H2ONE

203 Ashmore Road
Benowa QLD 4217

Water Supply and Sewer
Network Capacity Assessment

FINAL Report V1 - 23 May, 2025

H2One Pty Ltd

Water, Sewer and Stormwater Engineering Specialists

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Reviewed by RPEQ	Reg. No.	Signed	Date
Joshua May	18064		23 May, 2025

Version	Date	Author	Reviewer
DRAFT - V1	19 May, 2025	J Meesamphan	J May
FINAL - V1	23 May, 2025	J Meesamphan	J May

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1 INTRODUCTION

1.1 Background

A mixed-use development, at 203 Ashmore Rd, Benowa QLD, is currently in the planning phase of the Development Application (DA) process. The real property description for this site is Lot 822 on RP839746, with the proposed land-use type and density as per the following. Refer to Appendix 1 for the development layout plans.

- 306 x 2 bedroom apartments
- 91 x 3 bedroom apartments
- 13,000 m^2 Gross Floor Area (GFA) of retail and commercial space

To support the DA, City of Gold Coast (CoGC) requested a water supply and sewerage network capacity assessment to determine if the site's additional loading will impact system performance and trigger the need for infrastructure upgrades. H2One Pty Ltd was engaged to undertake the assessment in accordance with CoGC's requirements; "*South East Queensland Water Supply and Sewerage Design and Construction Code*" (2020) and the "*Water and Sewerage Connections Policy Procedure*" (2018). The results of the investigation are presented in this report.

1.2 Objectives

The objectives of the project were as follows.

1. Assess the capacity of existing gravity mains, rising mains, pumps, wet wells and emergency storage for the relevant sewer catchment; Sewer Pump Station (SPS) A16.
2. Assess standard flow and fire flow capacity of the relevant water supply network; Benowa Road District Metered Area (DMA).
3. Determine infrastructure upgrades necessary to achieve CoGC's minimum design standards, where system performance failures have occurred due to the additional loading of the new development, and;
4. Prepare a network capacity assessment report.

1.3 Sewerage Strategy

The development site is located within the SPS A16 sewerage catchment, with the proposed connection located on the existing diameter nominal (DN) 150 mm gravity main adjacent to the eastern property boundary. The development's sewage outfall will continue east via DN225 and DN300 trunk gravity pipes, discharging to SPS A16. This pump station operates with duty-assist pumps that inject into a shared pressure main that is ultimately serviced by the Coombabah Sewage Treatment Plant (STP).

As per CoGC's Local Government Infrastructure Plan (LGIP) demand model, SPS A16 is estimated to currently service 3,400 EP, which is projected to increase to a maximum of 5,230 EP at the Ultimate planning horizon (2066).

Refer to Appendix 1 and Appendix 2 for an overview of the site location and relevant service strategy.

1.4 Water Supply Zone

The development site is located within the Benowa Road DMA, which is serviced by a flow modulated Pressure Reducing Valve (PRV) with a maximum residual pressure setting of 40 m. The DMA is serviced

by the Molendinar LLZ water tanks (MO4, MO5 and MO6), via a network of DN965, DN750, and DN300 trunk pipes. The proposed connection point will be located on the existing DN150 main along Carrara Street.

The pipe chainage from the Molendinar water tanks to the proposed connection point is estimated at 5.5 km. The Molendinar tanks are positioned at an RL of 68.4 m AHD and currently services 175,000 EP, which is estimated to increase to a maximum of 509,000 EP at the ultimate planning horizon (2066).

Refer to Appendix 3 for an overview of site location and relevant service strategy.

1.5 Demand Assessment

A demand assessment of the development was undertaken to determine the approximate potable water and sewage demands attributed to the proposed land-use type and density. This was calculated using CoGC's adopted Equivalent Person (EP) unit rates and average "per capita" demands for potable water @ 220L/EP/day, and sewage @ 200 L/EP/day and 180 L/EP/day for the 2021-2041 and 2066 planning horizons, respectively.

Table 1. Estimated water supply and sewage loading from the proposed development

Site Land Use and Density	Demand Rate	EP	Water (kL/day)	Sewage (kL/day)
306 x 2 bedroom res. apt.	1.76 EP/Apt	538.6	118.5	107.7
91 x 3+ bedroom res. apt.	2.51 EP/Apt	228.4	50.3	45.7
13,000 m^2 (GFA) retail/com.	1.68 EP/100 m^2	218.4	48.0	43.7
	TOTAL	**985.4**	**216.8**	**197.1**

For the post-development scenarios of the water supply and sewer network assessment, CoGC's LGIP site demands were removed from the existing model and replaced with the demands presented in Table 1 above. These figures were provided by CoGC and are presented in Table 2 below.

Table 2. CoGC's LGIP demands (EP) removed from the water and sewer models @ post-develop.

Address	Node ID	2021	2026	2031	2036	2041	2066
203 Ashmore Rd, Benowa	SEMH_A016_9000155261 (sewer)	152.1	168.8	185.6	202.3	219.1	266.1
	MO_11100069906_WTFT (water)	170.9	189.7	208.5	227.3	246.1	298.9

Prior to the study, the demands presented in Tables 3 and 4 below were introduced to the hydraulic models to account for planned development within the local network. These figures were advised by CoGC and consider existing LGIP demands already present in the model.

Table 3. Development demands (EP) updated in the sewer model, prior to the hydraulic assessment

Address	Sewer Node ID	2021 (EP)	2066 (EP)
60 Allchurch Ave, Benowa	SEMH_A016_9000155261	241.9	236.5

Table 4. Development demands (EP) updated in the water supply model, prior to the hydraulic assessment

Address	Node ID	2021	2026	2031	2036	2041	2066	Water Pattern
60, 64 SeaWorld Dr, Main Beach	MO_11100226734_WTFT	1,077.2	1,058.0	1,039.8	1,021.6	1,002.4	822.5	RMF_1
6, 8, 10, 16 Frederick St & 18 Garfield Tce, Surfers Paradise	MO_11100440315_WTHY	348.1	341.8	335.6	326.2	316.8	316.8	RMF_1
59 Garfield Tce, Surfers Paradise	MO_11100444680_WTFT	110.8	110.6	110.4	110.2	110.0	7.7	RMF_1
21 Oak Ave & 11 Birt Ave, Surfers Paradise	MO_56918PIPE_11100441131_NODE	119.8	119.8	119.7	119.5	119.4	31.5	RMF_1
82-92 Ferny Ave, Surfers Paradise	MO_11100241154_WTFT	352.7	55.1	51.2	45.5	39.7	4.9	RMF_1
106-112 Ferny Ave, 3-19 Pine Ave, 2-18 Norfolk Ave, Surfers Paradise	MO_11100439594_WTHY, MO_11100203469_WTHY	1,662.2	195.5	175.9	146.5	117.1	117.1	RMF_1
5-7 Peninsular Dr, Surfers Paradise	MO_11100441540_WTHY	123.0	123.0	123.0	35.0	34.9	34.9	RMF_1
27 Thornton St, 26 Vista St, 2949-2957 Surfers Paradise Blvd, Surfers Paradise	MO_11100043886_WTHY	327.6	37.2	32.8	26.3	19.8	19.8	RMF_1
3550-3552 Main Beach Pde, Main Beach	MO_11100061909_WTFT	165.2	165.1	165.0	165.0	164.9	47.2	RMF_1
47-49 Pacific St, Main Beach	MO_11100329237_WTVL	52.2	52.0	51.9	51.8	51.5	0.0	RMF_1
24-26 Woodroffe Ave, Main Beach	MO_11100306043_WTHY	61.9	61.8	61.8	61.7	61.6	0.0	RMF_1
84-88 The Esplanade and 3271-3275 Surfers Paradise Blvd, Surfers Paradise	MO_11100053599_WTHY, MO_11100468121_WTFT	386.1	374.7	363.3	346.2	329.1	329.1	RMF_1
3513 Main Beach Pde, Main Beach	MO_11100307334_WTFT	36.5	36.4	36.4	36.3	36.2	35.9	RMF_1
3547-3549 Main Beach Pde, Main Beach	MO_11100203456_WTHY	296.0	295.9	295.9	295.8	189.8	94.2	RMF_1
3496 Main Beach Pde, Main Beach	MO_11100061761_WTHY	180.5	178.9	178.1	177.3	175.6	175.6	RMF_1
152, 154, 158, 162 Esplanade, Surfers Paradise	MO_11100439635_WTHY	167.4	159.2	151.0	138.7	126.3	126.3	RMF_1
3 Pacific St, Main Beach	MO_11100237192_WTVL	205.9	119.6	118.9	118.2	116.8	116.8	RMF_1
3155-3173 Surfers Paradise Blvd & 24-26 Orchid Ave, Surfers Paradise	MO_11100467794_WTFT, MO_11100443791_WTFT	1,430.0	1,430.0	1,430.0	1,430.0	1,430.0	1,430.0	RMF_1

Note it is understood that the above development may still be undergoing assessment with CoGC's approval yet to be provided. As a result, consideration of relevant demands is indicative only.

2 METHODOLOGY

2.1 Design Standards

The design standards adopted for the hydraulic assessment were based on the "*South East Queensland Water Supply and Sewerage Design and Construction Code*" (2020), with exception to the maximum depth of gravity pipe flow at 1.0 m freeboard. This requirement is merely a standard industry practice adopted by water authorities in South-east Queensland, and is not a specific design standard from either the SEQ Code or Water Service Association of Australia (WSAA) Sewerage Code. A summary of the relevant design provisions utilised for the project is as follows.

Table 5. SEQ Code provisions relevant to the study

	Provision	Specification
Sewerage	ET to EP conversion factor	2.79
	Average Dry Weather Flow (ADWF)	200 L/EP/day
	Peak Wet Weather Flow (PWWF)	5 x ADWF
	Single pump capacity	C1 x ADWF (L/s) where; C1 = 3.5 to 5.0 $C1 = 15 \times (EP)^{-0.1587}$
	Pump station operational storage (m^3)	0.9 x Q / N where; Q = Single pump capacity (L/s) N = Number of pump starts per hour, where N = 12 for duty pump motor < 100 kW N = 8 for duty pump motor 100 – 200 kW N = 5 for duty pump motor > 200 kW
	Pump station emergency storage (m^3)	4 hours ADWF
	Total pump station capacity (L/s)	PWWF
	Maximum depth of gravity flow (proposed system)	75% pipe diameter
	Maximum depth of gravity flow (existing system)	1.0 m below manhole level
	Maximum pressure main flow velocity	3.0 m/s
Water Supply	ET to EP conversion factor	2.79
	Average Day Demand	220 L/EP/day
	Maximum pipe velocity (m/s)	2.5 m/s
	Standard flow minimum network pressure and background demand	22m at the property boundary at PH demand
	Residential fire flow minimum network pressure and background demand	12m at 2/3 PH demand Positive pressure at PH demand Reservoir at Minimum Operating Level (15%)
	Commercial fire flow minimum network pressure and background demand	12m at PH demand
	Fire flows	Residential - 15L/s Commercial/industrial - 30L/s

2.2 Sewerage Network Assessment

The methodology adopted for the hydraulic analysis of the sewer network is as follows.

