Addendum to Fishermans Bend Infrastructure Assessment

December 2012

1 Overview

As a result of revised development scenarios developed for residential, retail and commercial growth in the Fishermans Bend Precinct, Places Victoria engaged GHD to provide an understanding of the impact of these scenarios compared with the redevelopment scenarios previously assessed.

The revised scenarios, and the comparative change compared to the previous figures, are summarised in the table below.

### Table 1 Revised Redevelopment Scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Number of Dwellings</th>
<th>Change</th>
<th>Commercial / Retail Gross Floor Area (GFA)</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Incremental</td>
<td>5,000</td>
<td>Same</td>
<td>50,000 m²</td>
<td>16% decrease</td>
</tr>
<tr>
<td>2 Low Density</td>
<td>15,000</td>
<td>25% decrease</td>
<td>200,000 m²</td>
<td>66% increase</td>
</tr>
<tr>
<td>3 Medium Density</td>
<td>30,000</td>
<td>25% decrease</td>
<td>500,000 m²</td>
<td>60% increase</td>
</tr>
<tr>
<td>4 High Density</td>
<td>60,000</td>
<td>Same</td>
<td>850,000 m²</td>
<td>65% increase</td>
</tr>
</tbody>
</table>

Also of relevance in the stormwater sector, and also in terms of integrated water management solutions for the site, is the public open space area under each scenario. Table 2 summarises the proposed open space compared with the existing open space.

### Table 2 Public Open Space

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Montague</th>
<th>Sandridge</th>
<th>Lorimer</th>
<th>Wirraway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing</td>
<td>-</td>
<td>3.9</td>
<td>-</td>
<td>24.4</td>
</tr>
<tr>
<td>1 Incremental *</td>
<td>-</td>
<td>3.9</td>
<td>-</td>
<td>24.4</td>
</tr>
<tr>
<td>2 Low Density</td>
<td>6.1</td>
<td>3.9</td>
<td>-</td>
<td>24.4</td>
</tr>
<tr>
<td>3 Medium Density</td>
<td>6.1</td>
<td>7.0</td>
<td>4.7</td>
<td>24.4</td>
</tr>
<tr>
<td>4 High Density</td>
<td>10.8</td>
<td>9.4</td>
<td>4.7</td>
<td>34</td>
</tr>
</tbody>
</table>

* Public open space per precinct for the Incremental Scenario is assumed to be consistent with the existing public open space area.

2 Methodology

The methodology employed to undertake the revised assessment was as follows:

a) Develop demands based on each scenario. Relevant demands were determined based on the development scenarios provided in Table 1. These demands are included as an attachment to this memorandum.

b) Liaise with service authorities. Demands with the service authorities to determine whether our assessments are realistic. Provided that is the case, the impacts of each growth scenario will be discussed in relative terms. Key stakeholders are:

- Gas – Zinfra (MultiNet Gas)
- Power – Citipower / SP Ausnet
- Sewer / Water – South East Water / Melbourne Water
- Stormwater – Cities of Melbourne and Port Phillip
- Telecommunications – NBNCo

c) Prepare tabulated statement of relative impacts. From the above discussions, and GHD’s understanding of the networks, the impacts have been summarised in Table 3.

3 Additional Information

As part of the consultation phase of this project, some key stakeholders offered additional information or notified GHD of changes within a sector, summarised as follows:

- South East Water has four interface points (IP) across the Yarra River of which three are with City West Water and one with Melbourne Water. For billing purposes however, Melbourne Water owns all four (bi-directional) billing meters at these IP’s. Subject to demand, supply across these four IPs could be from either direction.

- South East Water noted that whilst in the short to medium term, there could be excess capacity in CWW Williams Rd 600 mm pipeline to supply the initial development in the Fishermans Bend Precinct, there is no guarantee that this capacity would still be available in the long term ie future development in CWW area could use up that excess capacity.

- The retail metropolitan water companies have a Bulk Water Supply Agreement (BWSA) with Melbourne Water that guarantees quantity, flow rate and quality at each IP. Consequently, should demand from the Fishermans Bend precinct result in minimum pressures at the Punt Road IP falling below that guarantee in the BWSA, Melbourne Water would be obliged under the agreement to augment its transfer system to restore the guaranteed pressure. The cost of these augmentation works would be passed on to SE Water through higher Melbourne Water charges.

- The gas sector has changed the structure of the responsible authorities. MultiNet Gas is the asset owner and distributor. Zinfra was the asset manager, however this function is now being provided by MultiNet Gas. Zinfra is now the operational and maintenance service provider for MultiNet Gas. This change came into effect this week (week beginning 03/12/2012). In practice, the impact in terms of redevelopment of the Fishermans Bend Precinct is likely to be minimal. Developers who request gas supply are likely to continue to deal with Zinfra in the first instance, and in the case of a very large load, for example a co-generation plant, both Zinfra and MultiNet Gas are likely to be involved.
4 Summary of Impacts

Impacts of each scenario on the utility networks considered have been provided in Table 3. These impacts are considered to be preliminary only and are subject to change.

Table 3 Summary of Impacts

<table>
<thead>
<tr>
<th>Sector</th>
<th>Incremental</th>
<th>Low Density</th>
<th>Medium Density</th>
<th>High Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stormwater</td>
<td>There is no change to the public open space areas therefore the impact on the stormwater network would be dependent on any increase in impervious land areas within lots</td>
<td>In each of the low, medium and high density scenarios, there is an increase in the public open space area, as shown in Table 2. The increased public open space area, if grassed or vegetated, would increase the pervious area in the relevant precinct and would achieve Melbourne Water’s desire to have no impact on stormwater flows due to any increase in impervious areas for established areas. There may also be greater potential for water reuse for irrigation of the public open spaces which would be of benefit to the viability of some integrated water management strategies that may be considered. Any increase in impervious area within lots would have an impact on the stormwater drainage network and may require stormwater management.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Supply</td>
<td>Could be supplied from existing infrastructure</td>
<td>New 600mm pipeline required between Punt Road and the Fishermans Bend Precinct</td>
<td>15ML underground storage tank and new 600mm pipeline required between Punt Road and the Fishermans Bend Precinct</td>
<td>30ML underground storage tank and a new 825mm pipeline required between Punt Road and the Fishermans Bend Precinct</td>
</tr>
<tr>
<td>Sewerage</td>
<td>The higher the density the greater likelihood of higher costs</td>
<td>South East Water considers that the trunk network is likely to have sufficient capacity under all four scenarios however this would ultimately need to be confirmed with Melbourne Water. Upgrades to South East Water’s reticulation system and possibly some of the branch sewers (Fishermans Bend Branch Sewer, Ingles Street Branch Sewer and Bridge Street Branch Sewer) may be required under all four scenarios.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gas Supply</strong></td>
<td>For the incremental and low density scenarios there is likely to be no material change to what was previously reported.</td>
<td>For the medium and high density scenarios, due to the doubling and tripling of the commercial / retail component there may well be the need for additional infrastructure which may include construction of larger mains and network reinforcements.</td>
<td></td>
<td></td>
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<tr>
<td>---</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In each scenario, depending on the timing and development plans (i.e. realignment of roads, block titles, road modifications &amp; beautification etc.) it is likely that MultiNet would be forced to consider bringing forward a component of its renewal works and would require a co-contribution approach to fund works that are required to be brought forward.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electricity</strong></td>
<td>Supply will continue to be from existing zone substations. Supply will continue to be from the existing FBTS. Supply will continue to be from existing zone substations with some upgrading required. This scenario is likely to trigger the standby transformer at the FBTS being placed on load.</td>
<td>This scenario is likely to trigger the E Zone substation being converted into an 11kV zone substation. This scenario is likely to trigger the standby transformer at the FBTS being placed on load and a fourth transformer being added. This scenario is likely to trigger the E Zone and Port Melbourne zone substations being converted into 11kV zone substations. This scenario is also likely to trigger a new zone substation. This scenario is likely to trigger the standby transformer at the FBTS being placed on load and a fourth transformer being added.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>New 11kV feeders and local substations will be required to match the load generated by redevelopment in each scenario.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Telecommunications</strong></td>
<td>The greater the number of premises in the Fishermans Bend Precinct the greater the capacity that NBNCo will need to allocate to the area. Commercial / retail development typically requires double the fibre allocation of residential development therefore significant increases in commercial / retail development would have a bigger impact than the equivalent increase in residential premises. If redevelopment occurs after NBNCo has rolled out NBN to the area as part of their brownfields rollout, and the number of premises ends up being significantly greater than what was allowed for, NBNCo may need to redesign their network or reinstall additional fibre. The cost to developers is the same under each scenario; however any redesign or retrofitting of the NBN network following the brownfields rollout is likely to be costly for NBNCo.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Executive Summary

GHD was engaged by Places Victoria in June 2012 to provide an assessment of existing infrastructure capacity and future requirements to accommodate renewal of the Fishermans Bend Precinct in Melbourne.

Findings considered to be the most significant from the perspective of developers are summarised in Table 1.

Table 1 Key Findings

<table>
<thead>
<tr>
<th>Sector</th>
<th>Findings</th>
</tr>
</thead>
</table>
| General                     | Consultation with key utility provider and asset owner stakeholders throughout the master planning, design and construction phases is recommended  
Co-ordination of construction of utility assets with other underground services may reduce project costs  
Relocations of major transmission and trunk assets, if required and attributable to developers, could prove prohibitive due to the high likely costs  
Developer Contribution Plans for the installation, relocation and upgrade of utility networks, road and tram infrastructure are recommended to be established as early as possible. This is of particular importance for any precinct wide servicing strategies |
| Stormwater Drainage & Flooding | Contaminated ground conditions are likely to increase costs associated with upgrade and asset duplication works  
New Special Building Overlays are being prepared by CoPP and MWC and are anticipated to be in place by mid 2013  
The extent of flooding, particularly within existing overlays in 5 year storm events, may not be considered acceptable to developers  
MM would like to see no impact on stormwater flows due to any increase in impervious areas for established areas  
Stormwater and rainwater harvesting should be considered  
The scale and risk of inundation due to the effects of climate change in the Fishermans Bend Precinct is not certain but MWC, CoPP and CoM are likely to consider climate change and risk mitigation measures in their planning for future scenarios |
| Water Supply                | South East Water has upgrade works planned in the medium term to increase supply to the Fishermans Bend Precinct  
The timing and density of redevelopment may trigger or increase the capital expenditure required for these upgrade works  
An additional connection to the MWC main in Punt Road may be required for the low, medium and high density redevelopment scenarios  
An underground storage / balancing tank may be required to support |
Gas Supply

- Zinfra has reported that the establishment of an overall servicing strategy for the Fishermans Bend Precinct as early as possible would maximise efficiency of construction for required gas assets and reduce long term costs.
- Typically provision of gas is at a lower cost to the asset owner for areas where high pressure gas mains are present or in close proximity and the cost of reinforcements for smaller consumers (typically residential developers fall into this category) is borne by the asset owner (MultiNet Gas).
- The financing of extensions of the gas network are economically feasibility tested and costs may be attributable to the developer who requests the extension.

Energy Initiatives

- Zinfra and CitiPower have suggested that energy efficiency and innovative opportunities could be considered for the Fishermans Bend Precinct.

- The impacts of a co or tri generation scheme on the electricity and gas networks should be considered for any building or precinct wide distributed energy systems.

Shell and BP Pipelines

- A 24" WAG Shell fuel pipeline in located parallel to the gas transmission pipeline in the Wirraway Precinct.
- Clearance of three metres is required to gas and fuel pipelines under Section 120 of the Pipelines Act 2005. In practice, a clearance distance of six metres is considered by Shell to be more appropriate where this can be achieved.

