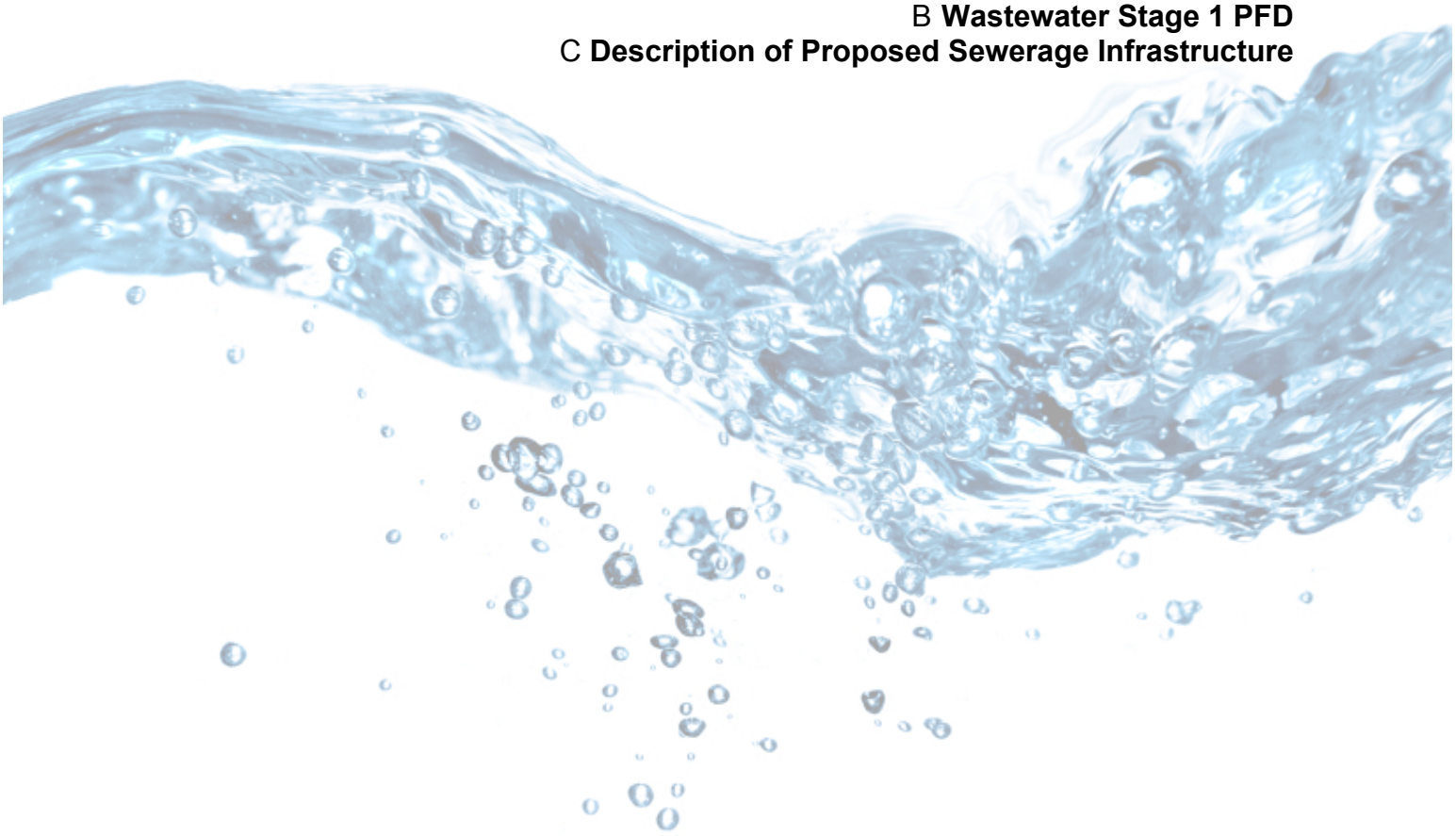
Appendix 4.3.1 **Sewerage Infrastructure**

A **Overall PFD**
B **Wastewater Stage 1 PFD**
C **Description of Proposed Sewerage Infrastructure**



PROCESS FLOW DIAGRAM OVERALL

WYONG COUNCIL KANANGRA DRIVE RESERVOIR

WYONG COUNCIL | SOLO WATER

TOTAL WATER DEMAND:
ADD: 337.1 kL/d
PDD: 987.8 kL/d
PDD FLOW: 12.5 L/s in 22 hours
FIRE FLOW: 10.0 L/s
TOTAL PEAK FLOW 22.5 L/s

EMERGENCY BACKUP

POTABLE
ADD: 151.3 kL/d
PDD: 179.0 kL/d
2.3 L/s IN 22 hrs

FIRE:
10 L/s

AIR GAP

NON-POTABLE
ADD: 185.7 kL/d
PDD: 808.8 kL/d
10.2 L/s IN 22 hrs

AIR GAP

1.2 ML POTABLE WATER + FIRE STORAGE (0.5ML DEDICATED FIRE STORAGE)

0.85 ML RECYCLED WATER STORAGE

185.7 kL/d

BULK POTABLE WATER TRANSFER SYSTEM

TRANSFER PIPELINE

- TOTAL PIPELINE 6.3 km x DN 200 mm HDPE
- 4.2 km EXISTING HDPE MAIN IN NPWS/RFS CLASS 1 FIRE TRAIL
- 1.5 km OF NEW HDPE MAIN TO CONNECT KANANGRA DR RESERVOIR TO THE EXISTING MAIN
- 0.6 km OF NEW HDPE MAIN TO CONNECT THE EXISTING MAIN TO ONSITE POTABLE WATER STORAGE TANK (REFER TO BULK WATER MAIN LAYOUT PLAN IN APPENDIX 4.1.3)

NEW TRANSFER PUMP STATION

- LOCATED AT THE EXISTING WYONG COUNCIL KANANGRA DR RESERVOIR SITE
- VARIABLE SPEED DRIVE BOOSTER PUMP SET WITH BUILT IN STANDBY CAPACITY
- PEAK DESIGN FLOW 23.3 L/s

POTABLE WATER RETICULATION NETWORK
ADD: 151.3 kL/day
PDD: 179.0 kL/day

CATHERINE HILL BAY DEVELOPMENT LOTS
470 ET

RECYCLED WATER RETICULATION NETWORK
ADD: 185.7 kL/day
PDD: 808.8 kL/day

ADD: 118.4 kL/day
PDD: 472.4 kL/day

AWTP
(WWTP Stage 2)
RECYCLED WATER
CLASS A+
PRODUCTION: 185.7 kL/d

PUMP ROOM

CONTROL ROOM

CHEMICALS

MBR
(WWTP Stage 1)
PEAK CAPACITY 300 kL/day)

HIGH & LOW DEMAND

10 ML WET WEATHER STORAGE

209.2 kL/d

209.2 kL/d

213.2 kL/day

UF RETENATE 15.8 kL/day

AVG: 39.2 kL/day
PEAK: 196.2 kL/day

IRRIGATION OF OPEN SPACE AREAS
IRRIGATION AREA: 4.9 ha

AVG: 28.1 kL/day
PEAK: 140.2 kL/day

IRRIGATION OF LANDSCAPED ROAD BUFFERS
IRRIGATION AREA: 3.5 ha

RO REJECT

7.7 kL/day
4700 mg/L TDS

500 m² RO REJECT EVAPO-TRANSPIRATION WETLAND. SALT TOLERANT VETIVER GRASS

6.2 kL/day
5600 mg/L TDS

2000 m² RO REJECT EVAPORATION POND No. 1

2000 m² RO REJECT EVAPORATION POND No. 2

MISTING SPRAYERS

MISTING SPRAYERS

OFFSITE DISPOSAL OF SALT RESIDUE/SURPLUS BRINE TO APPROVED FACILITY USING LICENSED WASTE CONTRACTOR

4 kL/day MBR WASTE SLUDGE

197.4 kL/day

OFFSITE DISPOSAL TO APPROVED FACILITY USING LICENSED WASTE TRANSPORT CONTRACTOR

PRESSURE SEWER NETWORK

197.4 kL/day

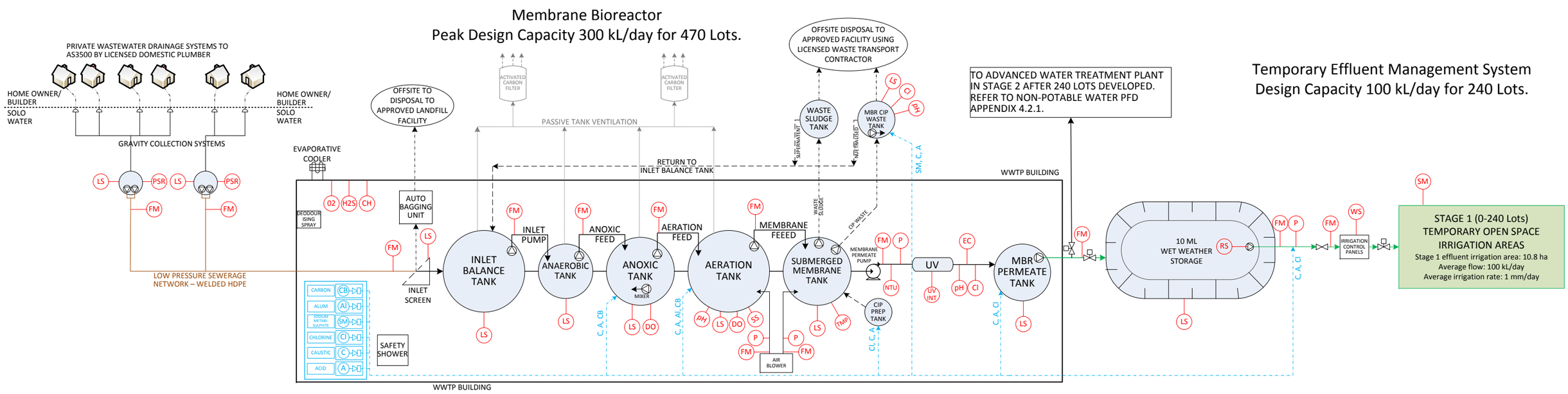
STAGE 1 TEMPORARY IRRIGATION AREA
(up to 240 lots or 100 kL/day)
IRRIGATION AREA: 10.8 ha

LEGEND

- POTABLE WATER PRESSURE BOOSTER PUMP SET WITH VARIABLE SPEED DRIVE
- NON-POTABLE WATER PRESSURE BOOSTER PUMP SET WITH VARIABLE SPEED DRIVE
- EMERGENCY STANDBY DEISEL PUMP WITH AUTOMATIC CHANGEOVER
- EMERGENCY STANDBY DEISEL PUMP WITH AUTOMATIC CHANGEOVER
- POTABLE WATER
- CLASS A+ RECYCLED WATER
- MBR + UV PERMEATE
- STAGE 1 TEMPORARY IRRIGATION
- REVERSE OSMOSIS REJECT
- UF RETENATE
- MBR WASTE SLUDGE
- PRESSURE SEWER

CLIENT:	PROJECT:	PHASE:	PRIVATE WATER UTILITY:	DRAWING TITLE:	DRAWING NUMBER:	IPART REFERENCE:
ROSE PROPERTY GROUP PTY LTD	CATHERINE HILL BAY RESIDENTIAL SUBDIVISION MONTEFIORE STREET, CATHERINE HILL BAY	IPART LICENSE APPLICATION	CATHERINE HILL BAY WATER UTILITY PTY LTD	PROCESS FLOW DIAGRAM OVERALL	H10052_P01C	APPENDIX 4.1.1
					DATE: 05/07/2013	

PROCESS FLOW DIAGRAM
STAGE 1 WASTEWATER TREATMENT PLANT



LOW PRESSURE SEWERAGE SYSTEM

- WASTEWATER WILL DRAIN THROUGH A GRAVITY SEWERAGE COLLECTION SYSTEMS TO A NUMBER OF DUPLEX LOW PRESSURE SEWAGE PUMP STATIONS THAT SERVICE 1 TO 4 LOTS EACH.
- WASTEWATER IS PUMPED IN A CONTROLLED MANNER THROUGH THE LOW PRESSURE SEWERAGE NETWORK TO THE INLET BALANCE TANK AT THE WWTP. OPERATION OF THE PRESSURE SEWER NETWORK PUMPS IS CONTROLLED BY THE DIRECT DIGITAL CONTROL SYSTEM AT THE WWTP TO CONTROL PEAK INFLOWS TO THE MBR.
- LOW PRESSURE SEWER NETWORK TO BE CONSTRUCTED WITH BROWN-STRIPED PN 16 HDPE PIPE WITH WELDED PIPE JOINTS AND FITTINGS.
- EACH LOW PRESSURE SEWERAGE PUMP STATION WILL INCLUDE:
  - PUMP HEAD AND FLOW CAPACITY TO SERVICE BETWEEN 1 AND 4 LOTS.
  - DUTY AND STANDBY PUMPS WITH ONLINE FAULT DETECTION AND ALARMS.
  - 24 HOURS EMERGENCY STORAGE CAPACITY IN THE WET WELL.
  - HARD WIRED COMMUNICATION CABLING BACK TO THE DIRECT DIGITAL CONTROL SYSTEM AT THE WWTP.
  - CONTINUOUS ONLINE WET WELL WATER LEVEL AND FLOW MONITORING WITH ALARMS.
  - AUTOMATED SYSTEM START-UP AND RECOVERY FOLLOWING POWER OUTAGE VIA THE DIRECT DIGITAL CONTROL SYSTEM.
  - ABILITY TO INSTALL ADDITIONAL ONLINE WATER QUALITY MONITORING PROBES, E.G. PH, TDS, TOC, FOR DETECTION OF INAPPROPRIATE CHEMICAL DISPOSAL OR TRADE WASTE PRACTICES, IF REQUIRED DURING OPERATION.

