop irrigation etc. The WQOs that are relevant for the Saibai Island STP are identified in Table 2.

Table 4 Water Quality Objectives for protection human use environmental values.

Environmental Value	Water Type	Water Quality objectives to protect the stated EV
Protection of the human consumer (oysters, fish crustaceans)	All coastal waters	WQOs as per ANZECC guidelines and Australia New Zealand Food Standards Code 6, Food Standards Australia New Zealand, 2007 and updates.
Protection of cultural and spiritual values	All coastal waters	Protect or restore indigenous and non-indigenous cultural heritage consistent with any relevant policies and plans.
Suitability for primary contact recreation	All coastal waters	Objectives as per NHMRC (2008), including: •Water free of physical (floating and submerged) hazards •Temperature range: 16–34°C •pH range: 6.5–8.5 •DO: >80% •Faecal contamination: designated recreational waters are protected against direct contamination with fresh faecal material, particularly of human or domesticated animal origin. Two principal components are required for assessing faecal contamination: – assessment of evidence for the likely influence of faecal material – counts of suitable faecal indicator bacteria (usually enterococci) These two components are combined to produce an overall microbial classification of the recreational water body. •Intestinal enterococci: 95th percentile ≤40 organisms per 100mL (for healthy adults) (NHMRC, 2008; table 5.7) •Direct contact with venomous or dangerous aquatic organisms should be avoided. Recreational water bodies should be reasonably free of, or protected from, venomous organisms (e.g. box jellyfish and bluebottles) •Waters contaminated with chemicals that are either toxic or irritating to the skin or mucous membranes are unsuitable for recreational purposes. •Cyanobacteria / algae: Recreational water bodies should not contain ≥ 10 cells/mL <i>Karenia brevis</i> and/or have <i>Lyngbya majuscula</i> and/or <i>Pfiesteria</i> present in high numbers. Further details are contained in NHMRC (2008) and table 3.10.
Suitability for secondary contact recreation	Fresh waters, estuarine and coastal waters	Objectives as per NHMRC (2008), including: •Intestinal enterococci: 95th percentile ≤ 40 organisms per 100mL (for healthy adults) (NHMRC, 2008; table 5.7)

Environmental Value	Water Type	Water Quality objectives to protect the stated EV
		•Cyanobacteria / algae—refer objectives for primary recreation, NHMRC (2008) and table 3.10.

2.5.1 Description and Resilience of the receiving environment

The receiving environment is categorised as tidal mudflats. As further detailed in the report 0615- SAIBAI STP Condition Assessment Report Rev B, the marine outfall pipeline has been cut at an unknown location with the actual location of the outfall is unable to be determined in detail.

The potential impact of the release of effluent from a sewage treatment plant is primarily in relation to additional nutrients being released into the ocean with the potential impact on the receiving environment determined by concentration and overall quantity. Nutrients have the potential to impact on the trophic stages of the receiving environment and eutrophication (nutrient enrichment) as a result of human activities is recognized as a key concern in the management of coastal areas.

The effluent that is being released through the outfall has elevated levels of nutrients when compared to the background levels. These nutrients are however readily diluted within the ocean and based on this no deterioration of the receiving environment is to be expected. The release of effluent is common practice around the world and a significant amount of research has been undertaken to determine the effect of the release of nutrients from STP effluent release. By adding Nitrogen and phosphorus (the two main potential growth limiting nutrients), Eutrophication can lead to ecosystem disturbance resulting in algal blooms however at the quantities released from Saibai island STP effluent in combination with the dilution of the nutrients this is unlikely to occur and there are no known events.

Appendix B - and Table 5 provides the details on the current effluent quality and identifies parameters (red is non-compliant) that are off concern in the current treatment plant. The parameters that are of concern (from a compliance perspective) are identified in red.

The isolated position of Saibai Island and the relatively small population on the island in combination with the absence of larger populations in the region provides further justification that there is no basis to expect a significant impact on the receiving environment. There is no information available that would suggest that there will be an increase in the population in the region.

