CAROLE PARK STP

OPERATING PRINCIPLE

DOCUMENT APPROVAL			
TITLE	**NAME**	**SIGNATURE**	**DATE**
Author	Wakib Khan		
Manager, Process Control and Efficiency	Zane Tomlins		

Document Revision History

DATE	REV NO	REVISION DESCRIPTION	AUTHOR:
27/5/2014	01	Draft	Wakib Khan
18/06/2016	02	Final	Wakib Khan

Stakeholder Review History

AREA	NAME	REV NO.	SENT	REQUESTED RETURN BY	RECEIVED	COMMENTS RECEIVED
T&EM	Sonja toft	01	15.06.2014	19.06/2014	18.06.2014	Yes
T&EM	Neil Tite	01	18.06.2014	20.06.2014	19.06.2014	Yes

TABLE OF CONTENTS

1 CAROLE PARK STP OPERATING PRINCIPLE

1.1 Key purpose of Carole Park STP

The Carole Park STP key function is to treat sewage from the Carole Park catchment. An additional goal is to maximise nutrient removal from sewage and produce recycled water to the community. The Carole Park catchment receives substantial trade waste load from industry and the treatment process is constrained by COD load. The approximate design EP is 16,000 with current load of 28,980 EP. The Carole Park STP is operated in accordance with the DEHP development Approval-EPPR 00692313.

1.2 Existing Load and Design Information

Table 1 Existing load and design information

Parameter	Current		Design	
	Stg 1&2	Stg 3	Stage 1&2	Stage-3
ADWF, ML/day	1.2	2.5	4.6 *	2.8
PDWF, L/S	1.2	6		
PWWF, ML/day	1.5	9.9	2.2	11.7
SRT, (day)	2-4	12-15	2-4	12-15
EP				
Inlet work Bypass	>5 ADWF (185 l/s, based on current ADWF 3.2ML/day			
EP	28,980		20301	

Note: * Stage 1&2 Original design with Primary Sedimentation tanks in operation

1.3 History

The Carole Park STP Stage-1 was built in 1973 and Stage -2 was built in 1983 with a combined total nominal capacity of 4.6 ML/d. The original plant, Stage 1&2 consisted of three primary sedimentation tanks, three final settling tanks, two aeration tanks and digesters.

The process was designed to operate as a low sludge age /high rate activated sludge treatment process. In 1995, the plant underwent a nutrient removal upgrade and capacity enhancement. During this upgrade, Stage -3 treatment train was built which consisted of two bioreactors, two final settling tanks and auxiliary system. The nominal capacity of the new plant is 2.8 ML/d.

With the commissioning of the Stage-3 process, flow to Stage-1&2 was scaled down to 1.2 ML/d. The primary sedimentation tank and digester operation was ceased in 2002. The treatment plant had used solar drying beds for sludge dewatering until 1998 when the belt filter press was installed.

1.4 Upgrade Key Items

A number of minor projects are being undertaken to rectify process and operational bottlenecks.

1.4.1 Current projects

- Stage 3 aeration system enhancement for improved operational control and efficiency
- Automation of polymer batching system
- Stage 3 aeration pipe replacement
- Replacement of all raw sewage pumps

1.4.2 Future projects

- Refurbishment of Stage 1&2
- Stage 3 aeration diffuser replacement
- Replacement of effluent pumps with redundancy
- Chlorine contact tank valves and service water pump replacement
- Enhancement of recycle water supply network

1.5 System overview

Carole Park STP consists of two treatment process trains. Stage 1&2, the original plant is a high rate activated sludge treatment process and Stage-3, the new plant is a biological nutrient removal (BNR) process.

The treatment plant consists of the following process areas (also shown in the process flow diagram in Section 1.6):

- Preliminary Treatment Area
  - Raw Sewage Wet well and interceptor pit
  - Raw sewage pump station
  - Drum screen and screw conveyor
  - Vortex grit removal system
  - Odour Control system
  - Inlet flow splitter
  - Secondary process bypass system

- Secondary Treatment
  - Biological treatment and Aeration system
  - Final settling tanks
  - Return Activated Sludge (RAS)
  - Waste Activated Sludge (WAS)
  - Mixed liquor Recycle Pumping System
- Disinfection using chlorine gas
- Effluent pumping system
- Solids dewatering system- Belt Press and polymer system
- Site service water system
- Recycled Water storage dam and delivery system
- Utilities- Compressed air, Service water, potable water, Power Generator