- Clearances to Telstra assets are required to be maintained in redevelopment scenarios.
- There are likely to be significant costs associated with the relocation of existing Telstra assets if required.

- A temporary NBN solution may be required to support redevelopment prior to the rollout of the permanent network.
- The scale and density of development in the Fishermans Bend Precinct may result in it being granted priority in future rollout planning and may require NBNCo to allocate greater capacity to the area.

- The road and tram infrastructure in the Fishermans Bend Precinct is generally in good condition.
- VicRoads has noted that they prefer that activity centres do not straddle arterial roads.

- Noise generated from the freeway should be considered in the design of buildings located proximate to the West Gate Freeway.
- The implications of the redevelopment of the Wirraway Precinct due to the designation of Plummer Street and Todd Road as future preferred traffic routes would need to be considered in master planning for the Fishermans Bend Precinct.

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- There are likely to be significant costs associated with the relocation of existing Telstra assets if required.

- A temporary NBN solution may be required to support redevelopment prior to the rollout of the permanent network.
- The scale and density of development in the Fishermans Bend Precinct may result in it being granted priority in future rollout planning and may require NBNCo to allocate greater capacity to the area.

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- VicRoads has noted that they prefer that activity centres do not straddle arterial roads.

- Noise generated from the freeway should be considered in the design of buildings located proximate to the West Gate Freeway.
- The implications of the redevelopment of the Wirraway Precinct due to the designation of Plummer Street and Todd Road as future preferred traffic routes would need to be considered in master planning for the Fishermans Bend Precinct.

Recommended actions in addressing utility and infrastructure constraints and opportunities for the next stages of planning and design are:

- Review of master plan yield and/or Gross Floor Area (GFA) projections once progressed as part of the master planning stage.
- Determination of utility loadings based upon yield / GFA projections.
- Determination of potential system augmentation required through collaboration with relevant authorities and service providers and cost estimates for required works.
- Determination of costs and authority requirements in relation to specific asset relocations.
- Consultation with utility providers and assets owners to ensure offsets, clearances and other requirements are incorporated into the master plan to limit the risk of amendments to the master plan at a later stage of planning or design.
• Engagement with NBiNCo Multi Dwelling Unit (MDU) specialist and brownfields rollout department to ensure that adequate capacity is provided for the anticipated redevelopment
• Consideration of precinct wide integrated energy and water strategies
• Consideration of other developments in and around the Fishermans Bend Precinct in parallel with studies being performed by Places Victoria
• Land Ownership Assessment and consideration of staging of development throughout the Fishermans Bend Precinct
• Consultation with other developers to enable greater understanding of impact of all development upon networks and allow opportunity for creation of Developer Contributions Plans (DCP) if viable
• Development of preliminary cost estimates in collaboration with utility providers and asset owners

Engagement with NBiNCo Multi Dwelling Unit (MDU) specialist and brownfields rollout department to ensure that adequate capacity is provided for the anticipated redevelopment
Consideration of precinct wide integrated energy and water strategies
Consideration of other developments in and around the Fishermans Bend Precinct in parallel with studies being performed by Places Victoria
Land Ownership Assessment and consideration of staging of development throughout the Fishermans Bend Precinct
Consultation with other developers to enable greater understanding of impact of all development upon networks and allow opportunity for creation of Developer Contributions Plans (DCP) if viable
Development of preliminary cost estimates in collaboration with utility providers and asset owners

Contents
1. Introduction ........................................................................................................... 1
   1.1 History of Fishermans Bend......................................................................... 1
   1.2 Existing Precinct Description ................................................................... 1
   1.3 Project Background .................................................................................. 4
   1.4 Scope of Assessment .............................................................................. 4
   1.5 Methodology ........................................................................................... 5
   1.6 Redevelopment Scenarios ....................................................................... 6

2. Stormwater Drainage & Flooding ....................................................................... 9
   2.1 Responsible Authorities ........................................................................... 9
   2.2 Existing Conditions .................................................................................. 9
   2.3 Flood Overlays ........................................................................................ 11
   2.4 Planned Works ....................................................................................... 12
   2.5 Redevelopment Scenarios ....................................................................... 13
   2.6 Stormwater Harvesting and Reuse ......................................................... 14
   2.7 Water Sensitive Urban Design (WSUD) .................................................. 15
   2.8 Inundation Risks due to Climate Change ................................................. 15
   2.9 Cost Allocation ....................................................................................... 15

3. Water Supply ..................................................................................................... 17
   3.1 Responsible Authorities .......................................................................... 17
   3.2 Existing Conditions ................................................................................ 17
   3.3 Planned Upgrades .................................................................................. 17
   3.4 General Requirements .......................................................................... 18
   3.5 Redevelopment Scenarios ..................................................................... 19
   3.6 Cost Allocation ....................................................................................... 20

4. Sewerage ........................................................................................................... 22
   4.1 Responsible Authorities .......................................................................... 22
   4.2 Existing Conditions ................................................................................ 22
   4.3 Planned Upgrades .................................................................................. 22
   4.4 General Requirements .......................................................................... 23
   4.5 Redevelopment Scenarios ..................................................................... 23
   4.6 Cost Allocation ....................................................................................... 23

5. Integrated Water Management ........................................................................... 26
   5.1 A Holistic Approach .............................................................................. 26
   5.2 The Office of Living Victoria .................................................................. 26
   5.3 Existing Schemes .................................................................................. 26
   5.4 Opportunities ......................................................................................... 26

6. Electricity ........................................................................................................... 28
   6.1 Responsible Authorities .......................................................................... 28
1. Introduction

1.1 History of Fishermans Bend

Fishermans Bend has a long history of industrial occupation and remains the City of Port Phillip’s largest employment node. It is historically tied, through its geographical proximity, to the Port of Melbourne and the Central Business District (CBD).

There is a significant history of Government led housing development in Fishermans Bend. Between 1939 and 1942, public housing constructed in Fishermans Bend represented the Government’s answer to the inter war and post war housing crises for the lower working class and under-privileged.\(^1\)

The housing estates signified social reform and altruism, with the incorporation of mixed use facilities and community infrastructure including shopping, educational, sporting and recreational facilities\(^2\), long before the term “Place making” came into vogue.

The expected focus on liveability, sustainability and place making intended for development within the Fishermans Bend precinct would be a fitting continuation of this legacy.

Figure 1 The “Quartets” on the two acre site at 444 - 478 Williamstown Road

1.2 Existing Precinct Description

1.2.1 Precinct Location

Fishermans Bend is located on a peninsula south west of Melbourne’s CBD. It is geographically bound by the Yarra River to the north and west, and Hobsons Bay to the south. South Melbourne bounds the area to the east and Port Melbourne to the south.

Project borders were identified in September 2011 by the Department of Planning and Community Development (DPCD). This assessment focuses on four distinct precincts within the project border as shown in the following figure. For the purposes of this assessment, these four

\(^1\) City of Port Phillip ‘Fishermans Bend Guidelines’ October 2001 (Updated 2010)
\(^2\) City of Port Phillip ‘Fishermans Bend Guidelines’ October 2001 (Updated 2010)
Due in part to the history of industrial land use in the Fishermans Bend Precinct, there is varying risk of land contamination. Golder Associates completed a Land Contamination Study on behalf of Places Victoria in 2012.

This report states that the near surface stratigraphy for the Fishermans Bend Precinct is anticipated to consist of the Port Melbourne Sand and Coode Island Silt capped by a layer of fill over much of the area. It is anticipated that there may be contaminants throughout the Fishermans Bend Precinct. Groundwater is generally shallow, ranging from around one metre to three metres below the surface.

There is large and active ownership by developers, particularly Goodman and MAB.

In the Montague Precinct, there is some smaller office industry and a number of automotive premises. Places Victoria has reported that the number of people employed in the precinct is in the order of nine thousand.

There are major freight transport routes along Wirraway and Williamstown Road and the Fishermans Bend Precinct contains vital access to Webb Dock and for other port related traffic. Road reserves are generally wide to support large vehicle access. There are Westgate Freeway crossings at Salmon and Ingles Streets as well as Westgate Freeway access points at Todd Road and Montague Street. There is a light rail line along Montague Street and one bus service to the area.

The net developable area is shown in Appendix A. The net developable area excludes encumbered land, arterial roads, railway corridors, government schools and community facilities and public open space. It includes lots, local streets and connector streets. Encumbered land is described as land that is constrained for development purposes. Encumbered land includes easements for power/transmission lines, sewers, gas, waterway/drainage, retarding basins/wetlands, landfill, conservation and heritage areas.

On 5 July 2012, 240 hectares of the Fishermans Bend Precinct were rezoned to Capital City Zone via a Ministerial Amendment (C102). The area included is shown in Figure 3.

Figure 3 Fishermans Bend Minister Declared Urban Renewal Area
The amendment implements a comprehensive suite of changes to the Port Phillip Planning Scheme to facilitate the transition of the Fishermans Bend Urban Renewal Area (FBURA) from a primarily industrial precinct to a genuine mixed use precinct with a residential and commercial focus. These changes include:

- Modification of the schedule to Clause 61.01 of the Port Phillip Planning Scheme to make the Minister for Planning the responsible authority for administering the Fishermans Bend area for development proposals over a certain threshold
- Rezoning the land within the Fishermans Bend Urban Renewal Area to the Capital City Zone (CCZ21) excluding existing areas in public ownership. This revised zoning is shown in Appendix A
- Removal of Design and Development Overlays (Schedule 2, 8 & 9) from the land within the Fishermans Bend Urban Renewal Area
- Introduction of a new Schedule to the Development Contributions Plan Overlay (DCPO2) to the Fishermans Bend Urban Renewal Area
- Introduction of the Parking Overlay and associated schedule (PO1) to the overlay for the Fishermans Bend Urban Renewal Area
- Introduction of a new Local Planning Policy Clause 22.10– Urban Design within Fishermans Bend
- Updates to the Local Planning Policy to reflect the changes to strategic direction

Maps contained in Appendix A show the planning zones and overlays in the Fishermans Bend Precinct in April 2012, prior to the introduction of the Capital City Zone to the area.

1.3 Project Background

1.3.1 Vision

Redevelopment of the Fishermans Bend precinct represents a central plank in the Government’s vision for an expanded CBD offering an expansion of high density living beyond the Hoddle Grid, Docklands and Southbank. Advancement of this project during the 2012/13 financial year will focus on building on the Government’s vision for this urban renewal precinct by developing the project concept, feasibility and structure plan.

A clear understanding of current infrastructure capacity will be vital to inform decisions about where development and density within the Fishermans Bend precinct can and should be directed.

1.4 Scope of Assessment

The purpose of this assessment is to provide input into Places Victoria’s assessment of the feasibility of the Fishermans Bend precinct for renewal through identification of key issues, opportunities and constraints of the utility and transport networks and their ability to cater for intensified residential and mixed use development.

This assessment aims to identify and report on the condition, capacity and constraints associated with existing trunk and major infrastructure in the Fishermans Bend Precinct with a view to determining the upgrades, augmentation works network alteration and extensions that may be required to support a range of increased residential, commercial and retail growth scenarios. In particular, emphasis is placed on any large scale costs, or long lead items that are likely to impact on development costs or programming.

The focus of the assessment is on the trunk, transmission and major assets within the water, sewage, stormwater, power, gas, telecommunications, road and tram networks.

A separate transport strategy will be developed for the precinct, therefore this assessment is limited to the existing condition and planned upgrades for major road and tram infrastructure.

1.4.1 Limitations and Assumptions

Location of existing services has been approximately determined by GHD based on Dial Before You Dig information, information provided by key stakeholders and physical inspection on site where possible. 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. Non-destructive digging, network modelling and services proving are excluded from the scope of this project and are therefore not considered in estimating the condition and capacity of existing infrastructure.

