

Infrastructure Servicing Assessment

Planning Proposal, Gan Gan Road, Anna Bay, NSW



Final Report

P2208888JR13V01

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Prepared for AB Rise Pty Ltd

environmental science & engineering

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1 Introduction

1.1 Overview

Martens and Associates Pty Ltd (**MA**) have prepared this preliminary utility infrastructure assessment report on behalf of AB Rise Pty Ltd (the **Client**) to support a planning proposal for the rezoning and subsequent development of land at 196 Old Main Road and 263, 271, 273, 293 and 321 Gan Gan Road, Anna Bay, NSW (the **Site**) for residential purposes.

The Site is shown in Map 1.

1.2 Scope of Assessment

The scope of this assessment includes:

1. Determine the availability of existing utility services adjacent to the Site, including consultation with services providers where necessary.
2. Provide an estimation of water and sewage generation rates from the future development for each stage of the development.
3. Comment on the likely capacity of the existing services infrastructure to service the future development.
4. Consideration of infrastructure delivery requirements.

Refer to the previous water and sewer servicing report (Martens reference P2208888JR11V02, September 2023) for details of the Stage 1 water and sewer servicing requirements.

1.3 Proposed Development

The proposed development is based on the BKA Architecture (3 December 2024) *Proposed Masterplan and Yield* (the **Masterplan**, Appendix B) and consists of:

1. Subdivision of the Site into 478 lots of differing sizes (418 single occupancy blocks, 58 dual occupancy blocks and 2 multi-dwelling larger lots).
2. Construction of an internal road access network including new collector road between Gan Gan Road, Anna Bay and Saltbush Avenue, One Mile and to potential new developments to the east, west and north of the Site.
3. Provision of associated services including (but not limited to): sewer, water, electricity, telecommunications / internet and stormwater drainage.
4. Flood mitigation and drainage works.
5. New public reserves comprising areas of existing bushland and rehabilitated and reforested areas.

Table 1: Proposed development staging and proposed number of new lots and dwellings.

Stage	Sections	Proposed Lots	Proposed Dwellings
1 ¹	A – C	34	34
2	E – F	13	64
3	GA – GD	61	67
4	HA – HE	67	72
5	IA – IJ	124	136
6	N	14	15
7	MA – MC	73	94
8	LA – LC	46	48
9	KA – KC	43	45
10	JA – JC	37	43
Total excluding Stage 1	E – N	478	584

Notes:

1. Stage 1 of development is at the time of writing, the subject of a development application before Council.

1.4 Relevant Guidelines and Documents

The following guideline documents have been reviewed in preparation of this report:

1. Sewerage Code of Australia, WSA 02-2002-2.3 Hunter Water Edition Version 1 (**Hunter Water Sewer Code**).
2. Water Supply Code of Australia WSA 03-2002-2.3 Hunter Water Edition Version 1 (**Hunter Water Water Code**).
3. Port Stephens Council (2021) *Development Control Plan*.
4. BKA Architecture (9 August 2024) *Proposed Masterplan and Yield*.
5. Before You Dig Plans (obtained August 13 2024).
6. Hunter Water (19 August 2024) *Statement of Available Flow and Pressure*.

1.5 Site Characteristics

An overview of site characteristics is provided in Table 2.

Table 2: Site description.

Item	Details
Local Government Area	Port Stephens Council
Lot and DP	Lot 963 DP 731955 (196 Old Main Road, Anna Bay) Lot 21 DP 590387 (263 Gan Gan Road, Anna Bay) Lot 1 DP 536752 (271 Gan Gan Road, Anna Bay) Lot 901 DP 634550 (273 Gan Gan Road, Anna Bay) Lot 902 DP 634550 (293 Gan Gan Road, Anna Bay) Lot 1 DP 503876 (321 Gan Gan Road, Anna Bay)
Site Area	Approximately 118.8 ha
Current Land Use	Rural residential
Current Zoning	RU2 – Rural Landscape R2 – Low Density Residential C3 – Environmental Management
Surrounding Land Use	West, north and east of Site – generally rural residential with environment conservation. South of Site – Gan Gan Road and rural – residential / residential development.
Existing Site Infrastructure	Site contains six single dwellings with associated sheds, driveways / accesses, services (water, sewer, telecommunications, electricity and NBN).
Site topography	Site topography is characterised into three primary morphological units: Low lying: majority of Site is low lying and relatively flat (slopes <1%), elevation ranges between 0 – 2 mAHD. Sand dune: east / west aligned linear sand dune near to southern Site bounding. Reaches approximately 23 mAHD at the top of the dune. Grades vary between 0 – 20% in this area. Valley – narrow strip of land, approximately 100 m wide between the Sand dune and Gan Gan Road. Elevation is generally 5 – 7 mAHD.

2 Water Supply

2.1 Existing Services

A Before You Dig enquiry noted the following existing water supply infrastructure in the vicinity of the Site:

1. A 200 mm AC main located in Gan Gan Road to the south of the Site. This main is located on the northern (Site) side of the road reserve (**Main A**).
2. A 300 mm PVC-M main located in Gan Gan Road to the south of the Site on the southern side of the road reserve (**Main B**).
3. A 300 mm DICL main located in Gan Gan Road to the south of the Site on the southern side of the road reserve (**Main C**).
4. 150 mm PVC-O main located at the intersection of Salt Bush Avenue, Sea Mist Avenue and Harris Road (unformed road to the north east of the Site) (**Main D**).
5. 100 mm UPVC-HD main located on the southern side of Frost Road to the north of the Site which connects the main in Salt Bush Avenue to the existing water main in Gan Gan Road (**Main E**).

2.2 Hunter Water Advice

Preliminary servicing advice has been obtained from Hunter Water and is provided in Appendix C. They have advised the following in relation to potable water supply for the planning proposal:

1. An estimated developer servicing charge of approximately \$3,510 / ET (Nelson Bay Water Zone) will apply. Based on a total of 584 ET, this equates to approximately \$2,050,000.
2. Connection to existing Mains A, B and D are permitted.
3. Connection to existing Main C is not permitted as this supplies the town of Boat Harbour.
4. There is currently sufficient capacity in the local water supply network to service the proposed development, subject to confirmation in a formal Water Servicing Report to confirm the development connection points, security of supply, pressure management and staged servicing requirements.
5. No comment is provided regarding availability of connection or any upgrade requirements for existing Main D.
6. The development will require a Water Servicing Report to be completed by a Hunter Water accredited design consultant to confirm connection requirements.

2.3 Demand Assessment

2.3.1 Overview

The demand assessment determines adequacy of existing water supply infrastructure and likely augmentation required to service the development. The assessment makes an estimate of likely system demands including average and peak daily potable water demands and peak instantaneous demand.

2.3.2 Performance Criteria

Hunter Water performance criteria for design water service pressure are given in Table HW2.4 of the Hunter Water Water Code. These are summarised below in Table 3.

Table 3: Water main pressure performance requirements (Hunter Water, 2017).

Service Pressure Limit	Demand	Pressure (m)
Maximum	All demands.	60
Minimum	Peak hour flow – peak day of peak week.	20
	Peak hour flow on extreme day of extreme week.	12
	Peak hour flow on a 95 th percentile peak day plus fire fighting flow (at hydrant location).	15
	Peak hour flow on a 95 th percentile peak day plus fire fighting (other than at hydrant location).	3

2.3.3 Pressure and Flow

A pressure and flow enquiry was lodged with Hunter Water to determine the current available flow and pressure in the following existing potable water mains adjacent to the Site:

1. Main A.
2. Main D.

No pressure and flow enquiry was undertaken for either Main B or Main C.

