JBS Townsville

Environmental Evaluation Of Surface Water

Interim Report

Response to A Request

DES CA4544; 101/0008424

Ver 1.1

PREPARED FOR

JBS Australia

BY

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1 INTRODUCTION

Bio-Track Pty Ltd has been commissioned by JBS Australia Pty Ltd to prepare a response to a request from the Department of Environment and Science (Notice to conduct or commission an environmental evaluation, CA4544; 101/0008424, dated 19 April 2018).

It is assumed the reader is familiar with the Department of Environment and Science notice details. This report addresses surface water.

2 CATCHMENT DESCRIPTION

A number of surfaces are present within the JBS Townsville site. These are listed in Table 1. The estimated surface nutrient export rate for each surface is presented. The export rates for irrigated and non-irrigated pasture are tabled as kg/ha/y. The catchment area is then used to calculate the mass load in runoff. The export rates are based upon assessment of published data considered to represent the local conditions. The pasture areas have a low slope, permanent grass cover, are not grazed or cultivated. The only disturbance is harvesting of grass. Non-irrigated surfaces of this nature are widely used as riparian filter strips to improve runoff water quality.

The export rates for the disturbed surfaces are also based on an assessment of published data. The rates are based on a mean concentration (as tabled). The annual runoff is then used to calculate the mass load in runoff.

The cattle yards and organic storage areas flow to a sediment trapping basin the treatment lagoons and then are irrigated into the land. The farm storage ponds and tailwater pond are assumed to have zero net export.

The total mass load for all the surfaces has been totaled to provide the mass load (kg/y) as an estimated export rate. The mean concentrations are then calculated using the annual runoff total.

Figure 1 shows the regional catchment. Figures 2 and 3 shows the surfaces, shaded according to their flow path. The flow paths are:

1 To treatment lagoons and then to irrigation
2 To tailwater lagoons and then to irrigation, some wet season overflow events then flow east to the tidal flats.
3 To tailwater lagoon and then to Sandfly on the south boundary, flowing to the tidal flats

2.1 Stormwater Storage

The 24 hour, one in 10 year ARI storm event is 230 mm. The treatment and aerobic storage lagoons are bunded organic storage areas are maintained with a minimum freeboard of 230 mm to have this storage capacity.

The irrigation pumps have a daily pumping capacity of at least 2.2 ML. The storm event volume can be irrigated in 6.1 days.

The tailwater storage lagoon has the capacity to retain a 17 mm runoff event. A 17 mm runoff event is predicted to occur 6.4 times/year (based on MEDLI runoff - 50 hectare irrigated land areas, 100 years data).