FOR FURTHER INFORMATION ON THE LOW PRESSURE SEWER NETWORK REFER TO PRESSURE SEWERAGE SOLUTIONS PTY LTD.

STAGE 1 WASTEWATER TREATMENT PLANT – MEMBRANE BIOREACTOR

- ALL WASTEWATER TREATED IN THE MEMBRANE BIOREACTOR TO PRODUCE “CLASS A” RECYCLED WATER SUITABLE FOR CONTROLLED IRRIGATION OF TEMPORARY IRRIGATION AREAS. MBR TARGET EFFLUENT QUALITY:
  - BIOCHEMICAL OXYGEN DEMAND < 10 mg/L
  - SUSPENDED SOLIDS < 10 mg/L
  - TOTAL NITROGEN < 10 mg/L
  - TOTAL PHOSPHOROUS < 0.3 mg/L
  - pH 6.5 TO 8.5
  - FAECAL COLIFORMS < 10 cfu/100 mL
  - TURBIDITY < 2 NTU
- PEAK DESIGN CAPACITY OF MBR PROCESS TRAIN OF 300 kL/DAY WILL CATER FOR ULTIMATE DEVELOPMENT OF 470 LOTS WITH RESERVE CAPACITY.
- THE ADVANCED WATER TREATMENT PLANT TO PRODUCE “CLASS A+ RECYCLED WATER” WILL BE OPERATIONAL ONCE 240 LOTS ARE CONNECTED TO THE SYSTEM, OR WHEN FLOWS REACH 100 kL/day.
- OPERATION OF THE WWTP IS FULLY AUTOMATED AND INTEGRATED WITH OPERATION OF THE PRESSURE SEWER NETWORK TO CONTROL PEAK FLOWS INTO THE MBR USING THE DIRECT DIGITAL CONTROL SYSTEM.
- ENERGY CONSUMPTION IN THE PROCESS IS MINIMISED THROUGH THE USE OF VARIABLE SPEED DRIVE CONTROLLERS ON ALL PROCESS PUMPS AND AIR BLOWERS.
- ALL ONLINE MONITORING, CONTROL AND ALARM SYSTEM CAN BE REMOTELY ACCESSED THROUGH THE INTERNET. ALL DATA IS LOGGED FOR LATER REVIEW AND TROUBLE SHOOTING.
- THE MBR IS LOCATED INSIDE THE WWTP SHED TO MINIMISE NOISE AND ODOUR IMPACTS. ALL TANKS ARE ENCLOSED WITH PASSIVE VENTILATION THROUGH ACTIVATED CARBON FILTERS. AMBIENT AIR QUALITY INSIDE THE WWTP BUILDING IS CONTINUOUSLY MONITORED WITH ALARMS FOR ELEVATED HYDROGEN SULPHIDE, METHANE & OXYGEN CONCENTRATIONS. AIR CONDITIONING UNITS AND DEODORISING SPRAYS OPERATE AUTOMATICALLY TO MAINTAIN INDOOR AIR QUALITY WITHIN APPROPRIATE LIMITS.

STAGE 1 TEMPORARY EFFLUENT MANAGEMENT SYSTEM

- THE STAGE 1 EFFLUENT MANAGEMENT SYSTEM WILL SERVICE UP TO 240 LOTS, OR UP TO APPROX 100 kL/day.
- ALL MBR TREATED EFFLUENT IS STORED IN A HDPE LINED 10 ML WET WEATHER STORAGE DAM, WHICH PROVIDES APPROXIMATELY 100 DAYS STORAGE AT AVERAGE IRRIGATION FLOWS.
- EFFLUENT MANAGEMENT IS VIA CONTROLLED, RESTRICTED ACCESS, NIGHT TIME IRRIGATION OF TEMPORARY IRRIGATION AREAS USING MBR EFFLUENT.
-APPROXIMATELY 10.8 ha OF TEMPORARY, RESTRICTED ACCESS IRRIGATION AREAS WILL BE PROVIDED DURING STAGE 1 TO SERVICE UP TO 240 LOTS. AVERAGE IRRIGATION RATES DURING STAGE 1 ARE UP TO 1 mm/day.
- ALL TEMPORARY IRRIGATION AREAS, LANDSCAPING AND IRRIGATION INFRASTRUCTURE WILL BE PROVIDED BY THE DEVELOPER DURING CONSTRUCTION OF EACH DEVELOPMENT STAGE.
- DECOMMISSIONING OF THE TEMPORARY STAGE 1 IRRIGATION AREA WILL COMMENCE AFTER 240 LOTS ARE CONNECTED.
- AN IRRIGATION MANAGEMENT PLAN WILL BE DEVELOPED FOR THE TEMPORARY SCHEME THAT WILL OUTLINE SITE SPECIFIC IRRIGATION, ENVIRONMENTAL AND PUBLIC HEALTH CONTROL MEASURES FOR EACH IRRIGATION AREA. TYPICAL IRRIGATION CONTROLS WILL INCLUDE:
  - IRRIGATION SCHEDULING CONTROLS TO CONTROL THE TIME, FREQUENCY AND DURATION OF IRRIGATION EVENTS.
  - SOIL MOISTURE PROBES AND WEATHER STATION OVERRIDE ON IRRIGATION CONTROLLERS TO PREVENT IRRIGATION DURING RAINFALL, HIGH WIND OR ELEVATED SOIL MOISTURE.
  - SECURE, RESTRICTIVE ACCESS AREAS INCLUDING APPROPRIATE WARNING SIGNS, IDENTIFICATION AND LABELLING.
  - SITE BASED STORM WATER, RUN OFF AND ENVIRONMENTAL CONTROLS.
  - SURFACE SPRINKLERS WITH SPRAY DRIFT CONTROL INCLUDING SPRINKLER NOZZLES THAT OPERATE UNDER LOW PRESSURE WITH A LARGE DROPLET SIZE AND LOW THROW HEIGHT.

LEGEND

PROCESS MONITORING

- FM FLOW
- P PRESSURE
- PSR PUMP STARTS AND RUN HOURS
- LS WATER LEVEL
- DO DISSOLVED OXYGEN
- SS MIXED LIQUOR SUSPENDED SOLIDS
- pH pH
- Cl FREE CHLORINE RESIDUAL
- WS WEATHER STATION
- NTU TURBIDITY
- TMP TRANSMEMBRANE PRESSURE
- UV INT UV INTENSITY
- EC ELECTRICAL CONDUCTIVITY
- SM SOIL MOISTURE PROBE
- CH METHANE GAS
- H2S HYDROGEN SULPHIDE GAS
- 02 OXYGEN GAS

PROCESS EQUIPMENT

- INLET SCREEN
- MEMBRANE BIOREACTOR PROCESS TANKS
- SUBMERSIBLE PUMP
- DRY-MOUNTED PUMP
- MIXING PUMP
- MOTORISED VALVE
- HOUSEHOLD SEWERAGE CONNECTION POINT
- EVAPORATIVE AIR CONDITIONING UNIT

PROCESS CHEMICALS

- BUNDED CHEMICAL STORAGE AREA
- BUNDED CHEMICAL CONTAINERS AND DOSING PUMPS
- CHEMICAL DELIVERY LINES
- CB ACETIC ACID (CARBON) DOSING AS SUPPLEMENTARY FOOD SOURCE
- Al POLYALUMINIUM CHLORIDE DOSING FOR PHOSPHORUS REMOVAL
- Cl SODIUM HYPOCHLORITE FOR CHLORINATION
- SM SODIUM METABISULPHIDE DOSING FOR DECHLORINATION
- C SODIUM HYDROXIDE (CAUSTIC) FOR pH CORRECTION AND MEMBRANE CLEANING
- A HYDROCHLORIC ACID FOR pH CORRECTION AND MEMBRANE CLEANING

NOTES

1. PRELIMINARY PROCESS FLOW DIAGRAM FOR IPART APPLICATION ONLY. NOT FOR CONSTRUCTION
2. NOT TO SCALE. FOR WWTP SITE LAYOUT PLANS REFER TO APPENDIX 4.3.2.
3. SUBJECT TO MINOR CHANGES DURING DETAILED DESIGN

CLIENT:	PROJECT:	PHASE:	PRIVATE WATER UTILITY:	DRAWING TITLE:	DRAWING NUMBER:	IPART REFERENCE:
ROSE PROPERTY GROUP PTY LTD	CATHERINE HILL BAY RESIDENTIAL SUBDIVISION MONTEFIORE STREET, CATHERINE HILL BAY	IPART LICENSE APPLICATION	CATHERINE HILL BAY WATER UTILITY PTY LTD	PROCESS FLOW DIAGRAM WASTEWATER TREATMENT	H10052_P04C DATE: 05/07/2013	APPENDIX 4.3.1

Description of proposed sewerage infrastructure

Sewerage Infrastructure	Description
Wastewater minimisation	Water demand management strategy involving mandatory water efficient fixtures, smart metering, customer awareness and education. Residential customer supply agreement and trade waste agreement will be entered with each customer to outline responsibilities for appropriate waste disposal practices to minimise disposal of inappropriate substances to the sewer. Water tight sewerage system to minimise infiltration of stormwater and groundwater to the sewerage system.
Low pressure sewerage network – Constructed in line with development build out	Low pressure sewerage network constructed using PN 16 HDPE pipe with welded joints and fittings to minimise infiltration. Low pressure duplex pump stations service up to 4 lots with duty/standby pumps and 24 hours storage capacity in each pump well (refer to Appendix 4.3.3). Automated operation of the low pressure sewerage network is integrated with operation of the wastewater treatment plant through the direct digital control system to minimise peak inflow rates. Peak diurnal flows into the wastewater treatment plant are controlled using buffer storage provided in each pump well and at the inlet balance tank and the direct digital control system. For a more detailed overview of the Pressure Sewer System refer to page 3.
Membrane bioreactor (MBR) + Ultraviolet disinfection (UV) – Constructed during Stage 1	All wastewater produced under the scheme is treated in a Membrane Bio-Reactor with UV disinfection (MBR+UV) to produce “Class A” recycled water suitable for controlled irrigation of the stage 1 temporary irrigation areas. The full capacity of the MBR will be constructed upfront during stage 1 with the following target effluent quality: • Biochemical Oxygen Demand (BOD) < 10 mg/L • Suspended Solids (SS) < 10 mg/L • Total Nitrogen (TN) < 10 mg/L • Total Phosphorous (TP) < 0.3 mg/L • pH 6.5 to 8.5 • Faecal Coliforms < 10 cfu/100 mL • Turbidity < 2 NTU No pathogen log reduction credits are being claimed for the MBR. The MBR will be validated based on effluent quality. The peak design capacity of the MBR process train will be 300 kL/day and is sized to provide treatment of average wastewater flows of 197.4 kL/day with spare capacity. The MBR will be located inside the WWTP shed to minimise noise and odour impacts. All tanks are enclosed with passive ventilation through activated carbon filters. Ambient air quality inside the WWTP building is continuously monitored with alarms for elevated hydrogen sulphide, methane & oxygen concentrations. Air conditioning units and deodorising sprays operate automatically to maintain indoor air quality within appropriate limits.

