

Monash University
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Wastewater Treatment Plant Design

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EXECUTIVE SUMMARY

Executive summary to be added here afterwards

CONTENTS

1	Introduction and Conceptual Design Description	1
1.1	Population estimations	1
1.2	Current flowrates estimation	1
2	Preliminary treatment	2
3	Primary treatment	3
4	Secondary treatment	4
5	Environmental impact assessment	5
6	summary	6
Appendix A	Area and Population per suburb	8

1 INTRODUCTION AND CONCEPTUAL DESIGN DESCRIPTION

Population and economical growth among other factors require the subsequently development of cities and the general infrastructure that supports them. As a cities expand, the electrical grid, road systems, drinking water and Wastewater recolection and treatment, among others, need to increase their capabilities as well. In the recent years, a northwest area in Melbourne has been rapidly developping and therefore, requires the construction of a new Wastewater treatment plant that can address the current and future needs of the community. In the presente report, the authors present the design of the abovementioned plant following local guidelines.

1.1 Population estimations

To determine the waswater flowrates and mass loads for develoment areas that the plant should be capable of process, where actual flow and load measurements are not avilable, the population equivalent can be used. This is a standarization of the wastewater production and characteristics based on the amount of people that would produce the same values. For example, in the *AMF L8 Sewerage Planning and Design Principles* which is the standard for wastewater treatment plants, developed by *Yarra Valley Water* which covers the area underdesign in the present report, on *Table 3-4* equivalent population factors are presented for different development types for both residential and commercial use. For this report, based on previous surveys and analysis, it is known that the equivalent population from domestic contributions is equal to 340000. Similarly, for commercial contributions, the equivalent population is known to comply with the following calculation: $PE_{\text{commercial}} = \lceil \sqrt{10} \times 9000 \rceil = 28461$.

1.2 Current flowrates estimation

According to the *Water Service Association of Australia* the inflow rate percapita can be estimated as 180 L/PE/day [Yarra Valley Water, 2023]. Therefore, the $Q_{\text{current avg, domestic}}$ can be calculated as $\frac{Q_{\text{domestic per capita}} \times PE_{\text{domestic}}}{1000} = 61200.0 \text{ m}^3/\text{day}$. Similarly, based on previous surveys it got determine that the commercial contribution for this area is 280 L/PE/day. Therefore the $Q_{\text{current avg, commercial}}$ can be calculated as $\frac{Q_{\text{commercial per capita}} \times PE_{\text{commercial}}}{1000} = 7969.08 \text{ m}^3/\text{day}$.

The infiltration/inflow flowrate, when no data is available, can be estimated based on either the total length of the sewer system, or based on the area to be covered. For the last one, the ratio can vary from 0.2 up to 28 m³/ha/day [Metcalf and Eddy, 2014]. In this report, the authors has choosen the lower limit as the system will be new and therefore the damage on the pipelines will be minimum.

As no data of the covered area is available, the autors have

2 PRELIMINARY TREATMENT

3 PRIMARY TREATMENT

4 SECONDARY TREATMENT

5 ENVIRONMENTAL IMPACT ASSESSMENT

6 SUMMARY

REFERENCES

- [Australian Bureau of Statistics, 2021] Australian Bureau of Statistics (2021). Suburbs and localities.
- [Metcalf and Eddy, 2014] Metcalf and Eddy (2014). *Wastewater Engineering, Treatment and resource recovery*. McGraw, 5 edition.
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APPENDIX A AREA AND POPULATION PER SUBURB

Table of Melbourne suburbs with their area and population [Australian Bureau of Statistics, 2021].

Table 1: Melbourne suburbs with area and population

Suburb	Population Density	Population	LGA	Area (km2)
Southbank	11962.280000	22631	Melbourne (City)	1.890000
Carlton	10597.480000	16055	Melbourne (City)	1.510000
Fitzroy	7355.630000	10431	Yarra (City)	1.420000
Melbourne	7269.020000	16055	Melbourne (City)	2.210000
South Yarra	7087.660000	25028	Melbourne (City)	3.530000
Balaclava	7062.830000	5392	Port Phillip (City)	0.760000
Prahran	6975.820000	12203	Stonnington (City)	1.750000
Windsor	6729.210000	7273	Port Phillip (City)	1.080000
Collingwood	6719.020000	9179	Yarra (City)	1.370000
St Kilda	6365.640000	19490	Port Phillip (City)	3.060000
North Melbourne	6325.150000	14953	Melbourne (City)	2.360000
Richmond	6252.540000	28587	Yarra (City)	4.570000
Elwood	5989.600000	15153	Port Phillip (City)	2.530000
St Kilda West	5977.320000	2951	Port Phillip (City)	0.490000
Travancore	5933.010000	2116	Moonee Valley (City)	0.360000
St Kilda East	5784.110000	12571	Glen Eira (City)	2.170000
Glen Huntly	5637.580000	4905	Glen Eira (City)	0.870000
Seddon	5586.700000	5143	Maribyrnong (City)	0.920000
Ripponlea	5510.490000	1532	Port Phillip (City)	0.280000
Kingsville	5442.760000	3920	Maribyrnong (City)	0.720000
Brunswick East	5097.030000	13279	Moreland (City)	2.610000
Kensington	5073.670000	10745	Melbourne (City)	2.120000
Fitzroy North	5007.710000	12781	Moreland (City)	2.550000
South Melbourne	4986.300000	11548	Port Phillip (City)	2.320000
Brunswick	4910.310000	24896	Moreland (City)	5.070000
Princes Hill	4909.930000	2005	Yarra (City)	0.410000
Middle Park	4885.610000	4000	Port Phillip (City)	0.820000
Carnegie	4716.030000	17909	Glen Eira (City)	3.800000
Abbotsford	4700.750000	9088	Yarra (City)	1.930000
Brunswick West	4357.960000	14746	Moreland (City)	3.380000
Armadale	4201.390000	9368	Stonnington (City)	2.230000
Hawthorn East	4110.510000	14834	Boroondara (City)	3.610000
Northcote	4087.370000	25276	Darebin (City)	6.180000
Essendon North	4080.600000	3071	Moonee Valley (City)	0.750000
Ormond	4064.220000	8328	Glen Eira (City)	2.050000
Hawthorn	4000.510000	22322	Boroondara (City)	5.580000
Elsternwick	3975.800000	10887	Glen Eira (City)	2.740000
McKinnon	3897.170000	6878	Glen Eira (City)	1.760000
Gardenvale	3884.170000	1019	Glen Eira (City)	0.260000
Ascot Vale	3845.150000	15197	Moonee Valley (City)	3.950000
Caulfield	3806.120000	5748	Glen Eira (City)	1.510000
Coburg	3785.050000	26574	Moreland (City)	7.020000
Murrumbeena	3771.280000	9996	Glen Eira (City)	2.650000
Hughesdale	3759.200000	7563	Monash (City)	2.010000
Clifton Hill	3646.350000	6606	Yarra (City)	1.810000