1. CoGC's latest LGIP InfoWater SWMM sewerage network model was adopted for the analysis ("CO_*WSSIP_2019"*). The site's estimated demand was placed into the model on manhole "*SEMH_A016_9000155261"*, in addition to the demand changes described in Section 1.5 of this report. Refer to Appendix 2 for the location of the demand manhole.
2. The pump capacity of SPS A16 was assessed by running the model at PWWF and determining if wet well levels operated within the stand-by pump start/stop settings. This method was adopted as SPS A16 injects into a shared pressure system and was considered the most suitable option to assess the pump station's ability to manage inflow.

   If the pump station could not maintain acceptable levels and surcharging occurred, pump and/or rising main capacity upgrades were investigated until design standards were achieved. Impact to pump stations injecting against SPS A16 were also assessed to determine if they were negatively affected by changes to pump operation and/or upgrades.
3. The wet well operational storage of SPS A16 was subsequently evaluated by comparing the required operational storage capacity, post-development, against wet well volumes between duty pump start/stop levels.

   If the wet well's operational storage volume was above the minimum requirement, compliance was achieved. If it was below the minimum requirement, pump and pressure main upgrades were investigated until design standards were achieved.
4. The flow depth of gravity mains was assessed from the proposed connection point to SPS A16, at pre- and post-development PWWF. To avoid surcharging from unrelated issues downstream, pumps were deactivated from the model and gravity mains discharged directly to a wet well outlet.

   If flow depths could not be maintained within CoGC specifications, pipe augmentations were investigated until design standards were achieved.
5. The emergency storage of the SPS A16 catchment was assessed by determining the available ADWF network volume between the overflow level (RL 2.108 m AHD - 0.3 m) and pump duty start level (RL 0.04 m AHD). This was achieved by calculating the "empty" volume of the network and subtracting the post-development ADWF volume already present in the network.

   The available emergency storage was compared against the 4 hour ADWF requirement. If the available storage was above the minimum requirement, compliance was achieved. If it was below the minimum requirement, compliance was not achieved and storage augmentations were investigated.
6. Modelling results were verified and findings reported.

2.3 Water Supply Network Assessment

The methodology adopted for the water supply network analysis is as follows.

1. CoGC's latest InfoWater LGIP hydraulic model was adopted for the water supply analysis ("*Northern v102_WSSIP_2019*"). The site's estimated demand and diurnal pattern were placed into the model on node "*MO_11100069906_WTFT"*. LGIP demands were also introduced/removed as per Section 1.5 of this report. Refer to Appendix 3 for location of the demand node.

2. For all planning horizons, a detailed standard flow hydraulic analysis was undertaken on the supply tanks, property connection point/s and surrounding network. This was based on a 3 x consecutive Maximum Day (MD) demand scenario at pre- and post-development. Any deficiencies in the network were investigated and appropriate solutions determined.
3. The hydrants directly servicing the site was allocated 30 L/s for both pre- and post-development scenarios. A detailed fire flow hydraulic analysis was undertaken on the local network, based on a 1 x MD demand event. Any deficiencies in the network were investigated and appropriate solutions determined.
4. Modelling results were verified and findings reported.

3 RESULTS

3.1 Sewerage Network Assessment

3.1.1 Pumps

A pump capacity assessment was undertaken on SPS A16, as per the methodology described in Section 2.2 of this report. The analysis identified that the combined pump capacity was sufficient to incorporate the development's sewage loading, across all planning horizons. No pump capacity upgrades are therefore required.

Refer to Appendix 4 for detailed modelling results of the pump capacity assessment.

3.1.2 Wet Wells

An assessment on the operational storage capacity of the SPS A16 wet well was undertaken with the inclusion of the development's estimated loading. Table 6 below shows a summary of results and Appendix 5 provides detailed calculations.

Table 6. Operational storage capacity results (post-development)

Planning Horizon	Storage Available (kL)	Storage Required (kL)	Difference (kL)
2021	10.23	3.07	+7.16
2066	10.23	3.63	+6.60

The above table demonstrates there is sufficient operational storage to incorporate the additional site loading, across all planning horizons. No wet well capacity upgrades are therefore required to service the proposed development.

3.1.3 Gravity Mains

As per the methodology described in Section 2.2 of this report, gravity pipe flow depths were assessed against the CoGC's minimum requirement (1.0 m below manhole level), from site connection to SPS A16. The hydraulic analysis determined that the downstream gravity main system has insufficient capacity to service the proposed development within 1.0 m freeboard, across all planning horizons.

However, the identified flow depths remained within pipe and no overflows occurred. A potential pipe upgrade should be reviewed by CoGC as to the need and/or timing of construction. If required, this would consist of 270 m of DN150 pipework being upgraded to DN225.

Refer to Appendix 6 for a concept layout of the proposed pipe upgrade and Appendix 7 for detailed modelling results.

3.1.4 Emergency Storage

An emergency storage capacity assessment was undertaken on the SPS A16 catchment, with the inclusion of the additional ADWF attributed to the proposed development (1.9 L/s). Table 7 below shows a summary of results and Appendix 8 shows detailed calculations.

Table 7. Emergency storage capacity results (post-development)

Planning Horizon	Storage Available (kL)	Storage Required (kL)	Difference (kL)
2021	115.1	102.8	+12.4
2031	113.9	111.3	+2.7
2036	113.7	114.2	-0.4
2041	113.4	117.1	-3.6
2066	113.0	129.1	-16.1

The results in the above table demonstrate that there is sufficient emergency storage available to incorporate the additional site loading, at the 2021 to 2031 planning horizons. For the 2036 to 2066 planning horizons however, insufficient emergency storage was identified, triggered by the development's additional sewage loading. A 16.1 kL storage upgrade will therefore be required from the 2036 planning horizon, in order to achieve CoGC's minimum storage requirement of 4-hours ADWF.

3.2 Water Supply Network Assessment

3.2.1 Standard Flow

As per the methodology described in Section 2.3 of this report, a detailed standard flow network analysis was undertaken on all planning horizons with the inclusion of the estimated development demands. A summary of results is presented below in Table 8.

Table 8. Standard flow network modelling results (post-development)

	Planning Horizon					
Provision	**2021**	**2026**	**2031**	**2036**	**2041**	**2066**
Conn. (*MO_11100069906_WTFT*) min. pressure (m)	62.4	62.4	60.9	59.4	57.0	50.1
Network min. pressure (m)	38.8	38.5	36.9	35.3	33.0	27.3
Network min. pressure node ID	MO_11100320898_WTFT					
Network no. failures	0	0	0	0	0	0
Tank min. water level (%)	80%	82%	77%	72%	62%	48%
Max. pipe velocity (m/s)	0.8	1.0	1.0	1.0	1.0	1.0
Network max. velocity ID	MO_9546PIPE_11100057795					
Network no. failures	0	0	0	0	0	0

The above results demonstrate that the network performed within CoGC's minimum standard flow design standards, across all planning horizons. No infrastructure upgrades are therefore required to service the proposed development.

Refer to Appendix 9 for modelling results at pre- and post-development.

3.2.2 Fire Flow

As per the methodology described in Section 2.3 of this report, a detailed fire flow network analysis was undertaken on all planning horizons with the inclusion of estimated development demands. A summary of results is presented below in Table 9.

Table 9. Fire flow network modelling results (post-development)

		Planning Horizon					
Scenario		**2021**	**2026**	**2031**	**2036**	**2041**	**2066**
Peak Hour	Site hydrant (*MO_11100075453_WTHY*) min. pressure (m)	56.2	52.5	50.6	49.1	47.5	43.3
	Network hydrants min. pressure (m)	12.2	5.0	2.8	1.3	-0.4	-3.1
	Network hydrant min. pressure node ID	MO_11100067480_WTHY					
	Network hydrants no. failures	0	0	1	1	2	2
2/3 Peak Hour	Site hydrant (*DEM_NODE_HY*) min. pressure (m)	60.7	59.0	57.8	56.6	55.0	51.2
	Network hydrants min. pressure (m)	16.4	13.8	13.6	12.4	10.8	7.9
	Network hydrant min. pressure node ID	MO_11100067480_WTHY					
	Network hydrants no. failures	0	0	0	0	1	1

Note: Results based on supply reservoirs operating at MOL (15%), peak hour at 7 am and 2/3 peak hour at 3.30 pm.

The above results demonstrate that the network performed within CoGC's minimum fire flow design standards, with exception to a small number of peak hour and 2/3 peak hour failures from the 2031 planning horizon. Further investigation identified that these failures occurred due to a couple of model discrepancies, i.e. a misallocation of a 30 L/s fire flow within a residential area, and a DN100 cross-connection that has yet to be updated in CoGC's model. Refer to Figures 1 and 2 below for further details.

Figure 1. Residential node incorrectly allocated with 30 L/s fire flow (Source: CoGC’s online mapping tool)

Figure 2. DN100 cross-connection not present in CoGC’s model (Source: CoGC’s online mapping tool)

With the resolution of the above model issues, the minimum fire flow pressure were determined to be 16.5 m @ 15 L/s (2/3 PH) and 26.1 m @ 30 L/s (PH). This is in compliance with CoGC's minimum design standards, therefore no water supply infrastructure upgrades are required to service the proposed development.

Refer to Appendix 9 for the modelling results at pre- and post-development, prior to the implementation of the model updates described above.

4 CONCLUSION

A mixed-use development, at 203 Ashmore Rd, Benowa QLD, is currently in the planning phase of the Development Application (DA) process. The real property description for this site is Lot 822 on RP839746, with the proposed land-use type and density as per the following.

- 306 x 2 bedroom apartments
- 91 x 3 bedroom apartments
- 13,000 m^2 Gross Floor Area (GFA) of retail and commercial space

To support the DA, City of Gold Coast (CoGC) requested a water supply and sewerage network capacity assessment to determine if the site's additional loading (985 EP) will impact system performance and trigger the need for infrastructure upgrades. H2One Pty Ltd was engaged to undertake the assessment in accordance with CoGC's requirements; "*South East Queensland Water Supply and Sewerage Design and Construction Code*" (2020) and the "*Water and Sewerage Connections Policy Procedure*" (2018).

The hydraulic analysis determined that, theoretically, there was sufficient capacity in the water supply network to incorporate the development loading, across all planning horizons. For the sewer network however, the following capacity shortfalls were identified in servicing the proposed development.

- The gravity pipe system downstream of the connection point operated with a flow depth above 1.0 m from ground level, across all planning horizons. However, the maximum flow depth remained within pipe and no overflows occurred. The potential of a pipe upgrade should be reviewed by CoGC as to the need and/or timing of construction. If required, this would consist of 270 m of DN150 pipework being upgraded to DN225, downstream of the connection point.
- The SPS A16 catchment presented insufficient emergency storage capacity to service the proposed development, prior to the 2036 planning horizon. The installation of a 16.1 kL emergency storage upgrade will likely be required to achieve 4 hours of Average Dry Weather Flow (ADWF) storage.

