Department of Environment Land Water and Planning

Fishermans Bend Baseline Utility Assessment

Final Report

November 2016

Acronyms

ACMA Australian Communications and Media Authority (ACMA) is an Australian Government statutory authority within the Communications portfolio. The ACMA is tasked with ensuring media and communications works for all Australians. It does this through various legislation, regulations, standards and codes of practice.

AEMO Australian Energy Market Operator

AHD Australian Height Datum

ARI Average Recurrence Interval. The average or expected value of the periods between exceedances of a given rainfall total accumulated over a given duration.

AR&R Australian Rainfall and Runoff, a national guideline document, data and software suite that can be used for the estimation of design flood characteristics in Australia. It is published and supported by the Commonwealth of Australia.

BAU Business as Usual

CCZ Capital City Zone

CMP Construction Management Plan

CoM City of Melbourne

CoPP City of Port Phillip

CRC Cooperative Research Centre

CWW City West Water

DBYD Dial-Before-You-Dig - Free national referral service designed to prevent damage and disruption to the vast pipe and cable networks which provides Australia with essential services.

FBTS Fishermans Bend Terminal Station

FTTP Fibre-to-the Premises is a form of fibre-optic communication delivery, in which an optical fibre is run in an optical distribution network from a central equipment location all the way to the premises occupied by a subscriber

GSM Global System for Mobile Communications is a standard developed by the European Telecommunications Standards Institute to describe the protocols for digital cellular networks used by mobile phones. It has become the de facto global standard for mobile communications.

4G Fourth generation of GSM wireless mobile telecommunications technology.

5G Fifth generation of GSM wireless mobile telecommunications technology.

HFC Hybrid fiber-coaxial is a telecommunications industry term for a broadband network that combines optical fibre and coaxial cable.

ICT Information and Communications Technology is an extended term for information technology (IT) which stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information.

IWM Integrated Water Management

MWC Melbourne Water Corporation

NBNCo	NBN Co Limited is an Australian government-owned corporation tasked to design, build and operate Australia's National Broadband Network.
RSS	Redevelopment Services Scheme
SEW	South East Water
SFP	Strategic Framework Plan
SMP	Sewer Mining Plant
SMS	Safety Management Study
VCAT	Victorian Civil and Administrative Tribunal
VPA	Victorian Planning Authority (formerly MPA)
WiFi	WiFi is a technology that allows electronic devices to connect to a wireless LAN (WLAN) network, using authorised radio bands.
WSAA	Water Services Association of Australia

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1. Introduction

GHD was engaged by the Fishermans Bend Taskforce (Taskforce) to complete an assessment of the baseline utility infrastructure requirements for the ultimate infrastructure requirements of Fishermans Bend in 2051.

Plans have been previously prepared for the four Capital City Zone precincts however, there had been no significant work on the expanded employment zone to date. The inclusion of the employment zone requires significant interaction with the service authorities to develop an understanding of the existing infrastructure, its capacity, and its suitability for the proposed development. This inclusion also necessitated a review of the existing plan for the original four precincts.

This assessment is intended to be used to assist with preparation of the Strategic Framework Plan and subsequently the Precinct Plans that are being prepared by the Taskforce.

1.1 Background

Previously, GHD completed several assessments of Utility Infrastructure at Fishermans Bend. The reports were:

- 2012 Assessment of Utility Infrastructure
- 2013 Infrastructure Plan
- 2015 Utility Infrastructure Update

Essentially the above three reports move from an initial assessment of the capacity of the existing infrastructure, to the preparation of a BAU servicing strategy and an integrated servicing strategy, and then back to a review of the initial assessment.

It is important to note that only the final report dealt with the employment precinct, and then only in a very limited way as the new precinct was announced while the final report was underway.

1.2 Holistic Planning for Utility Infrastructure

This project is the first of three projects that will establish a holistic infrastructure plan for the Fishermans Bend precinct for the first time. The three phases of assessment for utility infrastructure are:

- Baseline infrastructure plan (this assessment)
- Integrated Servicing Strategy. This will review the previous integrated strategy, and bring it to current conditions in terms of economics and also technology, and incorporate the employment precinct into a holistic plan
- Costing. The final brief will cost the various options

1.3 Overview of this Assessment

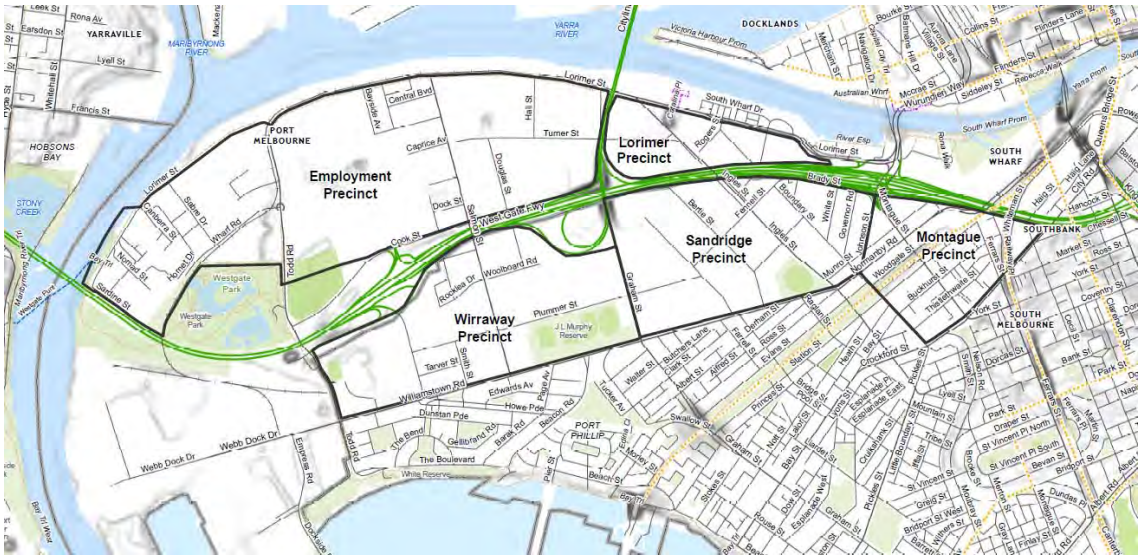
The scope of work for this assessment is to confirm the existing and future baseline utility infrastructure requirements for Fishermans Bend.

Five precincts make up the Fishermans Bend project area. The original four, residential and commercial precincts are Montague, Lorimer, Wirraway and Sandridge. The fifth precinct is the

Employment Precinct which is bound by the Port of Melbourne land to the north, Yarra River to the west, the Bolte Bridge to the east and the Westgate Freeway to the south.

The five precincts are indicatively shown in the figure below.

Figure 1 Fishermans Bend



The three key tasks that comprise this assessment are:

- Prepare **Existing Infrastructure Plans** that include all five (5) precincts
- Review and confirm the **Baseline Servicing Strategy** for the four (4) original precincts based on current regulatory, technological and planning arrangements and as a result of inclusion of the Employment Precinct
- Prepare **Baseline Infrastructure Plans** that outline future infrastructure required to support full build out of the precincts based on based on Growth Forecasts provided by the Taskforce (refer Appendix A)

1.3.1 Definition of 'Baseline'

The proposed baseline servicing approach in Fishermans Bend is not necessarily the standard or business as usual (BAU) approach adopted throughout Melbourne. Therefore, for the purpose of this assessment 'baseline' is defined as the 'baseline servicing approach that is intended for Fishermans Bend under the current planning and regulatory frameworks'.

1.4 Utility Stakeholders

Key contacts from Utility Stakeholder organisations consulted throughout this project are provided in Table 1.

Table 1 Key Contacts

Organisation	Key Contact	Email Address
South East Water	Pam Kerry	pam.kerry@sewl.com.au
CRC	Jamie Ewert	jamie.ewert@monash.edu
Melbourne Water	Leon Harvey	Leon.Harvey@melbournewater.com.au
CitiPower	Andrew Dinning	adinning@powercor.com.au

Organisation	Key Contact	Email Address
AusNet	Herman Debeer	Herman.debeer@ausnetservices.com.au
MultiNet	Elsie Zhao	Elsie.Zhao@ue.com.au
APA Group	Daniel Tucci	daniel.tucci@apa.com.au
	Mukhtiar Nanuan	Mukhtiar.Nanuan@apa.com.au
Australian Energy Market Operator	Philip Woodall	Philip.Woodall@aemo.com.au
Viva Energy	Creagh de Brabander	Creagh.de-Brabander@vivaenergy.com.au
NBNCo	Ian Lockyer	IanLockyer@nbnco.com.au
Telstra	Peter Ogdin	Peter.ogdin@team.telstra.com
Optus	Vince Viceconte	Vince.Viceconte@optus.com.au
City of Port Phillip	Mark Thompson	mthompso@portphillip.vic.gov.au
	Sam Innes	Sam.Innes@portphillip.vic.gov.au
City of Melbourne	Barry Fox	barry.fox@melbourne.vic.gov.au
	Ralf Pfleiderer	ralf.pfleiderer@melbourne.vic.gov.au

1.5 Limitations and Assumptions

This report is subject to, and must be read in conjunction with, the assumptions and qualifications contained throughout the Report.

The following general assumptions apply:

- Location of existing services has been approximately determined by GHD based on Dial Before You Dig information and information provided by key stakeholders. The locations and depths of existing information cannot be confirmed as accurate.
- Assessment of the condition and capacity of existing infrastructure has been based on advice and data received from utility providers and authorities. This study has not included any site inspections or other reviews of existing infrastructure
- Infrastructure requirements have been assessed for ultimate development of the adopted development scenario
- Demands are assumed to be uniform across the precinct
- Individual lot scale infrastructure is not included in the plans
- In order to prepare the gas demand forecasts, the following was assumed:
  - High efficiency gas appliances
  - Average of 30 jobs per commercial property
  - 7 star rated home insulation
  - 80% of dwellings are high rise units and most will use reverse cycle electric heating or community heating (central boiler)

  - 75% of new dwellings connected to gas supply
  - Each dwelling uses 28 GJ per annum
  - Each commercial property uses 185 GJ per annum
- In order to prepare power demand forecasts, the following was assumed:
  - Maximum demand calculations have been undertaken based upon AS 3000 Tables C1 and C2 to determine residential and commercial loads.
  - The figures provided in the documentation are based upon growth projections (i.e. adding to the existing demand)
  - A diversity factor of 0.8 has been used

2. Growth & Demand forecasts

2.1 Growth Forecasts

In order to understand the likely infrastructure demands of a future community in Fishermans Bend, an informed projection of population and employment is required.

The Fishermans Bend Taskforce prepared growth forecasts for dwellings, employment and population for each of the five (5) precincts. The Growth Forecast information is summarised in Table 2.

Table 2 Growth Forecasts to 2051 by Precinct

Precinct	Dwellings	Population	Jobs
Montague	12,250	22,050	13,475
Lorimer Street	10,150	18,270	6,090
Sandridge	8,800	17,600	15,840
Wirraway	8,800	21,120	4,400
Employment Precinct	0	0	20,000
Total (rounded)	**40,000**	**80,000**	**60,000**

2.2 Demand Forecasts – Gas and Electricity

Based on the Growth Forecasts outlined in Section 2.1, GHD prepared demand estimates for sewer, gas and power, to assist stakeholders to assess the impact of full buildout on their networks.

The demand forecasts are outlined in the tables below:

Table 3 Gas Demand Forecasts

Precinct	Dwellings	Jobs	# Commercial Properties	GJ/annum		
				Domestic	Commercial	Total
Montague	12,250	13,475	449	343,000	83,096	426,096
Lorimer Street	10,150	6,090	203	284,200	37,555	321,755
Sandridge	8,800	15,840	528	246,400	97,680	344,080
Wirraway	8,800	4,400	147	246,400	27,133	273,533
Employment Precinct	-	20,000	667	-	123,333	123,333
Total	**40,000**	**60,000**	**1,994**	**1,120,000**	**368,798**	**1,488,798**

Table 4 Electricity Demand Forecasts

Precinct	Dwellings	Population	Jobs	Electricity Demand (MVA)
Montague	12,250	22,050	13,475	94
Lorimer Street	10,150	18,270	6,090	75
Sandridge	8,800	17,600	15,840	72
Wirraway	8,800	21,120	4,400	62
Employment Precinct	0	0	20,000	5
Total	**40,000**	**80,000**	**60,000**	**236**

2.3 Demand Forecasts – Sewer and Water

At this stage SEW has retained the population forecasts and rate of growth adopted for the Fishermans Bend IWM Options Evaluation study (GHD, 2015). This Fishermans Bend IWM Options Evaluation study (GHD, 2015) adopted VPA's Ultimate Development Scenario as the design basis for water and sewer servicing within Fishermans Bend.

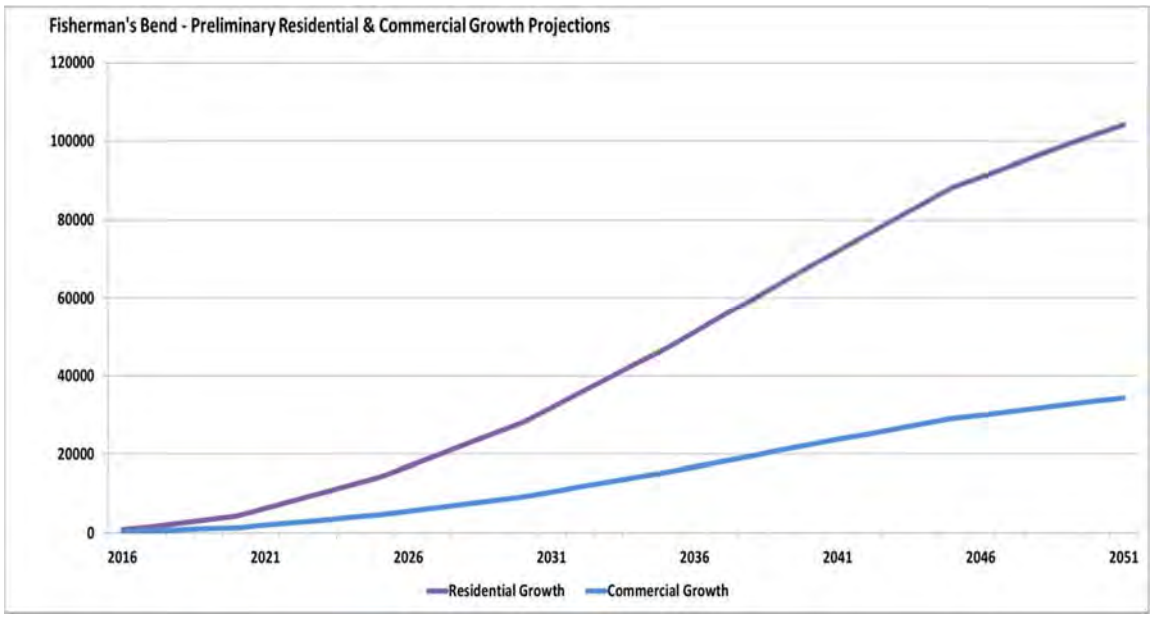
The population estimates adopted were developed for the four initial precincts within Fishermans Bend (excluding the Employment Precinct). SEW does not believe it is necessary to make an additional allowance for the projected increase in the employment population within the Employment Precinct due to the conservative nature of the adopted population scenario in the IWM work to date (VPA's Ultimate Development Scenario).

VPA's Ultimate Development Scenario was assumed to include 120,000 residents and 61,050 employees.[1] These population estimates were based on a draft population forecast of between 44,132 – 52,080 dwellings for 2051, and 60,000 dwellings at ultimate development (i.e. approximate 120,000 residents assuming that there is an average 2.0 persons/dwelling).

Figure 2 illustrates the estimated rate of residential and commercial growth based on discussions with the VPA during the delivery of the Fishermans Bend IWM Options Evaluation study (GHD, 2015).

[1] Note that 61,050 employees is an assumed population at ultimate development, which was derived by scaling up the 40,700 stated in the SFP by 50%.

Figure 2 Projected Rate of Growth



2.3.1 Future Sewage Generation Loads

Table 5 summarises the sewage generation rates assumed to determine the impact of the adopted development scenario from the Fishermans Bend IWM Options Evaluation Study (GHD 2015).

Table 5 Sewage Generation Rates

Scenario	Residential (L/p/d)	Non-residential (L/p/d)	Total (L/s)
Average Dry Weather Flow (ADWF)	175	86	304

2.3.2 Future Water Demands

Table 6 summarises the demands estimated for the Baseline strategy for potable and alternative water sources. The alternative water sources include Class A recycled water from a local sewer mining facility and rainwater from on-site rainwater tanks.

Table 6 Water Demands

Water Supply Type	Peak hour demand (L/s)	Peak day demand (L/s)	Peak day demand (ML/day)
Baseline - potable	588	263	22.7
Baseline – alternative water	402	238	20.6

The assumptions adopted for the development of the demand figures in the table above are outlined in Appendix A and are consistent with those adopted by SEW for the Fishermans Bend Integrated Water Management Strategy Options Assessment (GHD, 2015).

3. Stormwater Drainage & Flooding

3.1 Authorities Consulted

The regional drainage network in Fishermans Bend is managed by Melbourne Water (MWC). City of Melbourne (CoM) and City of Port Phillip (CoPP) are responsible for local drainage infrastructure, typically servicing catchments less than 60 Ha within their municipalities.

3.2 Status of Background Studies

The baseline strategy has been developed based on the following studies:

- Fishermans Bend IWM Options Evaluation study, GHD on behalf of SEW and MWC, 2015
- Fishermans Bend RSS, GHD for MWC, ongoing.

3.3 Existing conditions

The Fishermans Bend growth area is located within a relatively low lying area adjacent to the Yarra River, near to where it discharges into Port Phillip Bay, with ground levels generally varying from 1m AHD to 4m AHD.

Significant parts of the growth area are therefore vulnerable to inundation in tidal events, particularly towards the east within the Montague Precinct. This problem is further exacerbated by the effects of climate change and sea level rise.

The Existing Infrastructure Plan for drainage is contained in Appendix B.

3.4 Baseline Drainage Servicing Approach

3.4.1 Drainage

The design criteria for the drainage is as follows:

- 5 year ARI - no surface flooding in roads or private realm
- 100 year ARI - no surface flooding within property boundaries
- 100 year ARI - designated overland flow paths (inclusive of minor and/or major thoroughfares) meet a low safety risk in roads category where practical

In accordance with the MWC Flood Mapping Projects, Guidelines and Technical Specifications (MWC, 2014) a low safety risk in roads is defined as having a velocity times depth <= 0.40 cumecs/m with a depth <= 0.40 m. In addition, flooding is defined as a depth greater than 50 mm depth.

It is further understood that both CoM and CoPP have aspirations for no surface flooding in roads or private realm for a 20-year ARI event as this will reduce ongoing maintenance issues caused by flood events less than the 20 year ARI.

3.4.2 Rainwater tanks

Based on guidance received from VPA in relation to the intent of the Strategic Framework Plan (SFP) requirements, it is understood that the rainwater tanks need to capture the first 101 mm (equivalent to the total rainfall from a 5 year 72 hour storm event) from the building roof and any podium hardstand, and retain a minimum of 50% of this volume. It is assumed that given the tanks are typically drawn down reasonably fast (i.e. within 24-48 hours) there is no requirement to separate the retention and detention elements of a rainwater tank.

For illustrative purposes, the average size that a building scale rainwater tank would need to be is 278 kL, with 50% for reuse (139 kL) and 50% for slow release (139 kL). The average size of 278 kL is based on:

- An average building roof area of 1903 sqm.
- An average contributing podium area of 853 sqm (representing 70% of the podium, based on the land use assumptions derived by GHD in collaboration with VPA).

In practice, the size of the rainwater tanks will vary from site to site.

For the baseline drainage plan it is assumed that the rainwater tanks will be slow release. These tanks are designed to primarily detain flood peaks with an orifice (leaky tank) half way up the tank. These tanks perform two functions, namely:

- Provide rainwater to the building scale third pipe network (primary supply) – bottom 50% of tank (139 kL on average)
- Have the ability to slowly release water to the Yarra River and Port Phillip Bay (after the flood peak has receded) – top 50% of the tank (139 kL on average)

3.4.3 Climate Change

The design requirements accommodate potential effects of climate change. The revised approach by AR&R has been adopted for estimating the potential effects of climate change on rainfall in the baseline drainage plan.