Sewerage Infrastructure	Description
10 ML Wet weather storage dam	A 10 ML HDPE lined wet weather storage dam will be constructed to receive "Class A" MBR+UV treated effluent. During stage 1 the MBR+UV effluent will be irrigated in temporary irrigation areas via a separate independent irrigation supply network. The wet weather storage dam will provide approximately 100 days storage at average irrigation flows. During stage 2, the MBR+UV treated effluent will be the source water to the AWTP and the wet weather storage will provide a buffer for non-potable water demand providing additional source water to the AWTP during periods of high demand. Water sourced from the wet weather storage will be pre-filtered to remove algae and suspended solids prior to undergoing treatment in the AWTP.
Stage 1 Temporary Effluent Irrigation Areas	Wastewater from the MBR+UV treatment process produced during stage 1 will be managed via controlled, restricted access, night time irrigation of approximately 10.8 ha of temporary irrigation areas. Stage 1 will service up to 240 Lots or flows up to 100 kL/day. Average irrigation rates during stage 1 will be up to 1 mm/day. All temporary irrigation areas, landscaping and irrigation infrastructure will be provided by the developer during construction of each development stage. An Irrigation Management Plan will be developed for the temporary scheme that will outline site specific irrigation measures to manage environmental and public health risks which will include: • Irrigation of high quality MBR+UV effluent with <10 faecal coliforms and <2 NTU. • Approximately 100 days storage at average irrigation flows is provided by the 10 ML wet weather storage dam. • Irrigation scheduling controls to control the time, frequency and duration of irrigation events with irrigation occurring at night time only. • Soil moisture probes and weather station override on irrigation controllers to prevent irrigation during rainfall, high wind or elevated soil moisture. • Secure, restrictive access areas including appropriate warning signs, identification and labelling. • Site based storm water runoff and environmental controls. • Surface sprinklers with spray drift control including sprinkler nozzles that operate under low pressure with a large droplet size and low throw height. • A minimum 30 m buffer distance between the edge of the temporary irrigation areas and the closest dwelling. • Non-irrigated, vegetated buffer strips down gradient of the temporary irrigation areas. • Monitoring to detect any potential impacts. Decommissioning of the temporary stage 1 irrigation area will commence after 240 lots are connected or flows reach approximately 100 kL/day.
Stage 2 (Ultimate) Open Space Irrigation	Once the Advanced Water Treatment Plant (AWTP) is constructed in stage 2, 100% of MBR+UV effluent will be treated in the AWTP to "Class A+" and used in the non-potable supply network including irrigation of open space areas. A description is included in Appendix 4.2.1.
Integrated online monitoring, control and alarm system	Continuous online monitoring, control and alarms for the sewerage infrastructure is centrally managed using the direct digital control system. The control system allows the infrastructure to operate unattended and automatically reports issues requiring operator attention. Online monitoring probes are manually calibrated and checked by operations staff on a routine basis to ensure all probes are recording accurate readings. All critical alarm system have a battery backup to ensure faults are reported during power failure. The control system is designed to automatically recover following power outage.

Overview of Pressure Sewer Systems

Pressure sewerage systems consist of a network of pressure pipes and grinder pumps, which integrate to form a collection system.

A pressure sewerage system comprises a two pump (duplex) Pressure Sewer Unit (PSU) installed to service up to four properties, depending upon the lot layout on occasions a single pump unit is installed at each property in the catchment. The pressure sewer unit will discharging to a common collection system.

The pump units macerate the sewerage into fine watery slurry for discharge through a small diameter pipeline. Being a pressure system, the network is not constrained by maintaining constant falls in most installation areas. Utilising shallower trenching and adopting trenchless technology where advantageous, the quantity of excavation and disruption to existing vegetation and ground surfaces is greatly reduced, providing environmental and social advantages to the community.

Energy savings are achieved when benchmarked against traditional gravity sewers installed in areas with topography requiring sewage pumping stations. The pressure sewer units selected by Solo Water are an EOne positive displacement type. The EOne units offer greater efficiency than traditional centrifugal type sewage pumping stations, and comparatively, the total nett energy used in a pressure sewerage system is less than a combined gravity / sewage pumping station solution.

An additional benefit of pressure sewerage systems when compared to traditional gravity systems is the reduction or elimination of wet weather flows. Wet weather flows significantly affect the performance of receiving Waste Water Treatment Plants, and can overload transfer pumping stations. Minimising wet weather flows has benefits in reduction of pumping energy, minimising environmental risk of overflow within the network and at receiving works, and removing the need for large wet weather storage structures normally associated with gravity collection systems.

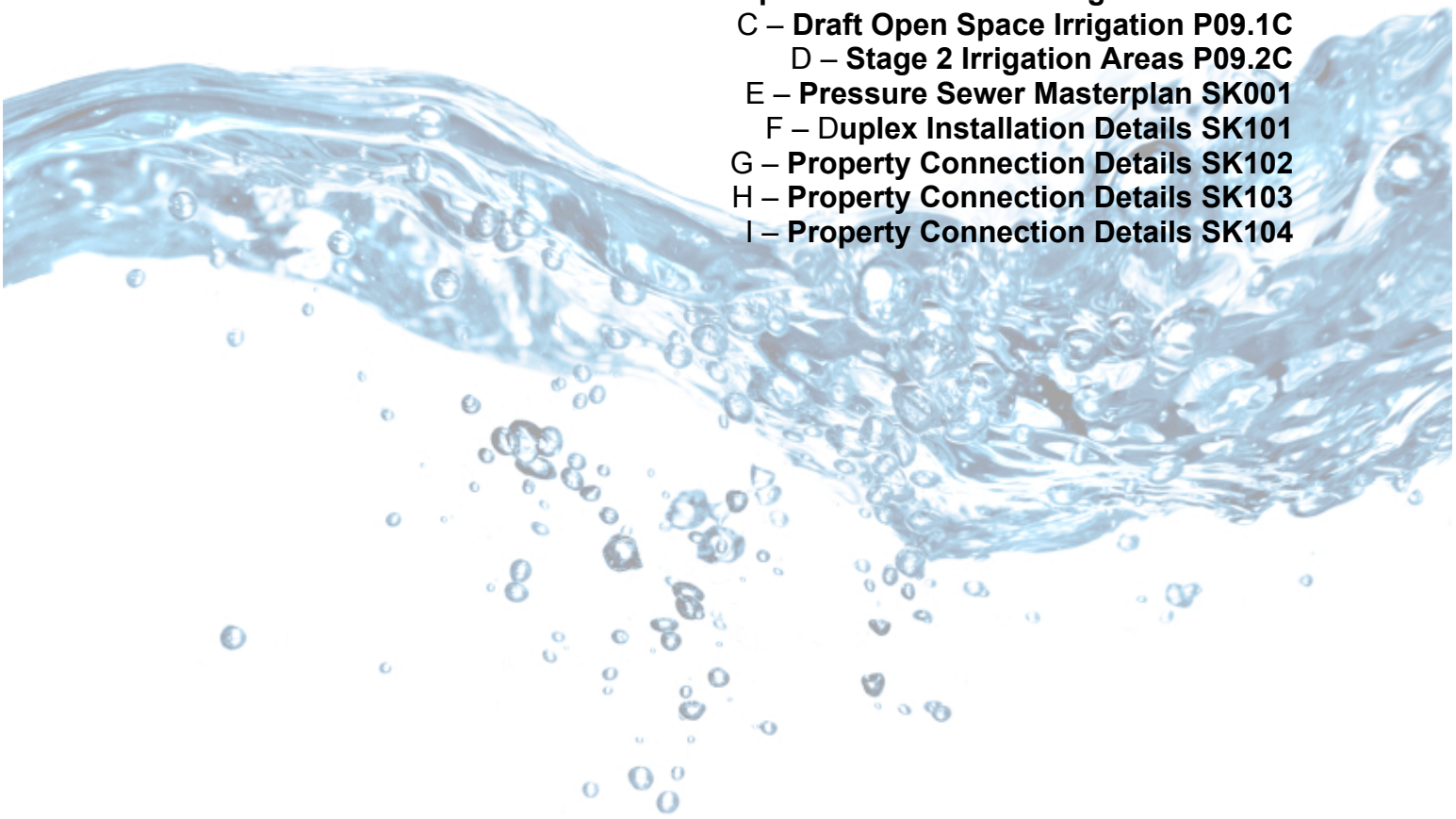
Eliminating wet weather flows is achieved through a combination of quality control during design and installation of the property gravity collection systems and the ongoing monitoring and maintenance of the system to detect illegal connections to the sewer system.

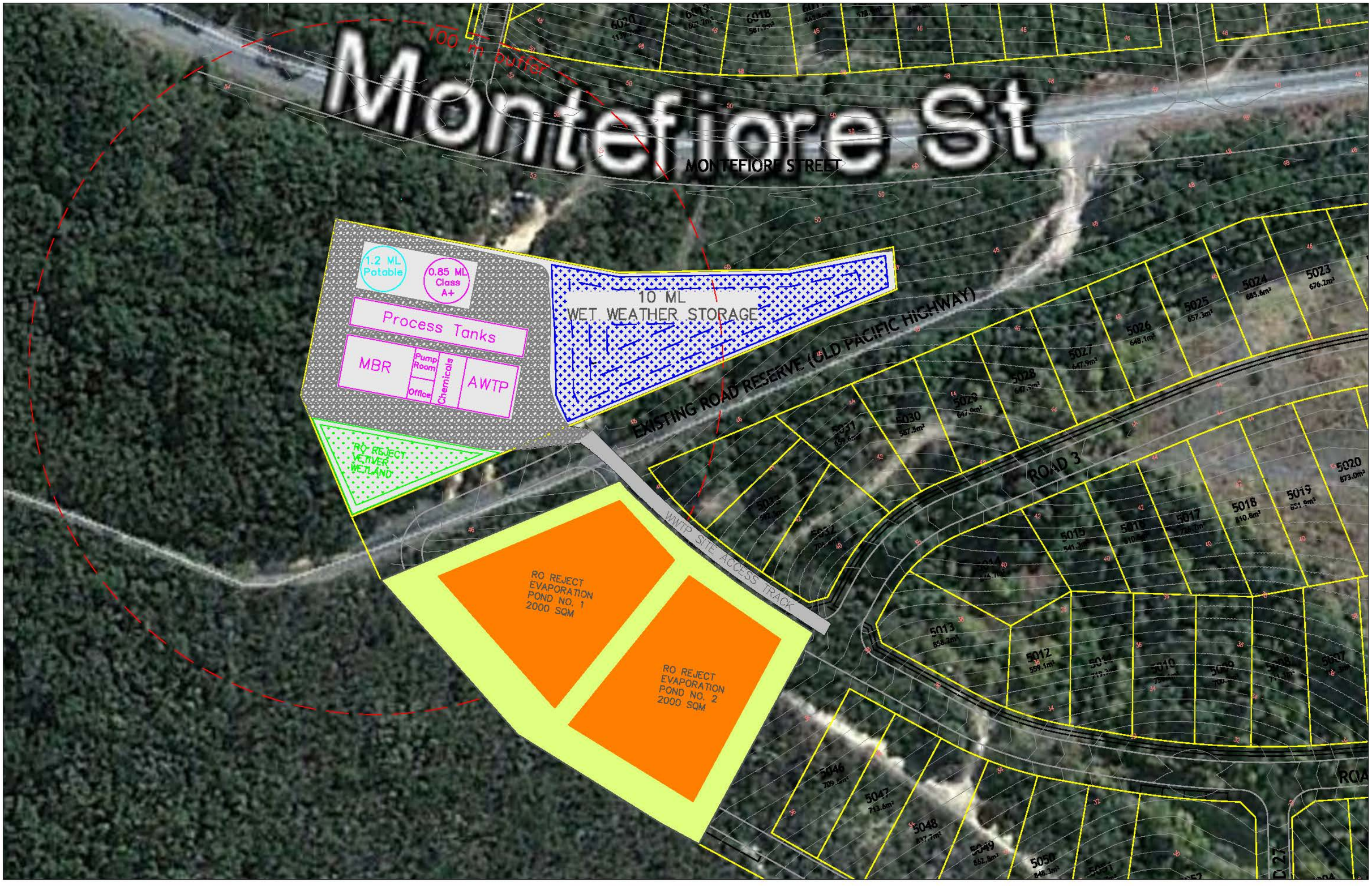
Polyethylene pipe is proposed to be used for the pipe network, which is fully sealed by electrofusion welded joints. Depending on the topography, size of the system and planned rate of connection, other appurtenances will include isolation valves, flushing points, air release valves at significant high points, check and stop valves at the junction of each property connection with the pressure sewerage main.