1.6 Carole Park Process Flow Diagram (PFD)

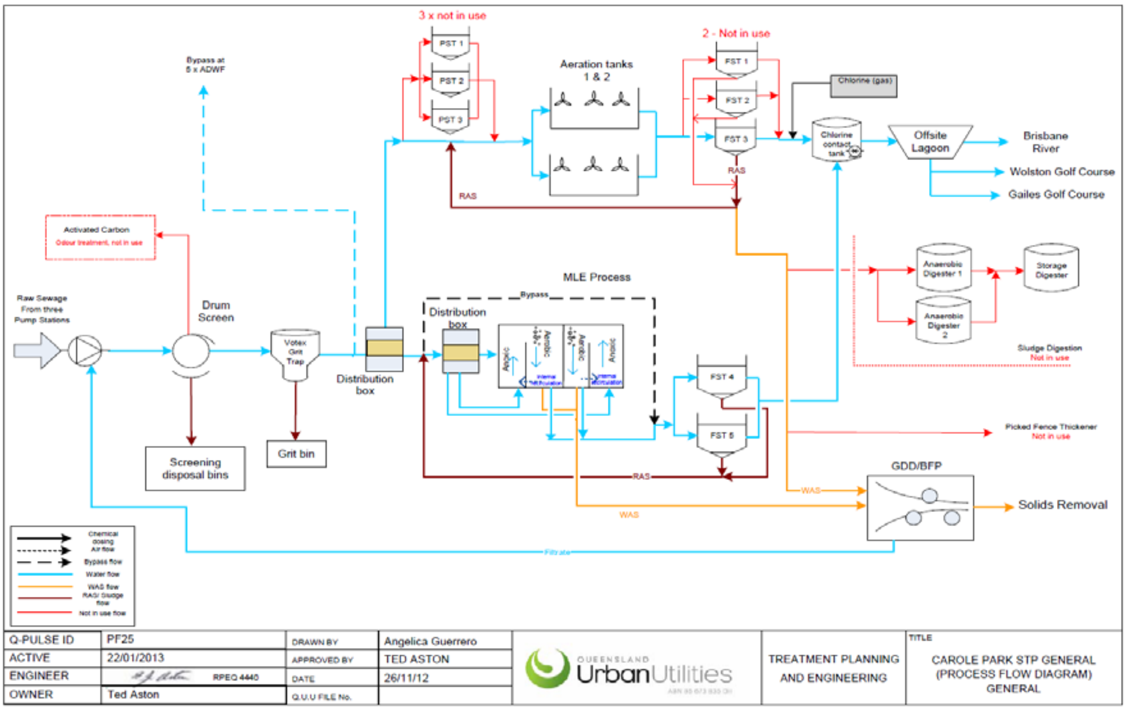

Figure 1 Carole Park STP process flow diagram

1.7 Preliminary Treatment

1.7.1 Wet well and Interceptor Pit

Raw sewage from the Carole Park catchment enters into the STP primarily by gravity (80%) via 750 mm sewer main. Three minor pump stations in the catchment at Cobalt Street (SP338), Southampton Rd (SP251) and Sinclair Drive Rd (SP250) pump approximately 20% of the sewage into the STP.

The sewage from the network enters an interceptor pit (Manhole No.4) located inside the treatment plant. The interceptor pit also collects internal process drainage as well as filtrate from the belt press. The raw sewage from manhole -4 then overflows to a raw sewage Wet Well. The wet well is 12m deep and 2.6m in diameter with a volume of 65 KL. It consists of two compartments. Each compartment can be isolated for maintenance. An ultrasonic level sensor is mounted in each section of the wet well (level sensor 1&2) to measure the level. These levels are displayed on the raw sewage pump station and on the SCADA system. A level switch (high high) is also installed in the wet well for alerting operators.

The raw sewage in excess of the capacity of the wet well increases the level in wet well, backs up into manhole (MH-4) and overflows to an emergency storage basin. When the emergency storage basin becomes full (approximate capacity 1.0 ML and the level rises to 17.9mRL, the raw sewage from MH-4 overflows directly to Sandy Creek.

1.7.2 Raw sewage Pump Station

The raw sewage pump station located in a dry well; consists of three dry mounted centrifugal pumps. The pumps transports raw sewage from the wet well to the inlet works. There is a sump pump in the dry well to prevent flooding of the well.