The following tide levels presented in Table 7 have been used.

Table 7 Tide levels

Event (ARI)	Tide level with no climate change (mAHD)	Tide level with climate change in 2100 (mAHD)
5	1.10	1.90
20	1.25	2.05
100	1.60	2.40

3.5 Level of service and flood mitigation

At present two levels of service are being considered for the baseline drainage plan. These two levels of service are outlined in Table 8.

The expected / normal level of service represents the design requirements outlined in Section 3.4. It is likely that significant drainage infrastructure will be required to achieve that level of service for Fishermans Bend and that the costs associated with providing that infrastructure may not be acceptable.

The lower level of service has therefore been identified, which provides a lower cost alternative.

At present the level of service that should be adopted for the baseline drainage plan has not been decided. It may potentially be a combination of, or fall between, the two levels of service identified in Table 8.

Table 8 Model scenarios for developing the baseline drainage plan

Level of service	Flood protection provided	Types of flood mitigation to be used
Lower level of service	Flood protection requirements* only to be met for rainfall events. Effects of tidal flooding to be managed separately, and possibly on a broader regional basis (ie minimum floor levels, access and egress, flood warnings etc).	Rainwater tanks, pipe capacity upgrades.
Expected / normal level of service	Flood protection requirements* to be met for rainfall and tidal events.	Rainwater tanks, levees, pipe capacity upgrades, pumping and raised roads for providing safe access and egress.
* **See Section 3.4 for requirements.**		

3.6 Ongoing work

Work is currently ongoing to prepare the baseline drainage plan. This work is expected to include:

- Completion of the hydraulic modelling for the two levels of service, including indicative drainage plans.
- Preparation of cost estimates for the two levels of service.

The current expectation is that this work will be completed in October 2016.

3.7 Conclusion

The Baseline Servicing Approach for the Fishermans Bend precinct differs from the BAU approach for provision of drainage infrastructure and flood management throughout the rest of Melbourne.

The approach will include rainwater tanks for all new development across Fishermans Bend, as well as flood mitigation measures. The level of service and associated flood mitigation measures are yet to be confirmed by MWC.

Amongst other factors, the impacts of tidal flooding, appetite for acceptance of flooding, climate change, the required level of service, requirement for rainwater tanks and existing topographical constraints underpin the Baseline Servicing Strategy.

The Baseline Servicing Strategy may result in greater costs being applied to developers compared to other parts of Melbourne however the funding model for the Baseline Servicing Approach is yet to be confirmed.

Acceptance of greater risk is considered a more adaptive response to flooding, as measures to eliminate or reduce flooding are typically very costly and only allow for a modelled storm / tidal event based on assumptions related to climate change.

It is likely that the Baseline Servicing Approach will need to be considered in the context of the Public Realm and Public Open Space areas, particularly in the context of overland flow and stormwater retention.

CoPP is considering storage of flood waters and how they can manage stormwater in their municipality in a smarter way. They are constrained by the impact of sea level at their drainage outfalls and their downstream position in the broader catchments, resulting in them having to deal with overland flow entering from other neighbouring municipalities.

CoPP and CoM have indicated that they intend to respond to the overarching drainage and flood management strategy that is being developed by MWC. In the short term, their drainage planning will be based around standard renewal and will not account for the projected growth in Fishermans Bend due to uncertainty around the timing and type of redevelopment and the fact that there are areas of higher flood risk in their municipalities at present.

4. Water Supply and Sewerage

4.1 Authorities Consulted

Melbourne Water Corporation (MWC) is the responsible authority for the trunk water supply and sewerage transfer network in Fishermans Bend.

South East Water Corporation (SEW) is the water retailer responsible for the water and sewer distribution and reticulation networks in Fishermans Bend.

City West Water (CWW) is the responsible authority for the water and sewer distribution and reticulation networks to the north and west of Fishermans Bend.

The Existing Infrastructure Plan for sewer and water is contained in Appendix B.

4.2 Status of Background Studies

The baseline strategy has been developed based on the following studies:

- Fishermans Bend IWM Options Evaluation study, GHD on behalf of SEW & MWC, 2015
- Fishermans Bend Sewer Mining Plant Concept Design, GHD on behalf of SEW, 2016

SEW is currently exploring:

- The potential feasibility of a pressure sewer network
- More detailed feasibility to enable board and treasury approval for the sewer mining plant and alternative pipe network business case

Further refinements to the baseline strategy may occur as a result of these concurrent studies.

4.3 Baseline Water Servicing Approach

4.3.1 Potable Water

The Fishermans Bend IWM Options Evaluation Study (GHD 2015) identified that there is no requirement for the Punt Rd potable water pumping station, transfer main and storage as previously explored in the Fisherman Bend Infrastructure Plan (GHD, 2013), on the basis that the sewer mining plant proceeds.

As identified within the Fishermans Bend IWM Options Evaluation Study (GHD 2015), 14.6 km of potable reticulation and distribution upgrades are likely to be required to service Fishermans Bend.

SEW is also investigating the feasibility of proactively renewing mains to a minimum potable water main size of 225 mm as per the CBD and in accordance with the WSAA code to ensure there is sufficient water for firefighting purposes without requiring onsite storage. No allowance has been made for minimum size 225mm water mains prior to development.

If sewer mining does not proceed at Fisherman Bend, then a potable water pump station and transfer main from Punt Rd main will be required early in the renewal development phase. Preliminary MWC modelling indicates further major transfer system augmentation may be required in the Preston zone to service growth by 2050 in the inner South East area of Melbourne. The scope of works is yet to be determined.

The extent of potable water main upgrades cannot be confirmed at this stage.

4.3.2 Alternative Water

As identified within the Fishermans Bend IWM Options Evaluation Study (GHD 2015), under the preferred scenario, 29.3 km of new recycled water reticulation and distribution mains are required. At this stage the location and extent of the proposed recycled water network cannot be confirmed.

The Fishermans Bend IWM Options Evaluation Study (GHD 2015) also recommended a preferred servicing scenario (Scenario 3), which involves a local sewer mining plant (SMP) to provide Class A recycled water throughout Fishermans Bend.

4.3.3 Sewer Mining Plant

A concept design for the sewer mining plant (SMP) was developed by GHD on behalf of SEW (GHD, 2016). At this stage the SMP has a nominal throughput of 18.5 ML/D, which would satisfy 90% of the peak day demand. The SMP would also comprise recycled water storages with capacity to store one day of peak day demand (i.e. 20.6 ML).

The SMP would be constructed in three equal stages to maximise potential for common standby/spare equipment, and maximise redundant capacity when one process unit/train is out of operation.

The current concept for the SMP includes the following unit processes:

- Inlet works (screening and grit removal)
- Salsnes filter (MBR pre-treatment and particulate organics removal)
- MBR
- UF filtration
- UV disinfection
- Chlorine disinfection
- Recycled water storage

The following construction sequence was proposed to satisfy this staging requirement:

- Infrastructure delivered in three (3) trains with some integration e.g. single inlet works, sharing reactor walls and standby pumpsets and blowers.
- Major civil works completed in Stage 1 including buildings, reactor concrete, inlet works and major piping. Due to the nature of the facility it is not considered practical to stage construction of the MBR reactor tanks
- Major electrical works completed in Stage 1
- Mechanical and control works completed in Stage 1 to include standby equipment. Additional mechanical and control works built for capacity each stage thereafter

A process flow diagram and architectural impression of the sewer mining plant facility is included in Appendix C.

Sewage Extraction and Transfer System

Sewage for the SMP would be sourced from the Hobson Bay Main Sewer (HBMS), via a new manhole to be constructed by MWC. This would provide facilities to enable sewage extraction and transfer to the SMP. The system would comprise:

- New access chamber HBM002A on the Hobsons Bay Main Sewer
- Diversion pipework at the offtake location

- Extraction pump wet well
- Extraction pump valve chamber
- Transfer pipeline

An aerial image showing the indicative location of the extraction system and transfer infrastructure is included in Appendix D.

4.4 Baseline Sewerage Servicing Approach

4.4.1 Reticulation Network

As identified within the Fishermans Bend IWM Options Evaluation Study (GHD 2015), under the preferred scenario (Scenario 3), 12.6 km of new sewer mains are required.

SEW is currently exploring the potential feasibility of a pressure sewer network at Fishermans Bend. At this stage the location and extent of sewer upgrades cannot be confirmed.

4.4.2 Trunk Network

MWC was consulted to confirm the impact of the adopted development scenario on its trunk infrastructure. The key MWC infrastructure affected by the increased loads from Fishermans Bend includes the Melbourne Main Sewer (MMS) and HBMS. In addition, downstream infrastructure such as Brooklyn Pump Station, Hoppers Crossing Pump Station and Western Treatment Plant would be affected.

MWC advised that upgrade of the HBMS is included in MWC's 20 Year Capital Plan. The project is driven by asset condition, but may also address capacity constraints in the system. MWC advised that any future renewal works for the HBMS would take into account growth, including the Fishermans Bend development. Therefore, future plans to upgrade this critical asset would ensure there is sufficient hydraulic capacity to cater for increased sewage loads.

The MMS runs from the Yarra River to Fennell Reserve and through to Swallow Street, where it connects to the HBMS. MWC recently completed the MMS replacement to address hydraulic constraints in the sewerage system. The new sewer has approximately three times the capacity of the original brick-lined sewer, and MWC advised that it has sufficient capacity to cater for the increased sewage loads from the Fishermans Bend development.

MWC also advised that its infrastructure downstream of the HBMS (i.e. Brooklyn pump station etc) has either sufficient existing capacity to cater for the increased sewage loads from Fishermans Bend, or there are planned upgrades that would address any constraints in the near future (i.e. upgrade of the activated sludge plant at Western Treatment Plant).

4.5 Conclusion

The Baseline Servicing Approach for the Fishermans Bend precinct differs from the BAU approach for provision of water infrastructure throughout the rest of Melbourne.

This approach is underpinned by the benefits of generating a recycled water source locally to eliminate the need to upgrade the trunk water infrastructure that could include a Punt Rd potable water pumping station, transfer main and storage.

The cost associated with water supply infrastructure required in Fishermans Bend would be funded through SEW's standard contribution arrangement. There is not likely to be a significantly greater attributable cost to developers as a result of the Baseline Servicing Approach.

The Baseline Servicing Approach for the Fishermans Bend precinct may differ from the BAU approach for provision of sewerage infrastructure throughout the rest of Melbourne. This will be confirmed following completion of SEW's assessments currently underway.

The alternate Baseline Servicing Approach being considered is to have pressure sewers across the precinct. This approach is being driven by the poor ground conditions and resultant high costs for a gravity sewerage network.

The cost associated with sewerage infrastructure required in Fishermans Bend would be funded through SEW's standard contribution arrangement. There is not likely to be a significantly greater attributable cost to developers as a result of the Baseline Servicing Approach.

In relation to the trunk infrastructure, the Fishermans Bend development would not trigger any upgrades to the MWC headworks in excess of their existing future planned capital works program.

5. Electricity

5.1 Authorities Consulted

AusNet Services is the responsible authority for the transmission supply of electricity to a bulk supply point (220 kV / 66 kV terminal station) in Fishermans Bend.

CitiPower receives electricity from AusNet's 220/66kV Terminal Station at 66kV and transmits this to its zone substations and high voltage customers via its sub-transmission network at 66kV. Residential, industrial and commercial customer properties in the five precincts are then supplied from CitiPower's zone substations, via its distribution network, generally at lower voltages.

The Australian Energy Market Operator (AEMO) is responsible for the planning of the Victorian transmission network. AEMO works closely with infrastructure investors and customers to make decisions on when and where new transmission network infrastructure should be built.

5.2 Existing Infrastructure

The existing AusNet transmission electricity assets within Fishermans Bend include:

- 220kV overhead transmission lines to the Fishermans Bend Terminal Station
- Fishermans Bend Terminal Station (FBTS) converts overhead electrical energy from 220 kV to 66 kV

The existing CitiPower medium voltage and distribution electricity assets within Fishermans Bend include:

- 66kV overhead lines and underground cables to the zone substations
- Existing zone substations
- 11kV, 6.6 kV and low voltage (415 and 240V) overhead and underground distribution network

The FBTS is located at the eastern end of the Employment Precinct and supplies the CitiPower zone substations that in turn distribute power to the five precincts. AusNet requires that the proposed development does not encroach on transformer access routes to the FBTS. Two of the 220/66 kV transformers at FBTS together with a 220 kV circuit breaker and some 66 kV circuit breakers will be replaced in circa 2020 to replace aged assets with increased failure rates. These upgrade works are likely to take three years to complete and will cost in the order of $54 million. In addition, a project is proposed to replace an additional 220/66 kV transformer at FBTS and associated circuit breakers in 2028 at a cost of $19 million.

The Existing Infrastructure Plan for the electricity network is contained in Appendix B.

The existing loadings and capacities for each of the five precincts are listed in the table below.

Table 9 Current Capacity by Precinct

Precinct	Area Supplied by:	Predicted Demand	Capacity Rating	Present Loading
Montague	Montague Zone Substation	94 MVA	19 MVA	11 MVA
Lorimer	Fishermans Bend, Montague and West Gate Zone Substations	75 MVA	68 MVA	50 MVA
Sandridge	Montague and Port Melbourne Zone Substations	72 MVA	45 MVA	27 MVA
Wirraway	Port Melbourne Zone Substation	62 MVA	28 MVA	19 MVA
Employment	Fishermans Bend Zone Substation	5 MVA	127 MVA	50 MVA

5.3 Baseline Servicing Approach

Additional electrical infrastructure will be required to meet to expected future demand.

The most likely approach that AusNet will adopt if there was significant increase in demand would be to replace one or more existing 220/66kV transformers with larger capacity transformers (there are currently 150 MVA at FBTS and AusNet could upgrade them to 225 MVA). It is unlikely that the 220 kV Transmission Lines will need to be replaced based solely on the additional demand at Fishermans Bend. The funding for any upgrading of the FBTS would be by AusNet and recovered through their network tariff charges.

The baseline servicing approach for CitiPower is twofold:

- When upgrading or replacing existing infrastructure to meet future demand, safety or reliability requirements the works would be funded by CitiPower through their tariff scheme. The expenditure for upgrades are reviewed every several years by the economic regulator, the Australian Energy Regulator, who will approve a certain level of expenditure for particular large projects or types of upgrades.
- Supplies to new properties or undergrounding of electricity infrastructure would be funded by an external party such a property developer, property owner or local council. The trigger to enable this work to occur would be connection agreement in the case of a new supply and a written agreement and contract with an external party for any undergrounding works.

Options previously discussed with CitiPower in 2015 to meet the additional load (and visual amenity objectives of the redevelopment of the precincts) included the following:

- Upgrade the electricity distribution network from 6.6 to 11 kV
- Upgrade all existing zone substations to 11 kV
- Develop a new zone substation, in addition to or as a replacement for existing zone substations in the precincts. This would be in response to a change in load centre across Fishermans bend and could potentially be developed within a new residential or commercial building.
- Conversion of all overhead power lines to an 11 kV underground power network

One option that could be considered to reduce the costs associated with the undergrounding of medium voltage (6.6 and 11kV) and distribution network would be to for the contractor responsible for upgrading the streetscapes to install electrical conduits. This would enable CitiPower to install power cables in the conduits at a later stage. However, this would require

close consultation during design and construction with CitiPower and inspections prior to practical completion by the contractor.

5.4 Conclusion

The Baseline Servicing Approach for the Fishermans Bend precinct is consistent with the BAU approach for provision of power infrastructure throughout the rest of Melbourne.

Planned upgrades to meet demand, safety or reliability requirements are funded by CitiPower and AusNet through their tariff schemes.

New connections for new builds or redevelopments in the area would be funded by the applicants for those developments, and it is likely that any new connection assets would be undergrounded from the outset. Undergrounding or relocation of any existing overhead powerlines that form part of the distribution or sub-transmission network would be funded by the party requesting the change. CoPP believes that undergrounding of power is essential as part of the anticipated streetscape upgrade process.

Significant costs and considerable technical and maintenance issues are likely to be prohibitive to undergrounding of AusNet's transmission powerline in the north of Fishermans Bend.

There are many uncertainties that exist in the power sector relating to the impact that technology will have on the way power is generated and distributed. Innovations such as electric cars, alternative power generation options such as solar and wind, distribution alternatives such as micro-grids and rapid advancements in battery storage technology are all likely to have a significant impact on the power sector as they become more widespread. As a result, the Baseline Servicing Strategy that is anticipated at present may need to adapt as disruptive technologies have an increasingly greater impact on the sector.

6. Gas and Fuel

6.1 Authorities Consulted

APA GasNet owns and operates gas transmission pipelines. Gas is depressurised at city gates and field regulators to appropriate pressures to distribute gas to final users by distribution companies.

Zinfra is responsible for managing the gas distribution assets in Fishermans Bend on behalf of United Energy and MultiNet Gas, the asset owners.

Viva Energy Australia (Viva Energy) supplies around a quarter of all Australia's petroleum products. Viva Energy owns and/or operates around 260 km of licensed pipelines that are used for conveying oil products in and around the greater Melbourne area, including three major pipelines.

6.2 Existing Infrastructure

The existing gas assets within Fishermans Bend include:

- APA's 750 mm diameter West Melbourne to Brooklyn (PL108 T33) transmission pipeline (Montague, Sandridge, Wirraway and Employment Precincts)
- APA's 750mm diameter Dandenong to West Melbourne (PL36 T16) transmission pipeline (Montague Precinct)
- APA's 150mm diameter Port Melbourne to Symex Holdings (PL164 T89) transmission pipeline (Montague and Sandridge Precincts)
- The existing gas distribution network in Fishermans Bend consists of low, medium and high pressure gas mains. The Lorimer, Montague and Wirraway Precincts have some coverage of high pressure gas mains. The Sandridge Precinct has extensive high pressure gas coverage. There is also transmission pressure gas to the now decommissioned Symex cogeneration plant.

APA's pipeline assets located within the Victorian Transmission System have been classified as 'Vital Critical Infrastructure' under the Emergency Management Act, 2013.

The principal fuel asset within Fishermans bend is:

- Viva's Westernport-Altona-Geelong (WAG) pipeline that crosses through the Wirraway Precinct, along the same alignment as APA's 750 mm diameter gas transmission pipeline

The Existing Infrastructure Plan for Gas and Fuel is contained in Appendix B.

6.3 Baseline Servicing Approach

6.3.1 Capacity for future development

MultiNet assessed the estimated demands and provided commentary, summarised in Table 10. They indicated there was a general requirement to upgrade the capacity of supply regulators, high pressure field regulators, district regulators and the associated custody transfer meters to all of the proposed zones.

Table 10 MultiNet Anticipated Capacity

Precinct	Anticipated Capacity
Montague	Subject to no mains removal, loss of connectivity or downsizing of existing high pressure gas infrastructure, Multinet has confirmed that there is sufficient capacity over the period of 2017 to 2021 to cater for any expected growth.
Lorimer	This Precinct requires mains extensions (potentially some large diameter mains) along with interconenction to the other proposed precincts over the period of 2017 to 2021. Any requests for metering pressures greater than 4kPa will not be possible with the existing gas infrastructure.
Sandridge	This Precinct requires mains extensions (potentially some large diameter mains) along with interconenction to the other proposed precincts over the period of 2017 to 2021. Any requests for metering pressures greater than 4kPa will not be possible with the existing gas infrastructure.
Wirraway	This Precinct is currently supplied via low pressure mains. Depending on the rate of development in the area, Multinet can confirm that there is sufficient capacity over the period of 2017 to 2021.
Employment	This Precinct requires mains extensions (potentially some large diameter mains) along with interconenction to the other proposed precincts over the period of 2017 to 2021.