Solo Water

Appendix 4.3.3 **Location of Sewerage infrastructure**

A – **WWTP Site Layout P10C**
B – **Example MBR AWTP Building Plan F0101A**
C – **Draft Open Space Irrigation P09.1C**
D – **Stage 2 Irrigation Areas P09.2C**
E – **Pressure Sewer Masterplan SK001**
F – D**uplex Installation Details SK101**
G – **Property Connection Details SK102**
H – **Property Connection Details SK103**
I – **Property Connection Details SK104**





ISSUE	DATE	ISSUE DETAILS
C	10/7/13	ADJUSTED RO REJECT POND & ADDED WWTP SITE ACCESS TRACK
B	15/5/13	ADJUSTED RO REJECT POND
A	30/3/13	WWTP LAYOUT FOR IPART APPLICATION

harvest
water management consultants pty ltd
184 Rivergum Drive
Burpengary, Qld 4505
0488 427 878
office@harvestwmc.com.au
www.harvestwmc.com.au
ABN: 54140 844 047

CLIENT: SOLO WATER – CATHERINE HILL BAY WATER UTILITY

PROJECT: CATHERINE HILL BAY RESIDENTIAL SUBDIVISION ROSE GROUP

SITE: MONTEFIORE ROAD CATHERINE HILL BAY NSW

DESIGN: BI | DRAWN: BI | APPROVED: BI

Bradley Irwin RPEQ (10837) CPENG NPER Environmental Engineer

SIGNED: _____ DATE: _____
for and on behalf of Harvest Water Management Consultants Pty Ltd

DRAWING TITLE: WASTEWATER TREATMENT PLANT SITE LAYOUT

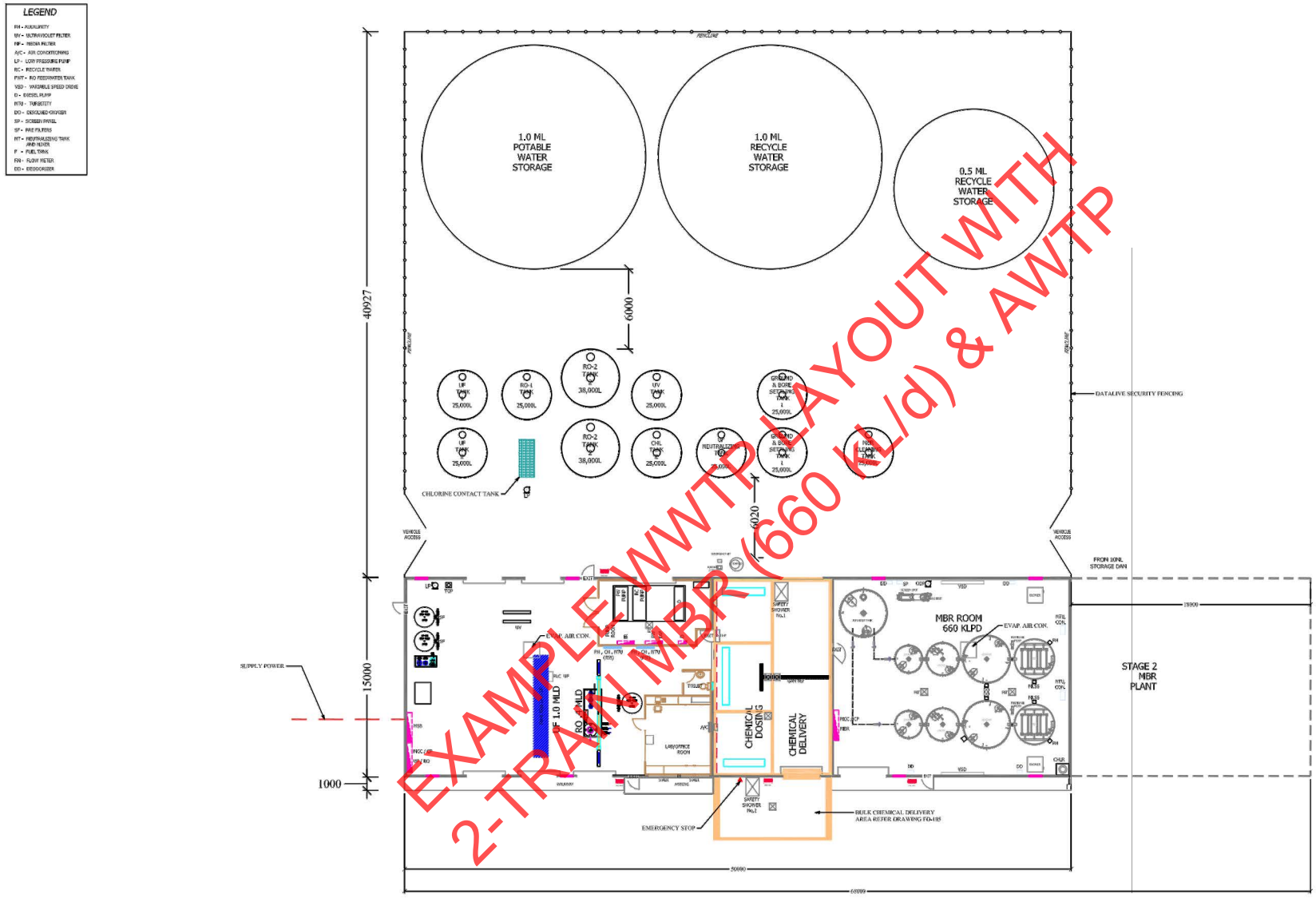
PROJECT NO.: H10052

SCALE: 1:1000 at A3 (0, 10, 20, 30, 40, 50)

DWG TYPE: CONCEPT ONLY NOT FOR CONSTRUCTION

DWG NO.: P10

ISSUE: C



EXAMPLE WWTP LAYOUT WITH 2-TRAIN MBR (660 KL/d) & AWTP

RevNo	Revision note	Date	Signature	Checked
A	PRELIMINARY	JAN 2013	TR	WW

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Drawn by	Checked by	Approved by - date	File name	Date	Scale
TR	WW	JAN 2013	TR	JAN 2013	N.T.S.

1/19 Hill Street
Sunshine Beach QLD 4567
P: 07 5447 4403
F: 07 5447 4403
E: wayne@solowater.com.au

SOLO WATER STANDARD WWTP BUILDING

FD-101	Edition	Sheet
	A	1/1

Montefiore St

WWTP BUILDING & 10 ML WET WEATHER STORAGE

SALINE EVAPORATION PONDS

WWTP Stage 1 Temporary Irrigation Areas

240 Lots - Development Stage 1 & 2

Label	Area (ha)
T1	4.69
T2	1.19
T3	0.54
T4	0.64
T5	0.89
T6	2.82
Total	10.77

ISSUE	DATE	ISSUE DETAILS
C	1/7/2013	REVISED IRRIGATION AREAS FOR IPART APPLICATION
B	26/6/2013	REVISED IRRIGATION AREAS FOR DISCUSSION
A	13/3/2013	FOR LMCC COMMENT

harvest
water management consultants pty ltd
184 Rivergum Drive
Burpengary, Qld 4505
0488 427 878
brad@harvestwmc.com.au
www.harvestwmc.com.au
ABN: 54140 944 047

CLIENT: SOLO WATER – CATHERINE HILL BAY WATER UTILITY

PROJECT: CATHERINE HILL BAY RESIDENTIAL SUBDIVISION ROSE GROUP

SITE: MONTEFIORE ROAD CATHERINE HILL BAY NSW

DESIGN: BI | DRAWN: BI | APPROVED: BI

Bradley Irwin RPEQ (10637) CPENG NPER Environmental Engineer

SIGNED: For and on behalf of Harvest Water Management Consultants Pty Ltd | DATE:

DRAWING TITLE: 10.75 ha TEMPORARY EFFLUENT IRRIGATION AREA WWTP STAGE 1 – 240 LOTS NO RECYCLING

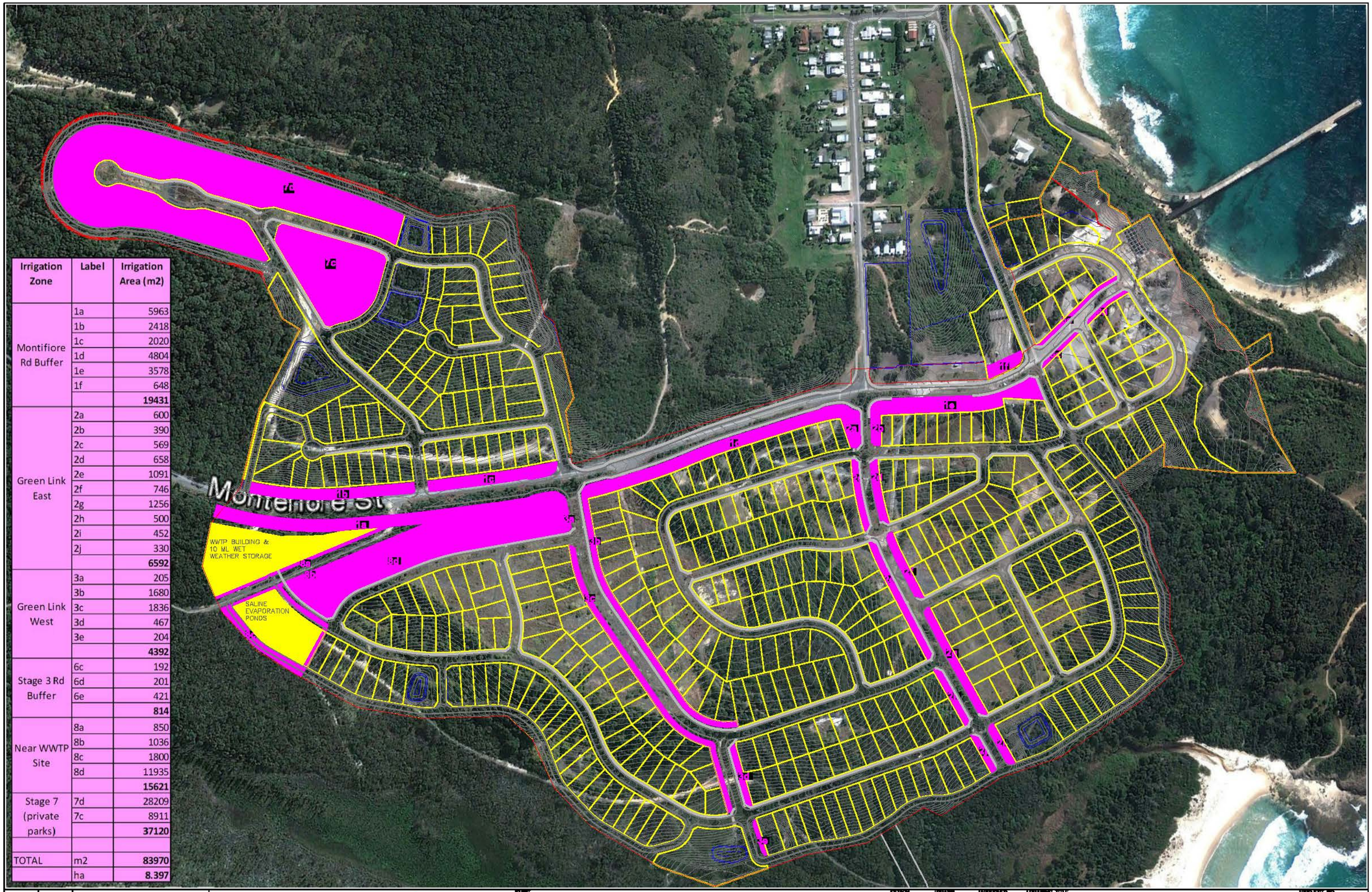
SCALE: 1:4000 at A3 (0, 40, 80, 120, 160, 200)