Results of the pressure and flow enquiry are summarised in Table 4.

Table 4: Summary of pressure and flow results.

Main	Maximum Flow (L/s)	Residual Pressure (m)			
		0 L/s	10 L/s	20 L/s	Maximum Flow
A	50.0	65.5	65.0	65.0	63.0
B	26.0	67.0	56.5	34.5	14.5

2.3.4 Methodology and Assumptions

The water supply calculations used the following methodology and assumptions:

1. Staged development as per the proposed Masterplan (BKA Architecture, August 2024) and detailed in Table 1.
2. Site potable water Average Daily Demand (**ADD**) is taken from Table 2.5 of the Hunter Water Water Code, being 270 kL/year for urban houses in the Port Stephens LGA. This equates to approximately 740 L/day or 1 Equivalent Tenement (**ET**).
3. Peak Daily Demand (**PDD**) is calculated as the ADD multiplied by a peaking factor and a diversity factor, where the peaking factor is 2.25 (in accordance with Table 2.2 of the Hunter Water Water Code) and the diversity factor is calculated as:

$$\text{Diversity Factor} = 2.653 \times ET^{-0.1067}$$

Based on a total ET for the development of 618 (inclusive of Stage 1), the diversity factor is 1.34. Multiplying the ADD by the peaking factor and diversity factor results in a Peak Daily Demand (**PDD**) of approximately 3 ET or approximately 2.22 kL/ET/day.

4. Peak Hourly Demand (**PHD**) is calculated as the PDD multiplied by the domestic peak and extreme week demand factors in Table 2.3 of the Hunter Water Water Code. The maximum domestic peak and extreme week factor is 2.02. Based on the above calculated PDD of 2.22 kL/ET/day, this gives a PHD of 0.052 L/s/ET.
5. All Site dwellings are assumed to generate 1 ET of average daily potable water demand regardless of whether that dwelling is a single dwelling on a lot, a dual occupancy dwelling or part of a multi-dwelling lot. This is anticipated to give a conservative result.
6. All Site potable water demands are assumed to be supplied by Hunter Water reticulated potable water supply mains with no reduction applied for rainwater tank supply (i.e. roofwater capture and reuse for non-potable purposes such as toilet flushing and irrigation of landscaped / garden areas), water reduction facilities (e.g. water reducing shower heads) or recycled treated effluent.
7. No additional demands are allowed for in this assessment.

2.3.5 Water Demands

Estimated water demands for each proposed stage are summarised in Table 5.

Table 5: Estimated water demands by stage.

Stage	Proposed ET	Average Daily Demand (kL/day)	Peak Daily Demand (kL/day)	Extreme Day Demand (kL/day)	Peak Instantaneous Demand (kL/day)	Peak Instantaneous Demand (L/s)
1	34	25.2	75.6	87.0	152.8	1.8
2	64	47.3	142.4	163.7	287.6	3.3
3	67	49.6	149.0	171.4	301.0	3.5
4	72	53.3	160.1	184.2	323.5	3.7
5	136	100.6	302.5	347.9	611.1	7.1
6	15	11.1	33.4	38.4	67.4	0.8
7	94	69.5	209.1	240.4	422.3	4.9
8	48	35.5	106.8	122.8	215.7	2.5
9	45	33.3	100.1	115.1	202.2	2.3
10	43	31.8	95.6	110.0	193.2	2.2
Total Excluding Stage 1	584	432.0	1,299.0	1,493.8	2,624.0	30.4
Total Including Stage 1	618	457.2	1,374.6	1,580.6	2,776.7	32.1

2.3.6 Preliminary PIPES Model Results

Preliminary network modelling using the proprietary water supply model PIPES has been completed for each stage of the proposed development to determine the preliminary requirements for reticulated water mains within the Site. Results of the PIPES models are provided in Appendix D. Modelling used the following data and assumptions:

1. Staged development as per Table 1, with associated mains constructed for each stage.
2. A DN 250 main connecting existing Mains A and D is assumed to be constructed concurrently with Stage 3 of the development.
3. A DN 250 ring main from Stages 3 – 5 to Stages 6 – 10, via the proposed internal roads connecting Stage 3 with Stages 6 – 10 and Stage 5 to adjacent future development to the north and west of the Site, is assumed to be constructed concurrently with Stage 6 of the development.
4. Peak instantaneous demands for each stage are as per Table 5. These are applied at specific nodes for each sub-stage and assumed to be for all dwellings within the sub-stage, rather than being modelled as individual dwelling demands.
5. Minimum diameters (100 mm) for potable water supply are as per Section 2.3.3 of the Hunter Water Water Code. The minimum pipe diameter for servicing up to

650 ET is 250 mm respectively. All ring mains through the Site are therefore assumed to be 250 mm.

6. All proposed mains are modelled as being PVC mains.
7. Dead end mains have been avoided. Stage 3 contains a single dead end street (cul-de-sac), however the water main supplying the lots on the street is configured to remove the dead end. This may be subject to detailed design. Additionally, there is a 250 mm dead end main in the model which is included as a future connection to the adjacent lot to the north and west of the Site.
8. Available pressure and flow in Mains A and D are assumed to be as for existing undeveloped conditions throughout the connection of additional development stages (i.e. pressure and flow does not change regardless of how many additional ET is being supplied by each main). This assumption would need to be confirmed as part of the formal Water Servicing Report.

Results of the PIPES modelling (see Tables in Appendix E) show:

1. Sufficient flow and minimum pressure is available at the most hydraulically disadvantaged lot for all stages of the proposed development.
2. Most of the potable water demand for the Site is drawn from Main A for all stages of the proposed development, with the maximum demand on Main D being of the order of 3 – 4 L/s.

3 Sewer

3.1 Existing Services

Before You Dig plans have been obtained from Hunter Water to determine the nearest sewerage connection points and existing system components. The following is observed:

1. The nearest sewerage connection point in the Anna Bay WWPS 6 catchment is located within Lot 2 DP 1227239 (229 Old Main Road, Anna Bay). This is a terminal maintenance structure connected to a 150 mm gravity sewer main.
2. The nearest sewerage connection point to the north-east of the Site is the existing pressure sewer in Seamist Avenue / Salt Bush Avenue to the north east of the Site. This pressure sewer consists of a 50 mm PE pressure / vacuum sewer main. This main increases in size to 63 mm within Salt Bush Avenue and Frost Road.
3. The rising main in Frost Road directs flows to an existing maintenance hole (J1305) located within the Gan Gan Road reserve adjacent to Lot 1 DP 1109948 (564 Gan Gan Road, One Mile). From maintenance hole J1305, sewage is directed via a 225 mm uPVC gravity main to the One Mile Wastewater Pump Station, also referred to in the Before You Dig maps as 'Anna Bay 8) (**One Mile WWPS**).
4. The One Mile WWPS is connected to a 300 mm DICL rising main directing flow northwards along Gan Gan Road to the downstream discharge point.
5. All flows in Anna Bay, Boat Harbour and One Mile are directed to the existing Boulder Bay Wastewater Treatment Plant (**Boulder Bay WWTP**).

