MWH

BUILDING A BETTER WORLD

REPORT

Sewer Strategic Infrastructure Plan - Gladstone Sewerage Scheme

Prepared for Gladstone Regional Council

August 2014

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Executive Summary

Introduction

The Gladstone Sewerage Scheme is a combination of gravity sewer and pump stations. Gladstone sewer network consists of four distinct networks, namely Gladstone A, which serves the north of Gladstone, including the Central Business District (CBD), Gladstone S, which serves the south of Gladstone, Gladstone D, which serves the Clinton industrial area to the west of Gladstone and Gladstone T, which serves the South Trees district.

All the flows from sewerage catchments A, S and D ultimately are conveyed to Gladstone Sewage Treatment Plant (STP) and the flows from sewerage catchment T are conveyed to South Tree STP.

The primary objective of the Sewer Strategic Infrastructure Plan was to identify the sewer infrastructure required to service the existing and future catchment demands in accordance with the Desired Standards of Service (DSS) in the Gladstone Sewerage Scheme.

In order to achieve the purpose of this study the following key task were undertaken:

- Develop and update a hydraulic all pipe sewerage model in H20 MAP SWMM
- Within the same model, develop scenarios for planning horizons; 2012 (Current), 2016, 2021, 2026, 2031 and 2041 (Ultimate) models based on the latest GIS based demand model.
- Assess existing system capacity to deliver Peak Wet Weather Flow (PWWF) (5 times Average Dry Weather Flow (ADWF)) for all planning horizons
- Assess currently proposed strategies as provided by GRC
- Develop infrastructure or non-infrastructure solutions to ensure DSS requirements are achieved over all planning horizons
- Provide cost estimates for all solutions

Model update

Two hydraulic models were received from GRC in H2OMAP SWMM format (one model for A, S and D catchments, one model for T catchment). The existing sewer GIS asset data was also supplied. The models were then reviewed against the asset data and updated.

Demands as contained within the concurrently developed GIS based demand model were allocated to hydraulic models for current, 2016, 2021, 2026, 2031 and ultimate planning horizons for infrastructure assessment purposes.

System Performance Assessment

System Performance was assessed against three standards as shown in Table A.

Table A: System Performance Assessment Standards

Gravity Sewers	
Surcharge requirements	For existing sewer, surcharge of no more than 1m below the manhole surface level at PWWF
Storage	
Emergency Storage	Volume (kL) = 4 hours ADWF of the pump station's gravity catchment + 50% of any immediately upstream pump station emergency storage requirement
Pumping Stations	
Pump station Capacity	PWWF

Where failures of these standards were identified, upgrade and augmentations were proposed.

Infrastructure Schedules

The upgrade requirements where pump station failures of the DSS were identified are shown in Table B Locations are shown in Figures A0 to A12 in Appendix A.

Table B: Summary of Pumping Station Upgrades

Sewerage Catchment	Pump Station ID	Upgrade ID	Planning Horizon	Flow	Duty Head	Location	Figure Ref. (Appendix A)
A	A01	SPS_A_001	2014	638	90	Lord Street	A1
A	A05	SPS_A_003	Ultimate	60	39	Agnes Street	A7
A	A06	SPS_A_004	2014	132	21	Friends Street	A4
A	A10	SPS_A_005	2014	83	29	Palm Drive	A3
A	A13	SPS_A_006	2014	5	7	Young Street	A4
A	A17	SPS_A_007	2014	9	9	Morgan Street	A1
A	A26	SPS_A_008	Ultimate	4	8	Hillard Street	A1
A	A28	SPS_A_009	2014	13	2	Chapple Street (North)	A3
A	A34	SPS_A_010	2014	5	26	Marina (Terminal Building)	A1
A	A41	SPS_A_011	2014	5	24	Clinton coal facility	A1
S	C03	SPS_S_001	2014	11	10	Neil Street	A6
D	D01	SPS_D_001	Ultimate	116	24	Garfield Street	A3
A	P01	SPS_A_012	2031	94	69	Beckinsale Street	A3
S	S01	SPS_S_002	2014	614	30	Cemetery Road	A6
S	S06	SPS_S_003	2026	26	5	Parksville Estate (Emerdale)	A9
S	S07	SPS_S_004	2014	19	37	Parsloe Street	A10
T	T01	SPS_T_004	2014	7	21	Boys Road	A12
T	T02	SPS_T_005	2016	60	51	Glen Eden	A10
T	T05	SPS_T_006	2014	11	15	Cavella Drive, Glen Eden	A10
T	TF01	SPS_T_001	Ultimate	91	4	Near Giles Street	A12
T	TF02	SPS_T_002	Ultimate	3	49	Gladstone Benaraby Road	A10
T	TF03	SPS_T_003	Ultimate	4	18	Bailiff Road	A11

Where emergency storage shortfalls were identified, upgrade requirements are shown in Table C. Locations are shown in Figures A0 to A12 in Appendix A.

Table C: Summary of Wet Well Storage Upgrades

Sewerage Catchment	Pump Station ID	Upgrade ID	Planning Horizon	Required Storage Volume (m^3)	Location	Figure Ref. (Appendix A)
A	A01	SES_A_001	2014	962	Lord Street	A1
A	A02	SES_A_002	2026	67	Parsloe Street	A2
A	A05	SES_A_003	2014	117	Strokarck Street	A7
A	A06	SES_A_004	2014	203	Agnes Street	A4
A	A10	SES_A_005	2014	184	Friend Street	A3
A	A17	SES_A_006	2014	5	Palm Drive	A1
A	A18	SES_A_007	2014	12	Morgan Street	A7
A	A41	SES_A_008	2014	2	Soppa Street	A1
A	P01	SES_A_009	2031	25	Glen Eden	A3
S	C02	SES_S_001	2014	72	Clinton coal facility	A5
S	S01	SES_S_002	2014	1101	Beckinsale Street	A6
S	S06	SES_S_003	2031	36	Cavella Drive, Glen Eden	A9
S	S07	SES_S_004	Ultimate	1	Thomson Street	A10
T	T01	SES_T_001	2014	25	Aerodrome Road	A10
T	T02	SES_T_002	2014	86	Cemetery Road	A10
T	T05	SES_T_003	2014	12	Parksville Estate (Emerdale)	A12

Where gravity sewer failures of the DSS are identified, the upgrade requirements are shown in Table DTable 7–3. Details of the upgrades are shown in Appendix B. Locations are shown in Figures A0 to A12 in Appendix A.

Table D: Summary of Gravity Sewer Mains Upgrades

Sewerage Catchment	Augmentation ID*	Planning Horizon	Length (m)	Diameter (mm)	Location	Figure Ref. (Appendix A)

Sewerage Catchment	Augmentation ID*	Planning Horizon	Length (m)	Diameter (mm)	Location	Figure Ref. (Appendix A)
A	SGM_A_002	2031	136	150-225	Corner of Hanson Road/Yarroon Street	A2
A	SGM_A_003	Ultimate	498	225-375	Friend Street/Wood Street	A4
A	SGM_A_004	Ultimate	322	450	Beckinsale Street	A3
A	SGM_A_006	Ultimate	364	600	Side Street to Ellen Street	A3
A	SGM_A_012	2012	96	225	Hughes Street/Gladstone Benaraby Road	A7
A	SGM_A_013	Ultimate	36	225	Larsen Street/Barry Street	A6
A	SGM_A_014	2026	155	300-450	Mylne Street	A3
A	SGM_A_015	2031	83	375	Palm Drive	A3
A	SGM_D_001	Ultimate	451	225-450	Bensted Street	A3/A6
A	SGM_D_002	Ultimate	211	225	Bensted Street	A6
A	SGM_D_003	2016	325	225-300	Near Red Rover Road/Bensted Street	A3
A	SGM_S_001	Ultimate	2,185	225	Toonee Park/Near Jooloo Court/ Lions Park/Near Police Creek	A6/A9
A	SGM_S_002	Ultimate	667	225-600	Dawson Highway/Philip Street	A6
A	SGM_S_003	2026	19	300	Near Wicks Street/Shaw Street	A6
A	SGM_S_004	2031	731	225-300	Emmadale Drive/Near Emmadale Drive/Clarance Drive	A9
A	SGM_S_005	2031	644	225-300	Huntington Court/Liriope Drive	A9
A	SGM_S_006	Ultimate	273	150-450	Lavender Boulevard	A9
A	SGM_S_007	Ultimate	439	225-750	Koowin Drive	A9
A	SGM_S_008	2026/2031	803	225-300	Rugby League Ground, Harvey Road	A9
A	SGM_S_009	Ultimate	424	150-450	Parsloe Street	A10
A	SGM_S_010	Ultimate	196	300	Corner of Harvey Road & Kirkwood Road	A9
A	SGM_S_011	Ultimate	382	450	Peter Corones Drive	A9
A	SGM_T_001	2016/2021	197	375	Parallel to Billabong Drive	A10/A11
A	SGM_T_002	Ultimate	122	225	Near Melaleuca Palace & Stoneybrook Drive	A11

Several new rising mains are required as shown in Table E. This rising mains are those identified in current GRC strategies The construction of the SRM_A_001 rising main from A06, bypassing pump station A02, is triggered by capacity requirements of pump station A06.

Table E: Summary of New Rising Mains

Sewerage Catchment	Augmentation ID*	SPS ID	Planning Horizon	ET Trigger	Length (m)	Diameter (mm)	Location	Figure Ref. (Appendix A)
A	SRM_A_001	A06	2014	3,903	3,400	375	Friend St.	A2/A4
A	SRM_A_002	A37	Ultimate	156	2,389	100	Marina (trawler area)	A1
T	SRM_T_001	TF02	Ultimate	76	1,019	150	Gladstone Benaraby Road	A10
T	SRM_T_002	TF03	Ultimate	147	810	150	Bailiff Road	A11
T	SRM_T_003	TF01	Ultimate	2,819	1,602	450	Near Giles St.	A12

Cost Estimates

The cost for the augmentations and upgrades identified in Infrastructure Schedules are summarised in Table F. Details of the cost of individual items are shown in Appendix C.

Table F: Summary of Costs per Planning Horizon

	2014	2016	2021	2026	2031	Ultimate
Sewer Gravity Mains	-	$214,000	$142,000	$201,000	$1,107,000	$4,678,000
Sewer Rising Mains	$2,453,000	-	-	-	-	$2,251,000
Sewage Pump Stations	$11,915,000	$434,000	-	$100,000	$892,000	$1,206,000
Emergency Storage	$1,291,000	-	-	$67,000	$84,000	$23,000
Total	$15,659,000	$648,000	$142,000	$368,000	$2,084,000	$8,158,000
Total (All Planning Horizons)						$27,059,000

The cost estimation predicts that most investment is required at the current (2014) planning horizon. This is mainly due to the upgrade requirements at major pump stations A01 and S01.

Significant investment is also predicted at the Ultimate planning horizon. This is mostly as the result of gravity sewer augmentation is the S catchment.

The cost estimation predicts the largest investment is required in the A catchment (approximately $15.8 million of which most investment is required in pump stations upgrades. The upgrade of pump station A01 dominates the costs with a cost estimate of approximately $8.5 million.

Conclusion

The following conclusions can be made from this study:

- The Demand Model estimates the total ET currently as 24,150 and ultimately as 43,490 within the Gladstone Sewerage Scheme.
- The hydraulic assessment of the network predicted 14 pump stations as being under capacity at the current planning horizon at PWWF. This included all the all the major pump stations A01, D01, S01 and T01 that convey flow to the STPs. Based on this assessment significant investment in upgrades at these major pump stations will be required to mitigate the risk of unacceptable overflows to the environment via existing overflow structures.
- The assessment of the gravity network performance identified no surcharge within 1m of ground level due to lack of capacity within gravity sewer at the current planning horizon. The majority of gravity sewer failures are predicted at the 2031 planning horizon and beyond and of these most occur due to growth within the S catchment.
- The review of emergency storage showed that there are 13 pump station catchments where there is a shortfall in emergency storage is predicted at the current planning horizon. Moreover, in pump station catchments A01, A05, A06 and A10 less than a third of the required emergency storage is available. A shortfall in emergency storage can be mitigated by the installation of an emergency generator. No review of the availability of emergency power generation has been undertaken by this study.

Recommendations

The following recommendations are made as a result of the findings of this study.

1. In order to increase confidence in the modelled predictions undertake the following:
    - Model pump run hours during ADWF should be compared against actual pump run hours based on SCADA data.
    - Records of observed controlled and uncontrolled overflows be reviewed which DSS failures is predicted at the 2014 planning horizon.
2. Demand allocation be reviewed at locations where DSS failures on reticulation gravity sewers are predicted prior to implementing any augmentations.
3. Prior to any capacity upgrades at individual pump stations undertake the following:
    - The supplier's pump curves should be obtained and modelled pump station capacity reviewed.
    - If no pump curves are available, pump draw down tests should be undertaken.
    - If pump upgrades are required, analysis of power costs be undertaken where the rising main velocity is predicted to exceed 1.5 m/s, to identify to if they is any benefit in upgrading the rising main.
4. The availability of emergency power generation should be reviewed at any pump station prior to considering any emergency storage upgrade. In addition, in major pump stations such as A01 and S01 where large emergency storage is required, it is recommended that installation of emergency generators be considered, if not already installed.
5. The surcharge that trigger the augmentation SGM_T_001 is caused by 150mm diameter sewer that is shown in the GIS asset data downstream of a 375mm diameter between Manhole ID

53353 and pump station T02. These pipe sizes may be incorrectly recorded in the GIS asset data. It is recommended that the pipe sizes be confirmed.

Gladstone Regional Council

Sewer Strategic Infrastructure Plan -

Gladstone Sewerage Scheme

CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1 Introduction

MWH were engaged by Gladstone Regional Council in 2014 to develop water supply and sewerage strategic infrastructure plans for the Gladstone and Agnes Water networks. As part of this engagement 4 individual reports were produced as follows:

- Water Supply Strategic Infrastructure Plan – Gladstone Water Supply Scheme
- Water Supply Strategic Infrastructure Plan – Agnes Water Water Supply Scheme
- Sewerage Strategic Infrastructure Plan – Gladstone City Area
- Sewerage Strategic Infrastructure Plan – Agnes Water

The report represents the sewerage strategic infrastructure plan for the Gladstone City area and documents the inputs, methodology, assumptions and approach adopted along with the water supply infrastructure outcomes.

All above listed reports have been prepared for the joint purpose of supporting Gladstone Regional Council's submission of the Local Government Infrastructure Plan (LGIP) for which updated water supply and sewerage infrastructure planning was required in the Gladstone City and Agnes Water networks.

1.1 Background

Gladstone Regional Council (GRC) was formed in 2008 from the amalgamation of Calliope Shire Council, Gladstone City Council and Miriam Vale Shire Council. GRC is drafting a planning scheme for the whole of Gladstone Region, to replace the individual planning schemes for the three former shires. As part of GRC's submission of the draft planning scheme for its first State Interest Review in August 2014, one of the submission requirements is to prepare a Local Government Infrastructure Plan (LGIP), formerly known as a Priority Infrastructure Plan (PIP).

The LGIP outlines the necessary infrastructure required to service the next 10 to 15 years of growth outlined within the planning scheme. The LGIP outlines the local government's plans for providing trunk infrastructure to service urban development growth in a coordinated, efficient and orderly way. Trunk infrastructure is generally defined as 'higher order' infrastructure that is shared between developments, whereas non-trunk infrastructure is 'lower order' and is internal to developments which connects to 'higher order' trunk infrastructure.

To achieve this, the LGIP outlines the following infrastructure types:

- Water supply
- Sewerage
- Stormwater
- Transport
- Public parks and land for community facilities.

GRC engaged MWH to prepare a Sewer Strategic Infrastructure Plan to enable the sewer component of the LGIP to be completed. The preparation of strategic infrastructure plans is in accordance with the *Sustainable Planning Act 2009,* Department of Local Government and Planning: Statutory Guideline 01/11 – Priority Infrastructure Plans, Queensland Planning Provisions (QPP) and the State Planning Regulatory Provision (SPRP).

This report documents the development and findings of the plan to support the sewer component of the LGIP.

1.2 Terms of Reference

The Local Government Infrastructure Plan (LGIP) is structured as follows:

- *Planning Assumptions*, which clearly outlines the type, scale, location and timing of future development and growth and how these align with the local government's preferred land use pattern.
- *Priority Infrastructure Area* (PIA), which defines the parts of a local government area intended to accommodate the next 10-15 years growth for urban purposes.
- *Desired Standard of Service* (DSS), which details the applicable design and service standards to the respective trunk and non-trunk infrastructure networks.
- *Plans for Trunk Infrastructure* (PFTI), which identifies the existing and future trunk infrastructure to service urban development within the PIA.

The Sewer Strategic Infrastructure Plan supports the *Plans for Sewerage Infrastructure* component of the LGIP. The terms of reference to prepare the Sewer Strategic Infrastructure Plan require the following tasks:

- Outline the development and growth factors affecting the need for additional sewer assets for the amalgamated GRC.
- Outline the desired sewer conditions to accommodate the region's needs.
- Identify sewer initiatives from previously prepared Priority Infrastructure Plans (PIPs).
- Provide a high level of assessment on the initiatives to determine their relative priority and year of implementation need.
- Deliver the sewer Strategic Infrastructure Plan to support the development of GRC's LGIP.

1.3 Project Scope

The primary objective of the Sewer Strategic Infrastructure Plan is to identify the sewer infrastructure required to service the existing and future catchment demands in accordance with the Desired Standards of Service (DSS).

In order to achieve the purpose of this study, the key tasks required are:

- Investigate the quality of data in GIS and extract data from GIS and other sources
- Define and confirm catchment boundaries and extents
- Develop and update a hydraulic all pipe infrastructure sewerage model in H20 MAP SWMM
- Within the same model, develop scenarios for planning horizons; 2012 (Current), 2016, 2021, 2026, 2031 and 2041 (Ultimate) models.
- Allocate loading in the model for all planning horizons based on the latest GIS based demand model
- Assess system capacity to deliver Peak Wet Weather Flow (PWWF) (5 times Average Dry Weather Flow (ADWF)) for the existing loads
- Assess existing system capacity to deliver PWWF for future loads
- Assess currently proposed strategies as provided by GRC
- Develop infrastructure or non-infrastructure solutions to ensure DSS requirements are achieved over all planning horizons
- Provide cost estimates for all solutions
- Prepare sewer infrastructure plans

1.4 Assessment Assumptions

MWH was supplied with an existing Gladstone Sewer hydraulic model for A, D and S catchments and and existing hydraulic model for T catchment both in H2OMAP SWMM. The latest GIS sewer asset data was also provided. A detailed review of the models was undertaken to identify any data quality issues and identify gaps in the data.

In order to use the provided data for assessment of the Gladstone sewer network, the following assumptions were required.

- The data set queries 'EX_A_2012' and 'EX_S_2012' for the existing 2012 scenarios, contained within the H2OMAP SWMM model received from GRC, were assumed to be the most accurate representation of the A and S catchments in Gladstone Sewerage Scheme. These were used as the base for the development of all planning models used in this study for A and S catchments.
- No scenario or data set query was available for the D catchment within the model received. The base model was developed on the infrastructure contained within the model and compared against the GIS data.
- A separate H2OMAP SWMM model was received for the T catchment. No scenario or data set queries were available for the T catchment within the model. The base model was developed on the modelled infrastructure contained in the model and compared against the GIS data.
- Several pump stations included in the data set query 'EX_S_2012' within the received model were excluded (modelled pump stations F04, F05 and SPS_F05). It was assumed that these pump station were in the model only to present future flows.
- Pump station P01 and significant upstream network was contained within the data set query 'EX_A_2012' for the A catchment. However, this was not shown in the GIS. The modelled infrastructure was assumed to be more up-to-date and pump station P01 and its upstream network were included in the base model for A catchment.
- The missing asset data not contained in the GIS data or the model, such as conduit invert levels and manhole chamber cover levels were interpolated appropriately from upstream and downstream data.
- Pump ON and OFF levels and pump curves provided in the model were assumed to be correct.
- The following proposed future strategies as received from GRC were incorporated into the assessment undertaken:
    - Construction of three new pumps station TF01, TF02 and T03 in T catchment. The timing of these pump stations is established based on the demand model planning horizon at which upstream ET is predicted.
    - Construction of a new rising main from pump station A06 to pump station A01 in order to bypass pump station A02. The timing of this rising main is established based predicted the planning horizon of predicted DSS failures.

2 Desired Standards of Service

The Desired Standards of Service (DSS) have been based on GRC's 'Water and Wastewater Master Planning Guideline', version 0.1 January 2014. Service standards for wastewater have been decided by the Council taking into consideration of historical data and local conditions of the Gladstone sewerage system. The DSS to be adopted for modelling are as detailed in Table 2–1.

Table 2–1: Design Standards of Service - Gladstone Sewerage System

Criteria	Value
Wastewater Demand	
Wastewater Demand	585 L/DAY
Average Dry Weather Flow (ADWF)	ADWF = 585 L/ET/DAY
Peak Wet Weather Flow (PWWF)	PWWF = 5 x ADWF
Gravity Mains	
Minimum Sewer Size	150 mm diameter for minimum ETs of 4
Surcharge requirements	For new sewers, gravity mains are to be no more than 100% full at PWWF For existing sewer, surcharge of no more than 1m below the manhole surface level at PWWF
Sewer Mains Capacity	Sized for PWWF
Friction losses	Head losses in gravity sewer mains are based on the Manning's formula $V = 1/N \times R^{0.67} \times S^{0.5}$ V = pipe velocity (m/s) N = Manning's roughness coefficient R = Hydraulic Radius (m) S = Pipe gradient (m/km)
Roughness Coefficients	N = 0.0130
Trunk Main	Classified as greater than 225NB or any main which is downstream of another trunk or any main which is downstream of a rising main
Branch Main	Classified as greater than 150NB and less than or equal to 225NB, downstream of a Branch main, downstream of a rising main
Rising Mains	
Maximum Velocity	1.5 m/s (at duty flow rate)
Friction losses	Head losses in rising mains are based on the Hazen-William formula $V= 0.3543 \times C \times S^{0.54} \times D^{0.63}$ V= Pipe velocity (m/s) C = Hazen-William roughness coefficient S = Pipe gradient (m/km) D = Pipe diameter (m)
Roughness Coefficient	C = 130
Storage	
Emergency Storage	Volume (kL) = 4 hours ADWF of the pump station's gravity catchment + 50% of any immediately upstream pump station emergency storage requirement
Pumping Stations	
Pump station Capacity	PWWF

Criteria	Value
Power	Power (kW) = ρgQH/1000 ρ - Fluid density = 1000 kg/m^3 g - Standard acceleration of gravity = 9.81 m/s Q - Duty flow rate (m^3/s) H - Total head (m)

3 Existing System Description

3.1 Background

Generally, the Gladstone sewerage system is a combination of gravity sewer and pump stations. Gladstone sewer network consists of four distinct networks, namely Gladstone A, which serves the north of Gladstone, including the Central Business District (CBD), Gladstone S, which serves the south of Gladstone, Gladstone D, which serves the Clinton industrial area to the west of Gladstone and Gladstone T, which serves the South Trees district.

