Appendix A

Central Coast Water Supply Headworks Development Servicing Plan 2019

Central Coast Council
Development Servicing Plan -Water Headworks 2019

Version 1.0
Satpal Singh

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1. Introduction

The purpose of this Development Servicing Plan (DSP) is to determine the headworks component of development charges applicable to the proposed new developments within the North and South regions of the Central Coast Council.

This plan has been prepared in accordance with the requirements of the Water Management Act 2000, using the methodology and parameters determined by the Independent Pricing and Regulatory Tribunal's Determination in October 2018 for Central Coast Council for levying maximum developer charges.

2. Area of the Plan

All lands contained within the Central Coast Council Local Government areas serviced by Water Supply headworks may be subject to this DSP. Local area DSPs where applicable will refer to this DSP for headworks component of developer charges.

3. Population and Equivalent Water Tenement Projection

Council has engaged *.id consulting* for its demographics analysis based on latest available Australian Bureau of Statistics (ABS) Census data. *.id* has provided population forecast figures for central coast council's North (former Wyong Shire Council LGA) and South (former Gosford City Council LGA) regions. *.id* has provided population projection up to 2036 only.

Further population projection from 2037 to 2050 is based on previous studies done for sewerage master plan of both North and South regions. The 2036 population has been linearly extrapolated at 1.39% and o.4% annual growth rates respectively for the Northern and Southern Regions. A small fraction of population is not connected to council's water services therefore both North and South population have been suitably modified to calculate serviced population.

Tenement projection has been done based on 150KL/tenement average annual water demand as per directions from IPART. The water demand patterns of both North and South regions are slightly different to each other which may further depart in future because of higher scope of growth of BASIX (more water efficient) housing in the northern region than the south.

Table 1 below summarises serviced population projection for the North and South regions. The individually climate corrected demand of both regions (239.5 l/c/d for North and 230 l/c/d for South) has been used to forecast water demand for both regions which is further used for calculating total equivalent water tenements.

Table 1 Population and tenement Projection

Year	North Total Population	South Total Population	North Serviced Population	South Serviced Population	North Tenements	South Tenements	Total Tenement
30/6/2021	173,178	176,428	171,446	174,664	99,916	97,966	197,882
30/6/2026	187,806	180,345	185,928	178,542	108,356	100,141	208,497
30/6/2031	204,810	182,955	202,762	181,125	118,166	101,590	219,756
30/6/2036	221,707	186,176	219,490	184,314	127,915	103,379	231,294
30/6/2041	237,551	189,931	235,175	188,032	137,056	105,464	242,520
30/6/2046	254,526	193,761	251,981	191,823	146,850	107,590	254,440
30/6/2049	265,288	196,095	262,635	194,134	153,059	108,887	261,946
30/6/2050	268,976	196,879	266,286	194,910	155,187	109,322	264,509

4. Reference to Other Development Servicing Plans

The development charge for the headworks component determined by this DSP will be included in all applicable North and South region DSP charges.

5. Estimates of Capital and Operation Costs

The capital costs are taken as Gross Replacement Costs of each of the Joint Headworks Assets are as per: 12099 - JWS W&S Final Report 29.09.16 and Gosford-Wyong JWS Fair Value Estimates - Dams & Weirs Final Report 07.06.2016. Assets Costs are determined by using Modern Engineering Equivalent Replacement Asset (MEERA) approach. These costs are further indexed as per June 2019 Update - NSW Water Supply and Sewerage Construction Cost Indices of NSW Reference Rates Manual.

The annual value charges are calculated using 0% discount rate for pre-1996 assets and 4.9% discount rate (real pre-tax WACC as in the prevailing IPART price determination) for post-1996 assets as per IPART's final report on "*Maximum prices to connect, extend or upgrade a service for metropolitan water agencies October 2018*."

Operating costs are not relevant to this DSP and are detailed in each Local Area DSP.

6. System Demand

Council has used iSDP (Integrated Supply Demand Model) for demand forecast. The iSDP model was first developed by the Institute for Sustainable Futures (ISF), part of the University of Technology Sydney, for Sydney Water Corporation (SWC) in the late 1990s to enable SWC to conduct a detailed water planning exercise. This included both the development of a detailed demand forecast and development of a broad range of demand management and supply options. The model was subsequently modified by SWC and later released in 2003 as the Water Services Association of Australia (WSAA) end use model (EUM). The tool, now

known as the iSDP model, has been further developed by ISF and CSIRO, and applied to numerous cities across Australia. The model is currently used as a planning tool by various large water service providers. Hunter Water who is working closely with Central Coast Council for long term water resources planning is using iSDP model for water demand forecasting.
Council has used iSDP for water sales forecast for recent IPART Water Pricing submission/ determination. The model assumptions have been suitably updated to use it forecasting long term water demand forecasting. The forecast demand is provided in the table below.

Table 2 Projected Water Demand for Central Coast Council

Year	Annual Average Demand ML/year	Average Day Demand ML/day	Peak Day Demand ML/day
30/6/2021	31,397	86	193
30/6/2026	32,829	90	202
30/6/2031	34,443	94	212
30/6/2036	36,194	99	223
30/6/2041	37,978	104	234
30/6/2046	39,900	109	246
30/6/2050	41,534	114	256

7. System Yield

The System Yield of 46,000 ML/year was adopted for the DSP in 2014. Since then council has reworked its system yield with combined system modelling with Hunter Water Corporation which has drastically reduced to 35,400ML/year. Council has also updated its Rainfall Runoff Model for Central Coast water catchments with latest SILO (Scientific Information for Land Owners, owned by Queensland Government) climate data using eSource platform. The rainfall runoff modelling has resulted in lower steam flows than predicted by the previous studies.

Council is currently in the process of building a joint WATHNET model with Hunter Water for system yield analysis but in the meantime the most relevant estimate of system yield (including Hunter Water connection contribution) is 35,400ML/year. While the current agreement with Hunter Water for inter-regional water sharing expires in 2026, it assumed for the purpose of this DSP that the provision for inter-regional water transfers will continue beyond 2026.

The predicted demand exceeds the above described system yield in 2034. A provision of Nominal Yield increase of 7,000 ML/year is proposed in future infrastructure works, enhancing the System Yield to 42,400ML/year

Total existing water treatment and distribution capacity provided for in the DSP is 300 ML/day which is sufficient to meet the peak day demand up to 2050.

The following graphs provide details of annual demand versus yield over time and peak day demand versus treatment capacity over time.

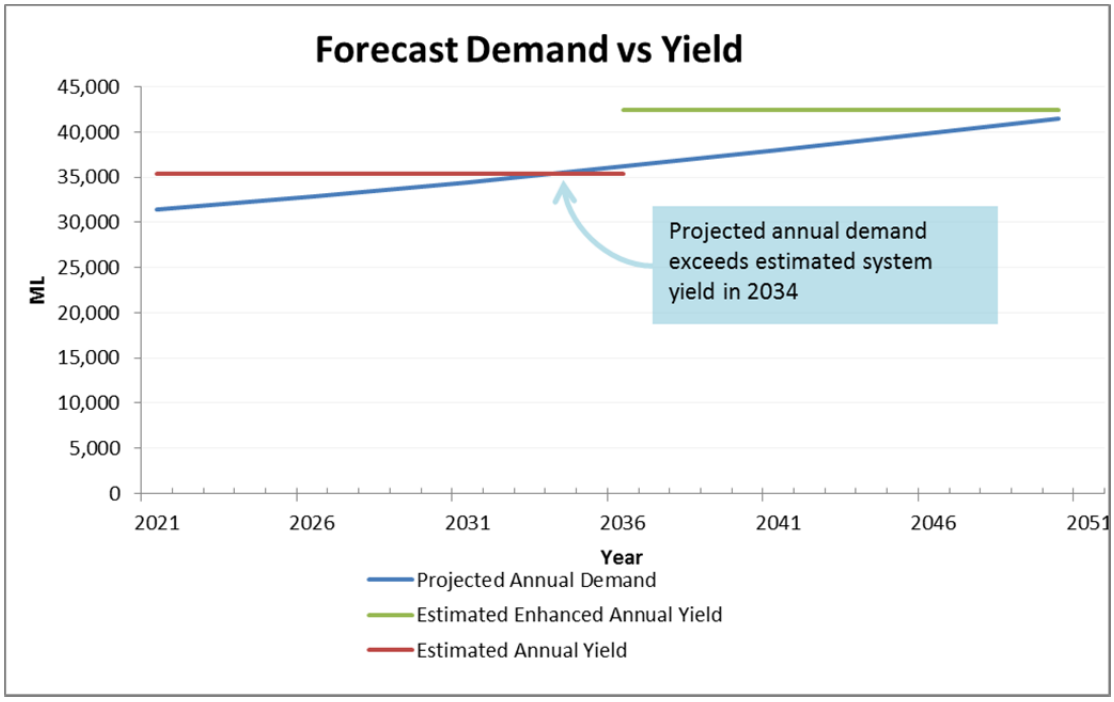

Figure 1 Forecast Demand versus System Yield

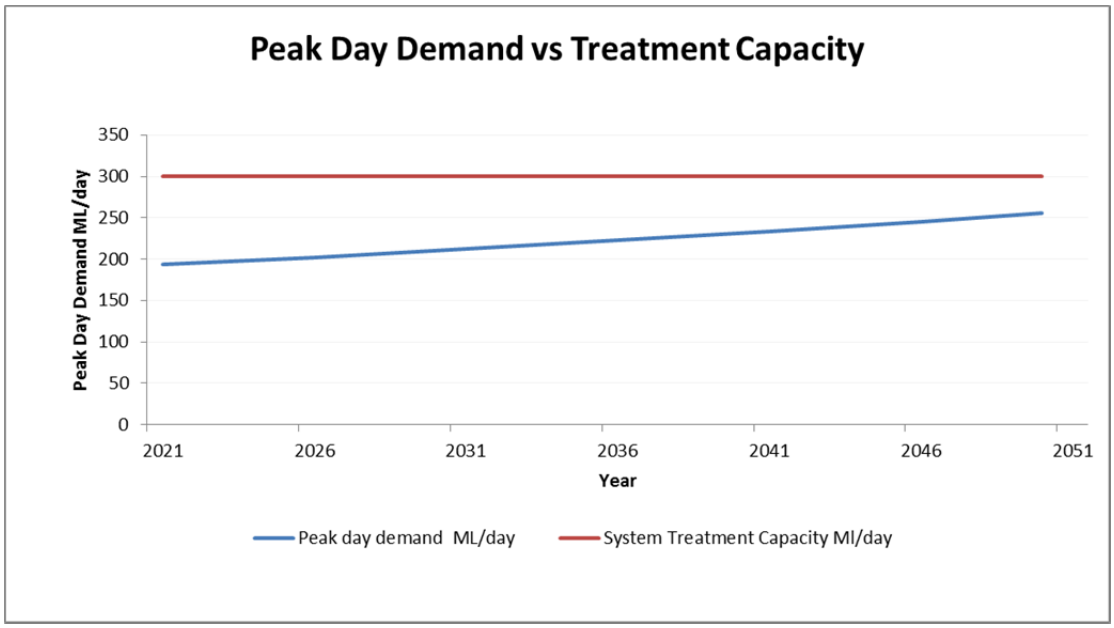

Figure 2 Theoretical Peak Day Demand versus Central Coast Water Treatment Capacity

8. Method of Reviewing/Updating Developer Charges

The Developer Charges determined in this DSP are incorporated in North and South Water DSPs developed by Central Coast Council. The value of charges payable under the Development Servicing Plan will be held constant in real terms for the life of the Plan by the adjustments specified within Local Area DSPs.

9. Calculation of Development Service Charges

The 2018 Calculation Template provided by IPART has been used to calculate maximum charges that can be levied for the headworks component of developer charges on new developments.

Headworks development service charges assessed on the basis of one equivalent tenement (ET) are determined as $3,933/ET.

10. References

The following Reports provide the basis upon which the need and capacity of capital works have been assessed:

i. PWD Report on Investigations for Water Supply to the Gosford – Wyong Region, January 1975.

ii. PWD Report on Investigations for Water Supply to the Gosford – Wyong Region, July 1985.

iii. WaterPlan 2050 with supporting documents

iv. DPWS Report on Mardi Dam Condition Assessment of Intake Tower and Outlet Pipe August 2000.

v. Gosford Wyong Water Supply Desalination Project Concept Design Report July 2005

vi. Mangrove-Enlarge-Options-Report-Draft-V2-130802-PlusAppendix July 2013

vii. Forecast.id Report on Central Coast Council Population and Household Forecasts December 2017

viii. Maximum prices for connecting, or upgrading a connection, to a water supply, sewerage, or drainage system- Sydney Water, Hunter Water and Central Coast Council October 2018

Central Coast Council Water Supply Headworks Development Servicing Plan

CALCULATION OF MAXIMUM PRICE

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Note: an input is required in F21 to incorporate the Headwork costs per ET into the maximum price.