3.2 Hunter Water Advice

Preliminary servicing advice has been obtained from Hunter Water and is provided in Appendix C. They have advised the following in relation to sewer connection for the planning proposal:

1. An estimated developer servicing charge of approximately \$4,740 / ET (Boulder Bay Wastewater Catchment) will apply. Based on a total of 584 ET, this equates to approximately \$2,770,000.
2. The Site is located east of the Anna Bay 6 WWPS gravity catchment and west of the Boat Harbour 4 WWPS gravity catchment. Neither of these WWPS catchments have at present sufficient capacity to accept the projected maximum flows from the Site.
3. The existing Boulder Bay WWTP has sufficient capacity to service the proposed development.
4. A Wastewater Servicing Strategy will be required to confirm the available network capacity for all proposed stages and likely system upgrades required to service the development at all stages. The Wastewater Servicing Strategy will require assessments of:

- a. Existing system loads and available spare capacity in the existing wastewater network.
 - b. Connection point(s) to the existing wastewater network.
 - c. Size and timing of sewage loads from the development.
 - d. Projected future development in each wastewater catchment.
 - e. Required wastewater system augmentation works.
 - f. Location(s) of all new infrastructure including new wastewater pump stations.
 - g. Staging and interim servicing options (where necessary) for each development stage.
 - h. Least community cost option.
5. The Wastewater Servicing Strategy will need to be prepared by a Hunter Water Accredited Design Consultant.
6. Developer works will be required to be designed and delivered for the development.
7. Hunter Water may require a Review of Environmental Factors (REF) in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979* (NSW).

3.3 Proposed System

Site topography is relatively flat and elevations to the north of the dune are generally of the order of 2 – 3 mAHD. As such, a gravity sewer system is not considered to be a cost effective or efficient option for the proposed development. Onsite wastewater management is also not considered to be feasible for the Site due to site constraints (notably flooding, groundwater and minimum setbacks to lot boundaries).

It is proposed that a pressure sewer system be used for the development. It is our understanding that several neighbouring urban areas to the east of the Site in One Mile use similar systems to provide reticulated sewer.

3.4 Sewage Generation

3.4.1 Overview

The assessment determines likely minimum Site sewer requirements including likely infrastructure requirements, connection points to the existing Hunter Water reticulated sewerage system and comments on likely upgrades required to the existing Hunter Water services.

3.4.2 Methodology and Assumptions

The sewage generation calculations used the following methodology and assumptions:

1. Staged development as per the proposed Masterplan (BKA Architecture, August 2024) and detailed in Table 1.
2. Site Average Dry Weather Flow (**ADWF**) is assumed to be 0.011 L/s/ET based on Hunter Water Sewer Code. This equates to approximately 950 L/day/ET.
3. Peak Dry Weather Flow (**PDWF**) is calculated as ADWF multiplied by a peak ratio factor 'R', where R is given as:

$$R = \sqrt{1.74 + \frac{56}{ET^{0.4}}}$$

and ET is greater than 30.

R is calculated to be approximately 2.45 for the Site (inclusive of Stage 1). This results in an ADWF of approximately 0.027 L/s/ET or 2.33 kL/d/ET.

4. Peak Wet Weather Flow (**PWWF**) is calculated as PDWF plus a Storm Allowance (**SA**), which for residential properties is 0.058 L/s/ET or approximately 5.0 kL/day/ET.
5. All dwellings are assumed to generate 1 ET of sewage per day as per the water demand estimation.

3.4.3 Sewage Generation

Estimated future sewage generation rates for the Site are summarised in Table 6.

Table 6: Estimated future sewage generation rates by stage.

Stage	Proposed ET	ADWF (kL/day)	PDWF (kL/day)	PWWF (kL/day)	PWWF (L/s)
1	34	32.3	79.3	249.7	2.9
2	64	60.8	149.3	470.0	5.4
3	67	63.7	156.3	492.0	5.7
4	72	68.4	167.9	528.7	6.1
5	136	129.3	317.2	998.7	11.6
6	15	14.3	35.0	110.2	1.3
7	94	89.3	219.3	690.3	8.0
8	48	45.6	112.0	352.5	4.1
9	45	42.8	105.0	330.5	3.8
10	43	40.9	100.3	315.8	3.7
Total Excluding Stage 1	584	555.0	1,362.2	4,288.7	49.6
Total Including Stage 1	618	587.3	1,441.5	4,538.4	52.5

3.4.4 Preliminary Sewerage Capacity Assessment

Based on the available advice and Before You Dig plans provided by Hunter Water and publicly available information, we provide the following preliminary comments regarding sewer capacity and likely infrastructure upgrades required to service the development:

1. Stages 1 and 2 will be directed to the existing system servicing Anna Bay via a new pressure main along Gan Gan Road.
 - a. The Stage 1 pressure main is currently the subject of a development application which will connect into a 150 mm gravity sewer at 229 Old Main Road, Anna Bay.
 - b. The Stage 2 will connect into the pressure main constructed as part of the Stage 1 works.
 - c. Upgrade works required downstream of the connection point will be subject to Hunter Water requirements.
2. Stages 3 – 10 will be serviced by a pressure sewer, with each dwelling pumping to a main directing flows to a new Sewage Pump Station (SPS) on the Site, likely in the north-east corner near to Stage 5.
 - a. The new site SPS will pump sewage to the One Mile SPS. This will require a new dedicated main, approximately 1.5 km in length as it is unlikely that the existing 50 mm rising main servicing properties on Sea Mist Avenue / Salt Bush Avenue will have sufficient capacity to convey additional loads from the development.
 - b. It is likely that One Mile SPS and downstream rising mains may require upgrading at the cost of the developer. Specific upgrades will depend on a further discussions with Hunter Water and a detailed study of the current sewerage network at the development application stage.
3. Design of the reticulated Site sewer for each stage will be completed at the development application stage.

4 Other Services

4.1 Electricity Supply

Preliminary servicing advice has been obtained from Ausgrid as the local electricity supplier to the Site. A copy of this preliminary servicing advice is provided in Appendix D. In summary, Ausgrid have advised:

1. New underground high and low voltage cables, conduits, pillars, streetlights and substations will be required. Underground electricity reticulation is the preferred option.
2. The existing 11 kV network has sufficient capacity to supply the expected additional load (estimated to be approximately 2 MVA).
3. Any load greater than 2 MVA will require augmentation of the existing 11 kV network. This consists of replacement approximately 50 m of underground 11 kV cable between Nelson Bay Zone and pole OR 80544. These are considered 'Contestable Works'.
4. Costs and timeframes for Contestable Works are not able to be confirmed by Ausgrid.
5. Connection of the site to electricity will require Ausgrid to provide auxiliary services and have an associated fee.

An accredited service provider will be required to undertake the detailed design of the reticulated electrical network servicing the Site. All required system upgrades are subject to confirmation at detailed design stage of the development.

4.2 Telecommunications and Broadband

Telstra maintains a Universal Service Obligation (**USO**) under the *Telecommunications (Consumer Protection and Service Standards) Act 1999* (Cth). This requires Telstra to provide standard telephone and payphone services to all properties. As such, reticulated telecommunications services will be available to all stages of the proposed development. It is anticipated that telecommunications will be provided in underground conduits within Site road reserves, with pits provided to enable individual property connections as required.

Before You Dig plans show that NBN is present in the Gan Gan Road reserve adjacent to the Site. A Universal Service Guarantee (**USG**) with regards to supply of broadband services applies to the USO. As such, reticulated NBN will also be available to all Site stages and will also likely be contained within underground conduits within Site road reserves.

Detailed design of telecommunications and NBN supply works shall be required at detailed design stage of the development.

4.3 Gas

Review of the Before You Dig plans shows that reticulated gas supply is not available to the Site at this time. It is our understanding that retail gas supply is unlikely to be available to the Site in the near future.

4.4 Stormwater Drainage

Road stormwater drainage will be required for all stages of the proposed development. This will include:

1. Formalised concrete kerbs (barrier or roll kerb) and associated roadside gutters.
2. Pit and pipe drainage including inlet and outlet works.
3. Water quantity and quality control works (i.e. energy dissipation / erosion controls, water quality measures such as gross pollutant traps, wetlands, bioremediation basins, etc.).