It is recommended that CoGC approves the proposed water supply and sewer service strategies for the proposed development at 203 Ashmore Rd, Benowa QLD, with consideration to the infrastructure requirements identified in this report.

Detailed modelling results, calculations and system plans can be observed in Appendices 1 through 9.

5 REFERENCE LIST

CoGC. (2020). *SEQ Water Supply and Sewerage Design and Construction Code*. Gold Coast: City of Gold Coast

CoGC. (2018). *Water and Sewerage Connections Policy Procedure.* Gold Coast: City of Gold Coast

6 APPENDICES

Appendix 1. Development layout plan and concept water/sewer service strategy

BENOWA GARDENS MASTER PLAN

SITE INFORMATION

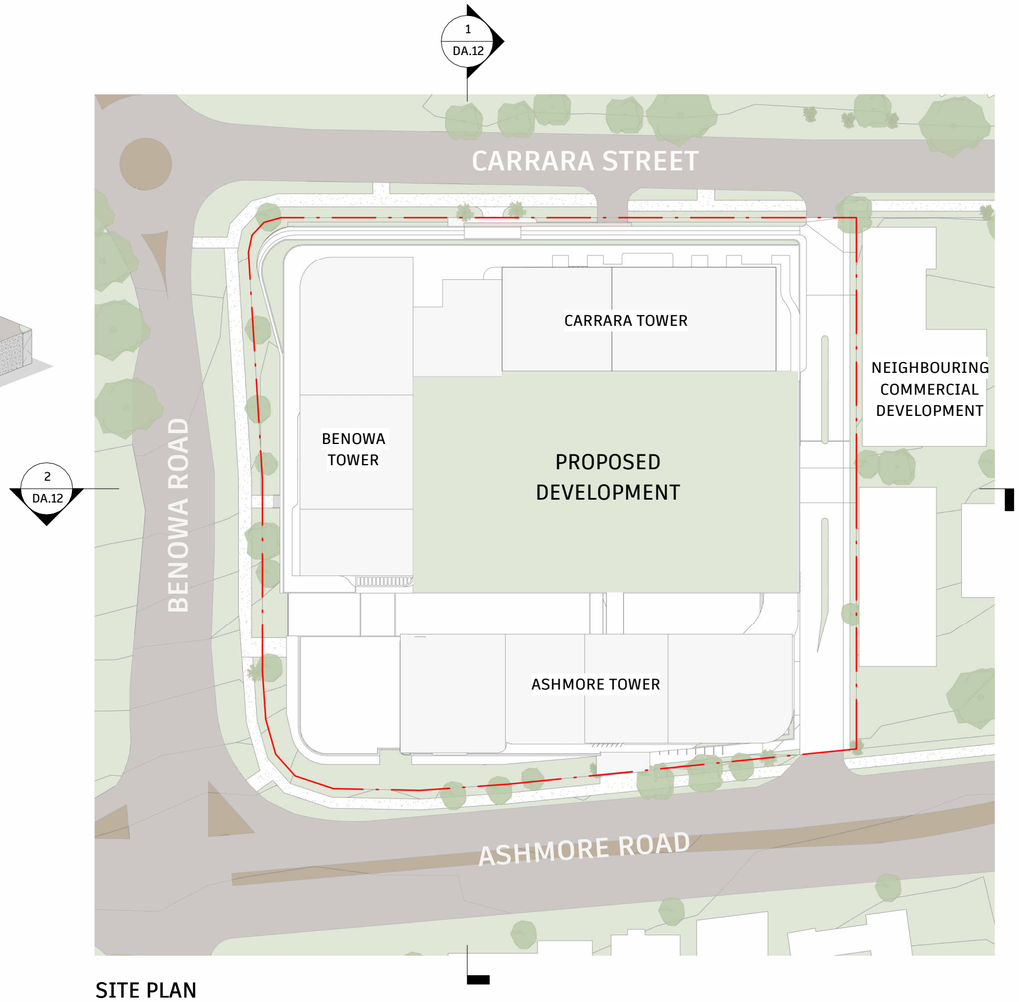
ADDRESS 203 ASHMORE ROAD
BENOWA QLD 4217

RPD LOT/DP: RP839746

SITE AREA 17,658m^2

LEGEND

- RETAIL
- STAFF BICYCLE PARKING
- COMMERCIAL
- RESIDENTIAL
- VISITOR BICYCLE PARKING
- COMMUNITY OUTDOOR
- REFUSE
- PERIMETER USE



SITE PLAN

1 : 1000

APARTMENT TYPES

	LEVELS	2 x BED	3 x BED	TOTAL
CARRARA TOWER	PER LEVEL (x 9)	12	3	15
	TOTAL PER TOWER	108	27	135
BENOWA TOWER	PER LEVEL (x 8)	12	4	16
	TOTAL PER TOWER	96	32	128
ASHMORE TOWER	PER LEVEL (x 7)	14	4	18
	PER HALF LEVEL (x 1)	4	4	8
	TOTAL PER TOWER	102	32	134
TOTAL APARTMENTS		**306**	**91**	**397**

PERIMETER USE: 8,400m^2

	SHORT STAY ACCOMMODATION	RESIDENTIAL 1 BED		HEALTH CARE
BASEMENT 2	130m^2 TUA (LOBBY)	-		-
BASEMENT 1	11	-		1,200m^2 TUA
GROUND (SHOPPING CENTRE)	15	-		1,200m^2 TUA
CARRARA LEVEL 1	15	-	**OR**	1,200m^2 TUA
CARRARA LEVEL 2	-	22		2,400m^2 TUA
CARRARA LEVEL 3	-	22		2,400m^2 TUA
TOTAL	**41**	**44**		**8,400m^2**

CARPARKING

RETAIL

BASEMENT 3	**190 CARS**
BASEMENT 2	**260 CARS**
BASEMENT 1	**250 CARS**
TOTAL RETAIL CARPARKS	**700 CARS**

RESIDENTIAL

LEVEL 2	**220 CARS**
LEVEL 3	**270 CARS**
TOTAL RESIDENTIAL CARPARKS	**490 CARS**

PERIMETER USE

BASEMENT 3	**270 CARS**
TOTAL PERIMETER USE CARPARKS	**270 CARS**

TOTAL CARPARKS	1,460

BICYCLE PARKING

STAFF

BASEMENT 2	**100 SPACES**
TOTAL STAFF SPACES	**100 SPACES**

VISITOR

BASEMENT 2	**86 SPACES**
BASEMENT 1	**114 SPACES**
TOTAL STAFF SPACES	**200 SPACES**

TOTAL BICYCLE SPACES	300

AREA CALCULATIONS

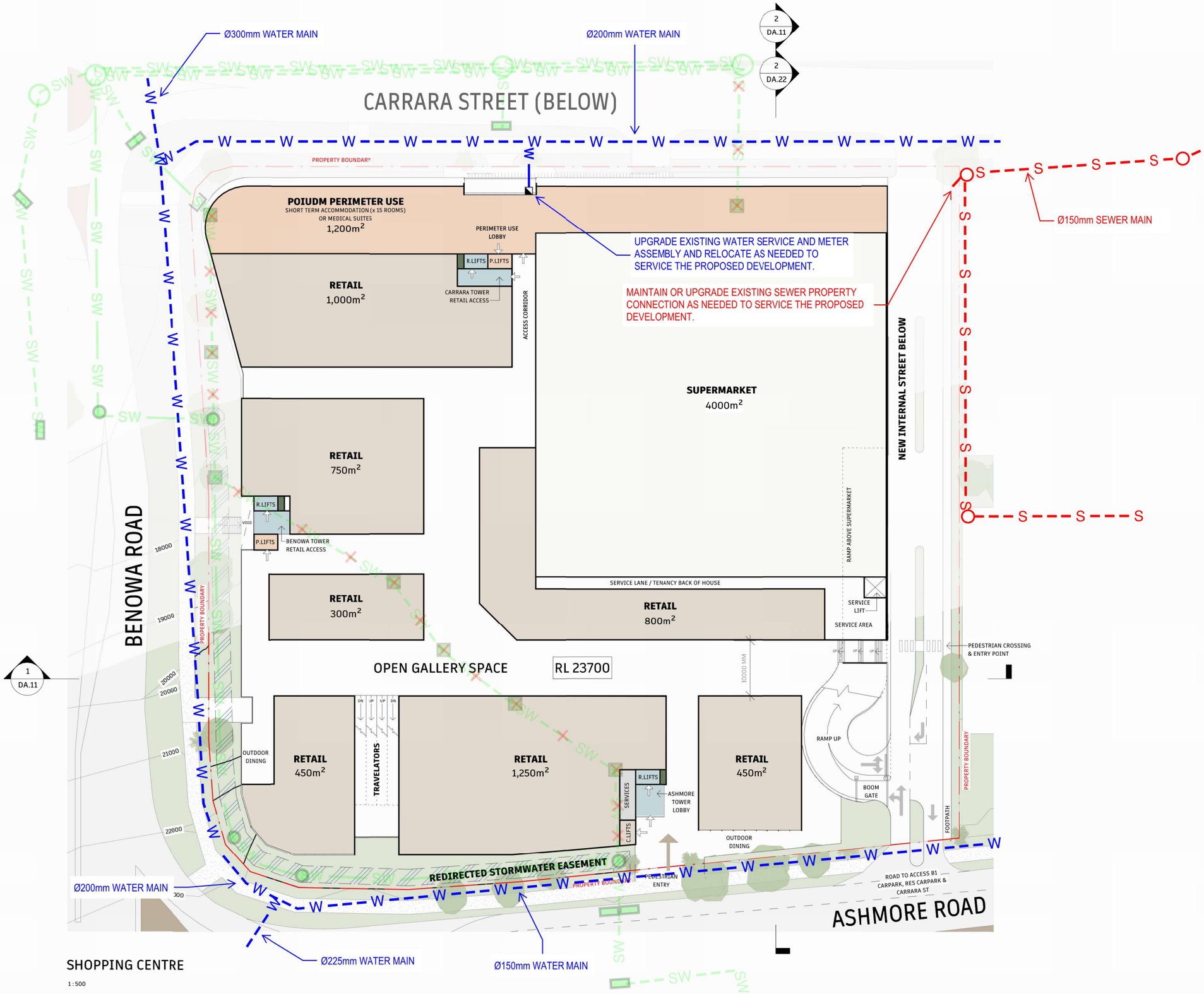
RETAIL AREA

SUPERMARKET	**4,000m^2**
SPECIALTY SHOPS:	**6,000m^2**
RETAIL BASEMENT 2 LEVEL:	**700m^2**
RETAIL BASEMENT 1 LEVEL:	**300m^2**
SHOPPING CENTRE LEVEL:	**5,000m^2**
TOTAL RETAIL	**10,000m^2**