Table 1: Calculation of maximum price ($, $2019-20)

Maximum price		Headworks costs per ET	Pre-1996 assets	Post-1996 commissioned assets	Post-1996 uncommissioned assets	Reduction for expected revenue and operation costs
	Costs to be recovered via DSP		257,145,045	125,963,168	25,234,269	0
	ETs		102,076	106,944	106,944	106,944
3,933	Value per ET		2,519	1,178	236	0

Table 2: Key variables used in maximum price calculation ($, $2019-20)

Sum of new ETs (not discounted)	Sum of PV of new ETs (discounted at pre-1996 asset discount rate)	Sum of PV of new ETs (discounted at post-1996 asset discount rate)	Sum of PV of new ETs (discounted at expected revenue and costs discount rate)	Sum of PV of Pre-1996 commissioned assets (discounted at pre-1996 asset discount rate)	Sum of PV of Post-1996 commissioned assets (discounted at post-1996 asset discount rate)	Sum of PV of Post-1996 uncommissioned assets (discounted at post-1996 asset discount rate)	Sum of PV of revenue for new customers (discounted at expected future revenue and costs discount rate)	Sum of PV of costs for new ETs (discounted at expected future revenue and costs discount rate)
102,076.149	102,076	106,944	106,944	257,145,045	125,963,168	25,234,269	0	0

PRE-1996 ASSETS WITH A NEXUS TO THE SERVICE FOR WHICH THE MAXIMUM PRICE IS BEING CALCULATED

Consideration must be given to the principles regarding asset exclusions presented on the 'Asset exclusions' worksheet before they are entered into the register
Hyperlink to the 'Asset exclusions' worksheet: Asset exclusions'!A1

Date range for assets

Start date	01 Jan 1970
End date	31 Dec 1995

Register of pre-1996 assets

General inputs				Service potential inputs			Asset value inputs				
Identifier	Description	Date commissioned	Date check	DSP areas serviced by asset	Expected system-wide ETs to be serviced by this asset	Proportion of asset cost to be recovered via this DSP	Number of units or length of asset (A)	Unit of measure in (A)	MEERA value per unit/measure of length (B) ($ as at 1 July 2019)	Total MEERA value (A x B) ($, $2019-20)	MEERA value to be recovered via DSP ($, $2019-20)
Raw Water Yield			-			-				-	-
	Mangrove Dam	1 January 1982	Date check - OK		261,946	39.0%	1		156,157,726	156,157,726	60,852,158
	Mardi Dam	1 January 1970	Date check - OK		261,946	39.0%	1		23,714,516	23,714,516	9,241,166
	Mangrove Creek Weir	1 January 1975	Date check - OK		261,946	39.0%	1		4,038,323	4,038,323	1,573,670
	Lower Wyong River Weir -Structure Upgrade	1 January 1990	Date check - OK		261,946	39.0%	1		83,383	83,383	32,493
	Ourimbah Creek Upper Weir	1 January 1979	Date check - OK		261,946	39.0%	1		1,359,603	1,359,603	529,816
	Ourimbah Creek to Mardi Dam WMR	1 January 1979	Date check - OK		261,946	39.0%	1		10,060,172	10,060,172	3,920,287
	Boomerang Creek Tunnel	1 January 1989	Date check - OK		261,946	39.0%	1		140,872,727	140,872,727	54,895,839
	Ourimbah Ck Tunnel	1 January 1979	Date check - OK		261,946	39.0%	1		5,255,000	5,255,000	2,047,789
	Mangrove Creek Pumping Station	1 January 1975	Date check - OK		261,946	39.0%	1		19,612,139	19,612,139	7,642,536
	Mangrove Creek PS to Somersby BalanceTanks WMR	1 January 1975	Date check - OK		261,946	39.0%	1		45,941,312	45,941,312	17,902,591
	Ourimbah Creek Pumping Station (WPS11)	1 January 1979	Date check - OK		261,946	39.0%	1		3,466,198	3,466,198	1,350,722
			-			-				-	-
Treatment and Transfer			-			-				-	-
	Somersby WTP Stage 1	1 January 1971	Date check - OK		261,946	39.0%	1		32,561,814	32,561,814	12,688,816
	Somersby Balance Tank 2	1 January 1971	Date check - OK		261,946	39.0%	1		3,947,031	3,947,031	1,538,094
	Kariong Reservoir No 1(K1)	1 January 1973	Date check - OK		261,946	39.0%	1		5,014,111	5,014,111	1,953,918
	Balance Tanks to Somersby WTP WM Treated Upgrade	1 January 1975	Date check - OK		261,946	39.0%	1		10,797,449	10,797,449	4,207,592
	Coastal Connection	1 January 1977	Date check - OK		261,946	39.0%	1		6,938,702	6,938,702	2,703,901
	Somersby WTP to K2 TM- Upgrade	1 January 1978	Date check - OK		261,946	39.0%	1		10,040,729	10,040,729	3,912,711
	K2 to North Gosford TM- Upgrade	1 January 1979	Date check - OK		261,946	39.0%	1		8,854,675	8,854,675	3,450,525
	Mardi Dam to Mardi WTP WM Treated	1 January 1982	Date check - OK		261,946	39.0%	1		1,965,896	1,965,896	766,078
	Mardi WTP Stage I: 80 ML/d	1 January 1982	Date check - OK		261,946	39.0%	1		42,950,227	42,950,227	16,737,013
	Somersby WTP Stage 2	1 January 1986	Date check - OK		261,946	39.0%	1		29,997,508	29,997,508	11,689,547
	Gosford -Wyong (Tuggerah 2) TM	1 January 1986	Date check - OK		261,946	39.0%	1		45,167,566	45,167,566	17,601,075
	Mardi WTP to Tuggerah 2 TM	1 January 1986	Date check - OK		261,946	39.0%	1		5,877,192	5,877,192	2,290,247
	Kariong Reservoir No 2 (K2)	1 January 1986	Date check - OK		261,946	39.0%	1		19,910,144	19,910,144	7,758,663
	Tuggerah 2 Reservoir	1 January 1986	Date check - OK		261,946	39.0%	1		15,114,431	15,114,431	5,889,851
	Forresters Beach Pumping Station	1 January 1987	Date check - OK		261,946	39.0%	1		1,375,162	1,375,162	535,879
	Ourimbah Pumping Station (WPS17)	1 January 1987	Date check - OK		261,946	39.0%	1		217,347	217,347	84,697
	Mardi WTP Stage II: 80 ML/d	1 January 1994	Date check - OK		261,946	39.0%	1		8,589,967	8,589,967	3,347,372
			-			-				-	-
			-			-				-	-

POST-1996 COMMISSIONED ASSETS WITH A NEXUS TO THE SERVICE FOR WHICH THE MAXIMUM PRICE IS BEING CALCULATED

Consideration must be given to the principles regarding asset exclusions presented on the 'Asset exclusions' worksheet before they are entered into the register.
Hyperlink to the 'Asset exclusions' worksheet: Asset exclusions'!A1

Date range for assets

Start date	01 Jan 1996
End date	30 Jun 2019

Register of post-1996 commissioned assets

General inputs				Service potential inputs			Asset value inputs				
Identifier	Description	Date commissioned	Financial year of commissioning		Expected system-wide ETs to be serviced by this asset	Proportion of asset cost to be recovered via this DSP	Number of units or length of asset (A)	Unit of measure in (A)	MEERA value per unit/measure of length (B) ($ as at 1 July 2019)	Total MEERA value (A x B) ($, $2019-20)	MEERA value to be recovered via DSP ($, $2019-20)
Raw Water Yield			-			-				-	-
	Mangrove Dam - Communications Upgrade	01 Jan 2010	2009-10		261,946	39.0%	1		395,416	395,416	154,087
	Mardi Dam Upgrades	01 Jan 2012	2011-12		261,946	39.0%	1		18,185,994	18,185,994	7,086,790
	Mooney Dam Upgrades-Instrumentation, Destratification and other minor works	01 Jan 2004	2003-04		261,946	39.0%	1		270,269	270,269	105,319
	Mangrove Creek Electrical Upgrades Works	01 Jan 2004	2003-04		261,946	39.0%	1		37,692	37,692	14,688
	Lower Wyong River Weir -Fishwayand other Upgrade	01 Jan 2010	2009-10		261,946	39.0%	1		1,429,042	1,429,042	556,875
	Ourimbah Creek Upper Weir- Fishway Upgrade	01 Jan 2007	2006-07		261,946	39.0%	1		637,781	637,781	248,533
	Lower Wyong PS to Mardi Dam WMR -Upgrade pipeline DN1000	01 Jan 2006	2005-06		261,946	39.0%	1		8,102,685	8,102,685	3,157,486
	Mardi Dam to Mangrove Dam WMR	01 Jan 2011	2010-11		261,946	39.0%	1		91,713,571	91,713,571	35,739,305
	Boomerang Creek Tunnel Upgrade	01 Jan 2004	2003-04		261,946	39.0%	1		234,533	234,533	91,394
	Mangrove Creek Pumping Station -Electrical Control Upgrade	01 Jan 2004	2003-04		261,946	39.0%	1		164,002	164,002	63,909
	Mooney Mooney Pumping Station- Electrical Control Upgrade	01 Jan 2004	2003-04		261,946	39.0%	1		158,701	158,701	61,843
	Mooney Pumpstation and Power upgrade	01 Jan 2016	2015-16		261,946	39.0%	1		3,397,358	3,397,358	1,323,896
	Mangrove Creek PS to Somersby BalanceTanks WMR-Upgrade	01 Jan 2007	2006-07		261,946	39.0%	1		426,706	426,706	166,280
	Wyong River WPS 1A	01 Jan 2012	2011-12		261,946	39.0%	1		11,311,913	11,311,913	4,408,071
	Ourimbah Creek Pumping Station (WPS11) Electrical Control Upgrade	01 Jan 2004	2003-04		261,946	39.0%	1		169,842	169,842	66,185
	Mardi Dam to Mangrove Creek Dam Pumping Station WPS24	01 Jan 2012	2011-12		261,946	39.0%	1		7,539,559	7,539,559	2,938,045
			-			-				-	-
Treatment and Transfer			-			-				-	-
	Somersby WTP Electrical Control Upgrade 1	01 Jan 2004	2003-04		261,946	39.0%	1		904,888	904,888	352,620
	Somersby WTP Electrical Control Upgrade 2	01 Jan 2004	2003-04		261,946	39.0%	1		2,020,896	2,020,896	787,511
	Mardi WTP-Elecrtical Control Upgrade 1	01 Jan 2004	2003-04		261,946	39.0%	1		1,920,427	1,920,427	748,360
	Mardi WTP-Elecrtical Control Upgrade 2	01 Jan 2004	2003-04		261,946	39.0%	1		486,884	486,884	189,731
	Somersby Balance Tank 1 Electrical Control Upgrade	01 Jan 2004	2003-04		261,946	39.0%	1		83,029	83,029	32,355
	Somersby Balance Tank 2 Electrical Control Upgrade	01 Jan 2004	2003-04		261,946	39.0%	1		142,936	142,936	55,700
	Kariong Reservoir No 1(K1) Electrical Power Upgrade	01 Jan 2004	2003-04		261,946	39.0%	1		156,599	156,599	61,024
	Kariong Reservoir No 2 (K2 -Electrical Power Upgrade	01 Jan 2004	2003-04		261,946	39.0%	1		192,333	192,333	74,949
	Tuggerah 2 Reservoir Electrical Power Upgrade	01 Jan 2004	2003-04		261,946	39.0%	1		126,120	126,120	49,147
	Forresters Beach Pumping Station Electrical Power Upgrade	01 Jan 2004	2003-04		261,946	39.0%	1		68,807	68,807	26,813
	Woy Woy WTP for Groundwater Bores	01 Jan 2007	2006-07		261,946	39.0%	1		9,735,059	9,735,059	3,793,596
	Hunter Connection	01 Jan 2007	2006-07		261,946	39.0%	1		21,297,039	21,297,039	8,299,114
	Somersby WTP Civil and Metal Upgrade	01 Jan 2008	2007-08		261,946	39.0%	1		1,099,601	1,099,601	428,497
	Mardi WTP- Civl/ Mech/Elec Upgrade	01 Jan 2008	2007-08		261,946	39.0%	1		1,592,590	1,592,590	620,607
	Mardi Dam to Mardi WTP Pumping Station WPS23	01 Jan 2010	2009-10		261,946	39.0%	1		5,037,338	5,037,338	1,962,970
	High Lift Pump Station WPS25	01 Jan 2011	2010-11		261,946	39.0%	1		9,936,469	9,936,469	3,872,082
	Ourimbah Pumping Station (WPS17) Electrical Power Upgrade	01 Jan 2013	2012-13		261,946	39.0%	1		1,197,930	1,197,930	466,814
			-			-				-	-

POST-1996 UNCOMMISSIONED ASSETS WITH A NEXUS TO THE SERVICE FOR WHICH THE MAXIMUM PRICE IS BEING CALCULATED

Consideration must be given to the principles regarding asset exclusions presented on the 'Asset exclusions' worksheet before they are entered into the register.
Hyperlink to the 'Asset exclusions' worksheet: Asset exclusions'!A1

Date range for assets
Start date: 01 Jul 2019

Register of uncommissioned assets

General inputs				Service potential inputs			Asset value inputs				
Identifier	Description	Date commissioned	Financial year of commissioning	DSP areas serviced by asset	Expected system-wide ETs to be serviced by this asset	Proportion of asset cost to be recovered via this DSP	Number of units or length of asset (A)	Unit of measure in (A)	MEERA value per unit/measure of length (B) ($ as at 1 July 2019)	Total MEERA value (A x B) ($, $2019-20)	MEERA value to be recovered via DSP ($, $2019-20)
Future Yield Augmentation			-			-				-	-
	Mardi to Warnervale Pipeline (M2WPL)	30 Jun 2021	2020-21		261,946	39.0%	1		13,714,819	13,714,819	5,344,445
	Future Yield Augmentation (DESAL)	30 Jun 2034	2033-34		261,946	39.0%	1		100,970,000	100,970,000	39,346,387
			-			-				-	-
			-			-				-	-

Appendix B

Water Supply Capital Works Summary

Components	Diameter (mm)	Length (m)	Unit Cost ($/m)	Cost ($2019/20)	Forecast Commissioning Year (iD 2017 Data)
Water main - Railway Crescent-Niagara Park (1)	250	615	393.67	$242,107.05	2026
Water main - Tuggerah St-Lisarow (2)	150	623	288.93	$180,003.39	2026
Water main - Narara Valley Drive -Narara (3)	300	187	460.44	$86,102.28	2036
Water main - Hanlan St / Narara (4)	200	381	328.94	$125,326.14	2022
Water main - Kalawarra Rd-Wyoming (5)	200	475	328.94	$156,246.50	2026
Water main - Avoca Dr-Kincumber (6)	375	1440	540.22	$777,916.80	2031
Water main - Central Coast Hway, East Gosford (7)	200	284	328.94	$93,418.96	2021
Water main - Newling Rd to Bannerman Rd, Lisarow(8)	300	270	460.44	$124,318.80	2020
Water main - From Kathleen Morreau rd along Railway line Lisarow(9)	150	100	288.93	$28,893.00	2020
Water main-Linking mains of Sylvan Valley Close-Perratt Close(10)	150	140	288.93	$40,450.20	2020
Watermain-Deane St from Narara ValleyRd to existing 150(13)	150	160	288.93	$46,228.80	2020
Watermain- Research Rd up to Narara Eco Village (16)	150	175	288.93	$50,562.75	2020
Watermain-Hastings Rd up to Serpentine Rd(17)	250	930	393.67	$366,113.10	2026

Appendix C

Methodology for Water Supply Capital Works

Water Supply augmentations were decided based on three studies carried out as following;

- Master Plan 2012
- System assessments carried out for Local Environmental planning (2018)
- DSP 2014

Master Plan 2012;

The strategy was developed with the consideration of current capacity, performance and future growth. The level of service was agreed by a technical memorandum which was based on WSAA (Sydney Water Edition).