Stormwater drainage design would be required at detailed design stage of the development and be subject to the requirements of Port Stephens Council engineering specifications and Port Stephens Council (2021) *Development Control Plan*. A concept stormwater management plan has been prepared for the planning proposal in Martens & Associates document reference P2208888JR16V01 (December 2024).

5 References

BJA Architecture (3 December 2024) *Proposed Masterplan and Yield*.

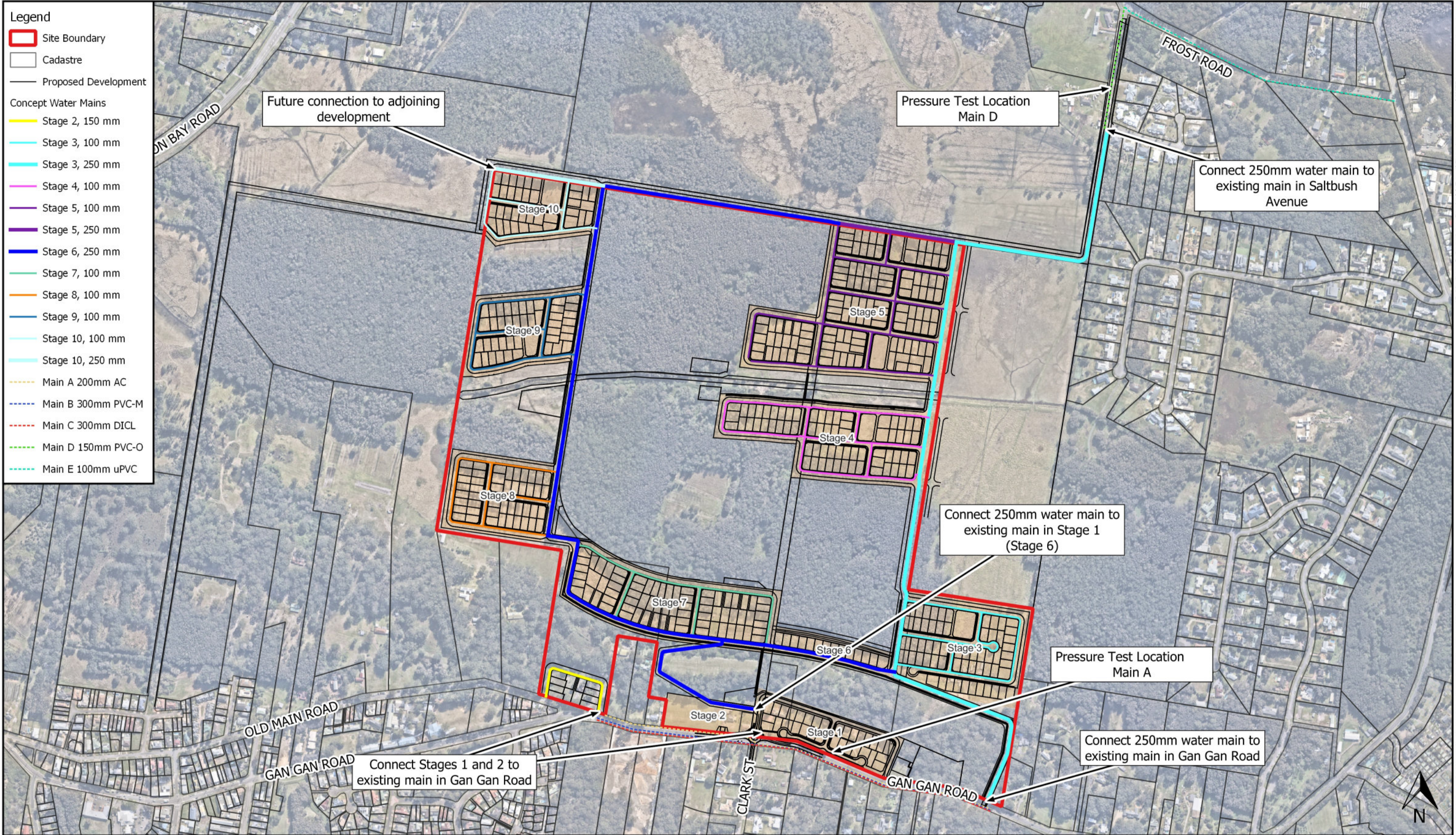
Hunter Water (2017) *Sewerage Code of Australia, WSA 02-2002-2.3 Hunter Water Edition Version 1*.

Hunter Water (19 August 2024) *Statement of Available Flow and Pressure*.

Hunter Water (2017) *Water Supply Code of Australia WSA 03-2002-2.3 Hunter Water Edition Version 1*.

Port Stephens Council (2021) *Development Control Plan*.