Figure 1

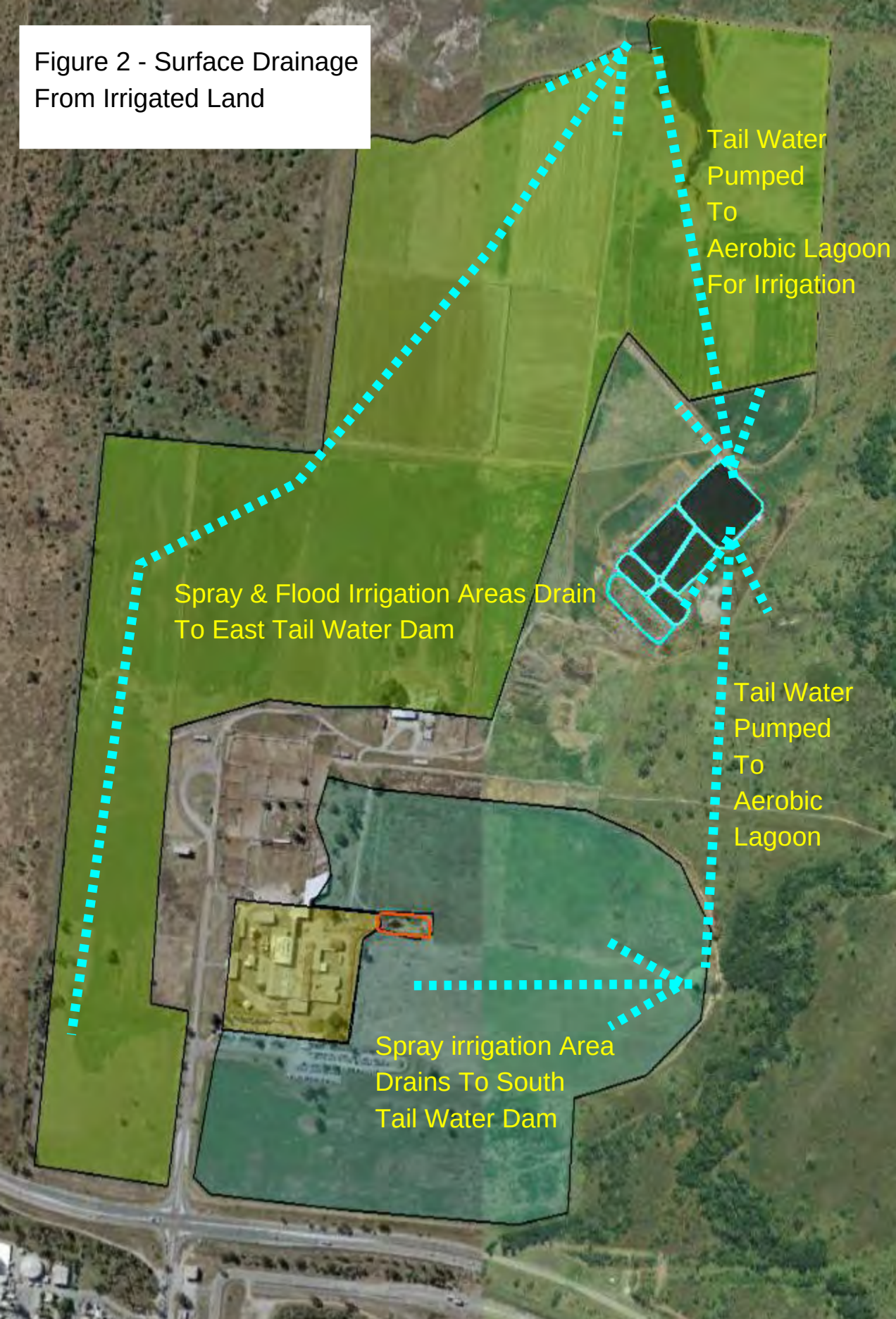
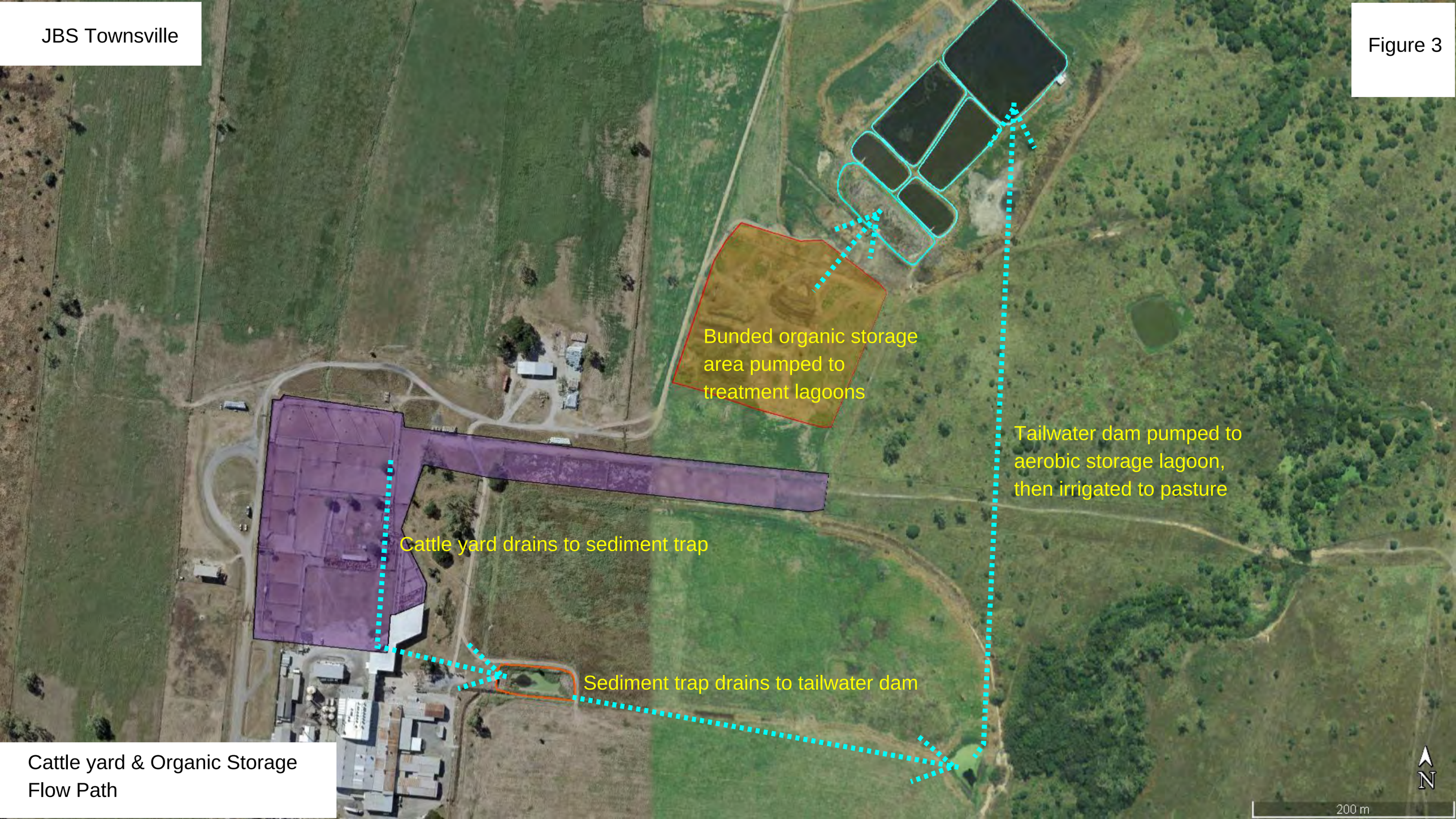