The raw sewage pumps are controlled by individual variable speed drives (VSD) and the VSDs are controlled by PLC by a RUN digital output and a SPEED REFERENCE analog output. Each pump can be run manually from the local control panel at the raw sewage pump station and remotely from the SCADA system. When selected in manual, the pumps can be started, stopped and speed controlled at the local control panel. When remote automatic control is selected, the pump operation and speed is controlled by the level sensor. The level in the wet well is controlled by a PID control loop with the following parameters:

Table 2 Raw sewage pump station parameters

Parameter	Configuration	Settings
Process variable	The level of pump wet well as selected (either level sensor 1 or 2 or maximum of both)	-
Duty Pump Start	17.0 mRL	Operator adjustable
Follow Pump Start	18.5 mRL	
Follow Pump Stop	17.5 mRL	
Duty Pump Stop	15.5 mRL	

Pump start sequence:

Three raw sewage pumps operate as duty, assist and standby mode.

When the output signal from the level sensor exceeds the duty/lead pump start set point, the duty/lead pump starts. If the raw sewage flow to the wet well is greater than the duty pump flow rate and the level rises to assist pump start level, the Assist/Follow pump starts. Speed of the pumps (duty and assist) is controlled by the PID loop. The duty and assist pumps stop when the level in the well drops to respective stop level.

The raw sewage pump flow to the inlet works is measured by a magflow meter located on the combined outlet of the raw sewage pumps.

<u>Only two raw sewage pumps can run at any particular time. If three pumps are run manually, the flow will exceed the hydraulic capacity of the inlet works and will cause bypass leading to Licence non-compliance. The inlet flow splitter is designed for 185 L/s or 5XADWF (TBC)</u>.

The raw sewage pump flow capacities are shown in the Table below:

Table 3 Raw sewage pump flow capacities

Number of pumps	Flow (L/s)
1	170
2	270

Note: Peak Wet weather flow; estimated by Network Modelling is 212 L/s or 18.4 ML/d

1.7.3 Screenings

The screening removal system removes debris and gross solids from raw sewage. Raw sewage from the pump station enters into a rotary drum screen. The screening materials captured by the screen passes through a screw conveyor and drops into a bin.
The screen can handle 150 l/s. The raw sewage flow from the pumps is limited to 150 l/s (TBC) to avoid bypass at the screen and at the inlet flow splitter.
Flow greater than 150 L/s will bypass the screen and pass through a course bar screen. The screen and the screw conveyor run as a group and 24/7.

<u>There is no redundancy of screen</u>.

1.7.4 Grit Removal

The purpose of the grit chamber is to remove grit particles from the sewage. Screened sewage from the drum screen flows through a channel into a grit tank where sands and grits drop to the base of the tank. The grits collected at the base of the tank is then driven, by opening a knife gate valve, to a wedge weir grit classifier. Dewatered grit drops into a bin and water drains to manhole-4. The grit system is run on weekdays only.

The screenings and grit is collected in the same bin and removed offsite twice a week.

<u>There is no redundancy of Grit system</u>

1.7.5 Primary Treatment Area (PTA) Flow Splitter

After screen and grit removal, the sewage enters the primary treatment area flow splitter. This function of the flow splitter is to distribute raw sewage into three directions:

- Stage 1&2
- Stage-3
- Bypass excess flow to chlorine contact tanks

Flow to Stage 1&2 and Stage-3 can be isolated by a manually operated penstock in each line.
Flow to Stage 1&2 is measured by a magflow meter but there is no flow meter in the Stage 3 line.

Flow in excess of 185 l/s (5XADWF) bypasses the secondary treatment process and flows to chlorine contact tanks.

1.8 Secondary Treatment Process

The secondary treatment process at Carole Park consists of two process streams, Stage 1&2 and Stage -3. Stage 1&2 train is rated to treat ADWF 1.2 ML/d and Stage -3 is rated to treat ADWF 2.8 ML/d.

1.8.1 Stage 1&2 Treatment process

The Stage 1&2 treatment train is the older plant. It originally consisted of three primary sedimentation tanks, two activated sludge bioreactors, three final settling tanks and two anaerobic digesters. Operation of the primary tanks, two final settling tanks (No.1&2) and digesters have been discontinued in 2002.

The treatment train at present comprises of two activated sludge bioreactors, fitted with two mechanical surface aerators in each and a single final settling tank (FST-3).