Appendix A – Maps



0 90 180 270 360 450 m

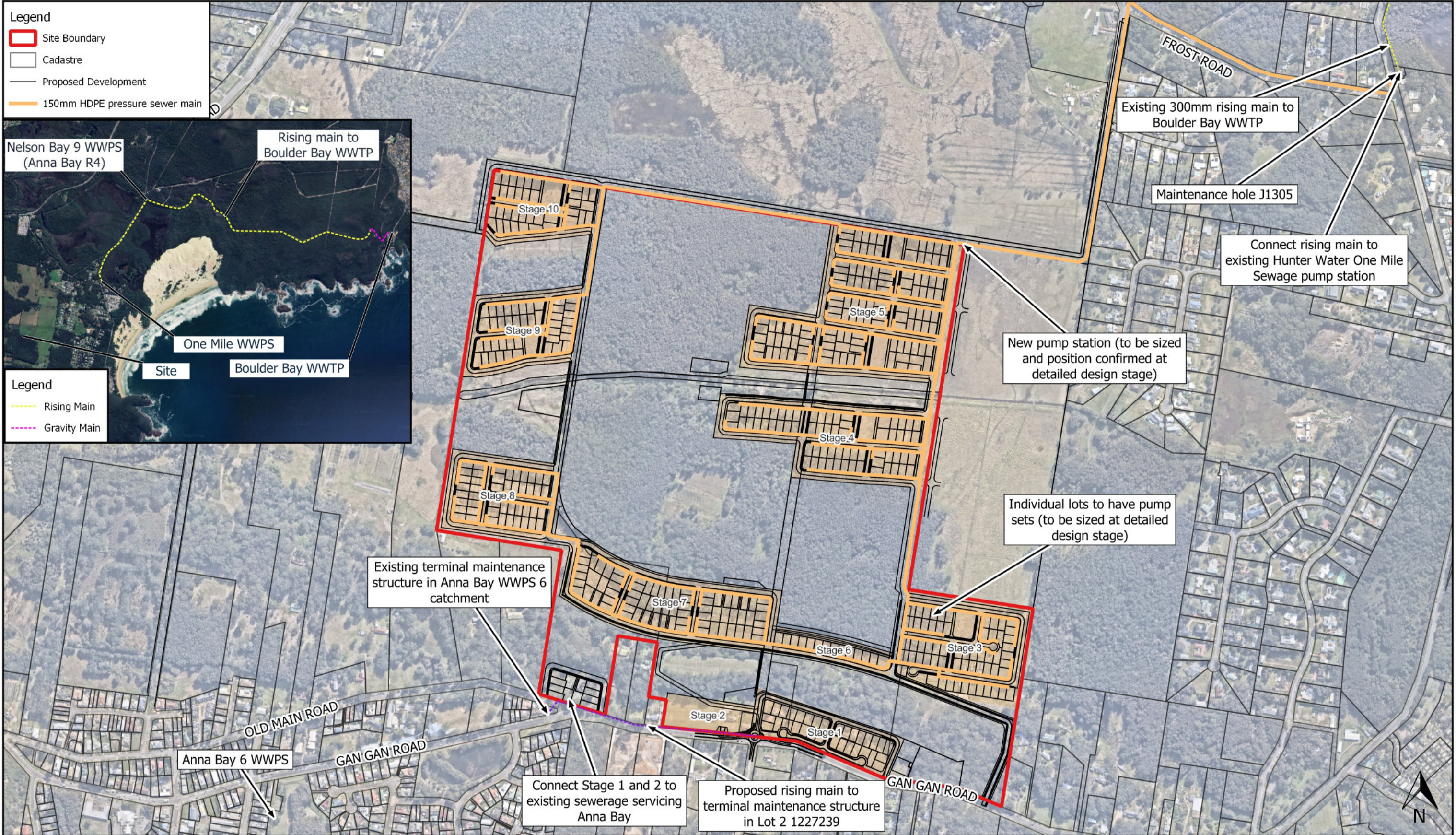
1:8000 @ A3

Viewport

Note:
- Aerial from Nearmap (2024).
- Existing water mains position from Hunter Water (2024).

Map Title / Figure:

Water Services



0 90 180 270 360 450 m

1:8000 @ A3

Viewport

Note:
- Aerial from Nearmap (2024).
- Existing sewage pump station from Hunter Water (2024).

Appendix B – Masterplan



1 Proposed Masterplan
1:5000

DKA Architecture
22011 Gan Gan Rd, Anna Bay

Calculations

Site Area Gan Gan Rd 1,186,830 m2 approx

Stage	Section	Residential Area m2	Standard Blocks #		Dual Occupation #		Dwellings # R2	Public Park m2 RE1	Evironmental Reserve m2 E3
			500m2	600m2	600m2	20m x 30m			
			16.7m x 30m R2	20m x 30m R2	20m x 30m R2	20m x 30m R2			
Stage 1	A	8,138	16				16		
	B	8,153	16				16		
	C	2,854	2	0			2		
Stage 2	EA	6,337					25		
	EB	4,328					25		
	FA	6,838	8		3		14		
Stage 3	GA	6,939	11		2		15		
	GB	5,697	10		1		12		
	GC	12,844	24		1		26		
	GD	9,287	10		2		14		
Stage 4	HA	8,083	16				16		
	HB	5,724	10		1		12		
	HC	8,097	8		2		12		
	HD	5,743	10		1		12		
	HE	9,766	18		1		20		
Stage 5	IA	12,127	18		3		24		
	IB	7,957	14		1		16		
	IC	9,783	8		4		16		
	ID	5,728	10		1		12		
	IE	5,728	10		1		12		
	IF	7,728	8		2		12		
	IG	6,068	12				12		
	IH	8,073	16				16		
	IJ	8,071	16				16		
	JA	7,212	13		1		15		
Stage 6	MA	11,622	12		7		26		
Stage 7	MB	15,050	24		3		30		
	MC	15,858	16		11		38		
Stage 8	LA	8,071	16				16		
	LB	7,644	14		1		16		
	LC	7,712	14		1		16		
Stage 9	KA	7,838	11		1		13		
	KB	7,697	15				15		
	KC	8,379	15		1		17		
Stage 10	JA	7,961	13		2		17		
	JB	5,701	8		2		12		
	JC	9,279	10		2		14		

TOTAL	280,970.24	418	58	584
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TOTAL Dwellings 584
TOTAL Lots 476 plus 2 Multi Dwelling Housing Lots
NOTE: Excludes current R2 zoning (DA)

General Notes
DO NOT SCALE FROM DRAWING. USE FIGURED DIMENSIONS ONLY. CHECK ALL DIMENSIONS ON SITE BEFORE ANY MANUFACTURE OR CONSTRUCTION
All dimensions are in millimetres unless stated otherwise.
All architectural drawings are to be read in conjunction with the relevant consultant documents. All dimensions and levels are to be checked and verified on site prior to the commencement of work, shop drawings or fabrication of any components. Refer all discrepancies to the Architect for determination. Drawings are not to be scaled, use only figured dimensions. This drawing is copyright and must not be retained, copied or used without the permission of BKA Architecture. This document has been prepared for and on behalf of the clients noted on the drawing. BKA Architecture's responsibility is to these clients only and not to any third party who may rely on these documents.
Nominated Architects (NSW) - John Baker 3552, John Kavanagh 5999

Rev	Date	Issue
A	4/3/2024	Preliminary Issue to Council
B	22/3/2024	Issue for Scoping Report
C	3/12/2024	Issue for Planning Proposal

Client
AB Rise Pty Ltd

Architect
BKA Architecture
SYDNEY Suite 104, 77 Dunning Ave, Rosebery, NSW 2018
NEWCASTLE Suite 4, 19 Bolton St, Newcastle NSW 2300
NORTH COAST 39-41 Main St, Clunes, NSW 2480
T: +61 2 9318 9200 E: bka@bka.com.au W: www.bka.com.au
T: +61 2 4926 5563 T: +61 2 6687 2712

Scale at A1
1:5000

Date
3/12/2024

North



Drawn
VK, JG

Project Address
Gan Gan Road, Anna Bay

Checked JG Status Not for Construction

Drawing
Proposed Masterplan and Yield

Project No. 22011 Revision C Drawing No. A100

Appendix C – Hunter Water Correspondence



Hunter Water Corporation
ABN 46 228 513 446

PO Box 5171
HRMC NSW 2310
36 Honeysuckle Drive
NEWCASTLE NSW 2300
1300 657 657
enquiries@hunterwater.com.au
hunterwater.com.au

17 May 2024

AB RISE PTY LTD
C/- Martens & Associates
SUITE 201, 20 GEORGE ST
HORNSBY NSW 2077

PRELIMINARY SERVICING ADVICE APPLICATION

Property Address:	196 OLD MAIN RD, ANNA BAY NSW 2316
Lot & Plan number:	Lot 963 DP 731955, Lot 21 DP 590387, Lot 1 DP 536752, Lot 901 DP 634550, Lot 902 DP 634550, Lot 1 DP 503876
Development Description:	Preliminary Servicing Application for Torrens Title Subdivision of 6 lots into 528 lots
Hunter Water Reference:	2024-465

Hunter Water offers the following preliminary servicing advice for the provision of water and sewerage facilities for the development detailed above.

General information on water and sewer issues relevant to the proposal are included in this correspondence. This information is indicative only and based on Hunter Water's knowledge of its system performance and other potential developments in the area at the present time. This advice may change substantially due to a range of factors and a detailed analysis of available capacity will be undertaken upon lodgement of a [Development Application](#) to Hunter Water.

When you have development approval, you may submit this Development Application to determine the formal requirements for the development. Hunter Water will then issue a Requirements Letter including an offer for network capacity. You will need to comply with each of the requirements in this Letter for the issue of a [Section 50 Compliance Certificate](#) for the development.

Financial Requirements

A reimbursement contribution may be required towards the cost of any water and sewer infrastructure that is constructed by a third-party developer and utilised to serve this development. Reimbursements include GST and cannot be determined until the connection points are defined and a Development Application is submitted.

A Developer Charge is required to be paid

We are phasing in developer charges for water and wastewater services from 1 July 2023 ([find out more here](#)). We have detailed what this transition looks like for your development in each financial year in your calculation below.