Master Plan consisted of identification of infrastructure to serve the 2051 projected populations that consisted of Major developments, Centres and the infill within the suburbs as forecasted by Forecast.id. The analysis consisted of following two areas;

- Existing Service Area

The existing serviced area for master planning purposes generally comprised all properties, including vacant properties, within the general boundaries of the year 2010 serviced area. A major component of the development consisted of Gosford CBD area, Somersby Industrial Park and Mount Penang developments. The infrastructure identified for these areas have not been included in 2019 DSP.

- Potential Service Area

The system performance analysis has shown that new growth occurring as a result of the Wyoming, Narara, Kariong and Erina do not need major upgrades. Some local service extensions and link mains have been identified for these in 2014 DSP that have been included in 2019 DSP too. Details of the water mains identified under this category are given in Summary of Developer Strategies South 2019 (Appendix G).

Under Future Development areas identified in Master Plan2012, water main amplification to Erina Heights along Hastings Rd has been identified. Servicing Narara Research Centre was identified initially under Master Plan and subsequently analysed under Narara Eco Village development and a new main along Research Rd has been proposed.

System assessments carried out for Local Environmental planning (2018);

A system performance assessment was carried out for the new proposed Local Environment Plan (LEP) to assess how the system performance would change with the introduction of the proposed LEP (new lot size 450m^2 instead of 550m^2). The CCC south water network was assessed to identify the assets that need amplification for the current demand with the potential additional lots.

Max day demand analysis carried out for current scenario identified some mains that experience high head loss>10m/km and velocity around 2m/s. Some trunk mains and reticulation mains were identified for capacity restriction as per above criteria. These assets were included in 2019 DSP. More details of the mains identified under this system performance assessment are given in Summary of Developer Strategies South 2019 in Appendix G.

2014 DSP;

2014 DSP has identified some link water mains that were needed to enhance supply to some areas. These were mostly located in Narara and Lisarow DSP areas. These mains were included in the 2019 DSP. Summary of Developer Strategies South 2019 in Appendix G.

Appendix D

Sewerage Capital Works Summary

Proposed Sewer Gravity Mains Amplifications

SPS Catchment	Line Number	Dia(mm)	Length(m)	Precinct/Suburb	Year	Rate ($/m)	Cost ($2019/20)
C05	1	300	305.2	Terrigal	2026	644.9	$196,816
S06	2	450	350.18	East Gosford	2022	1018.3	$356,601
S03	3	525	455.4	East Gosford	2022	1090.9	$496,807
ER11	4	225	364.8	Green Point	2021	511.3	$186,512
ER10	5	300	213.79	Green Point	2021	644.9	$137,868
ER10	6	450	106.4	Green Point	2021	1171.9	$124,693
N02	7	225	106.3	Narara	2031	511.3	$54,348
WG06	8	225	245.1	Tascott	2020	647.0	$158,575
WG03B	9	300	286	Point Clare	2020	644.9	$184,435
KA03	10	225	478	Kariong	2021	511.3	$244,388
C08	11	225	306.8	Wamberal	2026	511.3	$156,858
NAM	12	300	170.7	North Avoca	2020	644.9	$110,080
KA01	13	225	247	Kariong	2020	511.3	$126,284
N04	14	225	257.8	Narara	2020	511.3	$131,806
N18	15	225	180.7	Lisarow	2020	511.3	$92,387
S02	16	225	176.5	East Gosford	2021	511.3	$90,240
N18	17	375	26.43	Lisarow	2026	838.4	$22,160
TMJ	18	600	125	Terrigal	2022	1372.9	$171,608
TMJ	19	525	400	Terrigal	2026	1363.4	$545,357
ER1	20	300	215	Erina	2021	644.9	$138,648
ER1	21	225	65	Erina	2021	511.3	$33,233
N7	22	225	296	Narara	2020	511.3	$151,337

Proposed Sewer Rising Mains Upgrades and New Rising Mains					
SPS	**Dia(mm)**	**Length(m)**	**Year**	**Rate**	**Cost**
M3	200	240	2026	$ 459	$ 110,081
S8	100	161	2021	$ 368	$ 59,280
FB2	100	285	2026	$ 368	$ 104,937
FB1B	300	1290	2021	$ 586	$ 755,894
C13	300	639	2020	$ 586	$ 374,431
C1	225	847	2031	$ 479	$ 405,713
TMJ(Proposed additional RM	600	900	2021	$ 1,473	$ 1,325,520
SI5(New SPs)	100	206	2031	$ 368	$ 75,849
SI6(New SPs)	100	432	2031	$ 368	$ 159,062
NAMJ Rising main(Upto Kincumber tunnel)	600	1400	2031	$ 1,473	$ 2,061,920

Proposed Pump Station Capacity Upgrades					
SPS	**Year**	**Capacity**	**M&E Cost**	**Civil Cost**	**Total Cost**
ER11	2031	25	$ 216,405	$401,895	$ 618,300
ER9	2031	22	$ 202,129	$375,383	$ 577,512
ER1	2031	103	$ 481,264	$0	$ 481,264
KS2	2021	13	$ 158,004	$0	$ 158,004
M1	2020	201	$ 703,080	$0	$ 703,080
M2	2021	153	$ 599,256	$1,112,904	$ 1,712,160
M3	2026	115	$ 511,114	$949,211	$ 1,460,325
SD2	2021	110	$ 498,677	$0	$ 498,677
SD5	2026	34	$ 253,176	$0	$ 253,176
SD9	2026	44	$ 295,138	$0	$ 295,138
M4	2026	34	$ 253,176	$0	$ 253,176
S5	2026	103	$ 481,264	$893,777	$ 1,375,041
S6	2026	40	$ 283,458	$526,422	$ 809,880
S8	2021	31	$ 240,198	$0	$ 240,198
S9	2026	27	$ 225,922	$0	$ 225,922
NA2	2021	46	$ 306,818	$0	$ 306,818
A4	2026	99	$ 471,206	$0	$ 471,206
A6	2022	15	$ 170,982	$0	$ 170,982
FB4	2020	33	$ 253,176	$0	$ 253,176
FB2	2023	21	$ 197,371	$0	$ 197,371
FB1B	2021	182	$ 664,146	$0	$ 664,146
C15	2026	38	$ 270,480	$502,320	$ 772,800
C13	2020	241	$ 789,600	$1,466,400	$ 2,256,000
C12	2026	26	$ 216,405	$0	$ 216,405
C11	2031	19	$ 183,960	$0	$ 183,960
C8	2031	39	$ 279,132	$0	$ 279,132
C5A	2031	39	$ 279,132	$518,388	$ 797,520
C1	2031	114	$ 508,626	$944,592	$ 1,453,218
KA2	2031	63	$ 366,734	$681,077	$ 1,047,810
WG3A	2021	201	$ 703,080	$0	$ 703,080
WG4	2026	116	$ 511,114	$949,211	$ 1,460,325
WG6	2026	72	$ 392,690	$0	$ 392,690
N2	2026	26	$ 221,164	$0	$ 221,164
OB2	2031	27	$ 225,922	$0	$ 225,922
WYMJ	2026	1150	$ 1,916,799	$3,559,770	$ 5,476,569
NAMJ	2031	590	$ 1,333,564	$0	$ 1,333,564
A7	2022	34	$ 257,502	$478,218	$ 735,720

Appendix E

Methodology for Sewerage Capital Works

Sewer network augmentations were decided based on three studies carried out as following;

- Master Plan 2012
- Terrigal Major Strategy and Coastal Carrier Strategy
- System assessments carried out for Local Environmental planning (2018)
- Pump Station system performance Analysis

Master Plan 2012;

The strategy was developed with the consideration of current capacity, performance and future growth.

- Development of level of service for Sewer services
- Analysis of Population Growth and identifying Future Service Areas
- Derive dry weather and wet weather flows for each horizon and assess system performance for each horizon
- Preparation of Sewer System Servicing Strategy

The storm flow analysis has been based on the rational method as described within the for infiltration and inflow analysis WSA 02 code. A course validation of the parameters of the applied rational method has been undertaken. As the system ages it is likely to allow increased IIF. A deterioration allowance of 0.5% per year has been applied to predicted storm and GWI flows. This equates to 20% increases of storm flows between 2011 and 2051.

Master Plan has analysed the requirements of the potential service areas that have Onsite Sewerage Management (OSSM) in operation that need to be connected to the system in future.
Also the new reticulation mains required for Future Development Areas have been identified the sewer gravity mains (mostly DN 150) as shown following;

	Un-serviced Area (Ha)	ET	Timing	Sewer Gravity main	Sewer Rising main	SPS
DSP Area				(DN 150)	(DN100)	
Wyoming East	88	199	2021-2031	1636		
Kariong	16	66	2019-2031		250	1(5l/s)
Erina (East of James Sea Dr	31	219	2021-2031	583		
Lisarow	15	14	2015-2031	214		
Investigation and Future Development						
Erina Heights	167	2667	2031-2051	12100		
Killcare Heights	9	33	2021-2031	1109		
Wamberal North	121	139	2031-2051	11100		
Wamberal South	214	205	2031-2041	16700		
Mac Masters Beach	162	84	2015-2041	1480		
Karalta Rd	12	44	2031-2036	1200		
SIP Eastern Extn			2031-2036		550	1(5 l/s)
Rezoning of Non-Urban Lands						
Narara Eco Village	12	150	2020-2031	296 (DN225)		

Master Plan study identified the SPSs that needed emergency storages by analysing the dry weather flow for current and future and upgrades of storages of three major pump stations (NAMJ, WYMJ and TMJ) were identified. Also PWWF for current and future (2051) scenarios were assessed for 1 in2 yr ARI, 1in 5yr ARI event and 1in 10yr ARI event. These wet weather assessment have identified a list of minor SPSs that need amplification but they have not been included in the future asset requirements.

Coastal Carrier Strategy and Terrigal Major Strategy;

The Coastal Carrier System (CCS) comprises all infrastructures in the Northern Beaches areas of Gosford City. The suburbs include, Forrester's Beach, Terrigal, Wamberal, North Avoca, Avoca, and Kincumber. In the recent past there had been rapid residential development in the northern most section of Terrigal catchment. These consist of Forrest Glen Retirement village and Bakali Rd subdivisions. Also there is considerable development proposed in Terrigal Haven area and Terrigal Centre (SPS C1 Catchment) in near future. Following table shows the anticipated development contributing to Coastal Carrier flow.

Suburb	**Forecast ID Dev**	**Contributing ET(2018-2036)**
Forrester's Beach & Wamberal	Forest Glen retirement Village (SPS FB4)	232
	Bakali North (SPS FB4)	100
	Bakali South (SPS FB1)	57
	Forecast ID Infill	157
Terrigal & North Avoca	SPS C18 catchment(Kings Ave)	127
	SPS TMJ Catchment (Misc)	84
	SPS C1 Catchment(Misc)	365
	Forecast ID Infill	403

With the above developments and the additional flow that is anticipated from the infill the flow that is anticipated at SPS Terrigal Major is expected to increase in the future. However, the assets downstream of TMJ have restricted capacity to carry this flow and the flow from the catchment of North Avoca Service Area. Costal Carrier Strategy has looked at the major infrastructure that is necessary to hold the above flow. Also, reassessment of the Coastal Carrier Strategy is planned for 2019/2020 that may result in a change in the currently identified infrastructure. Following major assets have been identified by the studies carried up to now.

1. DN 525 Gravity main duplication from SPPS CB5B and C10 ring main end to SPS C4
2. DN 600 TMJ Rising main duplication (Two sections of length)
3. Additional storages and ERS at TMJ pump station
4. NAMJ SPS capacity upgrade, storage upgrade and ERS
5. NAMJ rising main duplication up to Kincumber Tunnel
6. Relocation and upgrading of SPS A7 and re-directing of rising main

Further details are shown in Figure 2 and Figure 3 of Summary of Developer Servicing Strategies South 2019 (Appendix G).

