Appendix B

Supporting Information for Construction Environmentally Relevant Activity 15(b) Application, Jilalan Rail Yard Upgrade Project

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Supporting Information for Construction Environmentally Relevant Activity 15(b) Application
Jilalan Rail Yard Upgrade Project
Queensland Rail

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0	1 November 2007	For review	GS			
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Contents

1. Terms of reference

The information below contains reference sections for the application for Environmentally Relevant Activity (ERA) 15(b).

Environmental Issues	Reference	Comment
Site based management plan	Appendix G	
Description of treatment process	Section 4.5	
Capacity of treatment system	Section 4.2	
Identification of pump stations	Section 4.5.1	
A scale location plan	Figure 3.1	
A scale site plan	Figure 3.2 and Appendix A	
A large scale site plan	Appendix A	
A description of site topography and site flood potential	Section 6.3 and 6.4	
Responsible persons for operation and maintenance of the WWTP	Section 8.1	
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2. Introduction

The report contains details as part of the application for ERA 15(b) and is an appendix to the ERA supporting document for ERAs 11(a), 15(b), 19(b), 22(c), 28 and 62.

2.1 Background

The proposed Jilalan Rail Yard Upgrade Project (JRYUP) construction accommodation village and site office is a temporary facility (approximately 2 years) and includes the following ERA under Schedule 1 of the Environment Protection Act 1994:

- ERA 15(b) – a standard sewage treatment works with a peak design capacity to treat sewage of 100 or more equivalent persons (EP) but less then 1,500 EP

2.2 Scope of report

This report addresses a range of operational and environmental issues to enable regulatory compliance with all relevant environmental laws, including:

- Routine procedures to minimise environmental harm
- Wastewater treatment
- Contingency and emergency plans for risks and hazards
- Environmental monitoring program
- Environmental records
- Staff training and awareness

2.3 Legislative requirements, guidelines and standards

The following legislative requirements, Australian Standards and regulatory guidelines are relevant to this operation:

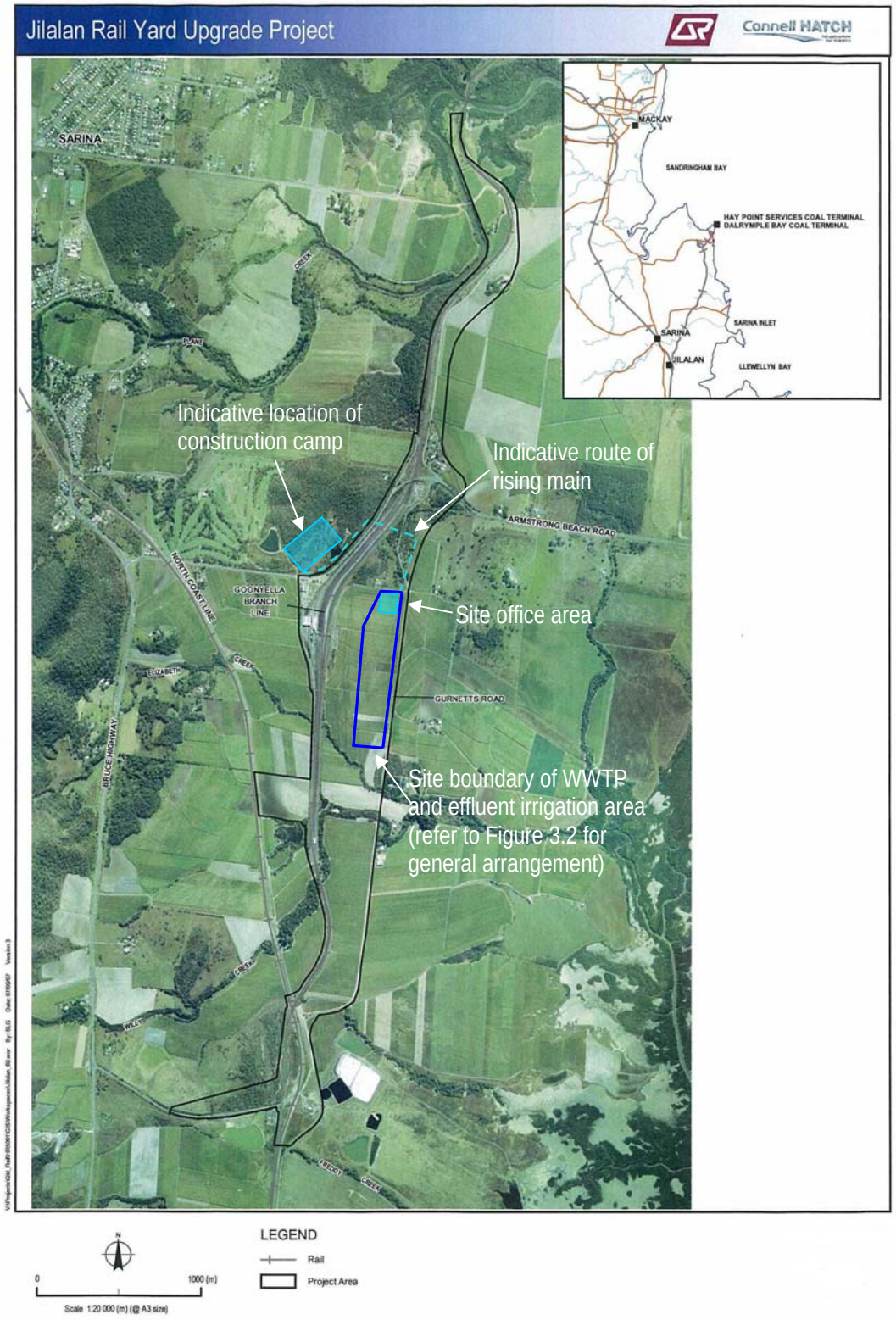
- *Queensland plumbing and drainage Act 2002* and associated regulation
- DLGP onsite sewerage code 2003
- *Environmental Protection Act 1994* and associated regulations and guidelines
- *Workplace Health and Safety Act 1995*
- Queensland water recycling guidelines 2005
- Queensland water quality guidelines 2006

3. Site description

3.1 Location

The existing Jilalan Rail Yard is located 3 km south of Sarina, which is approximately 35 km south of Mackay on the central Queensland coast. The Bruce Highway, a state controlled road is located approximately 1 km west of the existing Goonyella Branch Line (refer Figure 3.1).

Figure 3.1 Locality plan and site boundary of temporary WWTP and effluent irrigation area



3.2 General site description and location of ERA 15(b)

The land surrounding the JRYUP is predominantly used for the cultivation of sugar cane, with associated residential dwellings sparsely scattered throughout with some cattle also farmed in the area.

An existing industrial facility is located adjacent to and east of the rail at the southern end of the project area. This facility is owned and operated by CSR and produces fertiliser from sugar mill waste and other biological matter.