In addition to the above summary, MultiNet made the following comments regarding capacity and works required to support growth:

- Scheduling of upgrades works for the area has yet to be confirmed.
- Fishermans Bend was previously assessed as industrial with zero growth in gas demand. The rezoning to CCZ changes this situation.
- Growth will be assessed based on submitted development proposals
- MultiNet manages a 5-year capital works window in accordance with regulatory requirements

APA do not have any plans for installation of a new gas transmission pipeline in this area. The ‘remaining life’ of the gas transmission pipelines as per AS2885 is 42 years remaining.

6.3.2 Funding Arrangements

There are two types of tariff arrangements for gas customers depending on the volume of gas required. Customers such as residential developers usually fall into the category of a Tv customer. Td customers have an extremely high peak hourly load (10,000MJ/hour) or annual volume required (10TJ/annum). Cost for gas is less expensive for Td customers but they are liable for greater capital costs in financing extensions and network augmentation.

MultiNet noted that in line with regulatory requirements gas project funding is determined in several ways. Where a connection request is made for commercial and residential sites, future gas distribution revenues for the site are calculated and offset against the construction costs

associated with the gas assets. Where a shortfall occurs, it is the responsibility of the applicant / developer to finance the deficit in order for the project to proceed.

Extensions and network augmentation would be economically assessed in accordance with Table 11.

Table 11 Gas Tariff Arrangements

	Tariff (volume) Tv	Tariff (demand) Td
Financing of Extensions	Economic Feasibility Tested	Almost invariably fully chargeable to applicant. Proposal analysed to check if any non-chargeable network benefit would be realised
Financing of Network Augmentation	Funded by MultiNet (specific case dependent)	Economic Feasibility Tested (Any revenue shortfall required to establish an economic proposal is generally chargeable to applicant unless some augmentation component is incorporated to allow for other non-Td future development)

Where a request is made for installation of a gas connection to a building or site for the purposes of enabling future connection, with one of the below characteristics, the full construction cost is passed on to the applicant / developer:

- No connection load information
- Tariff D
- Non-standard installation request

If any upgrade works to APA's network were required, they would be funded privately by APA VTS Australia (Operations) Pty Ltd.

6.3.3 Protection Requirements

Pipeline protection (if required) eg slabbing over pipelines, is normally financed by the applicant / developer that triggers the need for protection works. When there are multiple developers and staging of development the cost sharing is complicated and difficult to administer.

MultiNet Gas has indicated that the following buffer zones / easement requirements should be considered in the context of future development in Fishermans Bend:

- Buffer zones may be established as a result of associated Risk Assessments
- Easements will be subject to review upon submission of plans. Any proposed title, boundary, road changes could result in the need to either extinguish or grant new easements for MultiNet
- In the event a license / lease is required, the terms and conditions along with any ongoing costs will be passed onto the applicant / developer
- It is likely that Environmental Reports and Impact Studies will be required prior to the commencement of any works due to the likely contaminated land in areas that are / were industrial use

MultiNet has assets within Fishermans Bend that are subject to the Gas Safety Act 1997 and the Pipelines Act 2005. This will have a particular impact on planning for sensitive uses such as schools, hospitals and aged care facilities that will need special consideration.

The Pipeline Measurement Length (hazardous zone) for APA's 750mm diameter transmission pipelines is 450 metres and for APA's 150mm diameter transmission pipeline the length is 77 metres. The Pipeline Measurement Length is applied to either side of the transmission pipelines.

APA notes that risk mitigation measures will be required where land use classification changes as part of the area development. For example, as part of the pipeline integrity assessment underway, installation of a protective concrete slab over the transmission pipeline is being considered in Douglas Street and Ferrars Street due to a new Primary School and public park being constructed in Montague. The cost of protection works is attributable to the developer / applicant who triggered the works.

MutiNet and APA reiterated their preference for being involved in early planning. It is APA's objective to protect human life and infrastructure whilst ensuring future land use, subdivision and development does not inhibit the potential of an existing high pressure transmission pipeline system to be able to provide capacity required to meet the needs for natural gas in Victoria. In particular, they believe it's important for their involvement in early discussions regarding:

- Supply into areas
- Timing
- Reticulation or suitability of assets
- Identification of key local infrastructure requiring larger than normal supply (eg Co Gen / Tri Gen facilities)

APA recommends that high density residential development or other "sensitive" land use facilities (eg schools, hospitals, aged care facilities, preschools etc) are located beyond the Pipeline Measurement Length (hazardous zone). This separation or "measurement length" clearly defines the region that would be affected by the worst case scenario pipeline failure and identifies the distance where development should be carefully designed and considered by the planning authority in relation to gas transmission pipelines.

Redevelopment within the vicinity of high pressure gas pipelines must be in accordance with the following legislation:

- APA VTS Australia's Guidelines (Appendix 1)
- AS2885, Part 1, Clause 4.3.4 - Primary Location Classification (Appendix 2)
- AS2885, Part 1, Clause 4.7.4 – Change of Location Class (Appendix 3)

MultiNet and APA recommend that a Safety Management Study (SMS) as required by the Gas Safety Act be conducted as soon as possible at a precinct scale to assess the impacts of proposed development on the fuel and gas pipelines and develop controls to mitigate the constraints and risks to development within the Pipeline Measurement Length (hazardous zone).

APA has developed 'Guidelines to Planning and Development around High Pressure Gas Transmission Pipelines', contained in Appendix E.

The technical regulator, Energy Safe Victoria (ESV) and the applicable Australian Standard, AS2885 Pipelines – Gas and Liquid Petroleum, impose obligations on pipeline licensees to maintain appropriate safety risk levels of pipelines despite changes in the surrounding environment and population.

Within three metres (either side) of the edge of a gas transmission pipeline, the following constraints must be adhered to:

- No structure will be permitted within three (3) metres of a pipeline asset without prior written approval
- Line of sight along the pipeline ROW must be maintained
- Three (3) metre minimum clearance between the pipeline and any vegetation greater than 0.5m in height must be maintained at all times

APA notes that for all developments adjacent to the pipeline or in the near vicinity, construction methodology and proposed plant and equipment to be utilised during construction for any proposed works will be required prior to construction for assessment and approval by APA prior to future construction works. This would be best implemented through the mandatory requirement of a Construction Management Plan (CMP). This CMP requirement and approval of the CMP by APA has been utilised in numerous other PSP developments throughout Melbourne and should be applied accordingly.

6.4 Viva Fuel Pipeline

Upgrade works to Viva Energy assets within Fishermans Bend are not anticipated, however protection measures need to be considered.

Pipeline protection (eg slabbing over pipelines) if required, is normally financed by the applicant / developer that triggers the need for protection works. When there are multiple developers and staging of development the cost sharing is complicated and difficult to administer.

Viva Energy has indicated that the following buffer zones / easement requirements should be considered in the context of future development in Fishermans Bend:

- Buffer zones may be established as a result of associated Risk Assessments
- Easements will be subject to review upon submission of plans. Any proposed title, boundary, road changes could result in the need to either extinguish or grant new easements
- In the event a license / lease is required, the terms and conditions along with any ongoing costs will be passed onto the applicant / developer

The Pipeline Measurement Length (hazardous zone) for Viva Energy's 600mm diameter WAG pipelines is 150 metres. The Pipeline Measurement Length is applied to either side of the pipeline.

Viva Energy notes that risk mitigation measures will be required where land use classification changes as part of the area development.

Viva Energy has assets within Fishermans Bend that are subject to the Pipelines Act 2005 and Pipeline Regulations 2007. This will have a particular impact on planning for sensitive uses such as schools, hospitals and aged care facilities that will need special consideration.

Viva Energy recommends that high density residential development or other 'sensitive' land use facilities (eg schools, hospitals, aged care facilities, preschools etc) are located beyond the hazardous zone. This hazardous zone is defined as the region that would be affected by the worst case scenario pipeline failure and identifies the zone where development should be carefully designed and considered by the planning authority in relation to high pressure pipelines.

Redevelopment within the vicinity of high pressure pipelines must be in accordance with the following legislation:

- AS2885, Part 1, Clause 4.3.4 - Primary Location Classification (Appendix 2)
- AS2885, Part 1, Clause 4.7.4 – Change of Location Class (Appendix 3)

Viva Energy recommend that a Safety Management Study (SMS) as required by the Pipelines Act and AS2885 be conducted as soon as possible at a precinct scale to assess the impacts of proposed development on the fuel and gas pipelines and develop controls to mitigate the constraints and risks to development within the hazardous zone.

The Pipelines regulator, Energy Safe Victoria (ESV) and the applicable Australian Standard, AS2885 impose obligations on pipeline licensees to maintain appropriate safety risk levels of pipelines despite changes in the surrounding environment and population.

Viva Energy notes that for all developments adjacent to the pipeline or in the near vicinity, construction methodology and proposed plant and equipment to be utilised during construction for any proposed works will be required prior to construction for assessment and approval by Viva energy.

Viva Energy notes that the following issues arise from the absence of regulation in the Victorian Planning Provisions for land use and development around licenced pipelines:

- Developers are rarely aware of the importance of ensuring that their design and construction process accounts for the presence of the pipeline until late in the planning process when pipeline licensees are notified by the responsible authority. This typically adds significant time and cost to projects.
- There is no guidance as to the appropriate use, development or design requirements for developments located near licensed pipelines. Licensed pipelines carry hazardous and/or volatile material, and are closely and carefully managed by licensees to ensure that any safety risks are appropriately identified and managed. There needs to be similar oversight of any changes in the density, design and type of land use around licensed pipelines, and the manner in which those changes occur. Any proposed developments around licensed pipelines should be required to design their developments in consultation with ESV and/or pipeline licensees to ensure that the design does not restrict access of pipeline licensees to maintain pipelines or increase safety risks.
- There is a risk that planning applications may proceed potentially with little awareness of the precautions that should be taken when working around a licenced pipeline. This could affect the access or maintenance of pipelines and may result in an increased risk to people, property and the environment

6.5 Conclusion

The Baseline Servicing Approach for the Fishermans Bend precinct is consistent with the BAU approach for provision of gas infrastructure throughout the rest of Melbourne.

Planned upgrades to meet demand, safety or reliability requirements are funded based on MultiNet's standard tariff and funding arrangements.

MultiNet, APA and Viva Energy are united in recommending that a SMS as required by the Gas Safety Act and Pipelines Act be conducted as soon as possible at a precinct scale. This SMS would assess the impacts of proposed development on the fuel and gas pipelines and develop controls to mitigate the constraints and risks to development within the Pipeline Measurement Length (hazardous zone). The constraints and protection measures that are likely to be attributable to developers who plan to redevelop sites within the hazardous zone may be significant in terms of cost, time and urban form impacts and need to be well understood early in the planning and development process.

APA and Viva Energy would like to be consulted much earlier in the planning application process, particularly for developments proposed within the pipeline measurement lengths

(hazardous zones) to allow important pipeline safety policies and regulations to be taken into account as part of the planning approval process.

APA and Viva Energy recommend that the pipeline measurement lengths (hazardous zones) be incorporated into the Development Contributions Plan Overlay under clause 45.06 of the local planning scheme that is being prepared by the Victorian Planning Authority due to the significant implications of developing sites within the vicinity of high pressure gas transmission assets.

APA and Viva Energy further recommend that the land within the pipeline measurement length (hazardous zones) be classified as a sensitive use under Australian Standard AS-2885.

Viva Energy believes that further consultation is required to determine appropriate land use planning controls for land in the vicinity of licenced pipelines. For example, one strategy might be to include a schedule or overlay in areas affected by pipelines that:

- Establishes the pipeline owners / authorities as referral bodies for all planning applications within the Pipeline Measurement Length
- Triggers the requirement for a planning permit
- Sets out the design and construction requirements that will need to be addressed as part of the planning permit application

Requires the applicant to work with the relevant pipeline licensee / ESV to satisfy the requirements of the Pipelines Act and Australian Standard 2885-2012

7. Telecommunications

7.1 Authorities Consulted

The existing precincts are currently serviced by Optus, Telstra and NBNCo fixed line infrastructure. Wireless service providers covering this area have not been actively consulted as part of these discussions.

7.2 Existing Infrastructure

Based on responses at the Sector Discussions, DBYD and provided information, the area has an existing in ground pit and conduit system reticulating throughout the precincts.

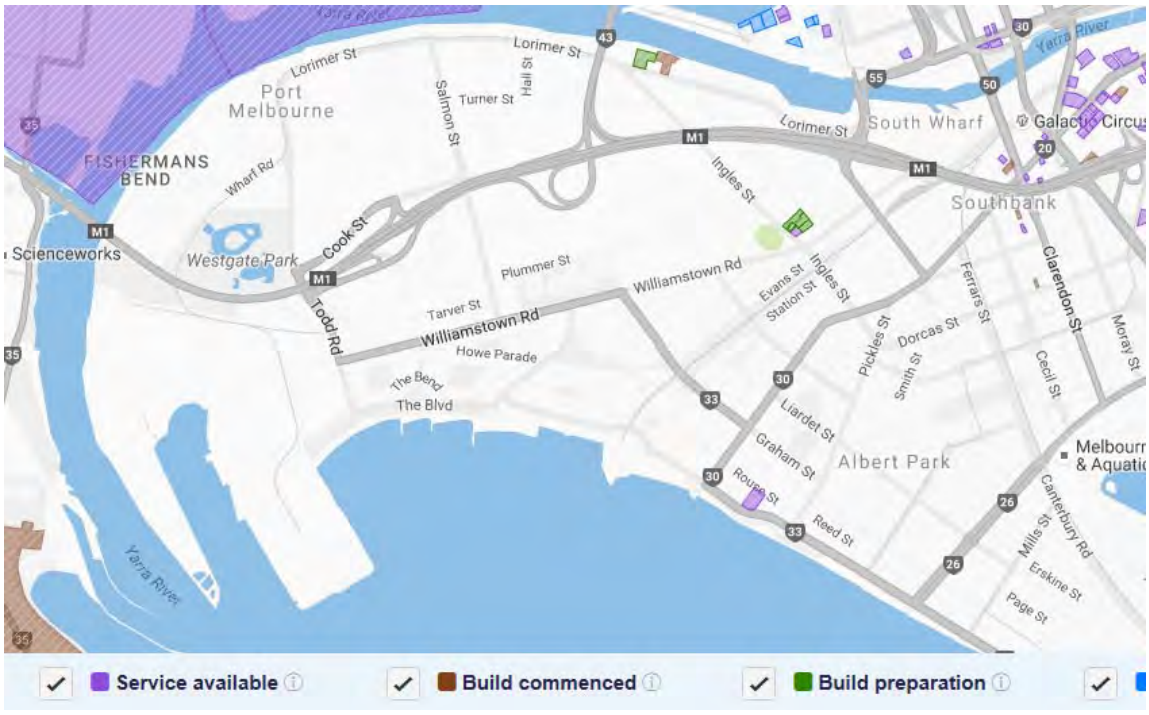
Telstra notes their existing infrastructure is likely to be inadequate and will not have the capacity for the expected population growth. Conversion of an industrial area into a large population centre will require more conduit infrastructure. Conduit requirements will be recognised by Telstra and provisioning must occur in a timely manner to suit development. It was suggested by Telstra that materials used in large portions of this system contain asbestos. Asbestos conduits are generally covered by at least 450mm of earth and are only a problem when improper techniques are employed to cut or remove them. There are procedures for ensuring pit and conduit removal and adjustment is carried out in a safe manner.

There is a need for careful consideration regarding provisions of in-ground infrastructure to ensure that it is not over capitalised as witnessed by Telstra at a number of sites – with some underground conduits empty and unused in large service tunnels. It is customary to provide additional conduits over and above what is immediately required to allow for growth and to allow for replacement of faulty or damaged cables.

The Existing Infrastructure Plan for Telecommunications is contained in Appendix B.

The current NBNCo rollout map (obtained from the NBNCo website) indicates that in the Port Melbourne areas there has been only a small number of NBNCo installations.

Figure 3 NBN Rollout Map (as at September 2016)



The coverage maps from the main wireless service providers (obtained from the various wireless service providers websites) indicate that currently the Port Melbourne area has approximately 100% 4G coverage.

Figure 4 Vodafone Wireless Coverage Map (as at September 2016)

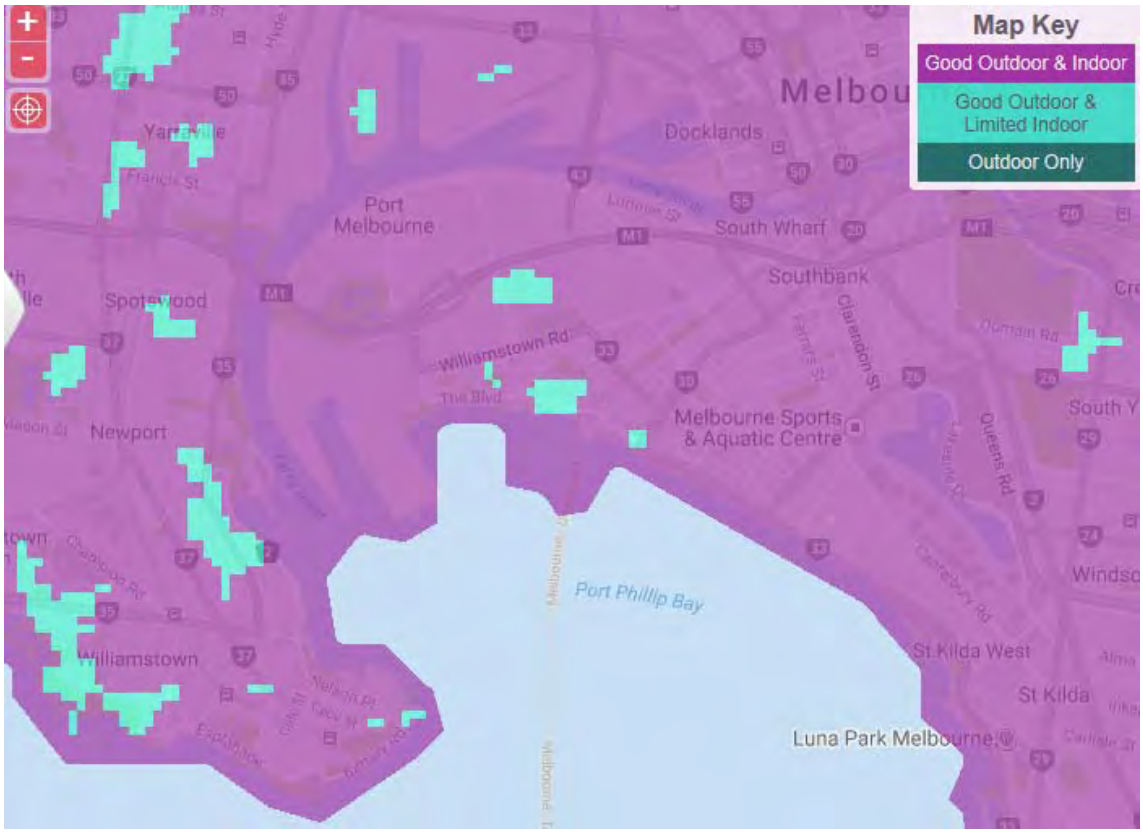


Figure 5 Optus Wireless Coverage Map (as at September 2016)

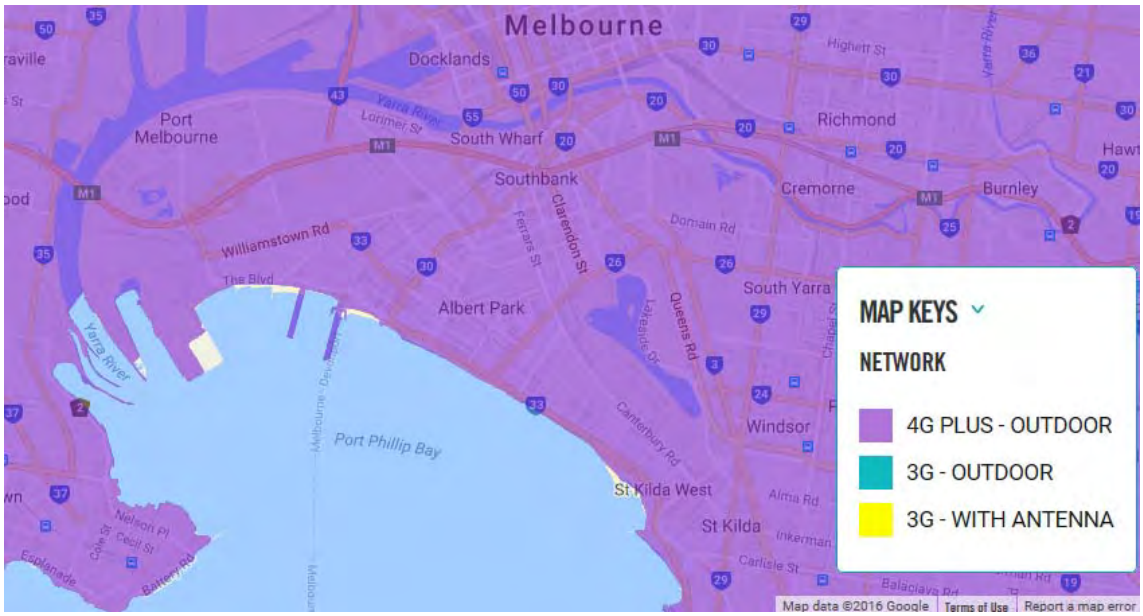


Figure 6 Telstra Wireless Coverage Map (as at September 2016)

7.3 Baseline Servicing Approach

7.3.1 Fixed Line Telecommunication Services

The BAU approach for fixed line telecommunication services is through an application process. For single dwellings, the Owner/Developer contacts Telstra to arrange for pre-provisioning works that include the conduits and lead in cabling to the property. For large multi-dwelling developments, Developers submit an application to NBNCo (or Telstra) for the FTTP (fibre to the premise) provision for fixed line services. Developers are responsible for providing fibre-ready pit and pipe infrastructure within their developments and the lead in conduits (reference: Communications Alliance, Industry Guideline G645:2011).