All the flows from sewerage catchments A, S and D ultimately are conveyed to the Gladstone Sewage Treatment Plant (STP) and the flows from sewerage catchment T are conveyed to the South Tree STP.

The total drainage catchment covers an area of 6,669 ha and contains approximately 374km of gravity sewers and 54 pumping stations.

The majority of the sewers are Asbestos Cement (AC) pipes, with PVC and uPVC pipes constituting the majority of the remaining pipelines.

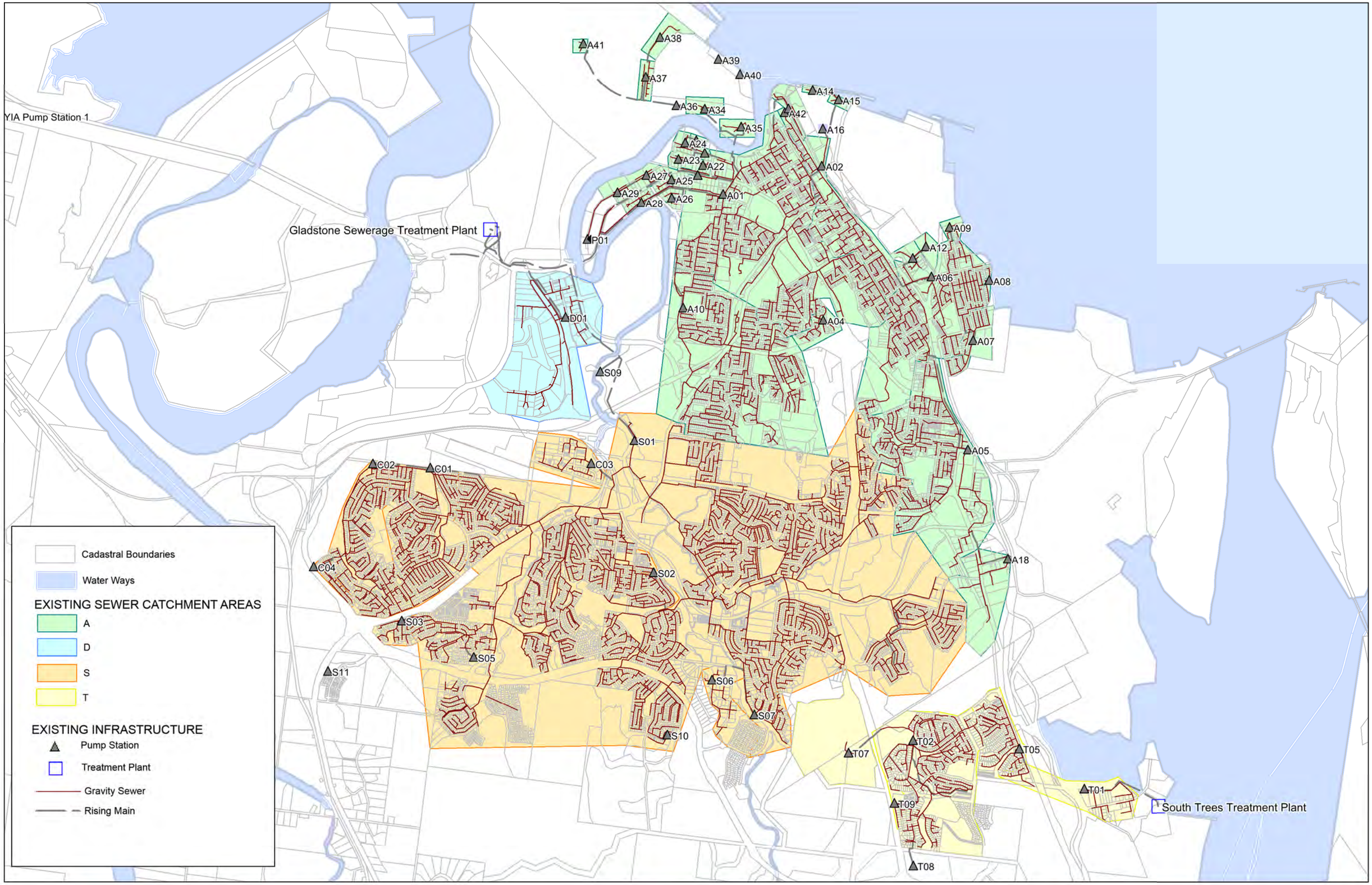
Table 3–1 summarises the details of existing sewerage system in GRC.

Table 3–1: Details of Existing Gladstone Sewerage System

Asset	Quantity
Sewage Treatment Plant (STP)	2*
Sewage Pumping Station (SPS)	55
Emergency Overflows	8
All Manholes	8,627
All Pipes	8,815
Length of Gravity Mains (km)	374
Length of Rising Mains (km)	33

**Gladstone STP and South Trees STP*

Figure 3–1 shows the existing sewerage network and Figure 3–2 shows the schematic of sewerage system in Gladstone sewerage catchment.



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SEWER INFRASTRUCTURE PLAN

Map Created:

Coordinate System: GDA 1994 MGA Zone 50

A4 Scale: 1:20,000

File Name: A3_Landscape

0 2

kilometres

Gladstone Gravity Sewer Scheme - Existing Network

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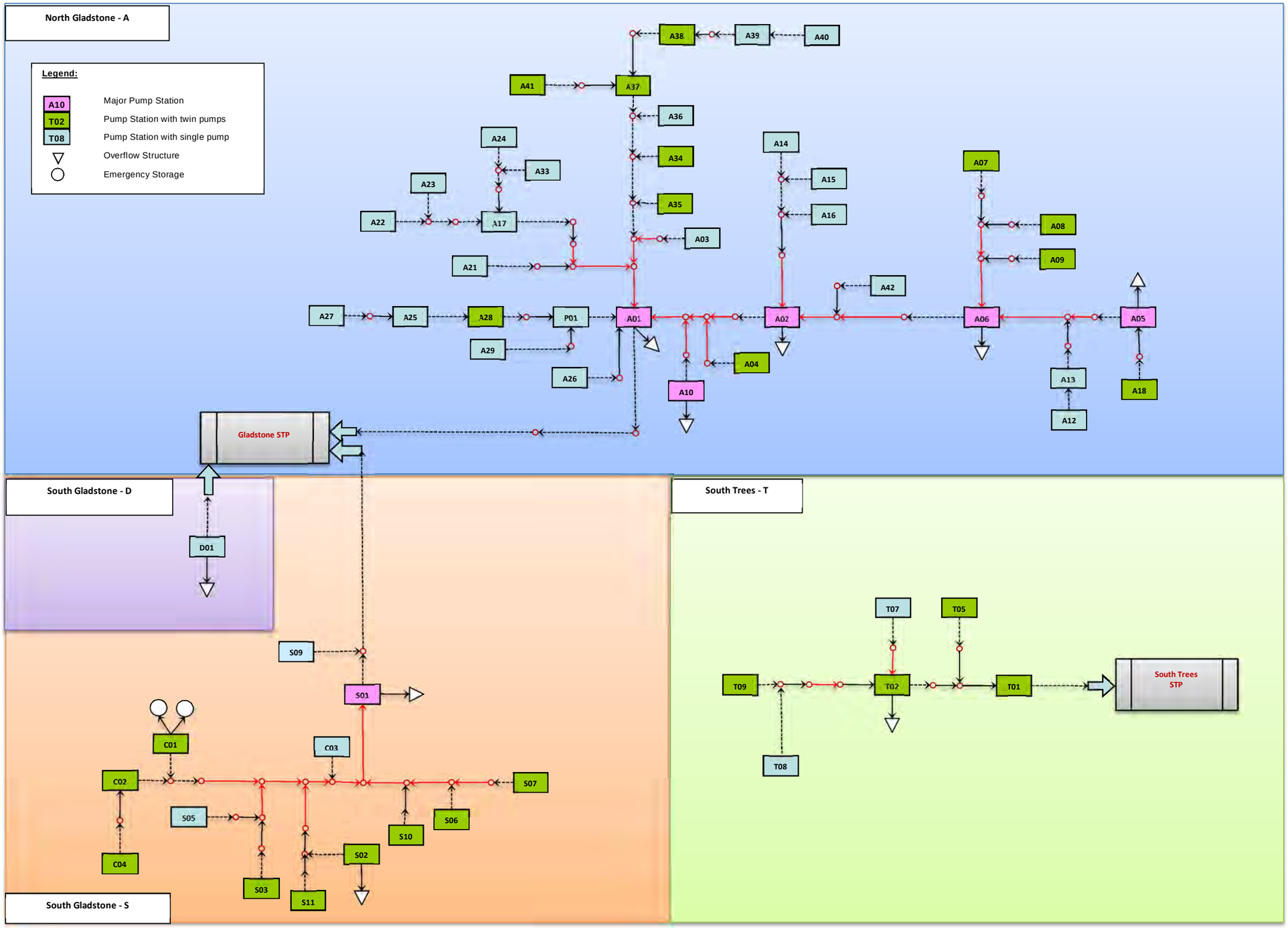
Figure 3-1

Figure 3–2: Schematic of Gladstone Sewerage System



3.2 Gladstone Sewerage Catchment A

The Gladstone A catchment covers the north of Gladstone, including the CBD and harbour area. The catchment has an area of 2,560ha. All flows are pumped to Gladstone STP from pumping station A01.

The network consists of approximately 128km of gravity sewer, ranging in diameter from 150mm to 600mm. There are 37 pumping stations and 5 emergency overflows within the network.

Table 3–2 summarises the details of existing SPSs in Gladstone sewerage catchment A.

Table 3–2: Existing Sewage Pumping Station Details - Gladstone Sewerage Catchment A

Pump Station ID	Location	Modelled Pump Capacity (L/s)	Overflow Pipe (mm)
A01	Lord Street	300	150
A02	Strokarch Street	102	150
A03	Flinders Parade	3.5	-
A04	Kellett Street	3	-
A05	Agnes Street	58	150
A06	Friend Street	68	380
A07	Yaralla Street	16.3	-
A08	The Esplanade	5	-
A09	Barney Street	3.6	-
A10	Palm Drive	50	150
A12	Young Street and Hopper Road	4.9	-
A13	Young Street	3.6	-
A14	MacFarland Drive	5.6	-
A15	McIntosh Street	4.9	-
A16	BP Depot Rd. (Fison Street)	4.9	-
A17	Morgan Street	4.9	-
A18	Soppa Street	10.2	-
A21	Hanson Road	4.9	-
A22	Drew Street (town end)	3	-
A23	Drew Street	4.9	-
A24	Rooksby Street (north)	3.6	-
A25	Chapple Street	14	-
A26	Hillard Street	3.6	-
A27	Beckinsale Street (south)	4.9	-
A28	Chapple Street (north)	3.6	-
A29	Beckinsale Street (north)	5.6	-
A33	Rooksby Street (south)	4.9	-
A34	Marina (terminal building)	4.8	-
A35	Marina (university)	4	-
A36	Marina (dry boat storage)	2.5	-
A37	Marina (trawler area)	8	-
A38	Marina (slipway)	8	-
A39	Leo Zussina Drive (west)	3.8	-
A40	Leo Zussina Drive (east)	3.8	-
A41	Clinton Coal Facility	3.8	
A42	Flinders Parade	3.2	
P01	Beckingsale Street	35.5	

3.3 Gladstone Sewerage Catchment S

The Gladstone S catchment covers the south of Gladstone. The catchment has an area of 2,523 ha. All flows are pumped to Gladstone STP for pump stations S01 and S09.

The network consists of approximately 203 km of gravity sewer, ranging in diameter from 150mm to 825mm.There are 12 pumping stations and 2 emergency overflows within the network.

Table 3–3 summarises the details of existing SPSs in Gladstone sewerage catchment S.

Table 3–3: Existing Sewage Pumping Station Details - Gladstone Sewerage Catchment S

Pump Station ID	Location	Modelled Pump Capacity (L/s)	Overflow Pipe Details (mm)
S01	Cemetery Road	208	150
S02	Sandpiper Avenue	4.9	150
S03	Lady Elliot Court	6	-
S05	Fitzroy Avenue	2	-
S06	Parksville Estate (Emerdale)	10	-
S07	Parsloe Street	10	-
S09	Callamondah Lake	2	-
S10*	Telopea Place	-	-
S11*	Petrel Street	-	-
C01	Aerodrome Road (Anderson St.)	45	-
C02	Aerodrome Road	42	-
C03	Neil Street	9	-
C04	Red Rover Road	7.1	-

*No information was available on pump stations S10 and S11 within the model received from GRC. Therefore neither has not been included for assessment. Both are small pump station upstream in the S catchment.

3.4 Gladstone Sewerage Catchment D

The Gladstone D catchment covers the area of Clinton, to the west of Gladstone. The catchment has an area of 763 ha. All flows are directed via pump station D01 to Gladstone STP.

The network consists of approximately 7km of gravity sewers, ranging in diameter from 150mm to 450mm. There is one pump station with an emergency overflow within the network.

Table 3–4 summarises the details of existing SPSs in Gladstone sewerage catchment D.

Table 3–4: Existing Sewage Pumping Station Details - Gladstone Sewerage Catchment D

Pump Station ID	Location	Existing Modelled Pump Capacity (L/s)	Overflow Pipe Details (mm)
D01	Garfield Street	32	150

3.5 Gladstone Sewerage Catchment T

The Gladstone T catchment covers the area of South Trees, to the south east of Gladstone. The catchment has an area of 823ha. All flows are pumped to South Trees STP via pump station T01.

The network consists of approximately 26km of pipeline, ranging in diameter from 150mm to 375mm. There are 6 pumping stations and there is 1 emergency overflow within the network.

Table 3–5 summarises the details of existing at SPS in Gladstone sewerage catchment T.

Table 3–5: Existing Sewage Pumping Station Details - Gladstone Sewerage Catchment T

Pump Station ID	Location	Existing Pump Capacity (L/s)	Overflow Pipe Details (mm)
T01	Boys Road	32	-
T02	Glen Eden	36	225
T05	Cavella Drive, Glen Eden	2	-
T07	Botanic Gardens	3.8	-
T08	Immunuel College	6	-
T09	Billibong Estate	6	-

4 Demand Development and Outcomes

4.1 Demand Development

The development of the GIS based demand model for the current and future demand horizons is described in detail in the 'Gladstone Regional Council Demand Model Development Technical Memo (MWH, July 2014)'. The methodology detailed within this report is summarised as follows:

1. The demand model was based on the future ultimate development GIS cadastre file supplied by GRC;

2. Each lot was designated a lot based land use as follows:
   a. The land uses were simplified and mapped to the model diurnal demand profile categories as shown in **Table 4-1** below;
   b. Any areas outside of the study area or not serviced by water or sewerage currently and into the future were designated with a RURAL land use type to indicate this;

Table 4-1: Land Use Code Mapping

GRC Land Use	Diurnal Pattern Profile
Single Family Residential	Residential
Multi-Family Residential	Residential
Commercial	Commercial
Mixed	Residential & Commercial
Industrial	Industrial
Community	Commercial
Public Open Space	Park
Schools	School

   c. The GRC existing customer accounts were used to identify whether an existing residential lot was single family residential (RES) or multi-family residential (RES-M);
   d. For multi-family residential and mixed use blocks, the GIS cadastre file contains a polygon for each individual residence and at least one for the lot area. To avoid over allocation of demand the lot polygons were designated a Land Use 'BLOCK';
   e. The land use for future development lots was determined from future development information supplied by GRC;

3. Existing (2014) Demand Development:
   a. For residential lots the following Equivalent Tenement (ET) ratios were adopted for existing lots in line with the GRC's Water and Wastewater Master Planning Guidelines;
      Single Family Residential = 1 ET/dwelling; and
      Multi-family Residential = 0.8125 ET/dwelling
      For the current horizon, demand was only allocated to lots with existing accounts.
   b. For existing non-residential lots ET was determined from the ET data provided by GRC. This ET had been determined from 2012/13 consumption data and ET derived using the average day water usage of 1,450 L/ET/day.

4. The demand model was extended to 2016, 2021, 2026, 2031, 2036 and Ultimate growth horizons.
   a. The future residential demand was grown in-line with the published Office of Economic and Statistical Research (OESR) population growth figures for each SA2 zone.

b. The future non-residential demand was grown in line with the Gladstone Priority Infrastructure Plan (PIP) employment projections.

5. Information on all future identified development locations and was provided by GRC along with an order of expected development for each SA2 area. ET demand was provided for a number of these parcels by GRC. For others ET was assigned based on an ET/ha development density derived with support of GRC and the standard demand ratios contained within the GRC Water and Wastewater Master Planning Guidelines. Developments were generally bought online in the demand model in priority order to match the demand growth profiles determined above.

6. As a validation of the demand model, ET was converted to an equivalent persons (EP) value to allow comparison with the published Office of Economic and Statistical Research (OESR) population projections. In most zones the persons per dwelling number determined by the Australian Bureau of Statistics (ABS) from the 2011 Census were applied. In the cases of Clinton – New Auckland and Telina – Toolooa these original high occupancy rates resulted in a much higher population than the OESR data predicts. Discussion with GRC indicated that the ABS numbers from 2011 represent a time when a high number of migrant workers were living in the area and may not be representative of the current occupancy. In these cases the planning value of 2.6 EP/dwelling was adopted as detailed in **Table 4-2.**

Table 4-2: Persons Per Dwelling

SA2 Zone	ABS 2011 Census	Adopted Value
Clinton - New Auckland	2.8	2.6
Gladstone	2.3	2.3
Kin Kora - Sun Valley	2.9	2.9
Telina - Toolooa	3	2.6
West Gladstone	2.5	2.5

Figure 4–1 to **Figure 4**–5 show that the resulting EP growth profiles compare well to the OESR population growth for these SA2 areas when these person per dwelling values are applied.