The NCL (a single track passenger and freight railway) runs parallel with the existing Goonyella Branch Line at the southern end of the project area and crosses under the Goonyella Branch Line north of the CSR facility. A cane rail system runs generally parallel to the NCL at this location, with both tracks running to Sarina. The NCL and the Cane Rail Line are not electrified. A cane rail siding is located on the eastern side of the NCL underpass.

An aerial photo showing the site boundary and surrounding area is detailed in Figure 3.1 and an aerial photo with general arrangement is shown in Figure 3.2. The proposed sites for development that relate to ERA 15(b) are included in Table 3.1.

Table 3.1 ERA 15(b) locations

ERA	Lot/Plan
15(b) - Sewage Treatment Plant Wastewater treatment plant	8RP741153
Pumping station(s), effluent storage pond and effluent irrigation area)	1RP726644, road reserve, 4SP168447, 6 RP746880

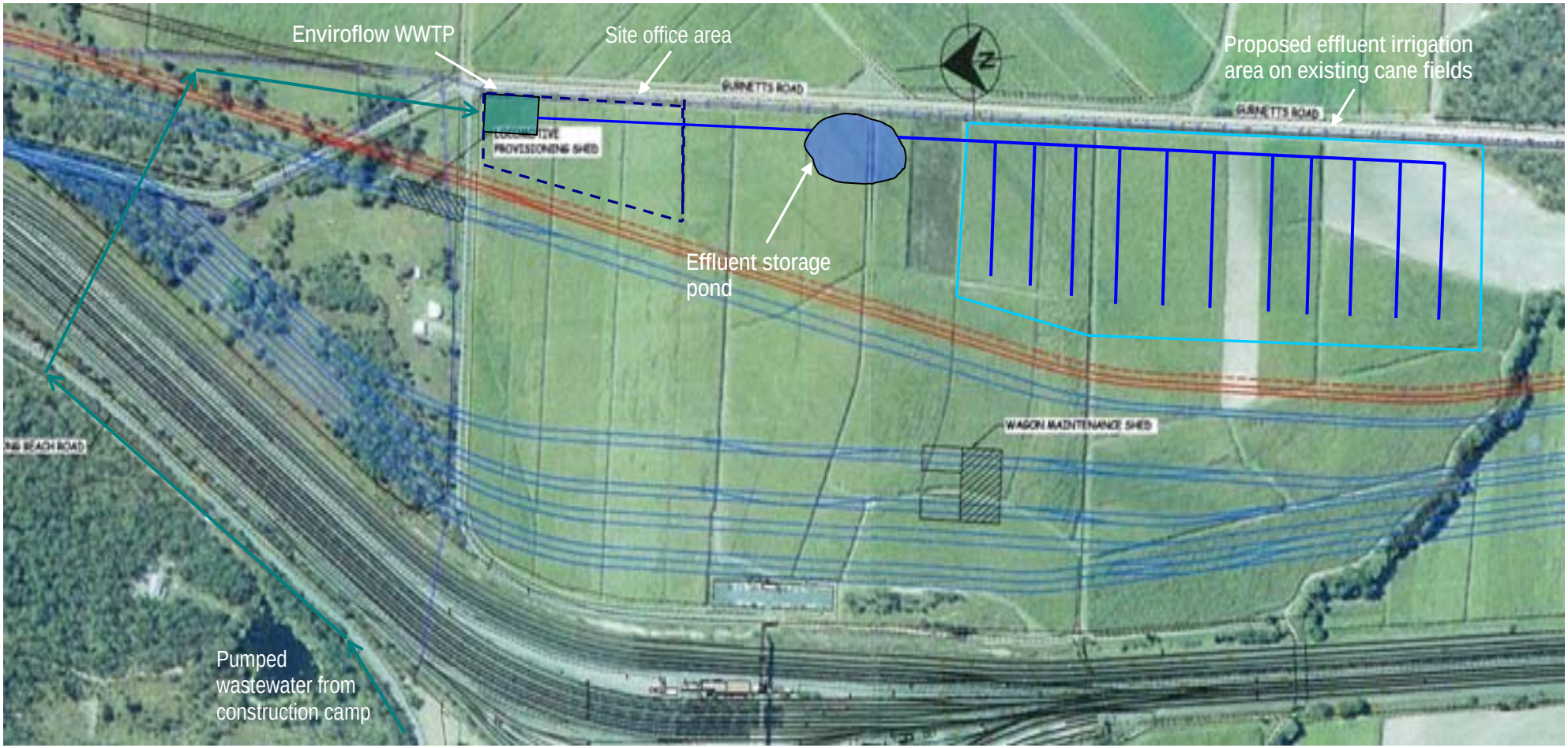
3.3 Proposed development and site operation

The proposed development of the construction accommodation village and site office, including pumping station and WWTP will serve the JRYUP, which is to provide:

- A new bidirectional locomotive provisioning facility
- A new wagon maintenance facility
- Refurbishment of an existing wagon maintenance building into a new locomotive maintenance facility
- New tracks to store three trains, assembled and ready for immediate deployment
- New bypass tracks to eliminate conflicts between through rail traffic and the new yard facilities
- New station and yard control facility

The accommodation village will be occupied 24 hours a day 7 days per week over a period of approximately 2 years (life of the project construction stage only). The construction site office will operate in accordance with the hours as stipulated in the Construction Environment Management Plan (CEMP), included as Appendix F of the ERA supporting document. The proposed pump stations, WWTP, effluent storage pond and effluent irrigation area will be operational for the life of the project.

Figure 3.2 Site boundary of proposed WWTP and effluent irrigation area



4. Proposed wastewater collection and treatment system

4.1 Sources of wastewater

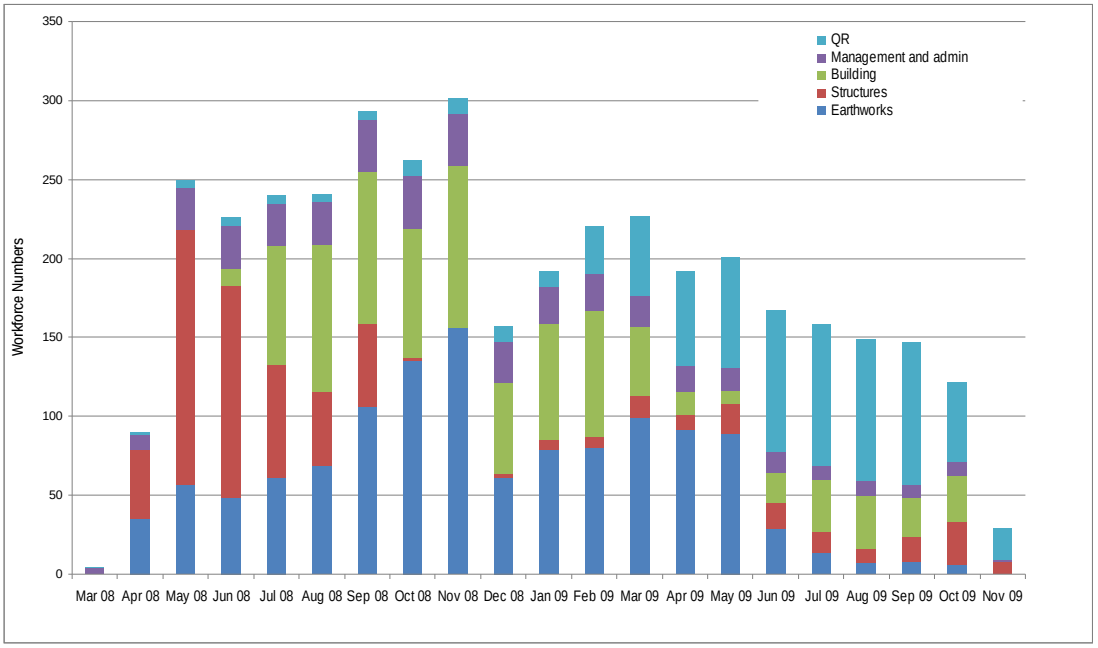
The project construction accommodation village will house the construction crew. The sources of domestic wastewater for treatment from the accommodation village and site office will be from:

- Toilets
- Hand basins
- Showers
- Kitchen
- Laundry

4.2 Wastewater treatment system sizing

The initial number of personnel expected to be working at the project is approximately 90, with an ultimate population of 300. The nominal distribution of the labour for the project at any given time is illustrated in Figure 4.1. This distribution shows that over the 2 year construction phase the workforce is expected to exceed 250 personnel for a period of approximately 3 months.

Figure 4.1 Indicative workforce



The project construction accommodation village, including WWTP and associated infrastructure will be designed to accommodate a peak capacity of 300 persons. The accommodation village will be constructed and demobilised in stages of 50-100 rooms at a time.

A hydraulic load of 200L/EP/d has been adopted from WSA 02-2002 Sewerage Code of Australia. As the site office will only operate during the business hours specified in Section 3.3 a reduced hydraulic load of 40L/EP/d has been adopted. Hydraulic influent loadings for the sizing of the WWTP are given in Table 4.1 and the assumed average organic loads for the influent are given in Table 4.2. Based on the ultimate population this equates to a total design hydraulic load of 75 kL/d.

Table 4.1 Hydraulic loading

Population	Hydraulic load (L/EP/d)			Total hydraulic load (kL/d)
	Accommodation camp	Site office	Total	
90	200	40	240	21.6
250	200	40	240	60.0
310	200	40	240	74.4 (say 75)

Table 4.2 Average organic loading

Parameter	Unit loading
Organic matter (BOD5)	70g/EP/d
Total suspended solids (TSS)	70g/EP/d
Total nitrogen (TN)	15g/EP/d
Total phosphorus (TP)	2.5g/EP/d

Source: On-site domestic wastewater treatment units AS1546.3:2001

4.3 Treated effluent quality

It is proposed to adopt a Class A effluent quality, which allows for unrestricted irrigation. This is based on the Queensland Water Recycling Guidelines (EPA, 2005) and the effluent quality requirements are given in Table 4.3.

Table 4.3 Recommended water quality specifications for Class A effluent

E.coli (median) cfu/100mL	BOD5 (median) mg/L	Turbidity (max) NTU 95%ile	SS (median) mg/L	TDS mg/L or ECµS/cm TDS/EC (median)	pH	Typical uses	Irrigation buffer zones
< 10	20	2	5	1000/1600	6.0 to 8.5	Above ground open space irrigation, uncontrolled access	No specific buffer zone required

Source: Queensland Water Recycling Guidelines (EPA, 2005)

4.4 Wastewater treatment

Generally, for this size of development and domestic type of wastewater, package plants are the most suitable. These are usually based on the activated sludge process and the aeration chamber in this type of plant can use suspended growth or attached growth media. Package plants are of standard design and available in standard sizes to suit particular hydraulic and organic loads.

Package activated sludge plants usually include a screen or comminutor, a partitioned tank or two or three tanks with some form of aeration and a clarifier and/or an effluent polishing system. UV disinfection or chlorination units are also included.

4.5 WWTP process

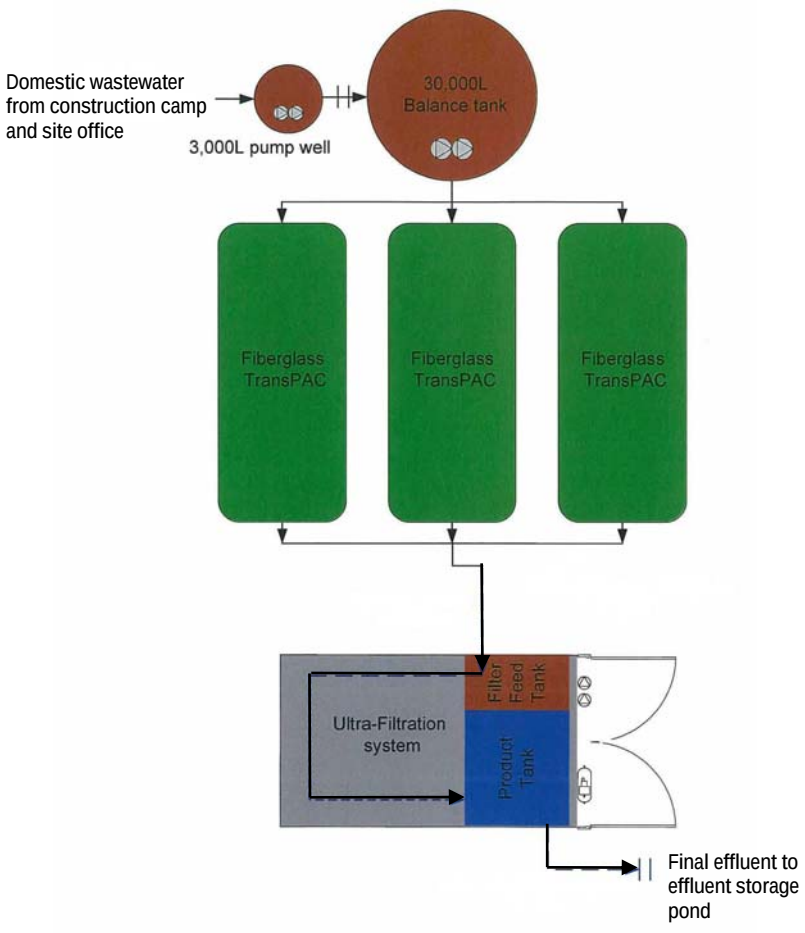
Enviroflow have been selected as the preferred WWTP supplier and their system is capable of treating the wastewater to a Class A effluent, and is low maintenance with weekly inspections required. A summary of the selected WWTP is given in Table 4.4 and further details contained Appendix B.