Based on the information that is available (limited samples are available), approximately 5kg (or 58mg/l) of nitrogen and 0.6kg (5 mg/l) of phosphorus is released on a daily basis by the population of Saibai Island (refer to Appendix B - Table 5 for further details). This quantity of nitrogen and phosphorus will be readily diluted to a point that this will be below the limit of detection. The exceedances noted would have added approximately 2.5kg per day of additional nitrogen to the system, which given the expected dilution and the absence of other pressures on the system is considered negligible. The exceedances were caused by plant operational issues, considered a worst case scenario, under normal operating conditions compliance will not be a problem.

Other parameters that are (in the current operating regime) sometimes in non-compliant are TSS, BOD, Ammonia and Coliforms. These parameters will also be rapidly diluted down with no impact expected on the receiving environment. Table 6 provides an overview of the potential effect that these parameters have on the environmental values.

The compliance issues noted are associated with the current performance of the treatment plant. When the data is interrogated it appears that when the treatment plant is operating an immediate improvement can be noted on the total nitrogen (19-07-2016). These types of performance concerns will be absent when the treatment plant is upgraded or repaired.

Table 5 Effluent Quality and compliance to environmental licence

Date Sampled	13-Sep-16	4-Feb-16	19-May-16	14-Jun-16	19-Jul-16	18-Oct-16	8-Nov-16	11-Jan-16	7-Mar-17	6-Feb-17	9-May-17	13-Apr-17
	Effluent											
TSS (mg/L)	16	14	54	26	15	36	30	25	200	110	19	12
BOD (mg/L)	140	100	80	110	34	96	88	120	130	110	31	9.6
Total Chlorine (mg/L)	0.02	<0.01	<0.01	0.03	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Oil & Grease (mg/L)	6.6	5.2	2.8	8.2	1.4	7.6	5.6	5.5	3.6	18	1	1
TP (mg/L)	5.8	6.2	6.1	5.5	2.1	4.1	5.4	3.2	6.2	3.7	3.5	2.9
TN (mg/L)	51	58	53	47	21	37	47	30	47	29	21	23
Ammonia (mg/L)	44	46	41	38	29	28	34	25	33	25	8.8	19
Colliforms (CFU/100mL)	>100 000	>100 000	>100 000	>100 000	>100 000	>100 000	>100 000	>100 000	>100 000	>100 000	>100 000	2500 0

Table 6 Effluent Quality Parameters and potential effect on EV's

Parameter	Potential effect on EV's
TSS (mg/L)	Total suspended solids (TSS) are particles that are larger than 2 microns found in the water column. TSS is typically made up out of inorganic materials but they can also consists of algae. Elevated Total Suspended Solids in the effluent will affect the WQO's for TSS, turbidity and Secchi depth. Dilution to achieve water quality objectives is approximately 10 times at current criteria with the plant achieving compliant effluent for this parameter. This is dilution is considered to be easily achieved and no adverse effect is expected on either TSS, turbidity and Secchi. In the natural environment elevated TSS is associated with storms where solids are resuspended through wind or wave action and through direct run-off.
BOD (mg/L)	Biochemical oxygen demand is a measure of the quantity of oxygen used by microorganisms (e.g., aerobic bacteria) in the oxidation of organic matter which is present in the effluent. BOD in the effluent has the potential to affect the WQO's parameters for Dissolved Oxygen which can drop the oxygen levels below the 95% saturation Oxygen level in a tidal mudflat system however are naturally fluctuating and with the high dilution rates there are no significant or lasting adverse impacts expected.
Total Chlorine (mg/L)	Total chlorine present in the effluent is a result of the disinfection of the effluent to achieve the Coliform criteria. Chlorine levels should be below the level of detection (typically <0.01mg/l) to avoid impact on the receiving environment and associated WQO's.
Oil & Grease (mg/L)	Oil and Grease contamination of the effluent is a result of either bypass of oil/water separators or though small quantities being carried over as an emulsion. At the levels identified in the Environmental Authority no negative impact on WQO's is expected.