Servicing and Infrastructure Capacity Analysis 2018;

Under the above study a system performance assessment was carried out for the new proposed Local Environment Plan (LEP) to assess how the system performance would change with the introduction of the proposed LEP (new lot size 450m^2 instead of 550m^2). The CCC south sewer network was assessed to identify the assets that need amplification for the current demand with the potential additional lots.
Some sewer mains were identified as mains that needed amplifications as these mains experienced a peak wet weather flow for 1: 5 year ARI event exceeding the pipe full capacities. The locations are shown in Figure 7, Figure 8, Figure 9 & Figure 10 of Summary of Developer Servicing Strategies South 2019.

Appendix F

Sewer Pump Station Upgrade Assessment

For former Gosford LGA a sewer pump station assessment was carried out for all the pump stations in 2012 Mater Plan study.
The first step was to identify the SPSs that need amplifications for the 2012 scenario.
This study identified the pump stations that need amplifications on emergency storage and pump capacity by assessing dry weather emergency storages and peak wet weather flow.
Peak wet weather analysis was carried out for 1in 2 yr ARI, 1in 5 yr ARI and 1 in 10Yr ARI rainfall events. However, a specific containment standard was not recommended in Master Plan study. Hence, SPSs were not included in the recommended asset amplifications.
Some of the pump stations identified as capacity restricted in 2012 Master Plan study have been amplified already (E.g. SPS SI2,KA1).

The assessment carried out for new Local Environment Plan (LEP) assessment also carried out an analysis on the pump capacity for each catchment. All sewer systems were assessed for 1in 5 yr ARI event and pump stations that had a capacity less than or close to the peak wet weather flow were for current scenario were selected for as SPSs that need amplification.

Two sewer models were used to assess future wet weather flow;

- Master Plan Model 2012; The average and peak dry weather in each catchment was assessed by running dry weather flow runs for model scenarios in Master Plan 2012 model for future. The growth up to 2031 horizon in each catchment was assessed by these results.

- Calibrated model 2015; The storm allowance for each catchment was calculated based on dry weather and wet weather flow in the calibrated model (2015). The future wet weather flow was calculated based on future dry weather flow and storm allowance in each catchment. Proposed pump capacity was decided on the peak wet weather predicted for future horizon.

The current emergency storage time for each pump station was assessed by using the current calibrated model. The future emergency storage time for each pump station was assessed by calculating the holding time proportionately to the growth within the catchment.

Rising main velocity for the current pump capacities were obtained from the current calibrated model. The rising mains that had velocities higher than 2.5 m/s were identified for amplifications. In addition the rising main velocities were assessed for future pump capacities and proposed for amplification if the velocities were higher than 2.5 m/s.

The following attached tables shows the analysis carried out for identification of SPS upgrade , rising main amplification and emergency storage upgrade.

Pump Station Analysis carried out based on future growth and current asset performance

Service Area	Sewer SPS catchment	SPS Capacity	ADWF_Current (l/s)	1: 5 YR PWWF-Current	ADWF_2031 (l/s)	1: 5 YR PWWF-2031	Emergency Storage time-Current(hrs)	Emergency Storage time-2031(hrs)	RM Velocity-Current(m/s)	RM Velocity_2031 (m/s)	1:5 Yr ARI (Current > SPS capacity)	Year of Mech Elec Upgrade	Year of RM Upgrade	Civil Upgrade	Comments (Comparison to results in Master Plan 2012)
KMJ	ER11	18	0.9	22.8	1.7	25	7	3.8	0.8	0.80	Yes	2031		2031	Identified as capacity restrained in 2012 MP
	ER9	19	0.7	20	1.5	22	6	2.9	1.1	0.71	Yes	2031		2031	
	ER1	108	6.3	98	8.1	103	5	3.9	1	1.46	No	2031	2031		
	K1	20	2.0	23	2.0	23	4	4.0	1.1	1.30	Yes				Identified as capacity restrained in 2012 MP
	KS2	7	0.4	12.5	0.4	13	23	23.0	0.9	1.59	Yes	2021			Identified as capacity restrained in 2012 MP
	M1	154	9.0	194.6	11.1	201	4.5	3.7	1.4	1.82	Yes	2020			Due for Upgrade within 2020(Identified in IPART18-2020)
	M2	130	6.0	144.5	8.7	153	3	2.1	1.84	2.16	Yes	2021	2021	2021	Additional storage is recommended
	M3	100	3.5	109.2	5.5	115	4	2.5	3.2	3.67	Yes	2026	2026	2031	Some sewer mains exceed capacity. 1:5 Yr ARI flow exceeds the pump capacity.
	SD2	80	6.0	105.8	7.5	110	9	7.2	0.72	1.00	Yes	2021			Identified as capacity restrained in 2012 MP
	SD5	25	1.6	33	1.9	34	23	19.4	0	1.08	Yes	2026			
	SD9	35	1.6	42	2.2	44	12	8.6	1.1	1.40	Yes	2026			
	M4	25	1.1	31.6	1.7	34	3	1.9	1.4	1.90	Yes	2026			
ECS	S4	33	2.1	36	2.1	36	4	3.9	1.9	2.04	Yes				Some reticulation mains upstream of SPS exceed capacity
	S5	80	10.0	91	14.1	103	2.5	1.8	1.1	1.46	Yes	2026		2021	Identified as capacity restrained in 2012 MP. Some trunk mains and reticulation mains upstream of SPS exceed capacity
	S6	32	1.7	38	2.5	40	3	2.1	1.8	2.28	Yes	2026	2026	2026	Some reticulation mains upstream of SPS exceed capacity
	S8	15	1.2	29	1.8	31	7	4.7	1.93	3.92	Yes	2021	2026		Due for Upgrade within 2020(Identified in IPART18-2020)
	S9	15	3.5	21	5.5	27	4	2.5	0.22	0.38	Yes	2026			

Service Area	Sewer SPS catchment	SPS Capacity	ADWF_Current (l/s)	1: 5 YR PWWF-Current	ADWF_2031 (l/s)	1: 5 YR PWWF-2031	Emergency Storage time-Current(hrs)	Emergency Storage time-2031(hrs)	RM Velocity-Current(m/s)	RM Velocity_2031 (m/s)	1:5 Yr ARI (Current > SPS capacity)	Year of Mech Elec Upgrade	Year of RM Upgrade	Civil Upgrade	Comments (Comparison to results in Master Plan 2012)
NAMJ	NA2	37	2.8	45	3.2	46	3	2.7	0.9	1.16	Yes	2021			Identified as capacity restrained in 2012 MP. Some mains exceeding capacity
	NA3	10	0.6	12	0.9	13	5	3.3	1.3	1.64	Yes				
	A4	82	5.8	92	8.1	99	7	5.0	1.2	1.40	Yes	2026			Identified as capacity restrained in 2012 MP & Some mains exceeding capacity
	A7*	7													Identified in CC Strategy to be upgraded in 2021/22. A7 repositioning and rising main to be connected to A1 rising main.
	A6	11	0.8	13.4	1.2	15	14	9.4	1.4	1.85	Yes	2031			Some mains exceeding capacity
TMJ	FB4	25	1.3	24	2.8	33	4	1.9	1.4	1.87	No	2019	2019	2031	SPS due for upgrade 19/20 due to rapid future development in the catchment.
	FB2	15	0.4	19	1.1	21	14	5.5	1.9	2.68	Yes	2026	2026		
	FB1B	144	5.4	165	11.1	182		0.0	2	2.58	Yes	2021	2021		Due for Upgrade within 2020(Identified in IPART18-2020)
	C15	32	1.2	34.6	2.2	38	6	3.3	1.8	2.13	Yes	2026	2026	2031	
	C13	165	11.7	226	16.6	241	4	2.8	2.3	3.40	Yes	2020	2020	2031	Due for Upgrade within 2020(Identified in IPART18-2020)
	C12	20	0.8	25	1.1	26	11	8.7	1.1	1.45	Yes	2026			
	C11	15	0.9	17.7	1.2	19	9.5	7.1	1.9	2.37	Yes	2031	2031		
	C8	30	2.3	36	3.3	39	7	4.9	1.7	2.21	Yes	2031	2031		I/I reduction program proposed for 2019/20. Pump may be not necessary dpeending on this program.
	C5A	34	2.7	35.6	4.0	39	2	1.4	1.9	2.22	Yes	2031	2031	2031	I/I reduction program proposed for 2019/20. Pump may be not necessary dpeending on this program.
	C1	108	6.9	112	7.7	114	7.5	6.7	1.4	2.88	Yes	2031	2031	2031	Sewer mains and SPS have reached the capacity
WGMJ	KA2	50	2.1	60.4	3.0	63	2	1.4	1	1.29	Yes	2031		2031	Flow exceeds capacity in some reticulation and emergency storage available is less than 4hrs
	WG3A	160	14.3	187	18.9	201	12	9.1	1.4	1.26	Yes	2021			Flow exceeds capacity in trunk mains and some reticulation
	WG4	100	6.4	109	8.7	116	3.25	2.4	1.4	1.64	Yes	2026		2026	Identified as capacity restrained in 2012 MP
	WG6	60	3.9	67.8	5.2	72	10	7.5	1.2	1.46	Yes	2026			Identified as capacity restrained in 2012 MP
WYMJ	N2	25	1.2	23	2.2	26		0.0	1.3	0.83	No	2026			Identified as capacity restrained in 2012 MP
WWMJ	OB2	25	0.7	27	0.8	27	20	17.5	1.4	1.54	Yes	2031			Identified as capacity restrained in 2012 MP

Appendix G

Summary of Developer Servicing Strategies Southern Region 2019

MEMO –Summary of developer servicing strategy documents for water and sewer in Southern Region Development Servicing Plan Area

Background

To support the next generation of the Developer Servicing Plan (DSP) 2019, this summary document is provided to give an overview of the methodology followed to identify the proposed assets to fulfil the system performance standards followed by Central Coast Council and to address the new development that takes place within the CCC southern area.

1. Coastal Carrier Strategy & Terrigal Major Strategy

The Coastal Carrier System (CCS) comprises all infrastructures in the Northern Beaches areas of Gosford City. The suburbs include, Forrester's Beach, Terrigal, Wamberal, North Avoca, Avoca, and Kincumber. The CCS joins the Gosford Kincumber Gravity Main (GKCM) just prior to Kincumber Major.

It has been identified that Coastal Carrier sewer system has been experiencing capacity constraints for a considerable time and to address these deficiencies two strategies have been carried out in the past as following;

Terrigal Major Strategy:

The Terrigal Major strategy has identified the pump station that are under capacity and some have been amplified in the past. Terrigal Major SPS and some of the upstream infrastructure have been augmented in the recent past, specifically pump stations C1, C4, C5, C8, C13, C15 and FB1. However, the amplifications carried out in the past have restricted operation capacity due to lack of capacity in the major carriers in the downstream area. In the recent past there had been rapid residential development in the northern most section of Terrigal catchment (refer Figure2). These consist of Forrest Glen Retirement village and Bakali Rd subdivisions. Due to these developments it was identified SPS FB4 is needed to be amplified in 2019/2020. The other major developments are located in C18 catchment and C1 catchments (Refer Table 1).

Coastal Carrier Strategy:

With the above developments and the additional flow that is anticipated from the infill the flow that is anticipated at SPS Terrigal Major is expected to increase in the future. However, the assets downstream of TMJ have restricted capacity to carry this flow and the flow from the catchment of North Avoca Service Area. A duplicate rising main for SPS TMJ had been partially constructed. The completion of this RM would increase the working capacity of SPS TMJ to about 810 L/s, but this would exceed the capacity of some downstream components. Coastal Carrier Strategy has identified the infrastructure shown in Figure 2 and Figure 3 as necessary to service the areas TMJ and NAMJ service Areas. However, reassessment of the Coastal Carrier Strategy is planned for 2019/2020 that may result in a change in the currently identified infrastructure.