NBNCo publishes data on their planned rollout on their public website. They have stated “while we are eager to collaborate with you wherever possible we are not able to give you any further details on future works planned at this time”.

The Fisherman’s Bend Precinct is an NBNCo rollout area and contains NBN infrastructure. Any new dwelling or business will be eligible to receive the NBN network via the New Developments rollout.

The fixed line service providers appear to be reactive in terms of provisioning of infrastructure. This appears to be due to fixed line service providers’ reducing exposure to capitalising of new infrastructure or upgrading existing infrastructure (pits and conduits) which may not be used. Advances in technology allows smaller cabling, which have greater capacities, to be installed in the existing infrastructure.

7.3.2 Wireless Services

For wireless service providers, the baseline approach is generally through the provision of coverage to service the area based upon the current wireless technology (4G at present). It is

expected that when the new wireless technologies (5G and beyond) are adopted these will be rolled out by the wireless services providers to service this area.

Infrastructure to support future wireless rollouts should be addressed as part of the development plan and opportunities explored to integrate with other services.

There are two basic types of wireless services available at present although satellite and aircraft based systems are under development. The two are:

- GSM (mobile phone) carriers
- WiFi.

Both wireless services are supported locally via sets of terrestrial transmitters. Both technologies require denser antennae installations to service greater numbers of users and to deal with higher traffic levels. These systems are typically private sector owned although NBN is permitted to install GSM towers.

GSM Towers connect to the backhaul network over fibre optic cables and require a mains power connection. Typically, a tower comprises one or two equipment racks together with supporting services located inside a 9 m^2 structure with external antennae. In urban areas these are commonly located in leased spaces on the roofs of commercial privately owned premises. In the suburbs, standalone towers are installed. A small rental is normally paid. Access and containment is required for power and communications cables to these locations. Each service provider would require a tower every 500 m to 1000 m in a densely populated area.

There are three GSM service carriers in Melbourne although they do sometimes operate under service sharing arrangements. The three are:

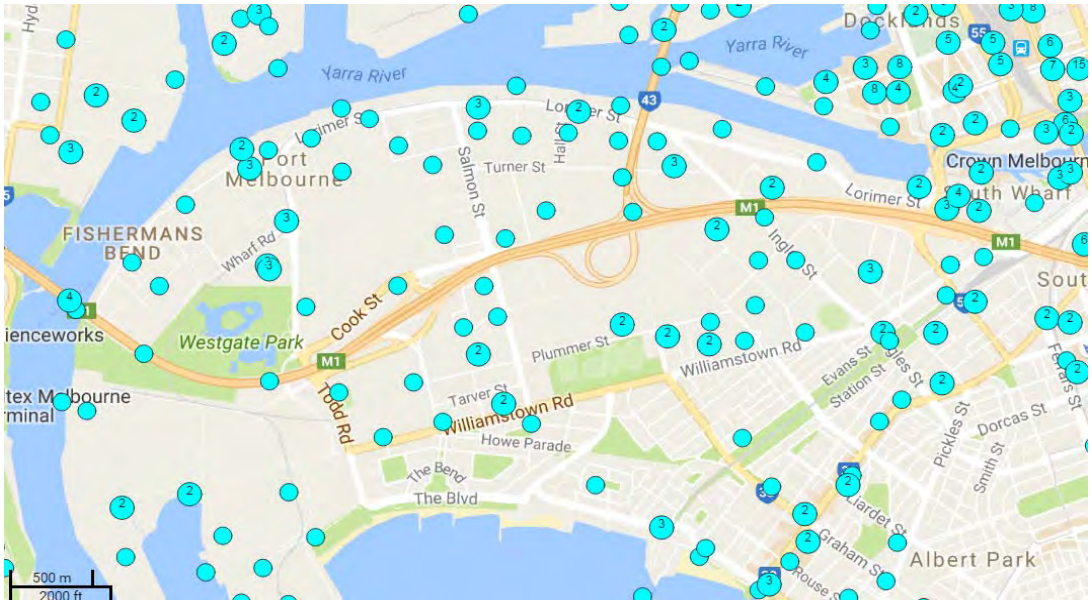
- Telstra
- Vodafone Hutchison
- Optus Mobile

All three operators include Fisherman's Bend in their "full coverage" maps.

Building interiors can be equipped with Distributed Antenna Systems (DAS) to supplement signal strength and bandwidth if licenced by one or more of the approved carriers.

The Australian Government (ACMA *Australian Communications and Media Authority*) hosts a register of radio communications licences located in Fisherman's Bend. The site is interactive and the licensee can be determined for each location along with technical details of the installation. (http://web.acma.gov.au/pls/radcom/site_proximity.main_page)

Figure 7 ACMA Registered GSM Wireless Antennae Map (as at September 2016)



WiFi service is not freely available across Melbourne at present. A number of individual companies, councils and agencies do offer free localised WiFi hotspots around Melbourne, for example at federation Square and Vic Market.

Several global cities and precincts do provide a wide area free public WiFi service. Examples include:

- Adelaide and Perth, Australia
- Paris, France
- Hong Kong
- Auckland, New Zealand
- Florence, Italy and many others.

The Victorian Government has launched a pilot of free public Wi-Fi in central Ballarat and central Bendigo, aimed at developing tourism, education, social inclusion, encouraging new business models, and creating a consistent Wi-Fi experience for residents and visitors.

Telstra is deploying a national WiFi network in conjunction with local councils (Telstra Air ©).

WiFi antennae are typically lower powered than GSM systems and as such individually have shorter range requiring more installations. There are several options under development including antennae located inside purpose designed street light poles. Building mounted options exist as well.

An opportunity exists for a Municipal wireless network (a city-wide or precinct–wide) wireless network to be installed at Fishermans Bend. This would be done by providing municipal broadband via Wi-Fi to large parts or all of the area by deploying a wireless mesh network. The typical deployment design uses hundreds of wireless access points deployed outdoors, often on poles. The operator of the network acts as a wireless internet service provider. The operator could be municipal or from the private sector.

7.3.3 NBNCo Services

NBNCo has a three year plan for the national roll out of services, and from information obtained from the NBNCo website, it appears that NBNCo plan to initiate infrastructure construction works in the Fishermans Bend area around 2017/18.

Table 12 NBN Rollout for Fishermans Bend

State	Region	Areas where construction scheduled to commence before end Sep 2018	Estimated number of premises within areas	Anticipated technology	Expected time of first site to commence construction
VIC	Port Melbourne	Albert Park Middle Park Port Melbourne South Melbourne Southbank	13800	HFC	H1-2017
VIC	Port Melbourne	Port Melbourne South Wharf	3700	FTTN	H1-2018

It may be prudent to discuss the timing of this planned rollout to avoid possibility of damage and abortive costs being incurred. It may make sense to advise NBN to delay the rollout in this precinct until the Fishermans Bend plans are more concrete.

Responses in relation to the future servicing and planning information from the other fixed line service providers are yet to be received.

Discussions held with the fixed line service providers highlighted the difficulty in predicting the capacity requirements and potential infrastructure requirements. Advances in wireless technologies could quite possibly render fixed line services redundant given the past experience with mobile phone technology.

7.4 Developing and Promoting New Technology Opportunities

An opportunity presents to formalise a variety of ideas, challenges, opportunities and uses where technology and digital systems can be employed as an innovative and intelligent approach to minimise problems.

Technology is a tool that can help the Fisherman's Bend Taskforce to address future challenges and meet the service needs of future residents and visitors. Technology alone is not a solution to urban challenges but an enabler. Technology is continuously changing with its own intrinsic limitations but nevertheless provides multiple benefits. Digital technologies or information and communication technologies (ICT) can automate operations and functions, and provide access to real-time information that can lead to immediate benefits and actions. This could aid in controlling risks and threats, keeping down costs and resource consumption, improving the quality and performance of public services, and communicating effectively with the people.

Opportunities could include:

- Dynamic street markings and signage responsive to cyclists, pedestrians and road traffic.
- Embedding technology to provide real time navigation, parking and usage support.

- Designing for autonomous and electric vehicle use. Support for drones.
- Use of street lighting and furniture to support wireless technology.
- Support for cargo cycles.
- Monitoring and presentation of air quality, insolation, utilities consumption and other parameters.
- Below ground waste collection or smart bins.
- Point to point wireless broadband instead of fibre or cabled links.

Installation of common/shared telecommunications infrastructure in anticipation of development may be appropriate. This would comprise ducts with hauling pits throughout the area on both sides of the street and have multiple designated road crossing points at strategic locations. This would require a “duct agreement” with an access process and a service level agreement with minimum response time to be drawn up and agreed by all telecommunications providers.

There is a trend for additional service diversity to be provided in the form of dual duct and pit access to be provided for each building.

7.5 Conclusion

The Baseline Servicing Approach for the Fishermans Bend precinct is consistent with the BAU approach for provision of telecommunications infrastructure throughout the rest of Melbourne.

The telecommunications industry is likely to experience significant technological change and disruption in the timeframe considered as part of this assessment and as a consequence, there are many opportunities for innovation in this sector.

It will be beneficial if enabling technology is embedded in the Fishermans Bend development in a flexible and scalable way. This flexibility will allow technology to be upgraded and improved over time in response to the changes in the challenges that will inevitably arise. The ‘Internet of Things’ revolution is creating innovative and interoperable ways to drive efficiencies across all of the public and private spaces.

Given aspirations for Fishermans Bend to offer world’s best practice for telecommunications and precinct wide WiFi to support a knowledge economy, a pit and conduit system will be required to support fibre optic cable links to all potential antennae locations. This will enable any and all service providers to provide varying degrees of service with technology independence.

This pit and pipe infrastructure will typically be the NBN system for the GSM networks and could possibly host a private system should an authority such as City of Melbourne wish to provide a full coverage WiFi system as is occurring in several cities locally and overseas. The alternative would be a common/shared Telecommunications infrastructure described previously. The NBN network is an open access network specifically for the provision of fixed broadband services. It is a mixed technology network. It is most likely that other service providers will provide their own infrastructure to support mobile phone services.

The earlier a service provider strategy is developed the better to ensure appropriate planning is incorporated early.

8. Recommendations

Further investigations are required to define the infrastructure requirements in greater detail and how they might be staged and integrated within Fishermans Bend along with the governance, ownership and commercial arrangements for delivery of the plan. To that end, a number of next steps have been defined for the broad categories of design and development, implementation and governance.

It is recommended that further engagement with authorities is undertaken to:

- Rationalise street network
- Develop fully dimensioned typical street cross sections for the various road / laneways that incorporate existing and proposed utility assets
- Develop typical cross sections for critical trunk / transmission assets (particularly gas and fuel) to standardise development adjacent to these sensitive assets to protect the integrity of these assets and to provide guidance to developers regarding the limitations to development in the vicinity of critical utility assets
- CoPP has advised that they have commenced preparation of streetscape upgrade Design and Technical Standards to establish proposed street profiles in Fishermans Bend, beginning with the Montague Precinct. Further work is required to coordinate common trenching/ underground utility locations with tree planting and WSUD. This will guide species selection and early establishment of trees to achieve the streetscape character and vision for each neighbourhood.
- Incorporate offsets, clearances, pipeline measurement lengths and other requirements into the master plan to limit the risk of amendments to the master plan at a later stage of planning or design
- Develop hypothetical servicing strategies based on assumed demands and staging

Engagement could be via additional workshops or individual meetings.

It is further recommended that the following activities are undertaken:

- Review current zoning to consider appropriate land uses near sensitive infrastructure such as gas and fuel pipelines and other transmission and distribution assets.
- Understand Land Ownership and likely impact on staging of redevelopment
- Review mandatory referral authorities under the planning scheme to incorporate all affected stakeholders, for example Viva / APA

Appendices

Appendix A – Water and Sewer Demand Basis

3132191 Fishermans Bend Urban Renewal Area WWCM Servicing Strategy

Design Basis Assumptions

Residential and Employment Demands

1. Residential

Average Demands

		Base Case	Alternative Cases	
Ave day demand (L/person/day)	Total	192.7	192.7	Adopted SEW Draft Design Basis Value.

End Use Distribution

End Use Distribution	Dishwasher	1%	1%	Adopted end-use proportions used for Western Region projects, as these are based on analysis of end-use studies by CWW.
* See below for additional cooling tower demand	Misc (incl. tap)	13%	13%	
	Shower (& bath tub)	37%	37%	
	Leak (potable)	8%	5%	
	Leak (RW)		3%	
	Clotheswasher	19%	19%	
	Toilet	18%	18%	
	Outdoor / Gardening	4%	4%	

Average Cooling Tower Demand (Additional demand for future sensitivity testing - not included in current average/peak demands)

Ave day demand (L/m2/day) (buildings with cooling towers)	Cooling Tower	2.19	2.19	Source: City of Sydney Benchmark 0.8 kL/m2/yr
Floor space to population ratio (m2 per person)	m2 per person	50	50	Source: Guess
Ave day demand (L/person/day) (buildings with cooling towers)	Cooling Tower	110	110	
Uptake (% of buildings)	Cooling Tower	25%	25%	
Ave day demand (L/person/day) (averaged across all buildings)	Cooling Tower	27	27	

End uses supplied by dual pipe / recycled water

Supplied By RW	Leak (RW)	0	1	
	Clotheswasher	0	1	
0 = Potable supply	Toilet	0	1	
1 = Recycled water supply	Outdoor / Gardening	0	1	

Average Demand Summary

Ave day	Potable	193	108	
(L/person/day)	Recycled Water	0	85	

Peaking Factors

Ave Day to Peak Day	Potable	1.49	1.49	Base Case peaking factors
	Recycled Water		1.5	
Peak Day to Peak Hour	Potable	2.5	2.24	
	Recycled Water		1.67	

Peak Demands

Peak Day	Potable	287	161	
(L/person/day)	Recycled Water	0	126	
Peak Hour (L/person/second)	Potable	0.0084	0.0042	
	Recycled Water	0	0.0024	

Wastewater Generation

End uses to sewer	L/person/day	175	175	Total ave demand minus 100% outdoor, 100% cooling, 50% leaks, 10% of taps (OLV Guidelines)

2. Employment

		Base Case	Alternative Cases	
Ave day (L/person/day)	Total	95	95	SEW/AECOM value adopted.

End Use Distribution	Other non-potable			CWW assumptions provide clearest breakdown of end uses for commercial demand.
* See below for additional cooling tower demand	Shower	2%	2%	
	Potable	30%	30%	Currently the cooling tower is assumed to be only 4% (not 34%), so everything else is scaled up accordingly.
	Other Non-Domestic	7%	7%	
	Fire System	3%	3%	
	Toilet	49%	49%	
	Irrigation	9%	9%	
	Clotheswashing			

Ave day (L/m2/day) (buildings with cooling towers)	Cooling Tower	2.19	2.19	Source: City of Sydney Benchmark 0.8 kL/m2/yr
Floor space to population ratio (m2 per person)	m2 per person	20	20	Source: Assumed average.
Ave day (L/person/day) (buildings with cooling towers)	Cooling Tower	44	44	
Uptake (% of buildings)	Cooling Tower	50%	50%	
Ave day (L/person/day) (averaged across all buildings)	Cooling Tower	22	22	

Supplied By RW	Toilet	0	1	
0 = Potable supply	Irrigation	0	1	
1 = Recycled water supply	Clotheswashing	0	0	

Ave day	Potable	95	40	
(L/person/day)	Recycled Water	0	55	

Ave Day to Peak Day	Potable	1.4	1.4	SEW/AECOM (Inner
	Recycled Water		1.4	
Peak Day to Peak Hour	Potable	2.2	2.01	
	Recycled Water		1.58	

Peak Day	Potable	133	56	
(L/person/day)	Recycled Water	0	77	
Peak Hour (L/person/second)	Potable	0.0034	0.0013	
	Recycled Water	0	0.0014	

End uses to sewer	L/person/day	86	86	Total demand minus 100% outdoor/gardening, 100% cooling towers, 50% leaks, 10% taps (OLV Guidelines)

Public open space demand

1. Estimated irrigation requirements

Demand	Unit	Elite Turf	Premium Turf	Local Turf	Passive Turf
Average annual	ML/ha/yr	5.5	2.2	1.6	1.0
January 50th %ile	ML/ha/mth	1.1	0.5	0.4	0.3
January 100th %ile (peak month)	ML/ha/mth	1.6	1.0	0.8	0.7
Average day (in peak month)	mm/ha/d	5.29	3.17	2.63	2.10
	L/ha/s	0.61	0.37	0.30	0.24

Demands derived by GHD using a monthly irrigation model. The model, based on SA Water's *Code of Practice: Irrigated Public Open Space (IPOS)* and *FAO Paper 56*, uses monthly evapotranspiration and rainfall data to calculate the theoretical crop water requirement to achieve a desired turf/vegetation quality (i.e. the unrestricted demand for irrigation water). These turf/vegetation qualities are specified for different types of open space (e.g. active, passive, streetscapes, etc.).

Results are shown as the average or percentiles over the period 1900 - 2013.

Assumptions:

Weather Station = Melbourne Regional Office (86071)
Ea (%) = 80%
AWHC (mm/m) = 60
Climate data source: SILO (daily patched point data from 1900 to 2013)

2. Peak irrigation rates

Ave Day to Max Day (in Peak Month)	1.2
Ave Day to Max Hour (in Peak Month)	3.0

	Irrigated Open Space	Turf Category (IPOS TQVS)	Average day demand (mm/ha/day)	Peak day demand (mm/ha/day)	Peak hour demand (mm/ha/day)
Demands (in Peak Month of January)	Active Open Space	Elite Turf	5.3	6.3	15.9
	Passive Open Space	Local Turf	2.6	3.2	7.9
	Streetscapes *	Passive Turf	2.1	2.5	6.3

* Inclusive of street trees

Population

1. Total Population

Column Ref	2	3	4
Total Population	**Design Basis**	**Sensitivities**	
	Ultimate Development	Low (-50%)	High (+50%)
Residential	120,000	80,000	180,000
Employment	61,050	40,700	91,575

Source:

SFP states 80,00 residents and 40,700 employment population (17,700 current + 23,000 additional)
MPA dwelling projections are 60,000 for ultimate development (assumed to be equal 120,000 population at 2.0 people per dwelling), noting that he dwelling count for the year 2050/51 appears to correspond with the residential population stated in the SFP.