The operation of aerators in bioreactors has been modified in an attempt to create anoxic and aerobic zones in the bioreactors to achieve some degree of de-nitrification.

The aerator in each bioreactor is variable Speed (VSD) controlled and operates on the dissolved oxygen concentration in the bioreactors. A DO value is set on the SCADA and the aerator speed is adjusted automatically to maintain the DO set point. The DO readings are displayed on the SCADA.

Sewage from the inlet works flows to bioreactors via a 450 mm rising main and splits into two streams in the channel. The sewage then enters into the anoxic zone followed by the aerobic zone. It comes in contact with the returned activated sludge containing autotrophic and heterotrophic bacteria to perform the biological degradation. Organic materials are degraded by the heterotrophic bacteria in the presence of air and are converted to biomass. Ammonia and organic nitrogenous compound in the raw sewage are converted by the autotrophic bacteria into nitrate and nitrites. Some degree of de-nitrification is achieved in the anoxic zone.

Treated sewage from the bioreactors containing biomass or mixed liquor suspended solids overflows to a distribution chamber. The mixed liquor is then directed into the final settling tanks for separation of solids. At present only one final settling is in operation (Final Settling Tank No.3). The final settling tanks 1&2 have been out of service due to poor mechanical condition. The mixed liquor from the distribution chamber enters at the centre of the clarifier and travels towards the periphery. A quiescent condition in the clarifier allows solids to separate and settle at the base.

A rotating bridge fitted with suction lift mechanism draws solids from the base of the clarifier to a channel up in the bridge. The solids then flow towards the centre of the clarifier and are dropped into a sludge hopper at the centre of the clarifier. The sludge hopper is connected with a telescopic valve mechanism (T-valve), which utilises hydraulic head to drive solids out of the clarifier to a pump chamber. Sludge from the pump station is returned (RAS) to the inlet of the bioreactors. The RAS flow to each bioreactor is controlled by manual valves. A magflow meter in line measures RAS flow.

Biomass generated in the process is removed by wasting activated sludge (WAS) from the RAS stream. Sludge wasting is performed by a manual valve on each RAS line and dewatered in a belt press system.

Table 4 Stage 1 & 2 operating envelope

Stage 1&2 raw sewage flow, L/s	14
Bioreactor DO concentration, mg/L	2.2-2.5
MLSS, mg/L	3400-4000
SRT,(day)	2-5
RAS flow, each bioreactor, L/s	18-20
WAS flow, KL/d, 5 days/week	200
Bioreactor volume, combined, KL	860

The treated effluent from final settling tank flows by gravity to chlorine contact tanks for disinfection.

Dimensions:

Bioreactor-1: Length: 22.6 meter, Width: 7.2 meter, Depth: 2.5 meter

Bioreactor-2: Length:24.6 meter, Width : 7.2 meter, Depth: 2.5 meter

FST-1(Not in use) : Diameter: 10.8 meter, Side water depth: 2.5 meter

FST-2(Not in use) : Diameter: 10.8 meter, Side water depth: 2.5 meter

FST-3(in use) : Diameter: 16.0 meter, Side water depth: 2.5 meter

1.8.2 Stage -3 Treatment Process

1.8.2.1 Bioreactors:

The Stage -3 activated sludge process consists of two bioreactor trains (3A and 3B). Each bioreactor is divided into anoxic, aerobic, post anoxic and re-aeration zones. The anoxic zones are fitted with mixers to maintain mixed liquor in suspension. The aerobic zones are fitted with fine bubble aeration diffusers for maintaining the required dissolved oxygen concentration.

Screened sewage from flow splitter -1 flows by gravity to a distribution chamber (Flow Splitter-2) and divides the flow into two streams; bioreactor-3A and Bioreactor 3B. Return activated sludge (RAS) from final settling tanks also mixes with the raw sewage at bioreactor inlet.

The flow splitter -2 was originally designed with automated penstock to bypass raw sewage in excess of the hydraulic capacity of the biological process of Stage-3 (>135 L/s TBC) and send it to final settling tanks. This bypass system was never commissioned and remains closed and isolated.