DWG TYPE: CONCEPT NOT FOR CONSTRUCTION

PROJECT NO.: H10052

DWG NO.: P09–1

ISSUE: C



Irrigation Zone	Label	Irrigation Area (m2)
Montifiore Rd Buffer	1a	5963
	1b	2418
	1c	2020
	1d	4804
	1e	3578
	1f	648
		19431
Green Link East	2a	600
	2b	390
	2c	569
	2d	658
	2e	1091
	2f	746
	2g	1256
	2h	500
	2i	452
	2j	330
		6592
Green Link West	3a	205
	3b	1680
	3c	1836
	3d	467
	3e	204
		4392
Stage 3 Rd Buffer	6c	192
	6d	201
	6e	421
		814
Near WWTP Site	8a	850
	8b	1036
	8c	1800
	8d	11935
		15621
Stage 7 (private parks)	7d	28209
	7c	8911
		37120
TOTAL	m2	**83970**
	ha	**8.397**

ISSUE	DATE	ISSUE DETAILS
C	6/7/2013	REVISED IRRIGATION AREAS FOR PART APPLICATION
B	26/6/2013	REVISED IRRIGATION AREAS FOR DISCUSSION
A	13/3/2013	FOR LMCC COMMENT

harvest
water management consultants pty ltd
184 Rivergum Drive
Burpengary, Qld 4505
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ABN: 54140 844 047

CLIENT: SOLO WATER – CATHERINE HILL BAY WATER UTILITY

PROJECT: CATHERINE HILL BAY RESIDENTIAL SUBDIVISION ROSE GROUP

SITE: MONTEFIORE ROAD CATHERINE HILL BAY NSW

DESIGN: BI | DRAWN: BI | APPROVED: BI

Bradley Irwin RPEQ (10837) CPENG NPER Environmental Engineer

Signed for and on behalf of Harvest Water Management Consultants Pty Ltd | Date

DRAWING TITLE: 8.3 ha OPEN SPACE EFFLUENT IRRIGATION AREAS WWTP STAGE 2 – 470 LOTS WITH RECYCLING

PROJECT NO.: H10052

SCALE: 1:4000 at A3 (0, 40, 80, 120, 160, 200)

DWG TYPE: CONCEPT NOT FOR CONSTRUCTION

DWG NO.: P09–2

ISSUE: C

Date: 04/04/2013

Drawing No: SK001

Rev: A

Scale: 0 20 40 60 80 100m
SCALE 1:2000 AT A1

CATHERINE HILL BAY PRESSURE SEWERAGE SCHEME
MASTER PLAN

Solo Water

Pressure System Solutions Pty Ltd
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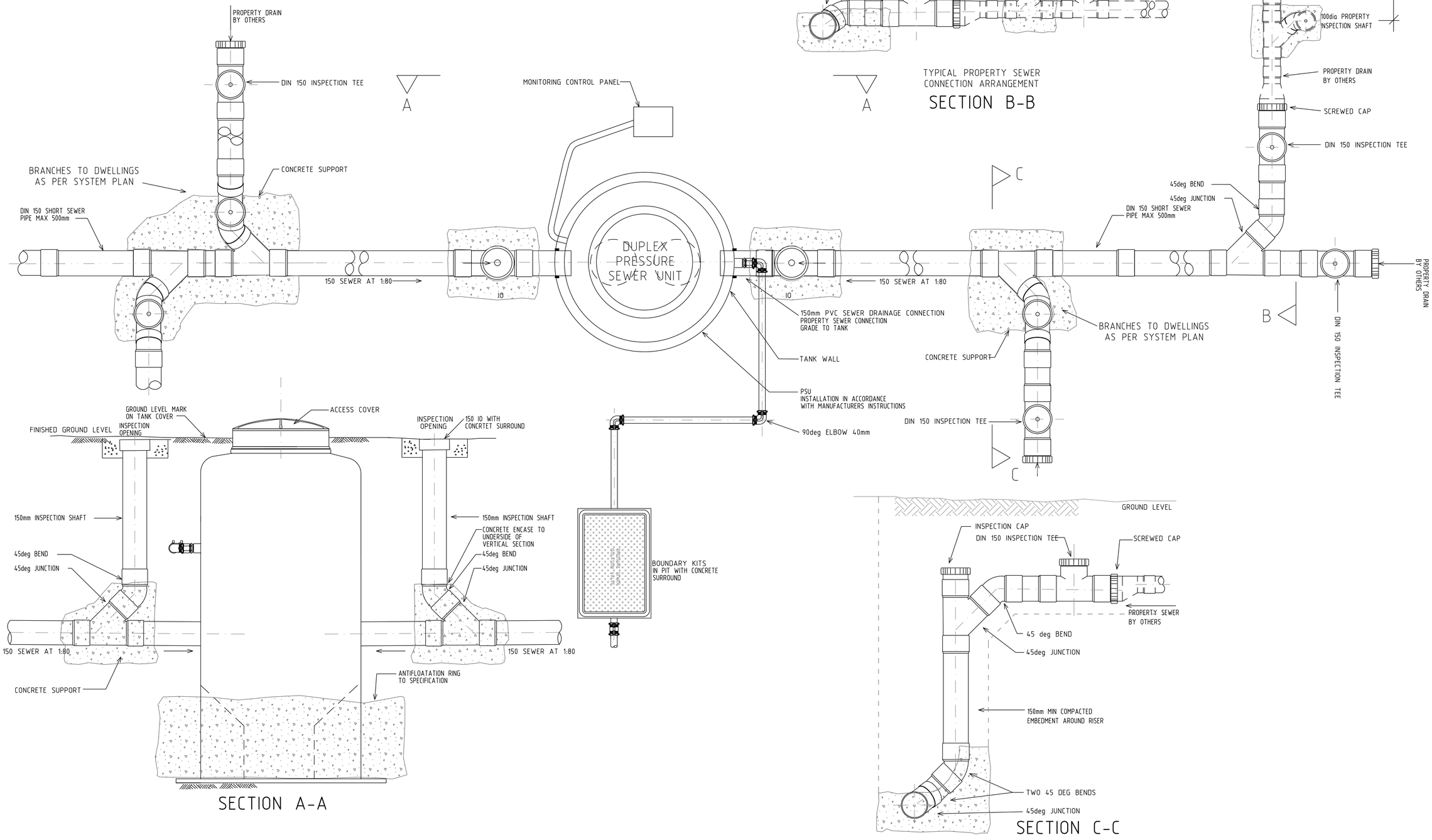

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Date: 16/04/2013

Drawing No: SK101

Rev: A

Scale:

CATHERINE HILL BAY PRESSURE SEWERAGE SCHEME
DUPLEX INSTALLATION DETAILS

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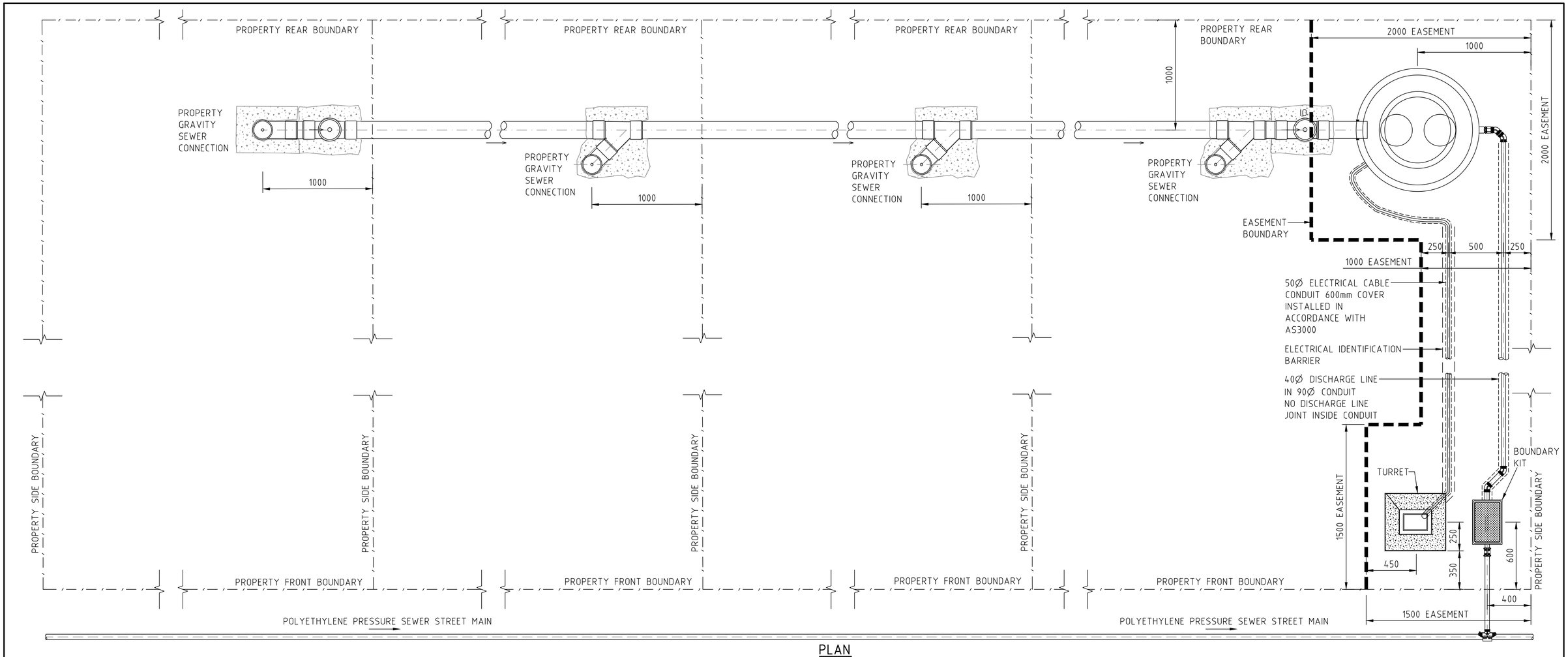
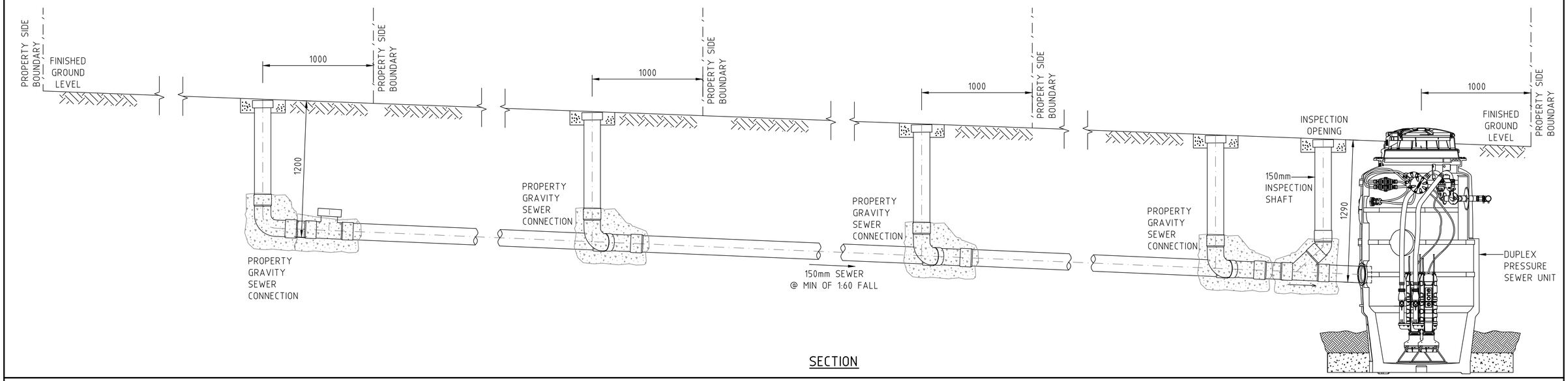


PLAN



SECTION

Date: 16/04/2013 Drawing No: SK102

Rev: A Scale:

CATHERINE HILL BAY PRESSURE SEWERAGE SCHEME
PROPERTY CONNECTION DETAILS 1

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PROPERTY REAR BOUNDARY

PROPERTY SIDE BOUNDARY

40Ø DISCHARGE LINE
IN 90Ø CONDUIT

2000 EASEMENT

1000

2500 EASEMENT

EASEMENT
BOUNDARY

BOUNDARY
KIT

300

600

250

350

TURRET

400

650

1000

PROPERTY
GRAVITY
SEWER
CONNECTION

PROPERTY FRONT BOUNDARY

50Ø ELECTRICAL CABLE CONDUIT 600mm COVER
INSTALLED IN ACCORDANCE WITH AS3000
ELECTRICAL IDENTIFICATION BARRIER

POLYETHYLENE PRESSURE SEWER STREET MAIN

PLAN

FINISHED
GROUND
LEVEL

INSPECTION
OPENING

150mm
INSPECTION
SHAFT

1290

DUPLEX
PRESSURE
SEWER UNIT

150mm SEWER
@ MIN OF 1:60 FALL

1200

SECTION

Date: 16/04/2013

Drawing No: SK103

Rev: A

Scale:

CATHERINE HILL BAY PRESSURE SEWERAGE SCHEME
PROPERTY CONNECTION DETAILS 2

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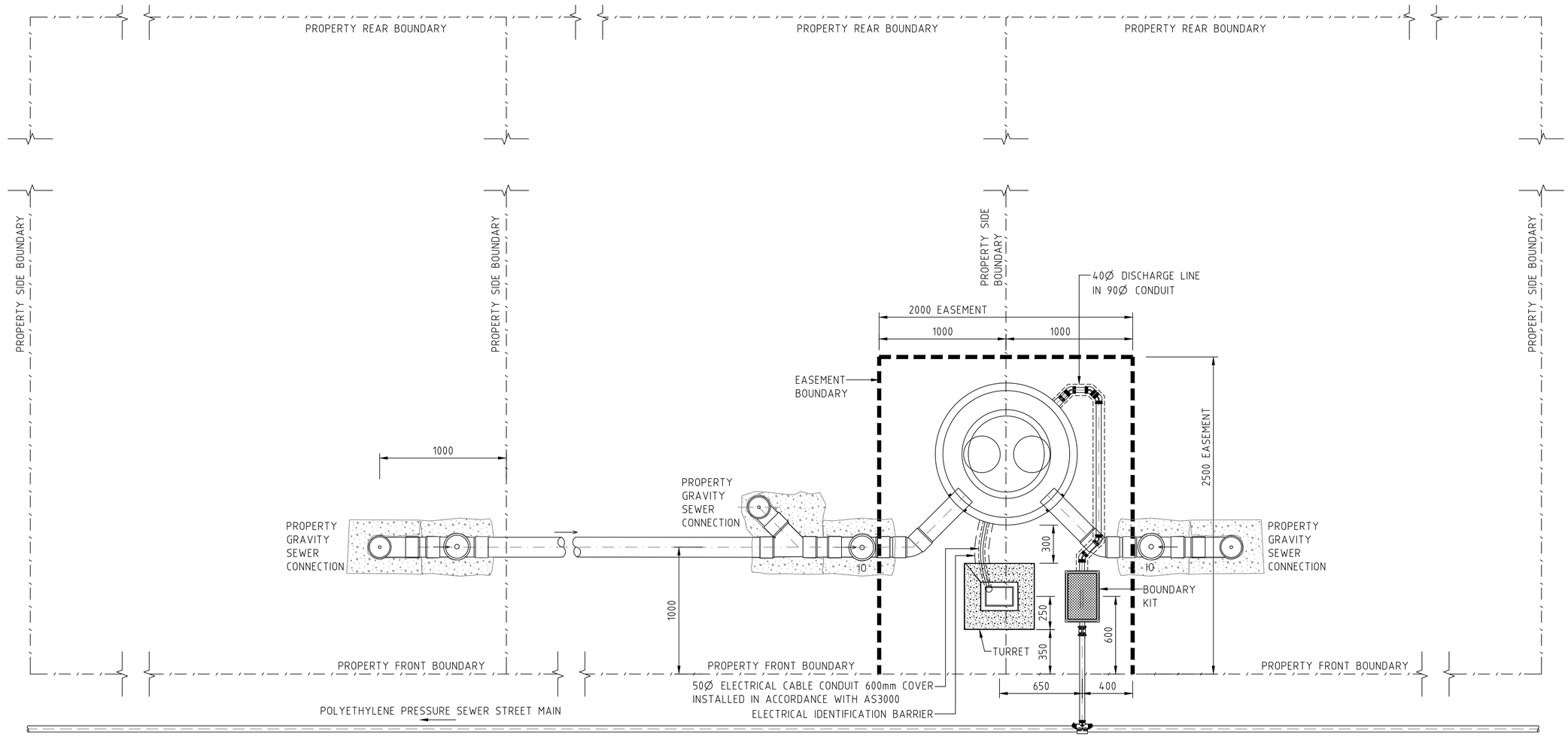
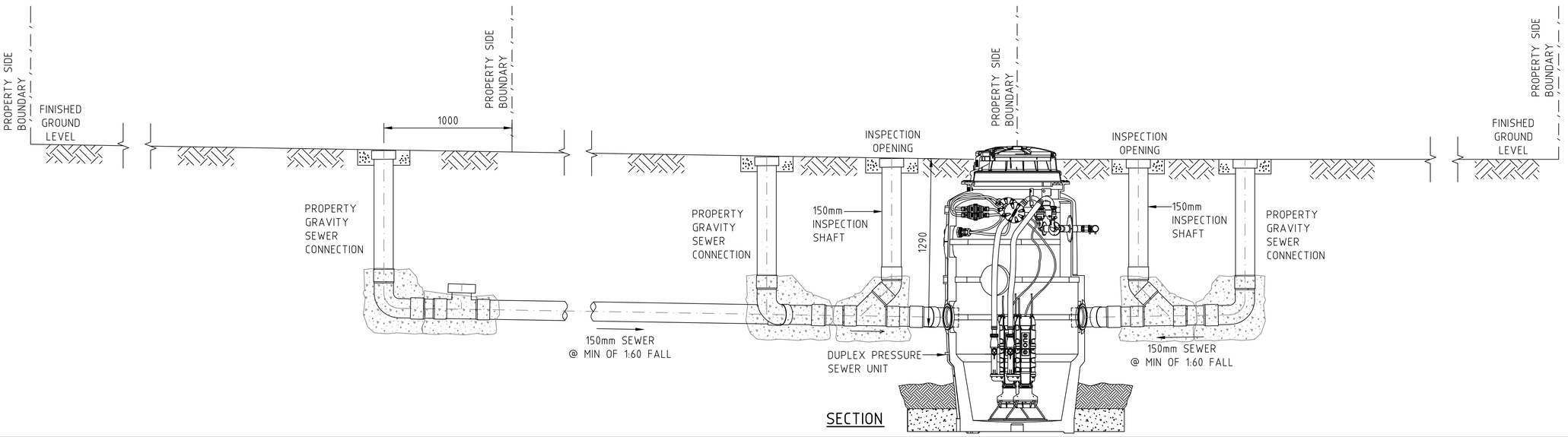


PLAN



SECTION

Date: 16/04/2013

Drawing No: SK104

Rev: A

Scale:

CATHERINE HILL BAY PRESSURE SEWERAGE SCHEME
PROPERTY CONNECTION DETAILS 3

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Appendix 4.3.9 **Sewerage Preliminary Risk Assessment**

Project: Catherine Hill Bay Water Utility
Client: Rose Group
Title: Sewerage Preliminary Risk Assessment for IPART Application
Author: BI
Date (Revision): 10/07/2013 (Revision B)
Risk Criteria: As per Tables 2.5, 2.6 & 2.7: Australian Guidelines for Water Recycling: Managing Health and Environmental Risks-phase 1 (2006)

Scheme Component	Hazard	Hazardous Event	Impact	Unmitigated Risk					Control Strategy	Mitigated Risk				
				Likelihood		Consequence		Risk		Likelihood		Consequence		Risk
Wastewater generation	Trace contaminants in domestic wastewater	Poor household chemical use and disposal practices resulting in excessive contaminant levels in recycled water	Potential environmental impacts on effluent irrigation areas	C	Possible	2	Minor	Moderate	1. Customer supply contracts and recycled water use agreement will be developed with each customer and will include obligations and education regarding appropriate substances to be disposed of to sewerage and substances that should be avoided. 2. Ongoing customer awareness campaigns and information provided with each water bill and through the CHB Water Utility website.	B	Unlikely	2	Minor	Low
	Trace contaminants in commercial wastewater	Poor trade waste management practices resulting in excessive contaminant levels in recycled water	Potential environmental impacts on effluent irrigation areas	D	Likely	2	Minor	Moderate	1. Predominately residential sewerage catchment with non-residential customers account for less than 1% of all wastewater generated. 2. Trade waste agreement will be developed with each non-residential customers to ensure wastewater is pretreated to domestic standards before discharge into the sewerage system. 3. Each non-residential customer will have its own low pressure sewage pump station to enable monitoring compliance of trade waste agreements.	B	Unlikely	2	Minor	Low
	Shock load of chemical	Poor chemical or trade waste management practices resulting in shock load of contaminants on MBR	Potential biomass die off and reduction in MBR effluent quality. Chemicals may also be an OHS hazard.	A	Rare	2	Minor	Low	1. Continuous online monitoring of MLSS, DO, pH, EC and other process parameters to detect potential impacts on the treatment process. 2. Investigation will be undertaken into the source of contamination. This may involve review of Pressure Sewer Unit (PSU) operational data, water usage data, trade waste agreement etc. 3. Additional online water quality monitoring probes can be installed into suspect PSUs for tracing persistent sources of contamination if required. 4. Road tanker pump out of contaminated water from the inlet balance tank if required.	B	Unlikely	1	Insignificant	Low
	Gross pollutants in raw wastewater	Poor solid waste management practices resulting sewer blockage and overflow.	Potential sewer blockage and overflow	E	Almost certain	2	Minor	Moderate	1. Low pressure sewerage system with grinder pumps will macerate sewage prior to entering the pipe network. 2. Appropriately designed network with self cleansing velocities and high head pumps will minimise the potential for network blockage. 3. Sewer/pump blockage Emergency Response Plan will be developed for the scheme and will include step for identification of route cause and preventative actions. Where multiple blockages have occurred on the same pump station, specific customer awareness/education will be implemented or compliance notices issued. 4. Flushing and maintenance regime will be developed for the pressure sewer network.	C	Possible	2	Minor	Moderate
	Excessive wastewater generation	Peak tourist population or excessive water usage	Build up of raw wastewater in the inlet balance tank and PSUs. Potential overflow to the environment.	C	Possible	2	Minor	Moderate	1. Water demand management strategy including mandatory best practice water efficient fixtures, smart water metres, customer awareness. 2. MBR capacity based on treatment of average daily flows plus 10% contingency at 2.8 EP/ET. 3. Flow and level monitoring at each pump unit to detect sources of inflow. 4. Road tanker pumpout from individual PSUs if required.	B	Unlikely	1	Insignificant	Low
Low Pressure Sewerage Collection System	Inflow and infiltration to the sewerage network	Inflow and infiltration to the sewerage network	Potential overflow from PSU or inlet balance tank if combined inflows exceed capacity of MBR	D	Likely	2	Minor	Moderate	1. Low pressure sewerage system constructed with PN16 HDPE with welded joints and fittings. 2. Contractor induction and education. 3. Inspection and quality assurance during construction. 4. Flow and level monitoring at each pump unit to detect sources of inflow. 5. PSU pump operation centrally controlled by the Direct Digital Control System. PSUs with high water level are given pumping priority. 6. Road tanker pumpout from individual pump units if required.	C	Possible	2	Minor	Moderate
	Inflow and infiltration upstream of Pressure Sewer Unit (PSU)	Inflow and infiltration upstream of Pressure Sewer Unit (PSU)	Potential overflow from PSU or inlet balance tank if combined inflows exceed capacity of MBR	E	Almost certain	2	Minor	Moderate	1. Plumbing inspection of all household plumbing installation prior to connection. 2. Induction and awareness training for all domestic plumbing contractors working in the scheme. 3. Flow and level monitoring at each PSU to identify sources of inflow. Customer education and rectification notices will be provided if required. 4. Road tanker pumpout from individual PSUs if required.	C	Possible	2	Minor	Moderate
	High peak diurnal flows	Excessive peak inflows	Potential overflow from PSU or inlet balance tank if combined inflows exceed capacity of MBR	C	Possible	2	Minor	Moderate	1. Inlet balance tank at WWTP provides buffer storage for diurnal flows. 2. Storage capacity in each PSU provides buffer storage for diurnal flows. 3. PSU pump operation centrally controlled by the Direct Digital Control System. PSUs with high water level are given pumping priority in the control system. 4. Road tanker pumpout from individual pump units if required.	A	Rare	2	Minor	Low
	Pressure main break	Pressure main failure or breakage due to unapproved excavation activity	Discharge of raw sewage to the environment	C	Possible	3	Moderate	High	1. All mains constructed with PN16 HDPE pipe with welded joints and fittings. 2. All mains are pressure tested and certified during construction. 3. Pressure sewer mains are generally located at the bottom of a common services trench, hence other pipes will be damaged from poor excavation practices before the pressure sewer. 4. Signage and identification tape to be installed above all pressure mains. 5. All sewer pipe locations registered with dial before you dig service. 6. Flow monitoring at the WWTP will identify major variations in daily flow. 7. Customer Service Centre and fault reporting with maximum response times for operations staff. 8. Sewer spill Emergency Response Plan and cleanup procedures will be developed. 9. Pressure and flow monitoring in the pressure sewer network.	B	Unlikely	2	Minor	Low