2. Precinct Population

Residential Population	**Design Basis**	**Sensitivities**		
by Precinct	Ultimate Development	Low (-50%)	High (+50%)	**Res Distribution ***
Lorimer Precinct	20,000	13,333	30,000	17%
Montague Precinct	30,000	20,000	45,000	25%
Sandridge Precinct	40,000	26,667	60,000	33%
Wirraway Precinct	30,000	20,000	45,000	25%
Total	**120,000**	**80,000**	**180,000**	

** MPA dwelling projections broken down by precinct.*

Employment Population	**Design Basis**	**Sensitivities**		
by Precinct	Ultimate Development	Low (-50%)	High (+50%)	**Emp Distribution ****
Lorimer Precinct	7,308	4,872	10,963	12%
Montague Precinct	11,435	7,623	17,152	19%
Sandridge Precinct	30,622	20,415	45,934	50%
Wirraway Precinct	11,684	7,790	17,527	19%
Total	**61,050**	**40,700**	**91,575**	

*** Places Victoria floor space data for the Integrated Infrastructure Plan*

3. Population disagregrationto local/polygon scale

Method:

1. Distribute precinct population based on area.
2. Scaling applied based on development height (e.g. twice as many people allocated to 12 storey than 6 storey).

Column ref	2	3
Scaling factors	**Residential**	**Commercial**
12 storey discretionary (40)	40%	40%
18 storey discretionary (60m)	60%	60%
30 storey discretionary (100m)	100%	100%
4 storey discretionary (15m)	15%	15%
6 storey discretionary (20m)	20%	20%
6m Setback	0	0
8 storey discretionary (27m)	27%	27%
Discretionary	150%	150%
Existing Open Space	0	0
Green Link	0	0
Proposed Local Recreational Open Space	0	0
Proposed Neighbourhood Open Space	0	0
Roads	0	0
Proposed Road	0	0

Land Use

1. Impervious fractions / surface type assumptions for each mapped land use

		3	4	5	6	7	8	9	10		
		Irrigated Pervious			Other Pervious	Impervious					
Scaling factors		**Active Open Space**	**Passive Open Space**	**Streetscapes**	**Other**	**Road**	**Pavements**	**Roof**	**Platform**	**Total**	**Impervious**
12 storey discretionary (40)	BUILDING	0%	0%	0%	0%	0%		100%	0%	100%	100%
12 storey discretionary (40)	PLATFORM	0%	50%	0%	0%	0%		0%	50%	100%	50%
18 storey discretionary (60m)	BUILDING	0%	0%	0%	0%	0%		100%	0%	100%	100%
18 storey discretionary (60m)	PLATFORM	0%	50%	0%	0%	0%		0%	50%	100%	50%
30 storey discretionary (100m)	BUILDING	0%	0%	0%	0%	0%		100%	0%	100%	100%
30 storey discretionary (100m)	PLATFORM	0%	50%	0%	0%	0%		0%	50%	100%	50%
4 storey discretionary (15m)	BUILDING	0%	0%	0%	0%	0%		100%	0%	100%	100%
6 storey discretionary (20m)	BUILDING	0%	0%	0%	0%	0%		100%	0%	100%	100%
6m Setback	(blank)	0%	0%	100%	0%	0%		0%	0%	100%	0%
8 storey discretionary (27m)	BUILDING	0%	0%	0%	0%	0%		100%	0%	100%	100%
8 storey discretionary (27m)	PLATFORM	0%	50%	0%	0%	0%		0%	50%	100%	50%
Discretionary	BUILDING	0%	0%	0%	0%	0%		100%	0%	100%	100%
Discretionary	PLATFORM	0%	50%	0%	0%	0%		0%	50%	100%	50%
Existing Open Space	(blank)	60%	20%	0%	0%	0%		20%	0%	100%	20%
Green Link	(blank)	0%	0%	50%	0%	0%	50%	0%	0%	100%	50%
LANEWAY	(blank)	0%	0%	0%	0%	0%	100%	0%	0%	100%	100%
Proposed Local Recreational Open Space	(blank)	60%	20%	0%	0%	0%		20%	0%	100%	20%
Proposed Neighbourhood Open Space	(blank)	0%	80%	0%	0%	0%	20%	0%	0%	100%	20%
Roads		0%	0%	20%	0%	60%	20%	0%	0%	100%	80%

Note: The Green link land use category has been mapped as a 6m linear park adjacent to the "Green link roads"

2 Exported Land Use from Base Map

		Land Area (m2)				Total (m2)	Total (ha)
Land Use Category		**Lorimer Precinct**	**Montague Precinct**	**Sandridge Precinct**	**Wirraway Precinct**		
12 storey discretionary (40)	BUILDING			24338	50269	74,606	7
12 storey discretionary (40)	PLATFORM			27228	39469	66,697	7
18 storey discretionary (60m)	BUILDING		9892			9,892	1
18 storey discretionary (60m)	PLATFORM		9956			9,956	1
30 storey discretionary (100m)	BUILDING		20525			20,525	2
30 storey discretionary (100m)	PLATFORM		21156			21,156	2
4 storey discretionary (15m)	BUILDING		33179	118839	87123	239,141	24
6 storey discretionary (20m)	BUILDING	5699				5,699	1
6m Setback	(blank)		2230	11938	13887	28,056	3
8 storey discretionary (27m)	BUILDING		27172			27,172	3
8 storey discretionary (27m)	PLATFORM		26902			26,902	3
Discretionary	BUILDING	69233	52984	131842	114024	368,083	37
Discretionary	PLATFORM	70310	52633	133858	95802	352,604	35
Existing Open Space	(blank)			34190	194797	228,988	23
Green Link	(blank)		8001	13820	6807	28,629	3
LANEWAY	(blank)	14204	16805	54662	47698	133,369	13
Proposed Local Recreational Open Space	(blank)	28961	6303	25935	41632	102,832	10
Proposed Neighbourhood Open Space	(blank)	30000		26944	29995	86,939	9
Roads		55405	145514	273857	258930	733,705	73
Total Area		**273,812**	**433,255**	**877,451**	**980,434**	**2564952**	**256**
Precinct areas from Kate's table		281443	433267	881354	981354	2,564,952	256.4952496

Source: Digitised from Strategic Framework Plan High Res PDFs

3. Impervious area totals

		Impervious Area (m2)				Total (m2)	Total (ha)
		Lorimer Precinct	**Montague Precinct**	**Sandridge Precinct**	**Wirraway Precinct**		
Impervious Area	Road	33,243	87,308	164,314	155,358	440,223	44
	Pavements	31,285	49,908	121,732	108,887	311,813	31
	Roof	80,724	145,014	287,043	298,702	811,483	81
	Platform	35,155	55,324	80,543	67,635	238,658	24
	Total	**180,408**	**337,555**	**653,633**	**630,581**	**1,802,177**	**180**
Impervious Fraction		**66%**	**78%**	**74%**	**64%**	**70%**	

4. Irrigated area totals

		Irrigated Area (ha)				Total (ha)
		Lorimer Precinct	**Montague Precinct**	**Sandridge Precinct**	**Wirraway Precinct**	
Irrigated Pervious	Active Open Space	2	0	4	14	20
	Passive Open Space	6	6	11	14	37
	Streetscapes	1	4	7	7	19

Water Quality Parameters

Wastewater contaminant concentrations

	N kg/ML	P kg/ML	TSS kg/ML
Wastewater	50	10	150
Wastewater Discharged at WTP	15	10	30

Stormwater quality management objectives

	N % reduction required	P % reduction required	TSS % reduction required
BPEM	45%	45%	80%
New BPEM	50%	50%	85%

Rainfall

639 mm, long term average annual rainfall

[1] Melbourne Regional Office 86071. LTA average from 1900-2013.

[2] 10th %ile and 90th %ile annual rainfall are 467 mm and 826 mm respectively (-27% and +29% relative to 50th %ile)

Stormwater quality management objectives

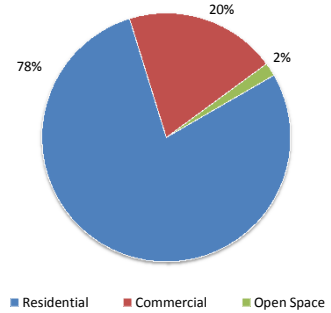
	N kg/ML	P kg/ML	TSS kg/ML
Stormwater runoff (pre-treatment)			
Road	2.2	0.5	270
Pavements	2	0.25	140
Roof	2	0.13	20
Platform	2	0.13	20
BPEM			
Road	1.2	0.28	54.0
Pavements	1.1	0.14	28
Roof	1.1	0.07	4
Platform	1.1	0.07	4
New BPEM *(not used in this pollutant balance)*			
Road	1.1	0.25	40.5
Pavements	1.0	0.13	21.0
Roof	1.0	0.07	3.0
Platform	1.0	0.07	3

Water Balance Summary

Water Demand

Annual averages

	Unit Demand		Average Annual Demand for Fishermans Bend			
			Design Basis	Sensitivities		
			Ultimate Development	Low (-50%)	High (+50%)	
Residential	193	L/person/day	8,440	5,627	12,660	ML/yr
Commercial	95	L/person/day	2,117	1,411	3,175	ML/yr
Open Space			188	188	188	ML/yr
Active Open Space	*5.5*	*ML/ha/yr*	*110*	*110*	*110*	*ML/yr*
Passive Open Space	*1.6*	*ML/ha/yr*	*59*	*59*	*59*	*ML/yr*
Streetscapes	*1.0*	*ML/ha/yr*	*19*	*19*	*19*	*ML/yr*
Total			***10,745***	***7,226***	***16,024***	**ML/yr**

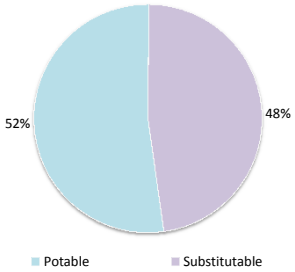


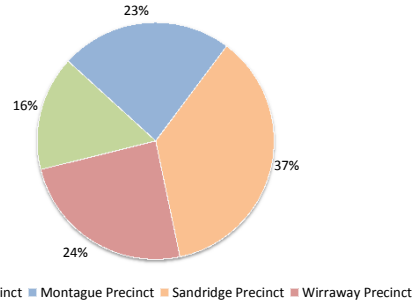
Summary by precinct

Average Demand	Lorimer Precinct	Montague Precinct	Sandridge Precinct	Wirraway Precinct	Total	
Residential	1,407	2,110	2,813	2,110	8,440	ML/yr
Commercial	253	396	1,062	405	2,117	ML/yr
Open Space	21	15	45	107	188	ML/yr
Total	**1,681**	**2,521**	**3,921**	**2,622**	**10,745**	**ML/yr**

Summary by potable / substitutable

Average Demand	Potable	Substitutable	Total	
Residential	4,728	3,712	8,440	ML/yr
Commercial	896	1,221	2,117	ML/yr
Open Space	0	188	188	ML/yr
Total	**5,624**	**5,121**	**10,745**	**ML/yr**





Wastewater Generation

	ADWF Per Capita		Average Dry Weather Flow for Fishermans Bend			
			Design Basis	Sensitivities		
			Ultimate Development	Low (-50%)	High (+50%)	
Residential	175	L/person/day	7,663	5,109	11,495	ML/yr
Commercial	86	L/person/day	1,909	1,273	2,864	ML/yr
Total			**9,573**	**6,382**	**14,359**	**ML/yr**

Stormwater Runoff

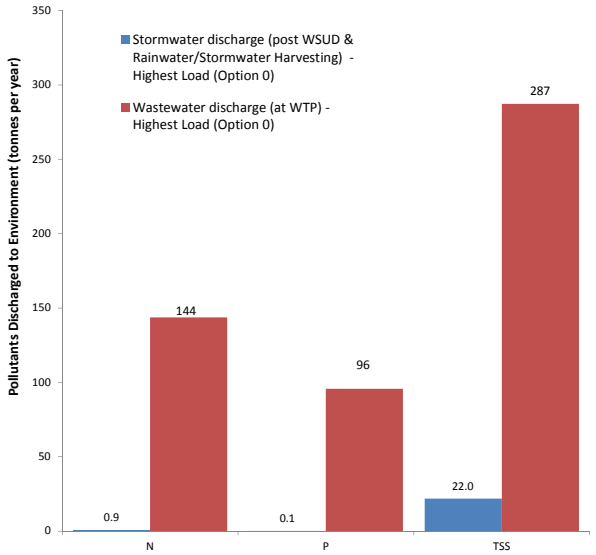
		Lorimer Precinct	Montague Precinct	Sandridge Precinct	Wirraway Precinct	Total	
Stormwater runoff from impervious surfaces (ML/yr)	Road	21	56	105	99	281	ML/yr
	Pavements	20	32	78	70	199	ML/yr
	Roof	52	93	183	191	519	ML/yr
	Platform	22	35	51	43	153	ML/yr
	Total	**115**	**216**	**418**	**403**	**1,152**	**ML/yr**

Pollutants

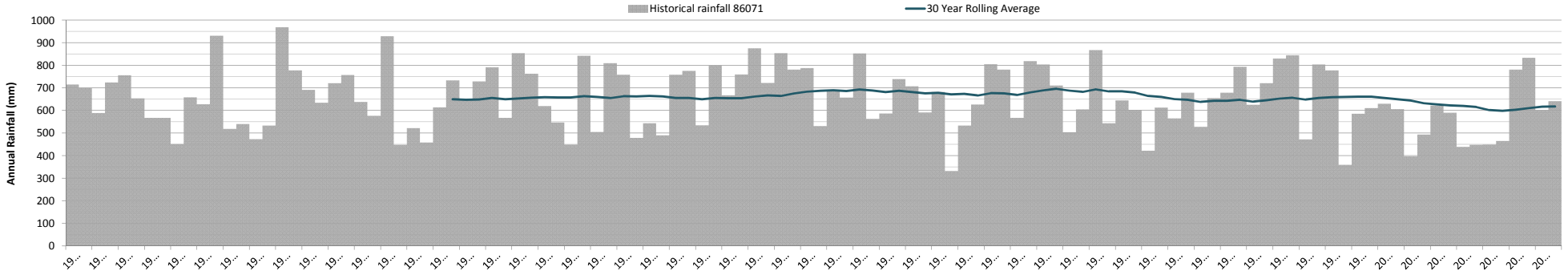
Stormwater		N	P	TSS	
Stormwater runoff	Road	619	141	75,952	kg/yr
	Pavements	398	50	27,895	kg/yr
	Roof	1,037	67	10,371	kg/yr
	Platform	305	20	3,050	kg/yr
	Total	**2,359**	**278**	**117,267**	**kg/yr**
Stormwater discharge to environment (from WSUD to meet BPEM)	Road	340	77	15,190	kg/yr
	Pavements	219	27	5,579	kg/yr
	Roof	570	37	2,074	kg/yr
	Platform	168	11	610	kg/yr
	Total	**1,298**	**153**	**23,453**	**kg/yr**
Stormwater discharge to environment (from WSUD & Stormwater harvesting - beyond BPEM)	Option 0	886	126	21,957	kg/yr
	Option 1	886	126	21,957	kg/yr
	Option 2	886	126	21,957	kg/yr
	Option 3	744	101	17,049	kg/yr
	Option 4	752	101	17,003	kg/yr
	Option 5	816	114	19,720	kg/yr

Wastewater	N	P	TSS	
Raw Wastewater	**478,634**	**95,727**	**1,435,901**	**kg/yr**
Treated Wastewater (WTP)	**143,590**	**95,727**	**287,180**	**kg/yr**

Combined	N	P	TSS	
Stormwater runoff	2.4	0.3	117.3	tonnes/yr
Raw wastewater	479	96	1,436	tonnes/yr
Stormwater discharge (post WSUD)	1.3	0.2	23.5	tonnes/yr
Stormwater discharge (post WSUD & Rainwater/Stormwater Harvesting) - Highest Load (Option 0)	0.9	0.1	22.0	tonnes/yr
Wastewater discharge (at WTP) - Highest Load (Option 0)	144	96	287	tonnes/yr



Historical Rainfall Record



Potable water demand summary (refer for Water Modelling)

1. Peak Day Demand Summary

	Unit Demand		Peak Day Demand for Fishermans Bend			
			Design Basis	Sensitivities		
			Ultimate Development	Low (-50%)	High (+50%)	
Residential	287	L/person/day	399	266	598	L/s
Commercial	133	L/person/day	94	63	141	L/s
Open Space			34	34	34	L/s
Active Open Space	6.3	mm/ha/day	15	15	15	L/s
Passive Open Space	3.2	mm/ha/day	14	14	14	L/s
Streetscapes	2.5	mm/ha/day	6	6	6	L/s
Total			**527**	**362**	**773**	**L/s**

2 Peak Day Demand by Precinct

Design Basis (Ultimate Development)

Peak Day Demand (L/s)	Lorimer Precinct	Montague Precinct	Sandridge Precinct	Wirraway Precinct	Total
Residential	66	100	133	100	399
Commercial	11	18	47	18	94
Open Space	4	3	9	18	34
Total	**82**	**121**	**189**	**135**	**527**

Sensitivity (Low)

Peak Day Demand (L/s)	Lorimer Precinct	Montague Precinct	Sandridge Precinct	Wirraway Precinct	Total
Residential	44	66	89	66	266
Commercial	8	12	31	12	63
Open Space	4	3	9	18	34
Total	**56**	**82**	**129**	**96**	**362**

Sensitivity (High)

Peak Day Demand (L/s)	Lorimer Precinct	Montague Precinct	Sandridge Precinct	Wirraway Precinct	Total
Residential	100	150	199	150	598
Commercial	17	26	71	27	141
Open Space	4	3	9	18	34
Total	**121**	**179**	**279**	**194**	**773**

Wastewater generation summary (refer for Sewer Modelling)

1. Summary

	ADWF Per Capita		Average Dry Weather Flow for Fishermans Bend			
			Design Basis	Sensitivities		
			Ultimate Development	Low (-50%)	High (+50%)	
Residential	175	L/person/day	243	162	365	L/s
Commercial	86	L/person/day	61	40	91	L/s
Total			**304**	**202**	**455**	**L/s**

2 By Precinct

Design Basis (Ultimate Development)

ADWF (L/s)	Lorimer Precinct	Montague Precinct	Sandridge Precinct	Wirraway Precinct	Total
Residential	41	61	81	61	243
Commercial	7	11	30	12	61
Total	**48**	**72**	**111**	**72**	**304**

Sensitivity (Low)

ADWF (L/s)	Lorimer Precinct	Montague Precinct	Sandridge Precinct	Wirraway Precinct	Total
Residential	27	41	54	41	162
Commercial	5	8	20	8	40
Total	**32**	**48**	**74**	**48**	**202**

Sensitivity (High)

ADWF (L/s)	Lorimer Precinct	Montague Precinct	Sandridge Precinct	Wirraway Precinct	Total
Residential	61	91	122	91	365
Commercial	11	17	46	17	91
Total	**72**	**108**	**167**	**109**	**455**

Appendix B – Existing Infrastructure Plans

Paper Size A3

0 65 130 260 390 520 650

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

Precinct Boundaries	Highway	Tracks	LGA outline
Tramway	Arterial	Ferry	Reserve
Railway	Collector	Watercourse	Sport facility
Freeway	Proposed	Lake	Parks

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Job Number	31-34251
Revision	B
Date	15 Sep 2016