Parameter	Potential effect on EV's
TP (mg/L)	Total Phosphorus and Nitrogen are nutrients required for the growth of plant life. High levels of nutrients will promote primary production which can lead to algal blooms. The criteria in the Environmental Authority will ensure protection of WQO's with no negative impact to be expected.
TN (mg/L)	
Ammonia (mg/L)	Ammonia is a nitrogen waste product released by animals, it is a primary byproduct of protein metabolism. Ammonia is toxic to aquatic life at high concentrations but is easily and readily metabolised through bacteria. High levels of ammonia are associated with insufficient aeration of the effluent within the treatment system and are typically easily managed. Ammonia is also naturally generated within the marine environment through decay processes and will be readily diluted and broken down. The dilution will ensure that the ammonia values will be within the WQO's range (2mg/l).
Coliforms (CFU/100mL)	Coliforms are used as an indicator for microbial safety of the water, the saltwater provides an environment that is aggressive to these types of bacteria and an effective kill is typically achieved within hours of release. As such there is no negative impact expected on the Aquatic ecosystem. There is a potential for impact on the environmental value Human consumers of aquatic foods however the dilution and basic hygiene practices will ensure that this is a very low and therefore an acceptable risk requiring no further mitigation.

Date	Water Quality Parameter	Water Quality Limit	Limit Type	Result
8 November 2016	Faecal Coliforms (Organisms/100 ml)	150 600 (organisms)	50 th percentile Maximum	- >100,000
8 November 2016	5-Day Bio-chemical Oxygen Demand (mg/L)	60mg/L	80 th percentile Maximum	- 88
8 November 2016	Total Nitrogen (mg/L)	40mg/L	50 th percentile Maximum	- 47
8 November 2016	Ammonia Nitrogen (mg/L)	8mg/L	50 th percentile Maximum	- 34
11 January 2017	5-Day Bio-chemical Oxygen Demand (mg/L)	20 60	80 th percentile Maximum	- 120
11 January 2017	Ammonia Nitrogen (mg/L)	5 8	50 th percentile Maximum	- 25

Figure 6 Effluent water quality noting the exceedance

The offence against section 430(3) of the Environmental Protection Act 1994 (condition C1) between 23-27 January 2017 (*overflow of effluent from the final effluent tank at Saibai Island STP, effluent was released to coastal waters adjacent to the facility*) is unlikely to have a lasting impact as it is understood that the effluent drained away in the sand directly adjacent to the treatment plant and was slowly drained to the ocean. This type of discharge is typical for an overflow from an in ground sewage pump station as a result of pump failure or during high intensity stormwater events. The relatively short duration of the discharge and the resilience of the receiving environment will ensure that no lasting negative impact on the environment is to be expected.

2.6 Effluent Quality to protect or enhance EV's and achieve the WQO's

The current environmental licence has criteria associated with the quality and the quantity of the effluent allowed to be released through the marine outfall pipeline. These limits are widely used for other treatment plants in similar communities and have not been associated with a deterioration of the receiving environment.

It is proposed that no changes are made to the licence conditions other than removal of the limit for coliforms. It is noted that the new plant (refer to Part 1: Condition Assessment, Part 2: Upgrade Options Study Report for details of the proposed plant) is a significant improvement of the current plant. The plant is designed to have a robust treatment process that is simple to operate to ensure that the effluent will be compliant under all operating conditions. Equipment and instrumentation has been kept to a minimum to minimise the change of equipment failure and redundant equipment has been provided to mitigate against any equipment failure.

Appendix A - Notice to conduct or commission an Environmental Evaluation

Notice

Environmental Protection Act 1994

Environmental Evaluation

Notice to conduct or commission an environmental evaluation

This notice to conduct or commission an environmental evaluation is issued by the administering authority pursuant to 326B of the Environmental Protection Act 1994

Chief Executive Officer
Torres Strait Island Regional Council
PO Box 7336
CAIRNS QLD 4870

Your reference: EPPR00713013
Our reference: STAT1145 / 101/0009197

5 June 2017

Take notice: that under the *Environmental Protection Act 1994* (the Act) a notice to conduct or commission an environmental investigation is issued to Torres Strait Island Regional Council (you) by the administering authority. The administering authority is the Chief Executive of the Department of Environment and Heritage Protection (the department).