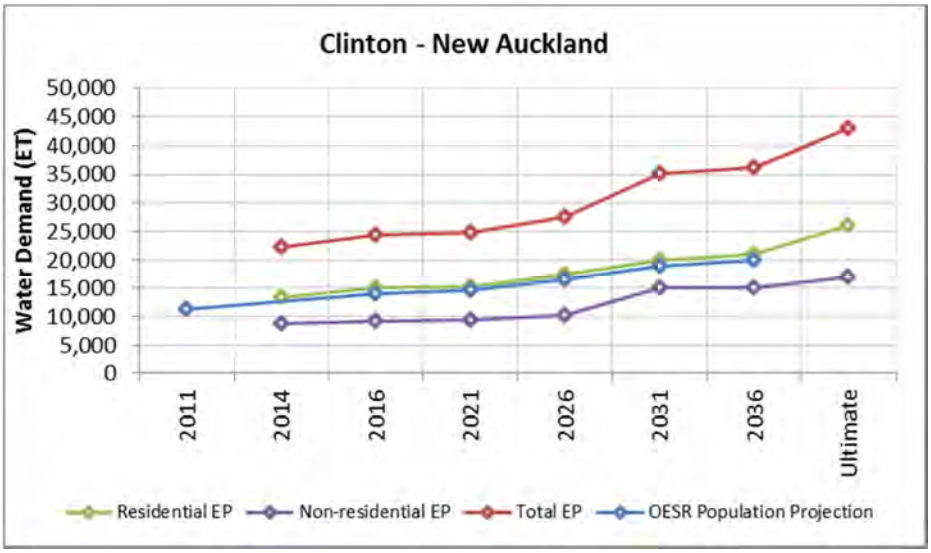


Figure 4–1: EP Growth Profile – Clinton – New Auckland SA2 Area

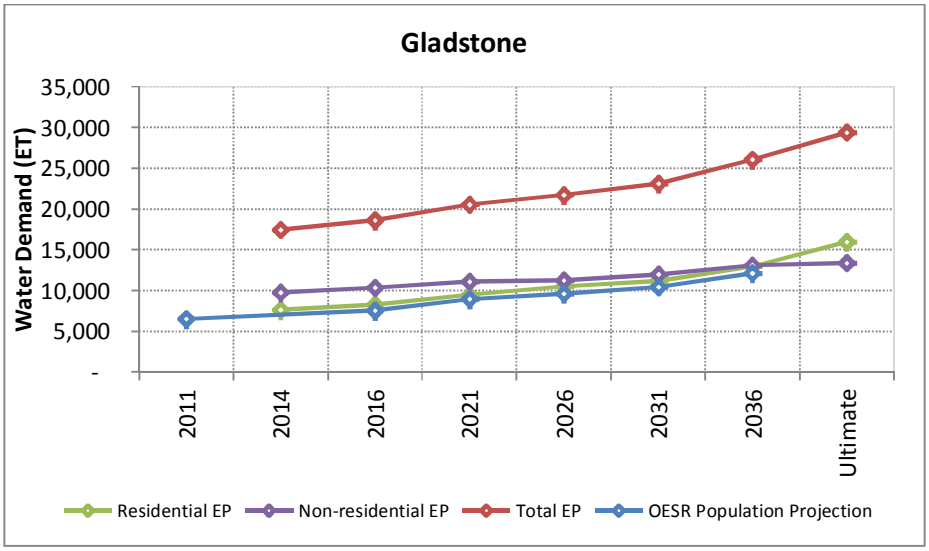


Figure 4–2: EP Growth Profile – Clinton – Gladstone SA2 Area

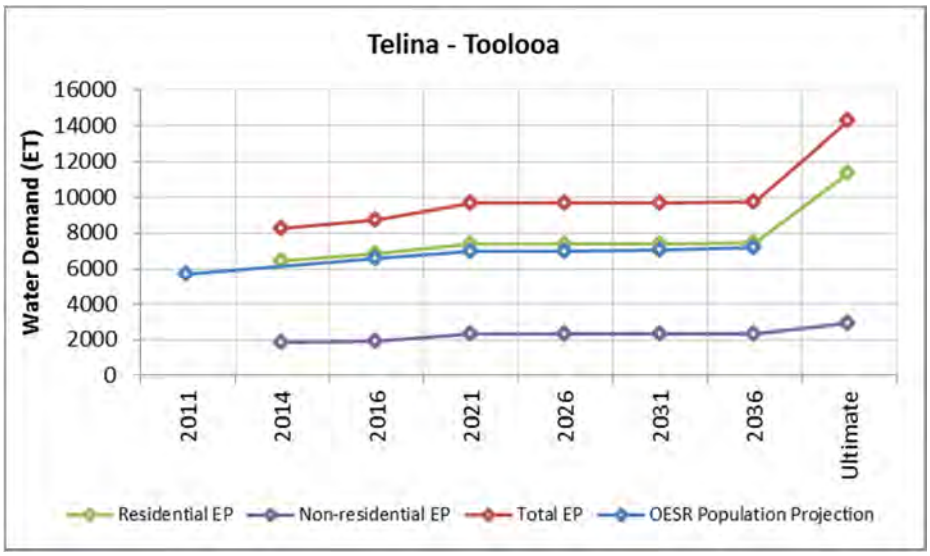


Figure 4–3: EP Growth Profile – Telina Toolooa SA2 Area

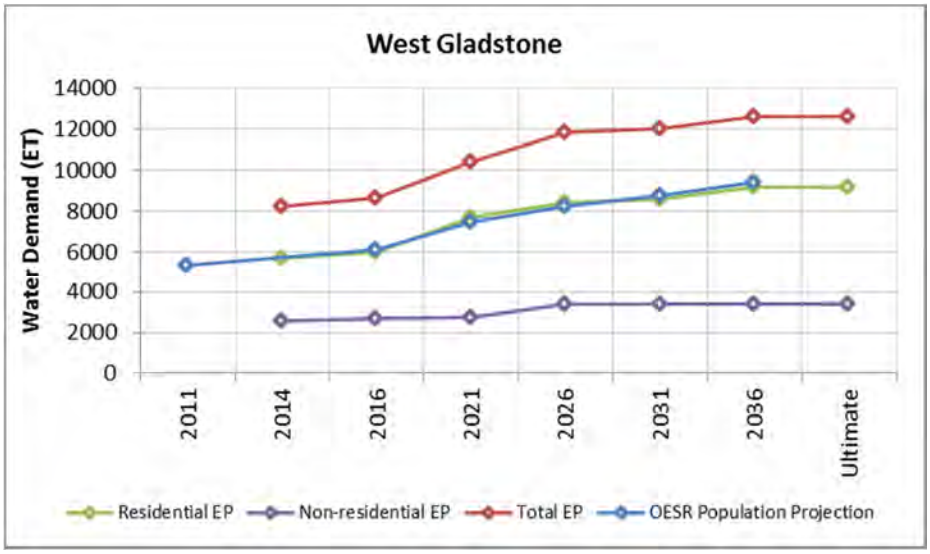


Figure 4–4: EP Growth Profile – Clinton – West Gladstone SA2 Area

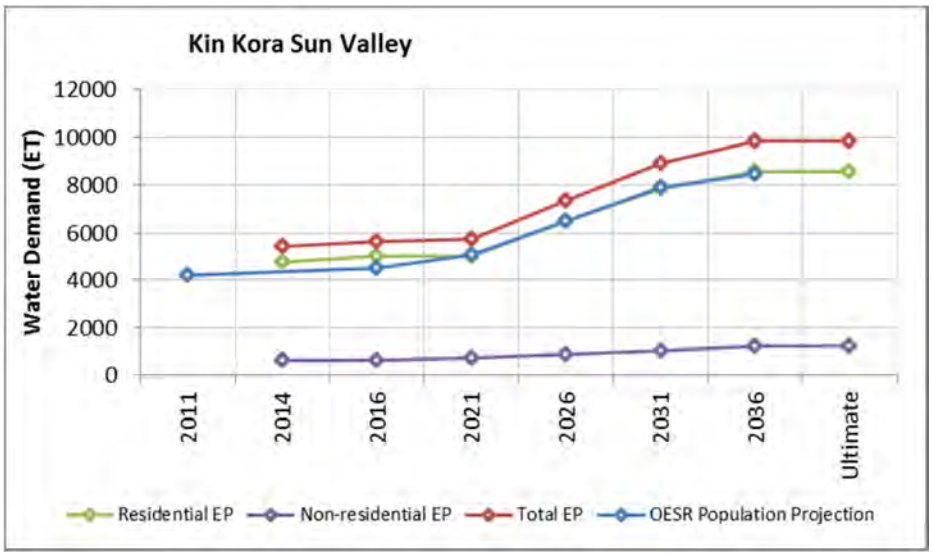


Figure 4–5: EP Growth Profile – Kin Kora – Sun Valley SA2 Area

4.2 Demand Outcomes

Demand outcomes area provided at a sewerage catchment level in the Section 5.3 provided below.

The Demand Model estimates the total ET currently as 24,150 and ultimately as 43,490 within the Gladstone Sewerage Scheme. Hydraulic loads were added at 585 L/ET/Day and the sewer network assessed at PWWF (5 x ADWF).

5 Model Update

5.1 Previous Model

A hydraulic model was received from GRC in H2OMAP SWMM format for use in developing the Sewer Strategic Infrastructure Plan. The Gladstone's sewer model was built in 2004 by Kellogg, Brown and Root (KBR) Pty Ltd for the wastewater planning studies. Later in 2010, MWH was engaged to build the 'All Pipe' Gladstone Sewer model in H2OMAP SWMM and also complete an assessment of S catchment. Further in 2012, Parson Brinckerhoff (PB) completed a study on developing strategic infrastructure plans for future scenarios.

A hydraulic model for the T catchment was received separately.

5.2 GIS Infrastructure Review

MWH was supplied with the existing sewer GIS asset data. A review of the GIS data identified any data quality issues. Missing asset data such as conduit invert levels and manhole chamber cover levels were interpolated appropriately from upstream and downstream data for use in the models.

The models received from GRC were then reviewed against the asset data. The models were updated to include any additional manholes and sewer contained within the GIS but not contained within the received model.

5.3 Demand Allocation

Demands as contained within the GIS based demand model were distributed throughout the network using the automated routine 'Demand Allocator' within H2O MAP SWMM Software for current, 2016, 2021, 2026, 2031 and Ultimate planning horizons. The routine was used to assign all lots/ETs to the nearest node on the sewer network. The automated demand allocation was reviewed manually.

The total ET within each pump station gravity catchment per planning horizon in the Gladstone Sewerage Catchment is shown in Table 5–1.

Table 5–1: Demand Allocation per Pump Station Catchment

Sewerage Catchment	Pump Station ID	Existing and Projected Local Equivalent Tenements					
		2014 (Current)	2016	2021	2026	2031	2041 (Ultimate)
A	A01	3695	3995	4961	5188	5406	7043
A	A02	1043	1042	1042	1295	1387	1901
A	A03	89	89	89	89	89	89
A	A04	66	66	66	66	66	86
A	A05	1360	1425	1425	1425	1425	1515
A	A06	1116	1190	1190	1286	1443	1713
A	A07	129	129	129	129	129	129
A	A08	22	22	22	22	22	22
A	A09	57	57	57	57	57	99
A	A10	1673	1727	2052	2052	2150	2439
A	A12	23	23	23	23	23	23
A	A13	106	106	106	106	124	133
A	A14	0	0	0	0	0	0
A	A15	0	0	0	0	0	0
A	A16	0	0	0	0	0	0
A	A17	21	21	21	21	21	30
A	A18	268	268	268	268	268	268
A	A21	68	68	68	68	68	72
A	A22	27	27	27	27	31	34
A	A23	75	75	75	75	79	83
A	A24	43	43	43	43	49	73
A	A25	153	153	153	153	153	170
A	A26	86	86	86	86	97	114
A	A27	83	83	83	83	98	125
A	A28	84	84	84	84	93	99
A	A29	75	75	116	116	116	118
A	A33	41	41	41	41	41	45
A	A34	156	156	156	156	156	156
A	A35	0	0	0	0	0	0

Sewerage Catchment	Pump Station ID	Existing and Projected Local Equivalent Tenements					
		2014 (Current)	2016	2021	2026	2031	2041 (Ultimate)
A	A36	0	0	0	0	0	0
A	A37	0	0	0	0	0	0
A	A38	0	0	0	0	0	0
A	A39	0	0	0	0	0	0
A	A40	0	0	0	0	0	0
A	A41	156	156	156	156	156	156
A	A42	0	0	0	0	0	0
A	P01	0	188	391	391	2265	2265
D	D01	2418	2457	2530	2860	2860	3438
S	C01	889	874	874	874	874	889
S	C02	661	660	667	714	855	1114
S	C03	337	337	337	337	337	337
S	C04	72	72	72	72	72	72
S	S01	7309	8190	8472	10325	11612	14137
S	S02	108	108	108	108	108	108
S	S03	99	97	97	97	97	160
S	S05	5	5	5	7	7	0
S	S06	178	264	264	371	593	755
S	S07	389	368	368	368	368	566
S	S09	0	0	0	0	0	0
T	T01	147	147	147	147	147	193
T	T02	880	1038	1243	1243	1243	1715
T	T05	271	271	271	271	271	312
T	T07	4	4	4	4	4	21
T	T08	0	0	0	0	0	157
T	T09	30	30	30	30	30	30
T	TF01	-	-	-	-	-	541
T	TF02	-	-	-	-	-	76
T	TF03	-	-	-	-	-	124
TOTAL ET		24510	26318	28418	31332	35489	43590

A summary of the Cumulative Demand at each pump station per planning horizon used is shown in Table 5–2.

Table 5–2: Summary of Cumulative Demand per Pump Station Catchment

Sewerage Catchment	Pump Station ID	Total Cumulative ETs					
		2014 (Current)	2016	2021	2026	2031	2041 (Ultimate)
A	A01	10715	11396	12931	13506	16012	18845
A	A02	4124	1042	1042	1295	1387	1901
A	A03	89	89	89	89	89	89
A	A04	66	66	66	66	66	86
A	A05	1628	1694	1694	1694	1694	1784
A	A06	3081	3221	3221	3317	3492	3903
A	A07	129	129	129	129	129	129
A	A08	22	22	22	22	22	22
A	A09	57	57	57	57	57	99
A	A10	1673	1727	2052	2052	2150	2439
A	A12	23	23	23	23	23	23
A	A13	129	129	129	129	147	156
A	A14	0	0	0	0	0	0
A	A15	0	0	0	0	0	0
A	A16	0	0	0	0	0	0
A	A17	206	206	206	206	220	265
A	A18	268	268	268	268	268	268
A	A21	68	68	68	68	68	72
A	A22	27	27	27	27	31	34
A	A23	75	75	75	75	79	83
A	A24	43	43	43	43	49	73
A	A25	237	237	237	237	251	295
A	A26	86	86	86	86	97	114
A	A27	83	83	83	83	98	125
A	A28	321	321	321	321	344	394
A	A29	75	75	116	116	116	118
A	A33	41	41	41	41	41	45
A	A34	156	156	156	156	156	156

Sewerage Catchment	Pump Station ID	Total Cumulative ETs					
		2014 (Current)	2016	2021	2026	2031	2041 (Ultimate)
A	A35	0	0	0	0	0	0
A	A36	0	0	0	0	0	0
A	A37	156	156	156	156	156	156
A	A38	0	0	0	0	0	0
A	A39	0	0	0	0	0	0
A	A40	0	0	0	0	0	0
A	A41	156	156	156	156	156	156
A	A42	0	0	0	0	0	0
A	P01	396	584	828	828	2725	2777
D	D01	2418	2457	2530	2860	2860	3438
S	C01	889	874	874	874	874	889
S	C02	733	732	739	785	927	1186
S	C03	337	337	337	337	337	337
S	C04	72	72	72	72	72	72
S	S01	10046	10975	11264	13273	14924	18139
S	S02	108	108	108	108	108	108
S	S03	99	97	97	97	97	160
S	S05	5	5	5	7	7	46
S	S06	178	264	264	371	593	755
S	S07	389	368	368	368	368	566
S	S09	0	0	0	0	0	0
T	T01	1331	1489	1694	1694	1694	193
T	T02	914	1072	1276	1276	1276	1766
T	T05	271	271	271	271	271	312
T	T07	4	4	4	4	4	21
T	T08	0	0	0	0	0	157
T	T09	30	30	30	30	30	30
T	TF01	-	-	-	-	-	2819
T	TF02	-	-	-	-	-	76
T	TF03	-	-	-	-	-	124

5.4 Scenario Setup

Three scenario types have been considered in this study for the purpose of assessing system performance and identifying necessary infrastructure and trigger points.

CURRENT

The model *Current* represents the current scenario where demands are based on ETs at a theoretical usage of 585 L/ET/DAY.

The *Current* model is differentiated into two scenarios; namely, Current Average Dry Weather Flow (ADWF) Scenario and Current Peak Wet Weather Flow (PWWF) Scenario.

INTERMEDIATE

The *Intermediate* scenarios represent four different demand sets for the years 2016, 2021, 2026 and 2031.

Each *intermediate* model is differentiated in to two scenarios; namely, Average Dry Weather Flow (ADWF) Scenario and Current Peak Wet Weather Flow (PWWF) Scenario. Different Facility Query sets have been created and utilised to account for any upgrades to hydraulic properties of the assets.

Different Facility Query sets have been created for the selected asset properties such as Conduits, Nodes, DWF Allocation, Pumps and Pump Curves. The Facility Query sets have been named as 'ADWF_CatchmentName_IntermediateYear' (Example: ADWF_A_2016) and 'PWWF_CatchmentName_IntermediateYear' (Example: PWWF_A_2016). These query sets have been utilized as base for modelling and identifying necessary upgrades for each scenario. The selection set 'without upgrades' contained the necessary nodes and links representing each development area with relevant demands assigned to the node.

ULTIMATE

The *Ultimate* model represents ultimate demand scenario and is based partly on PIA areas and partly on proposed developments.

The *Ultimate* model is differentiated in to two scenarios; namely, Ultimate Average Dry Weather Flow (ADWF) Scenario and Ultimate Peak Wet Weather Flow (PWWF) Scenario.

Table 5-1 shows the details of the analysed scenarios and query sets for different planning horizons.

Table 5–3: Scenarios Analysed and Query Sets Used

Catchment	Scenario	Query set	Comment
CURRENT			
A	CURRENT_A_ADWF	ADWF_A_CURRENT	Used to analyse the current scenario
A	CURRENT_A_PWWF	PWWF_A_CURRENT	
S	CURRENT_S_ADWF	ADWF_S_CURRENT	
S	CURRENT_S_PWWF	PWWF_S_CURRENT	
D	CURRENT_D_ADWF	ADWF_D_CURRENT	
D	CURRENT_D_PWWF	PWWF_D_CURRENT	
T	CURRENT_T_ADWF	ADWF_T_CURRENT	
T	CURRENT_T_PWWF	PWWF_T_CURRENT	
INTERMEDIATE			
A	2016_A_ADWF	ADWF_A_2016	
A	2016_A_PWWF	PWWF_A_2016	
A	2021_A_ADWF	ADWF_A_2021	
A	2021_A_PWWF	PWWF_A_2021	
A	2026_A_ADWF	ADWF_A_2026	
A	2026_A_PWWF	PWWF_A_2026	
A	2031_A_ADWF	ADWF_A_2031	
A	2031_A_PWWF	PWWF_A_2031	
S	2016_S_ADWF	ADWF_S_2016	

Catchment	Scenario	Query set	Comment
S	2016_S_PWWF	PWWF_S_2016	Used to analyse 2016, 2021, 2026 and 2031 scenarios
S	2021_S_ADWF	ADWF_S_2021	
S	2021_S_PWWF	PWWF_S_2021	
S	2026_S_ADWF	ADWF_S_2026	
S	2026_S_PWWF	PWWF_S_2026	
S	2031_S_ADWF	ADWF_S_2031	
S	2031_S_PWWF	PWWF_S_2031	
D	2016_D_ADWF	ADWF_D_2016	
D	2016_D_PWWF	PWWF_D_2016	
D	2021_D_ADWF	ADWF_D_2021	
D	2021_D_PWWF	PWWF_D_2021	
D	2026_D_ADWF	ADWF_D_2026	
D	2026_D_PWWF	PWWF_D_2026	
D	2031_D_ADWF	ADWF_D_2031	
D	2031_D_PWWF	PWWF_D_2031	
T	2016_T_ADWF	ADWF_T_2016	
T	2016_T_PWWF	PWWF_T_2016	
T	2021_T_ADWF	ADWF_T_2021	
T	2021_T_PWWF	PWWF_T_2021	
T	2026_T_ADWF	ADWF_T_2026	
T	2026_T_PWWF	PWWF_T_2026	
T	2031_T_ADWF	ADWF_T_2031	
T	2031_T_PWWF	PWWF_T_2031	
ULTIMATE			
A	ULT_A_ADWF	ADWF_A_ULT	Used to analyse Ultimate scenario
A	ULT_A_PWWF	PWWF_A_ULT	
S	ULT_S_ADWF	ADWF_S_ULT	
S	ULT_S_PWWF	PWWF_S_ULT	
D	ULT_D_ADWF	ADWF_D_ULT	
D	ULT_D_PWWF	PWWF_D_ULT	
T	ULT_T_ADWF	ADWF_T_ULT	
T	ULT_T_PWWF	PWWF_T_ULT	

6 System Performance Assessment

6.1 Assessment Methodology

A hydraulic analysis of the Gladstone catchments A, S, D and T was undertaken to identify potential hydraulic issues in the system as a result of predicted growth over the designated planning horizons. The performance of the existing sewer network was assessed against the flows generated from the demands predicted at the various planning horizons.

6.1.1 Pump Capacity Assessment

A detailed assessment of pump capacity was undertaken for all modelled pump stations. The assessment of pump performance was undertaken in accordance with the DSS summarised in Section 2. The theoretical PWWF for each of the modelled pump stations and for each planning horizon are shown in Table 6-1, with its associated existing modelled pump station capacity.

Table 6–1: Summary of Pump Station Capacity Requirements

Sewerage Catchment	Pump Station ID	No. of Modelled Pumps	Type of Modelled Pump Curves	Existing Modelled Pump Station Capacity (L/s)	Pump Station Capacity Requirement (L/s)					
					2014 (Current)	2016	2021	2026	2031	2041 (Ultimate)
A	A01	2	Fixed	300	**362.7**	**385.8**	**437.8**	**457.2**	**542.1**	**638**
A	A02	2	Fixed	102	35.3	35.3	35.3	43.8	47	64.3
A	A03	1	Fixed	3.5	3	3	3	3	3	3
A	A04	2	Fixed	3	2.2	2.2	2.2	2.2	2.2	2.9
A	A05	2	Fixed	58	55.1	57.3	57.3	57.3	57.3	**60.4**
A	A06	2	Fixed	68	**104.3**	**109**	**109**	**112.3**	**118.2**	**132.1**
A	A07	2	Fixed	16.3	4.4	4.4	4.4	4.4	4.4	4.4
A	A08	2	Fixed	5	0.7	0.7	0.7	0.7	0.7	0.7
A	A09	2	Fixed	3.6	1.9	1.9	1.9	1.9	1.9	3.3
A	A10	2	Fixed	50	**56.6**	**58.5**	**69.5**	**69.5**	**72.8**	**82.6**
A	A12	1	Fixed	4.9	0.8	0.8	0.8	0.8	0.8	0.8
A	A13	1	Fixed	3.6	**4.4**	**4.4**	**4.4**	**4.4**	**5**	**5.3**
A	A14	1	Fixed	5.6	0	0	0	0	0	0
A	A15	1	Fixed	4.9	0	0	0	0	0	0
A	A16	1	Fixed	4.9	0	0	0	0	0	0
A	A17	1	Fixed	4.9	**7**	**7**	**7**	**7**	**7.5**	**9**
A	A22	1	Fixed	3	0.9	0.9	0.9	0.9	1	1.2
A	A23	1	Fixed	4.9	2.5	2.5	2.5	2.5	2.7	2.8
A	A24	1	Fixed	3.6	1.5	1.5	1.5	1.5	1.7	2.5
A	A25	2	Fixed	14	8	8	8	8	8.5	10
A	A26	1	Fixed	3.6	2.9	2.9	2.9	2.9	3.3	**3.9**
A	A27	1	Fixed	4.9	2.8	2.8	2.8	2.8	3.3	4.2
A	A28	1	Fixed	3.6	**10.9**	**10.9**	**10.9**	**10.9**	**11.6**	**13.3**
A	A33	1	Fixed	4.9	1.4	1.4	1.4	1.4	1.4	1.5
A	A34	2	Fixed	4.8	**5.3**	**5.3**	**5.3**	**5.3**	**5.3**	**5.3**
A	A35	2	Fixed	4	0	0	0	0	0	0
A	A36	1	Fixed	2.5	0	0	0	0	0	0
A	A37	2	Fixed	8	5.3	5.3	5.3	5.3	5.3	5.3
A	A38	2	Fixed	8	0	0	0	0	0	0
A	A39	1	Fixed	3.8	0	0	0	0	0	0
A	A40	1	Fixed	3.8	0	0	0	0	0	0
A	A41	2	Fixed	3.8	**5.3**	**5.3**	**5.3**	**5.3**	**5.3**	**5.3**
A	A42	1	Fixed	3.2	0	0	0	0	0	0
A	P01	1	Fixed	35.5	13.4	19.8	28	28	**92.3**	**94**
D	D01	1	Fixed	32	**81.9**	**83.2**	**85.7**	**96.8**	**96.8**	**116.4**
S	C01	2	Fixed	45	30.1	29.6	29.6	29.6	29.6	30.1
S	C02	2	Fixed	42	24.8	24.8	25	26.6	31.4	40.1
S	C03	1	Fixed	9	**11.4**	**11.4**	**11.4**	**11.4**	**11.4**	**11.4**
S	C04	2	Fixed	7.1	2.4	2.4	2.4	2.4	2.4	2.4
S	S01	2	Fixed	208	**340.1**	**371.6**	**381.3**	**449.3**	**505.2**	**614.1**
S	S02	2	Fixed	4.9	3.7	3.7	3.7	3.7	3.7	3.7
S	S03	2	Fixed	6	3.3	3.3	3.3	3.3	3.3	5.4

Sewerage Catchment	Pump Station ID	No. of Modelled Pumps	Type of Modelled Pump Curves	Existing Modelled Pump Station Capacity (L/s)	Pump Station Capacity Requirement (L/s)					
					2014 (Current)	2016	2021	2026	2031	2041 (Ultimate)
S	S05	1	Fixed	2	0.2	0.2	0.2	0.2	0.2	0
S	S06	2	Fixed	10	6	8.9	8.9	**12.6**	**20.1**	**25.6**
S	S07	2	Fixed	10	**13.2**	**12.4**	**12.4**	**12.4**	**12.4**	**19.2**
S	S09	1	Fixed	2	0	0	0	0	0	0
T	T01	2	Fixed	32	**45.1**	**50.4**	**57.3**	**57.3**	**57.3**	6.5
T	T02	2	Fixed	36	30.9	**36.3**	**43.2**	**43.2**	**43.2**	**59.8**
T	T05	2	Fixed	2	**9.2**	**9.2**	**9.2**	**9.2**	**9.2**	**10.6**
T	T07	1	Fixed	3.8	0.1	0.1	0.1	0.1	0.1	0.7
T	T08	1	Fixed	6	0	0	0	0	0	5.3
T	T09	2	Fixed	6	1	1	1	1	1	1
T	TF01	1	Fixed	-	-	-	-	-	-	91.3
T	TF02	1	Fixed	-	-	-	-	-	-	2.6
T	TF03	1	Fixed	-	-	-	-	-	-	4.2

*Note: The numbers in **BOLD** indicate when predicted flows exceed existing modelled pump capacities.*

**At Ultimate SPS T01 is no longer predicted to be under capacity due to the construction of proposed SPS TF01.*

As can be seen in Table 6–1, all the major pump stations A01, D01, S01 and T01 conveying flow to STP are predicted to be under capacity at the current planning horizon. In total 14 pump stations are identified as being under capacity at the current planning horizon.

There are several pump stations with no ET predicted upstream in the demand model. It is likely that many of these pump stations receive minor flows.