Fishermans Bend Precincts

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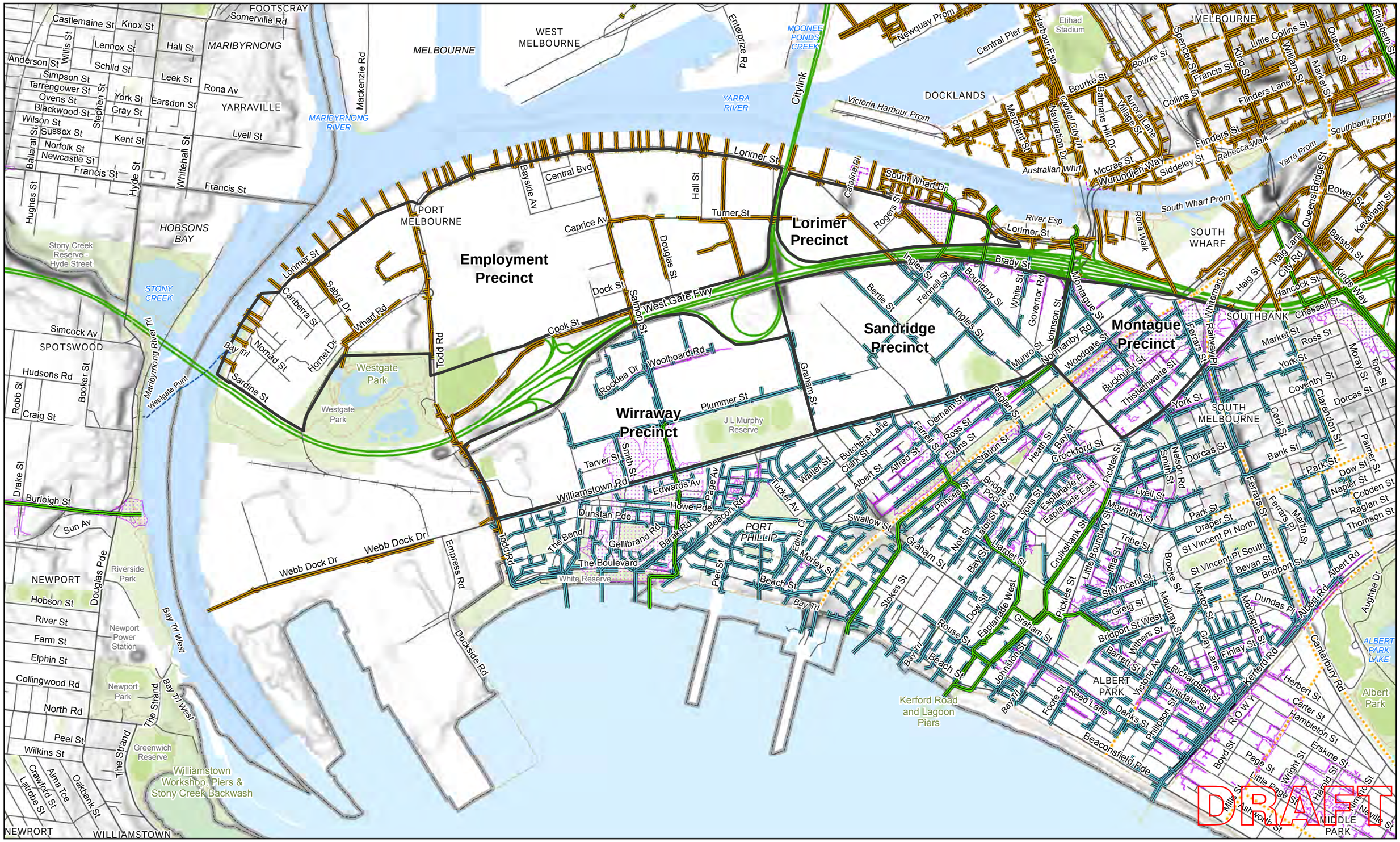
Data source: DELWP, VicMap, 2016; GHD, 2016; DELWP, Fishermans Bend Precincts, 2016 Created by: splaird

180 Lonsdale Street Melbourne VIC 3000 Australia **T** 61 3 8687 8000 **F** 61 3 8687 8111 **E** melmail@ghd.com **W** www.ghd.com



Paper Size A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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LEGEND

- Melbourne Water Drainage Assets
- City Of Melbourne Drainage Assets
- City of Port Phillip Drainage Assets

Planning overlay

- Special Building
- Precinct Boundaries
- Tramway
- Railway

- Freeway
- Highway
- Arterial
- Collector
- Proposed

- Tracks
- Ferry
- Watercourse
- Lake
- LGA outline

- Reserve
- Sport facility
- Parks

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Data source: DELWP, VicMap, 2016; GHD, 2016; City of Melborune Drainage Infrastructure (Provided 17/7/2016); City of Port Phillip Drainage Infrastructure (Provided 1/8/2016); MWC, Drainage Infrastructure (Provided 22/7/2016) Created by: splaird

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Revision B
Date 15 Sep 2016

Drainage Infrastructure

Figure 3

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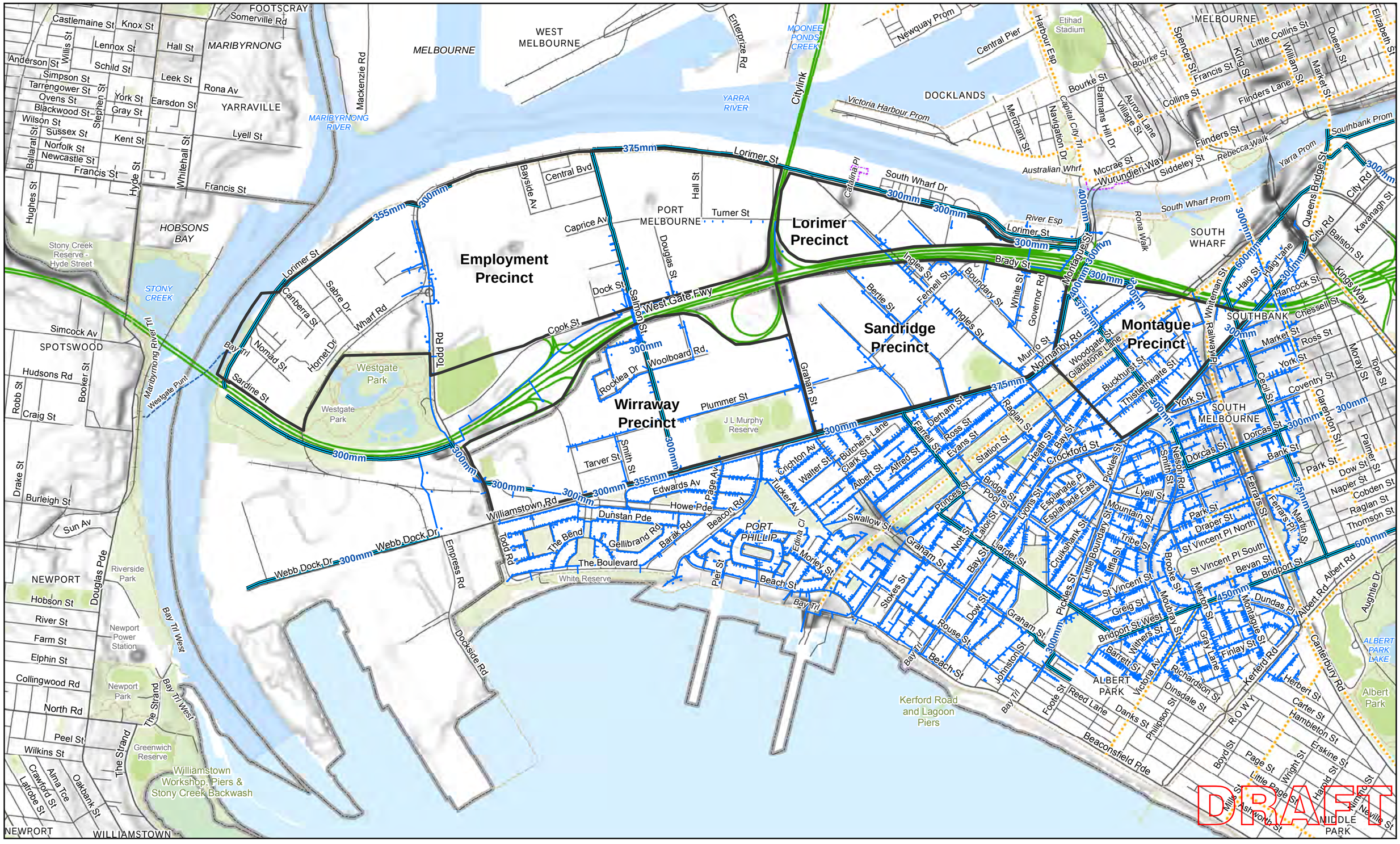

Paper Size A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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LEGEND

- South East Water Distribution Main
- Potable reticulation
- Precinct Boundaries
- Tramway
- Railway
- Freeway
- Highway
- Arterial
- Collector
- Proposed
- Tracks
- Ferry
- Watercourse
- Lake
- LGA outline
- Reserve
- Sport facility
- Parks

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Potable Water Infrastructure Figure 1

G:\31\34251\GIS\Maps\Deliverables\3134251_000_KBM_A3L.mxd [KBM: 12]

Data source: DELWP, VicMap, 2016; GHD, 2016; SEW, Water Infrastructure (Provided by MWC- 20/7/2016) Created by: splaird

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Paper Size A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

South East Water Sewer Main	Precinct Boundaries	Highway	Tracks	LGA outline
Sewer network	Tramway	Arterial	Ferry	Reserve
Melbourne Water Sewer Main	Railway	Collector	Watercourse	Sport facility
	Freeway	Proposed	Lake	Parks

GHD

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Date 15 Sep 2016

Sewer Infrastructure

Figure 2

G:\31\34251\GIS\Maps\Deliverables\3134251_000_KBM_A3L.mxd [KBM: 13]

Data source: DELWP, VicMap, 2016; GHD, 2016; SEW, Water Infrastructure (Provided by MWC- 20/7/2016); MWC, Water Infrastructure (Provided 20/7/2016) Created by: splaird

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Paper Size A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Precinct Boundaries
- **Multinet Gas**
- **Opertating pressure**
- Transmission pressure > 515kPa
- High pressure 200-515kPa High
- Medium pressure 7-200kPa Medium
- Low pressure < 7kPa Low Press
- Field regulators
- APA Pipelines
- South Melbourne - Brooklyn (T33) (750mm) 450m buffer
- Viva Westernport-Altona (**NB**: this line has been offset approx. 20m where parallel to APA for display purposes)
- Tramway
- Railway
- Freeway
- Highway
- Arterial
- Collector
- Proposed
- Tracks
- Ferry
- Watercourse
- Lake
- LGA outline
- Reserve
- Sport facility
- Parks

GHD

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Revision D
Date 15 Sep 2016

Gas Infrastructure

Figure 1

G:\31\34251\GIS\Maps\Deliverables\3134251_000_KBM_A3L.mxd [KBM: 11]

Data source: DELWP, VicMap, 2016; GHD, 2016; Viva, Pipeline Alignment (Provided 22/7/2016); VicMap Features of Interest, Gas Transmission/Oil Pipeline, 2016; APA, Gas Network (Provided 13/9/2016); Multinet, Gas Infrastructure (Provided 5/8/2016) Created by: splaird

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

Fishermans Bend Terminal Station

Ausnet Assets (Updated data yet to be received, from previous Fishermans Bend Projects)

- 220kV Transmission
- Overhead Fibre
- Underground Fibre

CitiPower

- HV Cable/Line
- LV Cable/Line
- Precinct Boundaries
- Tramway
- Railway

- Freeway
- Highway
- Arterial
- Collector
- Proposed
- Tracks
- Ferry
- Watercourse
- Lake
- LGA outline
- Reserve
- Sport facility
- Parks

GHD

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Revision B
Date 15 Sep 2016

Electrical Infrastructure

Figure 1

G:\31\34251\GIS\Maps\Deliverables\3134251_000_KBM_A3L.mxd [KBM: 15]

Data source: DELWP, VicMap, 2016; GHD, 2016; CitiPower, Electrical Infrastructure (Provided 17/7/2016); Ausnet, Electrical Infrastructure (Updated data yet to be received, from previous Fishermans Bend Projects), 2013 Created by: splaird

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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LEGEND

- Nextgen Cable
- TPG Cable
- Optus Aerial Fibre
- Optus Aerial Coax
- Optus Underground Fibre
- Telstra Cables
- Precinct Boundaries
- Tramway
- Railway
- Freeway
- Highway
- Arterial
- Collector
- Proposed
- Tracks
- Ferry
- Watercourse
- Lake
- LGA outline
- Reserve
- Sport facility
- Parks

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Job Number 31-34251
Revision B
Date 15 Sep 2016

Telecommunications Infrastructure Figure 1

G:\31\34251\GIS\Maps\Deliverables\3134251_000_KBM_A3L.mxd [KBM: 16]

Data source: DELWP, VicMap, 2016; GHD, 2016; Optus, Cable Locations (Provided 18/7/2016); Nextgen Networks, Cable Locations (Provided 14/7/2016); TPG, Cable Locations (Provided 22/7/2016); Telstra, Cable Locations (Provided 21/7/2016) Created by: splaird

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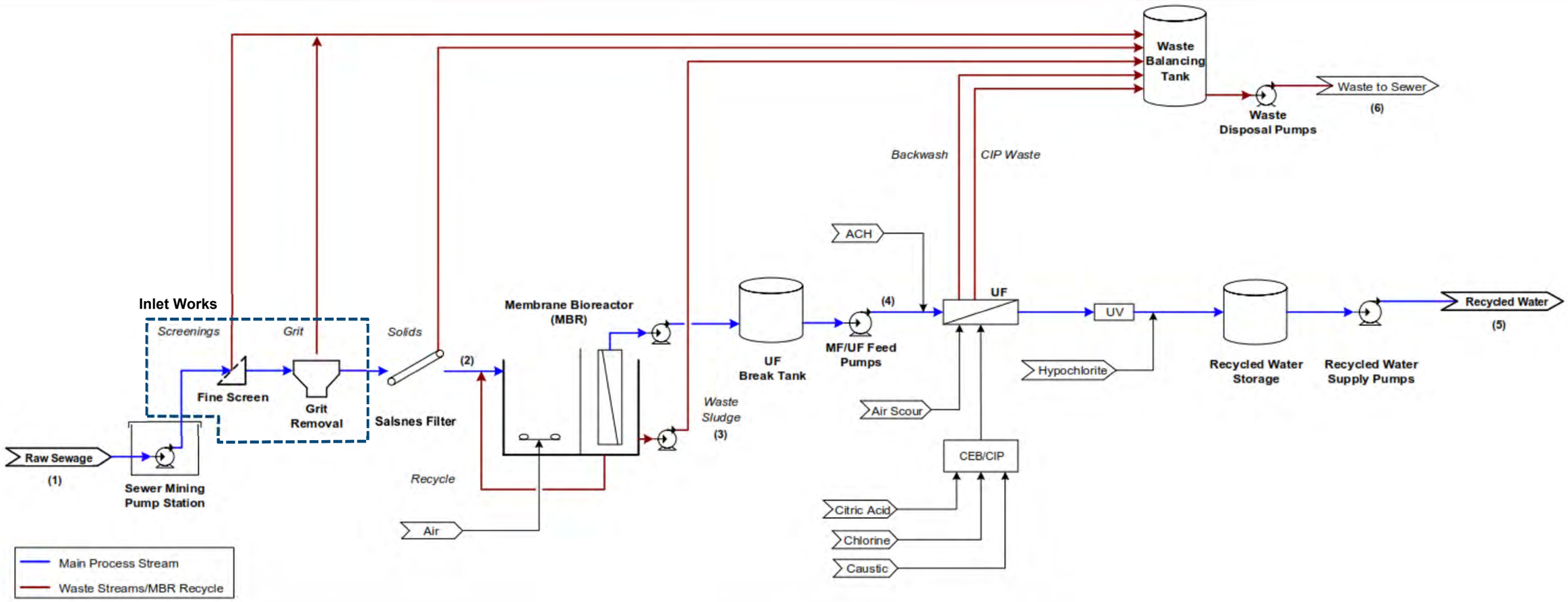
Appendix C – Sewer Mining Plant Facility



Major Stream Flows and Loads (18.5 ML/d)							
Parameter	Unit	Raw Sewage (1)	MBR Inlet (2)	Waste Sludge (3)	UF Feed (4)	Recycled Water (5)	Waste to Sewer (6)
Stream No.		1	2	3	4	5	6
Flow rate	ML/d	21.2	21.0	0.4	20.6	18.5	2.7
Flow rate	ML/y	7700	7700	150	7500	6800	1000
TSS	tonne DS/d	6.8	3.4	3.3	Negligible	Negligible	6.7

Major Stream Flows and Loads (36 ML/d)							
Parameter	Unit	Raw Sewage (1)	MBR Inlet (2)	Waste Sludge (3)	UF Feed (4)	Recycled Water (5)	Waste to Sewer (6)
Stream No.		1	2	3	4	5	6
Flow rate	ML/d	40.0	39.6	0.8	38.8	34.9	5.1
Flow rate	ML/y	14600	14400	300	14200	12700	1900
TSS	tonne DS/d	12.8	6.4	6.2	Negligible	Negligible	13.3

Fishermans Bend SMP Process Flow Diagram and Hydraulic Balance

Appendix D – Sewage Extraction & Transfer System

Appendix D – Sewage Extraction & Transfer System

CONCEPT DESIGN

Note: # indicates signatures on original issue or last revision of drawing

REF.	ZONE	REVISION	DATE	APP'D.
A		CONCEPT DESIGN		

CAD FILE NO. 31-33795-FIG01-FIG02.dwg

APERTURE CARD A1

G.H.D. DWG. NO. 31-33795-FIG01

GHD
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DESIGNED	DRAWN	SEWL PROJECT MANAGER
	R.MARRIOTT	
DESIGN CHECK	DRAFT CHECK	SEWL PROJECT DIRECTOR
APPROVED		

South East Water
ABN 89 066 902 547
20 Corporate Drive
Moorabbin 3189

FISHERMANS BEND
FISHERMANS BEND SEWER MINING PLANT CONCEPT DESIGN
TRANSFER PIPELINE
DN450 18.5 MLD
DN600 36.0 MLD

DO NOT SCALE

SCALE: NTS

DRAWING NUMBER: A

NUMERAL | REV

Plot Date: 25 July 2016 - 2:33 PM
Plotted by: Tony Jensen, ####
Cad File No: \\ghdnetnfgh01\AU\Melbourne\Projects\31\33795\CAD\Drawings\31-33795-FIG01-FIG02.dwg

Appendix E – APA and Viva Energy Guidelines to Planning and Development around High Pressure Gas and Fuel Transmission Pipelines

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1 July 2016

Fishermans Bend Task Force
Department of Environment, Land, Water & Planning
1 Spring Street
MELBOURNE VIC 3000
GPO Box 500
EAST MELBOURNE VIC 8002

Email to: fishermansbend@delwp.vic.gov.au **BY EMAIL**

Dear Sir/Madam,

RE: FISHERMAN'S BEND PRECINCT STRUCTURE PLAN & URBAN RENEWAL PROJECT - APA SUBMISSION.

This letter communication is in response to the Fisherman's Bend Precinct Structure Plan & Urban Renewal Project (*herein the PSP*). APA VTS Australia (Operations) Pty Ltd (*herein APA*) provides these comments on the proposed development around the known APA pipeline assets, adjacent to the study area (see figure 1). APA has the following comments and recommendations in relation to the proposal.

APA has three pipelines within the vicinity of the Study Area:

Table 1: Transmission gas pipelines in the area of consideration

Pipeline	Pipeline Licence	Easement Width (m)	Diameter (mm)	Measurement Length
West Melbourne to Brooklyn	PL108 (T33)	N/A	750	450
Dandenong to West Melbourne	PL36 (T16)	N/A	750	450
Port Melbourne to Symex Holdings	PL164 (T89)	N/A	150	77
Note: measurement length is applied to either side of the pipeline.				

APA would like to respond by expressing direct interests in the development of the Fisherman's Bend Precinct Structure Plan area and the future use of lands in the vicinity of its pipeline assets for residential, commercial and public open space purposes. It is APA's objective to protect human life and infrastructure whilst ensuring future land use, subdivision and development will not inhibit the potential of an existing high pressure transmission pipeline system to be able to provide capacity required to meet the needs for natural gas in Victoria.

In APA's previous response dated 22 November 2013, APA had included attachments indicating the legislative requirements of development within the vicinity of high pressure gas pipeline. These documents are still relevant and include:

- APA VTS Australia's Guidelines (Appendix 1)
- AS2885, Part 1, Clause 4.3.4 - Primary Location Classification (Appendix 2)
- AS2885, Part 1, Clause 4.7.4 – Change of Location Class (Appendix 3)

For your benefit, these attachments have once again been incorporated into this documented response.