Assessment of roads and tram infrastructure is limited to reporting on the condition and planned upgrades of existing networks in the Fishermans Bend Precinct. Places Victoria, in collaboration with Yarra Trams, the Department of Transport, VicRoads and Public Transport Victoria, will develop a separate Transport Strategy for the area.

This report has been prepared by GHD for Places Victoria and may only be used and relied upon by Places Victoria. GHD otherwise disclaims responsibility to any person other than Places Victoria arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on redevelopment scenarios described in Section 1.6. GHD disclaims liability arising from any of the growth forecasts being incorrect.

GHD has prepared this report on the basis of information provided by Places Victoria and project stakeholders listed in Table 3 who provided information to GHD which GHD has not independently verified or checked. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

Information provided by stakeholders is preliminary information only, should not be relied upon or omissions in that information.

GHD has prepared this report on the basis of information provided by Places Victoria and project stakeholders listed in Table 3 who provided information to GHD which GHD has not independently verified or checked. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.
• Provide the objectives, program and methodology for the assessment

Key stakeholders are listed in Table 3. These stakeholders, as well as representatives from relevant Government agencies were invited to the Stakeholder briefing.

Table 3 Stakeholders

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melbourne Water</td>
<td>Trunk stormwater, sewerage and water supply assets</td>
</tr>
<tr>
<td>City of Melbourne</td>
<td>Stormwater</td>
</tr>
<tr>
<td>City of Port Phillip</td>
<td>Stormwater</td>
</tr>
<tr>
<td>South East Water Corp</td>
<td>Sewerage and water supply</td>
</tr>
<tr>
<td>CitiPower</td>
<td>Electrical distribution</td>
</tr>
<tr>
<td>SPI PowerNet</td>
<td>Electrical transmission</td>
</tr>
<tr>
<td>Zinfra (MultiNet)</td>
<td>Gas supply</td>
</tr>
<tr>
<td>Shell</td>
<td>Fuel pipeline</td>
</tr>
<tr>
<td>VicRoads</td>
<td>Roads</td>
</tr>
<tr>
<td>Yarra Trams</td>
<td>Tram infrastructure</td>
</tr>
<tr>
<td>NBNNCo</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>Telstra</td>
<td>Telecommunications</td>
</tr>
</tbody>
</table>

The assessment was undertaken in four phases, as outlined in Table 4.

Table 4 Project Phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Identification of location and attributes of existing infrastructure</td>
</tr>
<tr>
<td>2</td>
<td>Planned upgrade / extension / relocation works in the short, medium and long term</td>
</tr>
<tr>
<td>3</td>
<td>Impacts on infrastructure networks due to four redevelopment scenarios, as outlined in Section 1.6.</td>
</tr>
<tr>
<td>4</td>
<td>Summary of key findings and review</td>
</tr>
</tbody>
</table>

During Phase 3 of the assessment, GHD met with stakeholders individually, or in groups based on sector. This continued consultation allowed a greater level of interrogation of advice and information provided to GHD by stakeholders.

The key findings of the infrastructure assessment have been summarised in this report by sector as part of Phase 4.

1.6 Redevelopment Scenarios

Places Victoria’s estimated re-development scenarios for the Fishermans Bend Precinct include incremental, low, medium and high density development options.

The scenarios are for full build out of the precincts and there is no consideration of details such as staging or timing of development at this stage.

Table 5 Summary of Redevelopment Scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Number of Dwellings</th>
<th>Commercial / Retail Gross Floor Area (GFA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5000</td>
<td>60000 m²</td>
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<tr>
<td>2</td>
<td>20000</td>
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<tr>
<td>3</td>
<td>40000</td>
<td>200000 m²</td>
</tr>
<tr>
<td>4</td>
<td>60000</td>
<td>300000 m²</td>
</tr>
</tbody>
</table>

Table 6 Scenario 1 Incremental Redevelopment

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sub-Precinct</th>
<th>Dwellings</th>
<th>Population</th>
<th>Comm / Retail GFA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montague</td>
<td>Nil</td>
<td>2,500</td>
<td>4,875</td>
<td>15,000</td>
</tr>
<tr>
<td>Sandridge</td>
<td>North of Fennel St</td>
<td>313</td>
<td>695</td>
<td>3,000</td>
</tr>
<tr>
<td></td>
<td>South of Fennel St</td>
<td>938</td>
<td>1,828</td>
<td>12,000</td>
</tr>
<tr>
<td>Lorimer</td>
<td>Nil</td>
<td>500</td>
<td>975</td>
<td>3,000</td>
</tr>
<tr>
<td>Wirraway</td>
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<td>563</td>
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<tr>
<td></td>
<td>West of Salmon St</td>
<td>188</td>
<td>366</td>
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<td>TOTAL</td>
<td></td>
<td>5000</td>
<td>9750</td>
<td>60000</td>
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Table 7 Scenario 2 Low Density Redevelopment

<table>
<thead>
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<th>Sub-Precinct</th>
<th>Dwellings</th>
<th>Population</th>
<th>Comm / Retail GFA</th>
</tr>
</thead>
<tbody>
<tr>
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<td>9,000</td>
<td>17,550</td>
<td>30,000</td>
</tr>
<tr>
<td>Sandridge</td>
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<td>1,250</td>
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<td>6,000</td>
</tr>
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<td>South of Fennel St</td>
<td>3,750</td>
<td>7,313</td>
<td>24,000</td>
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<td>Lorimer</td>
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<td>3,900</td>
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<td>Wirraway</td>
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<td>3,000</td>
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<td>12,000</td>
</tr>
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<td>39000</td>
<td>120000</td>
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Table 8 Scenario 3 Medium Density Redevelopment

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sub-Precinct</th>
<th>Dwellings</th>
<th>Population</th>
<th>Comm / Retail GFA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montague</td>
<td>Nil</td>
<td>16,000</td>
<td>31,200</td>
<td>50,000</td>
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<tr>
<td>Sandridge</td>
<td>North of Fennel St</td>
<td>2,500</td>
<td>4,875</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>South of Fennel St</td>
<td>7,500</td>
<td>14,625</td>
<td>40,000</td>
</tr>
<tr>
<td>Lorimer</td>
<td>Nil</td>
<td>4,000</td>
<td>7,800</td>
<td>10,000</td>
</tr>
<tr>
<td>Wirraway</td>
<td>East of Salmon St</td>
<td>7,500</td>
<td>14,625</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td>West of Salmon St</td>
<td>2,500</td>
<td>4,875</td>
<td>70,000</td>
</tr>
<tr>
<td>TOTAL</td>
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<td>40000</td>
<td>78000</td>
<td>200000</td>
</tr>
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</table>
### Stormwater Drainage & Flooding

#### 2.1 Responsible Authorities

The regional drainage network in the Fishermans Bend Precinct is managed by Melbourne Water Corporation (MWC). MWC is the floodplain management authority.

MWC is committed to working with councils, developers and Government to ensure that the stormwater drainage system functions appropriately while facing the challenges of projected population growth levels and the associated increase in the density of development.

City of Melbourne (CoM) and City of Port Phillip (CoPP) are responsible for local drainage infrastructure, typically serving catchments less than 60 Ha, within their municipalities.

#### 2.2 Existing Conditions

The flat and low lying nature of the Fishermans Bend Precinct constrains the municipal and Melbourne Water stormwater drainage networks. Contaminated ground conditions are likely to increase costs associated with upgrade and asset duplication works.

Existing stormwater drainage assets and associated overlays are shown in Appendix B.

The ‘Flood Management Plan’ (March 2012) prepared by CoPP and MWC in consultation with the Victoria State Emergency Service outlines how capital works are funded. A summary is included below:

- Councils have an annual budget for renewal and enhancement of the municipal drainage network to achieve 1 in 5 year capacity in the network
- MWC has a 5 Year Water Plan that contains proposed capital works.

#### 2.2.1 Municipal Drainage Systems

The existing conditions and capacity of the municipal stormwater drainage networks, as reported by CoPP and CoM are outlined in the following sections.

**CoPP Drainage System (Montague, Wirraway and Sandridge Precincts)**

CoPP believes that there are constraints to their stormwater drainage network due to the MWC drainage outfalls. These constraints can result in flooding caused by high tides reducing the capacity of the MWC stormwater drains to discharge runoff into Port Phillip Bay. A pumped outfall could improve the outfall capacity but is not being considered by MWC at this time.

Pumped outfalls are generally very costly. There is an existing pumped outfall installed by Major Project Victoria in Beacons Cove to the south of the Fishermans Bend Precinct.

Flooding in the area also could be caused by:

- Pipe blockages due to tree roots, sand, seaweed, tidal sand movement, debris covering grates
- Runoff being unable to get into the underground piped network
- Broken pipes
- Intense rainfall events, which create runoff greater than the capacity of the existing network

CoPP has increased its annual budget for cleaning pits and pipes and this has resulted in some improvement to flooding in the municipality.

### Table 9 Scenario 4 High Density Redevelopment

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sub-Precinct</th>
<th>Dwellings</th>
<th>Population</th>
<th>Comm / Retail GFA</th>
</tr>
</thead>
<tbody>
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<td>18,000</td>
<td>35,100</td>
<td>75,000</td>
</tr>
<tr>
<td>Sandridge</td>
<td>North of Fennel St</td>
<td>6,000</td>
<td>11,700</td>
<td>15,000</td>
</tr>
<tr>
<td></td>
<td>South of Fennel St</td>
<td>12,000</td>
<td>23,400</td>
<td>60,000</td>
</tr>
<tr>
<td>Lorimer</td>
<td>Nil</td>
<td>9,000</td>
<td>17,550</td>
<td>15,000</td>
</tr>
<tr>
<td>Wirraway</td>
<td>East of Salmon St</td>
<td>9,000</td>
<td>17,550</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td>West of Salmon St</td>
<td>6,000</td>
<td>11,700</td>
<td>105,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>60000</strong></td>
<td><strong>117000</strong></td>
<td><strong>300000</strong></td>
</tr>
</tbody>
</table>

Source: Places Victoria ‘Build Out Scenarios’ Provided 15 June 2012
Modelling undertaken by CoPP of the stormwater drainage network indicated that in a 1 in 5 year ARI storm event, there are some pipelines that will be at or approaching capacity. These pipelines are located in Plummer, Salmon and Prohasky Streets in the Warrandyte Precinct, Woodruff, Anderson, Ingles, Boundary, Gittus, Brady, Munro and White Streets in the Sandridge Precinct and in the majority of pipelines in the Montague Precinct.

Based on information reported by customers to CoPP and recorded in the customer service register, CoPP has determined “Flood Hot Spots” where upgrade or maintenance works may be undertaken. There are three Flood Hot Spots in the Fishermans Bend Precinct. These are:

- Gladstone Lane / Montague Street – Tidal, frequent street flooding. Lane has a muddy appearance. Cars parked in lane report damage. Flooding has been reported to enter buildings
- Johnston / Munro Streets – In heavy rain, runoff cannot enter pipes. Building damage due to flooding when there is a combination of high tide and rainfall. In tidal flooding events, mud and debris is pushed up the pipeline.
- Montague Street – Blockage over grates noted at underpass. Associated flooding has impacted on traffic flow

The majority of CoPP’s drainage pipelines are constructed of concrete (almost 90%). Of the remaining pipelines, most are of clay construction, with a small number of PVC and brick drainage pipelines.

**CoM Drainage System (Lorimer Precinct)**

CoM has reported there are no major flooding issues in the Lorimer Precinct. CoM has its own outfall to Hobson’s Bay that services the majority of the precinct, with a small catchment outfalling to CoPP’s drainage system.