COMMERCIAL AREA

LEVEL 1:	**2,500m^2**
LEVEL 2:	**500m^2**
TOTAL COMMERCIAL	**3,000m^2**

FLOOR PLAN-SHOPPING CENTRE



SHOPPING CENTRE

1:500

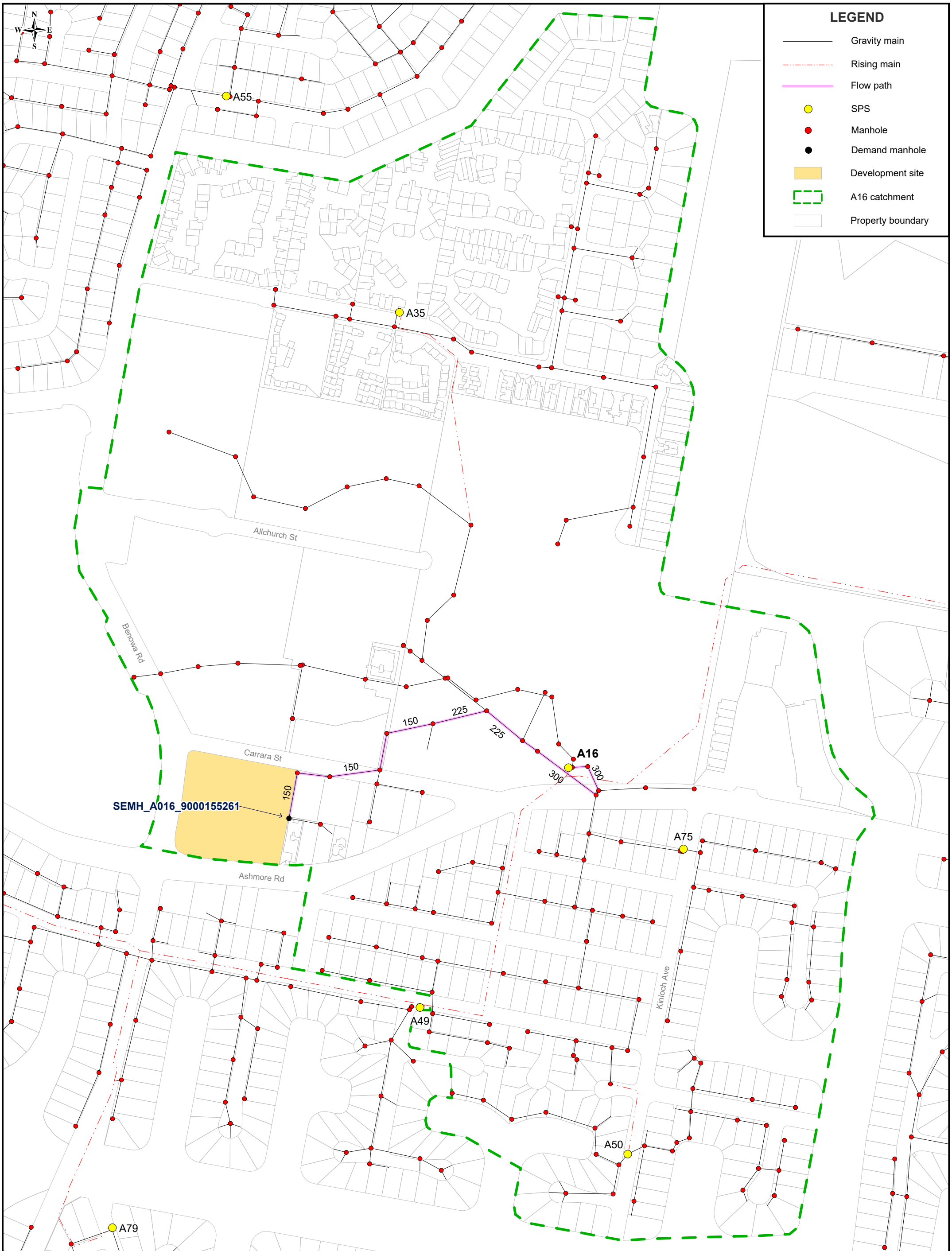
LEGEND

- RETAIL
- STAFF BICYCLE PARKING
- COMMERCIAL
- RESIDENTIAL
- VISITOR BICYCLE PARKING
- COMMUNITY OUTDOOR
- REFUSE
- PERIMETER USE

CONCEPT SERVICES PLAN
MCE 24191
LG_REV-2 06-02-25

0 5 10 25 45m

Appendix 2. Development site and SPS A16 sewer catchment



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DRAWN:	J Meesamphan
CHECKED:	J May
APPROVED:	J May
CLIENT PM:	
H2ONE PM:	J May

NOTE: DESIGN NOT TO BE AMENDED WITHOUT H2ONE PTY LTD ACCEPTANCE

No.	REVISION	APPROVED
A	ORIGINAL ISSUE - 19 MAY 2025	

DATUM:
HORIZ: MGA94 (ZONE 56)
HEIGHT: AHD

SCALE:
0 75 150
Metres

SURVEYED BY / DATE:
SURVEY CHECKED:

PROJECT NO: 2505699
FILE REF:
CAD FILE:

CITY OF GOLD COAST
PO BOX 5042, GCMC QLD 9729

203 Ashmore Rd Benowa QLD 4217 Water Supply and Sewerage Network Capacity Assessment

Appendix 2. Development site and SPS A16 sewer catchment

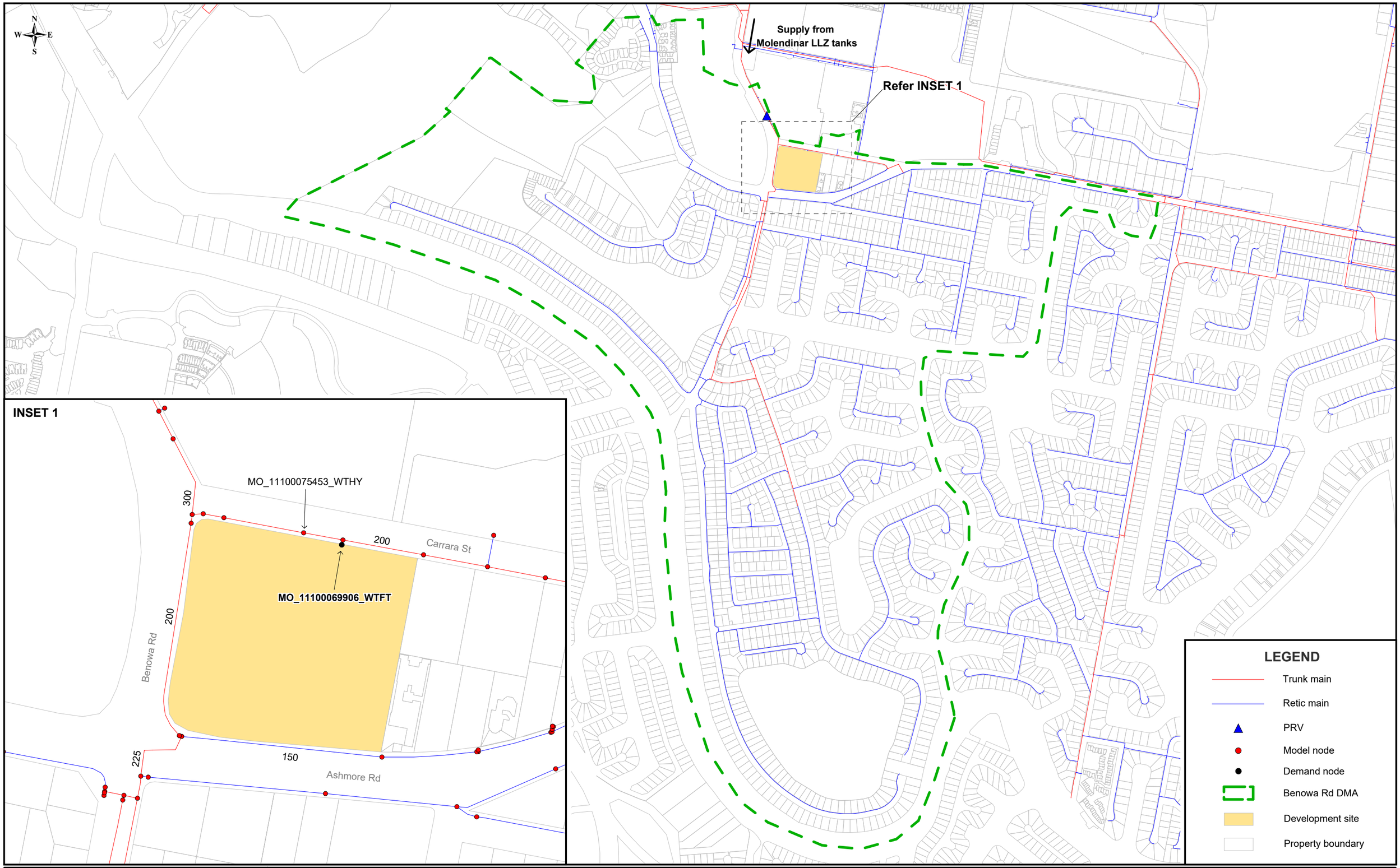
MAY, 2025

DATE SCANNED:

DRG No:

REV:

Appendix 3. Development site and Benowa Rd DMA



H2ONE

H2One Pty Ltd
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DESIGNED:	J Meesamphan
DRAWN:	J Meesamphan
CHECKED:	J May
APPROVED:	J May
CLIENT PM:	
H2ONE PM:	J May

NOTE: DESIGN NOT TO BE AMENDED WITHOUT H2ONE PTY LTD ACCEPTANCE

No.	REVISION	APPROVED
A	ORIGINAL ISSUE - 19 MAY, 2025	

DATUM:
HORIZ: MGA94 (ZONE 56)
HEIGHT: AHD

SCALE:
0 225 450
Metres

SURVEYED BY / DATE:

SURVEY CHECKED:

H2ONE REFERENCES

PROJECT NO:
2505699

FILE REFERENCE:

CAD FILE:

CITY OF GOLD COAST
PO BOX 5042, GCMC QLD 9729

203 Ashmore Rd Benowa QLD 4217 Water Supply and Sewerage Network Capacity Assessment

Appendix 3. Development site and Benowa Rd DMA

ORIGINAL ISSUE DATE:
MAY, 2025

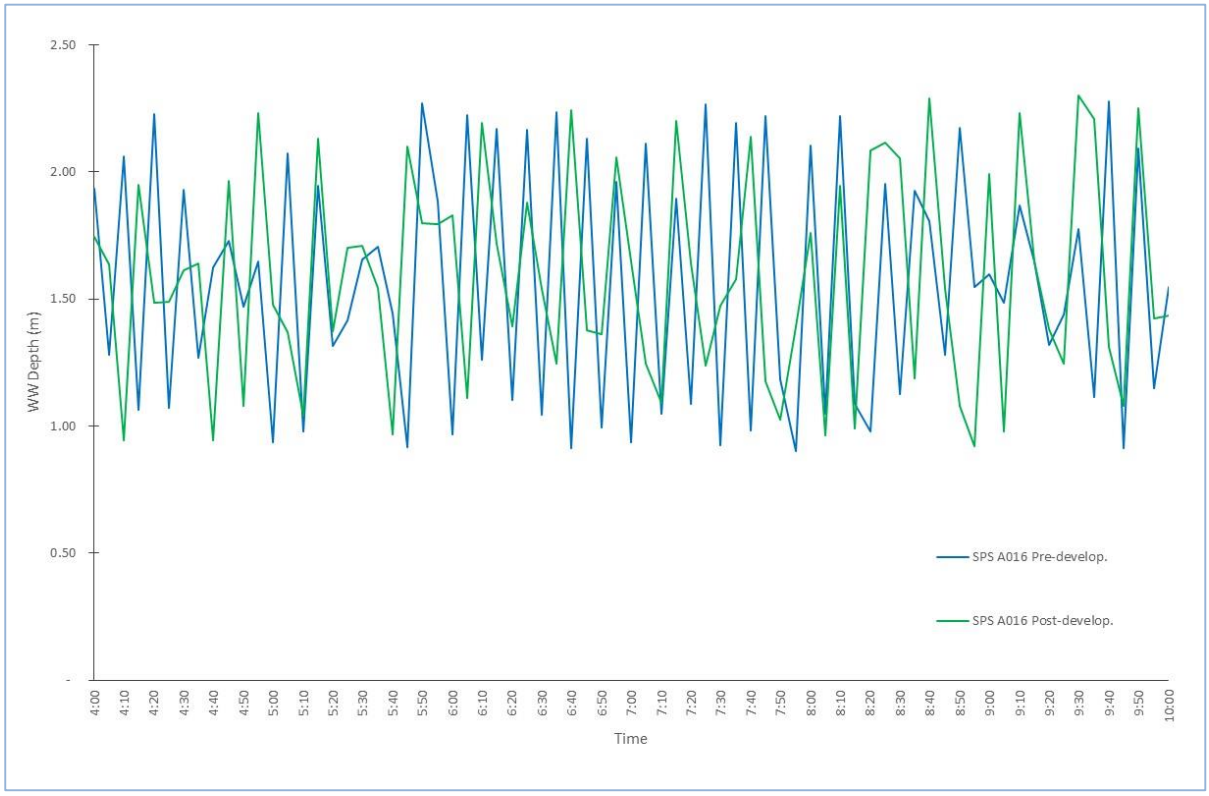
DATE SCANNED:

DRG No:

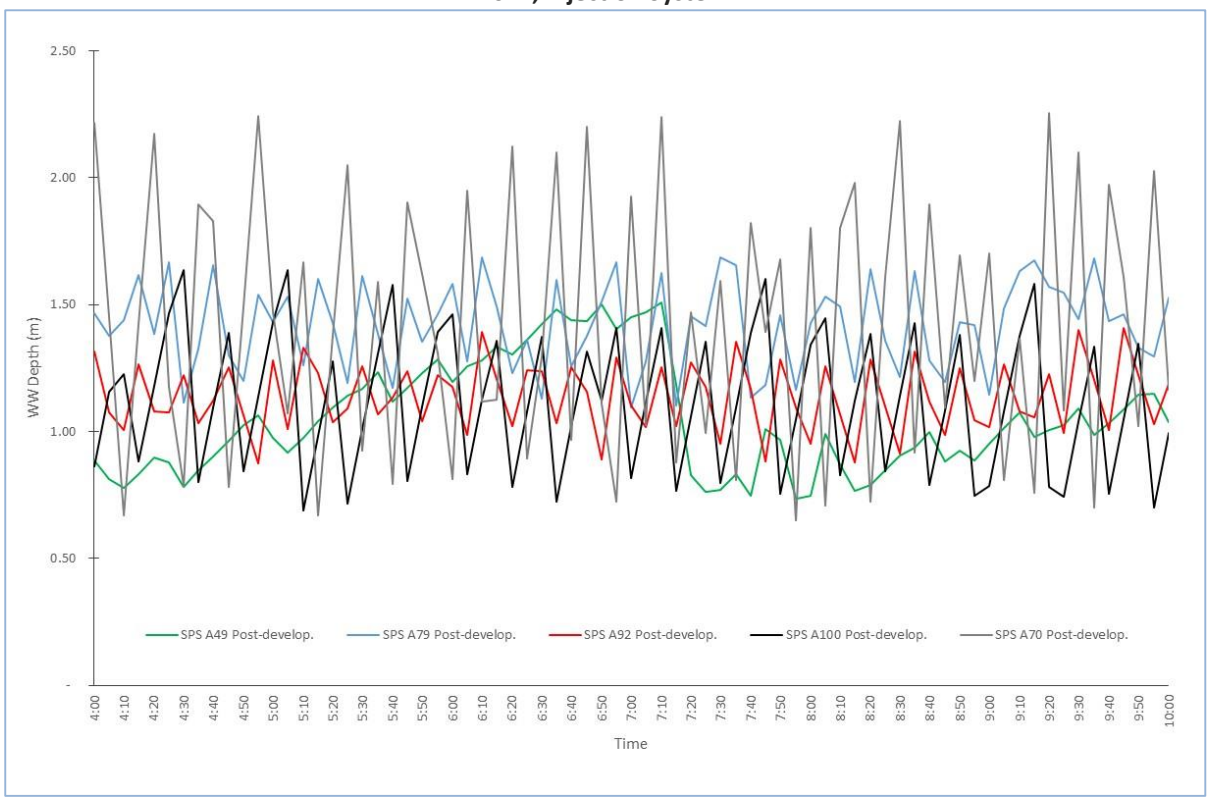
REV:

Appendix 4. Pump capacity assessment results

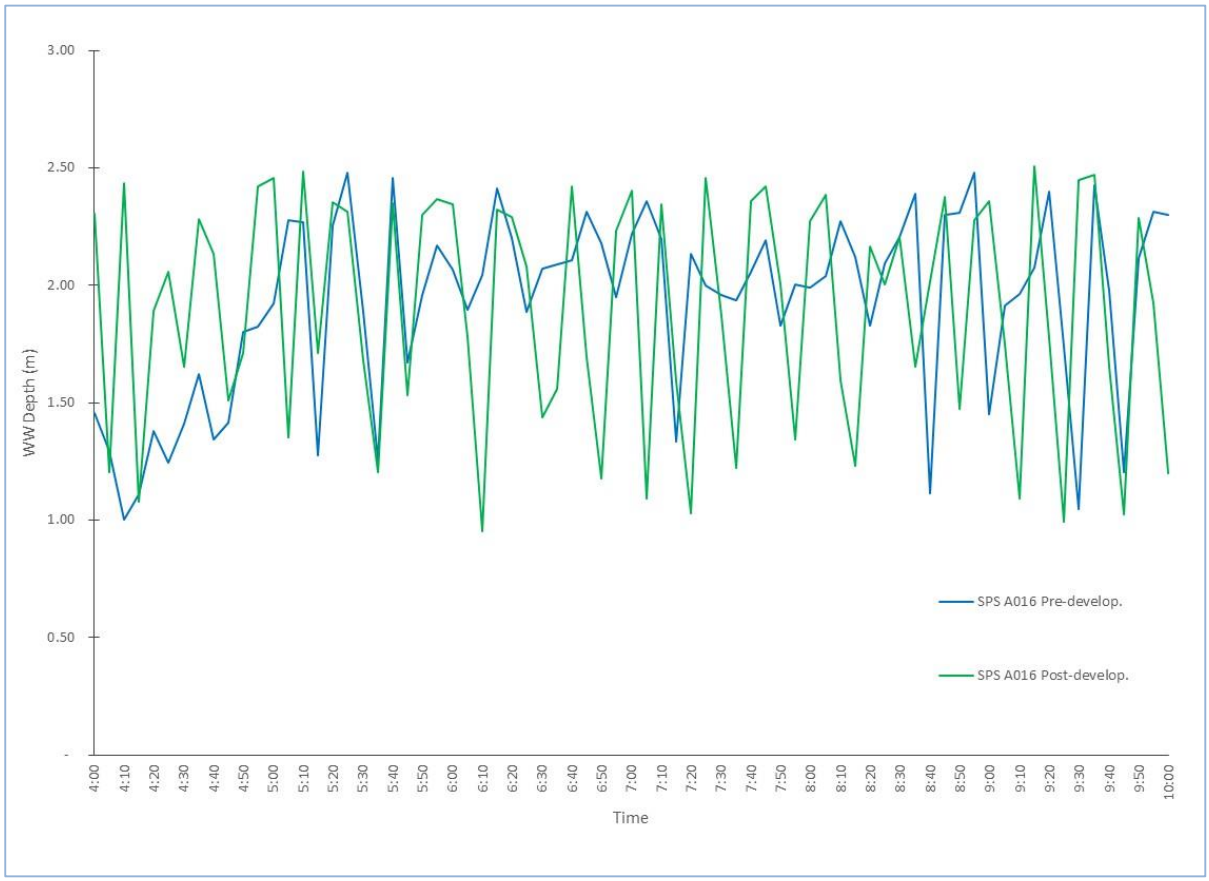
2021, SPS A016



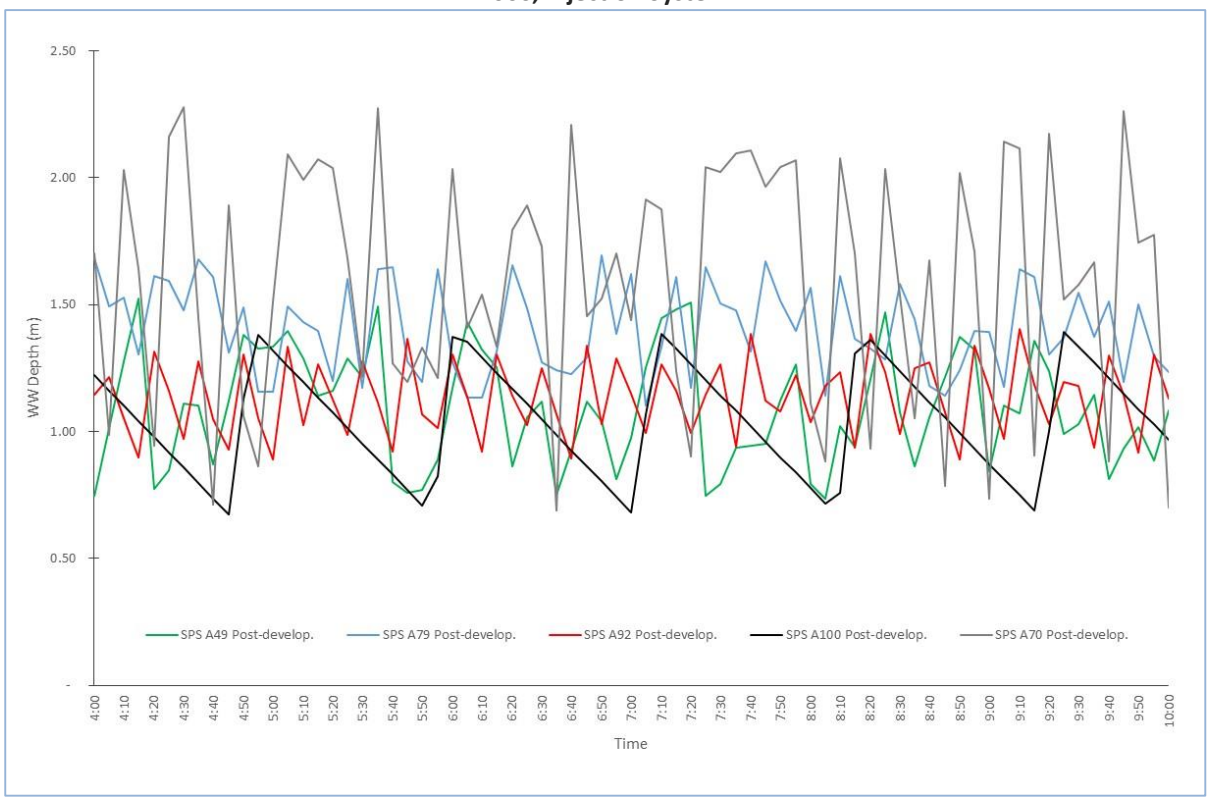
2021, Injection System



2066, SPS A016



2066, Injection System

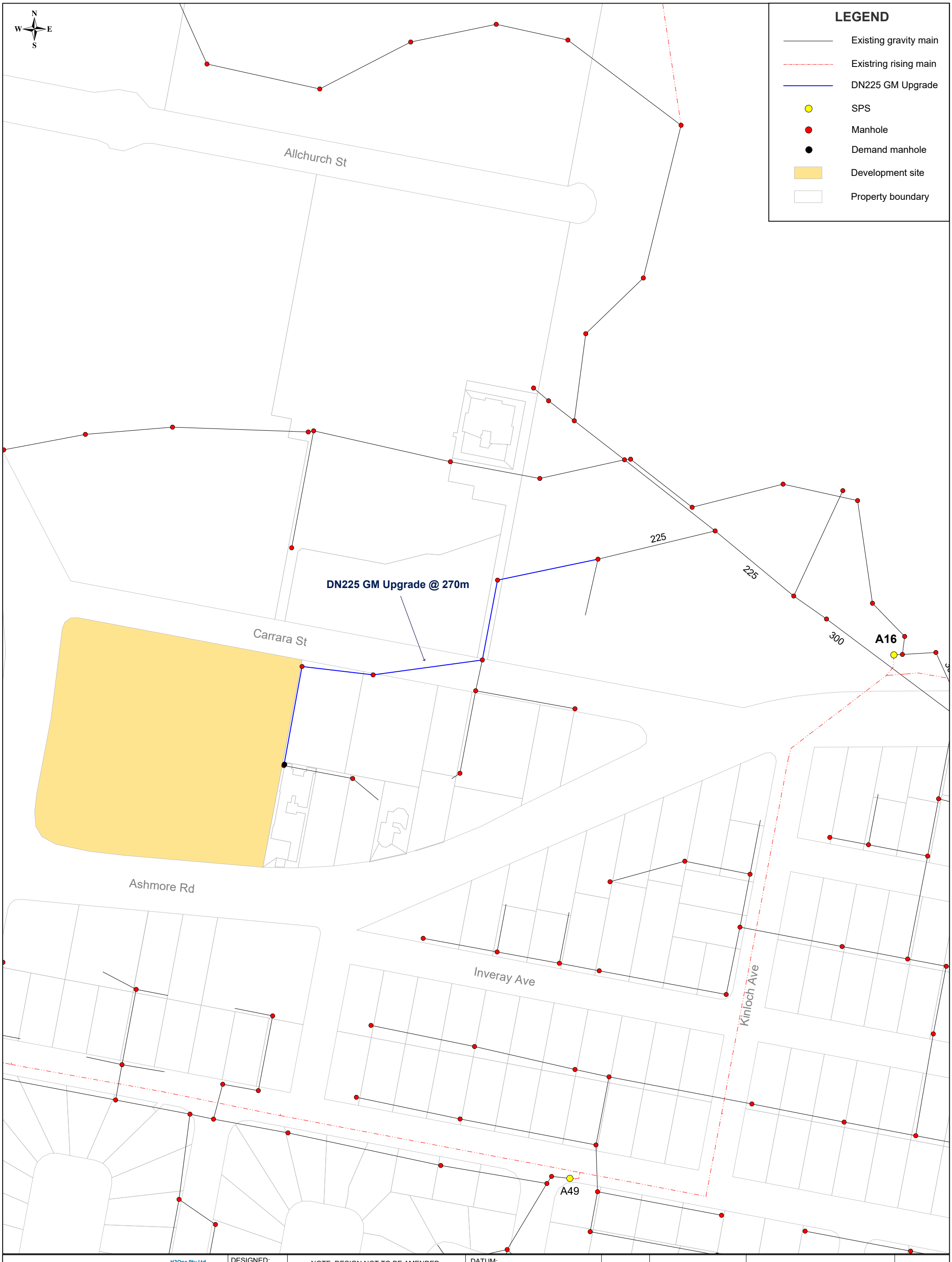


Appendix 5. Operational storage capacity assessment results

		2021 (Post-develop.)	2066 (Post-develop.)
Single Pump Capacity Required	C1	3.95	3.75
	ADWF (L/s)	10.35	12.89
	Q (L/s)	40.90	48.37
Storage Capacity Required	Pump Setup	Duty/Assist	Duty/Assist
	Duty Head (m)	NA	NA
	Pump Efficiency (%)	NA	NA
	Duty Power (kW)	<100.00	<100.00
	No. pump starts (n)	12.00	12.00
	Volume (kL)	3.07	3.63
Storage Capacity Available	Duty Start (m)	2.31	2.31
	Duty Stop (m)	0.90	0.90
	Duty Height (m)	1.41	1.41
	WW Diam. (m)	3.04	3.04
	Volume (kL)	10.23	10.23
OUTCOME	**Difference (kL)**	+7.16	+6.60
	Pass / Fail	**Pass**	**Pass**

Note: Wet well and pump details were sourced from the CoGC's LGIP hydraulic model.

Appendix 6. Recommended sewer gravity main upgrade



H2ONE

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NOTE: DESIGN NOT TO BE AMENDED WITHOUT H2ONE PTY LTD ACCEPTANCE

No.	REVISION	APPROVED
A	ORIGINAL ISSUE - 19 MAY 2025	

DATUM:
HORIZ: MGA94 (ZONE 56)
HEIGHT: AHD

SCALE:
0 30 60
Metres

SURVEYED BY / DATE:

SURVEY CHECKED:

PROJECT NO: 2505699

FILE REF:

CAD FILE:

CITY OF GOLD COAST
PO BOX 5042, GCMC QLD 9729

203 Ashmore Rd Benowa QLD 4217 Water Supply and Sewerage Network Capacity Assessment

Appendix 6. Recommended sewer gravity main upgrade

MAY, 2025

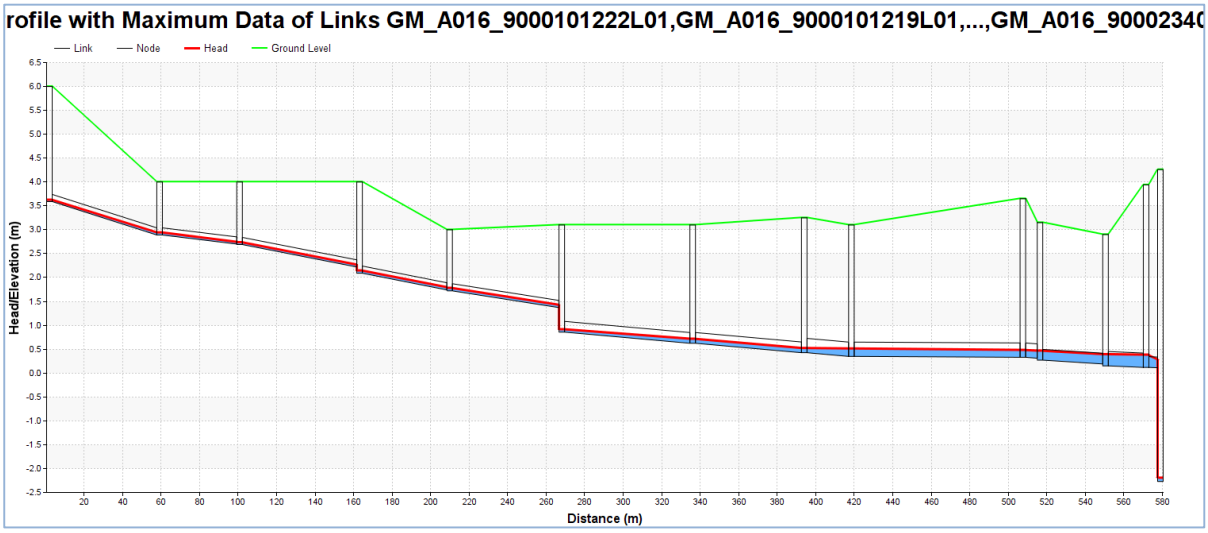
DATE SCANNED:

DRG No:

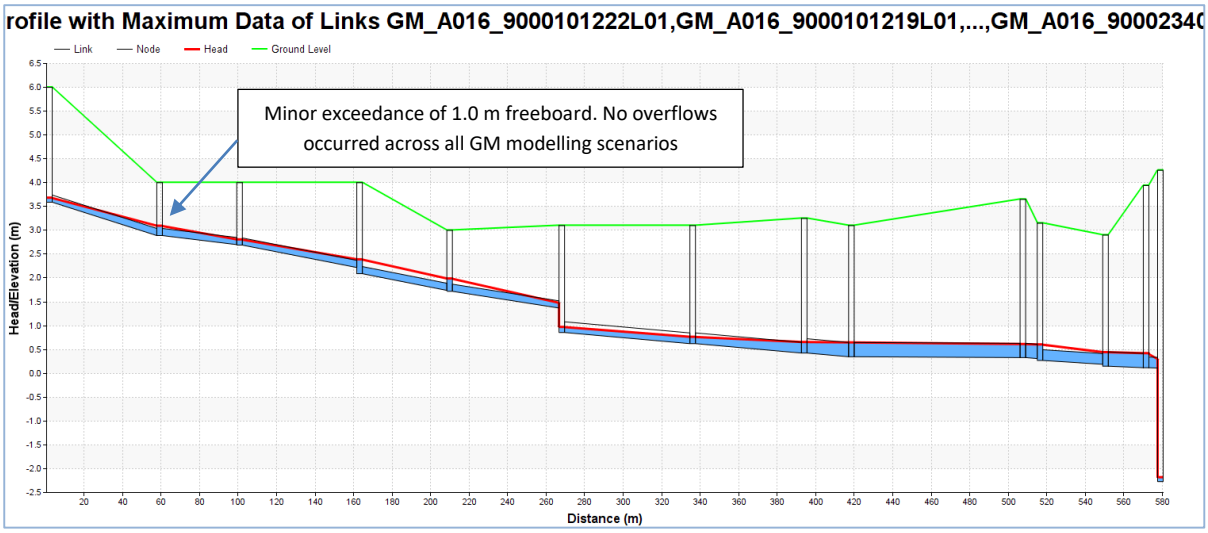
REV:

Appendix 7. Gravity main flow depth capacity assessment results

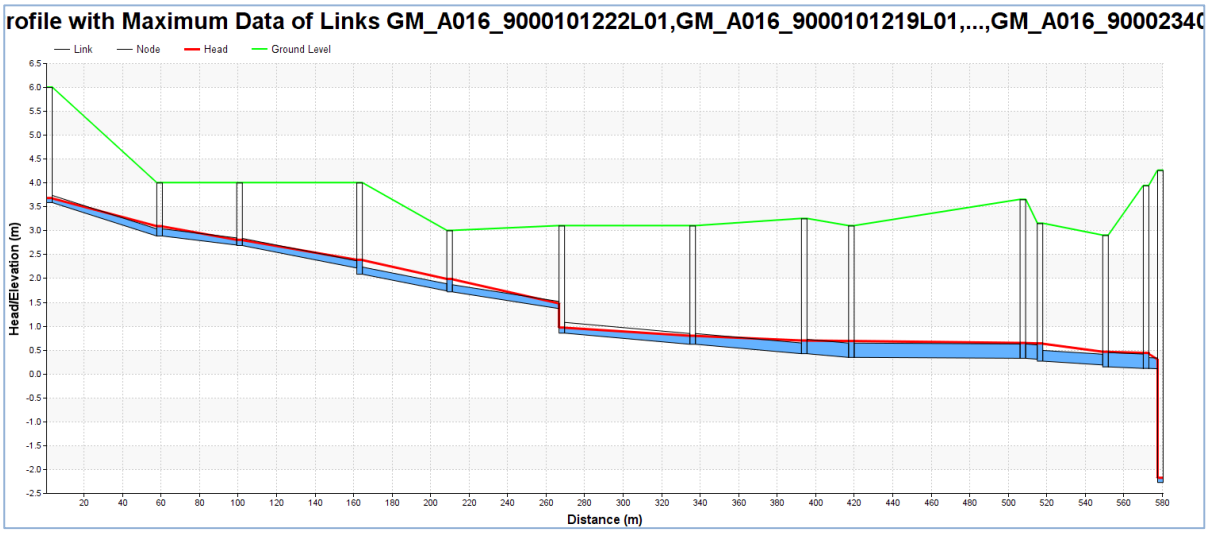
2021, Pre-development



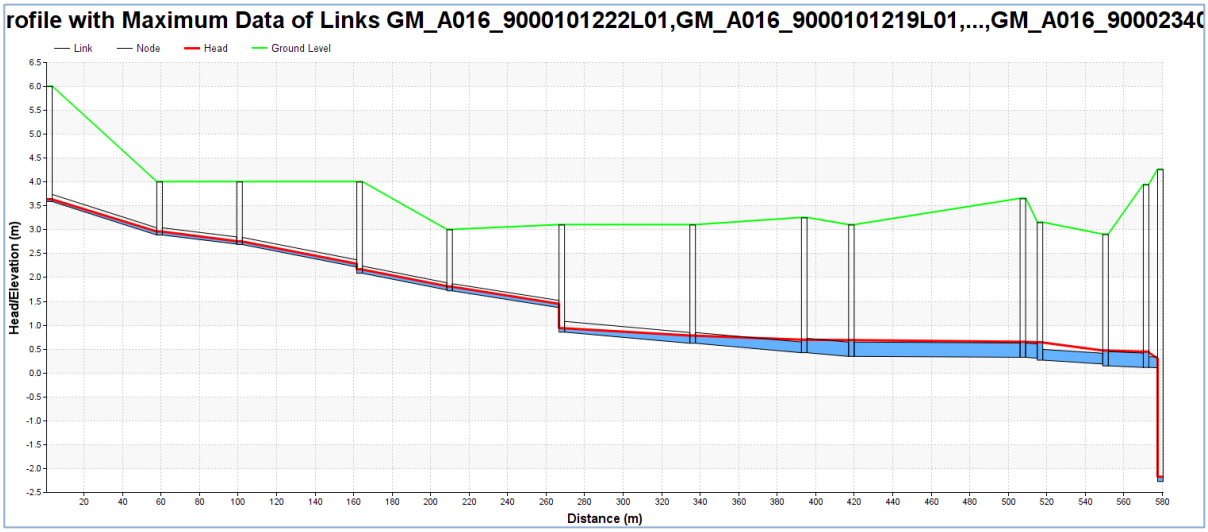
2021, Post-development



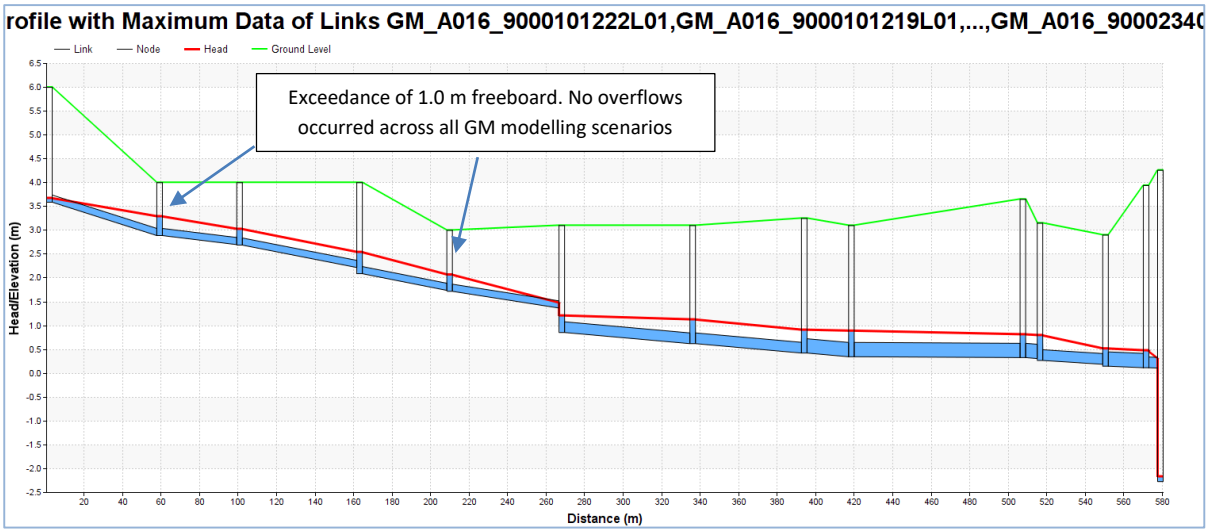
2026, Post-development



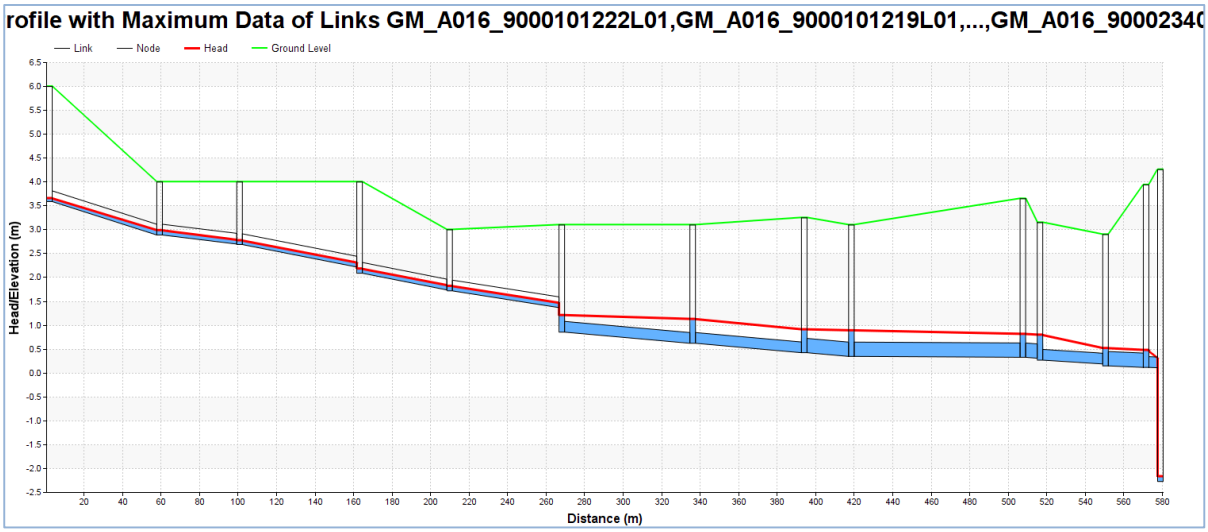
2066, Pre-development



2066, Post-development



2066, Post-development + DN225 upgrade



Appendix 8. Emergency storage capacity assessment results

	Pipe ID	US IL (m)	DS IL (m)	Length (m)	Length Below OF (m)	Slope (%)	Diam. (m)	Radius (m)	d/D (%)	Pipe Flow Depth (m)	Pipe Wetted Area (m)	Empty Vol. Below OF (m3)	ADWF Vol. Below OF (m3)	ES Vol. Avail. (m3)
2021 Pre-develop.	GM_A016_9000100916L01	0.62	0.43	59.2	59.2	0.0033	0.225	0.11	15.0%	0.034	0.0037	2.4	0.2	2.1
	GM_A016_9000101219L01	2.89	2.70	41.6	-195.2	0.0046	0.150	0.08	15.1%	0.023	0.0017	-3.4	-0.3	-
	GM_A016_9000101222L01	3.59	2.89	58.5	-90.4	0.0120	0.150	0.08	14.2%	0.021	0.0015	-1.6	-0.1	-
	GM_A016_9000101241L01	0.27	0.19	33.5	33.5	0.0024	0.225	0.11	21.0%	0.047	0.0061	1.3	0.2	1.1
	GM_A016_9000101247L01	0.86	0.62	70.0	70.0	0.0033	0.225	0.11	14.0%	0.032	0.0034	2.8	0.2	2.5
	GM_A016_9000154951L01	0.35	0.33	92.7	92.7	0.0002	0.300	0.15	18.0%	0.054	0.0086	6.5	0.8	5.8
	GM_A016_9000155308L01	0.15	0.12	19.6	19.6	0.0016	0.300	0.15	22.4%	0.067	0.0118	1.4	0.2	1.2
	GM_A016_9000233697L01	0.43	0.35	23.3	23.3	0.0033	0.300	0.15	16.0%	0.048	0.0073	1.6	0.2	1.5
	GM_A016_9000233921L01	0.33	0.31	6.5	6.5	0.0031	0.300	0.15	13.0%	0.039	0.0054	0.5	0.0	0.4
	GM_A016_9000233993L01	2.69	2.22	64.0	-56.1	0.0073	0.150	0.08	14.9%	0.022	0.0016	-1.0	-0.1	-
	GM_A016_9000234021L01	2.09	1.74	47.2	9.2	0.0074	0.150	0.08	17.1%	0.026	0.0020	0.2	0.0	0.1
	GM_A016_9000234025L01	1.72	1.37	59.6	59.6	0.0059	0.150	0.08	17.8%	0.027	0.0021	1.1	0.1	0.9
	GM_A016_9000234045L01	0.12	0.11	4.9	4.9	0.0016	0.225	0.11	30.4%	0.068	0.0102	0.2	0.0	0.1
2021 Post-develop.	GM_A016_9000100916L01	0.62	0.43	59.2	59.2	0.0033	0.225	0.11	23.4%	0.053	0.0071	2.4	0.4	1.9
	GM_A016_9000101219L01	2.89	2.70	41.6	-195.2	0.0046	0.150	0.08	32.4%	0.049	0.0050	-3.4	-1.0	-
	GM_A016_9000101222L01	3.59	2.89	58.5	-90.4	0.0120	0.150	0.08	30.4%	0.046	0.0045	-1.6	-0.4	-
	GM_A016_9000101241L01	0.27	0.19	33.5	33.5	0.0024	0.225	0.11	28.2%	0.063	0.0092	1.3	0.3	1.0
	GM_A016_9000101247L01	0.86	0.62	70.0	70.0	0.0033	0.225	0.11	23.5%	0.053	0.0071	2.8	0.5	2.3
	GM_A016_9000154951L01	0.35	0.33	92.7	92.7	0.0002	0.300	0.15	25.9%	0.078	0.0145	6.5	1.3	5.2
	GM_A016_9000155308L01	0.15	0.12	19.6	19.6	0.0016	0.300	0.15	27.6%	0.083	0.0159	1.4	0.3	1.1
	GM_A016_9000233697L01	0.43	0.35	23.3	23.3	0.0033	0.300	0.15	24.1%	0.072	0.0132	1.6	0.3	1.3
	GM_A016_9000233921L01	0.33	0.31	6.5	6.5	0.0031	0.300	0.15	17.9%	0.054	0.0086	0.5	0.1	0.4
	GM_A016_9000233993L01	2.69	2.22	64.0	-56.1	0.0073	0.150	0.08	30.1%	0.045	0.0045	-1.0	-0.3	-
	GM_A016_9000234021L01	2.09	1.74	47.2	9.2	0.0074	0.150	0.08	31.3%	0.047	0.0047	0.2	0.0	0.1
	GM_A016_9000234025L01	1.72	1.37	59.6	59.6	0.0059	0.150	0.08	32.6%	0.049	0.0050	1.1	0.3	0.8
	GM_A016_9000234045L01	0.12	0.11	4.9	4.9	0.0016	0.225	0.11	35.7%	0.080	0.0127	0.2	0.1	0.1
2066 Pre-develop.	GM_A016_9000100916L01	0.62	0.43	59.2	59.2	0.0033	0.225	0.11	19.3%	0.043	0.0054	2.4	0.3	2.0
	GM_A016_9000101219L01	2.89	2.70	41.6	-195.2	0.0046	0.150	0.08	19.4%	0.029	0.0024	-3.4	-0.5	-
	GM_A016_9000101222L01	3.59	2.89	58.5	-90.4	0.0120	0.150	0.08	17.8%	0.027	0.0021	-1.6	-0.2	-
	GM_A016_9000101241L01	0.27	0.19	33.5	33.5	0.0024	0.225	0.11	25.5%	0.057	0.0080	1.3	0.3	1.1
	GM_A016_9000101247L01	0.86	0.62	70.0	70.0	0.0033	0.225	0.11	18.3%	0.041	0.0050	2.8	0.3	2.4
	GM_A016_9000154951L01	0.35	0.33	92.7	92.7	0.0002	0.300	0.15	22.4%	0.067	0.0118	6.5	1.1	5.5
	GM_A016_9000155308L01	0.15	0.12	19.6	19.6	0.0016	0.300	0.15	27.6%	0.083	0.0159	1.4	0.3	1.1