It should be noted that all pumps in the Gladstone Sewerage Catchment are modelled with a 'fixed' discharge. It is unclear how these fixed discharges were established. No validation of the model has been undertaken as part of this study in order to gain confidence in the accuracy of the model predictions. Therefore the following is recommended prior to implementing any upgrade based on the findings of this study:

- The supplier's pump curves be obtained and the modelled pump station capacity is reviewed.
- If no pump curves are available, it is recommended pump draw down tests be undertaken.
- Model pump run hours during ADWF be compared against actual pump run hours based on SCADA data.
- Records of observed controlled and uncontrolled overflows be reviewed which DSS failures is predicted at the 2014 planning horizon.

6.1.2 Storage Assessment

A detailed assessment of the available emergency storage was undertaken for all pump station catchments. This was compared against the required emergency storage in as defined as the DSS standard in Section 2. The required emergency storage to achieve compliance with the DSS at each pump station for every planning horizon is shown in Table 6-2, along with the available emergency storage within the gravity catchment.

Table 6–2: Summary of Emergency Storage Requirements for Different Planning Horizons

Sewerage Catchment	Sewage Pumping Station	Existing Wet Well Storage (m^3)	Available Emergency Storage (m^3)					
			2014 (Current)	2016	2021	2026	2031	2041 (Ultimate)
A	A01	157	**571**	**615**	**735**	**774**	**904**	**1119**
A	A02	119	**156**	**102**	**102**	**126**	**135**	**185**

Sewerage Catchment	Sewage Pumping Station	Existing Wet Well Storage (m^3)	Available Emergency Storage (m^3)					
			2014 (Current)	2016	2021	2026	2031	2041 (Ultimate)
A	A03	37	9	9	9	9	9	9
A	A04	25	6	6	6	6	6	8
A	A05	44	**146**	**152**	**152**	**152**	**152**	**161**
A	A06	56	**190**	**201**	**201**	**210**	**226**	**260**
A	A07	63	13	13	13	13	13	13
A	A08	25	2	2	2	2	2	2
A	A09	15	6	6	6	6	6	10
A	A10	54	**163**	**168**	**200**	**200**	**210**	**238**
A	A12	15	2	2	2	2	2	2
A	A13	30	11	11	11	11	13	14
A	A14	10	0	0	0	0	0	0
A	A15	12	0	0	0	0	0	0
A	A16	6	0	0	0	0	0	0
A	A17	10	**11**	**11**	**11**	**11**	**12**	**14**
A	A18	14	**26**	**26**	**26**	**26**	**26**	**26**
A	A21	13	7	7	7	7	7	7
A	A22	14	3	3	3	3	3	3
A	A23	18	7	7	7	7	8	8
A	A24	21	4	4	4	4	5	7
A	A25	28	19	19	19	19	20	23
A	A26	23	8	8	8	8	9	11
A	A27	24	12	12	14	14	15	18
A	A28	33	16	16	16	16	17	18
A	A29	26	7	7	11	11	11	12
A	A33	10	4	4	4	4	4	4
A	A34	17	15	15	15	15	15	15
A	A35	33	0	0	0	0	0	0
A	A36	2	0	0	0	0	0	0
A	A37	25	8	8	8	8	8	8
A	A38	46	0	0	0	0	0	0
A	A39	3	0	0	0	0	0	0
A	A40	3	0	0	0	0	0	0
A	A41	13	**15**	**15**	**15**	**15**	**15**	**15**
A	A42	3	0	0	0	0	0	0
A	P01	207	8	26	48	48	**231**	**231**
D	D01	358	236	240	247	279	279	335
S	C01	104	87	85	85	85	85	87
S	C02	40	**68**	**68**	**69**	**73**	**87**	**112**
S	C03	49	33	33	33	33	33	33
S	C04	19	7	7	7	7	7	7
S	S01	469	**843**	**931**	**959**	**1147**	**1290**	**1570**
S	S02	15	11	11	11	11	11	11
S	S03	44	10	9	9	9	9	16
S	S05	13	0	0	0	1	1	0
S	S06	37	17	26	26	36	**58**	**74**
S	S07	54	38	36	36	36	36	**55**
S	S09	2	0	0	0	0	0	0
T	T01*	63	**70**	**78**	**88**	**88**	**88**	19
T	T02	68	**87**	**103**	**123**	**123**	**123**	**162**
T	T05	18	**26**	**26**	**26**	**26**	**26**	**30**
T	T07	7	0	0	0	0	0	2
T	T08	2	0	0	0	0	0	15
T	T09	18	3	3	3	3	3	3

*Note: The numbers in **BOLD** indicates that the wet well storage capacities upgrade over the existing pump capacity for the respective planning horizons.*
**At Ultimate SPS T01 no short fall in emergency storage is predicted due to the construction of proposed SPS TF01.*

As can be seen in Table 6–2, there are 13 pump station catchments where there is a shortfall in emergency storage predicted at the current planning horizon. At pump stations A01, A05, A06 and A10 less than a third of the required emergency storage is available. A shortfall in emergency storage can be mitigated by the installation of an emergency generator. No review of the availability of emergency

power generation has been undertaken by this study. It is recommended the availability of emergency power generation be reviewed at any pump station prior to considering any emergency storage upgrade.

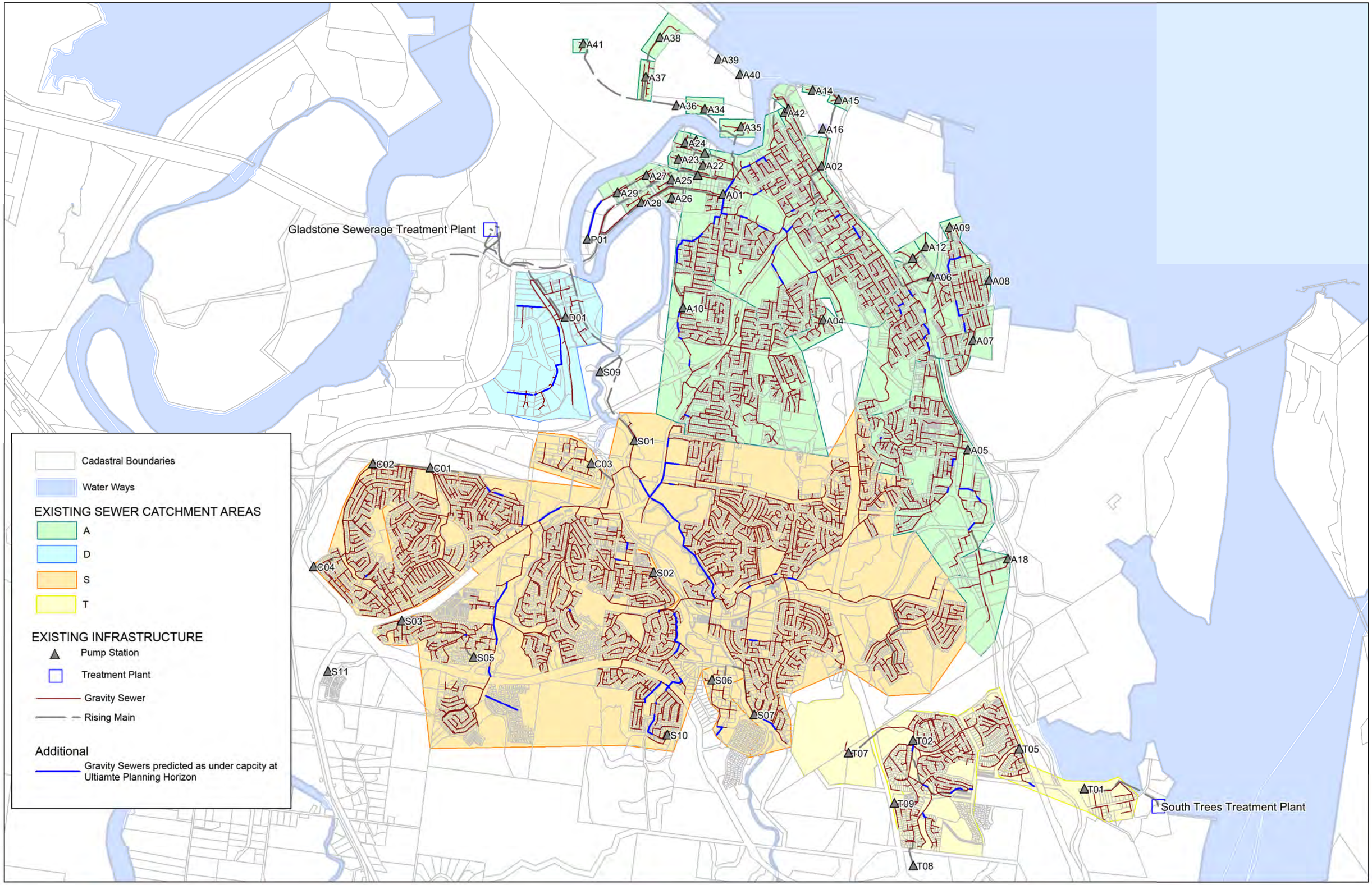
A further three pump stations are predicted to have shortfalls in emergency storage by the ultimate planning horizon.

6.1.3 Gravity Sewer Mains Assessment

A detailed assessment of gravity sewer main capacity was undertaken for all modelled sewers in the catchment. The assessment was undertaken in accordance with the DSS summarised in Section 2.

There are no surcharge is predicted to with 1m of ground level due to lack of capacity within the gravity network at the current planning horizon. There were several lengths of gravity sewer mains predicted to have a lack of capacity of PWWF conditions sufficient to result in predicted surcharge predicted at less 1m below ground level, thus failing the DSS. The majority of these DSS failures are at 2031 planning horizon and beyond.

The locations of under capacity in the gravity sewer at the ultimate planning horizon are shown in Figure 6–1. Augmentations have been proposed where under capacity sewers cause surcharge to within 1m of ground level (see section 7).



MWH

GLADSTONE REGIONAL COUNCIL

SEWER INFRASTRUCTURE PLAN

Map Created:

Coordinate System: GDA 1994 MGA Zone 50

File Name: A3_Landscape

0 2

kilometres

Ultimate Planning Horizon - Under Capacity Sewers

GLADSTONE REGIONAL COUNCIL

Figure 6-1

6.1.4 Raising Mains Assessment

An assessment of the predicted velocity at PWWF in rising mains for all pump stations where pump station capacity upgrades are predicted as being required is shown in Table 6–3.

Where upgrades of pump stations are required, the requirement to upgrade the rising main should also be reviewed to ensure the most cost effective capacity upgrade is undertaken. The DSS standard is based on a maximum velocity pf 1.5 m/s at the duty flows rate. Although defined as a maximum velocity, the standard should be considered a guideline. Velocity higher than this can be conveyed by rising mains but there are likely to be significant increase in head requirements and hence pumping costs. Table 6-3 shows an assessment of rising main velocities and associated head and sizes of the rising mains.

Table 6–3: Summary of Rising Main Velocity

Sewerage Catchment	Sewage Pumping Station	Pump Rate for Ultimate PWWF*	Existing Rising Main Diameter (mm)	Pump Head at Ultimate PWWF (m)	Calculated Velocity (m/s)
A	A01	**638.0**	600	90	**2.26**
A	A05	**60.4**	200	39	**1.92**
A	A06	**132.1**	350	21	1.37
A	A10	**82.6**	200	29	**2.63**
A	A13	**5.3**	100	7	0.67
A	A17	**9.0**	80	9	**1.79**
A	A26	**3.9**	100	8	0.49
A	A28	**13.3**	150	2	0.75
A	A34	**5.3**	75	26	1.19
A	A41	**5.3**	80	24	**2.69**
A	P01	**94.0**	250	69	**1.92**
D	D01	**116.4**	300	24	**1.65**
S	C03	**11.4**	300	10	0.16
S	S01	**603.4**	600	30	**2.13**
S	S06	**25.6**	200	5	0.81
S	S07	**19.2**	100	37	**2.44**
T	T01	6.5	225	21	1.44
T	T02	**59.8**	200	61	**1.90**
T	T05	**10.6**	100	19	1.34

*The numbers in **BOLD** indicates the velocity of rising mains that exceeds the DSS velocity of 1.5 m/s on up-grade of the pump capacities.*

Although there are several instances where the velocity following pump upgrades is predicted to exceed the DSS standard of 1.5m/s, all values predicted are within an acceptable range. When upgrading pump stations where velocity is predicted to exceed 1.5 m/s, it is recommended that cost analysis of power cost be undertaken to identify if they is any benefit in upgrading the rising main.

7 Infrastructure Schedules

This section of the report outlines all the upgrade and augmentation requirements in the Gladstone Sewerage Catchment based on the predicted DSS failures from the current to ultimate planning horizons.

Where pump station failures of the DSS are identified in Table 6–1, the upgrade requirements are shown in Table 7–1. Locations are shown in Figures A0 to A12 in Appendix A.

Table 7–1: Summary of Pumping Station Upgrades

Sewerage Catchment	Pump Station ID	Upgrade ID	Planning Horizon	Flow	Duty Head	Location	Figure Ref. (Appendix A)
A	A01	SPS_A_001	2014	638	90	Lord Street	A1
A	A05	SPS_A_003	Ultimate	60	39	Agnes Street	A7
A	A06	SPS_A_004	2014	132	21	Friends Street	A4
A	A10	SPS_A_005	2014	83	29	Palm Drive	A3
A	A13	SPS_A_006	2014	5	7	Young Street	A4
A	A17	SPS_A_007	2014	9	9	Morgan Street	A1
A	A26	SPS_A_008	Ultimate	4	8	Hillard Street	A1
A	A28	SPS_A_009	2014	13	2	Chapple Street (North)	A3
A	A34	SPS_A_010	2014	5	26	Marina (Terminal Building)	A1
A	A41	SPS_A_011	2014	5	24	Clinton coal facility	A1
S	C03	SPS_S_001	2014	11	10	Neil Street	A6
D	D01	SPS_D_001	Ultimate	116	24	Garfield Street	A3
A	P01	SPS_A_012	2031	94	69	Beckinsale Street	A3
S	S01	SPS_S_002	2014	614	30	Cemetery Road	A6
S	S06	SPS_S_003	2026	26	5	Parksville Estate (Emerdale)	A9
S	S07	SPS_S_004	2014	19	37	Parsloe Street	A10
T	T01	SPS_T_004	2014	7	21	Boys Road	A12
T	T02	SPS_T_005	2016	60	51	Glen Eden	A10
T	T05	SPS_T_006	2014	11	15	Cavella Drive, Glen Eden	A10
T	TF01	SPS_T_001	Ultimate	91	4	Near Giles Street	A12
T	TF02	SPS_T_002	Ultimate	3	49	Gladstone Benaraby Road	A10
T	TF03	SPS_T_003	Ultimate	4	18	Bailiff Road	A11

Where emergency storage failures of the DSS are identified in Table 6–2, the upgrade requirements are shown in Table 7–2. Locations are shown in Figures A0 to A12 in Appendix A.

It should be noted that the upgrade requirements of pump stations A01 and P01 may outside the range of standard submersible pumps due to the high head requirements.

Table 7–2: Summary of Wet Well Storage Upgrades

Sewerage Catchment	Pump Station ID	Upgrade ID	Planning Horizon	Required Storage Volume (m^3)	Location	Figure Ref. (Appendix A)
A	A01	SES_A_001	2014	962	Lord Street	A1
A	A02	SES_A_002	2026	67	Parsloe Street	A2
A	A05	SES_A_003	2014	117	Strokarck Street	A7
A	A06	SES_A_004	2014	203	Agnes Street	A4
A	A10	SES_A_005	2014	184	Friend Street	A3
A	A17	SES_A_006	2014	5	Palm Drive	A1
A	A18	SES_A_007	2014	12	Morgan Street	A7
A	A41	SES_A_008	2014	2	Soppa Street	A1
A	P01	SES_A_009	2031	25	Glen Eden	A3
S	C02	SES_S_001	2014	72	Clinton coal facility	A5
S	S01	SES_S_002	2014	1101	Beckinsale Street	A6
S	S06	SES_S_003	2031	36	Cavella Drive, Glen Eden	A9
S	S07	SES_S_004	Ultimate	1	Thomson Street	A10
T	T01	SES_T_001	2014	25	Aerodrome Road	A10
T	T02	SES_T_002	2014	86	Cemetery Road	A10
T	T05	SES_T_003	2014	12	Parksville Estate (Emerdale)	A12

As mentioned in section 6.1.2, installation of an emergency generator can mitigate the need for emergency storage upgrades. No review of the availability of emergency generators at the pump stations shown in Table 7–2 has been undertaken in this study. It is recommend that the availability of

emergency generator and these pump stations be undertaken prior to considering an emergency storage upgrade. In addition, in major pump stations such as A01 and S01 where large emergency storage is required, it is recommended that installation of emergency generators be considered, if not already installed.

Where gravity sewer failures of the DSS are identified, the upgrade requirements are shown in Table 7–3. Details of the upgrades are shown in Appendix B. Locations are shown in Figures A0 to A12 in Appendix A. No option or route assessment was undertaken. All augmentations consist of a duplication of the existing sewer along the same route of the existing sewer.

Table 7–3: Summary of Gravity Sewer Mains Upgrades

Sewerage Catchment	Augmentation ID	Planning Horizon	Length (m)	Diameter (mm)	Location	Figure Ref. (Appendix A)
A	SGM_A_002	2031	136	150-225	Corner of Hanson Road/Yarroon Street	A2
A	SGM_A_003	Ultimate	498	225-375	Friend Street/Wood Street	A4
A	SGM_A_004	Ultimate	322	450	Beckinsale Street	A3
A	SGM_A_006	Ultimate	364	600	Side Street to Ellen Street	A3
A	SGM_A_012	2012	96	225	Hughes Street/Gladstone Benaraby Road	A7
A	SGM_A_013	Ultimate	36	225	Larsen Street/Barry Street	A6
A	SGM_A_014	2026	155	300-450	Mylne Street	A3
A	SGM_A_015	2031	83	375	Palm Drive	A3
A	SGM_D_001	Ultimate	451	225-450	Bensted Street	A3/A6
A	SGM_D_002	Ultimate	211	225	Bensted Street	A6
A	SGM_D_003	2016	325	225-300	Near Red Rover Road/Bensted Street	A3
A	SGM_S_001	Ultimate	2,185	225	Toonee Park/Near Jooloo Court/ Lions Park/Near Police Creek	A6/A9
A	SGM_S_002	Ultimate	667	225-600	Dawson Highway/Philip Street	A6
A	SGM_S_003	2026	19	300	Near Wicks Street/Shaw Street	A6
A	SGM_S_004	2031	731	225-300	Emmadale Drive/Near Emmadale Drive/Clarance Drive	A9
A	SGM_S_005	2031	644	225-300	Huntington Court/Liriope Drive	A9
A	SGM_S_006	Ultimate	273	150-450	Lavender Boulevard	A9
A	SGM_S_007	Ultimate	439	225-750	Koowin Drive	A9
A	SGM_S_008	2026/2031	803	225-300	Rugby League Ground, Harvey Road	A9
A	SGM_S_009	Ultimate	424	150-450	Parsloe Street	A10
A	SGM_S_010	Ultimate	196	300	Corner of Harvey Road & Kirkwood Road	A9
A	SGM_S_011	Ultimate	382	450	Peter Corones Drive	A9
A	SGM_T_001*	2016/2021	197	375	Parallel to Billabong Drive	A10/A11
A	SGM_T_002	Ultimate	122	225	Near Melaleuca Palace & Stoneybrook Drive	A11

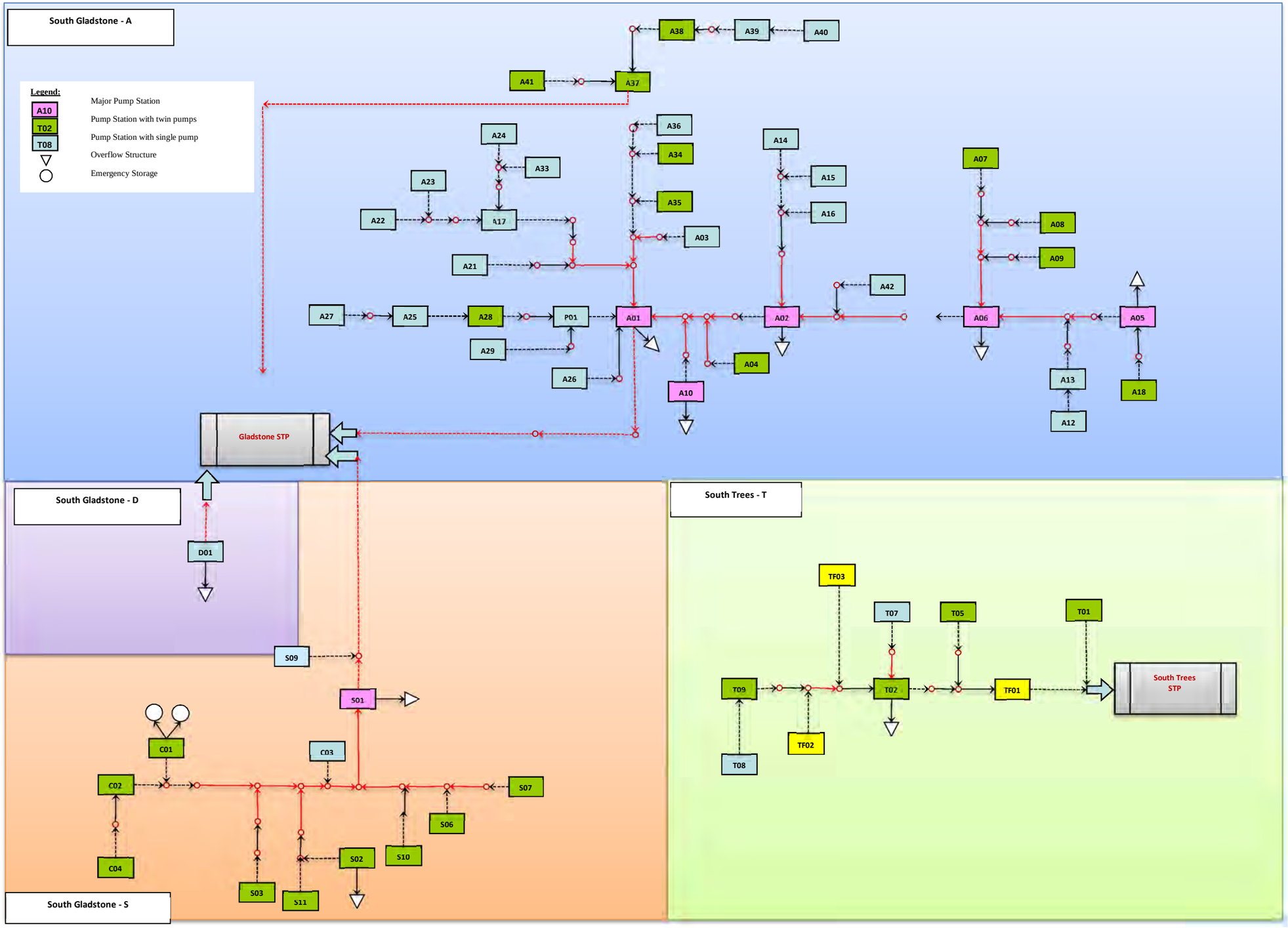
*The surcharge that trigger the augmentation SGM_T_001 is caused by 150mm diameter sewer that is shown in the GIS asset data downstream of a 375mm diameter between Manhole ID 53353 and pump station T02. These pipe sizes may be incorrectly recorded in the GIS asset data. It is recommended that the pipe sizes be confirmed.