From the information supplied the proposed PSP will significantly impact on APA assets on the land parcel, which increases the risk of our pipeline being detrimentally impacted upon. APA recognises the need for changes in land use and APA monitors its assets and operations accordingly, to ensure that urban encroachment, development and third party crossings are managed appropriately. For your information, APA has developed general guidelines on development within close proximity to its assets to reduce the risk to life and property (see Appendix 1).

We wish to emphasise it is APA's intent to ensure that high pressure gas pipelines and local communities are safely protected; in accordance with Australian Standards 2885 (AS2885) for Pipelines – Gas and Liquid Petroleum (Part 1). For new residential development within close proximity to the gas transmission pipelines, APA must be notified to enable the development to be considered from a safety perspective. We wish to emphasise that our intent is to ensure that transmission pressure gas pipelines and local communities are safely protected with minimum impact; in accordance with Australian Standards 2885 (AS2885) for Pipelines – Gas and Liquid Petroleum (Part 1), explicitly addressed in Clause 4.7.4 & 4.7.3 (Appendix 2 & 3) and subject to required Safety Management Study (SMS). Our technical regulator, Energy Safe Victoria (ESV) and the AS2885 impose obligations on pipeline licensees to maintain appropriate safety risk levels of pipelines despite changes in the surrounding environment and population.

It is recommended that high density residential development or other sensitive land uses should be located beyond the "measurement length" when planning or developing land in the vicinity of any high pressure gas transmission infrastructure as is proposed within the subdivision. Land in close proximity to the high pressure transmission pipeline should be developed to provide a level of separation whereby sensitive, high density and susceptible land uses are avoided where injury could result from a pipeline incident. This separation or **"measurement length"** (Table 1) clearly defines the region that would be affected by the worst case scenario pipeline failure and identifies the distance where development should be carefully designed and considered by the planning authority in relation to gas transmission pipelines.

APA has completed the review of the PSP and associated documents in relation to its high pressure gas transmission pipelines and associated infrastructure and submits the following comments to Government:

First and foremost APA notes that an independent Ministerial Advisory Committee (*herein MAC*) was announced on 21 July 2015 to advise the Minister for Planning on development within the Fisherman's Bend project area. The *MAC* provided a report to the Minister for Planning on the effectiveness of the planning process to date for the broader PSP study area. It is understood that the MAC continues to provide independent advice on the planning and future of the Fisherman's Bend Precinct.

APA is disappointed in the responses to numerous planning applications within the precinct area thus far. Numerous applications have bypassed normal planning practices and have been approved by the Minister of Planning without any consultation with stakeholders integral to the health and safety of the future local community. Due to the lack in consultation with APA, numerous planning decisions have been made resulting in important pipeline safety policies and regulations not taken into account. This failure to take such actions into account creates an unacceptable risk of external interference to APA's critical assets.

APA's pipeline assets located within the Victorian Transmission System have been classified as 'Vital Critical Infrastructure' under the *Emergency Management Act, 2013*. It is for this reason that planning and development around pipeline assets displayed in Table 1 above takes into account the sensitive and critical nature of the gas transmission pipeline assets.

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From the information supplied, the proposal will significantly impact on APA's assets within the study area.

Table 2: Fisherman's Bend Precincts and associated implicated High Pressure Gas Transmission.

Precinct Name	Pipelines Affected
Montague Precinct	PL108 (T33)
	PL36 (T16)
	PL164 (T89)
Sandridge Precinct	PL108 (T33)
	PL164 (T89)
Lorimer Precinct	NIL
Wirraway Precinct	PL108 (T33)
Employment Precinct	PL108 (T33)

- APA understands that the Metropolitan Planning Authority (*herein MPA*) is in the process of preparing a Development Contributions Plan Overlay under clause 45.06 of the local planning scheme which once finalised will apply to all land within the PSP study area. Due to the significant implications of developing lands within the measurement length of such significant high pressure gas transmission pipeline assets it is recommended that appropriate pipeline safety measures be incorporated into this piece of legislation in the future.
- Detailed cross-sections showing the location of the high pressure gas transmission pipelines should be produced as displayed in Figure 2 in consultation with APA to ensure all development along the APA pipeline right-of-way is standardised and protects the integrity of the pipeline asset. These cross-sections should be attached as an appendix to the Fisherman's Bend Strategic Framework Plan and/or final Precinct Structure Plan documents. It is imperative that potential developers are well aware of the pipeline assets within the measurement length and the implications associated with such assets. Currently, cross-sections such as for Buckhurst Street (Figure 2) do not show the APA pipeline asset.
- The proposed land use changes adjacent to the pipeline assets will trigger the requirement of a Safety Management Study in line with the Australian Standard AS-2885.
- The proposed land use surrounding the APA pipeline assets (see Figure 3), within the measurement length of APA pipelines will likely be classified as a sensitive use under the Australian Standard AS-2885.
- Numerous community infrastructure developments including landscaping in close proximity to the APA pipelines are proposed as demonstrated in Figure 3 attached within the Ferrars St and Buckhurst Street sections of the Montague precinct area. It is essential that APA is consulted in such planning from an early onset to ensure the pipeline asset is not placed at an increased risk or threat. APA notes it must have unimpeded 24 hour access to the pipeline for monitoring and maintenance purposes. Any proposed development or land use must not impact on APA's ability to meet their requirements as the pipeline licensee to maintain its' asset in line with the *Standard* and the *Act*.
- Restrictions on the use of the pipeline Right-of-Way (*herein the ROW*) on all proposed lands within three metres of the edge of pipeline within the Precinct Structure Plan Area (or in close vicinity of the pipeline) will be enforced in accordance with the *Victorian Pipelines Act, 2005*. In particular:
    - No structure will be permitted within three (3) metres of a pipeline asset without prior written approval.
    - Line of sight along the pipeline ROW must be maintained.
    - Three (3) metre minimum clearance between the pipeline and any vegetation greater than 0.5m in height must be maintained at all times.
- Detailed engineering plans for any proposed future public open space developments running parallel with APA high pressure gas transmission pipelines will be required by APA for assessment

and prior to future works to ensure its pipeline assets are not placed at an unacceptable risk. APA notes that for all developments adjacent to the pipeline or in the near vicinity, construction methodology and proposed plant and equipment to be utilised during construction for any proposed works will be required prior to construction for assessment and approval by APA prior to future construction works. This would be best implemented through the mandatory requirement of a Construction Management Plan (CMP). This CMP requirement and approval of the CMP by APA has been utilised in numerous other PSP developments throughout Melbourne and should be applied accordingly.

- Any proposed structures such as light poles and/or landscaping within the APA ROW must be approved by APA. APA must assess whether this will be classified as a permanent structure *under section 120 of the Victorian Pipelines Act 2005.*
- APA reserves the right to review any engineering plans developed that will impact on its existing pipeline infrastructure in the future.

It is recommended that project managers and/or design engineers have ongoing correspondence with APA in the future to discuss the scope of issues relating to any planning, design or construction activities adjacent to and/or across APA infrastructure to ensure its assets are thoroughly protected. It is APA's intent is to ensure that transmission pressure gas pipelines are safely protected with minimum impact on and mitigating any potential risks and proposed encroachment to ensure the integrity of its pipeline assets.

For any further enquiries relating to this submission please feel free to contact the Infrastructure, Planning & Protection Team on (03) 9797 5118 or (03) 9797 5265 or by email ipp@apa.com.au.

Yours faithfully,

LACHLAN MARSHALL
LAND AGENT- VICTORIA

CC: Daniel Tucci, Metropolitan Planning Authority, Port Phillip Council, Melbourne City Council, Energy Safe Victoria

- Figure 1: APA VTS Australia Pipeline Assets within Study Area.
- Figure 2: Proposed Buckhurst Street Public Green Link Cross Section.
- Figure 3: South Melbourne Ferrars St Primary School & Integrated Community Facilities Site Context and approximate location of pipeline asset.
- Figure 4: Proposed Ferrars/Buckhurst Streets Illustrative Plan & Site Context and approximate location of pipeline asset.
- Appendix 1: APA VTS Australia's Guidelines to Planning and Development around High Pressure Gas Transmission Pipelines.
- Appendix 2: Clause 4.7.4 Australian Standards 2885 for Pipelines – Gas and Liquid Petroleum (Part 1) - Primary Location Classification
- Appendix 3: Clause 4.3.4 Australian Standards 2885 for Pipelines – Gas and Liquid Petroleum (Part 1) - Change of Location Class

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Figure 1: APA VTS Australia Pipeline Assets within Study Area

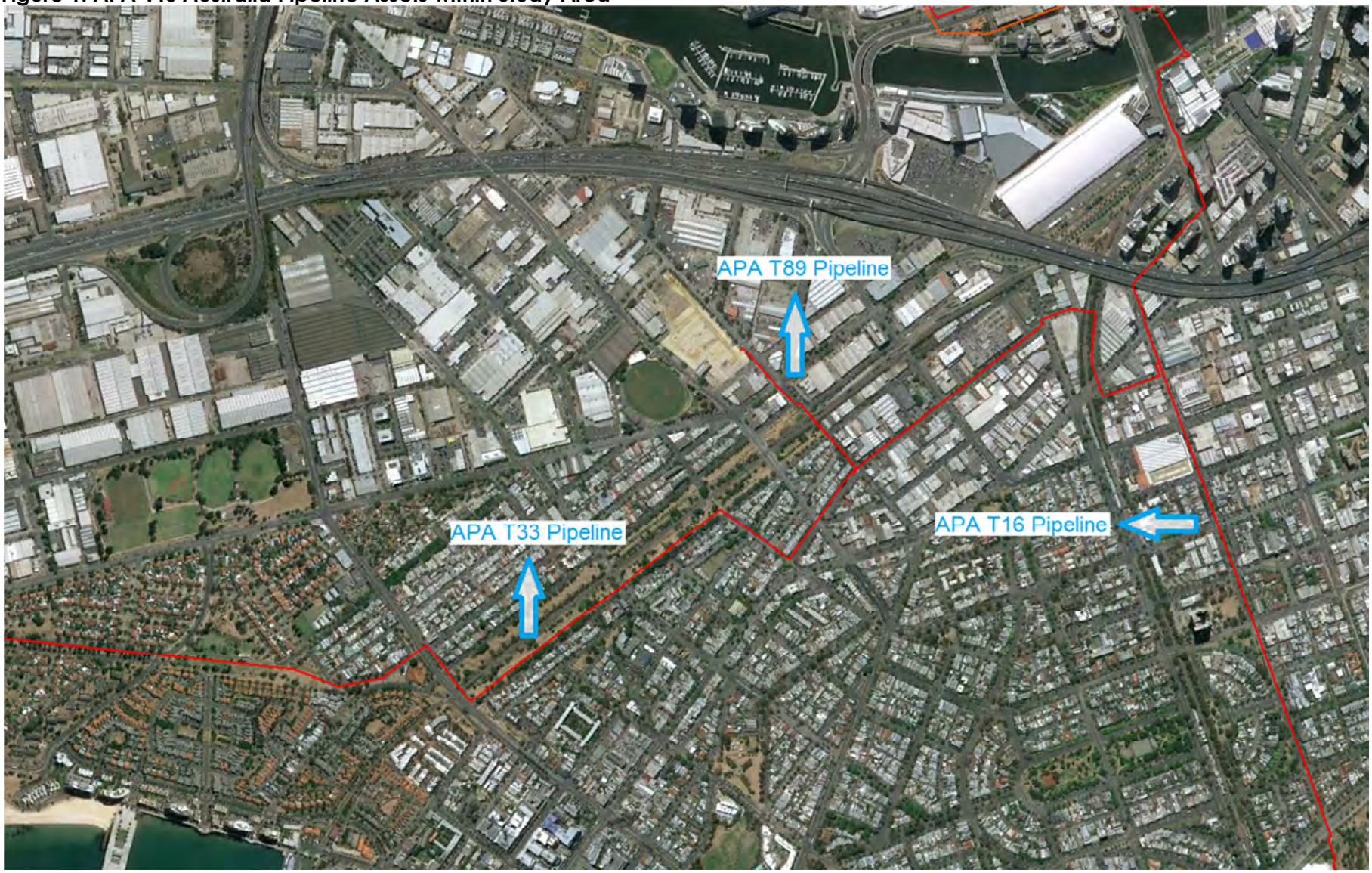

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Figure 2: Proposed Buckhurst Street Public Green Link Cross Section.

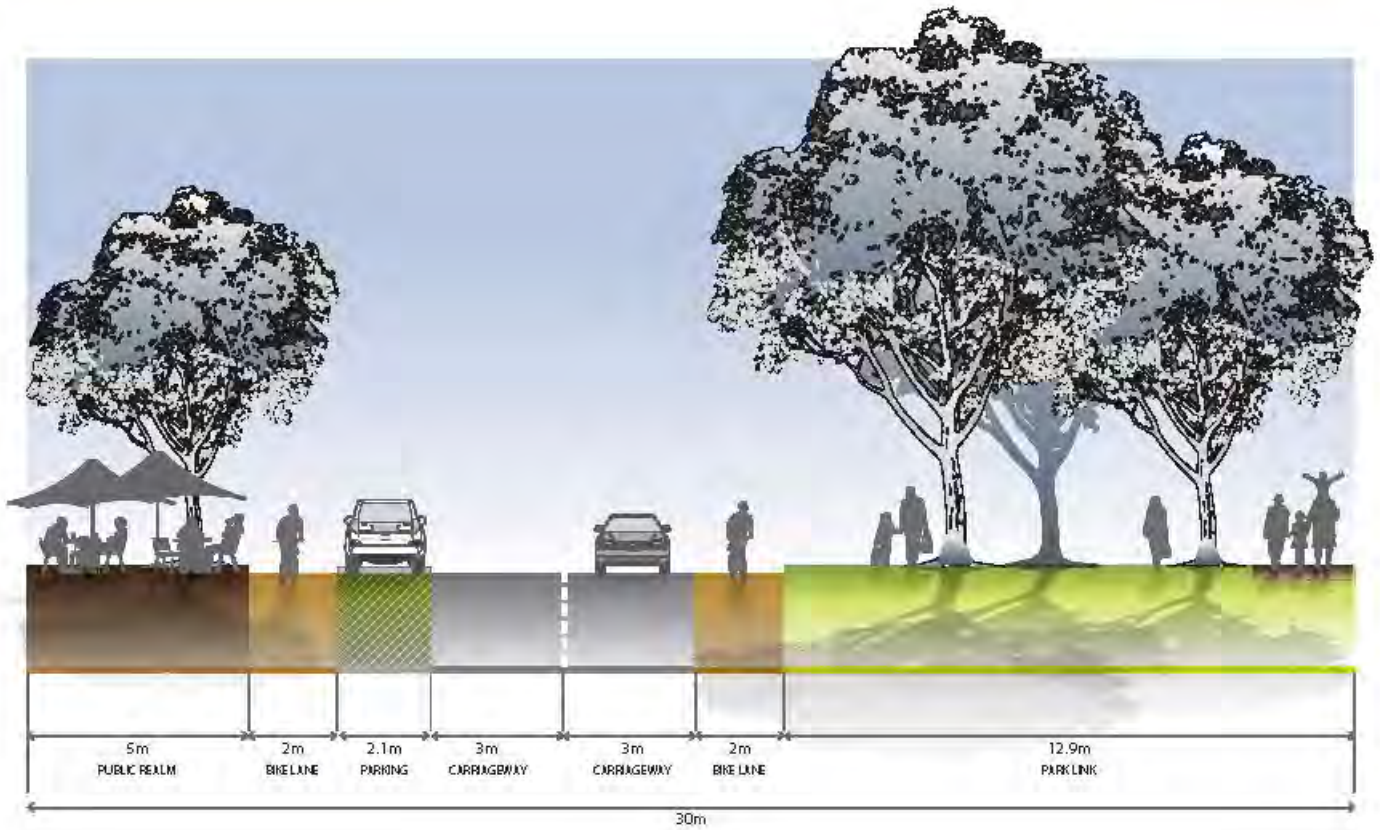

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Figure 3: South Melbourne Ferrars St Primary School & Integrated Community Facilities Site Context and approximate location of pipeline asset.

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Figure 4: Proposed Ferrars/Buckhurst Streets Illustrative Plan & Site Context and approximate location of pipeline asset.

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Appendix 1: APA VTS Australia's Guidelines to Planning and Development around High Pressure Gas Transmission Pipelines.

1. Planning Controls

Operations of gas transmission pipelines carry a level of risk, which must be assessed when considering development proposals in the vicinity of high pressure transmission pipelines, to ensure that risk to people, property and the environment is within acceptable levels.

Whilst Australian gas pipelines industry has an excellent safety record, in case of a pipeline failure an area of several hundred metres can be significantly impacted. The most frequent cause of pipeline failure worldwide is damage caused by external interference resulting from multiple activities such as construction or maintenance activities on or near gas pipelines.

Whilst the land that is required to control access to the pipeline itself is set aside in an **easement** in most situations, a much larger buffer should be considered when planning or developing land in the vicinity of any high pressure gas infrastructure.

The "**measurement length**" clearly defines the region that could be affected by the worst case scenario pipeline failure and identifies the distance where development proposals should be referred to the pipeline owners by the planning authority.

If there is any change in land use/zoning, in pipeline location classification or a construction activity is proposed within the measurement length, AS2885 requires a detailed **Safety Management Study** to be undertaken, which incorporates performing a risk assessment. For example, as a location classification changes from rural to residential (Appendix 2 and 3), the level of pipeline protection required normally increases to ensure protection of the pipeline and to manage the risk to the community and the environment.

2. All proposed development needs to be restricted in the pipeline's easements and/or within close proximity to the pipeline

APA owns and operates multiple natural gas transmission pipelines of various wall thickness and pressures throughout Victoria.

APA would oppose road construction (including water courses or structures) within or on the transmission pipeline easements parallel to or over the pipeline as it seeks to minimise construction works in the easements to reduce the likelihood of excavations potentially causing damage to the pipelines.

We advise that APA's position is supported by Government legislation and Australian Safety Standards:

- Pipelines Act (2005) - there is restrictions on works within close proximity to APA's pipelines.
- APA has restrictive covenants that control development within its easements, for example, restrictions on structures and excavation.
- AS2885.1 - APA has a duty to review and comment on changes in land uses in close proximity to the pipeline.

Each easement could be incorporated into a proposed development subject to early consultation with APA as periodic access is required to our pipelines.

Most transmission pipelines are protected by a registered easement which varies in width from 6.5 to 35m; however there is high pressure transmission pipelines located in various road reserves or

Government land without a registered easement. In such cases, a "Permit to Work", issued by APA, is required for any proving and/or construction activity deeper than 300mm within 3m of a transmission pipeline.

3. Crossing of an APA VTS Australia high pressure transmission pipeline or easement

Crossing high pressure transmission pipelines and/or any related easements by roads, rails and other services, would be permitted in principle with prior approval of APA (at a 90 degree angle) as the pipelines might need to be re-engineered for the proposed crossing.

Further assessments of road crossings, other services and potential impact on the pipeline will need to be assessed and conditions issued on a case by case basis upon consideration of a number of factors such as: the depth of pipeline cover, pipeline recoating, relocation of the pipeline and future pipeline accessibility, to the applicant's cost.

Each pipeline easement could be incorporated into a reserve or open space, that is, in other Structure Plans the easements have served as cycle links or linear paths connecting areas of open space.

The easement must be left grassed with no large trees or bushes planted that may cause damage to the pipeline coating. Any flora deemed a danger to the integrity of the pipeline will be removed. Plant species placed within the easement must be approved by APA.

Due to periodic access required to our pipelines for maintenance, significant disturbance to the easement may occur due to excavation around the pipeline.

4. Developments within the "measurement length" – urban encroachment issues

High pressure gas transmission pipelines have the potential to cause major damage if the gas ignites in case of a rupture. APA constantly monitors and maintains these pipelines to ensure their integrity; therefore the likelihood of a major incident is highly unlikely, however, under the safety obligations of AS2885, APA is required to ensure that adequate measures are taken to minimise the risk to public safety in close proximity of its pipelines.

The 'measurement length' relevant to APA pipelines in the area vary and proximity is determined by the diameter of the pipeline and its operating pressures.