Developer charges must be paid to Hunter Water prior to connecting to our networks. The estimated total developer charge for your proposed development appears in the table below. This estimate is based on a development yield of 528 standard residential lots over 11 stages presented in the plan prepared by BKA Architecture (22011 - Rev A - A100 dated 4/3/2024) and submitted with your application.

Further information on how developer charges are calculated [is here](#).

Please note, payment of the developer charge can only be made when:

- All requirements of this letter have been met; and
- A valid DA Consent or Complying Development Consent has been provided to us; and
- In the case of water or sewer works being required, once these works have been completed and a finalisation package has been submitted by your Accredited Design Consultant.

Once you have met all requirements, you will need to contact us and request a final calculation of your developer charge (CPI and phasing adjustment). We will issue an invoice for the final payment amount.

Developer Charge Calculation Estimate

DSP Area	DSP Charge	Calculation: [Utilisation (in ET) - Credit (in ET)] x DSP Charge = Developer Charge
W.2 Nelson Bay Water Zone	\$3,509.84 per ET	ET for your proposed development: 528.00 ET Credit ET for previous development: 5.00 ET Water Developer Charge = 523.00 ET x \$3,509.84 = \$1,835,646.32
S.2 Boulder Bay Wastewater Catchment	\$4,737.55 per ET	ET for your proposed development: 528.00 ET Credit ET for previous development: 0.00 ET Wastewater Developer Charge = 528.00 ET x \$4,737.55 = \$2,501,426.40
The total Developer Charge value will be phased in and detailed below		

Phased Developer Charge for each Financial Year

Charges applicable each Financial Year (FY)				
The NSW Government has directed that developer charges will remain at 0% for financial year 2023-24, before a phased reintroduction at 25% in financial year 2024-25, 50% in financial year 2025-26, prior to full reintroduction from financial year 2026-27 This is a one-off payment and will be invoiced at the time that all requirements of this letter have been met. Please note that the Developer Charge is indexed by CPI each Financial Year.				
	FY 23/24 (0%)	FY 24/25 (25%)	FY 25/26 (50%)	FY 26/27 (100%)
Phased estimated developer charge payable for your development:	\$0.00	\$1,084,268.18 (plus CPI)	\$2,168,536.36 (plus CPI)	\$4,337,072.72 (plus CPI)

Water Supply

The development site has frontage to the following watermain on Gan Gan Rd:

- DN200 AC watermain.
- DN250 PVC-M watermain.
- DN300 PVC-M watermain

Connection to the DN200 AC watermain and DN300 PVC-M watermain is permitted, while connection to the DN250 PVC-M watermain is not permitted.

There is currently sufficient capacity in the local water network to service the proposed development. However, a Water Servicing Report (outlined below) is required to confirm connection location(s) to the existing water supply network, security of supply, pressure management and staged/interim servicing.

Wastewater Transportation

The development site is located east of the Anna Bay 6 Wastewater Pump Station (WWPS) gravity catchment and west of the west of the Boat Harbour 4 WWPS gravity catchment. There is currently insufficient capacity in either of these wastewater pump station catchments to service the ultimate development yield.

You are therefore required to prepare a wastewater servicing strategy (outlined below) to determine the least community cost option to service the development.

Wastewater Treatment

The development site is located within the Boulder Bay Wastewater Treatment Works catchment and there is sufficient capacity to service the proposed development.

Water Servicing Report and Wastewater Servicing Strategy

Due to the location and size of the proposed development, a developer-funded Water Servicing Report and a developer-funded Wastewater Servicing Strategy are required to confirm available network capacity and determine the optimal servicing arrangement for the development.

As a minimum, the Water Servicing Report will need to include an assessment:

- Connection location(s) to the existing watermain on Gan Gan Road.
- Pressure management.
- Security of supply for the development once 100 lots have been delivered.
- Any staging and/or interim servicing options for the development.
- Least community cost option.

As a minimum, the Wastewater Servicing Strategy will need to include an assessment of:

- The size and timing of loads from your proposed development.
- Existing loads and future potential development in each catchment.
- Available capacity in the existing wastewater network.
- Connection point(s) to the existing wastewater network.
- Wastewater network augmentations.
- Location of new wastewater pump station(s).
- Staging and interim servicing options for the development.
- Least community cost option.

You will need to engage the services of an [Accredited Design Consultant](#) to prepare the Water Servicing Report and Wastewater Servicing Strategy in accordance with WSAA Hunter Water Design Guidelines.

The Water Servicing Report and Wastewater Servicing Strategy will need to be submitted to Hunter Water for review and approval, and assets then designed and constructed in accordance with the approved report and strategy.

Please contact Hunter Water to arrange an inception meeting to discuss and confirm the scope of work prior to commencement.

A strategy review fee will be required to be paid for each servicing strategy that is submitted.

Delivery of Developer Works

Developer works will need to be delivered under [Developer Works Deeds](#) executed by the Developer and Hunter Water.

All developer works are to be designed by an [Accredited Design Consultant](#) and constructed by an [Accredited Contractor](#).

Environmental Requirements

Hunter Water may require a [Review of Environmental Factors](#) (REF) to be submitted in accordance with the provisions of Environmental Planning and Assessment Act 1979 for the delivery of developer works. Hunter Water will assess the REF as a determining authority under provisions of Part 5 of the Act.

Entry Requirements

The proposed investigation works may require entry to another property. You will need to arrange for entry and have evidence of consent by way of a signed [Entry Permit](#) with the affected landowner.

These preliminary requirements are not commitments by Hunter Water and maybe subject to significant change prior to this development proceeding.

If you have any enquiries, please contact your designated assessment officer below.

Greg McHarg – Account Manager Major Development T: 02 4081 5835 E: greg.mcharg@hunterwater.com.au

**HUNTER WATER CORPORATION**

ABN 46 228 513 446
PO Box 5171
HRMC NSW 2310
36 Honeysuckle Dr
NEWCASTLE NSW 2300

19 August 2024

AB RISE PTY LTD
C/- Martens and Associates
SUITE 201, LEVEL 2, 20 GEORGE STREET
HORNSBY NSW 2077

Statement of Available Pressure and Flow

Property address:	293 GAN GAN RD, ANNA BAY NSW 2316
Lot & Plan number:	Lot 902 DP 634550
Hydrant No.	365435
Approximate Ground Level:	5.52 m AHD
Water Main Size and Location:	DN200 mm AC located in GAN GAN RD, ANNA BAY NSW 2316
Hunter Water reference:	2024-1271

Thank you for your application for a Statement of Available Pressure and Flow. We have assessed the pressure expected to be available at the nearest hydrant under the demand conditions identified in the table below.

The pressure and flow information provide in the table is to be read in conjunction with notes on the following page.

Expected Pressure at Hydrant	Additional Fire Flow (L/s)	Pressure (kPa)
Maximum pressure (Average Day Demand)	0	670
Minimum pressure (Peak Day Demand)	0	655
Pressure expected under peak day demand conditions		
Fire hose reel (x2)	0.66	655
Pressure expected under 95%ile peak day demand conditions		
Fire hydrant /sprinkler installations	10.0 L/s	650
Fire hydrant /sprinkler installations	20.0 L/s	650
Max available flow	50.0 L/s	630

Hydrant No.	10292373
Approximate Ground Level:	3.69 m AHD
Water Main Size and Location:	DN150 mm PVC-O(SER2) located in SALT BUSH AVE, ANNA BAY NSW 2316

Expected Pressure at Hydrant	Additional Fire Flow (L/s)	Pressure (kPa)
Maximum pressure (Average Day Demand)	0	690
Minimum pressure (Peak Day Demand)	0	670
Pressure expected under peak day demand conditions		
Fire hose reel (x2)	0.66	665
Pressure expected under 95%ile peak day demand conditions		
Fire hydrant /sprinkler installations	10.0 L/s	565
Fire hydrant /sprinkler installations	20.0 L/s	345
Max available flow	26.0 L/s	145

For further information, please direct enquiries to development.planning@hunterwater.com.au

Notes

This Pressure and Flow Statement is valid for **12 months**.