Figure 2 - Surface Drainage From Irrigated Land
Tail Water Pumped To Aerobic Lagoon For Irrigation
Spray & Flood Irrigation Areas Drain To East Tail Water Dam
Tail Water Pumped To Aerobic Lagoon
Spray irrigation Area Drains To South Tail Water Dam

JBS Townsville

Figure 3



Cattle yard & Organic Storage Flow Path

TABLE 1: Areas & Export	Area	N	P	Sediment	BOD	runoff	Runoff	TSS	TP	TN	TSS	TP	TN
	ha	*kg/ha*				*fraction #*	*ML/y*	*mg/L*			*kg/y*		
Roads, Car Park & Hard Stand	4				low	0.9	39.1	269	0.50	1.82	10523	20	71
Roof	1.2				low	0.95	12.4	20	0.13	1.82	247	2	23
Cattle Yards	3.18			0	high	0.85	29.4						
Tailwater & Stock Water Dams	2.2			0									
Organic storage areas	3.1			0	high	0.55	18.5						
Treatment Lagoons	2.76			0									
Spray Irrigated Land	58.8	10.8	1	250	moderate	0.54	344.8				14700	58.8	635.04
Flood Irrigated Land *	32	2.4	0.5	250	moderate	0.451	156.7				8000	16	76.8
Non-irrigated grass (balance)	158.76	2	0.06	200	low	0.451	777.6				31752	9.5	317.52
Site Total	266						1378.5	**MASS LOAD**			65222	106	1123
* rarely irrigated # proportion of rainfall shaded areas flow to treatment lagoons											**TSS**	**TP**	**TN**
											mg/L		
Annual Rainfall	1086	mm/y						**CONCENTRATION**			47	0.08	0.81

Storm Event Management			
Organic + Treatment Area		58600	m2
Storm Event		230	mm
		13.5	ML
Pump Capacity		2.2	ML/d
Drawdown Interval		6.1	days

TABLE 2: REGIONAL CATCHMENT		
Waterway Catchment	100	km2
Waterway Volume	200	ML
Catchment Runoff Event	2	mm
Catchment Runoff Volume	200	ML
JBS Site Runoff Volume	5.32	ML
Mixing Ratio	38	
Tailwater Dam Volume	15	ML
Tailwater Catchment Area	87.6	ha
Runoff Captured From Catchment	17	mm
Regional Runoff Nitrogen	0.7	mg/L
Regional Runoff Phosphorus	0.3	mg/L
Regional Runoff Suspended Solids	100	mg/L
Tailwater Nitrogen	4.1	mg/L
Tailwater Phosphorus	4.66	mg/L
Tailwater Suspended Solids	11	mg/L
Mixed Water Nitrogen	0.79	mg/L
Mixed Water Phosphorus	0.42	mg/L
Mixed Water Suspended Solids	97.63	mg/L
Change Nitrogen	13%	
Change Phosphorus	39%	
Change Suspended Solids	-2%	

3 RECEIVING WATERS

3.1 Estuary

Cleveland Bay adjacent to the JBS site receives runoff from heavy industry. The local catchment flows to a tidal waterway which discharged into Cleveland Bay. The outfall from the Townsville sewerage treatment plant is 100 metres from the mouth of this waterway. This treatment plant services a population of 126,000 people. This has a wet weather treatment capacity of 45 ML/day which is being upgraded to a capacity of 87 ML/day. The effluent quality during runoff events is unknown but is expected to be in the range of 15-30 mg N/L and 5-10 mg P/L.

A dry weather sewerage nutrient release based on 40 mg N/l and 15 mg P/l, ADWF of 18.3 ML is equivalent to 730 kg N/d and 274 kg P/d. This load or more will be released during wet weather events.

The potential for the JBS site to significantly modify the marine water quality at the mouth of the tidal creek is negligible. One storm water release event measured in March 2018 had 4.1 mg N/L and 4.7 mg P/L. This is expected to be less than the concentration of the discharged treated sewerage.

The mass load does add to the load entering the marine environment and this is important to all land holders within the coastal catchments of Queensland. Whilst the contribution of the JBS export, relative to the export from the Ross River catchment is very small, there remains an obligation to protect environmental values.

3.2 Tidal Waterway (through tidal flats to Cleveland Bay)

Monitoring data is available for Stuart Creek and Sandfly Creek. A brief summary of this is provided in Appendix 1. Sandfly Creek is reported to have poor water quality. Stuart Creek has elevated phosphorus. The monitoring test points are not known at this stage.