Table 4.4 Summary of selected WWTP

Supplier	Enviroflow Water Technologies
Description	The Envirflow treatment process consists of: • Primary tank for sedimentation, digestion and storage of solid matter • Balance tank for flow equalisation • Aeration compartment for reduction of organic matter • Clarifier for further removal of residual suspended solids • Ultra filtration membrane system to further reduce bacteria, suspended particulates, colloidal material and molecular weight material greater than 0.1 micron • Final effluent tank for disinfection and storage of treated water
Maximum loading	75kL/d
Disinfection system	Chlorination
Approximate footprint	Three tanks with dimensions of 6 m length x 2.4 m width x 2.4 m height

The process flow diagram of the proposed system is shown in Figure 4.2.

Figure 4.2 Process flow diagram for Enviroflow WWTP



Source: Enviroflow Water Technologies

4.5.1 Pumping station

A pumping station is required to collect domestic wastewater from the JRYUP construction accommodation village and pump it to the WWTP located near the site office. Raw wastewater from the site office will gravitate to the WWTP pumping station.

The construction camp pumping station is required to collect and transfer (by rising main) the domestic wastewater from the construction camp site to the WWTP, approximately 1,200 m away. The WWTP pumping station is required to lift the raw wastewater into the WWTP. The proposed pumping stations will have the following dimensions outlined in Table 4.5.

Table 4.5 Pumping station dimensions

Pumping station	Nominal diameter	Depth	Storage volume
Construction camp PS	1.6 m	2.125 m	3 kL
WWTP PS	2.4 m	1.0 m	4 kL

Both pumping stations will be fitted with duty and standby grinder pumps, as well as suction and discharge pipework and electrical components. A water tight lid will minimize the potential for stormwater ingress and overflow, and will allow for sufficient time to organize a waste contractor or an additional pump from the WWTP supplier located in Caboolture (if required).

Monitoring equipment and a high-level alarm will be fitted to the holding tank, detailed information is provided in Appendix C for the WWTP pumping station and Appendix C for the construction camp pumping station. During abnormal WWTP operation a licensed waste contractor will remove and dispose of the raw wastewater to a local municipal WWTP (if required).

4.5.2 Rising main

Construction of two risings mains is proposed, a rising main from construction camp pumping station to WWTP and a rising main from WWTP to the proposed effluent discharge pond. The general alignment of these rising mains is shown in Figure 3.2 and on drawings included as Appendix A. It is proposed that both rising mains will have a nominal diameter of 90mm and be constructed from high density polyethylene (HDPE) pipe.

4.5.3 Grease trap

A grease trap will be provided at the construction camp facility for the kitchen waste and will be located before the WWTP pumping station. This will prevent oils and fats impeding the WWTP biological treatment process.

4.5.4 Effluent disinfection

Disinfection of the treated effluent is required to meet the EPA requirements for E.coli of less than 10cfu/100mL. Chlorination will be achieved through a chlorine tablet dispenser. This method of dosing has the advantage of not requiring bulk storage or other safety equipment, such as safety showers. The operator only requires safety glasses and gloves to load the tablets, which come in 30 kg to 50 kg bulk drums. On average, the tablets would require replenishment approximately every three months. A low-level alarm will be fitted to the chlorine tank, as well as monitoring equipment for the chlorine residual in the treated effluent.

4.5.5 Effluent management

It is proposed that treated effluent is transferred from the WWTP to a lined effluent storage pond, approximately 350 m away. Treated effluent will then be used for dust suppression on the construction site or used to irrigate at the designed effluent irrigation area. Further detail on the proposed effluent reuse system is addressed in Section 5.

4.5.6 Waste sludge disposal

A waste contractor will remove and dispose of the waste sludge generated from the treatment process.

5. Proposed effluent reuse system

5.1 Effluent reuse assessment process

An effluent reuse study for the proposed development at the Jilalan Rail Yard was undertaken. The assessment process included a water balance model and assessment of nutrient loads.

5.1.1 Design criteria

The following design values have been used in this study:

Wastewater quantity	75kL/d (for all days, however this is the peak flow that would apply for less than 6 months of the project)
Wastewater composition	Nitrogen = 40mg/L Phosphorus = 10mg/L
Available irrigation area	9.6 ha (total 8 ha with land lost to marginal buffers)
Irrigation method	Furrow irrigation
Land use	Grass, harvested, possibly endemic to the area
Project life	Less than 2 years

5.1.2 Effluent reuse strategy

Two irrigation strategies have been examined.

Standard irrigation

The "standard" irrigation assessment assumes irrigation can be applied daily to the designated effluent irrigation area except when the soil moisture exceeds 80% of field capacity. In this case the effluent is stored in the effluent storage pond and not irrigated. When the storage is full and cannot be irrigated then the surplus volume is calculated as "surplus". This surplus effluent requires alternative disposal. This is a standard irrigation management strategy that prevents runoff of irrigation water and minimizes deep drainage of irrigation water.

Project irrigation

The "project" irrigation assessment assumes all of the irrigation water will be consumed by construction demands when rainfall is less than 2 mm and that the storage is empty. This is intended to replicate construction demands. Irrigation is then limited to 80% of field capacity as described for standard irrigation. If no construction water is used then a 3 ha irrigation area is required and has a 29% surplus (based on modelling). When construction water is used the surplus falls to 8% ie when construction water is used the irrigation rate is much lower.

The following effluent reuse strategy has been adopted:

1. Effluent will be used first for construction as a source of construction water (eg. for soil compaction and dust suppression). Up to 2 – 2.5 ML/d will be required during the peak construction period. The effluent will be used for construction in preference to irrigating the effluent irrigation area (existing cane farm refer Figure 3.2). A frequency distribution analysis of the daily rainfall total is presented in the Assessment of Treated Wastewater Disposal report included as Appendix D. On 79% of days the rainfall total is less than 2 mm. It is assumed that construction water demands will utilise all of the effluent on days when the rainfall is less than 2 mm. Any water held in the effluent storage pond will be used for construction in preference to irrigation.

2. On days when the construction demand is less than 75 kL/d, effluent will be irrigated to the effluent irrigation area, except when the following conditions prevail:
   - Ponding of rainwater or effluent is likely
   - Runoff of rainwater or effluent is likely
3. During periods when irrigation should not be applied to the effluent irrigation area it will be directed to the effluent storage pond (equivalent to 5 days storage (375 kL) and held for subsequent re-use either as construction water or irrigation water.
4. When the effluent storage pond is full and the soil is extremely wet, then an alternate disposal method for effluent should be incorporated.

In summary, the adopted effluent reuse strategy has the following objectives:

- Minimises the demand for alternative supplies of construction water
- Minimise the hydraulic load and nutrient load to the irrigation area
- Maximises the opportunity for land disposal when construction water demand is low
- Minimises runoff of effluent

5.1.3 Modelling

A daily time step water balance model has been used to examine the performance of the proposed effluent irrigation area. Three cases were modelled to assess hydraulic and nutrient loads, these are:

- Non-irrigated grass
- Irrigated grass, no construction water use
- Irrigated grass, construction water use

When construction water is used the nutrient load is 55 kg N/ha/yr and 14 kg P/ha/yr. The nitrogen application rate is well below the crop uptake rate. The phosphorus application rate is close to the crop uptake rate. However, provided the irrigation water has sufficient residence time within the crop root zone then very high rates of nutrient attenuation are predicted. Nitrogen will also be lost as a consequence of soil denitrification. The potential loss rate is approximately 330 kg N/ha/yr. This provides a second level of protection for nutrients not utilised by the crop. Phosphorus will be utilised by the crop as well as being lost through soil phosphate sorption and soil phosphate precipitation. The sorption capacity is predicted to be adequate for the period of irrigation.