The provision of additional flow for firefighting is not a requirement under Hunter Water Act or our Operating licence.

We use an InfoWorks hydraulic model for determining flow and pressure in our networks. Pressure and flow in the models are determined using theoretical system demands based on customer connections and peaking factors to adjust peak demand conditions.

While these models are intermittently calibrated using field testing, the accuracy of the results cannot be guaranteed due to ongoing modifications to our networks and increasing demands resulting from growth.

While we endeavour to maintain minimum firefighting pressure above 15m, this cannot be guaranteed into the future and adequate allowance should be made to any firefighting assessment.

The flow and pressure generated by the Info Works model is calculated at the centre of the pipe. Pressure losses due to flow through the hydrant or additional appurtenances, such as standpipes, are not included in the above results and must be factored into any fire flow assessment for the site.

It is the **applicant's responsibility** to ensure that minimum firefighting requirements for the subject site are satisfied.

The use of, and access to, stop valves and hydrants is restricted to Hunter Water employees only. It is an **offence** under Section 25 of the Hunter Water Act to interfere with our assets without prior consent.

Persons accessing our assets without our prior consent may be issued with a **penalty** notice and will be held liable for all costs to repair, rectify and remediate the water supply system impacted by the unauthorised access.

If you require access to our network to perform a flow test please email development.planning@hunterwater.com.au for requirements.

Appendix D – Ausgrid Correspondence



20 March 2024

Martens & Associates Pty Ltd
Attention: Andrew Noris
201 George Street
Hornsby NSW 2077

Email: rkolahdoozha@martens.com.au

Reference Number: 700009081

Address all relevant correspondence to:

Ausgrid Contestability Section
PO Box 487
Newcastle NSW 2300

E: Contestability@ausgrid.com.au

Dear Andrew

Preliminary Enquiry: Torrens Title residential subdivision of Lot 1 DP503876, 321 Gan Gan Rd Anna Bay NSW

I refer to your preliminary enquiry regarding the proposed electricity connections at the above development address and provide the following information.

- ☐ Ausgrid's assessment has determined that the following works are likely to be required to connect your development and provide a point of electrical connection for the individual allotments within the subdivision.
 - Installation of underground high voltage and low voltage cables, conduits, pillars, streetlights and substation(s) as required, for the underground electrical reticulation of the residential subdivision.
 - The existing 11kV network has sufficient capacity to supply an additional load of 2MVA (approximately 585 new dwellings).
 - Any load increases greater than 2MVA will require 11kV augmentation works. This work consists of replacing approximately 50m of underground 11kV cable between Nelson Bay Zone to pole OR80544.
- ☐ An extension/augmentation of the Ausgrid network is Contestable and requires the customer to engage accredited service providers to undertake the design and construction of the required works. Information on how to connect to the Ausgrid network can be found on our website at the following link:
<https://www.ausgrid.com.au/Connections>
- ☐ Ausgrid is unable to provide costs or timeframes for Contestable works. However, accredited service providers may be able to provide the information.
- ☐ The electrical connection will require Ausgrid to provide auxiliary services that only Ausgrid can provide. The auxiliary services and the associated fee are detailed in the Ausgrid document **Connection Policy – Connection Charges**. The document is available on our website at the following link:
<https://www.ausgrid.com.au/Connections/charges>
- ☐ To proceed further in obtaining a new or altered electrical connection to the property a Connection Application will need to be submitted. The various application forms are available on our website at the following link: <https://www.ausgrid.com.au/Connections>

It should be noted that the above advice is based on Ausgrid's policies and network status as of today and are subject to change.

Connections to the Ausgrid network are governed by a set of laws and rules referred to as the National Energy Customer Framework (NECF). Included in the NECF is the National Electricity Rules (NER). Under these rules, a binding contract may only be formed after a connection application is lodged and Ausgrid has made a connection offer in response to that application. Accordingly, to arrange for the electricity connection of the development to the Ausgrid network you should lodge a completed connection application.

Should you require any further information please contact me.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'PB', with a long horizontal stroke extending to the right.

Philip Bellamy
Contestability Project Coordinator
Ausgrid

Direct Telephone Number: 02 49519493

Email: pbellamy@ausgrid.com.au

Appendix E – PIPES Water Network Modelling

Table 7: PIPES model results – Stage 1.

Stage	Section	ET	Modelled Peak Instantaneous Demand (L/s)	Modelled Residual Pressure ¹ (m head)
1	A	16	0.8	55.0
	B	16	0.8	55.0
	C	2	0.2	55.0
Total		34	1.8	

Notes:

1. Residual pressure excludes elevation at modelled node.

Table 8: PIPES model results – Stage 2.

Stage	Section	ET	Modelled Peak Instantaneous Demand (L/s)	Modelled Residual Pressure ¹ (m head)
1	A	16	0.8	55.0
	B	16	0.8	55.0
	C	2	0.2	55.0
2	EA	25	1.3	51.0
	EB	25	1.3	51.0
	FA	14	0.7	51.0
Total		98	5.1	

Notes:

1. Residual pressure excludes elevation at modelled node.

Table 9: PIPES model results – Stage 3.

Stage	Section	ET	Modelled Peak Instantaneous Demand (L/s)	Modelled Residual Pressure ¹ (m head)
1	A	16	0.8	55.0
	B	16	0.8	55.0
	C	2	0.2	55.0
2	EA	25	1.3	51.0
	EB	25	1.3	51.0
	FA	14	0.7	51.0
3	GA	15	0.8	58.9
	GB	12	0.6	57.9
	GC	26	1.4	53.9
	GD	14	0.7	58.9
Total		165	8.6	

Notes:

1. Residual pressure excludes elevation at modelled node.

Table 10: PIPES model results – Stage 4.

Stage	Section	ET	Modelled Peak Instantaneous Demand (L/s)	Modelled Residual Pressure ¹ (m head)
1	A	16	0.8	55.0
	B	16	0.8	55.0
	C	2	0.2	55.0
2	EA	25	1.3	51.0
	EB	25	1.3	51.0
	FA	14	0.7	51.0
3	GA	15	0.8	58.9
	GB	12	0.6	57.9
	GC	26	1.4	53.9
	GD	14	0.7	58.9
4	HA	16	0.8	58.9
	HB	12	0.6	58.9
	HC	12	0.6	58.9
	HD	12	0.8	58.9
	HE	20	1.0	58.9
Total		237	12.3	

Notes:

1. Residual pressure excludes elevation at modelled node.

Table 11:PIPES model results – Stage 5.

Stage	Section	ET	Modelled Peak Instantaneous Demand (L/s)	Modelled Residual Pressure ¹ (m head)
1	A	16	0.8	55.0
	B	16	0.8	55.0
	C	2	0.2	55.0
2	EA	25	1.3	51.0
	EB	25	1.3	51.0
	FA	14	0.7	51.0
3	GA	15	0.8	58.8
	GB	12	0.6	57.8
	GC	26	1.4	53.8
	GD	14	0.7	58.8
4	HA	16	0.8	58.8
	HB	12	0.6	58.8
	HC	12	0.6	58.8
	HD	12	0.8	58.8
	HE	20	1.0	58.8
5	IA	24	1.3	58.8
	IB	16	0.8	58.8
	IC	16	0.8	58.8
	ID	12	0.6	58.8
	IE	12	0.6	58.8
	IF	12	0.6	58.8
	IG	12	0.6	58.8
	IH	16	0.8	58.8
	IJ	16	0.8	58.8
Total		373	19.4	

Notes:

1. Residual pressure excludes elevation at modelled node.

Table 12:PIPES model results – Stage 6.