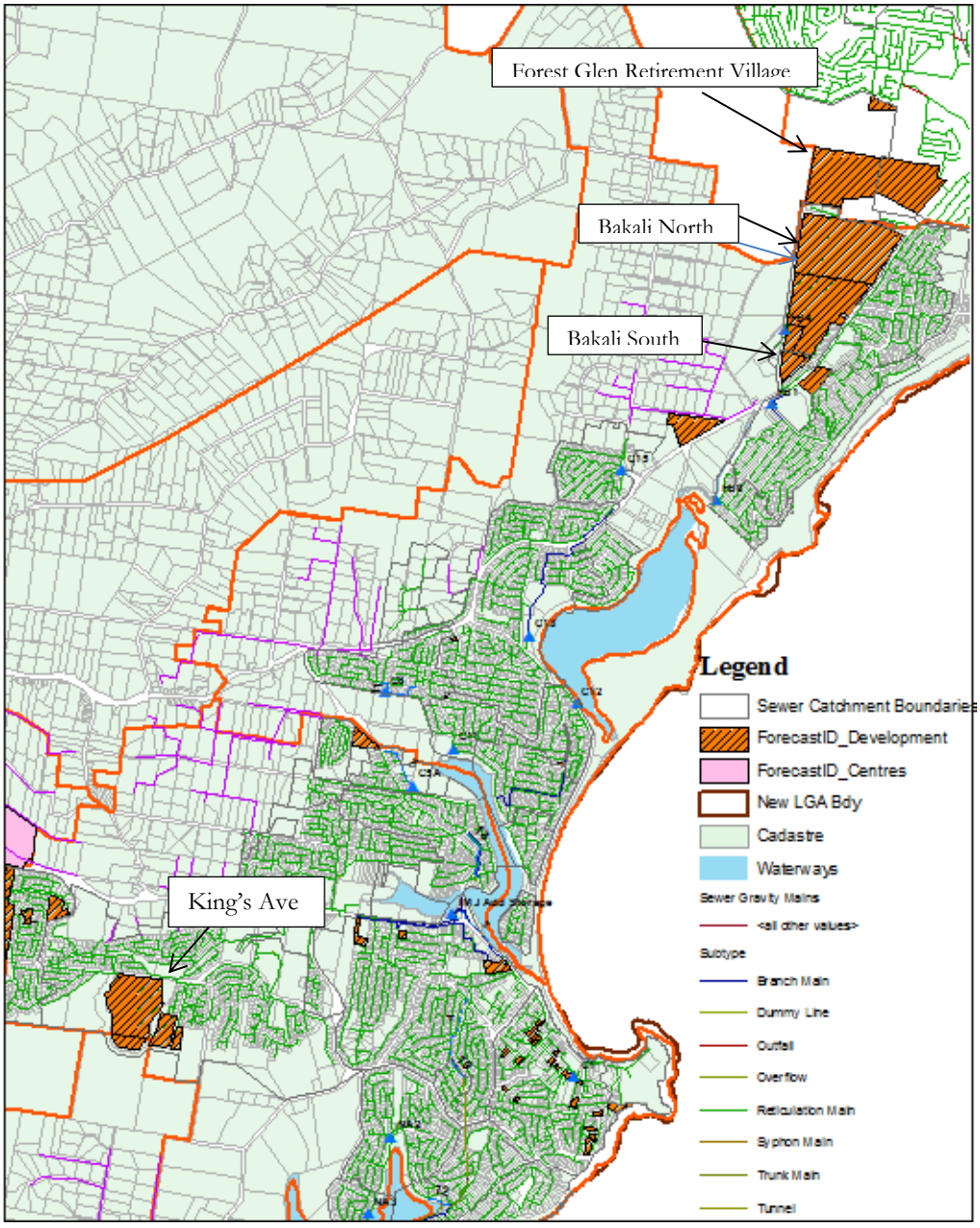


Figure 1: major Developments in Terrigal major catchment

Table 1: Major developments in Terrigal catchment

	Forecast ID Dev	Contributing ET(2018-2036)
Forrester's Beach & Wamberal	Forest Glen retirement Village (SPS FB4)	232
	Bakali North (SPS FB4)	100
	Bakali South (SPS FB1)	57
	Forecast ID Infill	157
Terrigal & North Avoca	SPS C18 catchment(Kings Ave)	127
	SPS TMJ Catchment (Misc)	84
	SPS C1 Catchment(Misc)	365
	Forecast ID Infill	403

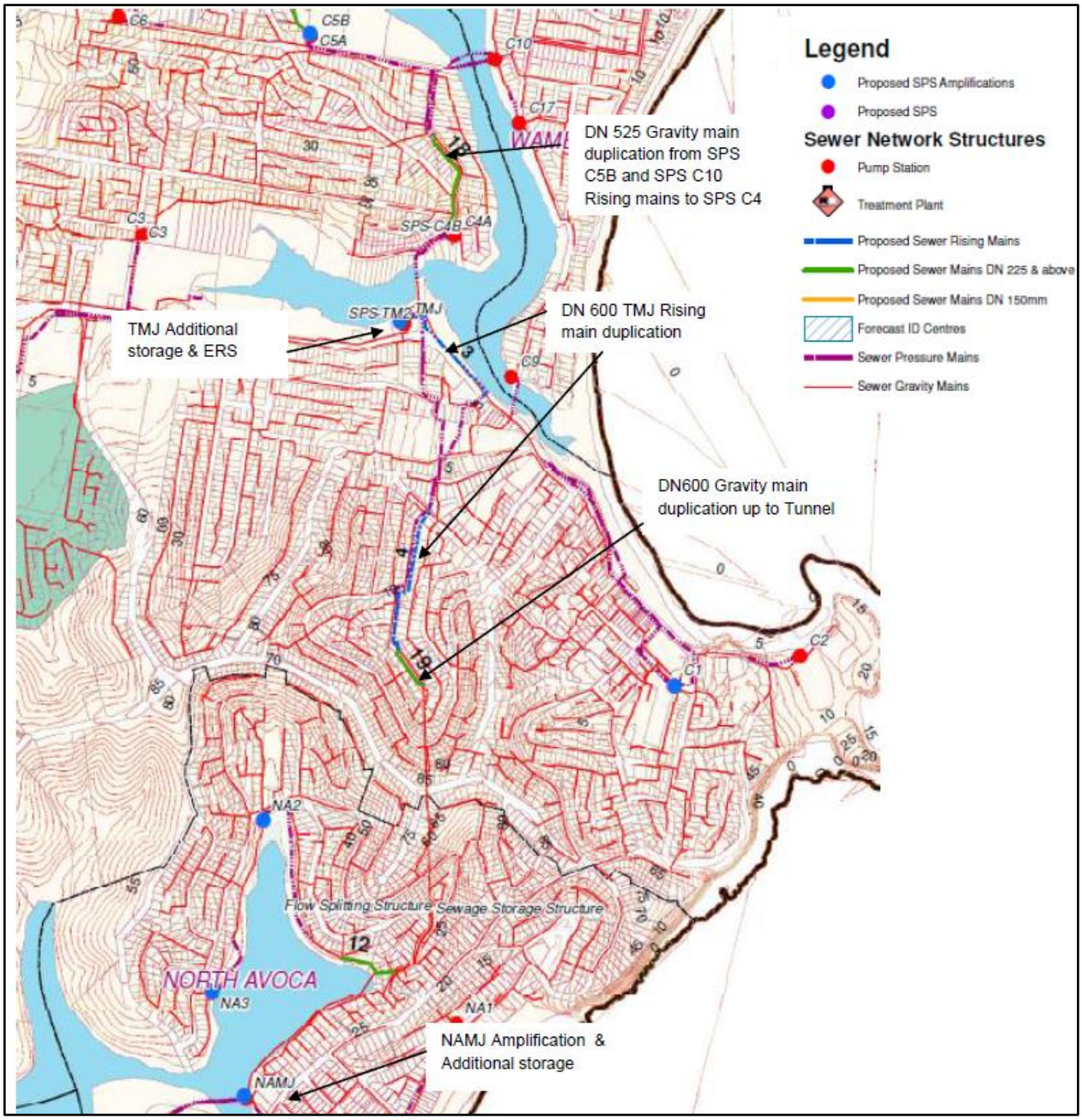


Figure 2: Infrastructure identified by Terrigal Major Strategy & Coastal Carrier Strategy

Figure 3: Infrastructure identified in Coastal Carrier Strategy

2. Master Plan 2012

A Master Plan for former Gosford council was developed in 2012 and it consisted of identification of the necessary infrastructure to service the population growth, satisfying the desired standard of service followed by CCC. Following are the main items that consisted of the Master Plan.

- Analysis and Development of level of Service for Water and Sewer services
- Analysis of Population Growth and identifying Future Service Areas
- Calculate Water demands and Sewer flows for each horizon
- Preparation of Water servicing Strategy and Sewer System Servicing Strategy

Master Plan identified following population growth forecast within former Gosford LGA and Table 2 shows the comparison of Master Plan Projections and 2019 Forecast ID projections.

Table 2: population Forecast in Master Plan 2012 and Forecast.id 2019

Year	2011	2016	2021	2026	2031	2036	2041	2046	2051
Population	166900	172800	177700	181800	185700	189900	192700	195500	198400
Forecast ID*	-	172046	179377	183557	186415	189883	-	-	-

* From 2019 report http://forecast.id.com.au/central-coast-nsw

Master Plan consisted of identification of infrastructure to serve the 2051 projected populations that consisted of major developments, Centres and the infill within the suburbs as forecasted by Forecast.id . Two separate studies for water and sewer infrastructure were carried out as requirements for water and sewer services were different due to presence of Onsite Sewerage Management (OSSM) were in operation for some areas that already had water service.

- Existing Service Area

The existing serviced area for master planning purposes generally comprised all properties, including vacant properties, within the general boundaries of the year 2010 serviced area. A major component of the development consisted of Gosford CBD area, Somersby Industrial Park and Mount Penang developments. Based on Master Plan 2012 two separate strategies were developed in (2016/2017) for Gosford CBD water and sewer Infrastructure amplifications. These infrastructure are at the design and construction stage currently and have been excluded from 2019 DSP. In addition, Industrial/Commercial precincts Somersby and Mount Penang also have been excluded in the 2019 DSP. The balance infrastructure is shown in Figure 4 and Figure 5 and briefly described

- Potential Service Areas; The following categories have been identified in Master plan and description of each development area is provided in Table xx.
    - DSP Areas; Servicing vacant urban lands covered by Developer Servicing Plans as a result new growth occurring of the Wyoming, Narara, Kariong and Erina by extension of low density residential zone into adjoining vacant lands
    - Investigation and Future Development Areas; These areas comprise relatively small isolated pockets of principally residential development, zoned urban and/or non-urban, with water but not sewer service that have on-site sewage management which may require servicing with sewer in near future
    - Rezoning of non-Urban lands; Formerly, the Gosford Horticultural Research Station (Narara Eco village), this 12 Ha property is zoned for urban residential development. The land will require water and sewer reticulation to be extended upon sub-division.

Table 3: Details of Potential Service Areas

	Unserviced Area (Ha)		ET	Timing	Water mains	Sewer Gravity main	Sewer Rising main	SPS
DSP Area	Water	Sewer				(DN 150)	(DN100)	
Wyoming East	79	88	199	2021-2031		1636		
Kariong	16	16	66	2019-2031			250	1
Erina (East of James Sea Dr	31	31	219	2021-2031		583		
Lisarow		15	14	2015-2031		214		
Investigation and Future Development								
Erina Heights		167	2667	2031-2051	930(DN250)	12100		
Killcare Heights		9	33	2021-2031		1109		
Wamberel North		121	139	2031-2051		11100		
Wamberel South		214	205	2031-2041		16700		
Mac Masters Beach		162	84	2015-2041		1480		
Karalta Rd		12	44	2031-2036		1200		
SIP Eastern Extn				2031-2036			550	1
Rezoning of Non-Urban Lands						(DN225)		
Narara Eco Village	12	12	150	2020-2031	175(DN150)	296		

- Water Strategy:

After excluding infrastructure that fall within Gosford CBD, Somersby Industrial Park and Mount Penang development, the system performance analysis has shown that new growth occurring as a result of the Wyoming, Narara, Kariong and Erina do not need major upgrades. Some local service extensions have been identified for these in 2014 DSP that have been included in 2019 DSP too. Out of the identified link mains and extensions some have been already constructed.

- Sewer Strategy:

Sewer Strategy consisted of upgrades of storages of three major pump stations (NAMJ, WYMJ and TMK) and infrastructure needed to service the potential service areas indicated in Table 3. Figure 4 shows the reticulation sewer mains of DN 150 that need to service these new areas. Master Plan had identified the sewer gravity mains that have capacity constraints but they have not been included in the proposed asset list.

Master Plan study identified the SPSs that needed emergency storages by analysing the dry weather flow for current and future. Also PWWF for current and future (2051) scenarios were assessed for 1 in2 yr ARI, 1in 5yr ARI event and 1in 10yr ARI event. These wet weather assessment have identified a list of minor SPSs that need amplification but they have not been included in the future asset requirements. Hence a separate assessment (LEP analysis) was used to identify SPSs that need capacity amplifications and emergency storage requirements.

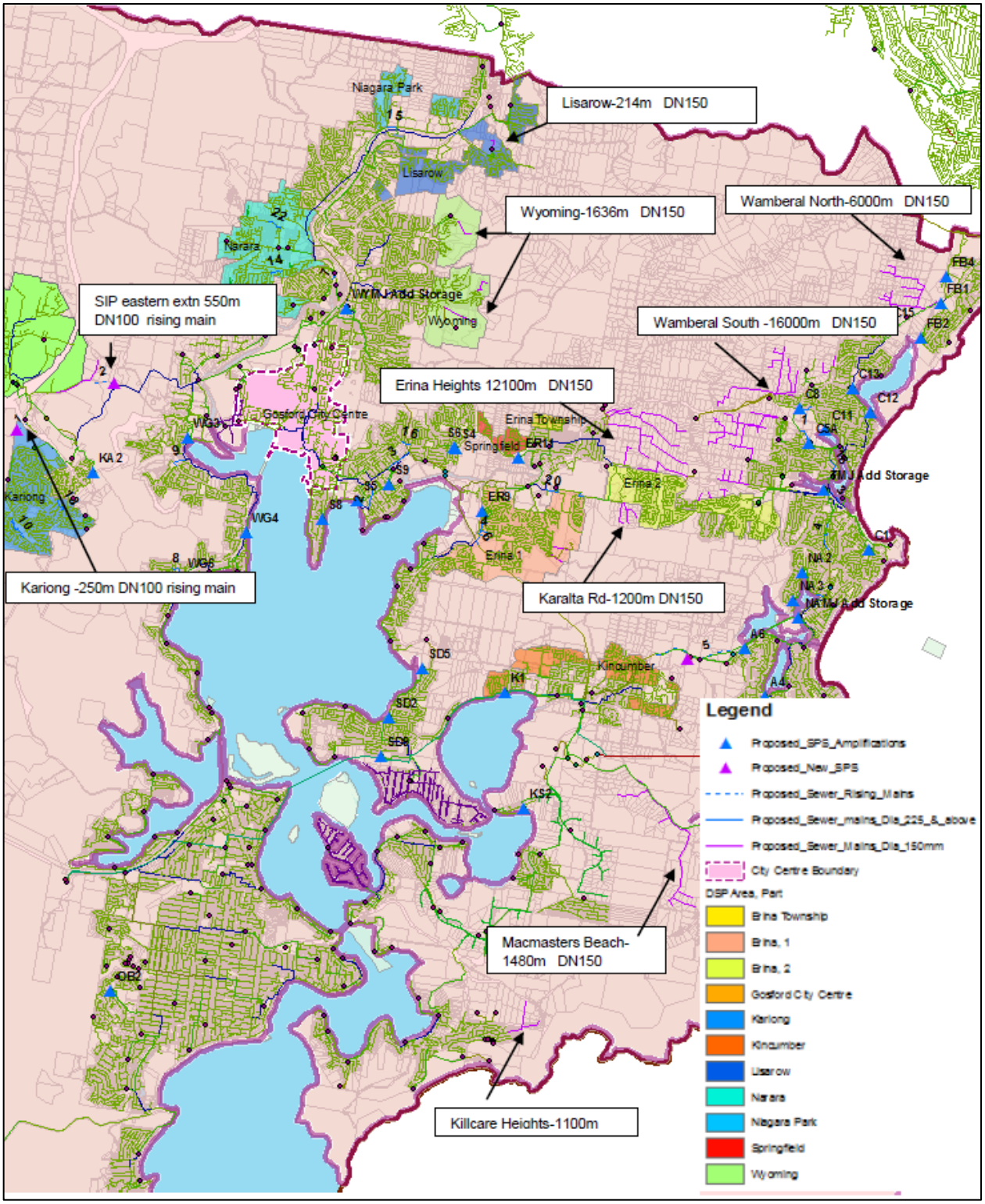


Figure 4: Sewer Gravity and rising mains mains for Potential Service Areas identified in Master Plan 2012

3. System Performance assessment for new Local Environmental Planning (LEP)

A system performance assessment was carried out for the new proposed Local Environment Plan (LEP) to assess how the system performance would change with the introduction of the proposed LEP (new lot size 450m^2 instead of 550m^2). The CCC south water network and sewer network were assessed to identify the assets that need amplification for the current demand with the potential additional lots.