The channel is estimated to 4.3 km long. If an average channel section is 50 m2 then the ponded volume is approximately 200 ML. The catchment has a mapped area of 104 square kilometres. A 100 km2 catchment is assumed for this study. A 2 mm runoff from a 100 km2 catchment generates 200 ML of runoff and would displace the marine channel volume in less than 24 hours.

The catchment at the JBS site is flat and grassed so runoff from non-irrigated pasture will lag behind the steeper regional catchment flow. The combination of tailwater recovery dams and slow runoff release times from the JBS catchment indicate the regional catchment runoff would be actively moving water through the channel and mixing with the JBS runoff. A 2 mm runoff volume from the JBS site represents 2.6% of a 2 mm runoff event from the regional (50 km2) catchment. The regional runoff mixes with the JBS runoff. The tailwater measurements recorded in March 2018 show this has a higher nutrient level than the regional catchment. The mixed water has a higher nutrient concentration. The calculations of water volumes and mixed concentration are provided in Table 2. The frequency of events is estimated to be 6.4/year.

The estimated increase in runoff concentration for the tidal waterway is 13% for nitrogen and 39% for phosphorus at a frequency of 6.4 times/year for a duration of 24 hours, or less. This becomes a 13% N increase and 39% P increase for 1.8% of the time.

4 TAILWATER RELEASE QUALITY

The soluble phosphorus measured in March, 2018 from the tailwater dam release is significantly higher than expected. The cause of this is unknown. Whilst both nitrogen and phosphorus are above the expected receiving water quality, the phosphorus level, measured on two consecutive days was high. The cause of the high N:P ratio is not expected to be a consequence of runoff from pasture, groundwater seepage or loss of treatment lagoon water. It is recommended the source is identified.

5 RELEASE WATER QUALITY OBJECTIVES

It is reasonable to base the objectives on the following criteria:

* acceptable environmental consequences for any surface water leaving the site
* management according to industry best practice
* long term commitment to reduce nutrient and sediment loads into Cleveland Bay to protect marine ecosystems
* practical and achievable standards

Very little site specific data is available to work with. The generic runoff export values and runoff assessment presented in this report indicate there will be a small number of short term increases in nutrient concentration in the tidal waterway east of the JBS site but not within Cleveland Bay. This assessment indicates the opportunity to cause environmental harm is low and no acute environmental hazard exists.

Until more monitoring data is available, it is regarded as inappropriate to propose water quality objectives, specific for this location. Typically, a minimum of 1-2 years of data collection is required to achieve the minimum of information required. The JBS site is expected to have something like 6 significant runoff events, per year, as a long term average. It is proposed to collect a data for a minimum of 10 runoff events, before making any recommendations. It is acknowledged the department (DES) is likely to require a time frame, rather than a number of sampling events. In anticipation of this requirement, it is proposed to undertake monitoring for a period of two years, before developing runoff quality objectives.

6 RECOMMENDATIONS

* establish a monitoring program that measures surface water quality during storm water events for a period of two years. Sampling is to be undertaken when water is released from any storage dam. The analytes to be tested are listed below. BOD is an expensive analyte and elevated total N or total P is regarded as a suitable indicator of an environmental hazard that would also be captured by measuring BOD.

  total N
  nitrate+nitrite N
  total P
  ortho-phosphate P
  EC
  pH
  suspended solids

The date, time and estimate of stream flow are to be recorded.

The test locations shown in Figures 4 & 5 need to be verified as easily accessible in wet weather and can be adjusted to meet this requirement. There are 3, 5 downstream points and one on Stuart Creek. Stuart Creek flows from the major catchment and mixes with runoff from the eastern catchment areas, prior to flowing through a drainage line across the tidal flats.

* the cause and source of the elevated phosphorus in the tailwater should be investigated and where possible, corrected.

* ensure routine maintenance is undertaken to ensure the integrity of all bunds, drains and other runoff controls

* ensure tail water dams are irrigated out to recover their storage capacity, as quickly as possible

* take particular note of organic materials stored, pending off-site disposal. This area is a “hot spot” for nutrient and justifies close maintenance and management. Ideally the mass of material would be kept to a minimum but it is acknowledged this is dependent upon a third party to remove the material to a recycling facility.