Compared to the drainage network in the rest of CoM’s municipality, which was constructed in the early 1900’s and has a proportion of brick and earthenware drains, the drainage network in the Lorimer Precinct is relatively new (30 – 50 years old) and constructed of concrete. As far as CoM is aware, the system is in relatively good condition. CoM has a condition assessment program planned over the next five to ten years to determine the condition of its entire drainage network. It is likely that Fishermans Bend will be assessed in the latter stages of this program.

The existing network was designed to cater for the tidal flows from the Yarra River and Hobson’s Bay; therefore the pipelines are generally quite large, with an average diameter of approximately 600 mm / 750 mm diameter. This allows for some storage within the drainage network. It is likely that Fishermans Bend will be assessed in the latter stages of this program.

2.2.2 **Melbourne Water Drainage System**

An 1800Ø MWC drain extends along Johnson Street which forms the boundary between the Sandridge and Montague Precincts. This drain outfalls to the Yarra River in the marina north of Lorimer. There is a 150Ø MWC drain extending from the intersection of Gittus and Brady Streets in the Sandridge Precinct north beneath the Westgate Freeway and through the Lorimer Precinct. This drain outfalls to the Yarra River near Point Park.

Additionally, a 1500 Ø MWC drain extends along Anderson Street in the Sandridge Precinct, beneath the Westgate Freeway then along Hartley Street in the Lorimer Precinct. This drain outfalls to the Yarra River north of South Wharf Drive.

A 1650Ø MWC drainage pipeline extends along Salmon Street and outfalls into Hobsons Bay.

MWC’s drainage assets are shown in Appendix B. All of MWC’s assets are of concrete construction.

As discussed in Section 2.2.1, high tides and major storm events can reduce the capacity of the MWC outfalls to discharge runoff into Hobsons Bay.

**Legacy Drainage Issues**

Prior to the late 1970’s subdivision drainage standards in Melbourne did not make adequate provision for runoff generated by large storms, and development often occurred without consideration of the flooding risks or natural drainage lines. As a result of major flooding in the 1970’s a number of policy initiatives were developed to improve control of development in flood-prone areas.

Whilst design standards now incorporate overland flow paths there are significant established areas of Melbourne, including parts of the Fishermans Bend Precinct, constructed prior to the late 1970’s that remain susceptible to flooding in storm events that exceed the design parameters of the underground drainage network (1 in 5 year ARI). These flooding issues are commonly referred to as “legacy” flooding issues.

**100 year flood levels**

In responding to the potential for greater rainfall events and urban flooding, MWC advises that the current approach to development may need to be reﬁned, particularly in areas that are particularly at risk, such as areas with Land Subject to Inundation and Special Building Overlays.

Development in areas within 100 year flood prone overlays (shown in Appendix B) is referred to Melbourne Water or the relevant Council. Typically, a freeboard level of 0.3m above the flood level is required for habitable space and 0.15m above the flood level is required for non-habitable space.

Melbourne Water has reported some inundation from 100 year flood events in the Fennell and Lorimer Precincts and in the southern portion of the Warrandyte Precinct.

2.3 **Flood Overlays**

Development within areas that are subject to Land Subject to Inundation Overlays (LSIO), Urban Floodway Zones (UFZ), Floodway Overlays (FO) and Special Building Overlays (SBO) is referred to Melbourne Water to ensure that the development is appropriately designed and to ensure overland flow paths are maintained.

Overlays in the Fishermans Bend Precinct are shown in Appendix B.

A description of each of these overlays / zones, as described by Melbourne Water’s Guidelines for Development in Flood-prone Areas, is included below:

- **Urban Floodway Zone**: The Urban Floodway Zone (UFZ) applies to land affected by flooding in urban areas where the primary function of the land is to convey active flood flows. No UFZs have been identified in the Fishermans Bend Precinct.
- **Floodway Overlay**: The Floodway Overlay (FO) applies to mainstream flooding in both rural and urban areas. No FOs have been identified in the Fishermans Bend Precinct.
- **Special Building Overlay**: The Special Building Overlay (SBO) applies to land affected by flooding from the piped system. With the redevelopment of existing urban areas and the proposed development of new areas, there is growing pressure to develop within...
overland flow path areas. The purpose of the SBO is to set appropriate conditions and building floor levels to address the flood risk and to ensure that flood waters are not obstructed or diverted by development. SBOs identified in the Fishermans Bend Precinct as shown in Appendix B.

- **Land Subject to Inundation Overlay**: The Land Subject to Inundation Overlay (LSIO) applies to mainstream flooding in both rural and urban areas. No LSIOs have been identified in the Fishermans Bend Precinct.

The ‘Flood Management Plan’ (March 2012) prepared by CoPP and MWC in consultation with the Victoria State Emergency Service has triggered a process of revision of the existing Special Building Overlays. New SBOs are being prepared and are anticipated to be in place by mid 2013 subject to the timing and feedback from public consultation. It is anticipated that the new SBOs will be in the same general locations but the area covered will increase by approximately 0 to 10%.

Conditions that are likely to be imposed on development that occurs within SBOs include:

- Pollution and sediment laden runoff shall not be discharged directly or indirectly into CoPP drains or waterways.
- The dwelling must be constructed with finished floor levels a minimum of 300mm above the applicable flood level.
- The garage must be constructed with finished surface levels a minimum of 150mm above the applicable flood level.
- Prior to the issue of a Certificate of Occupancy, a certified survey plan, showing finished floor levels (as constructed) reduced to the Australian Height Datum, must be submitted to CoPP to demonstrate that the floor levels have been constructed in accordance with CoPP requirements.

Additionally, CoPP and MWC have reported that an appropriate overlay needs to be developed in the future to cover coastal flooding due to sea level rise.

### 2.4 Planned Works

#### 2.4.1 Trunk Stormwater Drainage Assets

MWC has no planned works in the Fishermans Bend Precinct. The area has been assessed as having a medium risk of flooding in a 100 year ARI storm event and is therefore a lower priority for upgrade works compared with areas assessed as having a high or extreme risk.

MWC aims to work towards assessing and mitigating the risk of flooding in priority areas whilst ensuring that new development and inappropriate redevelopment does not occur in overland flow paths or land subject to inundation.

The level of tolerable flood risk that is acceptable needs to be determined and engineering solutions to mitigate flooding must be considered practical, economically feasible and necessary in order for these works to go ahead. Other measures such as planning controls and increasing community awareness and education may be determined to be more appropriate solutions to reduce flooding impacts in certain instances.

Factors which may make flood risks intolerable include:

- Significant threat to public life, health and safety
- Potential impacts to large numbers of people (psycho-social)
- Financial cost to the community (primarily property damage)

#### 2.4.2 Municipal Stormwater Drainage Assets

CoM has no planned works in the Fishermans Bend Precinct.

The only works planned by CoPP are those outlined in Section 2.2.1 to address Flood Hot Spots.

CoPP has reported that construction of planned works is likely to be triggered by significant property and community infrastructure damage from a 1 in 5 annual recurrence interval (ARI) storm event in residential areas or a 1 in 10 ARI storm event in commercial/industrial areas.

Upgrade works ensure that CoPP is meeting desired community service levels. CoPP has minor drainage improvement works and asset renewals to achieve 1 in 5 year capacity in the network.

The impact of climate change and associated sea level rise and increase in rainfall intensity would also act as triggers for upgrade works to CoPP’s stormwater drainage network.

CoPP works are funded through rates received from residents of the municipality. Planned upgrades do not presently take into account anticipated development in the Fishermans Bend Precinct.

### 2.5 Redevelopment Scenarios

#### 2.5.1 Redevelopment Conditions

There are no specific drainage redevelopment schemes in the CoPP. CoPP’s development engineer would review specific project proposals and make decisions on drainage requirements on a project by project basis.

The following initiatives would be supported by CoM and CoPP as conditions on redevelopment within the Fishermans Bend Precinct:

- On-site stormwater detention systems to ensure no net increase in pre-development 100 year flood levels and velocities
- Rainwater harvesting for re-use
- No groundwater discharge to stormwater drains though sealing basements and carparks against groundwater
- Permeable / pervious pavements
- Water Sensitive Urban Design
- Finished floor level of a new building / extension to existing building within SBO should be set 300mm above the 100-year flood levels considering climate change conditions
- Garage finish should be 150mm above the 100-year flood levels considering climate change conditions
- Apex of ramp to basement / car park should be set 300mm above the 100-year flood levels considering climate change conditions
- Sufficient open space within properties will be required to allow overland flows without an increase in 100 year flood levels
- Access and site safety are required to be achieved

Initiatives such as those listed above may serve to reduce the quantum of runoff from the sites within the precinct to the existing local stormwater networks.
Stormwater flows captured in basements and discharged to the sewerage network typically have a high salt load and may have an impact on MWC’s sewage treatment plants.

MWC would like to see no impact on stormwater flows due to any increase in impervious areas for established areas. Any proposed master plan should seek to reduce impervious surface areas throughout the Fishermans Bend Precinct.

MWC notes that due to the Yarra River being adjacent to South Bank and the Fishermans Bend Precinct, properties adjacent to the Yarra River may be at risk of flooding due to possible future climate change conditions.

As a result of the future climate change conditions, the flood levels of the Yarra River may be higher than the current flood levels in all storm events. Therefore, MWC recommend that finished floor levels of any new building / extension to an existing building adjacent to the Yarra River should be set at 600mm above the 100-year flood levels of the Yarra River considering climate change conditions.

**Redevelopment Services Schemes**

Redevelopment Services Schemes were established by MWC to ensure that any redevelopment in established areas does not compromise the level of service in these areas.

A recent review has highlighted limitations with their implementation that means MWC’s future approach to managing urban consolidation and redevelopment is under review.

Lot scale solutions may be included as part of MWC’s future approach.

### 2.6 Stormwater Harvesting and Reuse

CoPP regards stormwater harvesting and reuse as a viable strategy for the Fishermans Bend Precinct. CoPP suggests that identification and assessment of demand and supply opportunities needs to be undertaken in the Fishermans Bend Precinct to determine what opportunities for stormwater harvesting and reuse are viable.

A stormwater treatment wetland supplying water for open space is proposed for JL Murphy Reserve, and details are outlined in CoPP’s ‘Masterplan for JL Murphy Reserve’. Available flows are currently being verified through on site monitoring. Similar projects have been undertaken in Elsternwick and Elwood for irrigation of reserves and parkland.

Any stormwater harvesting scheme would need to have storage and water quality levels in accordance with the Australian Guidelines for Water Recycling for irrigation and domestic use.

CoM considers that stormwater harvesting in the Lorimer Precinct is not likely to be viable as the high salinity of the stormwater due to tidal flooding may mean that treating this water for reuse is too expensive to be a viable option. The Lorimer Precinct is additionally cut off from the rest of the Fishermans Bend Precinct by the Westgate Freeway which is a barrier to an interconnected system with the other three precincts.

CoM considers that a rainwater harvesting and reuse strategy within the Lorimer Precinct would be much more viable in terms of cost compared with stormwater harvesting. In this type of strategy, rainwater would be harvested from the roof of each building, stored and used for toilet flushing or irrigation. Additionally, CoM considers that such a strategy is likely to have positive impacts on the level of flooding and associated damage experienced in frequent ‘nuisance’ storm events (up to 1 in 50 year ARI event).

MWC suggests that stormwater harvesting should be considered as part of a wider Integrated Water Strategy for the Fishermans Bend Precinct.

### 2.7 Water Sensitive Urban Design (WSUD)

CoPP is committed to adopted best practice stormwater quality targets detailed in its Water Plan 2010. Whilst WSUD has a very limited application for flood mitigation, it is an essential component of CoPP’s strategy for integrated water management. CoPP has its own WSUD Guidelines which document targets.