An outline of the potential impacts and mitigation strategies resulting from the reuse of effluent is included in Section 6.4.

Modelling results are detailed in the Assessment of Treated Wastewater Disposal report, included as Appendix D.

5.2 Proposed effluent storage pond

The proposed volume for effluent storage pond is 375 kL, which equates to 5 days storage. A 5 day storage capacity provides an effective storage volume and is considered appropriate for the temporary nature of the project. Refer to Figure 3.2 and the drawings included as Appendix A for an overview of the proposed effluent storage pond. The effluent storage pond will be lined and constructed from material won from the project. It will incorporate inlet/outlet pipework and a high level overflow weir. A minimum free board of 500mm will be incorporated to facilitate wet weather events. Any overflows from the effluent storage pond will be released, in a controlled process to minimise erosion and sediment impacts.

5.3 Proposed effluent irrigation area

The available area for effluent irrigation is approximately 9.6 ha, however the usable area is approximately 8 ha to allow for buffer areas. Based on the results from the water balance model, only an area of 3 ha is required for irrigation of the effluent, based on the adopted effluent reuse strategy (outlined in Section 5.1.2). No advantage was determined in irrigating the full 8 ha, even under wet weather conditions, given that the entire area will be wet and irrigation of effluent could result in ponding or runoff.

5.4 DEIR requirements

Department of Employment and Industrial Relations (DEIR) have released a set of guidelines regarding the handling and use of non-potable water, including effluent.

Generally, the guidelines reflect requirements from the Queensland Water Recycling Guidelines (EPA, 2005), which the proposed Class A WWTP system has been designed to comply with. Guidance is also provided on the preparation of a site wide Water Management Plan (not mandatory). The majority of the issues addressed in the Water Management Plan are currently addressed in this SBMP.

A safety information data sheet will be compiled as per the new legislative requirements under the *Workplace Health and Safety Act 1995* expected to be in place by early 2008. This will then be provided to all persons involved in the transport and use of the effluent as part of the proposed onsite training (refer to Section 8.3). An example of the information to be addressed is given in the guidelines A Guide to Supplying Water to Workplaces Using Water Tankers (DEIR, 2007) and includes:

- Any health hazards associated with the water
- Recommended uses of the water
- Precautions for the safe use of the water, including guidance on storage
- Any relevant testing data

6. Environmental review and management strategies

6.1 Climate

This region has a subtropical climate featuring hot, humid and wet summers. Winters are warm with clear skies and low rainfall. The average maximum temperature varies from 30.6°C in December to 22.4°C in July, and the minimum temperature ranges from 24.9°C in February to 13.3°C in June.

Median rainfall is 1347 mm based on data collected by the Bureau of Meteorology at Mackay Airport. A large proportion of this rain (about 75 %) falls from December through to April, peaking in January and February. Table 6.1 outlines rainfall data from Mackay Aero monitoring station.

Table 6.1 Rainfall data taken from Mackay Aero monitoring station

Element	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Highest rainfall (mm)	1194	1288	887	842	537	288	266	230	71	201	244	380	3523
Lowest rainfall (mm)	56	51	5	15	14	9	0	1	0	0	1	1	711
90 percentile rainfall (mm)	583	679	376	402	143	126	60	78	38	59	162	232	2573
50 percentile rainfall (mm)	277	274	138	109	70	52	18	21	13	32	54	94	1347
Mean no. of rain days	13	14	11	11	8	7	4	4	3	4	6	8	92

Source: Bureau of meteorology Mackay Aero Station Number 033045

6.2 Winds

Wind data obtained at the Bureau of Meteorology's monitoring site at Mackay Airport between October 1995 and June 2007 is included in Appendix E of this document.

In general, although strong winds are evident from all directions, winds with speeds greater than 10 m/s are most frequent from the east-southeast through to the southeast. Winds from the west are most often light to moderate. Strong winds from the north and south are also observed.

Predominant synoptic winds are from the southeast and are produced by a ridge of high pressure extending from the subtropical high-pressure belt that is frequently associated with a high-pressure system located over the Tasman Sea. Afternoon northeast sea breezes commonly occur during the warmer months. Fresh southeast wind can blow along the coast for lengthy periods during summer and autumn. Gale force winds are rare but do occur with tropical cyclones.

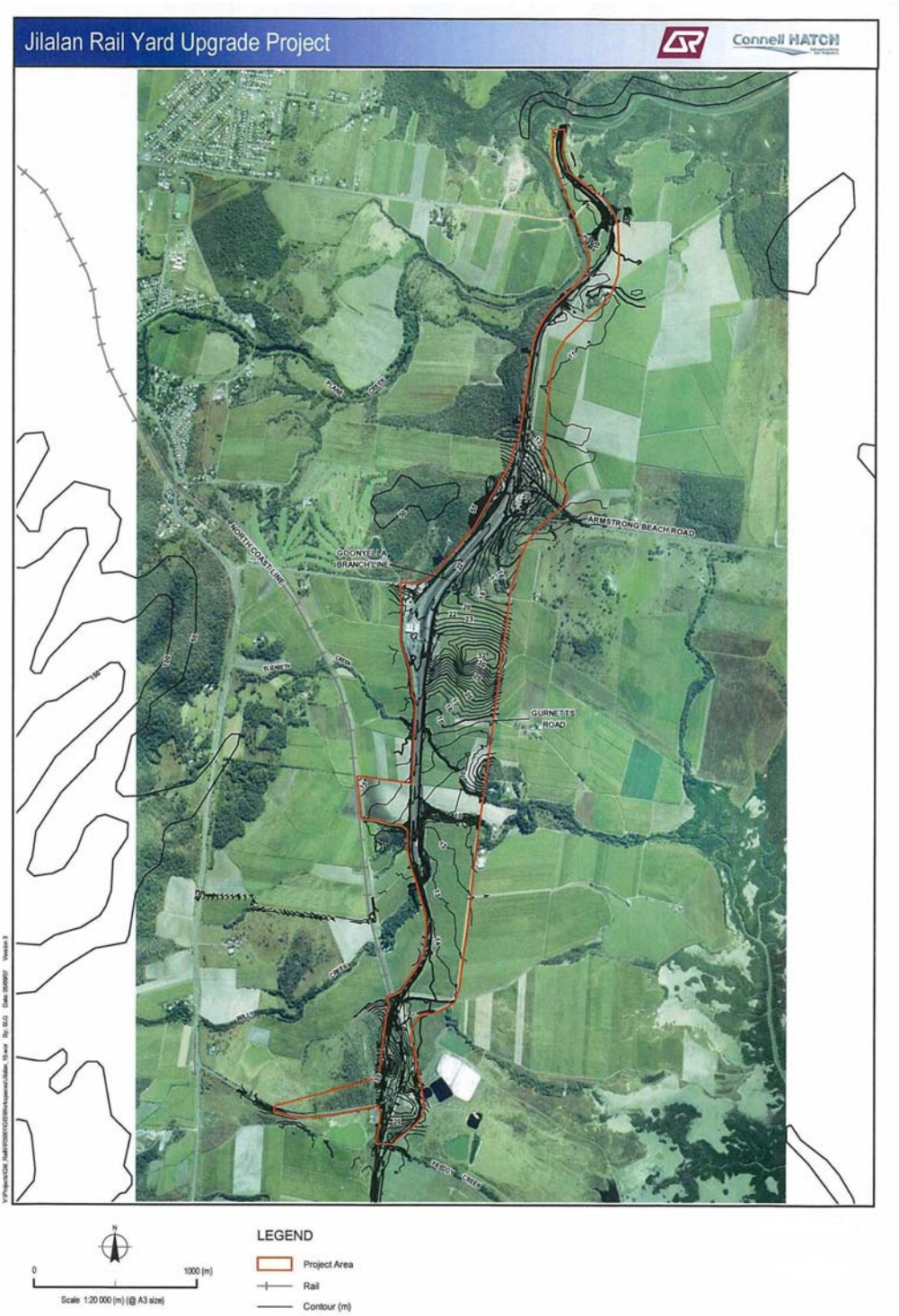
The cyclone season is from December through to April with on average, three (3) tropical cyclones occurring every ten years (based on data from BoM from 1969-1999).