Figure 4

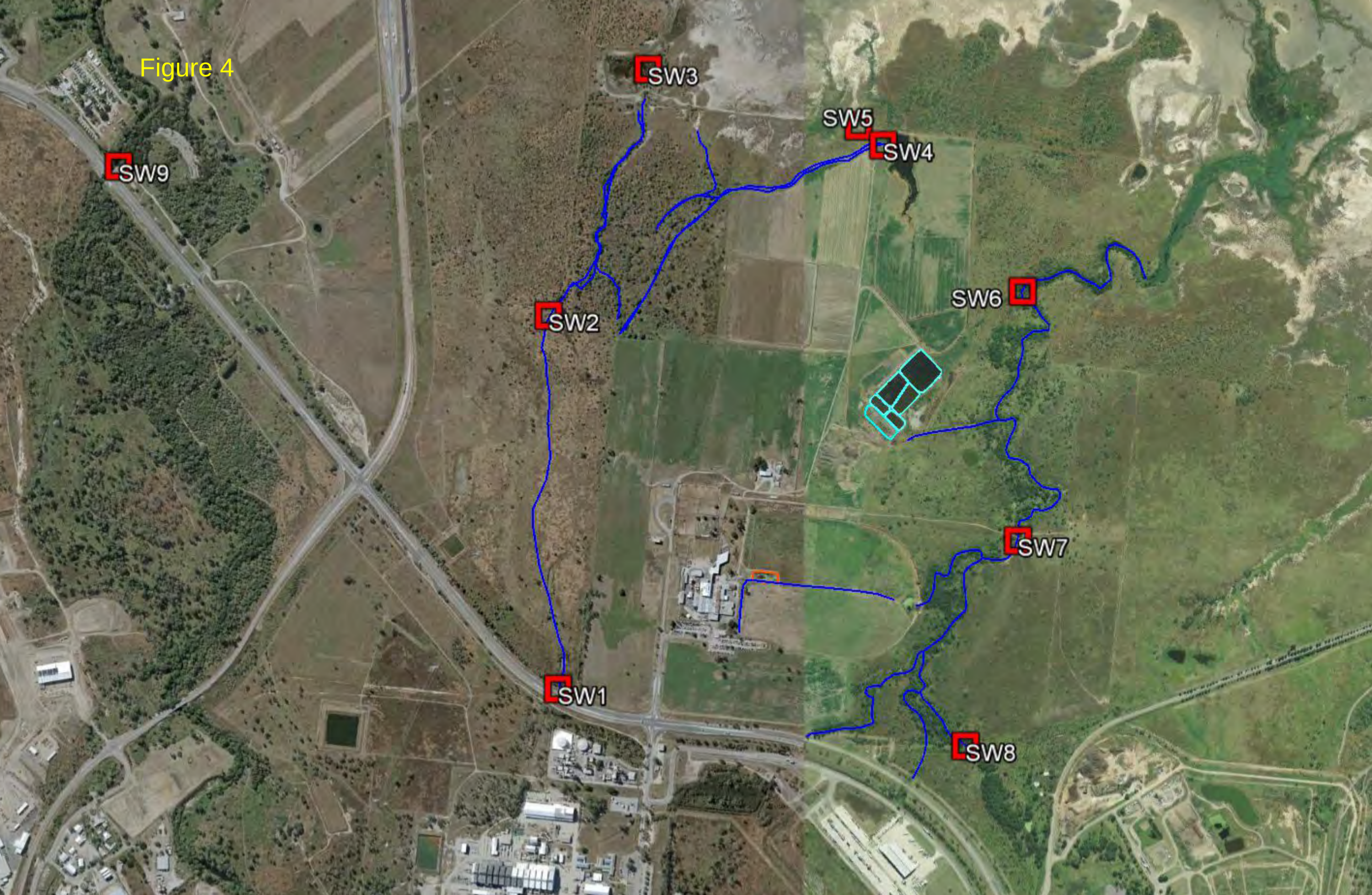


Figure 5

SW3
SW5
SW4
SW6
SW2
Google Earth
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7 APPENDIX 1: STUART CREEK INFORMATION

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STUART CREEK
SUB BASIN FACTSHEET