Water network system performance; Max day demand analysis carried out for current scenario identified some mains that experience high head loss>10m/km and velocity around 2m/s. The following marked water mains have been included in the 2019 DSP as they were identified for capacity constraints. Some of the assets identified in this exercise have also been identified in 2014 DSP too.

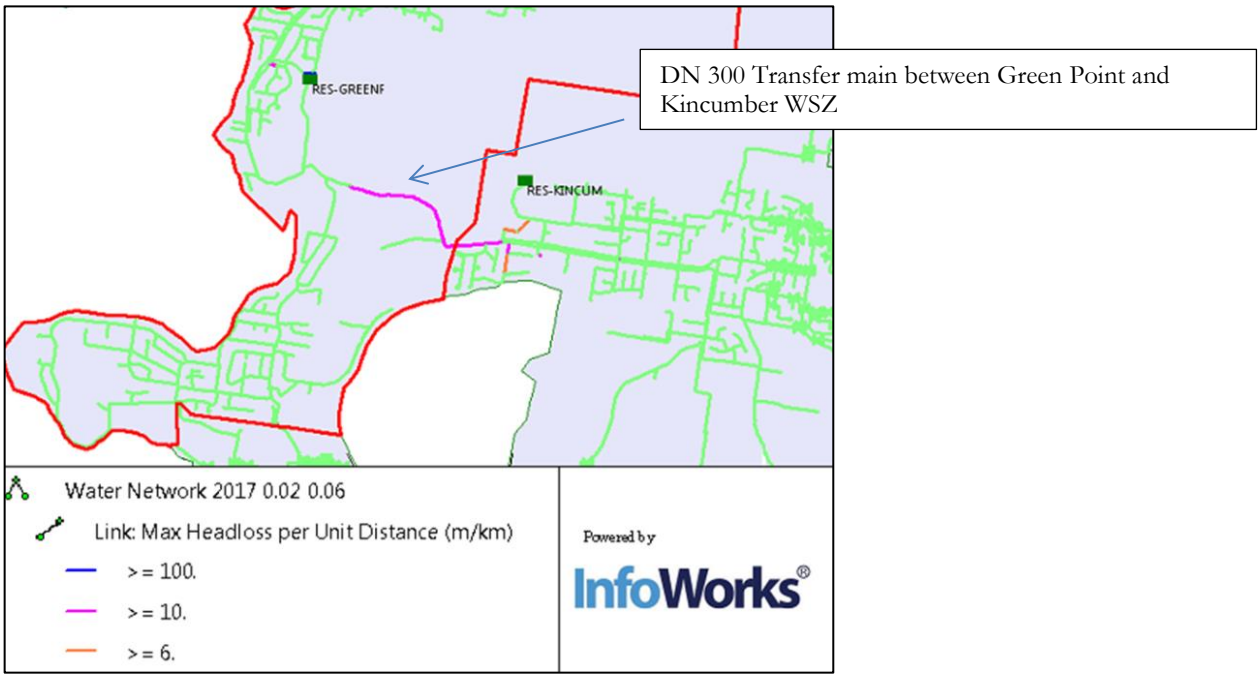


Figure 5: Identified trunk water mains with capacity constraints for current demand

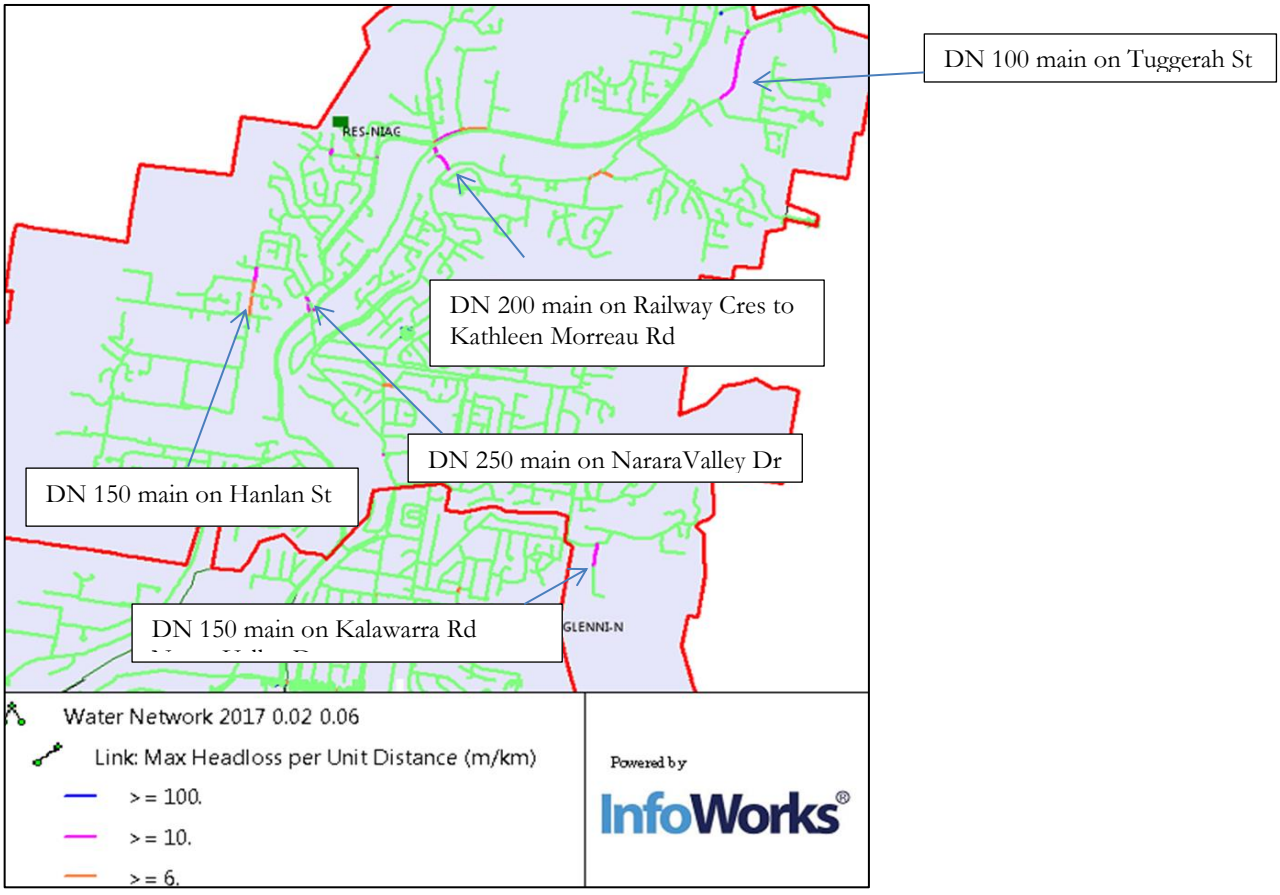


Figure 6: Identified reticulation mains with capacity constraints

Sewer network system performance assessment;

Following were sewer mains that were identified as mains that need amplification as these mains experienced a peak wet weather flow for 1: 5 year ARI event exceeding the pipe full capacities. The lines marked in the following figures have been included in 2019 DSP.

Figure 7: Sewer Gravity mains with capacity constraints in Erina Syphon Service Area

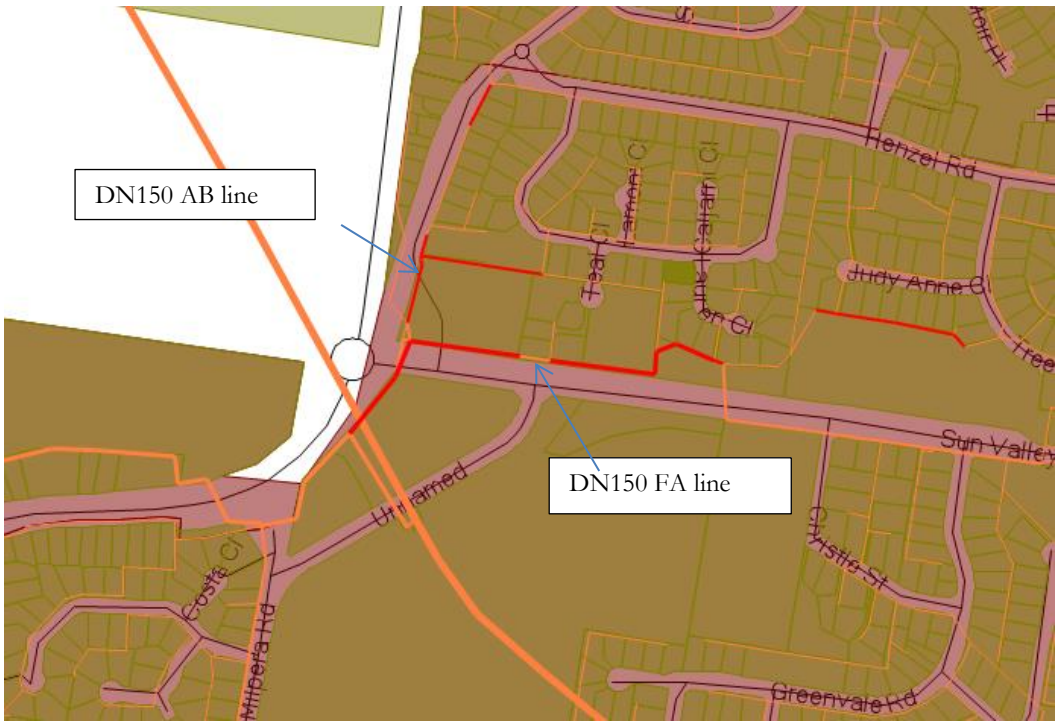


Figure 8: Reticulation mains identified in Erina Green Point Service Area

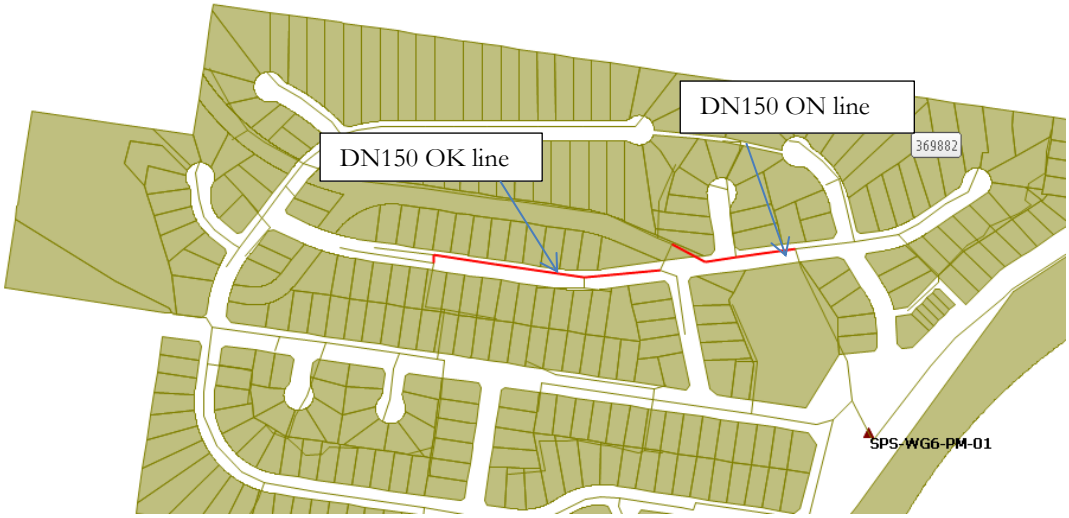


Figure 9: Sewer Gravity reticulation mains in West Gosford Service Area-WG6 catchment