6.3 Site topography and soils

Topography within and surrounding the project area is shown in Figure 6.1 and is dominated by a level to gently undulating plain, which is intercepted by a convergent, integrated tributary network of drainage lines and isolated hillcrests of rolling hills and low rises with gently inclined to steep slopes. Topographical elevations within the project area range from <5 m Australian Height Datum (AHD) within the drainage lines and channels to approximately 35 m AHD where the project alignment intercepts the adjoining hillslopes.

Soil types within the project area are sandy/silty clays, sandy silts, clayey gravels and clayey/silty sands.

Figure 6.1 Site topography



6.4 Surface water, groundwater, stormwater and effluent

6.4.1 Existing environment

The JRYUP is located in the lower reaches of the Plane Creek Drainage Basin as identified in the EIS. This basin encompasses an area of approximately 250,000 ha. The Plane Basin includes several small streams which discharge directly into Sarina Inlet, which is part of the Great Barrier Reef World Heritage Area (GBRWHA) and the Great Barrier Reef Marine Park (GBRMP), which is an area of international, national and state significance.

The location of the proposed construction camp pumping station is approximately 1,200 m away from Plane Creek and the proposed WWTP is more then 1,400 m from Plane Creek, with the closest watercourse being Willy Creek as indicated on Figure 3.1. Table 6.2 outlines the approximate distances of the proposed pump station, WWTP, effluent storage pond and effluent irrigation area from the defined watercourses.

Table 6.2 Distances from Willy Creek to WWTP and associated infrastructure

Infrastructure	Approximate shortest distance to Willy Creek
Construction camp pumping station	> 1,000 m
WWTP	900 m
Effluent storage pond	730 m
Effluent irrigation area	Minimum proposed buffer distance of 50 m

An isotopic analysis of groundwater was undertaken as part of the EIS process. Groundwater samples were drawn from coastal alluvial bores between Mackay and Sandy Creek. The report concluded that the groundwater found in the alluvial aquifers of the Pioneer Valley was relatively modern in age (less than 30 years old) and that aquifer recharge occurs rapidly, indicating that most recharge is from direct infiltration of rainfall or infiltration from flooded streams. The nature of the aquifers in the project area and their close proximity to both the Pioneer Valley and Alligator Creek catchments support the conclusion that recharge is of a similar nature within the project area.

Due to limited existing groundwater monitoring network or water level records for the area, it is not possible to determine the seasonal variations of groundwater in the immediate project area. However, it can be assumed that monitoring bore (12600302) screened within similar aquifer material in the adjacent Alligator Creek aquifer would reflect a similar seasonal variation.

Water level measurements were recorded biannually until 1992 and from this period on have been taken on a quarterly basis. It should be noted that this sampling pattern is most likely to miss short lasting extreme highs and lows. The records should however, provide sufficient information to determine a steady state aquifer sample. This bore was observed to have a seasonal variation on average of 1.49 m/y, a maximum of 3.04 m in a calendar year and a minimum seasonal fluctuation of 0.01 m/y.

6.4.2 Potential construction and operational impacts

Sediment

There is a potential risk of sediment being transported off site in stormwater runoff and water used during construction of the proposed WWTP, effluent storage pond and the effluent irrigation area. Excavation will be kept to a minimum during construction of the proposed WWTP, effluent storage pond and effluent irrigation area and appropriate erosion and sediment control measures will be implemented through the CEMP. A copy of the Draft CEMP is included as Appendix F of the ERA supporting document.

Therefore the potential impact on surface water, groundwater and stormwater quality from sediment during construction is considered to be low.

Effluent - nutrients

There is potential for effluent to runoff from the proposed effluent irrigation area to the creek, especially when the soil moisture content exceeds 80%. Furthermore there is a potential for nutrients to leach into the groundwater system.

However, based on the adopted effluent reuse strategy, short duration of the project and the relatively low effluent irrigation rate it is considered unlikely that there will be an accumulation of nutrients. Furthermore, it is predicted that there will be little or no change in the current rate of nutrient export (eg that from sugar cane land).

Therefore, the potential impact on surface water, groundwater and stormwater quality from nutrients in the effluent is considered to be low.

Effluent – surplus

The proposed effluent reuse strategy is not likely to result in an adverse environmental impact provided the management strategies as outlined below are followed. Care will need to be taken to manage the effluent irrigation area to minimise ponding and/or runoff after periods of wet weather extending beyond 5 days. A prolonged period of wet weather may result in filling of the effluent storage pond and wet soil conditions, precluding irrigation. Under these conditions an alternative to effluent irrigation maybe be required if construction continues and potential impacts are to be minimised. It is however likely that during prolonged wet weather the project will slow and/or stop. Hence the corresponding hydraulic load should diminish accordingly ie there will be fewer construction personnel on the project during prolonged wet periods and a corresponding smaller hydraulic load.

Therefore the potential impact on surface water, groundwater and stormwater quality resulting from the irrigation of effluent is considered to be low.

Effluent - pathogens

The effluent will be treated and disinfected to Class A standard. This level of disinfection permits primary contact with an acceptable risk to human health. Routine monitoring of the treatment process (according to the manufacturer specifications) is essential to ensure the treatment process is fully operational. The proposed method of irrigation is furrow irrigation and this method limits the generation of aerosols. The most persistent pathogen in the effluent is likely to be a virus. A virus attenuation model has been used to examine the minimum distance required to reduce the virus population. The model predicts a minimum distance of 4 m is required where the hydraulic gradient is 5%. It is understood that bore water is locally used and this water may be used as a domestic water supply. However, pathogens are not predicted to be a hazard as adequate separation will be maintained between bores and dwelling areas and the proposed effluent irrigation area.