CoM notes that the WSUD initiatives in the Docklands has experienced maintenance issues as inadequate space was provided for WSUD components within the public realm. It is recommended that this situation is not repeated within the Fishermans Bend Precinct.

MWC’s Stormwater Quality Offsets – A Guide for Developers states that current best practice encourages an integrated and distributed approach to stormwater quality treatment through WSUD. Unlike traditional ‘end of pipe’ solutions, stormwater quality treatment using WSUD treats stormwater at its source, is practical and achievable on large and small-scale (ABM 2004) developments, and has the ability to offer equal or better environmental outcomes at a lower overall cost to the community.

The new Sustainable Neighborhoods provisions (Clause 56) introduced by the Department of Sustainability and Environment now require all new residential subdivisions to meet the targets within each subdivision.

### 2.8 Inundation Risks due to Climate Change

The scale and risk of inundation due to the effects of climate change in the Fishermans Bend Precinct is not certain as the nature of forward planning means that the following can only be estimated:

- The exact rise in sea level
- Climatic variation and the associated weather patterns such as storm frequency and intensity and the timing and duration of periods of drought

Inundation risks due to Climate Change are further discussed in Appendix C.

The impacts to redevelopment due to flooding caused by sea level rise may be significant therefore MWC and both Councils should be consulted with on an ongoing basis as planning for Climate Change adaptation progresses.

### 2.9 Cost Allocation

Stormwater drainage infrastructure required within each development, including pits and pipes to the connection point with Council owned assets, WSUD initiatives and stormwater detention infrastructure, are attributable to developers.

#### 2.9.1 MWC Hydraulic Contributions

As Fishermans Bend is currently outside of MWC Redevelopment Schemes there are likely to be no hydraulic contributions required.

#### 2.9.2 MWC Stormwater Quality Offset Rates

MWC manages a Stormwater Quality Offsets Program. Stormwater offsets are a financial contribution to Melbourne Water for regional water quality works, undertaken elsewhere within the catchment to offset pollution loads not treated within the development. Offsets provide flexibility for developers where best practice performance objectives cannot be achieved on site, or where water quality works are planned as part of a drainage scheme.
3. **Water Supply**

### 3.1 Responsible Authorities

Melbourne Water Corporation (MWC) is responsible for the trunk water supply transfer network in the Fishermans Bend Precinct. South East Water Corporation (SE Water) is the water retailer responsible for distribution and reticulation infrastructure within the Fishermans Bend Precinct. City West Water (CWW) is the water retailer responsible for distribution and reticulation infrastructure in the CBD to the north.

CWW has not been consulted as part of this assessment, however where information relating to the CWW network has been provided by either MWC or SEWL it has been included as relevant. Information relating to CWW’s network would need to be confirmed with the retailer.

### 3.2 Existing Conditions

Existing water supply assets and associated easements are shown in Appendix B.

#### 3.2.1 MWC Assets

There are no MWC trunk water supply assets in the Fishermans Bend Precinct. The nearest MWC transfer mains are the Punt Road transfer main, to the east of the Fishermans Bend Precinct and the Footscray transfer main, which bisects the CBD to the north.

#### 3.2.2 SEWL Assets

The existing water network in Fishermans Bend has sufficient capacity to supply current requirements. The main source of supply to the Fishermans Bend Precinct is from a Melbourne Water transfer pipeline located in Punt Road which is supplied from Preston Reservoir to the north and Mt Waverley Reservoir from the south.

#### 3.2.3 CWW Assets

Supply into the Fishermans Bend Precinct is also supplemented by CWW supply pipelines that cross the Yarra River from the CBD at Queens Bridge and Charles Grimes Bridge.

### 3.3 Planned Upgrades

#### 3.3.1 MWC Assets

The MWC supply network throughout Melbourne is expected to be adequate to cater for bulk transfer and supply of water to 2026. Some renewal works will be carried out as part of Water Plan 3.

MWC is planning to replace the existing Punt Road main in approximately the next two to three years largely with the same diameter. MWC has reported that in the long term and at times of peak demand there is limited capacity in the Punt Road main due in part to growth in Southbank.

Preliminary investigations indicate there is currently more capacity in the Footscray Transfer main compared to the Punt Road transfer main.

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3.3.2 SE Water Assets

In the medium term, SE Water is upgrading a 700 metre section of the existing 450/375mm water main located in Cecil Street. This will provide the equivalent capacity of a 600mm pipeline between Punt Road and Williams Road.

South East Water has no works planned in the long term.

Major works are generally staged to avoid over investment and to minimise the NPV investment required. Generally, reticulation augmentation is funded by the developer that triggers the upgrade, whereas distribution and transfer asset upgrades are generally funded by the customer rate base under the current regulatory regime.

Planned works in the Fishermans Bend Precinct do not currently take into account anticipated redevelopment.

SE Water is developing an Integrated Water Management (IWM) Strategy to limit the loading on their transfer systems which would allow SE Water to defer augmentation works as well as reduce the demand on water resources.

3.3.3 CWW Assets

MWC has reported that CWW has connections across Queens Bridge and Charles Grimes bridge or 600mm and 375mm diameters respectively. The Footscray transfer main that supplies water to CWW’s network within the CBD should be considered as an alternative option to an additional connection to the Punt Road transfer main if it is determined that additional water supply is required in the Fishermans Bend Precinct to cater for growth.

City West Water has recently renewed the 600mm MSCL Williams Road pipeline through replacement with a main of the same diameter.

3.4 General Requirements

SE Water, in accordance with the Water Act, does not guarantee that water mains are sized for fire fighting. The minimum reticulation water main size for commercial, high density development is 150mm. In SE Water’s experience, it is common that developers elect to fund up sizing of reticulation assets where there is capacity available to avoid or minimise onsite tanks for fire fighting and fire pumps.

Typically, major water infrastructure is located in road reserves. Any asset owned and maintained by SE Water that traverses privately or Government owned land is likely to require an easement to provide unrestricted access in the event of required works. Restrictions and conditions may be associated with any easement and would require negotiation with SE Water during detailed design.

Owners must provide easements over all proposed and existing water, recycled water mains and sewers not located within road reserves on the formal plans of subdivision at no cost to the water retailer.

3.5 Redevelopment Scenarios

The higher the growth intensity in a specific infill area the more likely it is to trigger a system upgrade. There are generally high costs associated with works in infill areas.

There is likely to be an increase in hydraulic loads on the water supply system especially in the higher density development scenarios.

The following sections outline upgrade works to the conventional water supply system that SE Water considers would be required to support expected growth. The impact of a dual water supply system has not been considered in the below indicative upgrades.

The upgrade works included below are considered shared works and in general, shared works are funded by the water authority through new customer contributions. However, these works are not included in SE Water’s next two water plans. This means that if any of the below works were required within the next ten years, there may be costs attributable to developers due to the works being ‘brought forward’. Refer to Section 3.6.2 for details of the cost implications associated with shared works occurring out of sequence.

3.5.1 Impacts of Incremental Redevelopment Scenario

The growth anticipated in the Incremental Redevelopment Scenario would be equivalent to a peak hourly demand of approximately 5 ML/d which could be supplied from existing infrastructure.

3.5.2 Impacts of Low Density Redevelopment Scenario

The growth anticipated in the Low Density Redevelopment Scenario would be equivalent to a peak hourly demand of approximately 50 ML/d which would require a new 600mm pipeline between Punt Road and the Fishermans Bend Precinct.

3.5.3 Impacts of Medium Density Redevelopment Scenario

The growth anticipated in the Medium Density Redevelopment Scenario would be equivalent to a peak daily demand of approximately 50 ML which would require a 17ML underground storage tank and a new 600mm pipeline between Punt Road and the Fishermans Bend Precinct.

3.5.4 Impacts of High Density Redevelopment Scenario

The growth anticipated in the High Density Redevelopment Scenario would be equivalent to a peak daily demand of approximately 70 ML which would require a 25ML underground storage tank and a new 800mm pipeline between Punt Road and the Fishermans Bend Precinct.

3.5.5 Alternative Supply Augmentation from CWW Network

The Footscray transfer main that supplies water to CWW’s network within the CBD should be considered as an alternative option to an additional connection to the Punt Road transfer main if it is determined that additional water supply is required in the Fishermans Bend Precinct to cater for growth. Augmentation of CWW’s distribution and reticulation networks may be required.

MWC reports that preliminary investigations indicate there is currently more capacity in the Footscray Transfer main compared to the Punt Road transfer main which may have limited capacity in the long term / at peak demand due to growth in Southbank.

Further modelling and investigation would be undertaken by Melbourne Water, City West Water and South East Water to determine the most appropriate method of water supply to the Fishermans Bend Precinct.
3.6 Cost Allocation

3.6.1 General
Planning Referral responses to the relevant Council in accordance with Section 56 of the Planning and Environment Act 1987 generally requires that any developer of subject land, must enter into an agreement with South East Water to provide water, recycled water and sewer services and meet all requirements to SE Water’s satisfaction.

While SE Water has a general contributions policy, as detailed in the following section, specific details of the financial, servicing and special conditions that the developer must meet are described in the Development Deed, produced as part of any development.

Developers must meet all of these conditions before SE Water will issue its consent to the issuing of a Statement of Compliance to Council, as required by section 57 of the Subdivision (Procedures) Regulations 1989.

Where existing water and / or recycled water mains need to be realigned or abandoned due to the redevelopment or changes to the subdivision of land, the owners must pay all costs associated with such works.

3.6.2 SE Water Contributions Policy
SE Water has reported that developers in the Fishermans Bend Precinct will be required to make standard regulated development contributions as well as fund the construction of the water reticulation network within developments.

SE Water and developers provide services in accordance with Essential Services Commission’s Guidelines as detailed below:

- SE Water is responsible for providing shared distribution assets and temporary shared works.
- Developers are responsible for providing reticulation assets and temporary reticulation works (these assets are generally known as ‘gifted assets’).
- Developers are responsible for the financing costs associated with bringing forward the provision of shared distribution assets and temporary shared works.
- Developers are responsible for the cost of connecting their development to the SE Water’s shared infrastructure assets.
- Developers are responsible for the installation and financing of dedicated assets to service their development.

Shared distribution assets are infrastructure assets that are generally provided for more than one development and do not include:

- Reticulation assets
- Headworks and tailworks

Headworks and tailworks are infrastructure assets that are owned by a water and sewerage wholesaler (MWC) and may include major water supply reservoirs, raw sewage transfer pump stations, and major waste water purification plants and disposal systems.

SE Water is responsible for providing shared distribution assets which are funded by New Customer Contributions.

Where shared distribution assets are required to be installed South East Water will refund the developer the estimated or tendered value of the works, including an allowance of 8% for design, project management, and survey costs.

Asset size thresholds are for guidance only. The key determinant of whether an asset is a reticulation asset or a shared asset is the number of developments it serves. A reticulation asset is the minimum sized asset to serve one development.

If the asset has been upsized in any way from the minimum requirements to serve the development or had its location or route altered to serve future developments it should be considered a shared asset.

New Customer Contributions
SE Water may levy new customer contributions by scheduled or non-scheduled charges. Non-scheduled charges may be applied if the financing costs associated with South East Water bringing forward the provision of shared distribution assets and/or temporary shared works to an out-of-sequence development exceed the approved scheduled charge.

The percentage cost that may be levied as a non-scheduled charge is determined based on the timing of planned works in terms of logically sequenced network expansion. Typically the following applies:

- 0 - 5 years = 0% bring forward charge
- Over 5 and up to 15 years = 40% bring forward charge
- Greater than 15 years = 70% bring forward charge

New customer contributions are charged on an allotment basis where a lot is defined as separately titled property or any dwelling that can be separately metered. New customer contributions for water and recycled water are set out in Table 11.