Figure 10: Sewer Gravity main identified in West Gosford_WG3 catchment

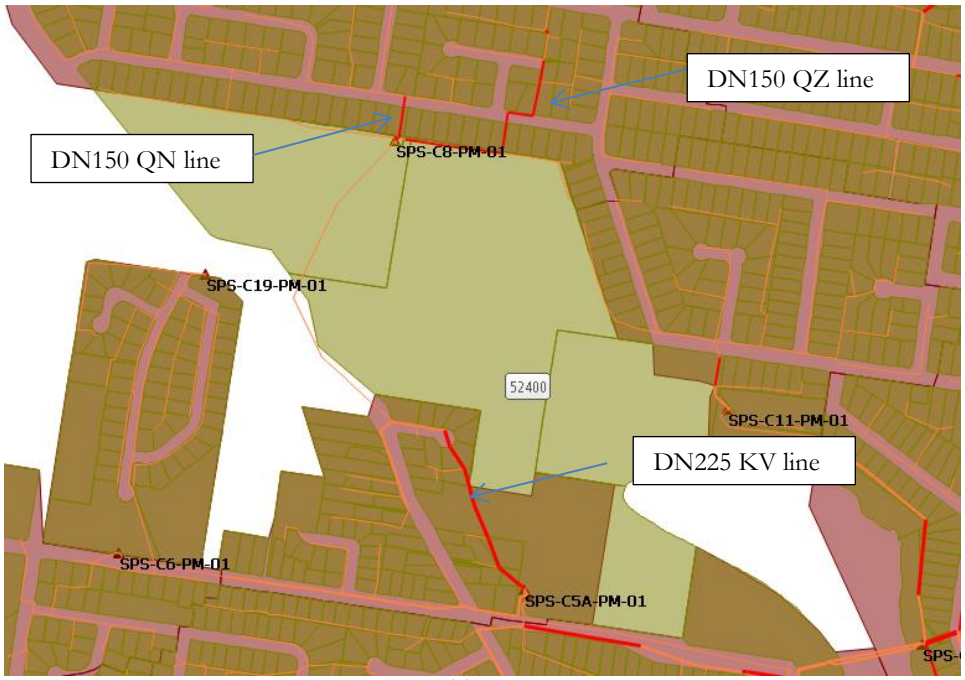


Figure 11: Sewer Gravity mains identified in Terrigal Major Service Area_C8 and C5A catchments

4. Pump Station Performance Assessment

2012 Master Plan had identified the pump stations that need amplifications on emergency storage and pump capacity by assessing dry weather emergency storages and by assessing peak wet weather at different intensities of wet weather events. Peak wet weather have been carried out for 1in 2 yr ARI, 1in 5 yr ARI and 1 in 10Yr ARI rainfall events. Some of the pump stations identified as capacity restricted in 2012 have been amplified already.

The assessment carried out for new Local Environment Plan (LEP) assessment also carried out an analysis on the pump capacity for each catchment. All sewer systems were assessed for 1in 5 yr ARI event and pump stations that had a capacity less than or close to the peak wet weather flow were for current scenario were selected for as SPSs that need amplification.

Two sewer models were used to assess future wet weather flow;

- Master Plan Model 2012; The average and peak dry weather in each catchment was assessed by running dry weather flow runs for model scenarios in Master Plan 2012 model for future(2026,2031,2036). The growth up to 2031 horizon in each catchment was assessed by these results.
- Calibrated model 2015; The storm allowance for each catchment was calculated based on dry weather and wet weather flow in the calibrated model(2015). The future wet weather flow was calculated based on future dry weather flow and storm allowance in each catchment. Proposed pump capacity was decided on the above procedure.

The current emergency storage time for each pump station was assessed by using the current calibrated model. The future emergency storage time for each pump station was assessed by calculating the holding time proportionately to the growth within the catchment.

Rising main velocity for the current pump capacities were obtained from the current calibrated model. The rising mains that had velocities higher than 2.5 m/s were identified for amplifications. In addition the rising main velocities were assessed for future pump capacities and proposed for amplification if the velocities were higher than 2.5 m/s.

5. 2014 DSP

2014 DSP indicated some assets that were identified to improve the system performance in Narara and Niagara Park and Lisarow. They are mostly link mains to connect dead ends and are aimed to system performance and water quality in the above areas. They have been included in 2019 DSP.

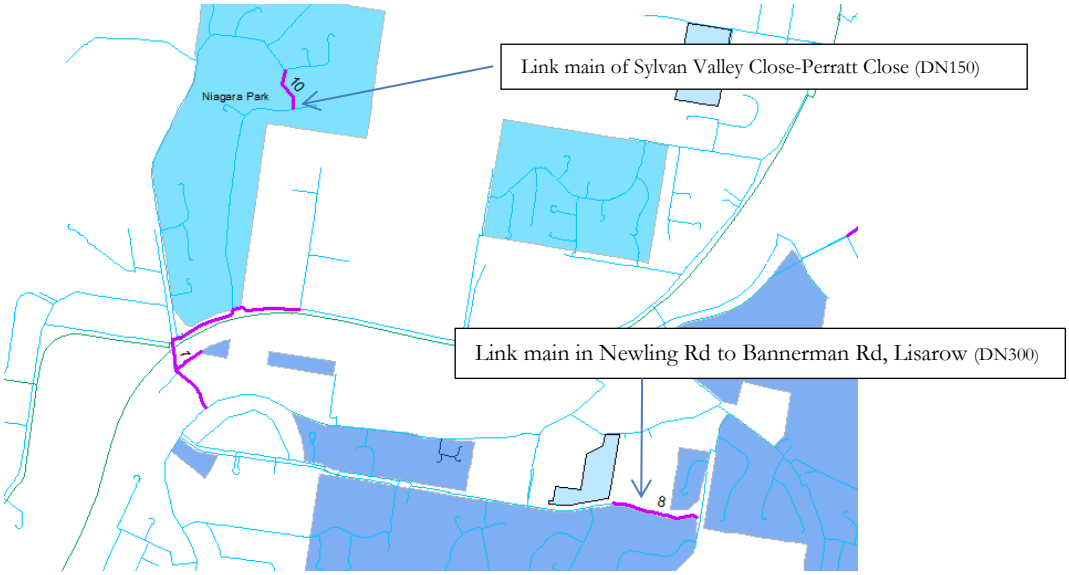


Figure 12: link mains in Narara and Lisarow areas

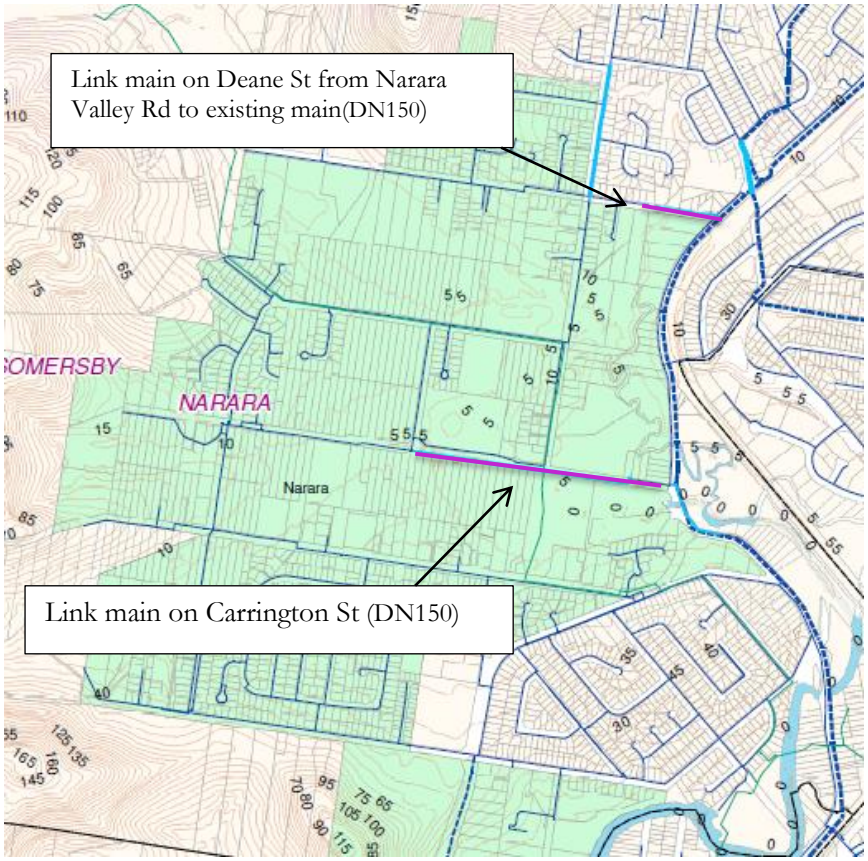


Figure 13: Link mains in Narara

References:

1. Water and sewerage Master Plan 2051- water system tech memoranda-2012
2. Water and sewerage Master Plan 2051- sewer system tech memoranda-2012
3. Servicing and Infrastructure capacity Analysis-2018
4. Terrigal Major sewer Pump Station Detailed Design Report -2000
5. Coastal Carrier Strategy Briefing Paper-Chris McDonald-2019
6. Gosford NAVGS detail design report-AECOM-2012

Appendix H
Central Coast Council Equivalent Tenement Calculation Matrix

Water and Sewer Loading Calculation - ET Assessment for Developer Charges - Central Coast Council

Category	ET Per Unit	Description	Examples
Land Subdivision			
Subdivision (all land use excluding large lot residential)	1 per lot	Land serviced with water supply and/or sewerage	Includes residential, commercial, industrial etc.
Large lot Residential Subdivision (where lot size is greater 2,000m2)	1.2 ET/lot for Water 1 ET/lot for Sewerage	Large lot residential subdivision where increased water consumption is common.	Rural residential development
Residential Accommodation			
Residential habitable multi-dwelling properties & tourist development			
1 Bedroom	0.5	Multi dwelling residential development subject to assessment of proposed number of bedrooms.	Granny flats, dual occupancies, unit development etc. Any dwelling meeting definition of a habitable dwelling.
2 Bedroom	0.75		
3 or more Bedrooms	1		
Commercial Accommodation			
Caravan Park-Short Term Site	0.5	Caravan/camp site with shared laundry and camp kitchen	
Caravan Park-Long Term Site	0.75	Permanent occupation site with shared laundry and camp kitchen	
Hostel Bed	0.15/bed	Hostel style accommodation with communal bathrooms, kitchens etc.	Backpackers, some boarding houses (dependant on fixtures arrangements), Youth Hostels
Hotel style accommodation	0.3/room	Hotel/Motel/Inn - Short term occupation	Hotels, motels, some boarding houses (dependant on fixtures arrangements)
Hospital Bed	1/bed	Health care facilities where patients are treated on a short-medium term basis with various support services provided.	Public/private hospitals
Nursing Home	0.4/bed	Residential care facilities where occupants receive aged care or disability support but share kitchen/dining facilities	Nursing homes (various levels of care), Aged care facilities
Seniors living development	as per residential multi dwelling	Self contained sites in a multi dwelling setting	
Commercial			
Shops/offices	0.005/sq m	General commercial/business development (excludes home offices within existing residential dwellings)	Hairdresser Beauty Salon Offices Retail shops
Shopping Centre Complex	0.001/sq m	Large scale commercial/business development	Westfield, Erina Fair, Woolworths
Bulky Goods	0.001/sq.m	Commercial premises utilised for the storage and sale of bulky goods, typically large floor areas.	Bunnings, Good Guys, Domayne
Café	0.005/sq.m	A premise used for the preparation or service of light food and coffee to the public	Coffee Shops Cafes
Food Premises	0.01/sq.m	A premise used for the preparation or service of food product to the public.	Take away food Restaurant
High Volume Food Premises	0.03/sq.m	A high volume premise used for the preparation or service of food products to the public	McDonalds KFC Hungry Jacks
Nursery	based on forecast water demand or meter size		Commercial nurseries
Showroom/Car yard	office rate for office area + bulky goods for showroom area		Holden Dealership
Car wash	based on water consumption	Car wash sites with varying levels of onsite water recycling	Car Lovers Car Wash
Licenced Club, Tavern	0.04/Per occupant	Licenced premises with number of occupants based on liquor licence. Floor area associated with internal restaurants/cafes to be assessed in line with food premises provisions.	Licenced Club Pub
Medical Centre/Practice/Vet	0.4/practice room	Includes consulting rooms, imaging rooms etc.	
Service Station	0.75/no. of lanes		
Laundromat	0.6/machine		
Stables	140	Per built up hectare when serviced with water and/or sewerage	
Industrial			
Light Industrial	0.0005/sq.m	Industrial development utilised for bulk storage and warehousing in which manufacturing is not undertaken. Water shall not be utilised for operational purposes except for provision of staff amenities. **Office and administration service areas are calculated separately where the office area exceeds 10% of the total building area.**	Bulk storage Warehousing
Medium Industrial	0.001/sq.m	Industrial development in which minimal water consumption may be intermittently utilised within the manufacturing or operational process. **Office and administration service areas are calculated separately where the office area exceeds 10% of the total building area.**	Dry Manufacturing Dry assembly Metal work Mechanical workshops Carpentry and joinery
Heavy Industrial	Water requirements and sewage generation	Industrial development in which water consumption forms an integral function within the manufacturing or operational process. Details on water demand and sewage loads must be provided on application. **Office and administration service areas are calculated separately where the office area exceeds 10% of the total building area.**	Concrete plants Food processing Breweries Depots for dirty industry, eg Ausgrid depots with bath house
Public Services/ Amenities			
School	0.04/per pupil-staff	Both headworks and distribution components apply	Child Care Pre School Day Care Centre
Marina	0.16/berth	per berth	Assumes water supply and sewage pump out facilities are made available.
	0.75/berth	only for permanent residence	
Swimming Pools	20/2,500m3 Olympic pool	Proposed pool scaled against an Olympic pool. Amenities calculated separately.	Swimming Pool
Halls/Auditoriums/Theatres/Recreation	0.5/per w.c, urinal	Public/private recreation and entertainment areas	Bowling alleys, cinemas, gyms, dance halls, squash courts, public halls, places of worship.
Amenities	0.5/per w.c, urinal	Public amenities. Charges will not be levied for amenities provided by not-for-profit community groups (non-government), at public assets.	Sports amenities Public amenities

Water and Sewerage Developer Charges 2019 DSP Equivalent Tenement Calculation Examples

Single Residential Development

An existing residential property, connected to Council's network within the existing water supply and/or sewerage scheme, has a credit of 1 Equivalent Tenement (ET).