For proposals within the 'measurement length' a pipeline risk management plan will be required to demonstrate that the risk from the pipeline is within acceptable levels. The risk management plan may require a safety assessment and must be undertaken in consultation with the pipeline owner/operator.

The safety assessment is conducted in the form of a Safety Management Study (SMS). The SMS is defined as the process that identifies threats to the pipeline system and applies controls to them, and (if necessary) undertakes assessment and treatment of any risks to ensure that residual risk is reduced to an acceptable level.

AS 2885.1 explicitly addresses the urban encroachment problem in **Clause 4.7.4** (Appendix 2); Change of Location Class. It addresses situations where higher population densities occur in areas where they were previously not permitted. In that situation the standard requires that:

> "...a safety assessment shall be undertaken and additional control measures implemented until it is demonstrated that the risk from *a loss of containment involving rupture* is As Low As Reasonably Possible (ALARP)."**AND**
>
> "...the assessment shall demonstrate that the cost of the risk reduction measures provided by alternative solutions is grossly disproportionate to the benefit gained from the reduced risk that could result from implementing any of the alternatives"

The assessment must include consideration of alternative risk reduction measures including Maximum Allowable Operating Pressure (MAOP) reduction, pipe replacement, pipeline relocation, modification of land use and additional physical and procedural protection. All measures to be further discussed and considered on specific developments upon early consultation with APA.

The additional physical and procedural external interference protection measures are:

- Physical controls**:** separation (burial, exclusion & barrier) and resistance to penetration (wall thickness and barrier to penetration).

- Procedural controls**:** pipeline awareness (landowner, third party liaison, community awareness program, one call service, marking, activity agreements with other entities) and external interference detection (planning notification zones, patrolling & remote intrusion monitoring).

AS2885 requires a metre by metre qualitative analysis to identify each threat to pipeline integrity followed by a defined process to manage each threat either by eliminating it through external interference or design processes, or by development of management procedures to reduce the risk from hazardous events to negligible, low or in unresolved cases, to ALARP.

APA will also conduct preliminary calculations and assessments of existing pipeline's credible threats to either rupture or create a hole. In addition APA would seek assistance from local Council in preventing the use of rippers and horizontal directional drills (HDDs) working in the vicinity of the pipeline.

Based on the above, APA recommends that '"T2" high density and "Sensitive"' land uses are preferably located the corresponding measurement length (see Table 1) from the pipeline away from either edge of the pipeline's easements.

'"T2" high density and "Sensitive"' land uses are defined in AS2885 as:

> "***T2" High density -*** *Applies where multi-storey development predominates or where large numbers of people congregate in the normal use of the area. High density includes areas of public infrastructure serving the high density use; roads, railways, major sporting and cultural facilities and land use areas of major commercial developments; cities, town centres, shopping malls, hotels and motels."* (Section 4.3.4[d] of AS2885).
>
> "***Sensitive"*** *– The sensitive use location class identifies land where the consequences of a failure may be increased because it is developed for use by sectors of the community who may be unable to protect themselves from the consequences of a pipeline failure. Sensitive uses are defined in some jurisdictions but include schools, hospitals, aged care facilities and prisons. Sensitive use location class shall be assigned to any portion of pipeline where there is a sensitive development within a measurement length. It shall also include locations of high environmental sensitivity to pipeline failure. The design requirement for high density shall apply."* (Section 4.3.5[a] of AS2885).

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We understand that the predominant land use within the measurement length of the gas pipeline in the Planning Scheme amendments as currently presented is residential land. Residential is defined in AS2885 as:

> "***Residential*** *applies where multiple dwellings exist in proximity to each other and dwellings are served by common public utilities. Residential includes areas of land with public infrastructure serving the residential use; roads, railways, recreational areas, camping grounds/caravan parks, suburban parks, small strip shopping centres. Residential land use may include isolated higher density areas provided they are not more than 10% of the land use. Land used for other purposes but with similar population density shall be assigned Residential location class."* (Section 4.3.4[c]of Australian Standard AS2885).

However, there could be possible conflicts if the location or isolated high density area land uses within the measurement length were to change and therefore APA would in that case request that '"T2" high density and "Sensitive"' is relocated preferably to a position located at least the measurement length from the pipelines away from either edge of the pipeline's easements.

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Appendix 2: Clause 4.7.4 Australian Standards 2885 for Pipelines – Gas and Liquid Petroleum (Part 1) - Primary Location Classification

4.7.4 Change of location class

Where there are changes in land use planning (or land use) along the route of existing pipelines to permit Residential, High Density, Industrial, or Sensitive development or Heavy Industrial development in areas where these uses were previously prohibited, a safety assessment shall be undertaken and additional control measures implemented until it is demonstrated that the risk from a loss of containment involving rupture is ALARP.

A location class change to Heavy Industrial requires compliance with this Clause only when pipeline failure in this location would create potential for consequence escalation.

This assessment shall include analysis of at least the alternatives of the following:

(a) MAOP reduction (to a level where rupture is non-credible).

(b) Pipe replacement (with no rupture pipe).

(c) Pipeline relocation (to a location where the consequence is eliminated).

(d) Modification of land use (to separate the people from the pipeline).

(e) Implementing physical and procedural protection measures that are effective in controlling threats capable of causing rupture of the pipeline.

For the selected solution, the assessment shall demonstrate that the cost of the risk reduction measures provided by alternative solutions is grossly disproportionate to the benefit gained from the reduced risk that could result from implementing any of the alternatives.

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Appendix 3: Clause 4.3.4 Australian Standards 2885 for Pipelines – Gas and Liquid Petroleum (Part 1) - Change of Location Class

Land through which the pipeline passes shall be classified as follows:

(a) Rural (R1) Land that is unused, undeveloped or is used for rural activities such as grazing, agriculture and horticulture. Rural applies where the population is distributed in isolated dwellings. Rural includes areas of land with public infrastructure serving the rural use; roads, railways, canals, utility easements.

(b) Rural Residential (R2) Land that is occupied by single residence blocks typically in the range 1 ha to 5 ha or is defined in a local land planning instrument as rural residential or its equivalent. Land used for other purposes but with similar population density shall be assigned rural residential location class. Rural residential includes areas of land with public infrastructure serving the rural residential use; roads, railways, canals, utility easements.

NOTE: In rural residential societal risk (the risk of multiple fatalities associated with a loss of containment) is not a dominant design consideration.

(c) Residential (T1) Land that is developed for community living. Residential applies where multiple dwellings exist in proximity to each other and dwellings are served by common public utilities. Residential includes areas of land with public infrastructure serving the residential use; roads, railways, recreational areas, camping grounds/caravan parks, suburban parks, small strip shopping centres. Residential land use may include isolated higher density areas provided they are not more than 10% of the land use. Land used for other purposes but with similar population density shall be assigned Residential location class.

(d) High Density (T2) Land that is developed for high density community use. High Density applies where multi storey development predominates or where large numbers of people congregate in the normal use of the area. High density includes areas of public infrastructure serving the high density use; roads, railways, major sporting and cultural facilities and land use areas of major commercial developments; cities, town centres, shopping malls, hotels and motels.

NOTE: In residential and high density areas the societal risk associated with loss of containment is a dominant consideration.

In rural and rural residential areas, consideration shall be given to whether a higher location class may be necessary at any location where a large number of people may be present for a limited period.

NOTE: Examples include roads subject to heavy traffic congestion and sports fields.

19th April 2016

Conditions for Works near Viva Energy Australia Pty Ltd owned and operated High Pressure Pipelines in Victoria

Introduction

Viva Energy Australia Pty Ltd (Viva Energy) on behalf of itself and as operator of W.A.G. Pipeline Proprietary Limited, Newport Industry Pipeline and Crib Point Pipeline operate a number of high pressure licensed pipelines in Victoria. These pipelines contain either crude oil, or refined petroleum products like diesel, LPG, petrol, or aviation fuel.

As the operating pressure can be as high as 9600 kPa damage to the pipelines may result in a potentially hazardous situation in terms of fire and/or explosion, and may lead to substantial environmental impact. Damage could also result in disruption of crude oil supply to refineries, or fuel supply to airports, service stations and other customers. The costs of such damage could result in the liability for payment of costs by the Authority, Principal or Developer responsible.

The requirements below have been put in place by Viva Energy to minimise the risk of damage to the pipelines.

In addition to complying with the requirements set out in these conditions and in the document 'Land Use Planning, Development & Subdivision near Viva Energy Australia owned and operated High Pressure Pipelines in Victoria', Viva Energy may require that anyone who proposes to carry out works in the vicinity of the pipelines:

(a) grants an easement to Viva Energy which contains provisions to ensure that the pipeline will be adequately protected both during and after the works and that Viva Energy will continue to have rights to access the pipeline; and/or

(b) enter into an agreement with Viva Energy in relation to the proposed work, which may include indemnities by the authority or developer in respect of any damage to the pipelines arising from the works and provision for recovery of Viva Energy costs in relation to any works which it is required to carry out to protect the pipeline.

Pipeline warning/danger signs

`High Pressure Pipeline' warning/danger signs are placed strategically along the pipeline routes within the vicinity of the pipeline. These signs do not give the exact location of the pipeline. The phone numbers on the signs vary according to the pipeline:

Viva Energy Australia - Pipelines – Emergency 1800 809 691

W.A.G. Pipeline - Emergency 1800 650 523

Lara LPG Pipeline – Emergency 03 5273 8250

Enquiries - (03) 9391 6568

Viva Energy Australia Right of Way Works Permit

Any works within three (3) metres of a licensed pipeline requires a Viva Energy Right of Way (ROW) permit. The ROW permits are obtained from the Pipeline Inspectors.

Notification of Intent

For proposed works within the vicinity of a pipeline, detailed submissions at the concept stage are to be made to Viva Energy Pipelines Manager,

C/o Linda Busbridge - Pipeline Officer by letter or email: linda.busbridge@vivaenergy.com.au

Note: Under section 118 of the Pipelines Act 2005, a person may be guilty of an offence if the person carries out any excavation or bores or opens any ground within 3 metres of a pipeline without either obtaining the authority of the licensee or giving notice to the licensee in accordance with the regulations.

Installation and construction

Submissions including preliminary drawings and scope of work at concept stage (Including but not limited to Service Crossings) are to be made to Viva Energy Pipelines Manager,

C/o Linda Busbridge - Pipeline Officer by letter or email: linda.busbridge@vivaenergy.com.au

Approval from the Pipeline regulator may also be required.

Note: Under section 120 of the Pipelines Act 2005, a person must not construct a building so that any part of it is situated less than 3 meters from a point on the surface of the land, whose position is vertically above a part of the pipeline below the surface unless the Minister has first consented to the construction. Penalties and demolition orders apply to contravene.

Location proving

To ensure that the pipeline is not damaged, HAND EXCAVATED proving must be carried out - in the presence of a Pipeline Inspector - to determine the exact location of the pipeline prior to commencement of detail design and/or construction.

72 hours minimum prior notice of intention to prove dig and/or commence construction shall be given to arrange for a Pipeline Inspector to be on site during the location proving. Contact with an inspector can be made on the following numbers.

No charge is made for this service (unless substantial on-site time for the Pipeline Inspector is required).

Viva Energy Pipelines Coordinator – VIC

Name:	Matt Lynch
Phone:	M 0418 386 764 PH (03) 9391 6568
Email:	matthew.j.lynch@vivaenergy.com.au

Viva Energy Pipelines Maintenance Supervisor

Name:	David Kelly
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NO MECHANICAL EQUIPMENT is to be used within a horizontal distance of 1.0 m of the proven pipeline location unless approved by the Pipeline Inspector.

Accidental damage

Should any accidental damage be made to the pipeline and/or coating—even of a minor nature—Viva Energy must be notified on the above numbers to enable inspection and subsequent repair.

Note: Under section 119 of the Pipelines Act 2005, a person must not knowingly, recklessly or negligently break, injure, open or tamper with any pipeline. Penalties apply.

Minimum pipeline clearance requirements

The MINIMUM clearances from the pipeline (per the pipeline licensing authority) are as follows:

(a) 0.5 m to buried equipment or structures less than 1.5 m wide and crossing the pipeline;

(b) 0.5 m to buried equipment or structures greater than 1.5 m wide and crossing the pipeline;

(c) 1.0 m to buried equipment or structures laid parallel to the pipeline; and

(d) 3.0 m to any building* and the extremity of the pipeline (measured horizontally).

Note: * Under section 120 of the Pipelines Act 2005, a person must not construct a building so that any part of it is situated less than 3 metres from a point on the surface of the land whose position is vertically above a part of a pipeline below the surface unless the Minister has first consented to that construction. Penalties and demolition orders apply to contravention.

Excavation within 400 mm of the pipeline is to be backfilled with well compacted good quality packing sand.

Boring works

Where construction is to bore under or over the pipeline, hand excavation 1.0 m adjacent to the pipeline must first be made on the side from which the bore will approach. The above stated minimum clearance is to be confirmed with the Pipeline Inspector once the bore breaks through to this excavation.

Use of explosives

Conditions applying when blasting in the vicinity of the pipeline are as follows:

(a) No explosives are to be used within 30.0 m of the proven location.

(b) Persons using explosives must be licensed under the applicable dangerous goods regulations.

(c) Heavy coir or other approved matting must be used to cover the explosives area.

(d) ‘Cordtex’ or other detonating type fuses shall not cross the pipeline if less than 0.5 m cover exists.

(e) Carriers containing explosives must not be left within 5.0 m of the pipeline during blasting.

(f) No blasting is to proceed within the limits of clauses (b) and (c) above until approval is given by Pipeline personnel.

(g) Blasting methods must be arranged to limit ground vibrations to less than 20 mm/s peak particle velocity at any point on the pipeline.

Creagh de Brabander

Pipelines Operations Manager

Viva Energy Australia Pty Ltd

19th April 2016

Land Use Planning, Development and Subdivision near Viva Energy Australia owned and operated High Pressure Pipelines in Victoria

Introduction

Viva Energy Australia Pty Ltd (Viva Energy) on behalf of itself and as operator of W.A.G. Pipeline Proprietary Limited, Newport Industry Pipeline and Crib Point Pipeline operate a number of high pressure licensed pipelines in Victoria. These pipelines contain either crude oil, or refined petroleum products like diesel, LPG, petrol or aviation fuel.

Although being buried and constructed from high strength steel, damage to the pipeline may occur through unauthorised third party excavation. The purpose of this communication is to raise or to reinforce the awareness of the presence of the pipelines and to identify constraints with respect to the use of the land on and near the pipeline.

In addition to complying with the requirements set out in these conditions and in the document 'Conditions for Works near Viva Energy Australia owned and operated High Pressure Pipelines in Victoria', Viva Energy may require that anyone who proposes to carry out works in the vicinity of the pipeline:

a) grants an easement to Viva Energy which contains provisions to ensure that the pipeline will be adequately protected both during and after the development and that Viva Energy will continue to have rights to access the pipeline; and/or

b) enter into an agreement with Viva Energy in relation to the proposed development, which may include indemnities by the authority or developer in respect of any damage to the pipelines arising from the development and provision for recovery of Viva Energy costs in relation to any works which it is required to carry out to protect the pipeline.

Pipeline route and easements

The routes of pipelines are shown on a series of maps. The majority of the pipelines within the metropolitan area are within road reserves. The pipeline route outside of the metropolitan area when originally laid was predominantly through rural and semi-rural private property. Where practical the route was within existing pipeline corridors. Easements were created through this land. Over the years, the lands around the pipelines have gradually been developed with new roads, residential and industrial subdivisions, etc. reducing the extent of rural and semi-rural areas and increasing the urban and industrial areas.

The easement width varies along the route of the pipelines. It should be noted the pipeline is not necessarily located centrally and can be anywhere within the easement.

Constraints

To ensure land use planning, development and subdivision does not jeopardise the integrity of the pipeline the safety of the public and the environment, it is critical that land use planners, property and service designers, developers, owners and operators, construction organisations, etc. and the general public take into account the presence of the pipeline in their intended activities.

It is important that any planning, development or changes near the pipeline are advised to Viva Energy in the concept stages such that the work will not interfere with the pipeline and vice versa.

The work may require additional protection in the form of concrete slab cover, increasing the depth or varying the route of the pipeline. The cost of these changes would be borne by those initiating the work.

Various constraints are applied to ensure access is maintained, buildings are prevented, vegetation and addition of fill is restricted, power and telegraph poles, fencing and agricultural activities are controlled. These are detailed below.

Access to the pipeline

In order to maintain security and safe operation of the pipelines, regular patrol of the route is required under section 7.4 of AS2885.3-2012 in compliance with applicable pipelines legislation and as a condition of the pipeline licence.

To meet these requirements, the easement or pipeline route must be able to be accessed and traversed by pipeline personnel (and authorised contractors) at any time without delay.

Where gates are to be locked, access is usually achieved by adding a Viva Energy company padlock into the chain.

Note: Under section 117 of the Pipelines Act it is an offence to wilfully obstruct a person acting under the authority of a licensee in the lawful exercise of the licensee's powers in relation to the operation of a pipeline; or without the authority of a licensee, interfere with any works relating to the operation of a pipeline by the licensee. Penalties apply.

Prohibition of buildings near the pipeline

Under section 120 of the Pipelines Act 2005, a person must not construct a building so that any part of it is situated less than 3 metres from a point on the surface of the land whose position is vertically above a part of a pipeline below the surface unless the Minister has first consented to that construction. Penalties and demolition orders apply to contravention.

This clearance is to allow access for patrol and maintenance activities - in particular excavation of the pipeline. In practice, a clearance distance of 6.0 metres is more appropriate.

Vegetation on and near the pipeline

Vegetation is to be restricted to allow free passage along the pipeline route and to prevent root damage to the pipeline anti-corrosion coating. Accordingly, trees and shrubs are not to be planted on the easement and to prevent future damage to root systems during excavation for pipeline maintenance should not be planted closer than two-thirds of the mature height from the edge of the easement. Where no easement exists a minimum distance of 3.0 m but preferably 6.0 m either side of the pipeline should be substituted for easement.

Specifically, the following tree species are not to be planted within 6.0 m of the pipeline:

Cinnamomum (Camphor Laurel), Erythrina Species (Coral Trees), Eucalyptus Species (Gums, Stringy Barks, etc.), Ficus Species (Fig Trees), Grevillea Robusta (Silky Oak), Jacaranda Mimosifolia (Jacaranda Tree), Plantinus Species (Plane Trees), Populus Species (Poplar Tree), Salix Species (Willow Trees), Schinus Molle (Pepper Trees).

Addition of fill on or near the pipeline

It is preferred that fill is not added on or near the pipeline as this increased depth increases the cost of excavation and the poor stability of the fill increases the risk of cave-in during excavation. The depth of fill shall not exceed 1.0 m. If fill must be added, the depth and quality is to be advised prior to placement for agreement by Viva Energy Australia. Any landscaping shall be level within the easement or a minimum of 3.0 m (but preferably 6.0 m) either side of the pipeline to permit excavating equipment to operate without having to destroy the adjacent landscaping.

The addition of fill on or near the pipeline shall only be clean, preferably the same as the natural soil in that area and must not contain ash or chemicals - so as to not change the natural soil resistivity or affect the pipeline steel or anti-corrosion coating material.

Power and telegraph poles, fencing and agricultural activities

Proposed new or replacement power and telegraph poles (including strainer anchors and earth systems) and fencing across or along the easement or pipeline route are to be advised to Viva Energy Australia prior to commencement to prevent damage to the pipeline by pole hole augers or pole drivers. Poles are to be placed once the exact pipeline location has been marked by Viva Energy and the required minimum clearance of 3.0 m has been achieved. Fencing along the easement/pipeline route shall be a minimum of 3.0 m from the pipeline.

Agricultural activities such as deep ripping and the installation of drainage systems are not permitted on the pipeline easement or when no easement exists a minimum of 3.0 m (but preferably 6.0 m) either side of the pipeline. Such works adjacent are to be advised to Viva Energy prior to commencement to allow marking out the prohibited area.

Contact

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Document Statusa

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	M.George	S.Rowland	S.Rowland*	S.Rowland	S.Rowland*	15/9/16
B	M.George	S.Rowland	S.Rowland*	S.Rowland	S.Rowland*	24/10/16

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