As the sewage mixed with return activated sludge passes through the anoxic zones, heterotrophic bacteria perform de-nitrification and break down nitrate into nitrogen and oxygen. The flow stream then passes through the aerobic zone where a dissolved oxygen (DO) concentration is maintained by fine bubble diffused aeration system. A dissolved oxygen sensor located in each aerobic zone controls the DO in that zone. The DO sensors measure the dissolved oxygen concentration and adjust air flow control valves to maintain a DO set point. The DO for each zone is set on the Scada and automatically controlled via PLC. (DO set points are included in table PTO)

Each bioreactor is fitted with two mixed liquor recycle pumps (A-Recycle). These pumps run as duty and standby and continuously, returning mixed liquor from the post anoxic zone back to first anoxic zone.

Organic and nitrogenous compounds are converted into biomass, nitrates and nitrites. Mixed liquor then enters into post anoxic zones for residual de-nitrification and to the re-aeration zones prior to overflowing to final settling tank flow splitter (Flow Splitter-3).

Mixed liquor from FS-3 flows to final settling tanks for separating solids. As the mixed liquor enters the centre of the FSTs and travels towards the periphery, solids settle at the base and clear liquid overflows through the launder.

Solids settled at the base are lifted by a suction lift mechanism and deposited into sludge hopper. Solids then gravitate to a wet well and are pumped back as return activated sludge (RAS) into the bioreactors. An individual flow meter from each FST monitors flow from that tank.

The flow of RAS from FST is controlled by adjustment of suction lift valves located in the bridge of each FST. The bioreactors and the FSTs are fitted with scum removal devices. Scum from the bioreactors flows by gravity and the scum from FSTs are pumped using diaphragm pump into sludge wasting tank.

Solid is wasted from mixed liquor to maintain solids balance in the system.

Table 5 Stage 3 bioreactor operating envelope

Raw sewage flow to bioreactors (3A&3B), calculated,	**Combined total**	**32-35 L/s (ADWF), Max 135 L/s**
RAS	Individual Bioreactors	32 L/s
A-Recycle, flow paced	Individual Bioreactors	14-33 L/s
WAS, KL/day, 5/days /Week	Combined (3A&3B)	350
MLSS	Common	Design: 3400 mg/L, current 4000 mg/L
SRT	common	12-15 days
DO	Zone-1	1.80 mg/L
	Zone-2	1.80 mg/L
	Zone-3	1.00 mg/L
Bioreactor volume	Combined	2640 KL

Dimensions:

Bioreactor volume (each) : 1320 KL, total 2640 KL. Length= TBC Width=TBC Depth=TBC
FST : Diameter: TBC side water depth: TBC

1.8.2.2 Aeration system and dissolved oxygen control

The Stage -3 treatment train at Carole Park has two bioreactors; each has anoxic, aerobic, post anoxic and re-aeration zones. The main aeration zones are comprised of five aeration droppers (310 diffusers TBC) supplying air to the diffusers. Each aeration pipe with control valve is a dropper that supplies air to a bank of diffusers.

The control system divides the droppers into three grids, the first consists of three droppers (aeration zone-1), the second (aeration zone-2) has two and the final (aeration zone -3) has a single dropper. The aeration system consists of individual electrically modulating control valves for each aeration tank aeration grid to enable accurate aeration control based on DO in that zone.

The aeration control system works as follows:

- Air discharge pressure of the blowers is controlled by a PID controller with only two blowers running at any time
- DO in both bioreactor zone-1 are controlled by 2 PID controllers, one for each
- DO of both bioreactor zone-2 are controlled by 2 PID controllers, one for each
- DO of both bioreactor zone-3 are controlled by 2 PID controllers, one for each

The aeration system has two main control sequences:

- DO control and
- Header pressure control.

The DO control loop:

- Fixed set point (operator entered DO set point for each zone)
- Diurnal pattern trims from fixed set point for each zone
    - A citect look up table - where each month of the year has a settable trim value
    - This trim value is applied to the set point above depending on the current month of the year

Air header pressure:

- Constant (operator entered pressure set point)
- Most open valve trim from set point

1.8.2.2.1 Dissolved Oxygen Control

Each bioreactor is equipped with three DO sensors and three air control valves to control dissolve oxygen in each zone.