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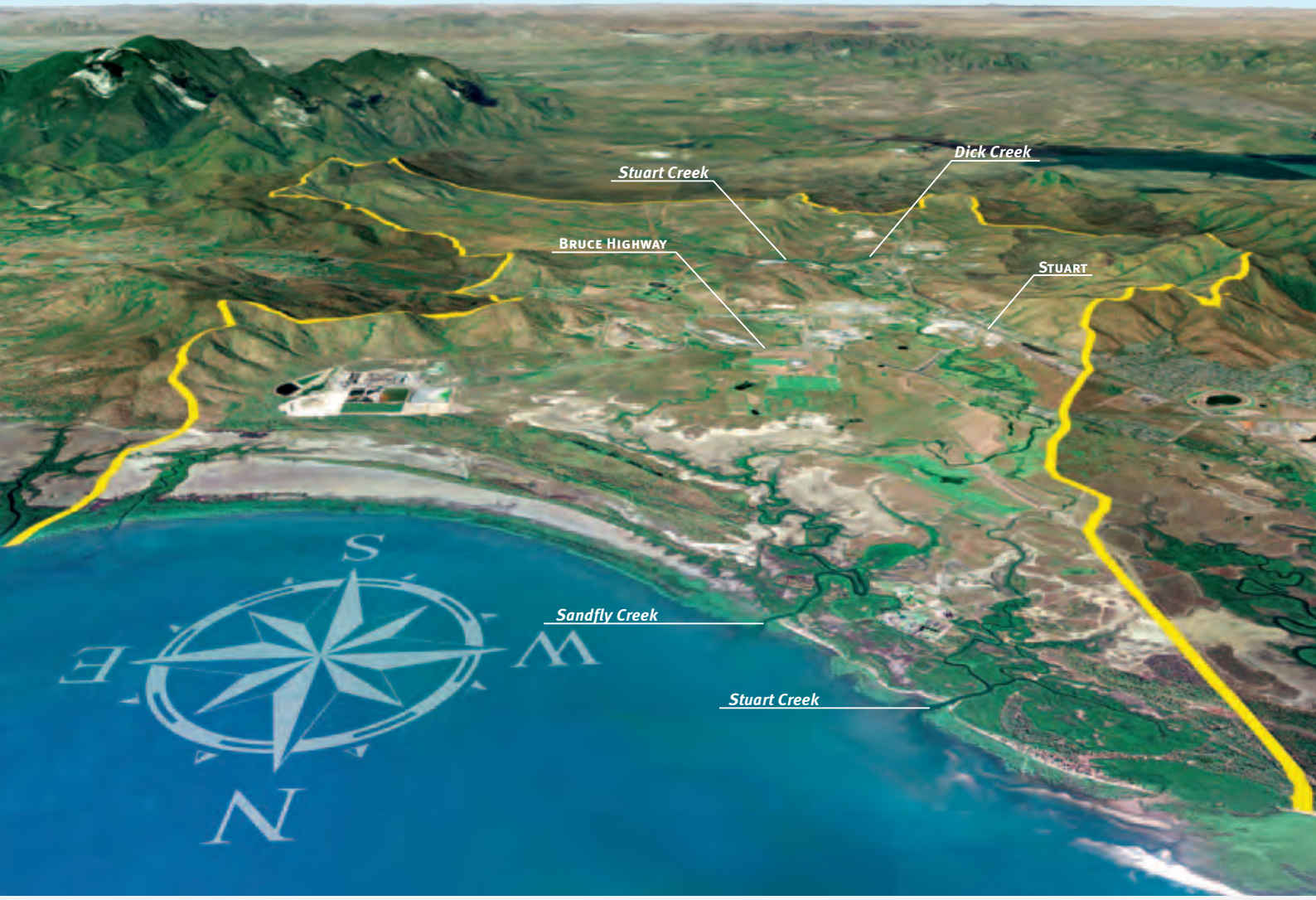
The Stuart Creek Sub Basin includes the Stuart Creek and Sandfly Creek catchments. There are also a number of smaller waterways that have been included in the catchments of these larger creeks.



Australian Government

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POPULATION

The 2006 census counted 1,230 residents within the Stuart Creek Sub Basin area. Limited residential use occurs at Stuart and Roseneath.

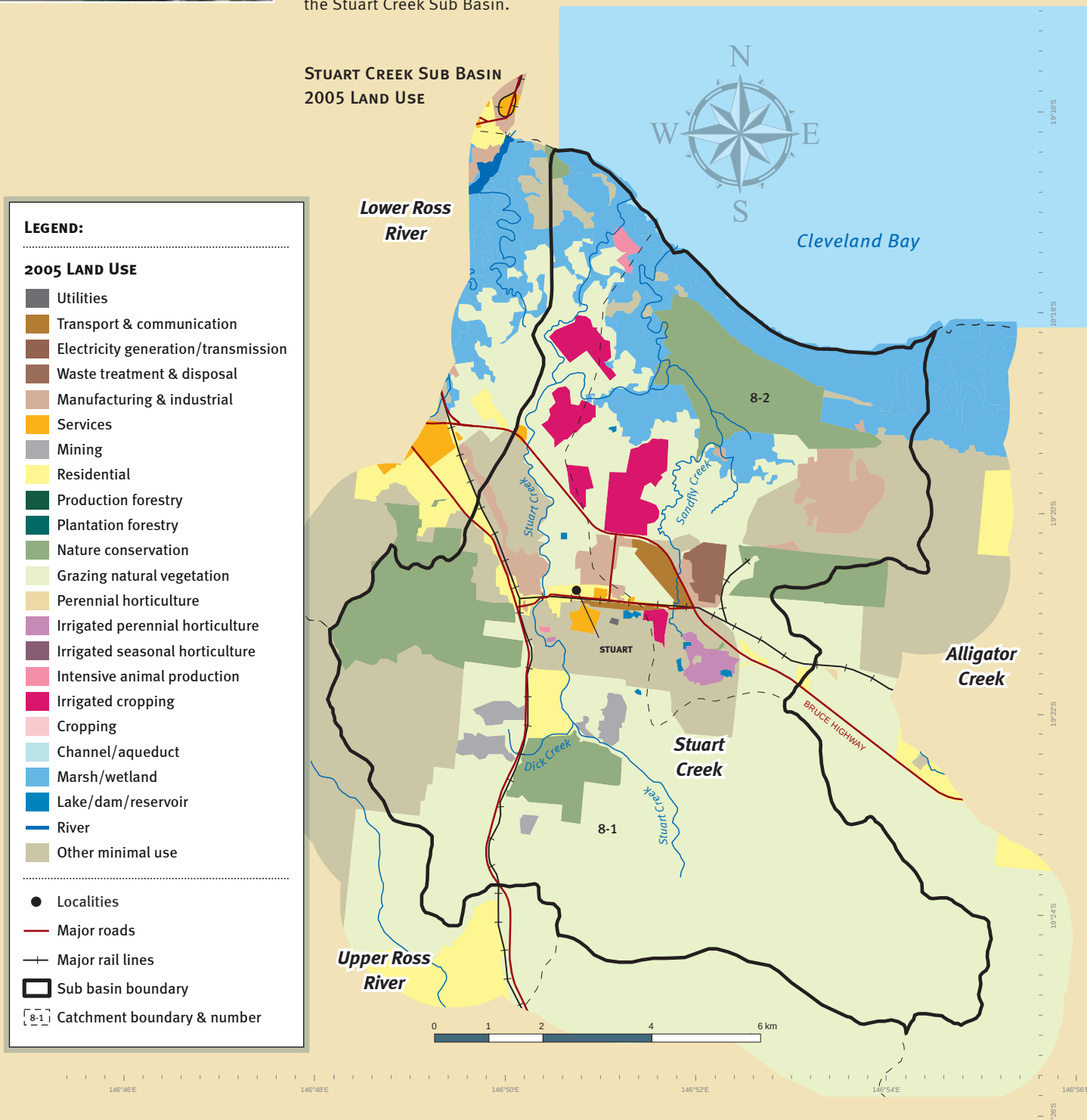
The median age of the Stuart Creek Sub Basin population is reported at 34 years (2006 census). Average household size, at 2.7 people per household, is slightly below the average occupancy for the Townsville local government area (2.8 people).