Several new rising mains are required as shown in Table 7–4. This rising mains are those identified in by current GRC strategies (see section 1.4). The construction of the SRM_A_001 rising main from A06, bypassing pump station A02, is triggered by capacity requirements of pump station A06.

Table 7–4: Summary of New Rising Mains

Sewerage Catchment	Augmentation ID*	SPS ID	Planning Horizon	ET Trigger	Length (m)	Diameter (mm)	Location	Figure Ref. (Appendix A)
A	SRM_A_001	A06	2014	3,903	3,400	375	Friend St.	A2/A4
A	SRM_A_002	A37	Ultimate	156	2,389	100	Marina (trawler area)	A1
T	SRM_T_001	TF02	Ultimate	76	1,019	150	Gladstone Benaraby Road	A10
T	SRM_T_002	TF03	Ultimate	147	810	150	Bailiff Road	A11
T	SRM_T_003	TF01	Ultimate	2,819	1,602	450	Near Giles St.	A12

Figure 7–1: Schematic of Ultimate Gladstone Sewerage Scheme



8 Cost Estimation

8.1 Cost Estimation Methodology

Cost estimates for all upgrades and augmentations were developed by this study based on the following assumptions:

- Unit rates were adopted from Harrison Grierson Unit Rates Report 2010. Rates were indexed to 2014 rates (11% increase)
- No geology assessment undertaken for soil factor multipliers. Harrison Grierson Unit Rates Report 2010 recommends the following multipliers based on soil type:

Hard Rock	1.36
Soft Rock	1.1
Clay	1
Sand	0.88

  No geology information was available for use in this study. A multiplier of 1 (clay) was assumed applied to unit rates at all locations.
- No contingency added to rates based on advice within Harrison Grierson Report.
- Cost Estimates for sewage pump station upgrades are developed using unit rates per kW. A pump efficiency of 70% is assumed to calculate the pump station power requirement.

8.2 Summary Cost Estimation Outcomes

The cost for the augmentations and upgrades described in section 7 Infrastructure Schedules are summarised in Table 8–1. Details of the cost of individual items are shown in Appendix C.

Table 8–1: Summary of Costs per Planning Horizon

	2014	2016	2021	2026	2031	Ultimate
Sewer Gravity Mains	-	$214,000	$142,000	$201,000	$1,107,000	$4,678,000
Sewer Rising Mains	$2,453,000	-	-	-	-	$2,251,000
Sewage Pump Stations	$11,915,000	$434,000	-	$100,000	$892,000	$1,206,000
Emergency Storage	$1,291,000	-	-	$67,000	$84,000	$23,000
Total	$15,659,000	$648,000	$142,000	$368,000	$2,084,000	$8,158,000
Total (All Planning Horizons)						$27,059,000

The cost estimation predicts that most investment is required at the current (2014) planning horizon. This is mainly due to the upgrade requirements at major pump stations A01 and S01.

Significant investment is also predicted at the Ultimate planning horizon. This is mostly as the result of gravity sewer augmentation is the S catchment.

A breakdown of summary of cost estimates across all catchments is shown in Table 8–2.

Table 8–2: Summary of Cost per Catchment

	A - Catchment	D - Catchment	S - Catchment	T - Catchment
Sewer Gravity Mains	$1,097,616	$519,095	$4,530,458	$195,164
Sewer Rising Mains	$2,848,251	-	-	$1,856,196
Sewage Pump Stations	$11,065,388	$365,190	$2,093,660	$1,022,410
Emergency Storage	$803,640	-	$490,620	$170,940
Total	$15,814,895	$884,285	$7,114,738	$3,244,710
Total (All Catchments)				$27,058,628

The cost estimation predicts the largest investment is required in the A catchment of which most investment is required in pump stations upgrades. The upgrade of pump station A01 dominates the costs with a cost estimate of approximately $8.5 million.

9 Discussion

9.1 Limitations

The key inputs to the development of the Sewer Strategic Infrastructure Plan were the H2OMAP SWMM hydraulic models and GIS layers of sewer infrastructure. The models were updated with the GIS data and additional assets were added to the model.

There were some discrepancies between the connectivity and extent of the sewer network as shown in the model and the GIS. These are summarised below.

S Catchment

In the S catchment the previous model showed pump stations F04, F05 and SPS_F05 in the data query set 'EX_S_2012' that did not appear to represent actual pump stations (no modelled rising mains). These were deactivated in the model and all upstream demands allocated to discharge point of these pump stations. These pump station were not reviewed as part of this study.

A Catchment

Pump station P01 and significant upstream network was contained in the data query set 'EX_S_2012' within the received model. However, this was not shown in the GIS. The modelled infrastructure was assumed to be more up-to-date and pump station P01 and its upstream network were included in the base scenario for A catchment. Pump station P01 was therefore included for review in this study.

There are several limitations to the findings as presented in this study due to the data available, assumption made and type of modelling methodology used. These are described as follows:

1. **Demand Allocation** – Demands as contained within the GIS based demand model were distributed throughout the network using the automated routine 'Demand Allocator' within H2OMAP SWMM Software. Large demand allocations were checked manually. However, there may locations where small demands are allocated to the incorrect modelled node on the correct sewer. These will generally be minor in nature and the estimates of catchment loading and loading on trunk sewers. However, it is recommended that the demand allocation be reviewed in the future at locations where DSS failures on reticulation gravity sewers are predicted.

2. **PWWF** – It is common practise to use fixed demands to assess the capacity of a sewer network using 5 x ADWF. However, this does not represent the 'leakiness' of the sewer network during we weather events. Therefore it is important that any assessment of sewer networks using fixed demands be validated against observed data to increase confidence in the modelled results. This can be either SCADA data recorded at pump stations or customer records of overflow events. No data was available to undertake validation as part of this study. Validation is required in order to confirm the required upgrades and augmentations and to prioritise any future capital works.

3. **Pump Curves** – All pumps within the model were modelled with a 'fixed' discharge. This study has assumed this discharge to be correct although it is unclear how the 'fixed' discharge was established (SCADA Data, pump draw down tests etc.). In addition, it may be an oversimplification of pump performance in some locations, which result in possible under prediction of flows during PWWF (i.e. a high water level in the wet well will generally result in greater pumped flows). This may result in possible surcharge in sewers downstream of the rising main discharge point not being identified.

4. **Emergency Storage** – No review of the installation of emergency power generation was made at pump stations. The significant shortfalls in emergency storage identified at some pump stations and the upgrades identified may not be required if suitable emergency power generation is available at these sites.

5. **Solutions** – The solutions developed by this study include pump station upgrades and augmentation of gravity sewers with duplicate parallel sewers. No options analysis or risk assessment of routes has been undertaken. All gravity sewers consist of duplications of the existing sewers along the same route.

It is important that the risks associated with the limitations be mitigated prior to the design and implementation of any solutions associated with DSS failures identified in this study. Section 11 includes recommendations that should be undertaken in order to mitigate the risk associated with these limitations.

10 Conclusions

This study has provided a review of the performance of the Gladstone Sewerage Scheme using H2OMAP SWMM modelling software. A review of the sewer networks performance under PWWF was undertaken for planning horizons from Current (2012) through to Ultimate. A review of available and required emergency storage was also undertaken.

An existing model was received in H2OMAP SWMM and updated based on GIS data. The data received was assumed to be correct although some discrepancies were identified. These have been described in section 9.1.

The following conclusions can be made from this study:

Demands

Contributing flows were loaded into the model from the GIS based ET Demand Model. The Demand Model estimates the total ET currently as 24,150 and ultimately as 43,490 within the Gladstone Sewerage Scheme. Hydraulic loads were added at 585 L/ET/Day and the sewer network assessed at PWWF (5 x ADWF).

Pump Stations

The hydraulic assessment of the network predicted 14 pump stations as being under capacity at the current planning horizon at PWWF. This included all the all the major pump stations A01, D01, S01 and T01 that convey flow to the STPs. Based on this assessment significant investment in upgrades at these major pump stations will be required to mitigate the risk of unacceptable overflows to the environment via existing overflow structures.

No options analysis was undertaken at pump stations. For the pump station capacity failures of DSS identified, pump upgrades are proposed. The velocity in rising mains where pump upgrades are proposed has been review. This study has concluded that no rising main upgrades should be triggered due to increases in velocities in rising mains. However, increases in capacity at pump stations may be achieved by a combination of pump upgrades and rising main upgrades. The benefits of these alternative capacity upgrade options should be investigated during the implementation of any capacity upgrades.

Gravity Sewer Network

The assessment of the gravity network performance identified no surcharge within 1m of ground level due to lack of capacity within gravity sewer at the current planning horizon. The majority of gravity sewer failures are predicted at the 2031 planning horizon and beyond and of these most occur due to growth within the S catchment.

No options analysis was undertaken on solutions to resolve predicted surcharge in the gravity sewer network. Solutions are proposed that involve the augmentation of existing gravity sewer with parallel duplicate sewers.

Emergency Storage

The review of emergency storage showed that there are 13 pump station catchments where there is a shortfall in emergency storage predicted at the current planning horizon. Moreover, in pump station catchments A01, A05, A06 and A10 less than a third of the required emergency storage is available. A shortfall in emergency storage can be mitigated by the installation of an emergency generator. No review of the availability of emergency power generation has been undertaken by this study.

Cost Estimation

The cost estimation predicts that most investment in assets is required at the current (2014) planning horizon. This is mainly due to the upgrade requirements at major pump station A01 and S01. Significant

investment is also predicted at the Ultimate planning horizon. This is mostly as the result of gravity sewer augmentation is the S catchment.

11 Recommendations

The following recommendations are made as a result of the findings of this study.

1. In order to increase confidence in the modelled predictions undertake the following:

    - Model pump run hours during ADWF be compared against actual pump run hours based on SCADA data.
    - Records of observed controlled and uncontrolled overflows be reviewed at locations of DSS failures predicted at the 2014 planning horizon.

2. Demand allocation be reviewed at locations where DSS failures on reticulation gravity sewers are predicted prior to implementing any augmentations.

3. Prior to any capacity upgrades at individual pump stations undertake the following:

    - The supplier's pump curves be obtained and modelled pump station capacity reviewed.
    - If no pump curves are available, pump draw down tests be undertaken.
    - If pump upgrades are required, analysis of power costs be undertaken where the rising main velocity is predicted to exceed 1.5 m/s, to identify to if they is any whole of life cost benefit in upgrading the rising main.

4. The availability of emergency power generation be reviewed at any pump station prior to considering any emergency storage upgrade. In addition, in major pump stations such as A01 and S01 where large emergency storage is required, it is recommended that installation of emergency generators be considered, if not already installed.

5. The surcharge that trigger the augmentation SGM_T_001 is caused by a 150mm diameter sewer that is shown in the GIS asset data downstream of a 375mm diameter between Manhole ID 53353 and pump station T02. These pipe sizes may be incorrectly recorded in the GIS asset data. It is recommended that the pipe sizes be confirmed.

Appendix A Proposed Infrastructure Maps

316000 318000 320000 322000 324000 326000 328000

7364000 7362000 7360000 7358000 7356000

HANSON ROAD

GLADSTONE
TREAMENT PLANT

GLENLYON ROAD

DAWSON HIGHWAY

FLORA DRIVE

KIRKWOOD ROAD

SOUTH TREES
TREAMENT PLANT

Cadastral Boundaries
Water Ways

Existing Sewer Catchment Areas
- A
- C
- D
- S
- T

EXISTING INFRASTRUCTURE
- Existing Sewer Pump Stations
- Treatment Plants
- Existing Rising Mains
- Existing Sewer Mains

AUGMENTATIONS AND UPGRADES

Proposed Pump Station Upgrades
- 2014
- 2016
- 2026
- 2031
- Ultimate

Proposed Emergency Storage Upgrades
- 2014
- 2026
- 2031
- Ultimate

Proposed Rising Mains
- 2014
- 2016
- Ultimate

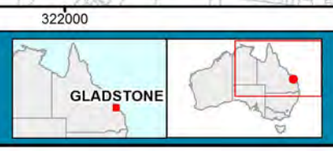
Proposed Gravity Sewer Augmentations
- 2016
- 2021
- 2026
- 2031
- Ultimate

MWH

GLADSTONE REGIONAL COUNCIL

SEWER INFRASTRUCTURE PLAN

Map Created: 4/08/2014 thatchc
Coordinate System: GDA 1994 MGA Zone 56
A4 Scale: 1:37,000
File Name: GLAD_SewerPlan_Master

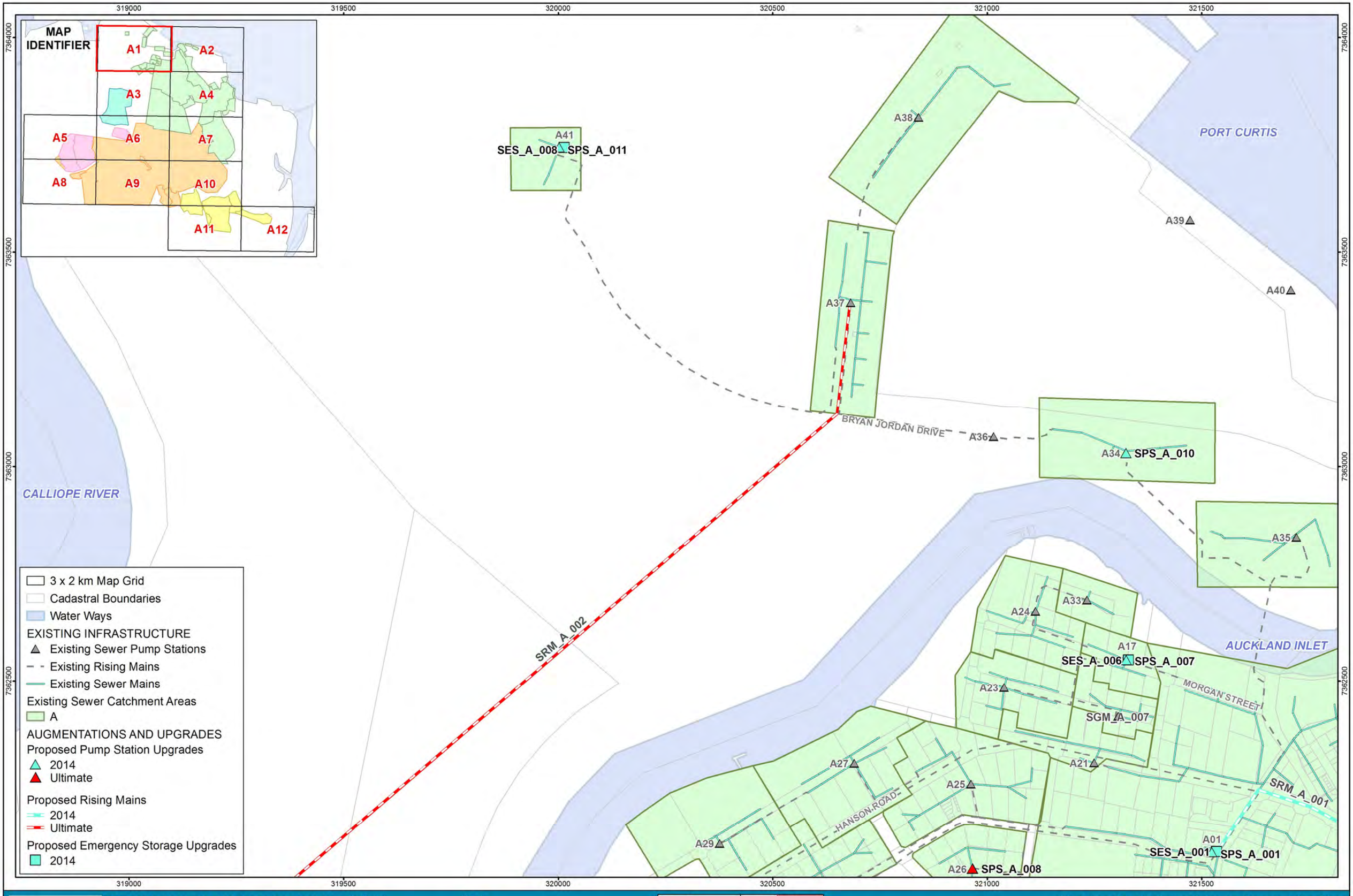


0 1 2 km

Gladstone Gravity Sewer Scheme - Augmentation Plan

GLADSTONE REGIONAL COUNCIL

A0



MWH

GLADSTONE REGIONAL COUNCIL

SEWER INFRASTRUCTURE PLAN

Map Created: 4/08/2014 thatchc

Coordinate System: GDA 1994 MGA Zone 56

A4 Scale: 1:7,650

File Name: GLAD_AugmentationPlan_A1

GLADSTONE

0 250 500 m

Gladstone Gravity Sewer Scheme - Augmentation Plan

GLADSTONE REGIONAL COUNCIL

A1

322000 322500 323000 323500 324000 324500

7364000 7363500 7363000 7362500

MAP IDENTIFIER

A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12

PORT CURTIS

AUCKLAND INLET

A14 A15 A03 A42 A16 A02

MCFARLAN DRIVE

OAKA-LANE

SGM_A_002 SRM_A_001

3 x 2 km Map Grid
Cadastral Boundaries
Water Ways
EXISTING INFRASTRUCTURE
Existing Sewer Pump Stations
Existing Rising Mains
Existing Sewer Mains
Existing Sewer Catchment Areas
A
AUGMENTATIONS AND UPGRADES
Proposed Gravity Sewer Augmentations
2031
Proposed Rising Mains
2014
Proposed Emergency Storage Upgrades
2026

MWH

GLADSTONE REGIONAL COUNCIL

SEWER INFRASTRUCTURE PLAN

MWH Global Pty Ltd can not be held responsible for any damages due to errors or omissions in this product.

Map Created: 31/07/2014 thatchc
Coordinate System: GDA 1994 MGA Zone 56
A4 Scale: 1:7,650
File Name: GLAD_AugmentationPlan_A2

GLADSTONE

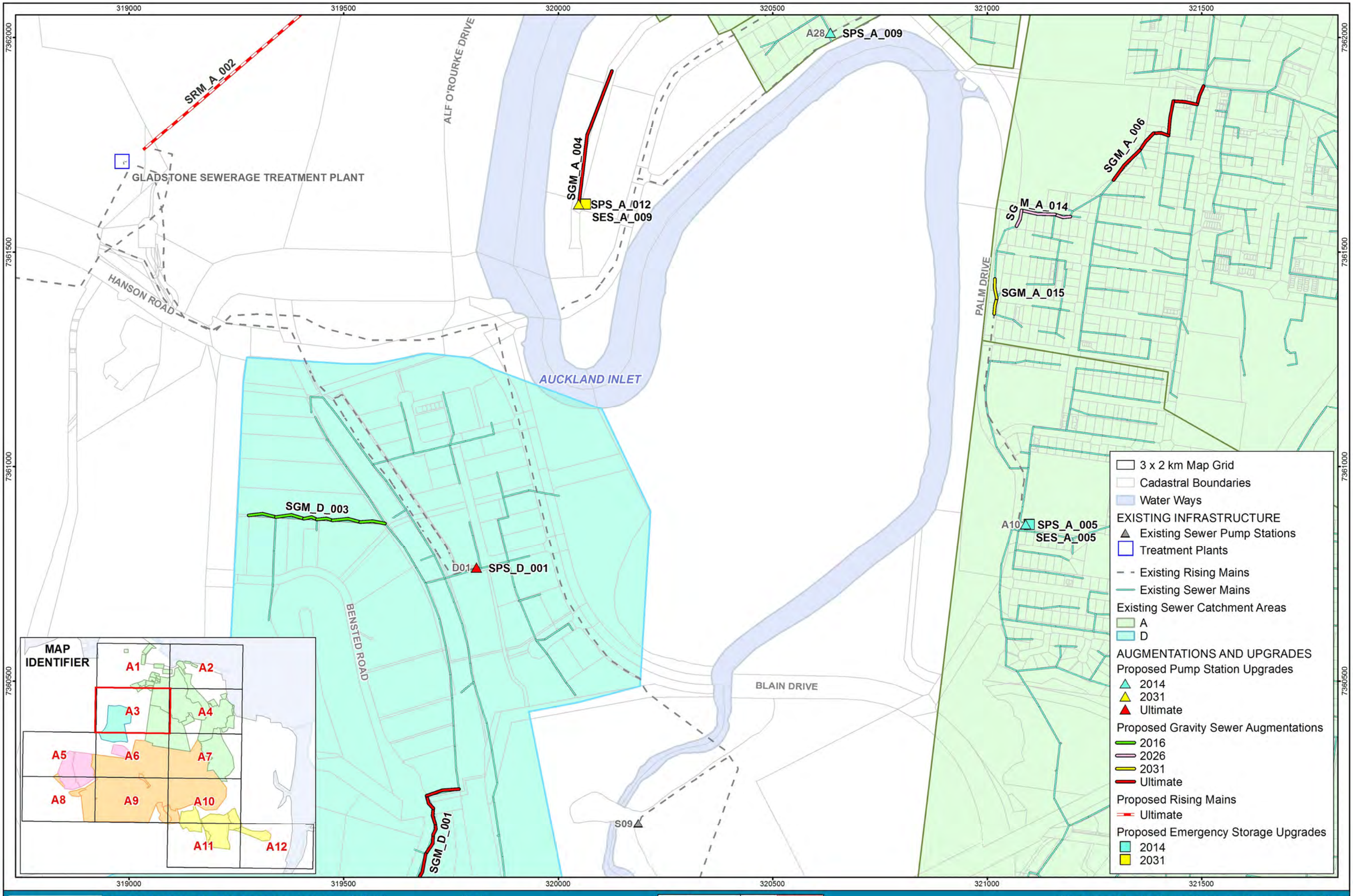
N

0 250 500 m

Gladstone Gravity Sewer Scheme - Augmentation Plan

GLADSTONE REGIONAL COUNCIL

A2



MWH

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SEWER INFRASTRUCTURE PLAN

Map Created: 4/08/2014 thatchc

Coordinate System: GDA 1994 MGA Zone 56

A4 Scale: 1:7,650

File Name: GLAD_AugmentationPlan_A3

GLADSTONE

0 250 500 m

Gladstone Gravity Sewer Scheme - Augmentation Plan

A3

322000 322500 323000 323500 324000 324500

7362000 7361500 7361000 7360500

SCENERY STREET
SRM_A_001
AUCKLAND STREET
TANK STREET
BRESLIN STREET
OFF LANE
SUTTON STREET
YOUNG STREET

A04 A06 A07 A08 A09 A12 A13

SPS_A13
SPS_A06
SES_A_004
SGM_A_003

MAP IDENTIFIER

A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12

3 x 2 km Map Grid
Cadastral Boundaries
Water Ways
EXISTING INFRASTRUCTURE
Existing Sewer Pump Stations
Existing Rising Mains
Existing Sewer Mains
Existing Sewer Catchment Areas
A
AUGMENTATIONS AND UPGRADES
Proposed Pump Station Upgrades
2014
Proposed Gravity Sewer Augmentations
Ultimate
Proposed Rising Mains
2014
Proposed Emergency Storage Upgrades
2014