- The aeration control valves in Bioreactor 3A Zone-1 and Bioreactor 3B Zone-1 are adjusted simultaneously with a delay in between each adjustment
- The aeration control valves in Bioreactor 3A Zone-2 and Bioreactor 3B Zone-2 are adjusted simultaneously with a delay in between each adjustment
- The aeration control valves in Bioreactor 3A Zone-3 and Bioreactor 3B Zone-3 are adjusted simultaneously with a delay in between each adjustment
- Each aeration control valve has a minimum position to prevent closing of the valve. The minimum position limit only applies to remote control. Local control does not have minimum position control limit and valve can be closed fully.
- If any DO transmitter faults, the respective DO controller will go to 'Manual Mode' and set point will be defaulted to a predefined value (set in the PLC, 1.5 mg/L, TBC). The manual defaulted set point is operator adjustable; after the controller has moved to the defaulted manual set point.

1.8.2.3 Mixed Liquor Recycle

Mixed liquor from post anoxic zone of each bioreactor is returned to the primary anoxic zone (first anoxic zone) by mixed liquor recycle pumps. There are two pumps; as duty/standby and the pumps operate on flow paced mode. The mixed liquor recycle flow pace mode is controlled by a PID loop on the Scada. The mixed liquor flow is calculated based on the ratio set point on the Scada. *The control system calculates flow to each bioreactor and multiplies the inflow with the ratio* set point and adjusts pump speed using a look up table in the PLC (TBC). The mixed liquor ratio is operator adjustable between 0-1 (TBC)

1.8.2.4 RAS

The RAS flow from each FST is dependent on the position of the manual valves on the suction lift mechanism of individual tanks. These valves are adjusted to increase or decrease RAS flow. The RAS pumps are variable speed controlled and operate on the level set point of the RAS wet well. RAS flow to each bioreactors is 26- 32 L/s.

1.8.2.5 WAS

Solids from bioreactors are wasted from mixed liquor. An actuated valve on the mixed liquor line from the mixed liquor channel allows mixed liquor to flow from bioreactor to the sludge wasting tank.

The valve operates on the level of the sludge waste tank. It opens at low level and closes at high level in the tank. Scum from bioreactors and FSTs also flows to the tank and is removed with WAS. There are two WAS pumps operated as duty and standby.

The sludge is wasted on week days only. The WAS system operates in automatic control when belt press is operational. The operator enters a ‘volume to be wasted’ set point in the belt press PLC. When belt press is started, WAS pump delivers flow to the belt press. The belt press runs until the ‘volume to be wasted’ is completed. At present sludge is wasted 5 days a week and approximately 350 KL/day based on MLSS concentration in the bioreactors.

1.9 Effluent Disinfection

1.9.1 Chlorine dosing system

The purpose of the disinfection process is to destroy pathogenic bacteria in the treated effluent to meet discharge limits and make it suitable for recycle use.

The treated effluent from Stage 1, 2 and 3 flows to chlorine contact tanks (CCT) for disinfection. Chlorine gas is used for disinfection. A chlorine dose rate is set on the SCADA and the PLC regulates the chlorine gas release from chlorine gas cylinder. Service water flow through a venturi meter then dissolves the gas in water and carries to the CCTs. There are manual valves for changing chlorine cylinders. Chlorine content of treated effluent is monitored online (total chlorine) with high level alert to operator, typically 3-5 mg/L.

When a CCT is taken offline, the corresponding valve on that CCT is closed.

The CCT has a detention time of 30 minutes (at peak flow TBC) and disinfection performed in the CCT meets regulatory requirements.

Disinfected effluent from the chlorine contact tank is pumped by two centrifugal pumps and is discharged offsite in two locations; the recycle water storage dam and to the Brisbane River. Two electrically actuated butterfly valves on the effluent transfer line determine the discharge location. Under normal operating condition, effluent flows to the recycle water dam for maximising reuse. If the dam is full effluent is automatically discharged to the river by switching the postion of the discharge valves.

The two valves on the effluent discharge line are controlled in such a way that at least one valve is open at any particular time to ensure effluent discharge flow path is open. The effluent pumps are operated as duty and assist, based on the level of the CCT. The level in the CCT is measured by a multitrode.

The effluent pumps operate on the following control sequence:

- When the level in CCT reaches pump start level (TBC), the duty pump starts at ‘Low Speed’
- When the level in CCT rises, the pump then runs at ‘High Speed’.
- When the level in the CCT rises to ‘Assist pump start level’ (TBC), both pumps run at ‘High Speed’
- When the level in CCT drops to assist pump stop level, the assist pump stops
- When the level drops below duty pump start level, the duty pump stops.