Project: Catherine Hill Bay Water Utility
Client: Rose Group
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Risk Criteria: As per Tables 2.5, 2.6 & 2.7: Australian Guidelines for Water Recycling: Managing Health and Environmental Risks-phase 1 (2006)

Scheme Component	Hazard	Hazardous Event	Impact	Unmitigated Risk					Control Strategy	Mitigated Risk				
				Likelihood		Consequence		Risk		Likelihood		Consequence		Risk
Low Pressure Sewerage Collection System continued..	Leakage from PSU wet well	Failure of PSU wet well resulting in subsurface leakage	Discharge of raw sewage to groundwater	C	Possible	2	Minor	Moderate	1. Clean water static pressure test of each wet well during construction. 2. Wet well designed to include allowances for all structural loads including hydrostatic and soil pressures. 3. Timber bollards or fencing around all PSUs to prevent vehicle access. 4. Water level and flow monitoring at each PSU.	B	Unlikely	2	Minor	Low
	Pump Failure	Pump failure by power surge, blockage, loss of suction etc	Potential discharge of raw sewage to the environment	D	Likely	3	Moderate	High	1. Duty and standby pumps in each PSU. 2. Fail safe in electrical system so pump can operate with failed network connections. 3. High quality robust pumps with long design life. Likely supplier is E-One. 4. Standard pumps with spare pumps maintained onsite for quick changeover if required.	B	Unlikely	3	Moderate	Moderate
	Power failure	Extended power failure across pressure sewer network	Potential discharge of raw sewage to the environment	E	Almost certain	3	Moderate	High	1. 24 hours emergency storage is provided in all PSUs. 2. Low pressure sewer network start up and recovery process is included in Direct Digital Control System logic to avoid excessive simultaneous pump operation. 3. Road tanker pump out from individual PSUs if required.	B	Unlikely	2	Minor	Low
Wastewater Treatment - Membrane Bioreactor + UV Disinfection	Structural failures of tanks and pipes	Tank failure	Discharge of process water to environment	C	Possible	3	Moderate	High	1. Stainless steel tanks with appropriately designed footings. 2. Quality assurance during tank manufacture and installation.	A	Rare	3	Moderate	Low
	Process tank overflows	Blockage or fault causing overflow of process tanks	Discharge of process water to environment	C	Possible	2	Minor	Moderate	1. All process tanks gravity overflow back to inlet balance tank. 2. Screening system on inlet to MBR to remove gross solids.	B	Unlikely	2	Minor	Low
	Mechanical/ electrical items	Failure of mechanical electrical items	Non-compliant recycled water	E	Almost certain	3	Moderate	High	1. Fault detection on all critical mechanical electrical components. 2. Continuous online water quality monitoring of critical process parameters, e.g. DO, pH, MLSS, transmembrane pressure, turbidity, UV intensity	C	Possible	2	Minor	Moderate
	Power blackouts	Extended power blackout	Loss of treatment capacity	E	Almost certain	3	Moderate	High	1. No sewage inflow to MBR during power blackout as pressure sewer system will also be down 2. Wastewater will build up in 24 hours emergency storage at each PSU. 3. Road tanker pump out from each PSU if required. 4. Electrical connection point for mobile power generator to power MBR if required.	C	Possible	2	Minor	Moderate
	Blockage of inlet screening unit	Blockage of screening unit caused by excessive solids in raw wastewater	Carryover of solids to MBR with reduced treatment performance and increased risk of membrane failure	C	Possible	2	Minor	Moderate	1. Only grinder pump macerated sewage will enter the plant. 2. Water level monitoring and high level alarm in screening unit. 3. If screening blockage occurs undertake investigation into source of gross solids and implement preventative actions.	B	Unlikely	2	Minor	Low
	Hydraulic overload during diurnal peak flows	Excessive sewerage flows	Build up of raw wastewater in the inlet balance tank and PSUs. Potential overflow to the environment.	C	Possible	2	Minor	Moderate	1. When peak capacity of the MBR is exceeded the inlet balance tank provides buffer storage for diurnal flows. 2. 24 hour storage capacity in each PSU can also provide buffer storage in extreme events. 3. PSU pump operation centrally controlled by the Direct Digital Control System. PSUs with high water level are given pumping priority through the control system logic. 4. Road tanker pump out from individual PSUs if required during operation.	B	Unlikely	2	Minor	Low
	Pollutant overload	Excessive BOD or ammonia load	Non-compliant recycled water	C	Possible	3	Moderate	High	1. Continuous online monitoring of MBR process DO, MLSS, pH with alarms. 2. Variable speed drive aeration system to match air supply with inflow. Reserve capacity is designed into the aeration system. 3. If process impacts due to high pollutant loads are observed a source control investigation will be undertaken using raw wastewater and trade waste data.	B	Unlikely	3	Moderate	Moderate
	Membrane CIP waste	Return of chemical laden CIP waste through MBR	Potential upset of treatment process and biomass die off	D	Likely	3	Moderate	High	1. MBR CIP waste is stored and neutralised prior to return to the inlet balance tank. 2. If operational problems are experienced MBR CIP waste will be trucked off site to nearest approved facility.	B	Unlikely	3	Moderate	Moderate
	Process chemicals	Spillage of process chemicals	Potential release of chemicals to the environment Potential OH&S impacts.	C	Possible	3	Moderate	High	1. Appropriate bunding and separation of chemicals in chemical storage and delivery area. 2. Standard operating procedures for the transport, receipt and use of chemicals.	A	Rare	2	Minor	Low
	Waste activated sludge	Inadequate sludge wastage rates	High MLSS in MBR, decline in effluent quality & increased membrane fouling.	E	Almost certain	3	Moderate	High	1. Continuous online monitoring of MLSS, DO and TMP with alarms. 2. When MLSS reaches maximum set point sludge is pumped from the bottom of the MBR tank to a sludge holding tank before offsite disposal to approved facility.	B	Unlikely	3	Moderate	Moderate
	Membrane failure	Membrane failure resulting in carryover of human pathogens	Non-compliant recycled water	D	Likely	4	Major	Very high	1. Continuous online monitoring of membrane permeate turbidity and transmembrane pressure. 2. If event occurs, identify and isolate failed membrane module and if required replace failed membrane module. 3. Shut off irrigation supply pump and undertake monitoring of pond water quality to ensure compliance. 4. Chemical treatment of pond water can be undertaken if necessary. 5. An Emergency Response Plan will be developed for MBR membrane failure.	B	Unlikely	4	Major	High

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				Likelihood		Consequence		Risk		Likelihood		Consequence		Risk
Wastewater Treatment - Membrane Bioreactor + UV Disinfection continued…	UV failure	Inadequate UV dose due to lamp failure, reactor fouling, high flow or high turbidity	Non-compliant recycled water	E	Almost certain	3	Moderate	High	1. Continuous online monitoring UV intensity, flow, upstream permeate turbidity and lamp failure. 2. If Low UV dose is recorded investigate and rectify. 3. Shut off irrigation supply pump and undertake monitoring of pond water quality to ensure compliance. 4. Chemical treatment of pond water can be undertaken if necessary. 5. An Emergency Response Plan will be developed for UV lamp failure.	C	Possible	3	Moderate	High
	Sabotage/ vandalism	Sabotage/vandalism	Potential loss of treatment function	C	Possible	4	Major	Very high	1. Lockable site with 6-foot secure fencing. 2. Lockable shed for all treatment equipment. 3. Remotely accessible CCTV system at WWTP site. 4. Community awareness and involvement in the local water scheme.	B	Unlikely	3	Moderate	Moderate
	Noise	Excessive noise generation	Noise complaints for nearby residents	C	Possible	2	Minor	Moderate	1. All treatment equipment is located inside the WWTP building. 2. 100 metre buffer to the nearest residential dwelling. 3. Noisy equipment items will be enclosed in purpose built noise enclosures or insulated plant room. 4. Equipment specification and design will ensure compliance with NSW Industrial Noise Policy of 5 dBA above background noise level at the nearest residential dwelling. 5. WWTP building located on Montefiore Road, which is impacted by background traffic noise. 6. Noise complaint management system through customer service processes.	A	Rare	2	Minor	Low
	Odour	Excessive odour generation	Odour complaints by nearby residents	C	Possible	2	Minor	Moderate	1. All treatment tanks are located inside the WWTP building. 2. 100 metre buffer to the nearest residential dwelling. 3. All treatment tanks are sealed with passive ventilation through Mcberns activated carbon filters located on the roof of the WWTP building. 4. WWTP building includes deodorising sprayers for use if required. 5. Odour complaint management system through customer service processes.	A	Rare	2	Minor	Low
	Aesthetics	Excessive visual impacts	Complaints from nearby residents	C	Possible	2	Minor	Moderate	1. All treatment equipment is located inside the WWTP building. 2. 100 metre buffer to the nearest residential dwelling. 3. Vegetation screening around the WWTP site.	A	Rare	2	Minor	Low
	Indoor air quality inside MBR shed	Contamination of indoor air with harmful sewer gases	OH&S impacts	B	Unlikely	4	Major	High	1. All treatment tanks are sealed and externally ventilated. 2. Continuous online monitoring of indoor air quality for oxygen, hydrogen sulphide and methane gas inside the WWTP building, with automated air conditioner/ventilation system operation and alarm systems.	B	Unlikely	3	Moderate	Moderate
Wet Weather Storage	Vector borne diseases	Vermin/mosquito invasion of wet weather storage	Potential spread of diseases	D	Likely	3	Moderate	High	1. Steep batters to minimise potential for mosquito growth. 2. Regular inspection for evidence vermin access, e.g. mosquito larvae, bird nests etc.	C	Possible	3	Moderate	High
	Unintended contact with recycled water	Human access into storage	Potential spread of disease. Potential drowning.	D	Likely	2	Minor	Moderate	1. Wet weather storage is fenced with appropriate warning signage. 2. Remote CCTV system used at WWTP site. 3. Safe egress point from storage.	A	Rare	3	Moderate	Low
	Blue green algae	Blue green algae outbreak in storage	Inhalation or contact with blue green algae toxins	D	Likely	3	Moderate	High	1. Low nutrient concentrations in MBR effluent (TP< 0.3 mg/L, TN < 10 mg/L) 2. Ongoing monitoring for early detection of algae outbreaks. Algae speciation will be undertaken if outbreak occurs. 3. Chemical treatment and/or aeration/mixing of pond will be undertaken if algae outbreak occurs. 4. If frequent outbreaks occur a permanent aeration/mixer will be installed into the pond.	B	Unlikely	2	Minor	Low
	Leakage to groundwater	Leakage to groundwater	Contamination of groundwater	C	Possible	3	Moderate	High	1. HDPE lined storage. 2. Continuous online monitoring of pond water level to detect leaks. 3. Groundwater monitoring	B	Unlikely	3	Moderate	Moderate
	Stormwater inputs	Stormwater runoff into storage during rain events	Increased potential for overflow	D	Likely	2	Minor	Moderate	1. Turkey nested dam to avoid inputs from stormwater runoff.	A	Rare	1	Insignificant	Low
	Uncontrolled overflow	Uncontrolled overflow from the wet weather storage during extended wet weather	Stormwater contamination	D	Likely	3	Moderate	High	1. MEDLI modelling indicates the 10 ML did not overflow based on 100-years of historic climate data. 2. Continuous online monitoring of storage water level with automatic scheduling of emergency irrigation events to irrigation areas will be undertaken as required to avoid uncontrolled overflow. 3. Removal of excess water by road tanker pump out if required.	A	Rare	2	Minor	Low
	Dam wall failure	Dam wall failure	Surface runoff and flooding	C	Possible	4	Major	Very high	1. Design of dam walls with scour protection in the unlikely event of uncontrolled overflow. 2. MEDLI modelling predicts the storage will not overflow based on historic rainfall data. 3. Continuous online monitoring of storage water level with automatic scheduling of emergency irrigation events as required to avoid uncontrolled overflow.	B	Unlikely	2	Minor	Low