Table 11 New Customer Contributions for Water and Recycled Water

<table>
<thead>
<tr>
<th>Lot Size</th>
<th>Potable Water</th>
<th>Recycled Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small lots &lt; 450sq.m</td>
<td>$608</td>
<td>$608</td>
</tr>
<tr>
<td>Standard lots: 450sq.m to 1,350sq.m</td>
<td>$1,216</td>
<td>$1,216</td>
</tr>
<tr>
<td>Large lots &gt; 1,350sq.m</td>
<td>$2,432</td>
<td>$2,432</td>
</tr>
</tbody>
</table>

*If recycled water supply is included as part of a development, the scheduled charge per lot for potable water is halved.

Application Fees
Application fees are required to be paid by developers in accordance with SE Water’s Land Development Policies and Pricing Manual.

Application fees may be charged due to:

- A connection to / extension of SE Water’s network(s)
- Early release of a Statement of Compliance
- Audit
- Supply of pressure and flow information / development deed
- Build over or creation of an easement
- Operations and maintenance for temporary works
4. Sewerage

4.1 Responsible Authorities

Melbourne Water Corporation (MWC) is responsible for the trunk sewerage network in the Fishermans Bend Precinct. South East Water Corporation (SE Water) is the water retailer responsible for distribution and reticulation infrastructure.

4.2 Existing Conditions

Existing sewerage assets and associated easements are shown in Appendix B. SE Water’s sewer system consists of a sparse network which currently services predominantly large industrial sites.

The MWC Melbourne Main sewer runs south from the Yarra River to Fennell Reserve and through to Swallow Street, where it connects to the MWC Hobsons Bay Main.

MWC has recently completed the Melbourne Main sewer replacement to mitigate hydraulic constraint in the sewerage system. The new sewer main has three times the capacity of the original brick-lined sewer and MWC reports that for construction reasons it is larger than the size likely to be required hydraulically.

The MWC Hobsons Bay Main runs along Swallow Street from the south east, through the Garden City Reserve and then along Howe Parade towards Spotswood alongside the electricity transmission tower line and the gas transmission pipeline.

4.3 Planned Upgrades

The Hobson’s Bay Main Sewer Yarra Crossing Rehabilitation and Duplication project is included in MWC’s current 20 Year Capital Plan. This project is driven by asset condition but may also address capacity constraints in the system. There will be on-going expenditure to carry out investigations and inspections on the crossing. The proposed project completion time is in approximately 2020/21.

Any future renewal works planned for the Hobson’s Bay Main would take into account growth. Any demand forecast information that can be provided to Melbourne Water will allow the size of augmentation works to be optimised.

Some allowance has been made by SE Water in Water Plan 3 for works in established areas with high anticipated growth such as works to increase the capacity of the sewerage network in Southbank. SE Water expects that there will be some reticulation upgrades in the medium term to support new development. These works are likely to be triggered by Port augmentation resulting in protection works for the Hobson’s Bay Main, hydraulic overloading of the existing sewerage network or surcharging / spilling that is not acceptable under EPA regulations.

Major works are generally staged to avoid over investment and to minimise the NPV investment required. Generally, reticulation augmentation is funded by the developer that triggers the upgrade, whereas distribution and transfer asset upgrades are generally funded by the customer rate base under the current regulatory regime.

SE Water’s planned works in the Fishermans Bend Precinct do not currently take into account anticipated redevelopment.

4.4 General Requirements

The higher the growth intensity in a specific infill area the more likely it is to trigger a system upgrade. High growth in established areas can be an issue particularly in suburbs with ageing networks. The capacity, condition and age of existing networks and any network augmentation would be assessed on receipt of an application from a developer.

Delays to the timing of anticipated growth can have a significant impact on sewerage networks. If the sewerage system is too under loaded awaiting growth, sewage residence times in pipelines increase resulting in sewage becoming anaerobic. This can generate odours and cause corrosion of sewerage infrastructure.

Typically, major sewerage infrastructure is located in road reserves. Any asset owned and maintained by SE Water that traverses privately or Government owned land is likely to require an easement to provide unrestricted access in the event of required works. Restrictions and conditions may be associated with any easement and would require negotiation with SE Water during detailed design.

4.5 Redevelopment Scenarios

SE Water has reported there is likely to be a reduction in organic sewage loads due to reduction in trade waste as land use changes from predominantly industrial and manufacturing use to residential and mixed use redevelopment. This will result in an increase in hydraulic loads on the sewerage system especially in the higher density development scenarios.

As a result of the recently completed Melbourne Main Sewer upgrade works, SE Water does not anticipate that there are any major works required in the Fishermans Bend Precinct to support redevelopment.

Upgrades and extensions of SE Water’s reticulation network are likely to be required to support redevelopment.

4.6 Cost Allocation

4.6.1 General

SE Water’s Planning Referal responses to the relevant Council in accordance with Section 56 of the Planning and Environment Act 1987 generally requires that any developer of subject land, must enter into an agreement with South East Water to provide water, recycled water and sewer services and meet all requirements to SE Water’s satisfaction.

As for water supply, while SE Water has a general contributions policy, as detailed in the following section, specific details of the financial, servicing and special conditions that the developer must meet are described in the Development Deed, produced as part of any development.

Developers must meet all of these conditions before SE Water will issue its consent to the issuing of a Statement of Compliance to Council, as required by section 57 of the Subdivision (Procedures) Regulations 1989.

Where existing sewerage assets need to be realigned or abandoned due to the redevelopment or changes to the subdivision of land, the owners must pay all costs associated with such works.
4.6.2 SE Water Contributions Policy

Developers are required to make standard regulated development contributions as well as fund the construction of the sewerage network within the development. The minimum reticulation sewer main size for commercial, high density development is 225mm.

Asset size thresholds are for guidance only. The key determinant of whether an asset is a reticulation asset or a shared asset is the number of developments it serves. A reticulation asset is the minimum sized asset to serve one development.

SE Water and developers provide services in accordance with Essential Services Commission’s Guidelines as detailed below:

- SE Water is responsible for providing shared distribution assets and temporary shared works.
- Developers are responsible for providing reticulation assets and temporary reticulation works (these assets are generally known as “gifted assets”).
- Developers are responsible for the financing costs associated with bringing forward the provision of shared distribution assets and temporary shared works.
- Developers are responsible for the cost of connecting their development to the SE Water’s shared infrastructure assets.
- Developers are responsible for the installation and financing of dedicated assets to service their development.

Shared distribution assets are infrastructure assets that are generally provided for more than one development and do not include:

- Reticulation assets
- Headworks and tailworks

Headworks and tailworks are infrastructure assets that are owned by a water and sewerage wholesaler (MWC) and may include major water supply reservoirs, raw sewage transfer pump stations, and major waste water purification plants and disposal systems.

SE Water is responsible for providing shared distribution assets which are funded by New Customer Contributions.

Where shared distribution assets are required to be installed South East Water will refund the developer the estimated or tendered value of the works, including an allowance of 8% for design, project management, and survey costs.

If the asset has been upsized in any way from the minimum requirements to serve the development or had its location or route altered to serve future developments it should be considered a shared asset.

New Customer Contributions

SE Water may levy new customer contributions by scheduled or non-scheduled charges. Non-scheduled charges may be applied if the financing costs associated with South East Water bringing forward the provision of shared distribution assets and/or temporary shared works to an out-of-sequence development exceed the approved scheduled charge.

The percentage cost that may be levied as a non-scheduled charge is determined based on the timing of planned works in terms of logically sequenced network expansion. Typically the following applies:

- 0 - 5 years = 0% bring forward charge
- Over 5 and up to 15 years = 40% bring forward charge
- Greater than 15 years = 70% bring forward charge

New customer contributions are charged on an allotment basis where a lot is defined as separately titled property or any dwelling that can be separately metered.

New customer contributions for sewerage are set out in Table 12.

### Table 12 New Customer Contributions for Sewerage

<table>
<thead>
<tr>
<th>Lot Size</th>
<th>Sewerage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small lots &lt; 450sq.m</td>
<td>$608</td>
</tr>
<tr>
<td>Standard lots: 450sq.m to 1,350sq.m</td>
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</tr>
<tr>
<td>Large lots &gt; 1,350sq.m</td>
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</tr>
</tbody>
</table>

Application Fees

Application fees are required to be paid by developers in accordance with SE Water’s Land Development Policies and Pricing Manual.

Application fees may be charged due to:

- A connection to SE Water’s network(s)
- Extension of SE Water’s network(s)
- Early release of a Statement of Compliance
- Audit
- Supply of pressure and flow information
- Build over or creation of an easement
- Operations and maintenance for temporary works
- Issue or revision of a development deed
- Sewage eduction

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9 Shared assets are often 225 mm diameter and above for water and 300 mm diameter and above for sewer, however this is not guaranteed
5. Integrated Water Management

5.1 A Holistic Approach

Consideration of innovative urban water management strategies individually can mean that they are not considered to be economically feasible. However, if consideration is given to the liveability of the urban environment and reducing the carbon intensity of any development, alternative water management strategies become a lot more attractive.

CoM suggests that in any Integrated Water Management Strategy or Structure Plan prepared for the Fishermans Bend Precinct, flood risk management and the heat island effect should be considered to ensure a holistic strategy is implemented in the area that will take into account uncertainty related to climate change and carbon constraints.

5.2 The Office of Living Victoria

The Office of Living Victoria (OLV) within the Department of Sustainability and Environment has been created as a result of the Living Victoria Ministerial Advisory Council recommendations. Its role is to drive reform through integration of urban and water planning. The intention of OLV is to focus on integrated water planning, including the development of integrated water cycle plans for inner Melbourne10. OLV will also prepare a regulatory impact statement for building controls to improve the water performance of new buildings and work with the Department of Planning and Community Development to amend Victorian planning provisions to improve stormwater management11.

It is recommended that OLV is consulted as part of the conceptual and feasibility stages of the Fishermans Bend Precinct.

5.3 Existing Schemes

There is a small recycled water system being developed by SE Water for the Docklands and a major recycled water system for the southern city region is being investigated. If a precinct wide recycled water scheme was implemented in the Fishermans Bend Precinct by SE Water it is likely that there would be mandated connection of new buildings within the precinct to the recycled water network with supply of Class A water for non potable uses.

SE Water is also investigating reticulated hot and cold water for distributed building heating and cooling in the Southbank Precinct.

5.4 Opportunities

CoPP would support adoption of any relevant integrated water management opportunities such as raingardens, porous pavements, wetlands, green infrastructure, water recycling and on site treatment. CoPP consider that it will be important to consider integrated infrastructure options to support emerging opportunities to deliver distributed water and energy solutions in the Fishermans Bend Precinct.

SE Water believes there are opportunities for synergies with the Southbank and Docklands precincts which may make an IWM approach to servicing more viable. Involvement of Places Victoria in the identification, assessment and implementation of an IWM approach to the Fishermans Bend Precinct and surrounding areas would be welcomed by SE Water.


11 Premier of Victoria Media Release ‘CEO Announced for Office of Living Victoria’ 2 July 2012
6. Electricity

6.1 Responsible Authorities

The majority of the transmission network in Victoria is owned, maintained and operated by SPI PowerNet. The assets that SPI PowerNet owns, maintains and operates include terminal stations as well as transmission lines, which connect the power stations to the terminal stations. The distribution network connects to the Terminal Stations, and extends to the individual properties. Within metropolitan Melbourne there are five distribution businesses that own, operate and maintain the distribution network. The relevant distribution business in the Fishermans Bend Precinct is CitiPower.