1.9.2 Alarms:

The following alarms are available to alert operators:

- CCT High High Level
- Effluent pump fault
- Final effluent chlorine dosing low flow
- Final effluent total chlorine low
- Final effluent total chlorine high
- Final effluent pH low
- Final effluent pH high
- Final effluent turbidity high

Effluent water quality is monitored online by local sensors:

- pH
- Total Chlorine
- Turbidity

Free chlorine is tested daily onsite using grab samples.
Bacteriological quality is monitored by manual sampling at the local sample point at the CCT. The compliance sample is monitored by SAS lab.

1.10 Effluent Pumping System

Disinfected effluent from the chlorine contact is pumped offsite to the recycle water storage dam and to the Brisbane River. The discharge location is controlled by two electrically actuated butterfly valves on the transfer line as shown in Figure-1.11. These valves operate opposite to each other i.e. if one valve is open , the other valve is closed. The effluent transfer pumps operate on the level of the CCT and controls the level in CCT.

Table 6 Effluent pump flow rates

No of pumps	Flow (L/s)
1 pump	180
2 pumps	285

From the storage dam effluent is pumped to the recycle water end users namely

- Wolston Park Golf Course
- Gailes Golf Course and
- Springfield Reservoir.

1.10.1 Schematic diagram of effluent transfer pipe works

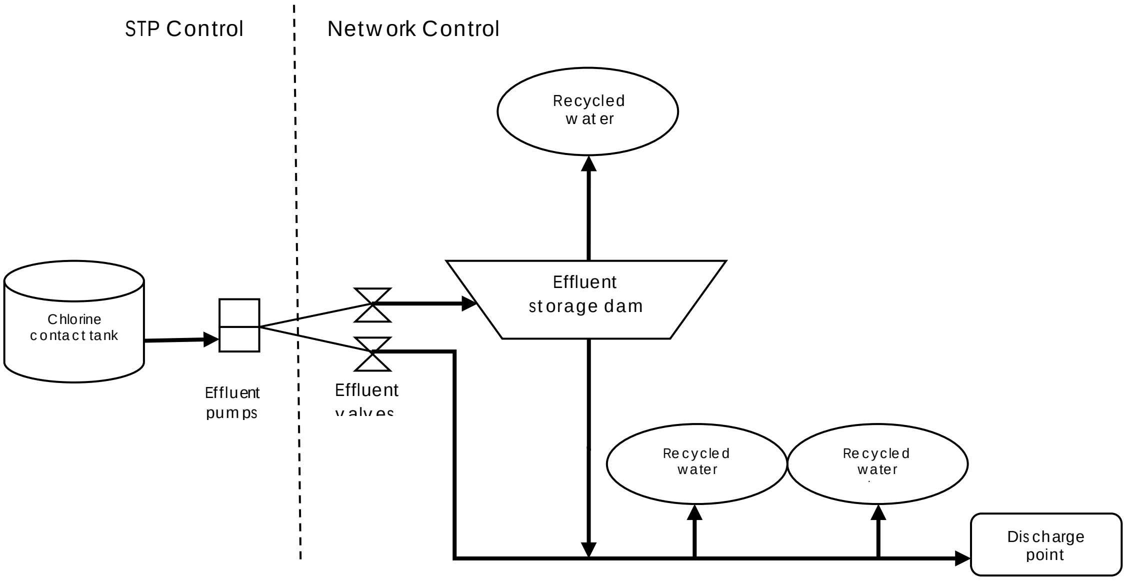

Figure 2 Schematic diagram of effluent transfer pipe works

1.11 Daily Inspection/Operator check sheet

(TBC)

2 RECYCLE WATER DISTRIBUTION SYSTEM

Carole Park STP supplies recycle water via a recycle water storage dam (also known as Waterford Road Recycle water Dam) to the following end users:

- Gailes Golf Course
- Wolston Park Golf Course
- Springfield Recycle water reservoir

Treated effluent from the STP is pumped by effluent pumps located inside the plant to either the dam or to the river. The discharge of effluent to the dam or the river is controlled by two electrical actuated butterfly valves on the transfer line. Under normal operation effluent will be discharged to the dam. The recycle water pumping station at the dam draws recycle water to service two golf courses and the Springfield Recycle Water Reservoir. When the dam is full, effluent water is discharged to the Brisbane River.