LAND USE

The Stuart Creek Sub Basin is approximately 104 square kilometres in size (~10,400 hectares). Grazing (49%) is the main land use in the Stuart Creek Sub Basin followed by minimal use, including Defence land (16%), and nature conservation (13%).

While being a significant economic driver for Townsville, and concentrated in the Stuart Creek Sub Basin, the manufacturing and industrial sector accounts for less than 7% of the land use in the Stuart Creek Sub Basin.

Stuart Creek Sub Basin 2005 Land Use

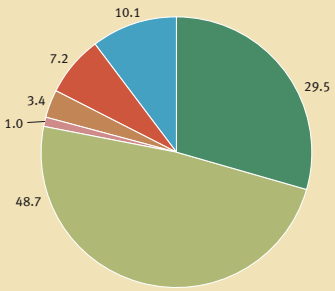


2005 Land Use Stuart Creek Sub Basin

Land Use	Ha	%	Principal Land Use	Ha	%
Nature conservation	1,366	13.2	Conservation and natural areas	3,069	29.5
Other minimal use	1,704	16.4			
Grazing natural vegetation	5,054	48.7	Grazing	5,054	48.7
Residential	191	1.8	Rural residential	101	1.0
Intensive animal production	23	0.2	Intensive agriculture	355	3.4
Irrigated cropping	299	2.9			
Irrigated perennial horticulture	56	0.5			
Manufacturing and industrial	353	3.4	Urban	746	7.2
Mining	116	1.1			
Services	32	0.3			
Transport and communication	68	0.7			
Utilities	2	<0.1			
Waste treatment and disposal	62	0.6			
Reservoir/dam	14	0.1	Water and wetlands	1,047	10.1
Marsh/wetland	1,033	10.0			
Totals	**10,371**	**100**		**10,371**	**100**

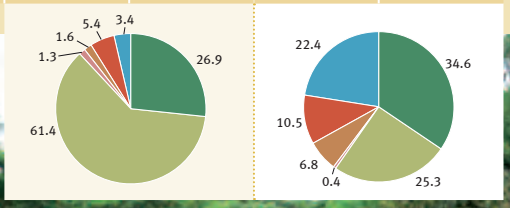
Note: Totals may not tally due to rounding of sub totals

Stuart Creek Sub Basin Land Use



Land Use by Catchment

	Ha	%	Ha	%
Land Use	**Stuart Creek (8-1)**		**Sandfly Creek (8-2)**	
Conservation and natural areas	1,808	26.9	1,261	34.6
Grazing	4,130	61.4	923	25.3
Rural residential	87	1.3	14	0.4
Intensive agriculture	107	1.6	247	6.8
Urban	365	5.4	381	10.5
Water and wetlands	229	3.4	818	22.4
Totals	**6,727**		**3,644**	



[More information about the basins, sub basins and catchments of the Black Ross WQIP can be found in; *Basins, Catchments and Receiving Waters of the Black Ross Water Quality Improvement Plan Area* (Gunn and Manning 2009)]

WATER RESOURCE CONDITION

LEGEND:

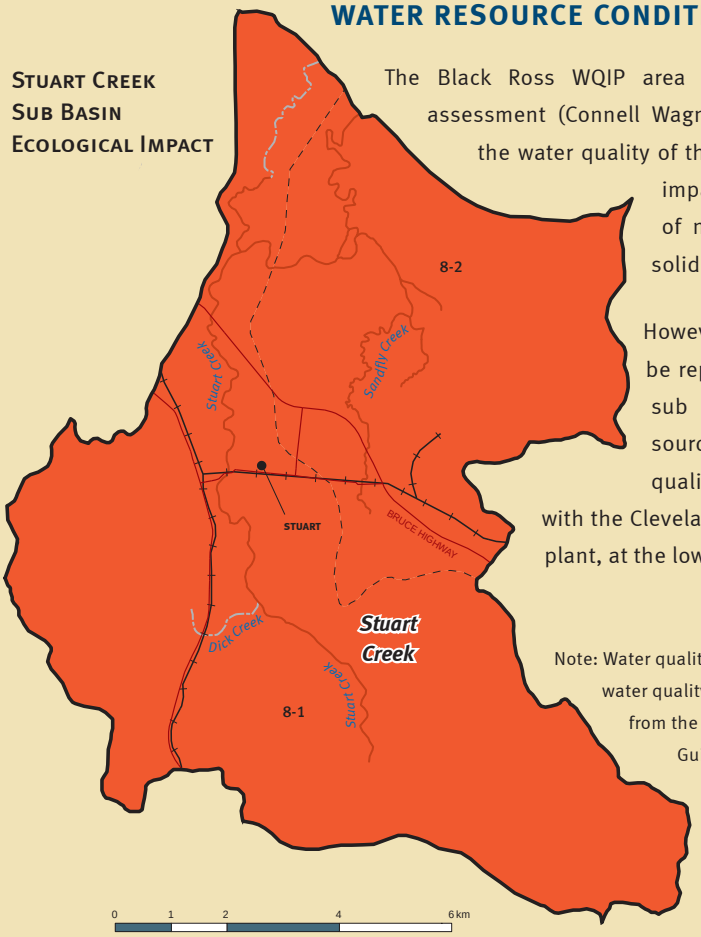
DRAINAGE - ECOLOGICAL IMPACT

- No data
- Insufficient data
- Healthy/Slightly impacted
- Slightly/Moderately impacted
- Moderately/Heavily impacted

CATCHMENTS - ECOLOGICAL IMPACT

- No data
- Insufficient data
- Healthy/Slightly impacted
- Slightly/Moderately impacted
- Moderately/Heavily impacted

- Localities
- Major roads
- Major rail lines
- Sub basin boundary
- 8-1 Catchment boundary & number



The Black Ross WQIP area water quality condition assessment (Connell Wagner 2008) indicated that the water quality of this sub basin was heavily impacted, with high levels of nutrients and suspended solids.

However this data is unlikely to be representative of the entire sub basin as the main data source for this area is the water quality monitoring associated with the Cleveland Bay sewage treatment plant, at the lower end of the catchment.

Note: Water quality data was assessed against water quality objectives (WQOs) derived from the Queensland Water Quality Guidelines (EPA 2006) for the Central Coast Region for lowland streams

WATER QUALITY AND WATER QUALITY OBJECTIVES (WQOS)

In general, the water quality condition data for the sub basin does not meet the WQOs for most of the water quality indicators. It should be noted that the water quality data for Sandfly Creek is not up to date and may not be a true reflection of current water quality condition of the catchment.

The water quality data from Stuart Creek indicates above average concentrations of all water quality indicators, with the exception of dissolved inorganic nitrogen (DIN), and shows the need for more rigorous analysis of the water quality data for this catchment.

COMPARING WQOS WITH WATER QUALITY

Stuart Creek Sub Basin	DIN	Org N	TN	FRP	TP	TSS
Stuart Creek 8-1	✔ *50%	✘ 19%	✘ 42%	✘ 295%	✘ 160%	✘ 420%
[1]Sandfly Creek 8-2	✘ 875%	✘ 233%	✘ 308%	ND	✘ 820%	✘ 150%

Notes: Tick/cross denotes if the WQO is met (✔) or not (✘) for the waterway based on the median value for the water quality indicator. The percentage indicates the amount by which the WQO is met or not met (the difference between the WQO and water quality condition median as a percentage of the WQO). No % is listed if the water quality condition is the same as the WQO. ND is no data.

DIN is dissolved inorganic nitrogen, Org N is organic nitrogen, TN is total nitrogen, FRP is filterable reactive phosphorus, TP is total phosphorus and TSS is total suspended solids (sediment).

* indicates inconsistency or a wide variation in the data, or insufficient data to calculate percentiles.

[1] indicates data is dated and may not reflect current condition.

[More information about water quality conditions and WQOs can be found in; *Environmental Values, Water Quality Objectives and Targets for the Black Ross Water Quality Improvement Plan* (Gunn, Manning, and McHarg 2009), and *Water Quality Condition of the Black and Ross River Basins* (Connell Wagner 2008)]

DISCLAIMER: Townsville City Council advises that the information in this document is derived from a number of different sources. The information may not be accurate or up to date and should not be solely relied upon for decision-making purposes.