The notice to conduct or commission an environmental investigation is issued in respect of the activities of Torres Strait Island Regional Council at the Saibai Island Sewage Treatment Plant on land described at Lot 3 on TS157 situated at Saibai Island (the premise).

A. Grounds

The notice to commission an environmental investigation is issued on the following grounds:

- An activity or proposed activity is causing or is likely to cause environmental harm.

The facts and circumstances forming the basis for these grounds are:

Offence against section 430(3) of the *Environmental Protection Act 1994* (condition C4)

1. The Torres Strait Island Regional Council (TSIRC) is the holder of Environmental Authority (EA) EPPR00713013, which authorises TSIRC to carry out Environmentally Relevant Activity (ERA) 16-1(b)(ii) Sewage treatment: >100-1,500EP with treated effluent discharged other than as in 1(b)(i).
2. TSIRC undertakes sewage treatment activities on land described as Lot 3 on TS157, Saibai Island.
3. On 31 January 2017, the Department of Environment and Heritage Protection (the department) was provided water quality monitoring results by TSIRC of treated sewage effluent from the Saibai Island STP, which is discharged via ocean outfall to adjacent waters.
4. The water quality monitoring was undertaken on 8 November 2016 and 11 January 2017, and the results identify the following exceedences with the EA:

Notice to conduct or commission an environmental evaluation

Date	Water Quality Parameter	Water Quality Limit	Limit Type	Result
8 November 2016	Faecal Coliforms (Organisms/100 ml)	150 600 (organisms)	50 th percentile Maximum	- >100,000
8 November 2016	5-Day Bio-chemical Oxygen Demand (mg/L)	60mg/L	80 th percentile Maximum	- 88
8 November 2016	Total Nitrogen (mg/L)	40mg/L	50 th percentile Maximum	- 47
8 November 2016	Ammonia Nitrogen (mg/L)	8mg/L	50 th percentile Maximum	- 34
11 January 2017	5-Day Bio-chemical Oxygen Demand (mg/L)	20 60	80 th percentile Maximum	- 120
11 January 2017	Ammonia Nitrogen (mg/L)	5 8	50 th percentile Maximum	- 25

Table 1: Water quality limit exceedances 8 November 2016 and 11 January 2017

Offence against section 430(3) of the *Environmental Protection Act 1994* (condition C1)

5. On 27 January 2017, TSIRC notified the department of an overflow of effluent from the final effluent tank at the Saibai Island STP.
6. The overflow event was first identified by TSIRC on 23 January 2017 and continued until 27 January 2017.
7. Effluent was released to coastal waters immediately adjacent to the activity.

Section 326B of the *Environmental Protection Act 1994*

8. The release of poorly treated effluent from the Saibai Island STP has the potential to cause environmental harm to the environmental values of surface water and aquatic ecosystems.

B. Requirements

The report on the environmental investigation must address the following relevant matters:

1. An **appropriately qualified person**, as defined in this Notice must:
 - a) Identify the environmental values (EVs) and water quality objectives (WQOs) relevant to releases from the Saibai Island STP;
 - b) Provide a description of the default EVs/WQOs, characteristics and resilience of the receiving environment;
 - c) With reference to items (a) and (b), determine the quality that must be achieved for effluent release to protect or enhance EVs and achieve the WQOs.

Environmental value is—

- a) a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety; or

Notice to conduct or commission an environmental evaluation

- b) another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation.

Note: This may involve a nominal assessment of EVs and WQOs including a desktop assessment.