The distribution network comprises of a number of components:

- Sub-transmission lines that connect Terminal Stations to Zone Substations
- Zone substations
- Distribution Feeders – either overhead or underground lines that connect Zone Substations to Local Substations
- Substations – indoor, kiosk or pole mounted
- Low Voltage Powerlines – either overhead lines or underground cables connecting the substations to the customers

The components of the transmission and distribution networks are broadly described in Figure 4.

![Figure 4 Typical Electricity Transmission and Distribution Network](image)

Source: CitiPower 2011 'Distribution System Planning Report' p10

6.2 Existing Conditions

Existing electricity assets and associated easements are shown in Appendix B.

6.2.1 Terminal Substations

The Fishermans Bend 220/66kV Terminal Substation (FBTS) is located to the west of the Lorimer Precinct, bound by Turner Street to the north, the CityLink Tollway to the east and the Princes Highway to the south. The footprint of FBTS is approximately 3.5 hectares. FBTS is outside the Fishermans Bend Precinct.

SPI PowerNet is the owner of the FBTS. The FBTS converts electrical energy from 220kV to 66kV and supplies the CitiPower and Powercor electricity distribution networks which in turn supply the neighbouring areas. The FBTS is connected to the electricity transmission network via a double circuit 220kV tower line through the Wirraway precinct to Newport Terminal Station (NPTS) and to Brooklyn Terminal Station (BLTS). A second double circuit 220kV tower line runs north from the FBTS to the north to connect with West Melbourne Terminal Station (WMTS).

The terminal stations listed above form part of a 220kV loop extending from the Keilor Terminal Station (KTS). The KTS forms part of the 500kV high capacity network which delivers power to western Melbourne.

The existing transmission network and terminal stations are shown in Figure 5.

![Figure 5 Metropolitan Area Electricity Transmission](image)


SPI PowerNet would require that transformer access routes to the FBTS are maintained. FBTS has three 150 MVA 220/66 kV transformers that supplies the 66 kV load. The installed N-1 Summer capacity is presently 346MVA.

Existing spare capacity (as at 2011) for the FBTS is 59MVA.
6.2.2 Zone Substations
The nearest existing zone substations to the Fishermans Bend Precinct and their attributes are listed in Table 13.

Table 13 Zone Substation Attributes

<table>
<thead>
<tr>
<th>Zone Substation</th>
<th>Rating</th>
<th>Present Loading</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>E Zone Substation (E)</td>
<td>22 MVA</td>
<td>7.4 MVA</td>
<td>6.6 kV supply</td>
</tr>
<tr>
<td>West Gate Zone Substation (WG)</td>
<td>72 MVA</td>
<td>40 MVA</td>
<td>11 kV supply</td>
</tr>
<tr>
<td>Port Melbourne Zone Substation (PM)</td>
<td>28 MVA</td>
<td>17 MVA</td>
<td>6.6 kV supply</td>
</tr>
<tr>
<td>Fishermans Bend Zone Substation (FB)</td>
<td>64 MVA</td>
<td>25 MVA</td>
<td>11 kV supply</td>
</tr>
<tr>
<td>Montague Zone Substation (MG)</td>
<td>62 MVA</td>
<td>45 MVA</td>
<td>11 kV supply</td>
</tr>
<tr>
<td>Docklands Substation (DLF)</td>
<td>unknown</td>
<td>unknown</td>
<td>22 kV supply</td>
</tr>
</tbody>
</table>

The existing spare capacity for the zone substations (not including the Docklands Substation) is 114 MVA.

6.2.3 Existing Assets
SPI PowerNet owns the 220kV transmission tower lines. The Australian Energy Market Operator (AEMO) is responsible for the augmentation planning of the shared transmission network, including the 220kV tower lines and 220kV terminal station assets. CitiPower is responsible for the connection and distribution asset augmentation planning at FBTS, including the 220/66kV transformers, and own and operate the 66kV electricity distribution circuits supplied from FBTS.

In addition to the 220kV transmission tower line, SPI PowerNet also owns overhead and underground optic fibre cables which are located in the Wirraway, Montague and Sandridge Precincts.

The 220kV transmission tower line extends from the north from WMTS across the Yarra River alongside the Bolte Bridge to FBTS. This 220kV transmission tower line then extends from FBTS across the Princes Highway and Westgate Freeway, along Woolboard Road and then alongside the Westgate Freeway to the west, to NPTS and BLTS.

The existing transmission network and terminal stations are shown in Figure 5.

Transmission Easements
The corridors of land that contain transmission towers and power lines are referred to as transmission line easements. Easements secure a ‘right of way’ for the safe transmission of power.

Usually SPI PowerNet doesn’t own the land contained within the easement; rather, they have acquired rights for its use by agreement with and compensation of the original landowner, for maintenance and access to the network. There are restrictions relating to what activities can occur within SPI PowerNet’s easements and what is located within easements.

Indicative easement widths based on the type of tower are shown in Figure 6. The transmission power line that bisects the northern part of the Wirraway Precinct is a 220kV double circuit tower line and has reported that it has a nominal 36 metre wide easement.

6.3 Planned Works

6.3.1 Short Term (< two years)
There are no works planned in the short term at either the terminal or zone substation level. At the local substation level, works are carried out as a result of customer applications.

6.3.2 Medium Term (3 – 9 years)
In the medium term, one 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 around 2019 to replace aged assets with increased failure rates. These upgrade works are likely to take three years to complete and to cost in the order of $25 million.

The ‘Joint Regulatory Test Report of the Western Metropolitan Melbourne Transmission Connection and Subtransmission Capacity’ (AEMO, Jemena and Powercor) reports that a new Deer Park terminal station (DPTS) will be constructed for service by the end of 2016 with two 225MVA 220/66kV transformers initially supplied by the No. 2 Geelong – Keilor 220kV transmission line. The DPTS will relieve forecast overloads at the KTS.
6.3.3 Long Term (10+ years)
In the long term, a fourth transformer will be installed at the FBTS and additional circuit breakers will be replaced. These two projects are expected to cost in the order of $20 million and $15 million respectively.

CitiPower notes that the level of augmentation required will result in increased fault levels exceeding the existing fault level capacity at the terminal station (FBTS).

Joint planning with many stakeholders such as Councils, developers, SPI PowerNet, AEMO and CitiPower will be required to develop a solution to manage the fault levels at FBTS. The E Zone and Port Melbourne Zone Substations are aging assets that need to be offloaded so they can be rebuilt and their feeder systems upgraded from 6.6kV to 11kV or 22kV.

It is likely to take five years for each of the zone substation upgrades and it is expected to cost in the order of $50 million for each zone substation to be converted. These works are expected to take place within the next 10 – 15 years. The conversion of the zone substations to 69kV is likely to be staged to facilitate offloading prior to the conversion works taking place. CitiPower would prefer to build a new substation on a site nearby to enable supply to be maintained during works.

Site inspections indicate a potential site for a new terminal station employing conventional outdoor switchgear (similar to FBTS) may exist in the vicinity of existing Tower 9 (Melway map reference 56F2). Indicative costs for such an installation are $65 million excluding costs associated with planning permission and site acquisition. A compact indoor terminal station within or close to the high density development zone may cost $150 million excluding costs associated with planning permission and site and easement acquisition.

All of the above works would be triggered by the annual cost of expected unserved energy exceeding the annual cost of a project according to probabilistic planning criteria of the failure of major plant to ensure supply security. These planned works will address the expected unserved energy due to loss of plant and do not take into account the redevelopment scenarios provided for the Fishermans Bend Precinct. However, ongoing joint planning with SPI PowerNet, CitiPower and AEMO ensures that future plans and demand growth are considered for all investment decisions.

In AEMO’s ‘Vision 2030’ planning document (Update 2009), the KTS to WMTS to FBTS 220kV transmission lines are included as likely to be upgraded. These upgrades are not expected to be undertaken prior to 2019 based on AEMO’s demand forecasts.

Undergrounding of Existing Overhead Assets

There are no planned undergrounding works in the Fishermans Bend Precinct. The majority of electricity assets within the Fishermans Bend Precinct are overhead, with the exception of underground lines in Lorimer Street.

Undergrounding of existing overhead assets would need to be fully funded by the developer. Costs vary according to the type and location. Any undergrounding of low voltage assets would involve substantial costs to replace service wires.

6.4 Redevelopment Scenarios

6.4.1 General
In general, CitiPower believes that high growth could be accommodated within its network, provided there is sufficient time to plan for the development. By way of example, a zone substation can take at least five years to plan and construct, provided there are no issues with finding and acquiring land and securing 66 kV line routes.

New 11kV feeders and local substations will be required to match the load generated by redevelopment as in CitiPower’s experience existing local substations are rarely located appropriately to suit redevelopment master plans.

One issue that is particularly pertinent to CitiPower is that associated with the procurement of land both for installations such as zone substations and distribution feeders. Additional supply lines or cables, if required, will generally need to be brought through existing developed areas, which can cause some disruptions for the residents of the existing developed areas and also add to the construction cost.

6.4.2 Impacts of Incremental Redevelopment Scenario
CitiPower has estimated that 5,000 dwellings (at a loading of 3kVA per dwelling) will result in an additional load of 15MV.A. Similarly, 6,000sqm of commercial and retail development (at a loading of 90VA/sqm) will result in an additional load of 5.4MV.A. In total, for the incremental growth redevelopment scenario the additional power requirement will be approximately 20.4MV.A. This figure is the average peak demand that the system would be designed to cater for.

This will result in a situation where:
- New 11kV feeders and local substations will be required to match the load generated by redevelopment
- Supply will continue to be from existing zone substations
- Supply will continue to be from the existing FBTS

6.4.3 Impacts of Low Density Redevelopment Scenario
CitiPower has estimated that 20,000 dwellings (at a loading of 3kVA per dwelling) will result in an additional load of 60MV.A. Similarly, 120,000sqm of commercial and retail development (at a loading of 90VA/sqm) will result in an additional load of 10.8MV.A. In total, for the incremental growth redevelopment scenario the additional power requirement will be approximately 70.8MV.A.

This will result in a situation where:
- New 11kV feeders and local substations will be required to match the load generated by redevelopment
- Supply will continue to be from existing zone substations with some upgrading required
- This scenario is likely to trigger the standby transformer at the FBTS being placed on load as discussed in Section 6.3.

6.4.4 Impacts of Medium Density Redevelopment Scenario
CitiPower has estimated that 40,000 dwellings (at a loading of 3kVA per dwelling) will result in an additional load of 120MV.A. Similarly, 200,000sqm of commercial and retail development (at a loading of 90VA/sqm) will result in an additional load of 18MV.A. In total, for the incremental growth redevelopment scenario the additional power requirement will be approximately 138MV.A.

This will result in a situation where:
- New 11kV feeders and local substations will be required to match the load generated by redevelopment

[...]
6.4.5 Impacts of High Density Redevelopment Scenario

CitiPower has estimated that 60,000 dwellings (at a loading of 3kVA per dwelling) will result in an additional load of 180MVA. Similarly, 300,000sqm of commercial and retail development (at a loading of 90VA/sqm) will result in an additional load of 27MVA. In total, for the incremental growth redevelopment scenario the additional power requirement will be approximately 207MVA.

This will result in a situation where:

- New 11kV feeders and local substations will be required to match the load generated by redevelopment
- This scenario is likely to trigger the E Zone and Port Melbourne zone substations being converted into 11kV zone substations as discussed in Sections 0 and 6.3
- This scenario is likely to trigger the standby transformer at the FBTS being placed on load and a fourth transformer being added to the FBTS as discussed in Section 6.3

6.4.6 Spatial Requirements

Spatial requirements for augmentation works to support redevelopment of the Fishermans Bend Precinct include:

- Building space for new local substations
- Road reserve space for underground cables
- A new location for a substation close to the Port Melbourne (PM) zone substation to facilitate its rebuilding. If a new location is not available, a temporary substation will need to be located in the vicinity to enable offloading of the PM zone substation during the rebuild on the existing site

6.4.7 Impacts due to Redevelopment of the Wirraway Precinct

Redevelopment of the Wirraway Precinct may impact approximately 2km of the existing 220kV FBTS – NPSD/BTLS double circuit tower line located in Wool Board Road, Rocklea Drive and the easement to Todd Road. This double circuit tower line has a nominal 36 metre easement width and since construction the surrounding area has been heavily developed.