2.1 Recycle water monitoring

The following water quality parameters are monitored online by local sensors:

- Turbidity
- pH
- Total Chlorine (online)

The compliance sample point for the scheme is at the Waterford dam as it is discharged from the dam to the reuse customers.

3 DEWATARING SYSTEM

Sludge dewatering system comprises of a GDD/BFP dewatering equipment with polyelectrolyte dosing system. A single belt press provides dewatering of waste activated sludge from Stage 1&2 and Stage-3.

The solids dewatering process can be divided into three distinct phases:

3.1 Sludge wasting (WAS) system

The sludge from Stage 1&2 is wasted from the RAS stream and Stage -3 from mixed liquor.
Stage 1&2 is manual while Stage-3 is auto. Sludge wasting can only be performed from one process train at any time i.e. either Stage1&2 or Stage -3.

3.2 Polymer dosing system

Polymer system :
The polymer dosing system at Carole Park was upgraded and automated in November 2013.

Liquid polymer is delivered in IBC 1000 kg batch (45% active polymer) and pumped into a storage tank. The tank has a storage capacity of 1200 L and fitted with an ultrasonic level sensor to monitor level. The tank is also fitted with a mixer which operates if level in the tank greater than 30%. Polymer solution from the storage tank to the dosing tank is pumped by an automatic poly batching system (Polymore unit). The Polymore System starts (if in automatic control) when level in the poly storage tank is above 12% and the level in the poly dosing tank is less than 20%. The system will stop if either the level in the poly storage tank is less than 10% or the level in the poly dosing tank is greater than 95%.
The batching tank provides approximately 45 minutes curing time (TBC) Polymer solution is dosed into the WAS stream before entering into the belt pres. The dose rate is set on the local control panel.
The belt press operates on 'volume of sludge to be wasted'. The belt press will stop when the volume wasted is completed.

3.3 GDD/BFP dewatering and dewatered cake out loading system

Dewatered sludge cake from the belt press directly drops into a semitrailer located underneath the belt press. The level in the semitrailer is visually monitored by operators. There is no hopper to store sludge cake onsite.

The sludge semitrailer is removed 2-3 times a week.

Table 7 GDD/BFP loading system parameters

Parameter	
Instantaneous flow from Stage 1&2, L/s	8-10
Instantaneous flow from Satge-3, L/s	8-10
Volume wasted from Stage 1&2, Kl/day, 5 days/week	200
Volume wasted from Stage- 3, KL/day, 5 days/week	350
Poly dose rate, L/s	4 -8

4 ENVIRONMENTAL DISCHARGE

Carole Park STP is designated to discharge treated effluent in the Brisbane River, discharge location W1, located at 63.7 AMTD (Submerged diffused outfall pipe).

The licence does not allow discharge of untreated or raw sewage to any location outside the plant (i.e Sandy Creek).

Table 8 Discharge flow limits (Cariole Park STP EA, Schedule C Table 2)

Dry or wet day	Flow limit
Dry weather day	10.45 ML
Wet weather day	29.9 ML

Table 9 Release quality characteristic limits (Carole Park STP EA, Schedule C Table 3)

Quality characteristics	Release Limit (Release Point #3)	Release Limit (Release Point #1,3,4)	Limit Type
5-Day BOD	15 mg/L	20 mg/L	Long Term 80 percentile
5-Day BOD	23 mg/L	30 mg/L	Long Term 80 percentile
5-Day BOD	30 mg/L	40 mg/L	Maximum
Suspended Solids	20 mg/L	30 mg/L	Long Term 80 percentile
Suspended Solids	30 mg/L	40 mg/L	Short Term 80 percentile
Suspended Solids	40 mg/L	60 mg/L	maximum
Dissolved Oxygen	2.0 mg/L	2.0 mg/L	minimum
pH	6.5 to 8.5	6.5 to 8.5	Range
Free Chlorine residual	0.70 mg/L	0.70 mg/L	Maximum
Faecal Coliform	1000 cfu/100 ml	1000 cfu/100 ml	Median value of 5 samples in a day
	4000 cfu/100 ml	4000 cfu/100 ml	4 of 5 samples less than 4000 cfu/100 ml

Note: Release Points: No.1, 2, 3 and 4 are at the same location of the River but the depth of diffusion in the water bed varies with the location number.

5 ENVIRONEMENTAL LICENCE

The Carole Park STP is operated under the environmental activity approval (Licence) number EPPR00692313 and is available in the Q-Pulse (LA37).