6.4.3 Management strategies

During construction of the pump stations, WWTP, effluent storage pond and effluent irrigation area excavation will be kept to a minimum. Appropriate erosion and sediment control measures will be implemented in accordance with the CEMP, included as Appendix F of the ERA supporting document.

Operational procedures will be designed to mitigate hazard to the groundwater, this typically includes transferring all chemicals and liquid waste by competent personnel using self-sealing/closing couplings on transfer hoses. A range of operational controls will be detailed in the WWTP Operational Manual, which will also include procedures to address emergency response, complaint response and spill response. This manual will be developed and implemented by the WWTP operator prior to commissioning of the proposed pump stations, WWTP, effluent, effluent storage pond and effluent irrigation area.

The flooding potential for the site has been identified as likely in a Q100 rain event given the close proximity of the site to Willy Creek, therefore all of the WWTP tanks are sealed to at least 1 m above ground level and pumping stations will have available storage. Further details on strategies that have been adopted to manage stormwater are included in Appendix F of this document.

The following specific effluent management controls are proposed:

- To minimise the risk of runoff it is proposed to incorporate a "dry period" of 12 hours after the last rainfall (event > 10 mm) prior to applying any effluent. This is intended to allow the surface soil to drain to the point where further effluent may be applied without causing runoff. Wherever possible, irrigation should not be applied under conditions that will result in runoff of effluent from the proposed effluent irrigation area.
- A minimum separation distance of 100 m will be maintained between effluent irrigation area and any bore that may be used as a domestic water supply. Effluent will not be applied within 50 m of a dwelling or drainage line to minimise the risk of surface movement of residual pathogens by overland flow.
- A drain at the lower boundary of the proposed effluent irrigation area should be used to collect any effluent runoff from the proposed effluent irrigation area.
- It is proposed to incorporate a 500 mm freeboard to the full level to minimise the risk of the effluent storage pond surcharging following extreme rainfall events.
- Routine monitoring of soil and water quality will be undertaken and the proposed monitoring schedule is included in the CEMP, included as Appendix F of the ERA supporting document.

6.5 Vegetation and habitat

6.5.1 Existing environment

The project area is located in the coastal environs of Sarina Shire Local Government Area (LGA). Previous land use activities within the area have had a negative impact on the area's biodiversity and habitat values.

Extensive clearing for the purposes of grazing and cropping (primarily sugar cane) has fragmented the landscape and reduced connectivity for local fauna. Scattered patches of eucalypt woodland and thin strips of paperbark open forest are restricted to the riparian zones of watercourses intersecting the area and areas not suitable for agriculture. These existing habitats/corridors are generally long, thin strips of vegetation.

6.5.2 Potential construction and operational impacts

No major clearing of vegetation (other than sugar cane) will be undertaken during construction of the proposed WWTP, pump stations, effluent storage pond and effluent irrigation area. No adverse impact on vegetation or habitat is predicted through the operation of the proposed WWTP and effluent irrigation area.

6.5.3 Management strategies

Any clearing of vegetation and habitat for the proposed WWTP, pump stations, effluent storage pond and effluent irrigation area will be minimized. No clearing of vegetation is proposed for the effluent irrigation area, other than sugar cane.

6.6 Air quality

6.6.1 Existing environment

The air quality for the site is typical for a rural area. The site generally has clean air and little odour. The EPA operates a monitoring site in Mackay that measures PM_{10} levels. Data has been sourced from January 1998 and June 2007. During this period there were a total of 24 days for which the EPA's monitoring site at Mackay recorded 24-hour average concentrations of PM_{10} that were greater than 50 $\mu g/m^3$, and 2 days with levels over 150 $\mu g/m^3$.

There are no measurements of total suspended particulates (TSP) from the EPA's monitoring station. Previous assessments by Katestone Environmental of data from monitoring sites at rural locations suggest that the background concentration of PM_{10} is approximately 50 % of the concentration of TSP.

Similarly, there are no measurements of dust deposition at this site. Based on estimates of background levels used for similar projects located in rural areas, an estimated background dust deposition rate of 20-30 mg/m^2/d is likely.

6.6.2 Potential construction and operational impacts

Potential construction impacts include dust from cleared and excavated areas.

Potential operational impacts include odours from the prolonged storage of treated effluent, odours/aerosols from the spraying of effluent for dust suppression and odours from the irrigation of effluent to land.

Based on the management strategies outlined below, it is considered that dust and odour impacts would be low during the construction and operation of the proposed pump stations, WWTP, effluent storage ponds and effluent irrigation area.

6.6.3 Management strategies

Cleared and excavated areas will be kept to a minimum and watered during windy conditions to minimise dust generation.

When irrigation is required it is proposed that the effluent will be applied using ground level diffuser pipes. This method should limit aerosol generation and should minimise any potential for odour.

The WWTP Operational Manual will stipulate operational controls to minimise odours generated from the operation of the pumping stations, WWTP, effluent storage pond and effluent irrigation area.

Appropriate maintenance of the proposed WWTP, pump stations, effluent storage pond and effluent irrigation area will be undertaken to minimise odour generation. Odour complaints will be recorded and investigated as soon as practicable in accordance with the requirements as stipulated in the WWTP Operational Manual.

6.7 Noise

6.7.1 Existing environment

Unattended ambient noise measurements were used to determine the “Rating Background Level” (RBL) for the daytime (7.00 am to 6.00 pm), evening (6.00 pm to 10.00 pm) and night-time (10.00 pm to 7.00 am) periods at each location.

The RBL is the median of the 90th percentile of the background (L_{A90}) noise levels in each assessment period (day, evening and night) over the duration of the monitoring. Table 6.3 outlines the determined RBL for each measurement location. The WWTP is located nearest to Location 3 and 4.

Table 6.3 Rating background levels

Monitoring location		Rating background level (dBA)		
		Day	Evening	Night
Location 1	Smyths Road, Sarina	43	45	44
Location 2	Arron Road, Sarina	39	38	35
Location 3	149 Gurnett Road, Sarina	34	37	36
Location 4	231 Gurnett Road, Sarina	37	39	38

6.7.2 Potential construction and operational impacts

Potential construction impacts include noise from construction equipment.

Potential operation impacts include noise associated with the operation of the proposed WWTP, pump stations, effluent storage pond and effluent irrigation area.

Based on the management strategies outlined below, it is considered that noise impacts would be low during the construction and operation of the proposed pump stations, WWTP, effluent storage ponds and effluent irrigation area.

6.7.3 Management strategies

All construction equipment is to be suitably maintained and have noise limiters where possible. The construction hours will be restricted to between the hours as stipulated in the CEMP. A copy of the CEMP is included as Appendix F of the ERA supporting document.