322000 322500 323000 323500 324000 324500

MWH

GLADSTONE REGIONAL COUNCIL

SEWER INFRASTRUCTURE PLAN

Map Created: 4/08/2014 thatchc
Coordinate System: GDA 1994 MGA Zone 56
A4 Scale: 1:7,650
File Name: GLAD_AugmentationPlan_A4

GLADSTONE

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0 250 500 m

Gladstone Gravity Sewer Scheme - Augmentation Plan

GLADSTONE REGIONAL COUNCIL

A4

316000 316500 317000 317500 318000 318500

7360000 7359500 7359000 7358500

CALLIOPE RIVER

MEEGAN ROAD

RED ROVER ROAD

DON YOUNG DRIVE

COL BROWN AVENUE

J HICKEY AVENUE

SES_S_001

C01 C02 C04

MAP IDENTIFIER

A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12

3 x 2 km Map Grid
Cadastral Boundaries
Water Ways

EXISTING INFRASTRUCTURE
Existing Sewer Pump Stations
Existing Rising Mains
Existing Sewer Mains

Existing Sewer Catchment Areas
C
S

Proposed Emergency Storage Upgrades
2014

316000 316500 317000 317500 318000 318500

MWH

GLADSTONE REGIONAL COUNCIL

SEWER INFRASTRUCTURE PLAN

Map Created: 31/07/2014 thatchc
Coordinate System: GDA 1994 MGA Zone 56
A4 Scale: 1:7,650
File Name: GLAD_AugmentationPlan_A5

GLADSTONE

0 250 500 m

Gladstone Gravity Sewer Scheme - Augmentation Plan

GLADSTONE REGIONAL COUNCIL

A5

319000 319500 320000 320500 321000 321500

7360000 7359500 7359000 7358500

BENSTED ROAD
SGM_D_002
SGM_D_001
SGM_A_013
MELLEFONT STREET
CEMETERY ROAD
SPS_S_002
SES_S_002
S01
SPS_S_001
C03
SGM_S_002
PHILIP STREET
SHAW STREET
SGM_S_003
SGM_S_001
SUN VALLEY ROAD

3 x 2 km Map Grid
Cadastral Boundaries

EXISTING INFRASTRUCTURE
Existing Sewer Pump Stations
Existing Rising Mains
Existing Sewer Mains

Existing Sewer Catchment Areas
A
C
D
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AUGMENTATIONS AND UPGRADES
Proposed Pump Station Upgrades
2014

Proposed Gravity Sewer Augmentations
2026
Ultimate

Proposed Emergency Storage Upgrades
2014

MAP IDENTIFIER

A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12

MWH

GLADSTONE REGIONAL COUNCIL

SEWER INFRASTRUCTURE PLAN

Map Created: 31/07/2014 thatchc
Coordinate System: GDA 1994 MGA Zone 56
A4 Scale: 1:7,650
File Name: GLAD_AugmentationPlan_A6

GLADSTONE

0 250 500 m

Gladstone Gravity Sewer Scheme - Augmentation Plan

GLADSTONE REGIONAL COUNCIL

A6

322000 322500 323000 323500 324000 324500

7360000 7359500 7359000 7358500

BOLES STREET
GLENLYON ROAD
ANN STREET
QAL ACCESS ROAD
PHILIP STREET
WATERSON DRIVE
TIGALEE CREEK
SOPPA STREET

A05
SPS_A_003
SES_A_003
SGM_A_012
A18
SES_A_007

MAP IDENTIFIER
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12

3 x 2 km Map Grid
Cadastral Boundaries
Water Ways
EXISTING INFRASTRUCTURE
Existing Sewer Pump Stations
Existing Rising Mains
Existing Sewer Mains
Existing Sewer Catchment Areas
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AUGMENTATIONS AND UPGRADES
Proposed Pump Station Upgrades
Ultimate
Proposed Gravity Sewer Augmentations
2021
Proposed Emergency Storage Upgrades
2014

MWH

GLADSTONE REGIONAL COUNCIL

SEWER INFRASTRUCTURE PLAN

Map Created: 4/08/2014 thatchc
Coordinate System: GDA 1994 MGA Zone 56
A4 Scale: 1:7,650
File Name: GLAD_AugmentationPlan_A7

GLADSTONE

N
0 250 500 m

Gladstone Gravity Sewer Scheme - Augmentation Plan

GLADSTONE REGIONAL COUNCIL

A7

316000 316500 317000 317500 318000 318500

7358000 7357500 7357000 7356500

MAP IDENTIFIER

A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12

C04

DAWSON HIGHWAY

S03

S05

KIRKWOOD ROAD

S11

BOUNDARY ROAD

CALLIOPE RIVER

PORT CURTIS

CLYDE CREEK

3 x 2 km Map Grid
Cadastral Boundaries
Water Ways
EXISTING INFRASTRUCTURE
Existing Sewer Pump Stations
Existing Rising Mains
Existing Sewer Mains
Existing Sewer Catchment Areas
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316000 316500 317000 317500 318000 318500

MWH

GLADSTONE REGIONAL COUNCIL

SEWER INFRASTRUCTURE PLAN

Map Created: 31/07/2014 thatchc
Coordinate System: GDA 1994 MGA Zone 56
A4 Scale: 1:7,650
File Name: GLAD_AugmentationPlan_A8

GLADSTONE

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0 250 500 m

Gladstone Gravity Sewer Scheme - Augmentation Plan

GLADSTONE REGIONAL COUNCIL

A8

319000 319500 320000 320500 321000 321500

7358000 7357500 7357000 7356500

HARVEY ROAD
SGM_S_008
SGM_S_008
BRIFFNEY CREEK
SGM_S_010
S05
KIRKWOOD ROAD
SGM_S_011
COCKATOO DRIVE
S02
SGM_S_001
GAPPARIS STREET
TIGALEE CREEK
WITNEY STREET
SGM_S_004
CARTHURBIE CREEK
AUCKLAND CREEK
EMMADALE DRIVE
SGM_S_005
SPS_S_003
SES_S_003
S06
SGM_S_006
SGM_S_007
REDGUM STREET
S10

3 x 2 km Map Grid
Cadastral Boundaries
Water Ways

EXISTING INFRASTRUCTURE
Existing Sewer Pump Stations
Existing Rising Mains
Existing Sewer Mains

Existing Sewer Catchment Areas
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AUGMENTATIONS AND UPGRADES
Proposed Pump Station Upgrades
2026

Proposed Gravity Sewer Augmentations
2026
2031
Ultimate

Proposed Emergency Storage Upgrades
2031

MAP IDENTIFIER
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12

MWH

GLADSTONE REGIONAL COUNCIL

SEWER INFRASTRUCTURE PLAN

Map Created: 31/07/2014 thatchc
Coordinate System: GDA 1994 MGA Zone 56
A4 Scale: 1:7,650
File Name: GLAD_AugmentationPlan_A9

GLADSTONE

0 250 500 m

Gladstone Gravity Sewer Scheme - Augmentation Plan

GLADSTONE REGIONAL COUNCIL

A9

322000 322500 323000 323500 324000 324500

7358000 7357500 7357000 7356500

3 x 2 km Map Grid
Cadastral Boundaries
Water Ways

EXISTING INFRASTRUCTURE
Existing Sewer Pump Stations
Existing Rising Mains
Existing Sewer Mains

Existing Sewer Catchment Areas
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AUGMENTATIONS AND UPGRADES
Proposed Pump Station Upgrades
2014
2016
Ultimate

Proposed Gravity Sewer Augmentations
2016
2021
Ultimate

Proposed Rising Mains
Ultimate

Proposed Emergency Storage Upgrades
2014
Ultimate

MAP IDENTIFIER
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12

DALRYMPLE DRIVE
GLENLYON ROAD
WITNEY STREET
AUCKLAND CREEK
POLICE CREEK
AL-LUNGA DRIVE
CAVELLA DRIVE

S07 SES_S_004
SPS_S_004
SGM_S_009
SPS_T_002
SRM_T_001
T02 SES_T_002
SPS_T_005
SGM_T_001
SES_T_003
SPS_T_006

322000 322500 323000 323500 324000 324500

MWH

GLADSTONE REGIONAL COUNCIL

SEWER INFRASTRUCTURE PLAN

Map Created: 31/07/2014 thatchc
Coordinate System: GDA 1994 MGA Zone 56
A4 Scale: 1:7,650
File Name: GLAD_AugmentationPlan_A10

GLADSTONE

N
0 250 500 m

Gladstone Gravity Sewer Scheme - Augmentation Plan

GLADSTONE REGIONAL COUNCIL

A10

322000 322500 323000 323500 324000 324500

7356000 7355500 7355000 7354500

T07 SRM_T_002 SGM_T_001 SPS_T_003 VICTORIA AVENUE SGM_T_002 T09 GLENLYON ROAD T08 POLICE CREEK KIRKWOOD DRIVE KIRKWOOD ROAD

- 3 x 2 km Map Grid
- Cadastral Boundaries
- Water Ways

EXISTING INFRASTRUCTURE
- Existing Sewer Pump Stations
- Existing Rising Mains
- Existing Sewer Mains

Existing Sewer Catchment Areas
- S
- T

AUGMENTATIONS AND UPGRADES

Proposed Pump Station Upgrades
- 2014
- Ultimate

Proposed Gravity Sewer Augmentations
- 2021
- Ultimate

Proposed Rising Mains
- Ultimate

Proposed Emergency Storage Upgrades
- 2014

MAP IDENTIFIER

A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12

MWH

GLADSTONE REGIONAL COUNCIL

SEWER INFRASTRUCTURE PLAN

Map Created: 31/07/2014 thatchc
Coordinate System: GDA 1994 MGA Zone 56
A4 Scale: 1:7,650
File Name: GLAD_AugmentationPlan_A11

GLADSTONE

0 250 500 m

Gladstone Gravity Sewer Scheme - Augmentation Plan

GLADSTONE REGIONAL COUNCIL A11

325000 325500 326000 326500 327000 327500

7356000 7355500 7355000 7354500

SPS_T_001
SPS_T_004
SES_T_001
T01
SRM_T_003
SOUTH TREES DRIVE
SOUTH TREES TREATMENT PLANT

MAP IDENTIFIER
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12

PORT CURTIS
SOUTH TREES INLET
GLADSTONE BENARABY ROAD

3 x 2 km Map Grid
Cadastral Boundaries
Water Ways
EXISTING INFRASTRUCTURE
Existing Sewer Pump Stations
Treatment Plants
Existing Rising Mains
Existing Sewer Mains
Existing Sewer Catchment Areas
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AUGMENTATIONS AND UPGRADES
Proposed Pump Station Upgrades
2014
Ultimate
Proposed Rising Mains
Ultimate
Proposed Emergency Storage Upgrades
2014

MWH

GLADSTONE REGIONAL COUNCIL

SEWER INFRASTRUCTURE PLAN

Map Created: 31/07/2014 thatchc
Coordinate System: GDA 1994 MGA Zone 56
A4 Scale: 1:7,650
File Name: GLAD_AugmentationPlan_A12

GLADSTONE

0 250 500 m

Gladstone Gravity Sewer Scheme - Augmentation Plan

GLADSTONE REGIONAL COUNCIL

A12

Appendix B Cost Estimates

SPS Upgrades

Upgrade ID	Pump Station ID	Planning Horizon	Sewerage Scheme	Sewerage Catchment	Upgrade Type	Duty Flow (L/s)	Duty Head (m)	Power (kW)	Address	Commentary	ET Trigger and Commentary	Item Cost Estimate ($)	Contingency ($)	Cost Estimate including contingency (%)
SPS_A_001	SPS_A01	2014	Gladstone	A - Catchment	Trunk	638	90	803	Lord Street	Upgrade to pump station SPS_A01	10715	$ 8,477,378	0%	$ 8,477,377.90
SPS_A_003	SPS_A05	Ultimate	Gladstone	A - Catchment	Trunk	60	39	33	Agnes Street	Upgrade to pump station SPS_A05	1784	$ 365,190	0%	$ 365,190.00
SPS_A_004	SPS_A06	2014	Gladstone	A - Catchment	Trunk	132	21	39	Friends Street	Upgrade to pump station SPS_A06	3081	$ 365,190	0%	$ 365,190.00
SPS_A_005	SPS_A10	2014	Gladstone	A - Catchment	Trunk	83	29	33	Palm Drive	Upgrade to pump station SPS_A10	1673	$ 365,190	0%	$ 365,190.00
SPS_A_006	SPS_A13	2014	Gladstone	A - Catchment	Trunk	5	7	0.5	Young Street	Upgrade to pump station SPS_A13	129	$ 100,000	0%	$ 100,000.00
SPS_A_007	SPS_A17	2014	Gladstone	A - Catchment	Trunk	9	9	1	Morgan Street	Upgrade to pump station SPS_A17	206	$ 100,000	0%	$ 100,000.00
SPS_A_008	SPS_A26	Ultimate	Gladstone	A - Catchment	Trunk	4	8	0.4	Hillard Street	Upgrade to pump station SPS_A26	114	$ 100,000	0%	$ 100,000.00
SPS_A_009	SPS_A28	2014	Gladstone	A - Catchment	Trunk	13	2	0.4	Chapple Street (North)	Upgrade to pump station SPS_A28	321	$ 100,000	0%	$ 100,000.00
SPS_A_010	SPS_A34	2014	Gladstone	A - Catchment	Trunk	5	26	2	Marina (Terminal Building)	Upgrade to pump station SPS_A34	156	$ 100,000	0%	$ 100,000.00
SPS_A_011	SPS_A41	2014	Gladstone	A - Catchment	Trunk	5	24	2	Clinton coal facility	Upgrade to pump station SPS_A41	156	$ 100,000	0%	$ 100,000.00
SPS_S_001	SPS_C03	2014	Gladstone	S - Catchment	Trunk	11	10	2	Neil Street	Upgrade to pump station SPS_C03	337	$ 100,000	0%	$ 100,000.00
SPS_D_001	SPS_D01	Ultimate	Gladstone	D - Catchment	Trunk	116	24	39	Garfield Street	Upgrade to pump station SPS_D01	3438	$ 365,190	0%	$ 365,190.00
SPS_A_012	SPS_P01	2031	Gladstone	A - Catchment	Trunk	94	69	90	Beckinsale Street	Upgrade to pump station SPS_P01	2725	$ 892,440	0%	$ 892,440.00
SPS_S_002	SPS_S01	2014	Gladstone	S - Catchment	Trunk	603	30	257	Cemetery Road	Upgrade to pump station SPS_S01	10046	$ 1,721,610	0%	$ 1,721,610.00
SPS_S_003	SPS_S06	2026	Gladstone	S - Catchment	Trunk	26	5	2	Parksville Estate (Emerdale)	Upgrade to pump station SPS_S06	371	$ 100,000	0%	$ 100,000.00
SPS_S_004	SPS_S07	2014	Gladstone	S - Catchment	Trunk	19	37	10	Parsloe Street	Upgrade to pump station SPS_S07	389	$ 172,050	0%	$ 172,050.00
SPS_T_004	SPS_T01	2014	South Tree	T - Catchment	Trunk	7	21	2	Boys Road	Upgrade to pump station SPS_T01	1331	$ 100,000	0%	$ 100,000.00
SPS_T_005	SPS_T02	2016	South Tree	T - Catchment	Trunk	60	51	43	Glen Eden	Upgrade to pump station SPS_T02	1072	$ 434,010	0%	$ 434,010.00
SPS_T_006	SPS_T05	2014	South Tree	T - Catchment	Trunk	11	15	2	Cavella Drive, Glen Eden	Upgrade to pump station SPS_T05	271	$ 113,220	0%	$ 113,220.00
SPS_T_001	SPS_TF01	Ultimate	South Tree	T - Catchment	Trunk	91	4	6	Near Giles Street	Upgrade to pump station SPS_TF01	2819	$ 148,740	0%	$ 148,740.00
SPS_T_002	SPS_TF02	Ultimate	South Tree	T - Catchment	Trunk	3	49	2.00	Gladstone Benaraby Road	Upgrade to pump station SPS_TF02	78	$ 113,220	0%	$ 113,220.00
SPS_T_003	SPS_TF03	Ultimate	South Tree	T - Catchment	Trunk	4	18	2.00	Bailiff Road	Upgrade to pump station SPS_TF03	124	$ 113,220	0%	$ 113,220.00

Emergency Storage Upgrades

Upgrade ID	Pump Station ID	Planning Horizon	Sewerage Scheme	Sewerage Catchment	Upgrade Type	Required Storage Volume (m3)	Address	Commentary	ET Trigger and Commentary	Item Cost Estimate ($)	Contingency (%)	Cost Estimate including contingency (%)
SES_A_001	SPS_A01	2014	Gladstone	A - Catchment	Trunk	962	Lord Street	Emergency Storage Upgrade for SPS_A01	3695	$ 308,580	0%	$308,580
SES_A_002	SPS_A02	2026	Gladstone	A - Catchment	Trunk	67	Strokarck Street	Emergency Storage Upgrade for SPS_A02	1043	$ 66,600	0%	$66,600
SES_A_003	SPS_A05	2014	Gladstone	A - Catchment	Trunk	117	Agnes Street	Emergency Storage Upgrade for SPS_A05	1360	$ 105,450	0%	$105,450
SES_A_004	SPS_A06	2014	Gladstone	A - Catchment	Trunk	203	Friend Street	Emergency Storage Upgrade for SPS_A06	1116	$ 105,450	0%	$105,450
SES_A_005	SPS_A10	2014	Gladstone	A - Catchment	Trunk	184	Palm Drive	Emergency Storage Upgrade for SPS_A10	1673	$ 105,450	0%	$105,450
SES_A_006	SPS_A17	2014	Gladstone	A - Catchment	Trunk	5	Morgan Street	Emergency Storage Upgrade for SPS_A17	21	$ 23,310	0%	$23,310
SES_A_007	SPS_A18	2014	Gladstone	A - Catchment	Trunk	12	Soppa Street	Emergency Storage Upgrade for SPS_A18	268	$ 23,310	0%	$23,310
SES_A_008	SPS_A41	2014	Gladstone	A - Catchment	Trunk	2	Clinton coal facility	Emergency Storage Upgrade for SPS_A41	156	$ 23,310	0%	$23,310
SES_A_009	SPS_P01	2031	Gladstone	A - Catchment	Trunk	25	Beckinsale Street	Emergency Storage Upgrade for SPS_P01	2265	$ 42,180	0%	$42,180
SES_S_001	SPS_C02	2014	Gladstone	S - Catchment	Trunk	72	Aerodrome Road	Emergency Storage Upgrade for SPS_C02	661	$ 66,600	0%	$66,600
SES_S_002	SPS_S01	2014	Gladstone	S - Catchment	Trunk	1101	Cemetery Road	Emergency Storage Upgrade for SPS_S01	7309	$ 358,530	0%	$358,530
SES_S_003	SPS_S06	2031	Gladstone	S - Catchment	Trunk	36	Parksville Estate (Emerdale)	Emergency Storage Upgrade for SPS_S06	593	$ 42,180	0%	$42,180
SES_S_004	SPS_S07	Ultimate	Gladstone	S - Catchment	Trunk	1	Parsloe Street	Emergency Storage Upgrade for SPS_S07	566	$ 23,310	0%	$23,310
SES_T_001	SPS_T01	2014	South Trees	T - Catchment	Trunk	25	Boys Road	Emergency Storage Upgrade for SPS_T01	147	$ 42,180	0%	$42,180
SES_T_002	SPS_T02	2014	South Trees	T - Catchment	Trunk	122	Glen Eden	Emergency Storage Upgrade for SPS_T02	880	$ 105,450	0%	$105,450
SES_T_003	SPS_T05	2014	South Trees	T - Catchment	Trunk	19	Cavella Drive, Glen Eden	Emergency Storage Upgrade for SPS_T05	271	$ 23,310	0%	$23,310

Augmentation ID	Pipe ID	Planning Horizon	Sewerage Scheme	Sewerage Catchment	Upgrade Type	Diameter (mm)	Length (m)	Address	Commentary	ET Trigger and Commentary	Geology	Landuse (Rural/Urban)	Unit Rate ($/m)	Item Cost Estimate ($)	Contingency	Cost Estimate including contingency (%)
SRM_A_001	a	2014	Gladstone	A - Catchment	Trunk	375	3400	Friend St.	A06 to A01 diversion	3903	Clay	Urban	721.5	$ 2,453,100	0%	$ 2,453,100
SRM_A_002	a	Ultimate	Gladstone	A - Catchment	Trunk	100	2389	Marina (trawler area)	Rising main augmentation from SPS A37 to the Gladstone STP	156	Clay	Greenfield	165.39	$ 395,151	0%	$ 395,151
SRM_T_003	a	Ultimate	South Tree	T - Catchment	Trunk	450	1602	Near Giles St.	Rising main augmentation from TF01 to the South Tree STP	2819	Clay	Greenfield	874.68	$ 1,401,478	0%	$ 1,401,478
SRM_T_001	a	Ultimate	South Tree	T - Catchment	Trunk	150	787	Gladstone Benaraby Road	Upgrade to rising main from TF02	76	Clay	Greenfield	248.64	$ 195,582	0%	$ 195,582
SRM_T_001	b	Ultimate	South Tree	T - Catchment	Trunk	150	232	Gladstone Benaraby Road	Upgrade to rising main from TF02	76	Clay	Greenfield	248.64	$ 57,737	0%	$ 57,737
SRM_T_002	a	Ultimate	South Tree	T - Catchment	Trunk	150	810	Bailiff Road	Upgrade to rising main from TF03	147	Clay	Greenfield	248.64	$ 201,398	0%	$ 201,398