The construction of a single residential dwelling, regardless of the number of bedrooms, is covered by the 1 ET credit.

Multi residential dwellings

An existing residential property, connected to Council's network within the existing water supply and/or sewerage scheme, has a credit of 1 ET.

The construction of multiple residential dwellings on a single parcel of land, will require an assessment of the number of bedrooms within each dwelling to determine the number of ETs payable, after accounting for the 1 ET credit.

Example 1

An existing residential property with a two bedroom house is redeveloped. One two bedroom dwelling is constructed, in addition to another three bedroom dwelling in a 'dual occupancy' arrangement:

Total loading = 0.75 ET + 1 ET
= 1.75 ET
Minus 1 ET credit for existing residential parcel
= 0.75 ET payable

Example 2

An existing residential property with a two bedroom house, has a single bedroom granny flat added, the original two bedroom dwelling remains unchanged:

Total loading = 0.75 ET + 0.5 ET
= 1.25 ET
Minus 1 ET credit for existing residential parcel
= 0.25 ET payable

Example 3

An existing residential property with a single bedroom house, has a single bedroom granny flat added. The original single bedroom dwelling remains unchanged:

Total loading = 0.5 ET + 0.5 ET
= 1 ET
Minus 1 ET credit for existing residential parcel
= 0 ET payable

Example 4

Three existing residential parcels of land are acquired by a single developer with the site redeveloped into a residential unit development. A total of eight two bedroom units and nine single bedroom units are constructed. The ground floor of the new development also features a 50 square metre Café.

Total loading = 6 ET (8 x 0.75) + 4.5 ET (9 x 0.5) + 0.25 ET ($50m^2$ * 0.005 ET/m^2)
= 10.75 ET
Minus 3 ET credit for existing residential parcels
= 7.75 ET payable

Industrial Development - Heavy Industrial (Wet Industry)

A beverage manufacturing plant is proposed which will have the following demand and discharge characteristics:

Average annual water demand	15 ML
Peak day water demand	50 kL
Average daily trade waste discharge	30 kL

The determination of water supply equivalent tenements is based on an assessment of average annual demand and peak day demand in accordance with the DSP as follows:

One Equivalent Tenement equals:

Water Supply

- 150 kL/year annual water demand (IPART Determination) or
- 0.92 kL/day peak day water demand (whichever is greater)

Sewerage

- 125 kL/year annual sewage discharge (IPART Determination)

Water Developer Charges

Average annual water demand = 15 ML
= 15 ML x (1000 kL/ML) / 150 kL/ET/year
= 100 ET

Peak day water demand = 50 kL
= 50 kL / 0.92 kL/ET/day
= 54.35 ET

Average annual demand governs for the calculation of Water Supply Developer Charges for this example. 100 Equivalent Tenements payable minus any existing site credits for Water Supply.

Sewerage Developer Charges
Average daily trade waste discharge = 30 kL
= 30 kL x (365 days/year) / 125 kL/year
= 87.6 ET

87.6 Equivalent Tenements payable minus any existing site credits for Sewerage.

Industrial Development – Manufacturing with offices

An existing factory building located on a parcel of land within an existing industrial subdivision is converted into a manufacturing business. The sites previous use (and previous developer charges paid) resulted in a credit of 0.6 ET being applicable to the building.

The building has a total floor area of 1,600m^2 of which 1,300m^2 will be used for manufacturing and assembly, with the remaining 300m^2 to be used as an office space to support the production activities.

Proposal utilises over 10% of the factory area for offices, therefore a combination of Medium Industrial and Office development types apply (exceeds 10% allowance for offices within Light and Medium Industrial uses).

Balance of floor area exceeding 10% to be paid at 'office rate' with remainder of floor area to be paid at 'medium industrial' rate as shown in ET calculation matrix.

Office Area payable = 300m2 – (1,600m2 x 10%)
= 140m2 x 0.005ET/m2
= 0.7 ET

Medium Industrial Area payable = (1,600m2 – 140m2) * 0.001 ET/m2
= 1.46 ET

Total loading = 0.7 ET + 1.46 ET
= 2.16 ET
Minus 0.6 ET credit for existing industrial building
= 1.56 ET payable

Appendix I

Valuation of Existing and Proposed Assets

Water Mains	
Diameter (mm)	Unit Rate $ 2019/20
150	$ 288.93
200	$ 328.94
250	$ 393.67
300	$ 460.44
375	$ 540.22
450	$ 665.58
500	$ 756.75
525	$ 802.33
600	$ 927.69
650	$ 982.12
750	$ 1,201.20
825	$ 1,286.24
1050	$ 1,584.41

Note: 1. Extra credit rate of $1,000 per meter applies to contributed (not donated) water pressure main which is required to be installed by trechles technology but will face environmental constraint or regulatory requirment from relevant authority (eg; RMS, Sydney Train).

2. DN150mm water mains are required to be donated as part of reticulation assets for new developments.

Existing and Proposed Sewerage Asset Unit Rates 2019 DSP

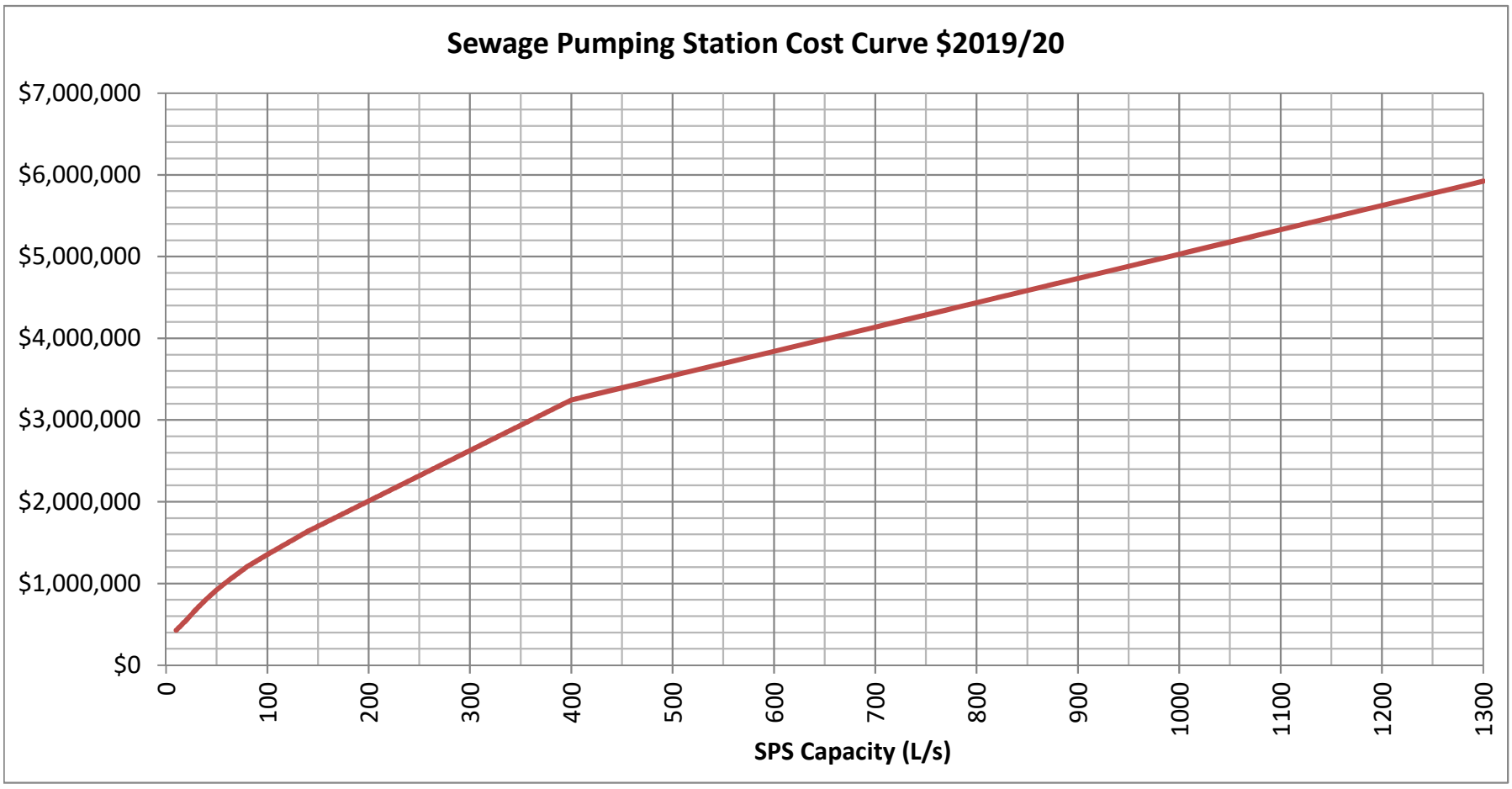
Gravity Sewer Mains Trunk Mains ($/m) 2019/20 FY

Dia	Depth (m) Min Depth	1.5-3	3-4.5	> 4.5 m
225	$ 413	$ 511	$ 647	$ 790
300	$ 560	$ 645	$ 814	$ 942
375	$ 716	$ 838	$ 978	$ 1,117
450	$ 905	$ 1,018	$ 1,172	$ 1,300
525	$ 1,091	$ 1,091	$ 1,363	$ 1,506
600	$ 1,263	$ 1,373	$ 1,555	$ 1,688
750	$ 1,105	$ 1,814	$ 1,938	$ 2,071

Rising Mains ($/m)

Dia	$2019/20 FY Rate per m
100	$ 368
150	$ 423
200	$ 459
225	$ 479
250	$ 513
300	$ 586
375	$ 714
450	$ 842
600	$ 1,473

Note: Extra credit rate of $1,000 per meter applies to contributed (not donated) gravity sewer main & pressure mains which is required to be installed by trechless technology but will face environmental constraint or regulatory requirement from relevant authority (eg. RMS, Sydney Train).



Note: An additional credit of $100,000 is included for new greenfield sewage pumping station to cover odour specity control due to the intake of new development occurs over the years.

Appendix J

Southern Region Developer Charges Calculation Sheet

Southern Region Sewerage

CALCULATION OF MAXIMUM PRICE

Index

Note: an input is required in F21 to incorporate the Headwork costs per ET into the maximum price.

Table 1: Calculation of maximum price ($, $2019-20)

Maximum price		Headworks costs per ET	Pre-1996 assets	Post-1996 commissioned assets	Post-1996 uncommissioned assets	Reduction for expected revenue and operation costs
	Costs to be recovered via DSP		139,482,493	4,916,625	7,338,460	26,802,343
	ETs		26,017	36,528	36,528	6,907
1,816	Value per ET	0.00	5,361	135	201	3,881

Table 2: Key variables used in maximum price calculation ($, $2019-20)

Sum of new ETs (not discounted)	Sum of PV of new ETs (discounted at pre-1996 asset discount rate)	Sum of PV of new ETs (discounted at post-1996 asset discount rate)	Sum of PV of new ETs (discounted at expected revenue and costs discount rate)	Sum of PV of Pre-1996 commissioned assets (discounted at pre-1996 asset discount rate)	Sum of PV of Post-1996 commissioned assets (discounted at post-1996 asset discount rate)	Sum of PV of Post-1996 uncommissioned assets (discounted at post-1996 asset discount rate)	Sum of PV of revenue for new customers (discounted at expected future revenue and costs discount rate)	Sum of PV of costs for new ETs (discounted at expected future revenue and costs discount rate)
26,017.000	26,017	36,528	6,907	139,482,493	4,916,625	7,338,460	42,110,272	15,307,929

Southern Region Water Supply

CALCULATION OF MAXIMUM PRICE

Index

Note: an input is required in F21 to incorporate the Headwork costs per ET into the maximum price.

Table 1: Calculation of maximum price ($, $2019-20)

Maximum price		Headworks costs per ET	Pre-1996 assets	Post-1996 commissioned assets	Post-1996 uncommissioned assets	Reduction for expected revenue and operation costs
	Costs to be recovered via DSP		14,558,850	2,591,711	326,692	13,678,003
	ETs		26,274	37,040	37,040	6,907
2,585	Value per ET	3,933.00	554	70	9	1,980

Table 2: Key variables used in maximum price calculation ($, $2019-20)

Sum of new ETs (not discounted)	Sum of PV of new ETs (discounted at pre-1996 asset discount rate)	Sum of PV of new ETs (discounted at post-1996 asset discount rate)	Sum of PV of new ETs (discounted at expected revenue and costs discount rate)	Sum of PV of Pre-1996 commissioned assets (discounted at pre-1996 asset discount rate)	Sum of PV of Post-1996 commissioned assets (discounted at post-1996 asset discount rate)	Sum of PV of Post-1996 uncommissioned assets (discounted at post-1996 asset discount rate)	Sum of PV of revenue for new customers (discounted at expected future revenue and costs discount rate)	Sum of PV of costs for new ETs (discounted at expected future revenue and costs discount rate)
26,274	26,274	37,040	6,907	14,558,850	2,591,711	326,692	33,088,708	19,410,705