	GM_A016_9000233697L01	0.43	0.35	23.3	23.3	0.0033	0.300	0.15	20.2%	0.061	0.0102	1.6	0.2	1.4
	GM_A016_9000233921L01	0.33	0.31	6.5	6.5	0.0031	0.300	0.15	16.1%	0.048	0.0074	0.5	0.0	0.4
	GM_A016_9000233993L01	2.69	2.22	64.0	-56.1	0.0073	0.150	0.08	19.7%	0.030	0.0025	-1.0	-0.1	-
	GM_A016_9000234021L01	2.09	1.74	47.2	9.2	0.0074	0.150	0.08	22.9%	0.034	0.0030	0.2	0.0	0.1
	GM_A016_9000234025L01	1.72	1.37	59.6	59.6	0.0059	0.150	0.08	23.8%	0.036	0.0032	1.1	0.2	0.9
	GM_A016_9000234045L01	0.12	0.11	4.9	4.9	0.0016	0.225	0.11	36.6%	0.082	0.0132	0.2	0.1	0.1
2066 Post-develop.	GM_A016_9000100916L01	0.62	0.43	59.2	59.2	0.0033	0.225	0.11	24.9%	0.056	0.0077	2.4	0.5	1.9
	GM_A016_9000101219L01	2.89	2.70	41.6	-195.2	0.0046	0.150	0.08	31.9%	0.048	0.0049	-3.4	-0.9	-
	GM_A016_9000101222L01	3.59	2.89	58.5	-90.4	0.0120	0.150	0.08	29.7%	0.044	0.0044	-1.6	-0.4	-
	GM_A016_9000101241L01	0.27	0.19	33.5	33.5	0.0024	0.225	0.11	30.5%	0.069	0.0103	1.3	0.3	1.0
	GM_A016_9000101247L01	0.86	0.62	70.0	70.0	0.0033	0.225	0.11	24.7%	0.056	0.0077	2.8	0.5	2.2
	GM_A016_9000154951L01	0.35	0.33	92.7	92.7	0.0002	0.300	0.15	27.6%	0.083	0.0159	6.5	1.5	5.1
	GM_A016_9000155308L01	0.15	0.12	19.6	19.6	0.0016	0.300	0.15	31.1%	0.093	0.0187	1.4	0.4	1.0
	GM_A016_9000233697L01	0.43	0.35	23.3	23.3	0.0033	0.300	0.15	25.7%	0.077	0.0143	1.6	0.3	1.3
	GM_A016_9000233921L01	0.33	0.31	6.5	6.5	0.0031	0.300	0.15	19.4%	0.058	0.0096	0.5	0.1	0.4
	GM_A016_9000233993L01	2.69	2.22	64.0	-56.1	0.0073	0.150	0.08	30.3%	0.046	0.0045	-1.0	-0.3	-
	GM_A016_9000234021L01	2.09	1.74	47.2	9.2	0.0074	0.150	0.08	32.6%	0.049	0.0050	0.2	0.0	0.1
	GM_A016_9000234025L01	1.72	1.37	59.6	59.6	0.0059	0.150	0.08	34.0%	0.051	0.0053	1.1	0.3	0.7
	GM_A016_9000234045L01	0.12	0.11	4.9	4.9	0.0016	0.225	0.11	40.1%	0.090	0.0149	0.2	0.1	0.1

	2021	2026	2031	2036	2041	2066
LGIP ES Avail. (kL)	116.7	116.2	115.5	115.3	115.0	114.1
LGIP ES Upgrade (kL)	-	-	-	-	-	-
ES Storage Lost (kL)	1.55	1.55	1.55	1.55	1.55	1.10
ES Req. (kL)	102.8	105.9	111.3	114.2	117.1	129.1
Difference (kL)	12.4	8.7	2.7	-0.4	-3.6	-16.1
Pass/Fail	PASS	PASS	PASS	FAIL	FAIL	FAIL

Appendix 9. Water supply standard flow and fire flow modelling results

Standard Flow

Provision	2021		2026		2031		2036		2041		2066	
	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.
Conn. (*MO_11100069906_WTFT*) min. pressure (m)	62.4	62.8	62.4	62.6	60.9	62.3	59.4	60.8	57.0	58.5	51.2	52.2
Network min. pressure (m)	38.8	39.1	38.5	38.6	36.9	38.3	35.3	36.7	33.0	34.4	27.3	28.3
Network no. failures	0	0	0	0	0	0	0	0	0	0	0	0
Min. pressure node ID	MO_11100320898_WTFT											
Tank min. water level (%)	80%	80%	82%	82%	77%	77%	72%	72%	62%	61%	48%	47%
Max. pipe velocity (m/s)	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Network no. failures	0	0	0	0	0	0	0	0	0	0	0	0
Network max. velocity ID	MO_9546PIPE_11100057795											

Note: Peak hour occurred at 7 am across all planning horizons.

Fire Flow

Scenario		2021		2026		2031		2036		2041		2066	
		Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.	Pre-develop.
Peak Hour	Site hyd. (*MO_11100075453_WTHY)* min. pressure (m)	56.2	58.3	52.5	54.7	50.6	52.8	49.1	51.3	47.5	49.7	43.3	45.0
	Network hydrant min. pressure (m)	12.2	13.1	5.0	6.7	2.8	4.5	1.3	3.0	-0.4	1.3	-3.1	-1.8
	Network hydrant no. failures	0	0	0	0	1	0	1	1	2	1	2	2
	Min. pressure node ID	MO_11100067480_WTHY											
2/3 Peak Hour	Site hyd. (*DEM_NODE_HY)* min. pressure (m)	60.7	62.1	59.0	61.0	57.8	59.4	56.6	58.2	55.0	56.6	51.2	52.5
	Network hydrant min. pressure (m)	16.4	16.5	13.8	14.0	13.6	13.6	12.4	13.5	10.8	12.0	7.9	8.8
	Network hydrants no. failures	0	0	0	0	0	0	0	0	1	1	1	1
	Min. pressure node ID	MO_11100067480_WTHY											

Note 1: Results do not consider MOL (15%) of the supply tanks, as the Benowa Rd PRV operates as a “break of head”.

Note 2: Peak hour occurred at 7 am and 2/3 peak hour at 6:30 pm across all planning horizons.