Gravity Sewer Augmentations

Augmentation ID	Pipe ID	Upstream Manhole ID	Downstream Manhole ID	Planning Horizon	Sewerage Scheme	Sewerage Catchment	Upgrade Type	Diameter (mm)	Length (m)	Address	Commentary	Geology	Landuse (Rural/Urban)	Unit Rate ($/m)	Item Cost Estimate ($)	Contingency	Cost Estimate including contingency (%)
SGM_A_002	a	MH_00228	44489	2031	Gladstone	A - Catchment	Trunk	225	37	Corner of Hanson Road/Yarroon Street	Augmentation required to resolve flooding and surcharging in Corner of Hanson Road/Yarroon Street	Clay	Urban	446.22	$ 16,505	0%	$ 16,505
SGM_A_002	b	F_MAL_N1	MH_00228	2031	Gladstone	A - Catchment	Reticulation	150	42	Corner of Hanson Road/Yarroon Street	Augmentation required to resolve flooding and surcharging in Corner of Hanson Road/Yarroon Street	Clay	Urban	326.34	$ 13,795	0%	$ 13,795
SGM_A_002	c	40398	F_MAL_N1	2031	Gladstone	A - Catchment	Reticulation	150	22	Corner of Hanson Road/Yarroon Street	Augmentation required to resolve flooding and surcharging in Corner of Hanson Road/Yarroon Street	Clay	Urban	326.34	$ 7,074	0%	$ 7,074
SGM_A_002	d	40399	40398	2031	Gladstone	A - Catchment	Reticulation	150	35	Corner of Hanson Road/Yarroon Street	Augmentation required to resolve flooding and surcharging in Corner of Hanson Road/Yarroon Street	Clay	Urban	326.34	$ 11,541	0%	$ 11,541
SGM_A_003	a	44460	40113	Ultimate	Gladstone	A - Catchment	Trunk	225	82	Wood Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Wood Street	Clay	Urban	446.22	$ 36,386	0%	$ 36,386
SGM_A_003	b	44461	44460	Ultimate	Gladstone	A - Catchment	Trunk	225	74	Wood Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Wood Street	Clay	Urban	446.22	$ 32,929	0%	$ 32,929
SGM_A_003	c	38116	44461	Ultimate	Gladstone	A - Catchment	Trunk	225	49	Wood Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Wood Street	Clay	Urban	446.22	$ 21,746	0%	$ 21,746
SGM_A_003	d	38117	38116	Ultimate	Gladstone	A - Catchment	Trunk	225	71	Wood Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Wood Street	Clay	Urban	446.22	$ 31,870	0%	$ 31,870
SGM_A_003	e	44644	44643	Ultimate	Gladstone	A - Catchment	Trunk	225	56	Friend Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Friend Street	Clay	Urban	446.22	$ 25,055	0%	$ 25,055
SGM_A_003	f	44643	39374	Ultimate	Gladstone	A - Catchment	Trunk	225	10	Friend Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Friend Street	Clay	Urban	446.22	$ 4,258	0%	$ 4,258
SGM_A_003	g	39374	44219	Ultimate	Gladstone	A - Catchment	Trunk	225	5	Friend Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Friend Street	Clay	Urban	446.22	$ 2,187	0%	$ 2,187
SGM_A_003	h	44219	SPS_A06	Ultimate	Gladstone	A - Catchment	Trunk	375	6	Friend Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Friend Street	Clay	Urban	714.84	$ 4,394	0%	$ 4,394
SGM_A_003	i	44641	44644	Ultimate	Gladstone	A - Catchment	Trunk	225	38	Friend Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Friend Street	Clay	Urban	446.22	$ 17,046	0%	$ 17,046
SGM_A_003	j	44642	44641	Ultimate	Gladstone	A - Catchment	Trunk	225	50	Friend Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Friend Street	Clay	Urban	446.22	$ 22,335	0%	$ 22,335
SGM_A_003	k	40113	44642	Ultimate	Gladstone	A - Catchment	Trunk	225	57	Friend Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Friend Street	Clay	Urban	446.22	$ 25,368	0%	$ 25,368
SGM_A_004	a	MH_P01_1	SPS_P01	Ultimate	Gladstone	A - Catchment	Trunk	450	322	Beckinsale Street	Augmentation required to resolve flooding and surcharging in Beckinsale Street	Clay	Urban	858.03	$ 276,582	0%	$ 276,582
SGM_A_006	b	43033	43126	Ultimate	Gladstone	A - Catchment	Trunk	600	45	Side Street to Ellen Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Side Street to Ellen Street	Clay	Urban	1208.79	$ 54,935	0%	$ 54,935
SGM_A_006	c	42195	43033	Ultimate	Gladstone	A - Catchment	Trunk	600	57	Side Street to Ellen Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Side Street to Ellen Street	Clay	Urban	1208.79	$ 68,330	0%	$ 68,330
SGM_A_006	d	37613	42195	Ultimate	Gladstone	A - Catchment	Trunk	600	82	Side Street to Ellen Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Side Street to Ellen Street	Clay	Urban	1208.79	$ 98,939	0%	$ 98,939
SGM_A_006	e	37612	37613	Ultimate	Gladstone	A - Catchment	Trunk	300	36	Side Street to Ellen Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Side Street to Ellen Street	Clay	Urban	592.74	$ 21,550	0%	$ 21,550
SGM_A_006	f	37614	37612	Ultimate	Gladstone	A - Catchment	Trunk	300	50	Side Street to Ellen Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Side Street to Ellen Street	Clay	Urban	592.74	$ 29,819	0%	$ 29,819
SGM_A_006	g	39723	37614	Ultimate	Gladstone	A - Catchment	Trunk	300	94	Side Street to Ellen Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Side Street to Ellen Street	Clay	Urban	592.74	$ 55,504	0%	$ 55,504
SGM_A_012	a	40198	40191	2021	Gladstone	A - Catchment	Trunk	225	23	Hughes Street/Gladstone Benaraby Road	Augmentation required to resolve flooding and surcharging in Hughes Street/Gladstone Benaraby Road	Clay	Urban	446.22	$ 10,048	0%	$ 10,048
SGM_A_012	b	40197	40198	2021	Gladstone	A - Catchment	Trunk	225	73	Hughes Street/Gladstone Benaraby Road	Augmentation required to resolve flooding and surcharging in Hughes Street/Gladstone Benaraby Road	Clay	Urban	446.22	$ 32,643	0%	$ 32,643
SGM_A_013	a	41487	41582	Ultimate	Gladstone	A - Catchment	Trunk	225	36	Larsen Street/Barry Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Larsen Street/Barry Street	Clay	Urban	446.22	$ 16,116	0%	$ 16,116

Gravity Sewer Augmentations

Augmentation ID	Pipe ID	Upstream Manhole ID	Downstream Manhole ID	Planning Horizon	Sewerage Scheme	Sewerage Catchment	Upgrade Type	Diameter (mm)	Length (m)	Address	Commentary	Geology	Landuse (Rural/Urban)	Unit Rate ($/m)	Item Cost Estimate ($)	Contingency	Cost Estimate including contingency (%)
SGM_A_014	a	42300	42298	2026	Gladstone	A - Catchment	Trunk	450	37	Mylne Street	Augmentation required to resolve flooding and surcharging in Mylne Street	Clay	Urban	858.03	$ 31,952	0%	$ 31,952
SGM_A_014	b	42297	42300	2026	Gladstone	A - Catchment	Trunk	300	79	Mylne Street	Augmentation required to resolve flooding and surcharging in Mylne Street	Clay	Urban	592.74	$ 46,664	0%	$ 46,664
SGM_A_014	c	42299	42297	2026	Gladstone	A - Catchment	Trunk	300	39	Mylne Street	Augmentation required to resolve flooding and surcharging in Mylne Street	Clay	Urban	592.74	$ 23,115	0%	$ 23,115
SGM_A_015	a	44097	44099	2031	Gladstone	A - Catchment	Trunk	375	37	Palm Drive	Augmentation required to resolve flooding and surcharging in Palm Drive	Clay	Urban	714.84	$ 26,288	0%	$ 26,288
SGM_A_015	b	44099	44815	2031	Gladstone	A - Catchment	Trunk	375	46	Palm Drive	Augmentation required to resolve flooding and surcharging in Palm Drive	Clay	Urban	714.84	$ 32,640	0%	$ 32,640
SGM_D_001	a	38427	38429	Ultimate	Gladstone	D - Catchment	Trunk	225	49	Bensted Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Bensted Street	Clay	Urban	446.22	$ 21,860	0%	$ 21,860
SGM_D_001	b	38425	38427	Ultimate	Gladstone	D - Catchment	Trunk	225	91	Bensted Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Bensted Street	Clay	Urban	446.22	$ 40,686	0%	$ 40,686
SGM_D_001	c	38424	38425	Ultimate	Gladstone	D - Catchment	Trunk	225	49	Bensted Street	Augmentation required to resolve flooding and surcharging in Bensted Street	Clay	Urban	446.22	$ 21,699	0%	$ 21,699
SGM_D_001	d	38423	38424	Ultimate	Gladstone	D - Catchment	Trunk	225	84	Bensted Street	Augmentation required to resolve flooding and surcharging in Bensted Street	Clay	Urban	446.22	$ 37,604	0%	$ 37,604
SGM_D_001	e	38429	38430	Ultimate	Gladstone	D - Catchment	Trunk	225	29	Bensted Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Bensted Street	Clay	Urban	446.22	$ 12,775	0%	$ 12,775
SGM_D_001	f	38430	38333	Ultimate	Gladstone	D - Catchment	Trunk	300	37	Bensted Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Bensted Street	Clay	Urban	592.74	$ 22,009	0%	$ 22,009
SGM_D_001	g	38333	38334	Ultimate	Gladstone	D - Catchment	Trunk	450	34	Bensted Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Bensted Street	Clay	Urban	858.03	$ 29,157	0%	$ 29,157
SGM_D_001	h	38334	38335	Ultimate	Gladstone	D - Catchment	Trunk	450	78	Bensted Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Bensted Street	Clay	Urban	858.03	$ 66,776	0%	$ 66,776
SGM_D_002	a	38326	38327	Ultimate	Gladstone	D - Catchment	Trunk	225	73	Bensted Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Bensted Street	Clay	Urban	446.22	$ 32,421	0%	$ 32,421
SGM_D_002	b	38327	38329	Ultimate	Gladstone	D - Catchment	Trunk	225	55	Bensted Street	Augmentation required to resolve flooding and surcharging in Bensted Street	Clay	Urban	446.22	$ 24,460	0%	$ 24,460
SGM_D_002	c	38329	38330	Ultimate	Gladstone	D - Catchment	Trunk	225	83	Bensted Street	Augmentation required to resolve flooding and surcharging in Bensted Street	Clay	Urban	446.22	$ 37,082	0%	$ 37,082
SGM_D_003	a	42867	42865	2016	Gladstone	D - Catchment	Trunk	300	65	Near Red Rover Road/Bensted Street	Augmentation required to resolve flooding and surcharging in Near Red Rover Road/Bensted Street	Clay	Urban	592.74	$ 38,453	0%	$ 38,453
SGM_D_003	b	42865	42863	2016	Gladstone	D - Catchment	Trunk	225	67	Near Red Rover Road/Bensted Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Near Red Rover Road/Bensted Street	Clay	Urban	446.22	$ 29,983	0%	$ 29,983
SGM_D_003	c	42863	42862	2016	Gladstone	D - Catchment	Trunk	225	32	Near Red Rover Road/Bensted Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Near Red Rover Road/Bensted Street	Clay	Urban	446.22	$ 14,132	0%	$ 14,132
SGM_D_003	d	42862	42866	2016	Gladstone	D - Catchment	Trunk	225	38	Near Red Rover Road/Bensted Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Near Red Rover Road/Bensted Street	Clay	Urban	446.22	$ 16,738	0%	$ 16,738
SGM_D_003	e	42866	42864	2016	Gladstone	D - Catchment	Trunk	300	66	Near Red Rover Road/Bensted Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Near Red Rover Road/Bensted Street	Clay	Urban	592.74	$ 38,862	0%	$ 38,862
SGM_D_003	f	42864	42956	2016	Gladstone	D - Catchment	Trunk	300	58	Near Red Rover Road/Bensted Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Near Red Rover Road/Bensted Street	Clay	Urban	592.74	$ 34,396	0%	$ 34,396
SGM_S_001	a	44982	40503	Ultimate	Gladstone	S - Catchment	Trunk	450	448	Toonee Park, Sun Valley Road	Augmentation required to resolve flooding and surcharging in Toonee Park, Sun Valley Road	Clay	Greenfield	750.36	$ 336,107	0%	$ 336,107
SGM_S_001	b	44590	44589	Ultimate	Gladstone	S - Catchment	Trunk	600	67	Near Police Creek	Augmentation required to resolve flooding and surcharging in Near Police Creek	Clay	Urban	1208.79	$ 81,121	0%	$ 81,121
SGM_S_001	c	44705	44590	Ultimate	Gladstone	S - Catchment	Trunk	450	107	Near Police Creek	Augmentation required to resolve flooding and surcharging in Near Police Creek	Clay	Urban	858.03	$ 91,422	0%	$ 91,422
SGM_S_001	d	44696	44705	Ultimate	Gladstone	S - Catchment	Trunk	450	15	Lions Park, Near Dawson Highway	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Lions Park, Near Dawson Highway	Clay	Greenfield	750.36	$ 11,413	0%	$ 11,413
SGM_S_001	e	44707	44696	Ultimate	Gladstone	S - Catchment	Trunk	450	102	Lions Park, Near Dawson Highway	Augmentation required to resolve flooding and surcharging in Lions Park, Near Dawson Highway	Clay	Greenfield	750.36	$ 76,227	0%	$ 76,227

Gravity Sewer Augmentations

Augmentation ID	Pipe ID	Upstream Manhole ID	Downstream Manhole ID	Planning Horizon	Sewerage Scheme	Sewerage Catchment	Upgrade Type	Diameter (mm)	Length (m)	Address	Commentary	Geology	Landuse (Rural/Urban)	Unit Rate ($/m)	Item Cost Estimate ($)	Contingency	Cost Estimate including contingency (%)
SGM_S_001	f	40892	44707	Ultimate	Gladstone	S - Catchment	Trunk	450	109	Lions Park, Near Dawson Highway	Augmentation required to resolve flooding and surcharging in Lions Park, Near Dawson Highway	Clay	Greenfield	750.36	$ 81,646	0%	$ 81,646
SGM_S_001	g	44706	40892	Ultimate	Gladstone	S - Catchment	Trunk	450	4	Lions Park, Near Dawson Highway	Augmentation required to resolve flooding and surcharging in Lions Park, Near Dawson Highway	Clay	Greenfield	750.36	$ 3,197	0%	$ 3,197
SGM_S_001	h	44764	44706	Ultimate	Gladstone	S - Catchment	Trunk	450	21	Lions Park, Near Dawson Highway	Augmentation required to resolve flooding and surcharging in Lions Park, Near Dawson Highway	Clay	Greenfield	750.36	$ 15,794	0%	$ 15,794
SGM_S_001	i	44855	44764	Ultimate	Gladstone	S - Catchment	Trunk	450	135	Toonee Park, Sun Valley Road	Augmentation required to resolve flooding and surcharging in Toonee Park, Sun Valley Road	Clay	Greenfield	750.36	$ 101,341	0%	$ 101,341
SGM_S_001	j	44762	44855	Ultimate	Gladstone	S - Catchment	Trunk	450	70	Toonee Park, Sun Valley Road	Augmentation required to resolve flooding and surcharging in Toonee Park, Sun Valley Road	Clay	Greenfield	750.36	$ 52,801	0%	$ 52,801
SGM_S_001	k	44763	44762	Ultimate	Gladstone	S - Catchment	Trunk	450	111	Toonee Park, Sun Valley Road	Augmentation required to resolve flooding and surcharging in Toonee Park, Sun Valley Road	Clay	Greenfield	750.36	$ 83,022	0%	$ 83,022
SGM_S_001	l	43588	44763	Ultimate	Gladstone	S - Catchment	Trunk	450	68	Toonee Park, Sun Valley Road	Augmentation required to resolve flooding and surcharging in Toonee Park, Sun Valley Road	Clay	Greenfield	750.36	$ 51,390	0%	$ 51,390
SGM_S_001	m	40839	43588	Ultimate	Gladstone	S - Catchment	Trunk	450	33	Toonee Park, Sun Valley Road	Augmentation required to resolve flooding and surcharging in Toonee Park, Sun Valley Road	Clay	Greenfield	750.36	$ 24,710	0%	$ 24,710
SGM_S_001	n	38914	40839	Ultimate	Gladstone	S - Catchment	Trunk	450	45	Toonee Park, Sun Valley Road	Augmentation required to resolve flooding and surcharging in Toonee Park, Sun Valley Road	Clay	Greenfield	750.36	$ 34,133	0%	$ 34,133
SGM_S_001	o	38913	38914	Ultimate	Gladstone	S - Catchment	Trunk	450	50	Toonee Park, Sun Valley Road	Augmentation required to resolve flooding and surcharging in Toonee Park, Sun Valley Road	Clay	Greenfield	750.36	$ 37,297	0%	$ 37,297
SGM_S_001	p	43591	38913	Ultimate	Gladstone	S - Catchment	Trunk	450	78	Toonee Park, Sun Valley Road	Augmentation required to resolve flooding and surcharging in Toonee Park, Sun Valley Road	Clay	Greenfield	750.36	$ 58,515	0%	$ 58,515
SGM_S_001	q	40503	43591	Ultimate	Gladstone	S - Catchment	Trunk	450	80	Toonee Park, Sun Valley Road	Augmentation required to resolve flooding and surcharging in Toonee Park, Sun Valley Road	Clay	Greenfield	750.36	$ 59,714	0%	$ 59,714
SGM_S_001	r	124048	124047	Ultimate	Gladstone	S - Catchment	Trunk	300	128	Near Jooloo Court/Links Court	Augmentation required to resolve flooding and surcharging in Near Jooloo Court/Links Court	Clay	Urban	592.74	$ 75,711	0%	$ 75,711
SGM_S_001	s	124050	124049	Ultimate	Gladstone	S - Catchment	Trunk	300	45	Near Jooloo Court/Links Court	Augmentation required to resolve flooding and surcharging in Near Jooloo Court/Links Court	Clay	Greenfield	503.94	$ 22,867	0%	$ 22,867
SGM_S_001	t	124047	124046	Ultimate	Gladstone	S - Catchment	Trunk	300	128	Near Jooloo Court/Links Court	Augmentation required to resolve flooding and surcharging in Near Jooloo Court/Links Court	Clay	Urban	592.74	$ 76,144	0%	$ 76,144
SGM_S_001	u	124049	124048	Ultimate	Gladstone	S - Catchment	Trunk	300	45	Near Jooloo Court/Links Court	Augmentation required to resolve flooding and surcharging in Near Jooloo Court/Links Court	Clay	Greenfield	503.94	$ 22,530	0%	$ 22,530
SGM_S_001	v	124046	124045	Ultimate	Gladstone	S - Catchment	Trunk	300	41	Near Jooloo Court/Links Court	Augmentation required to resolve flooding and surcharging in Near Jooloo Court/Links Court	Clay	Urban	592.74	$ 24,584	0%	$ 24,584
SGM_S_001	w	124045	43593	Ultimate	Gladstone	S - Catchment	Trunk	450	4	Near Jooloo Court/Links Court	Augmentation required to resolve flooding and surcharging in Near Jooloo Court/Links Court	Clay	Urban	858.03	$ 3,513	0%	$ 3,513
SGM_S_001	x	43593	44944	Ultimate	Gladstone	S - Catchment	Trunk	450	70	Toonee Park, Sun Valley Road	Augmentation required to resolve flooding and surcharging in Toonee Park, Sun Valley Road	Clay	Greenfield	750.36	$ 52,244	0%	$ 52,244
SGM_S_001	y	44944	44993	Ultimate	Gladstone	S - Catchment	Trunk	450	84	Toonee Park, Sun Valley Road	Augmentation required to resolve flooding and surcharging in Toonee Park, Sun Valley Road	Clay	Greenfield	750.36	$ 63,129	0%	$ 63,129
SGM_S_001	z	44993	44982	Ultimate	Gladstone	S - Catchment	Trunk	450	97	Toonee Park, Sun Valley Road	Augmentation required to resolve flooding and surcharging in Toonee Park, Sun Valley Road	Clay	Greenfield	750.36	$ 72,857	0%	$ 72,857
SGM_S_002	a	44704	44990	Ultimate	Gladstone	S - Catchment	Trunk	225	85	Dawson Highway	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Dawson Highway	Clay	Urban	446.22	$ 37,927	0%	$ 37,927
SGM_S_002	b	44989	44990	Ultimate	Gladstone	S - Catchment	Trunk	225	94	Corner of Dawson Highway/Philip Street	Augmentation required to resolve flooding and surcharging in Corner of Dawson Highway/Philip Street	Clay	Urban	446.22	$ 41,893	0%	$ 41,893