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Risk Criteria: As per Tables 2.5, 2.6 & 2.7: Australian Guidelines for Water Recycling: Managing Health and Environmental Risks-phase 1 (2006)

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				Likelihood		Consequence		Risk		Likelihood		Consequence		Risk
Stage 1 temporary, restricted access Irrigation System	Cross connection with potable or non-potable water networks	Cross connection between temporary irrigation network and other water networks	Contamination of other water supplies	C	Possible	5	Catastrophic	Very high	Temporary irrigation management plan will be developed for the scheme and will include the following cross connection controls: 1. Temporary irrigation system to operate under low pressure. 2. Unique pipe materials. Temporary Irrigation Network is to use Lilac striped HDPE pipe. 3. Temporary Irrigation Network pipes to be laid in their own separate trench with identification tape and above ground signage. 4. Only approved, trained and supervised plumbing contractors are permitted to work on reticulation systems.	B	Unlikely	3	Moderate	Moderate
	Unintended uses or human contact with recycled water	Unintended uses or human contact with recycled water	Potential health impacts	D	Likely	3	Moderate	High	Log reduction targets for the temporary irrigation system will be achieved with the following site based controls: 1. Secure, restrictive access temporary irrigation areas including warning signs, identification and labelling. 2. Surface sprinklers with spray drift control including sprinkler nozzles that operate under low pressure with a large droplet size and low throw height. 3. A minimum 30 m buffer distance between the edge of the temporary irrigation areas and the closest dwelling. 4. No above ground taps or fixtures in temporary irrigation areas. 5. Lockable irrigation valves pits and controllers etc. 6. Soil moisture probes and weather station override on irrigation controllers to prevent irrigation during rainfall, high wind or elevated soil moisture. 7. Irrigation at night time only under normal conditions. 8. Non-irrigated, vegetated buffer strips down gradient of the temporary irrigation areas.	A	Rare	3	Moderate	Low
	Spray drift during irrigation	Spray drift onto sensitive receptor	Potential ingestion of recycled water	E	Almost certain	3	Moderate	High	1. Weather station override on irrigation controllers to prevent irrigation during high wind. 2. Surface sprinklers with spray drift control including sprinkler nozzles that operate under low pressure with a large droplet size and low throw height. 3. A minimum 30 m buffer distance between the edge of the temporary irrigation areas and the closest dwelling.	A	Rare	2	Minor	Low
	Irrigation during wet weather	Irrigation during wet weather resulting in surface runoff or deep percolation of effluent	Contamination of surface and/or groundwaters	E	Almost certain	3	Moderate	High	1. 10 ML wet weather storage provides approximately 100 days storage at average irrigation rates. 2. Soil moisture probes and weather station override on irrigation controllers to prevent irrigation during rainfall, high wind or elevated soil moisture. 3. Non-irrigated, vegetated buffer strips down gradient of the temporary irrigation areas.	A	Rare	2	Minor	Low
	Irrigation rates and scheduling	Inappropriate irrigation scheduling	Increased risk of surface and ground water contamination	C	Possible	2	Minor	Moderate	1. Irrigation scheduling will use programmable irrigation controllers to control irrigation frequency, time and duration. Irrigation rates will be calibrated to ensure no ponding. 2. Irrigation rates will be seasonally adjusted in the irrigation controller to match seasonal irrigation demand.	B	Unlikely	2	Minor	Low
	Recycled water	Surface runoff during irrigation	Potential contamination of surface water	C	Possible	3	Moderate	High	1. All temporary irrigation areas to use irrigation scheduling controls to control the time, frequency and duration of irrigation events. 2. Soil moisture probes and weather station override on irrigation controllers to prevent irrigation during rainfall or elevated soil moisture. 3. Site based storm water run off and environmental controls. 4. Non-irrigated, vegetated buffer strips down gradient of the temporary irrigation areas.	B	Unlikely	2	Minor	Low
	Nitrogen	Excessive nitrogen load resulting in leaching of nitrate from irrigation areas	Contamination of groundwater	C	Possible	3	Moderate	High	1. Irrigation of "Class A" recycled water with total nitrogen concentration of 10 mg/L and low average irrigation rates of around 0.9 mm/day. 2. MEDLI modelling indicates all nitrogen applied in irrigation is taken up by vegetation. 3. MEDLI modelling indicates negligible nitrate concentration in deep drainage.	B	Unlikely	2	Minor	Low
	Phosphorus	Excessive phosphorous load resulting in leaching of phosphate from irrigation area	Contamination of groundwater	C	Possible	3	Moderate	High	1. Irrigation of "Class A" recycled water with total phosphorus concentration of 0.3 mg/L and low average irrigation rates of around 0.9 mm/day. 2. MEDLI modelling indicates the majority of phosphorus applied in irrigation is taken up by vegetation. 3. MEDLI modelling indicates negligible phosphate concentration in deep drainage. 4. MEDLI modelling predicted Phosphorus adsorption into soil at a low rate of 0.3 kg/ha/year. 5. Critical P-sorption life of the soil is conservatively estimated to be >166 years based on P-sorption capacity of holocene sand.	B	Unlikely	2	Minor	Low
	Effluent Salinity	Impacts on plant growth due to salinity	Reduction in plant growth and water and nutrient uptake rates	C	Possible	2	Minor	Moderate	1. MEDLI modelling indicated no impacts on plant growth due to salinity based on a conservative effluent TDS of 1500 mg/L. 2. Landscape design processes will ensure appropriate vegetation is selected in temporary irrigation areas that can tolerate the required salt concentrations. 3. The natural sandy top soil profile and relatively high rainfall at the site will assist with flushing of salt through the soil profile to minimise potential salinity impacts on vegetation.	B	Unlikely	3	Moderate	Moderate

Project: Catherine Hill Bay Water Utility
Client: Rose Group
Title: Sewerage Preliminary Risk Assessment for IPART Application
Author: BI
Date (Revision): 10/07/2013 (Revision B)
Risk Criteria: As per Tables 2.5, 2.6 & 2.7: Australian Guidelines for Water Recycling: Managing Health and Environmental Risks-phase 1 (2006)

Scheme Component	Hazard	Hazardous Event	Impact	Unmitigated Risk					Control Strategy	Mitigated Risk				
				Likelihood		Consequence		Risk		Likelihood		Consequence		Risk
Stage 1 temporary, restricted access Irrigation System continued...	Effluent SAR	Long term sodicity impacts on soil	Soil dispersion, reduction in permeability	C	Possible	2	Minor	Moderate	1. Topsoil profile is dominated by sand, hence the likelihood of sodicity impacts is low. 2. Detail geotechnical testing to be undertaken for each development stage will avoid areas with high clay content and Exchangeable Sodium Percentage (ESP). 3. Ongoing monitoring of soil cations will detect changes in soil ESP over time. 4. If required gypsum/lime application to irrigation areas will be undertaken. 5. If required the irrigation water SAR will be adjusted through addition of calcium/magnesium or reduction in sodium inputs to maintain effluent SAR<5.	B	Unlikely	2	Minor	Low
	Metals and trace contaminants	Trace contaminants in irrigation supply resulting in long term accumulation in irrigation area	Contamination of soil and groundwater	C	Possible	2	Minor	Moderate	1. Source catchment is >99% domestic wastewater hence the likelihood of trace contaminants is low. 2. Customer awareness campaigns, supply contracts, trade waste agreements and recycled water use agreements will further reduce the likelihood of events occurring. 3. Detailed monitoring of effluent quality for trace contaminant will be undertaken annually using a NATA accredited laboratory. 4. Soil monitoring in temporary irrigation area will identify any build up or increase in contaminants. 5. If contaminants are detected then an investigation into the likely source will be undertaken and trade waste/source controls implemented. 6. If required additional treatment processes can be installed, e.g. BAC, ion exchange.	B	Unlikely	2	Minor	Low
	Recycled water	Pipe breakage	Potential contamination of surface or groundwater	C	Possible	2	Minor	Moderate	1. Flow and pressure monitoring in the temporary irrigation supply system. 2. Visual inspection to identify boggy areas or erosion etc.	B	Unlikely	2	Minor	Low
	Odour	Odour released during irrigation	Odour impacts on nearby residents	B	Unlikely	2	Minor	Low	1. Irrigation of high quality "Class A" recycled water with low BOD 2. Algae control in the wet weather storage 3. Irrigation at night time only. 4. A minimum 30 m buffer distance between the edge of the temporary irrigation areas and the closest dwelling.	A	Rare	2	Minor	Low
	Stormwater runon	Stormwater running onto irrigation areas from upgradient	Water logging of irrigation area	D	Likely	2	Minor	Moderate	1. Stormwater diversion drains to divert all upgradient stormwater runoff around temporary effluent irrigation areas. 2. Appropriate buffers to waterways, ponds, stormwater drains and SEPP14 wetlands	A	Rare	2	Minor	Low
	Percolation to groundwater	Excessive percolation of effluent to groundwater	Contamination of groundwater	C	Possible	3	Moderate	High	1. Low long term average irrigation rate of approximately 0.9 mm/day, hence low risk of groundwater contamination. 2. Minimal presence of groundwater within 3 metres of ground surface in geotechnical investigation. 3. Irrigation of high quality "Class A" recycled water with low nutrients. 4. MEDLI modelling indicates negligible concentrations of nutrients in deep drainage for conservative sandy soil profile. 5. A minimum of 600mm sandy loam topsoil cover will be provided on irrigation areas if there is potential for seasonal high water table.	B	Unlikely	2	Minor	Low

SEWERAGE

QUALITATIVE ENVIRONMENTAL AND PUBLIC HEALTH RISK ASSESSMENT CRITERIA

From tables 2.5, 2.6 and 2.7 on Page 39 of the Australian Guidelines for Water Recycling Managing Health & Environmental Risks Phase 1 (2006)

Qualitative measures of likelihood

Level	Descriptor	Example Description from AGWR
A	Rare	May occur only in exceptional circumstances. May occur once in 100 years
B	Unlikely	Could occur within 20 years or in unusual circumstances
C	Possible	Might occur or should be expected to occur within a 5- to 10-year period
D	Likely	Will probably occur within a 1-to 5-year period
E	Almost certain	Is expected to occur with a probability of multiple occurrences within a year

Qualitative measures of consequence or impact

Level	Descriptor	Example Description from AGWR
1	Insignificant	Insignificant impact or not detectable
2	Minor	Health — Minor impact for small population Environment — Potentially harmful to local ecosystem with local impacts contained to site
3	Moderate	Health — Minor impact for large population Environment — Potentially harmful to regional ecosystem with local impacts primarily contained to on-site
4	Major	Health — Major impact for small population Environment — Potentially lethal to local ecosystem; predominantly local, but potential for off-site impacts
5	Catastrophic	Health — Major impact for large population Environment — Potentially lethal to regional ecosystem or threatened species; widespread on-site and off-site impacts

Qualitative risk analysis matrix: Level of risk

		Consequences				
Likelihood		1	2	3	4	5
		Insignificant	Minor	Moderate	Major	Catastrophic
A	Rare	Low	Low	Low	High	High
B	Unlikely	Low	Low	Moderate	High	Very high
C	Possible	Low	Moderate	High	Very high	Very high
D	Likely	Low	Moderate	High	Very high	Very high
E	Almost certain	Low	Moderate	High	Very high	Very high