2. An **appropriately qualified person**, as defined in this Notice, must conduct an assessment of the projected sewage flow loadings into the Sabai Island STP for a 20 year planning horizon and be developed with the Department of Energy and Water Supply *'Planning Guidelines for Water Supply and Sewerage, April 2010'* (including Chapter 6 amendments made March 2016).
3. Detail the capacity of existing sewage infrastructure to meet current and future service demands and environmental standards and identify options for achieving release quality that must be achieved to protect or enhance EVs and achieve the WQOs. The details should include, but not be limited to:
 - a) A statement of the current performance of the plant in respect to effluent release;
 - b) Details of all options available and a detailed evaluation of potential options to improve and maintain suitable quality of effluent releases;
 - c) Details of technology considerations and their suitability for use in relation to the locality and skill level of operators;
 - d) Review of similar technology and applications in similar environments; and
 - e) Details of cost considerations that include installation/augmentation, commissioning and maintenance.
4. Report on the analysis of options considered, which must:
 - a) Determine an evaluation criteria linked to quantified service objectives, and which must include consideration of service standards, regulatory compliance, operational and performance efficiency as well as social, environmental and financial objectives;
 - b) Determine options which include existing, non-asset and new asset options; and
 - c) Undertake the options analysis, which must include whether the option is technically feasible; considers the physical and operational capacity of the infrastructure including infrastructure appropriateness, condition and limitations; a financial analysis to determine financial viability including financial constraints of each option over the whole lifecycle of the sewage treatment plant and associated infrastructure; analysis of environmental impacts; and a risk assessment of each chosen option.
5. Outline a proposed implementation strategy based on the option/s identified through Requirement 4, which must:
 - a) Determine the preferred project delivery option; and
 - b) Develop an implementation program with consideration of funding sources and allocation.

Appropriately qualified person(s) means a person or person who has professional qualifications, training skills and or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis to performance relative to the subject matter using the relevant protocols, standards, method or literature.

The environmental report must be submitted to the department on or before:

- **5:00pm, Tuesday 7 November 2017.**

Notice to conduct or commission an environmental evaluation

As the recipient of this notice, you are also required to provide a statutory declaration in the form attached, to accompany the environmental report submitted to the department. The suitably qualified person who prepares the environmental report must also provide a statutory declaration in the form attached to accompany the environmental report submitted to the department.

You can view an electronic version of the statutory declaration for a recipient using the following search term ([ESR/2016/1997](#)).¹

An electronic version of the statutory declaration for a suitably qualified person form is available using the search term ([ESR/2016/2266](#)).

Take notice:

- the requirements of the notice to conduct or commission an environmental investigation take effect immediately upon service of this notice;
- this notice remains in force until further notice from the department; and
- you are responsible for meeting the costs of conducting or commissioning the environmental evaluation, preparing the environmental report and providing any further information as requested by the department.

C. Reviews and appeals

The provisions regarding reviews of decisions and appeals are found in sections 519 to 539 of the Act.

A person who is dissatisfied with certain decisions of the department, may be able to apply to have the department review that original decision.

Generally, a request to have a decision reviewed must be made:

- within 10 business days of the decision being notified to the person;
- be supported by enough information to enable the department to decide the application for review; and
- be made using the application for review of an original decision form ([ESR/2015/1573](#)).

Where an application has been made for a decision to be reviewed, the applicant may also apply to the relevant court for a stay of the decision to secure the effectiveness of the review.

Once the original decision has been reviewed, a person who is dissatisfied with the review decision may be able to appeal against that decision to the relevant court within 22 business days after receiving notice of the review decision.

A person whose interests are or would be adversely affected by a decision of the department may also be able to request a statement of reasons for a decision or a statutory order review under the *Judicial Review Act 1991*.

For further information about reviews and appeals see the:

- Information sheet - internal review and appeal to the Planning and Environment Court ([ESR/2015/1572](#)).

¹ This is the publication number. The publication number can be used as a search term to find the latest version of a publication at <www.ehp.qld.gov.au>.

Notice to conduct or commission an environmental evaluation

- Information sheet - internal review and appeal to the Land Court ([ESR/2015/1742](#)).

You may have other legal rights or obligations and should seek your own legal advice.

D. Penalty

Failure to comply with a notice to conduct or commission an environmental evaluation is an offence.

1. The maximum penalty for an individual is 300 penalty units, totalling \$36,570.00.
2. The maximum penalty for a corporation is 1500 penalty units, totalling \$182,850.00.