Gravity Sewer Augmentations

Augmentation ID	Pipe ID	Upstream Manhole ID	Downstream Manhole ID	Planning Horizon	Sewerage Scheme	Sewerage Catchment	Upgrade Type	Diameter (mm)	Length (m)	Address	Commentary	Geology	Landuse (Rural/Urban)	Unit Rate ($/m)	Item Cost Estimate ($)	Contingency	Cost Estimate including contingency (%)
SGM_S_002	c	44991	44989	Ultimate	Gladstone	S - Catchment	Trunk	225	57	Corner of Dawson Highway/Philip Street	Augmentation required to resolve flooding and surcharging in Corner of Dawson Highway/Philip Street	Clay	Urban	446.22	$ 25,249	0%	$ 25,249
SGM_S_002	d	44990	44693	Ultimate	Gladstone	S - Catchment	Trunk	225	92	Dawson Highway	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Dawson Highway	Clay	Urban	446.22	$ 40,946	0%	$ 40,946
SGM_S_002	e	44693	44703	Ultimate	Gladstone	S - Catchment	Trunk	225	57	Dawson Highway	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Dawson Highway	Clay	Urban	446.22	$ 25,443	0%	$ 25,443
SGM_S_002	f	44703	44911	Ultimate	Gladstone	S - Catchment	Trunk	225	78	Dawson Highway	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Dawson Highway	Clay	Urban	446.22	$ 34,986	0%	$ 34,986
SGM_S_002	g	44911	44714	Ultimate	Gladstone	S - Catchment	Trunk	600	59	Dawson Highway	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Dawson Highway	Clay	Urban	1208.79	$ 71,891	0%	$ 71,891
SGM_S_002	h	44714	44713	Ultimate	Gladstone	S - Catchment	Trunk	600	91	Dawson Highway	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Dawson Highway	Clay	Urban	1208.79	$ 110,512	0%	$ 110,512
SGM_S_002	i	44713	44706	Ultimate	Gladstone	S - Catchment	Trunk	600	53	Dawson Highway	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Dawson Highway	Clay	Urban	1208.79	$ 64,197	0%	$ 64,197
SGM_S_003	a	44168	44171	2026	Gladstone	S - Catchment	Trunk	300	9	Near Wicks Street/Shaw Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Near Wicks Street/Shaw Street	Clay	Urban	592.74	$ 5,621	0%	$ 5,621
SGM_S_003	b	44171	44170	2026	Gladstone	S - Catchment	Trunk	300	10	Near Wicks Street/Shaw Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Near Wicks Street/Shaw Street	Clay	Urban	592.74	$ 5,642	0%	$ 5,642
SGM_S_004	a	39834	39833	2031	Gladstone	S - Catchment	Trunk	300	38	Emmadale Drive	Augmentation required to resolve flooding and surcharging in Emmadale Drive	Clay	Urban	592.74	$ 22,759	0%	$ 22,759
SGM_S_004	b	39067	39074	2031	Gladstone	S - Catchment	Trunk	300	48	Clarance Drive	Augmentation required to resolve flooding and surcharging in Clarance Drive	Clay	Urban	592.74	$ 28,339	0%	$ 28,339
SGM_S_004	c	39740	39834	2031	Gladstone	S - Catchment	Trunk	300	27	Emmadale Drive	Augmentation required to resolve flooding and surcharging in Emmadale Drive	Clay	Urban	592.74	$ 16,264	0%	$ 16,264
SGM_S_004	d	39074	39072	2031	Gladstone	S - Catchment	Trunk	300	52	Clarance Drive	Augmentation required to resolve flooding and surcharging in Clarance Drive	Clay	Urban	592.74	$ 30,741	0%	$ 30,741
SGM_S_004	e	39072	39071	2031	Gladstone	S - Catchment	Trunk	300	6	Clarance Drive	Augmentation required to resolve flooding and surcharging in Clarance Drive	Clay	Urban	592.74	$ 3,304	0%	$ 3,304
SGM_S_004	f	39833	39067	2031	Gladstone	S - Catchment	Trunk	300	29	Clarance Drive	Augmentation required to resolve flooding and surcharging in Clarance Drive	Clay	Urban	592.74	$ 17,463	0%	$ 17,463
SGM_S_004	g	44387	39740	2031	Gladstone	S - Catchment	Trunk	300	17	Emmadale Drive	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Emmadale Drive	Clay	Urban	592.74	$ 9,926	0%	$ 9,926
SGM_S_004	h	39832	44387	2031	Gladstone	S - Catchment	Trunk	300	26	Emmadale Drive	Augmentation required to resolve flooding and surcharging in Emmadale Drive	Clay	Urban	592.74	$ 15,702	0%	$ 15,702
SGM_S_004	i	39741	39832	2031	Gladstone	S - Catchment	Trunk	300	35	Emmadale Drive	Augmentation required to resolve flooding and surcharging in Emmadale Drive	Clay	Urban	592.74	$ 20,588	0%	$ 20,588
SGM_S_004	j	39835	39741	2031	Gladstone	S - Catchment	Trunk	300	55	Emmadale Drive	Augmentation required to resolve flooding and surcharging in Emmadale Drive	Clay	Urban	592.74	$ 32,650	0%	$ 32,650
SGM_S_004	k	42429	39835	2031	Gladstone	S - Catchment	Trunk	300	60	Emmadale Drive	Augmentation required to resolve flooding and surcharging in Emmadale Drive	Clay	Urban	592.74	$ 35,732	0%	$ 35,732
SGM_S_004	l	39836	38000	2031	Gladstone	S - Catchment	Trunk	300	34	Emmadale Drive	Augmentation required to resolve flooding and surcharging in Emmadale Drive	Clay	Urban	592.74	$ 20,258	0%	$ 20,258
SGM_S_004	m	38000	42429	2031	Gladstone	S - Catchment	Trunk	300	89	Emmadale Drive	Augmentation required to resolve flooding and surcharging in Emmadale Drive	Clay	Urban	592.74	$ 52,921	0%	$ 52,921
SGM_S_004	n	39749	39836	2031	Gladstone	S - Catchment	Trunk	300	51	Emmadale Drive	Augmentation required to resolve flooding and surcharging in Emmadale Drive	Clay	Urban	592.74	$ 30,468	0%	$ 30,468
SGM_S_004	o	39848	39751	2031	Gladstone	S - Catchment	Trunk	225	18	Near Emmadale Drive/Creekwood Cl	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Near Emmadale Drive/Creekwood Cl	Clay	Urban	446.22	$ 7,872	0%	$ 7,872
SGM_S_004	p	39751	39750	2031	Gladstone	S - Catchment	Trunk	225	43	Near Emmadale Drive/Creekwood Cl	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Near Emmadale Drive/Creekwood Cl	Clay	Urban	446.22	$ 19,252	0%	$ 19,252
SGM_S_004	q	39750	39749	2031	Gladstone	S - Catchment	Trunk	225	90	Near Emmadale Drive/Creekwood Cl	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Near Emmadale Drive/Creekwood Cl	Clay	Urban	446.22	$ 40,302	0%	$ 40,302
SGM_S_004	r	MH_00300	39749	2031	Gladstone	S - Catchment	Trunk	300	11	Emmadale Drive	Augmentation required to resolve flooding and surcharging in Emmadale Drive	Clay	Urban	592.74	$ 6,672	0%	$ 6,672
SGM_S_005	a	112640	112639	2031	Gladstone	S - Catchment	Trunk	225	32	Huntington Court	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Huntington Court	Clay	Urban	446.22	$ 14,068	0%	$ 14,068
SGM_S_005	b	112639	112588	2031	Gladstone	S - Catchment	Trunk	225	5	Huntington Court	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Huntington Court	Clay	Urban	446.22	$ 2,342	0%	$ 2,342

Gravity Sewer Augmentations

Augmentation ID	Pipe ID	Upstream Manhole ID	Downstream Manhole ID	Planning Horizon	Sewerage Scheme	Sewerage Catchment	Upgrade Type	Diameter (mm)	Length (m)	Address	Commentary	Geology	Landuse (Rural/Urban)	Unit Rate ($/m)	Item Cost Estimate ($)	Contingency	Cost Estimate including contingency (%)
SGM_S_005	c	112588	112587	2031	Gladstone	S - Catchment	Trunk	225	68	Huntington Court	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Huntington Court	Clay	Urban	446.22	$ 30,374	0%	$ 30,374
SGM_S_005	d	112587	112586	2031	Gladstone	S - Catchment	Trunk	225	69	Huntington Court	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Huntington Court	Clay	Urban	446.22	$ 30,806	0%	$ 30,806
SGM_S_005	e	112586	112585	2031	Gladstone	S - Catchment	Trunk	225	41	Huntington Court	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Huntington Court	Clay	Urban	446.22	$ 18,506	0%	$ 18,506
SGM_S_005	f	112585	40983	2031	Gladstone	S - Catchment	Trunk	225	51	Huntington Court	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Huntington Court	Clay	Urban	446.22	$ 22,612	0%	$ 22,612
SGM_S_005	g	40983	40984	2031	Gladstone	S - Catchment	Trunk	225	72	Huntington Court	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Huntington Court	Clay	Urban	446.22	$ 31,935	0%	$ 31,935
SGM_S_005	h	112589	112588	2031	Gladstone	S - Catchment	Trunk	225	41	Huntington Court	Augmentation required to resolve flooding and surcharging in Huntington Court	Clay	Urban	446.22	$ 18,278	0%	$ 18,278
SGM_S_005	i	40984	40985	2031	Gladstone	S - Catchment	Trunk	225	45	Huntington Court	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Huntington Court	Clay	Urban	446.22	$ 20,081	0%	$ 20,081
SGM_S_005	j	40985	40986	2031	Gladstone	S - Catchment	Trunk	300	81	Huntington Court	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Huntington Court	Clay	Urban	592.74	$ 48,284	0%	$ 48,284
SGM_S_005	k	112642	112641	2031	Gladstone	S - Catchment	Trunk	225	77	Liriope Drive	Augmentation required to resolve flooding and surcharging in Liriope Drive	Clay	Urban	446.22	$ 34,246	0%	$ 34,246
SGM_S_005	l	112641	112640	2031	Gladstone	S - Catchment	Trunk	225	21	Liriope Drive	Augmentation required to resolve flooding and surcharging in Liriope Drive	Clay	Urban	446.22	$ 9,329	0%	$ 9,329
SGM_S_005	m	10986	89847	2031	Gladstone	S - Catchment	Trunk	300	42	Huntington Court	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Huntington Court	Clay	Urban	592.74	$ 24,725	0%	$ 24,725
SGM_S_006	a	FMH_9904	112608	Ultimate	Gladstone	S - Catchment	Reticulation	150	78	Lavender Boulevard	Augmentation required to resolve flooding and surcharging in Lavender Boulevard	Clay	Urban	326.34	$ 25,548	0%	$ 25,548
SGM_S_006	b	112608	112607	Ultimate	Gladstone	S - Catchment	Reticulation	150	68	Lavender Boulevard	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Lavender Boulevard	Clay	Urban	326.34	$ 22,202	0%	$ 22,202
SGM_S_006	c	112607	112606	Ultimate	Gladstone	S - Catchment	Reticulation	150	47	Lavender Boulevard	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Lavender Boulevard	Clay	Urban	326.34	$ 15,334	0%	$ 15,334
SGM_S_006	d	112606	112596	Ultimate	Gladstone	S - Catchment	Reticulation	150	7	Lavender Boulevard	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Lavender Boulevard	Clay	Urban	326.34	$ 2,145	0%	$ 2,145
SGM_S_006	e	112596	112595	Ultimate	Gladstone	S - Catchment	Trunk	225	20	Lavender Boulevard	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Lavender Boulevard	Clay	Urban	446.22	$ 9,051	0%	$ 9,051
SGM_S_006	f	112595	112594	Ultimate	Gladstone	S - Catchment	Trunk	450	53	Lavender Boulevard	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Lavender Boulevard	Clay	Urban	858.03	$ 45,763	0%	$ 45,763
SGM_S_007	a	158825	158822	Ultimate	Gladstone	S - Catchment	Trunk	225	67	Koowin Drive	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Koowin Drive	Clay	Urban	446.22	$ 29,870	0%	$ 29,870
SGM_S_007	b	158822	158823	Ultimate	Gladstone	S - Catchment	Trunk	225	48	Koowin Drive	Augmentation required to resolve flooding and surcharging in Koowin Drive	Clay	Urban	446.22	$ 21,623	0%	$ 21,623
SGM_S_007	c	158823	158824	Ultimate	Gladstone	S - Catchment	Trunk	750	11	Koowin Drive	Augmentation required to resolve flooding and surcharging in Koowin Drive	Clay	Urban	1795.98	$ 20,506	0%	$ 20,506
SGM_S_007	d	158824	133646	Ultimate	Gladstone	S - Catchment	Trunk	750	52	Koowin Drive	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Koowin Drive	Clay	Urban	1795.98	$ 92,652	0%	$ 92,652
SGM_S_007	e	133646	133647	Ultimate	Gladstone	S - Catchment	Trunk	750	89	Koowin Drive	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Koowin Drive	Clay	Urban	1795.98	$ 160,032	0%	$ 160,032
SGM_S_007	f	133647	133648	Ultimate	Gladstone	S - Catchment	Trunk	750	59	Koowin Drive	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Koowin Drive	Clay	Urban	1795.98	$ 106,598	0%	$ 106,598
SGM_S_007	g	133648	112672	Ultimate	Gladstone	S - Catchment	Trunk	750	41	Koowin Drive	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Koowin Drive	Clay	Urban	1795.98	$ 73,560	0%	$ 73,560
SGM_S_007	h	112672	112647	Ultimate	Gladstone	S - Catchment	Trunk	750	71	Koowin Drive	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Koowin Drive	Clay	Urban	1795.98	$ 128,285	0%	$ 128,285
SGM_S_008	a	40667	40666	2031	Gladstone	S - Catchment	Trunk	300	133	Rugby League Ground, Harvey Road	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Rugby League Ground, Harvey Road	Clay	Greenfield	503.94	$ 66,991	0%	$ 66,991
SGM_S_008	b	40666	44860	2031	Gladstone	S - Catchment	Trunk	300	136	Rugby League Ground, Harvey Road	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Rugby League Ground, Harvey Road	Clay	Greenfield	503.94	$ 68,626	0%	$ 68,626
SGM_S_008	c	44860	44857	2031	Gladstone	S - Catchment	Trunk	300	133	Rugby League Ground, Harvey Road	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Rugby League Ground, Harvey Road	Clay	Greenfield	503.94	$ 67,122	0%	$ 67,122
SGM_S_008	d	44857	44858	2031	Gladstone	S - Catchment	Trunk	300	79	Rugby League Ground, Harvey Road	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Rugby League Ground, Harvey Road	Clay	Greenfield	503.94	$ 39,593	0%	$ 39,593
SGM_S_008	e	42634	40665	2026	Gladstone	S - Catchment	Trunk	225	123	Rugby League Ground, Harvey Road	Augmentation required to resolve flooding and surcharging in Rugby League Ground, Harvey Road	Clay	Greenfield	362.97	$ 44,510	0%	$ 44,510
SGM_S_008	f	40665	44863	2026	Gladstone	S - Catchment	Trunk	225	120	Rugby League Ground, Harvey Road	Augmentation required to resolve flooding and surcharging in Rugby League Ground, Harvey Road	Clay	Greenfield	362.97	$ 43,409	0%	$ 43,409

Gravity Sewer Augmentations

Augmentation ID	Pipe ID	Upstream Manhole ID	Downstream Manhole ID	Planning Horizon	Sewerage Scheme	Sewerage Catchment	Upgrade Type	Diameter (mm)	Length (m)	Address	Commentary	Geology	Landuse (Rural/Urban)	Unit Rate ($/m)	Item Cost Estimate ($)	Contingency	Cost Estimate including contingency (%)
SGM_S_008	g	44863	40667	2031	Gladstone	S - Catchment	Trunk	300	80	Rugby League Ground, Harvey Road	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Rugby League Ground, Harvey Road	Clay	Greenfield	503.94	$ 40,368	0%	$ 40,368
SGM_S_009	a	53217	53218	Ultimate	Gladstone	S - Catchment	Reticulation	150	75	Parsloe Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Parsloe Street	Clay	Urban	326.34	$ 24,450	0%	$ 24,450
SGM_S_009	b	53218	53301	Ultimate	Gladstone	S - Catchment	Reticulation	150	67	Parsloe Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Parsloe Street	Clay	Urban	326.34	$ 21,959	0%	$ 21,959
SGM_S_009	c	53301	53302	Ultimate	Gladstone	S - Catchment	Reticulation	150	51	Parsloe Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Parsloe Street	Clay	Urban	326.34	$ 16,524	0%	$ 16,524
SGM_S_009	d	53302	53354	Ultimate	Gladstone	S - Catchment	Reticulation	150	22	Parsloe Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Parsloe Street	Clay	Urban	326.34	$ 7,290	0%	$ 7,290
SGM_S_009	e	53354	53303	Ultimate	Gladstone	S - Catchment	Reticulation	150	72	Parsloe Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Parsloe Street	Clay	Urban	326.34	$ 23,656	0%	$ 23,656
SGM_S_009	f	53303	53304	Ultimate	Gladstone	S - Catchment	Reticulation	150	48	Parsloe Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Parsloe Street	Clay	Urban	326.34	$ 15,716	0%	$ 15,716
SGM_S_009	g	53304	53355	Ultimate	Gladstone	S - Catchment	Trunk	450	88	Parsloe Street	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Parsloe Street	Clay	Urban	858.03	$ 75,614	0%	$ 75,614
SGM_S_010	a	132314	132313	Ultimate	Gladstone	S - Catchment	Trunk	300	95	Corner of Harvey Road & Kirkwood Road	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Corner of Harvey Road & Kirkwood Road	Clay	Greenfield	503.94	$ 47,704	0%	$ 47,704
SGM_S_010	b	132315	132314	Ultimate	Gladstone	S - Catchment	Trunk	300	48	Corner of Harvey Road & Kirkwood Road	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Corner of Harvey Road & Kirkwood Road	Clay	Greenfield	503.94	$ 24,221	0%	$ 24,221
SGM_S_010	c	132316	132315	Ultimate	Gladstone	S - Catchment	Trunk	300	54	Corner of Harvey Road & Kirkwood Road	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Corner of Harvey Road & Kirkwood Road	Clay	Greenfield	503.94	$ 27,032	0%	$ 27,032
SGM_S_011	a	NEW_20	FMH_9911	Ultimate	Gladstone	S - Catchment	Trunk	450	382	Peter Corones Drive	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Peter Corones Drive	Clay	Urban	858.03	$ 327,964	0%	$ 327,964
SGM_T_001	a	40301	SPS_T02	2016	South Tree	T - Catchment	Trunk	375	5	Parallel to Billabong Drive	Augmentation required to resolve flooding and surcharging in Parallel to Billabong Drive	Clay	Urban	714.84	$ 3,548	0%	$ 3,548
SGM_T_001	b	38448	40301	2016	South Tree	T - Catchment	Trunk	375	53	Parallel to Billabong Drive	Augmentation required to resolve flooding and surcharging in Parallel to Billabong Drive	Clay	Urban	714.84	$ 37,786	0%	$ 37,786
SGM_T_001	c	136666	38448	2021	South Tree	T - Catchment	Trunk	375	3	Parallel to Billabong Drive	Augmentation required to resolve flooding and surcharging in Parallel to Billabong Drive	Clay	Urban	714.84	$ 1,914	0%	$ 1,914
SGM_T_001	d	53353	136666	2021	South Tree	T - Catchment	Trunk	375	59	Parallel to Billabong Drive	Augmentation required to resolve flooding and surcharging in Parallel to Billabong Drive	Clay	Urban	714.84	$ 41,959	0%	$ 41,959
SGM_T_001	e	53359	53352	2021	South Tree	T - Catchment	Trunk	375	78	Parallel to Billabong Drive	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Parallel to Billabong Drive	Clay	Urban	714.84	$ 55,634	0%	$ 55,634
SGM_T_002	a	123543	123544	Ultimate	South Tree	T - Catchment	Trunk	225	26	Near Melaleuca Palace & Stoneybrook Drive	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Near Melaleuca Palace & Stoneybrook Drive	Clay	Urban	446.22	$ 11,428	0%	$ 11,428
SGM_T_002	b	123542	123543	Ultimate	South Tree	T - Catchment	Trunk	225	27	Near Melaleuca Palace & Stoneybrook Drive	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Near Melaleuca Palace & Stoneybrook Drive	Clay	Urban	446.22	$ 12,131	0%	$ 12,131
SGM_T_002	c	123544	123546	Ultimate	South Tree	T - Catchment	Trunk	225	69	Near Melaleuca Palace & Stoneybrook Drive	Augmentation required to resolve under capacity gravity sewer and resolve surcharging in Near Melaleuca Palace & Stoneybrook Drive	Clay	Urban	446.22	$ 30,764	0%	$ 30,764

SPS Upgrades

Upgrade ID	Pump Station ID	Planning Horizon	Sewerage Scheme	Sewerage Catchment	Upgrade Type	Duty Flow (L/s)	Duty Head (m)	Power (kW)	Address	Commentary	ET Trigger and Commentary	Item Cost Estimate ($)	Contingency ($)	Cost Estimate including contingency (%)
SPS_A_001	SPS_A01	2014	Gladstone	A - Catchment	Trunk	638	90	803	Lord Street	Upgrade to pump station SPS_A01	10715	$ 8,477,378	0%	$ 8,477,377.90
SPS_A_003	SPS_A05	Ultimate	Gladstone	A - Catchment	Trunk	60	39	33	Agnes Street	Upgrade to pump station SPS_A05	1784	$ 365,190	0%	$ 365,190.00
SPS_A_004	SPS_A06	2014	Gladstone	A - Catchment	Trunk	132	21	39	Friends Street	Upgrade to pump station SPS_A06	3081	$ 365,190	0%	$ 365,190.00
SPS_A_005	SPS_A10	2014	Gladstone	A - Catchment	Trunk	83	29	33	Palm Drive	Upgrade to pump station SPS_A10	1673	$ 365,190	0%	$ 365,190.00
SPS_A_006	SPS_A13	2014	Gladstone	A - Catchment	Trunk	5	7	0.5	Young Street	Upgrade to pump station SPS_A13	129	$ 100,000	0%	$ 100,000.00
SPS_A_007	SPS_A17	2014	Gladstone	A - Catchment	Trunk	9	9	1	Morgan Street	Upgrade to pump station SPS_A17	206	$ 100,000	0%	$ 100,000.00
SPS_A_008	SPS_A26	Ultimate	Gladstone	A - Catchment	Trunk	4	8	0.4	Hillard Street	Upgrade to pump station SPS_A26	114	$ 100,000	0%	$ 100,000.00
SPS_A_009	SPS_A28	2014	Gladstone	A - Catchment	Trunk	13	2	0.4	Chapple Street (North)	Upgrade to pump station SPS_A28	321	$ 100,000	0%	$ 100,000.00
SPS_A_010	SPS_A34	2014	Gladstone	A - Catchment	Trunk	5	26	2	Marina (Terminal Building)	Upgrade to pump station SPS_A34	156	$ 100,000	0%	$ 100,000.00
SPS_A_011	SPS_A41	2014	Gladstone	A - Catchment	Trunk	5	24	2	Clinton coal facility	Upgrade to pump station SPS_A41	156	$ 100,000	0%	$ 100,000.00
SPS_S_001	SPS_C03	2014	Gladstone	S - Catchment	Trunk	11	10	2	Neil Street	Upgrade to pump station SPS_C03	337	$ 100,000	0%	$ 100,000.00
SPS_D_001	SPS_D01	Ultimate	Gladstone	D - Catchment	Trunk	116	24	39	Garfield Street	Upgrade to pump station SPS_D01	3438	$ 365,190	0%	$ 365,190.00
SPS_A_012	SPS_P01	2031	Gladstone	A - Catchment	Trunk	94	69	90	Beckinsale Street	Upgrade to pump station SPS_P01	2725	$ 892,440	0%	$ 892,440.00
SPS_S_002	SPS_S01	2014	Gladstone	S - Catchment	Trunk	603	30	257	Cemetery Road	Upgrade to pump station SPS_S01	10046	$ 1,721,610	0%	$ 1,721,610.00
SPS_S_003	SPS_S06	2026	Gladstone	S - Catchment	Trunk	26	5	2	Parksville Estate (Emerdale)	Upgrade to pump station SPS_S06	371	$ 100,000	0%	$ 100,000.00
SPS_S_004	SPS_S07	2014	Gladstone	S - Catchment	Trunk	19	37	10	Parsloe Street	Upgrade to pump station SPS_S07	389	$ 172,050	0%	$ 172,050.00
SPS_T_004	SPS_T01	2014	South Tree	T - Catchment	Trunk	7	21	2	Boys Road	Upgrade to pump station SPS_T01	1331	$ 100,000	0%	$ 100,000.00
SPS_T_005	SPS_T02	2016	South Tree	T - Catchment	Trunk	60	51	43	Glen Eden	Upgrade to pump station SPS_T02	1072	$ 434,010	0%	$ 434,010.00
SPS_T_006	SPS_T05	2014	South Tree	T - Catchment	Trunk	11	15	2	Cavella Drive, Glen Eden	Upgrade to pump station SPS_T05	271	$ 113,220	0%	$ 113,220.00
SPS_T_001	SPS_TF01	Ultimate	South Tree	T - Catchment	Trunk	91	4	6	Near Giles Street	Upgrade to pump station SPS_TF01	2819	$ 148,740	0%	$ 148,740.00
SPS_T_002	SPS_TF02	Ultimate	South Tree	T - Catchment	Trunk	3	49	2.00	Gladstone Benaraby Road	Upgrade to pump station SPS_TF02	78	$ 113,220	0%	$ 113,220.00
SPS_T_003	SPS_TF03	Ultimate	South Tree	T - Catchment	Trunk	4	18	2.00	Bailiff Road	Upgrade to pump station SPS_TF03	124	$ 113,220	0%	$ 113,220.00