Stage	Section	ET	Modelled Peak Instantaneous Demand (L/s)	Modelled Residual Pressure ¹ (m head)
1	A	16	0.8	55.0
	B	16	0.8	55.0
	C	2	0.2	55.0
2	EA	25	1.3	51.0
	EB	25	1.3	51.0
	FA	14	0.7	51.0
3	GA	15	0.8	58.9
	GB	12	0.6	57.9
	GC	26	1.4	53.9
	GD	14	0.7	58.9
4	HA	16	0.8	58.9
	HB	12	0.6	58.9
	HC	12	0.6	58.9
	HD	12	0.8	58.9
	HE	20	1.0	58.9
5	IA	24	1.3	58.9
	IB	16	0.8	58.9
	IC	16	0.8	58.9
	ID	12	0.6	58.9
	IE	12	0.6	58.9
	IF	12	0.6	58.9
	IG	12	0.6	58.9
	IH	16	0.8	58.9
	IJ	16	0.8	58.9
6	NA	15	0.8	59.0
Total		388	20.2	

Notes:

1. Residual pressure excludes elevation at modelled node.

Table 13:PIPES model results – Stage 7.

Stage	Section	ET	Modelled Peak Instantaneous Demand (L/s)	Modelled Residual Pressure ¹ (m head)
1	A	16	0.8	55.0
	B	16	0.8	55.0

Stage	Section	ET	Modelled Peak Instantaneous Demand (L/s)	Modelled Residual Pressure ¹ (m head)
2	C	2	0.2	55.0
	EA	25	1.3	51.0
	EB	25	1.3	51.0
	FA	14	0.7	51.0
3	GA	15	0.8	58.9
	GB	12	0.6	57.9
	GC	26	1.4	53.9
	GD	14	0.7	58.9
4	HA	16	0.8	58.9
	HB	12	0.6	58.9
	HC	12	0.6	58.9
	HD	12	0.8	58.8
	HE	20	1.0	58.8
5	IA	24	1.3	58.9
	IB	16	0.8	58.9
	IC	16	0.8	58.9
	ID	12	0.6	58.9
	IE	12	0.6	58.9
	IF	12	0.6	58.9
	IG	12	0.6	58.9
	IH	16	0.8	58.9
	IJ	16	0.8	58.9
6	NA	15	0.8	58.9
7	MA	26	1.4	58.9
	MB	30	1.6	58.4
	MC	38	2.0	58.9
Total		482	25.1	

Notes:

1. Residual pressure excludes elevation at modelled node.

Table 14: PIPES model results – Stage 8.

Stage	Section	ET	Modelled Peak Instantaneous Demand (L/s)	Modelled Residual Pressure ¹ (m head)
1	A	16	0.8	55.0
	B	16	0.8	55.0

Stage	Section	ET	Modelled Peak Instantaneous Demand (L/s)	Modelled Residual Pressure ¹ (m head)
	C	2	0.2	55.0
2	EA	25	1.3	51.0
	EB	25	1.3	51.0
	FA	14	0.7	51.0
3	GA	15	0.8	58.8
	GB	12	0.6	57.8
	GC	26	1.4	53.8
	GD	14	0.7	58.8
4	HA	16	0.8	58.8
	HB	12	0.6	58.8
	HC	12	0.6	58.8
	HD	12	0.8	58.8
	HE	20	1.0	58.8
5	IA	24	1.3	58.8
	IB	16	0.8	58.9
	IC	16	0.8	58.9
	ID	12	0.6	58.9
	IE	12	0.6	58.9
	IF	12	0.6	58.9
	IG	12	0.6	58.9
	IH	16	0.8	58.9
	IJ	16	0.8	58.9
6	NA	15	0.8	58.9
7	MA	26	1.4	58.9
	MB	30	1.6	58.4
	MC	38	2.0	58.9
8	LA	16	0.8	58.8
	LB	16	0.8	58.8
	LC	16	0.8	58.8
Total		530	27.6	

Notes:

1. Residual pressure excludes elevation at modelled node.

Table 15:PIPES model results – Stage 9.

Stage	Section	ET	Modelled Peak Instantaneous Demand (L/s)	Modelled Residual Pressure ¹ (m head)
1	A	16	0.8	55.0
	B	16	0.8	55.0
	C	2	0.2	55.0
2	EA	25	1.3	51.0
	EB	25	1.3	51.0
	FA	14	0.7	51.0
3	GA	15	0.8	58.8
	GB	12	0.6	57.8
	GC	26	1.4	53.8
	GD	14	0.7	58.8
4	HA	16	0.8	58.7
	HB	12	0.6	58.7
	HC	12	0.6	58.7
	HD	12	0.8	58.7
	HE	20	1.0	58.7
5	IA	24	1.3	58.7
	IB	16	0.8	58.7
	IC	16	0.8	58.8
	ID	12	0.6	58.8
	IE	12	0.6	58.8
	IF	12	0.6	58.8
	IG	12	0.6	58.8
	IH	16	0.8	58.8
	IJ	16	0.8	58.8
6	NA	15	0.8	58.9
7	MA	26	1.4	58.8
	MB	30	1.6	58.3
	MC	38	2.0	58.8
8	LA	16	0.8	58.8
	LB	16	0.8	58.8
	LC	16	0.8	58.8
9	KA	13	0.7	58.7
	KB	15	0.8	58.7

Stage	Section	ET	Modelled Peak Instantaneous Demand (L/s)	Modelled Residual Pressure ¹ (m head)
	KC	17	0.9	58.7
Total		575	29.9	

Notes:

1. Residual pressure excludes elevation at modelled node.

Table 16: PIPES model results – Stage 11.

Stage	Section	ET	Modelled Peak Instantaneous Demand (L/s)	Modelled Residual Pressure ¹ (m head)
1	A	16	0.8	55.0
	B	16	0.8	55.0
	C	2	0.2	55.0
2	EA	25	1.3	51.0
	EB	25	1.3	51.0
	FA	14	0.7	51.0
3	GA	15	0.8	58.8
	GB	12	0.6	57.8
	GC	26	1.4	53.8
	GD	14	0.7	58.8
4	HA	16	0.8	58.8
	HB	12	0.6	58.8
	HC	12	0.6	58.8
	HD	12	0.8	58.7
	HE	20	1.0	58.7
5	IA	24	1.3	58.8
	IB	16	0.8	58.8
	IC	16	0.8	58.8
	ID	12	0.6	58.8
	IE	12	0.6	58.8
	IF	12	0.6	58.8
	IG	12	0.6	58.8
	IH	16	0.8	58.8
	IJ	16	0.8	58.8
6	NA	15	0.8	58.9
7	MA	26	1.4	58.8
	MB	30	1.6	58.3

Stage	Section	ET	Modelled Peak Instantaneous Demand (L/s)	Modelled Residual Pressure ¹ (m head)
	MC	38	2.0	58.8
8	LA	16	0.8	58.8
	LB	16	0.8	58.8
	LC	16	0.8	58.8
	KA	13	0.7	58.8
9	KB	15	0.8	58.8
	KC	17	0.9	58.8
	JA	17	0.9	58.7
10	JB	12	0.6	58.8
	JC	14	0.7	58.8
Total		618	32.1	

Notes:

1. Residual pressure excludes elevation at modelled node.