Should you have any queries in relation to this notice, please contact Calvin Quick of the department on telephone number (07) 4222 5161.



Signature

5 June 2017

Date

Tony Baker
Manager (Compliance)
Delegate of the Chief Executive
Department of Environment and Heritage Protection
Environmental Protection Act 1994

Enquiries:
Calvin Quick
Senior Environmental Officer
Department of Environment and Heritage
Protection
Level 3, 5B Sheridan Street
CAIRNS QLD 4870
Ph: (07) 4222 5161
Email: calvin.quick@ehp.qld.gov.au

Appendix B - Effluent Quality Data

Saibai STP Influent Envelope

[illegible]

EA Licence Limits

Max. ADW/FW Flow	150L/tL	kg released / 150kL
5-Day BOD (mg/L)	20/80th Percentile	3
	60 Max.	9
	30/80th Percentile	4.5
TSS (mg/L)	90Max.	13.5
	6.5 Min.	
pH	8.5 Max.	
DO (mg/L)	2 minimum	0.3
	5/50th Percentile	0.75
Ammonia Nitrogen (mg/L)	8 Max.	1.2
	20/50th Percentile	3
Total Nitrogen (mg/L)	40Max.	6
	10/50th Percentile	1.5
Phosphorus (mg/L)	15 Max.	2.25
Oil and Grease (mg/L)	10Max.	1.5
	150/50th Percentile	
Faecal Coliforms (org/100mL)	600/Max.	

Daily Flow

	100 µL											
TSS (kg)	1.6	1.4	5.4	2.6	1.5	3.6	3	2.5	20	11	1.9	1.2
BOD (kg)	14	10	8	11	3.4	9.6	8.8	12	13	11	3.1	0.96
Total Chlorine (kg)	0.002	0.001	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Oil & Grease (kg)	0.66	0.52	0.28	0.82	0.14	0.76	0.56	0.55	0.36	1.8	0.1	0.1
TP (kg)	0.58	0.62	0.61	0.55	0.21	0.41	0.54	0.32	0.62	0.37	0.35	0.29
TN (kg)	5.1	5.3	5.3	4.7	2.5	3.7	4.7	3	3.3	2.9	2.1	2.3
Ammonia (kg)	4.4	5.8	4.1	3.8	2.9	2.8	3.4	2.5	3.3	2.5	0.88	1.9

Daily Flow

	150 µL													
TSS (kg)	2.4	2.1	8.1	3.9	2.25	5.4	4.5	3.75	30	16.5	2.85	1.8		
BOD (kg)	21	15	12	16.5	5.1	14.4	13.2	18	19.5	16.5	4.65	1.44		
Total Chlorine (kg)	0.003	0.0015	0.0015	0.0045	0.0015	0.0045	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015		
Oil & Grease (kg)	0.99	0.78	0.42	1.23	0.42	1.14	0.84	0.825	0.54	2.7	0.15	0.15		
TP (kg)	0.87	0.93	0.915	0.825	0.315	0.615	0.81	0.48	0.93	0.555	0.525	0.435		
TN (kg)	7.65	8.7	7.95	7.05	3.15	5.55	7.05	7.05	7.05	4.35	4.35	3.45		
Ammonia (kg)	6.6	6.9	6.15	5.7	4.35	4.2	5.1	3.75	4.95	3.75	1.32	2.85		

kg over the release limits

BOD (mg/L)	12	6	3	7.5	5.4	4.2	9	10.5	7.5	-4.35	-7.56
Oil & Grease (mg/L)	-0.51	-0.72	-1.08	-0.27	-0.36	-0.66	-0.675	-0.96	1.2	-1.35	-1.53
TP (mg/L)	-1.38	-1.32	-1.35	-1.425	-1.935	-1.44	-1.77	-1.32	-1.695	-1.725	-1.815
TN (mg/L)	1.65	2.7	1.95	1.05	-0.45	1.05	-1.5	1.05	-1.65	-2.85	-2.55
Ammonia (mg/L)	5.4	5.7	4.95	4.5	3.15	3	3.9	3.75	2.55	0.12	1.65