Design features have been included to minimise noise emissions of the proposed WWTP (which is fully enclosed), pump stations, effluent storage pond and effluent irrigation area. The WWTP operational manual will stipulate operational controls to minimise noise generated from the operation of the pump station, WWTP, effluent storage pond and effluent irrigation area. Routine maintenance activities will only be undertaken during normal working hours.

Noise complaints will be recorded and investigated as soon as practicable in accordance with the requirements as stipulated in the WWTP Operational Manual.

6.8 Waste

6.8.1 Existing environment

It is proposed that the WWTP will be constructed on land currently used for agricultural purposes and therefore any waste material currently generated will be organic in nature and managed with standard agricultural practices.

6.8.2 Potential construction and operational impacts

Potential construction impacts include general waste material generated from construction activities, such as green waste, excess excavated material, construction waste, etc.

Potential operational impacts include biosolids from the wastewater treatment process, of which approximately 0.15 kg are produced by each person per annum, and impacts from treated effluent, of which 75 kL/d is produced at the peak of construction. The maximum rate of biosolids produced is approximately 47 kg each year for the 2 year construction phase.

6.8.3 Management strategies

The contractor undertaking the construction of the proposed pump station(s), WWTP, effluent storage pond and effluent irrigation area will be required to develop and implement a waste management plan (WMP). The WMP will be incorporated into the WWTP Operational Manual.

A licensed waste management contractor will remove biosolids during WWTP operation when required.

6.9 Cultural heritage

6.9.1 Existing environment

As part of the EIS process the relevant Aboriginal Parties were identified through the DNRW database for the project area. For the project area, the following two Aboriginal Parties (claimant groups) have claims over this area:

- Yuibera People
- Wiri People # 2

In accordance with the ACH Act, Wiri People # 2 and Yuibera People have been notified of the project and were invited to be involved in preparing a Cultural Heritage Management Plan (CHMP). Both groups have expressed interest in being involved as endorsed Indigenous parties under the ACH Act.

There are no registered Cultural Heritage Body's for the project area.

6.9.2 Potential construction and operational impacts

There is potential for disturbance of cultural heritage material during excavation activities and as such cultural heritage management strategies will be in place to mitigate such impacts.

There have been no significant potential impacts on cultural heritage identified as a result of operating the pump station, WWTP, effluent storage pond and effluent irrigation area.

6.9.3 Management strategies

The management strategies for this development will be identified as part of the CHMP.

6.10 Social

6.10.1 Existing environment

The construction site is within a largely agricultural area with the railway line and Bruce Highway in close proximity.

6.10.2 Potential construction and operational impacts

No socio-economic impacts are anticipated from construction of this proposed WWTP, pump stations, effluent storage pond and effluent irrigation area.

No socio-economic impacts are anticipated from the two year operation of the proposed WWTP, pump stations, effluent storage pond and effluent irrigation area.

6.10.3 Management strategies

Any complaints received regarding the construction or operation of the WWTP, pump stations, effluent storage pond and effluent irrigation area will be recorded and monitored in accordance with the requirements stipulated in the WWTP Operational Manual.

7. Site based management plan

Refer to Appendix G for the site based management plan.

8. WWTP operation and effluent management

8.1 General

The proposed WWTP, pump stations, effluent storage pond and effluent irrigation area are relatively low maintenance and will require daily to weekly inspections by operation and maintenance staff to check all components are operating. Operations will also include sampling, testing, recording of effluent quality, cleaning of treatment units and refilling chlorination unit.

Monitors and alarms are provided with the proposed WWTP for the following:

- Flow turbidity
- pH
- Chlorine residual
- Filter's differential pressure (DP)
- High-level alarms for all tanks
- Low-level alarm for chlorine tank
- High turbidity alarm and shut down
- pH 'out of range' alarm
- Chlorine residual 'out of range' alarm
- Pump failure alarm

Monitoring will be undertaken in accordance with the requirements as stipulated in Appendix G, the CEMP. The WWTP Operational Manual will also include the monitoring requirements. A copy of the CEMP is included as Appendix F of the ERA supporting document.

8.2 Organisational structure and responsibility

At this stage no contractors have been awarded contracts to fulfil the responsibilities outlined in Table 8.1, however once these contracts are negotiated, Table 8.1 will be updated to provide details of contractors and contacts responsible for the operation and maintenance of the proposed WWTP, pump stations, effluent storage pond and effluent irrigation area.

Table 8.1 Company and contact information

Responsibility	Company	Contact	Qualification
Operation and maintenance of WWTP	TBA	Fraser Ramsey Alliance Director Ph. (07) 3840 5304 Fax. (07) 3840 5499	It is likely that Enviroflow or a similar qualified contractor will be engaged on a service agreement for the WWTP and will provide training during commissioning phase of the WWTP. The Coal Stream Alliance have personnel experienced in the operation of WWTPs
Biosolids collection and disposal	TBA	Fraser Ramsey Alliance Director Ph. (07) 3840 5304 Fax. (07) 3840 5499	Licensed contractors
Effluent collection for construction and reuse	TBA	Fraser Ramsey Alliance Director Ph. (07) 3840 5304 Fax. (07) 3840 5499	Licensed contractors

Responsibility	Company	Contact	Qualification
Emergency removal of untreated wastewater and treated effluent	TBA	Fraser Ramsey Alliance Director Ph. (07) 3840 5304 Fax. (07) 3840 5499	Licensed contractors

8.3 Contingency and emergency response plans

The WWTP, pump stations, effluent storage pond and effluent irrigation area contingency and emergency response procedures will be incorporated as part of the WWTP Operational Manual. This manual will also define routine operation and maintenance tasks, including process control/testing and trouble shooting, as well as safety requirements and procedures to minimise impact to the local environment.

The WWTP Operational Manual will also provide procedures to address abnormal operation and WWTP failure. Effluent will continue to discharge to the effluent storage pond during abnormal operation. Should the treated effluent fail to meet the EPA Class A quality requirements then a licensed contractor will pump out and dispose of the non complying effluent.

8.4 Training

It is proposed that onsite training be undertaken by the operations personnel during the installation and commissioning period of the WWTP, pump stations, effluent storage pond and effluent irrigation area. The WWTP Operational Manual will address training and typically include the following:

- Requirements to maintain equipment in good order
- Obligations with respect to waste management and disposal
- Implementation of contingency plans and emergency response actions
- General health and safety requirements for operation of a WWTP as per DEIR guidelines
- General environmental duty and reporting obligations under the *Environment Protection Act (Queensland)*

Regular training will be undertaken onsite so that environmental awareness and responsibility is continually addressed. This will also enable any procedures to be updated and refined to address site specific issues that arise.

9. Environmental records

The following environmental records will be maintained onsite:

- Environmental complaint form
- Environmental incident reporting form
- Employee and contractor training records
- Removal of solid waste by contractor
- Removal of effluent for construction uses

Examples of some of these forms are included as Appendix G. The environmental records will be developed prior to commencing construction.