Existing assets in the Wirraway Precinct are shown in Figure 7.

The following options to relocate the existing 220kV FBTS – NPSD/BTLS double circuit tower line were identified by SPI PowerNet based on a high level review of the neighbourhood. The costs are indicative and high level and should be used for comparative purposes only. These costs are subject to change.

New Tower Line South of Freeway

- A new 36m wide double circuit easement and new transmission tower line, free of encumbrance from existing Tower 9 along the southern side of the freeway to existing Tower 15 must be created prior to decommissioning and removal of the existing tower line
- Desktop design and construction estimate of $15M excludes costs associated with planning permission and easement acquisition

New Tower Line North of Freeway

- A new 36m wide double circuit easement and transmission tower line, free of encumbrance from existing Tower 9 over freeway near Todd Road then via tower line generally along Cook St to new tower on north side of Freeway opposite existing Tower 15 must be created prior to decommissioning and removal of the existing tower line
- Desktop design and construction estimate of $25M excludes costs associated with planning permission and easement acquisition

Two New Underground Cables South of Freeway

- Two new 9m wide underground cable easements and transmission cables, free of encumbrance from existing Tower 9 along the southern side of the freeway to existing Tower 15 must be created prior to decommissioning and removal of the existing tower line. A separate easement is required for each 220kV underground circuit. The easements will require re-instatement of existing roadways
7. Gas Supply

7.1 Responsible Authorities

The transmission of natural gas involves transporting gas through pipelines from extraction to reticulation processing facilities at city gates or field regulators, and direct supply to major customers, including distribution businesses. APA GasNet is the transmission pipeline network asset owner.

Gas is depressurised at city gates and field regulators to appropriate pressures for the distribution of gas to final users which can include commercial and industrial users as well as residential users. Gas is transported in smaller volumes and at lower pressures through the distribution networks than along the transmission pipelines.

The asset manager organisation Zinfra is responsible for the gas distribution assets in the Fishermans Bend Precinct on behalf of MultiNet Gas, the asset owner.

7.2 Existing Conditions

Existing gas supply assets and associated easements are shown in Appendix B.

7.2.1 Transmission Network

There are no gas transmission pipelines within the Lorimer Precinct.

A 150mm diameter gas transmission pipeline extends along Boundary Street to the Symex site, which has an onsite 4.5 MW co generation facility that generates steam and power. From Boundary Street, a 750mm diameter transmission pipeline extends along Buckhurst Street and then runs south along Railway Place to the edge of the precinct. A gas transmission pipeline also crosses the east-western corner of the Montague Precinct along Cecil Street.

In the Sandridge Precinct, a gas transmission line extends along Boundary Street from the south to approximately fifty metres north of Munro Street. In the Wirraway Precinct, a 750mm diameter gas transmission pipeline runs along the extension of Howe Parade through the Melbourne Grammar Sportsground, extending along what would be the extension of Howe Parade, then along the same alignment as the overhead electricity cables to the west. This gas transmission line bisects the south west corner of the Wirraway Precinct. This pipeline is protected by an easement within the privately owned sportsground property; however there is no APA GasNet easement in the municipal reserve bounded by Williamstown Road and Howe Parade.

The 750mm diameter gas transmission main that passes through the Montague and Wirraway Precincts is a major APA GasNet asset that provides gas supply to approximately one third of Melbourne customers, as well as Ballarat, Bendigo and Geelong. This asset was constructed in the late 1960s. Where an easement is registered on title or the gas transmission main is located within Crown Land, APA GasNet has the right to review/approve any development proposals under the Pipelines Act.

This pipeline is considered by APA GasNet to be a major asset and pipeline protection works may be required for asset integrity and public safety reasons.

7.2.2 Distribution Network

The existing gas distribution network in the Fishermans Bend Precinct consists of low, medium and high pressure gas mains.
The Lorimer Precinct has medium pressure gas mains running along Ingles Street, and a network of high pressure gas mains servicing the properties along South Wharf Drive and Lorimer Street and extending to the medium pressure gas network in Rogers Street. There are no low pressure gas mains in the Lorimer Precinct.

The Montague Precinct has an extensive low pressure gas network, a section of medium pressure gas mains in the south west end of Thistledewtuwa Street and high pressure gas mains along sections of Buckhurst, Ferrars, Munro, Montague, Johnson and Boundary Streets and Normanby Road.

The Sandridge Precinct has an extensive high pressure gas network, with mains located along sections of White, Munro, Boundary, Woodruff, Bertie, Plummer and Bridge Streets. A medium pressure gas network runs generally along Ingles Street from the north to the south of the precinct. There are no low pressure gas mains in the Sandridge Precinct.

The Wirraway Precinct has a high pressure gas network, with mains located along sections of Salmon, Plummer, Smith, Prohasky Streets and Woolboard Road. There are no medium or low pressure gas mains located in the Wirraway Precinct.

7.3 Redevelopment Scenarios

7.3.1 General

The existing gas infrastructure capacity is highly variable and specific to precise locations across the low, medium and high pressure networks that traverse the Fishermans Bend Precinct. Generally the amount of gas load that could be accommodated if evenly distributed across existing mains would not equate to even the smallest load scenario of 5000 dwellings. Consequently mains augmentations are likely to be necessary for all four redevelopment scenarios outlined in Section 1.6. No works for expansionary forward planning that incur capital expenditure are planned at this time. Zinfra is generally reactive in its forward planning for network expansion and can only be conducted once for example gas use forecasts are available (e.g. number of dwellings, where and when).

Augmentation of the network would be achieved most cost effectively through expanding the high pressure network. Upstream field regulator augmentation works may be required to differing extents for each of the scenarios. Little of the costs for the above works are likely to be incurred by applicants as the volume based tariffs for non-industrial consumers typically recover costs for such works (refer to Table 14 for details of typical gas tariff arrangements).

The scale of works would dictate the period over which works are undertaken post receipt of acceptance of a supply offer issued via a retailer. Zinfra notes that the range for connection and extension works to service a new development is typically between two and six months. The need for high pressure gas to developments within the Fishermans Bend Precinct will be contingent upon the proposed usage of each development and installation of any commercial kitchen type fittings.

An extension from the MultiNet sub transmission main located in Bay Street, Port Melbourne may be required to support gas supply to the Fishermans Bend Precinct if the supply required exceeds the available capacity of the network.

APA GasNet does not anticipate that there would be any additional transmission mains required to support the redevelopment scenarios assuming no transmission pipeline pressure customers are likely in the precinct (e.g. for Gas-Fired Power Stations).

7.3.2 Zinfra Fishermans Bend Contribution Estimate

Changes in current land use such as amendments to the layout of the road network within the Fishermans Bend Precinct may result in easements being granted in favour of MultiNet Gas and APA GasNet to protect their assets.

Currently, the Crown Land Agreement between the gas authorities and the State Government gives the same rights to authorities as they would have if they had a registered easement. If the land use changed, then easement, licence or lease arrangements may need to be formalised.

Clearances to gas assets need to be maintained for asset integrity reasons, but also in the interest of public safety. This is of particular importance for transmission mains.

7.3.3 Pipeline Relocations

In the instance that redevelopment of the Fishermans Bend Precinct necessitates the relocation of a gas pipeline, the following points should be considered:

- Zinfra anticipates that the majority of their infrastructure would be constructed in registered road reserves
- APA GasNet prefers that transmission assets are not constructed in road reserves, but rather, are constructed within registered easements
- APA GasNet’s preference is that their existing assets not be relocated as any relocation or deepening of transmission mains is expected to be a very costly exercise particularly if mains shutdown is required. Other alternatives may include concrete encasement or recoating their assets

7.3.4 Zinfra Low / Medium to High Pressure Upgrade Program

A program to upgrade the existing low and medium pressure networks to high pressure is underway across Melbourne. The Fishermans Bend Precinct is not within the six year forward planning strategy for this program. Upgrading of the low and medium pressure networks to high pressure as part of this program could be twenty years or more in the future.

7.3.5 Zinfra Fishermans Bend Contribution Estimate

Advice from Zinfra is that it is difficult to estimate contributions required from applicants in the Fishermans Bend Precinct without more detailed information relating to development that will ultimately occur. Costs will vary dependant on the distance, and therefore actual cost to extend the high pressure network and the annual volume demanded by the development.

In total for the Fishermans Bend Precinct, in present value terms it is estimated that approximately $10,000,000 of aggregate chargeable components could be incurred, the large concentrated loads for the largest developments incorporating more than 80% of this total, the
remaining 20% of chargeable shortfalls more evenly distributed across perhaps a hundred or so contributors.

7.4 Cost Allocation

7.4.1 Gas Tariff Arrangements and Applicant Costs

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.

Typically provision of gas is at a lower cost to the asset owner for areas where high pressure gas mains are present or in close proximity. This does not conversely mean that there is a greater likelihood of economic shortfalls payable by applicants in low and medium pressure areas as the cost of reinforcements for smaller consumers (Tv) is borne by the asset owner.

If a higher metering pressure than can be offered by the low pressure or medium pressure network is requested by a developer, there may be a requirement for a mains extension from the nearest high pressure network. This would be economically assessed in accordance with Table 14.

Table 14 Gas Tariff Arrangements

<table>
<thead>
<tr>
<th>Tariff (volume)</th>
<th>Tariff (demand)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing of Extensions</td>
<td>Economic Feasibility Tested</td>
<td>Almost invariably fully chargeable to applicant. Proposal analysed to check if any non-chargeable network benefit would be realised</td>
</tr>
<tr>
<td>Financing of Network Augmentation</td>
<td>Funded by Zinfra (specific case dependent)</td>
<td>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)</td>
</tr>
</tbody>
</table>

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.

Where a request is made for installation of a gas main to a building or site for the purposes of enabling future connection, with no connection requests being current at the time of installation, the full construction cost is passed on to the developer.

Zinfra notes that connections that are located adjacent to existing high pressure mains would not incur any charge assuming they do not require mains extensions and are likely to be Tv customers.

8. Energy Initiatives

8.1 Opportunities

Zinfra and CitiPower have suggested that the following opportunities could be considered for the Fishermans Bend Precinct:

- Centralised strategically positioned co / tri generation
- Natural Gas Cooling
- Distributed Energy
- Natural Gas vehicle home refuelling
- Electric vehicle charging stations, both public and private

An Integrated Demand Management (IDM) Scheme would be one way to maintain electricity network augmentation costs to supply some increasing loads. Each of these opportunities is further discussed in Appendix E.

8.2 Co and Tri Generation

Implications for Gas Network

The introduction of co / tri generation facilities would accelerate the timing of augmentation required for the gas network. The nature of these works would be very much case specific. Cost efficiency would be maximised by earliest possible commitment to a more complete strategy for which loads, sites and road network designs are known to avoid rework and inefficient "duplications".

Assuming co / tri generation would be an additional load to the domestic gas demands; the extent of additional load would determine the network augmentation required and the extent of chargeable shortfalls charged to the applicant. The gas network can be readily augmented to facilitate either multiple site connections or even a single centralised hub concept.

Small scale Gas Powered Generation (GPG) or co / tri generation is likely to require economic feasibility tested calculations for chargeable shortfalls where upstream reinforcement is required. Dedicated infrastructure for the facility would be fully chargeable to the applicant. Dedicated infrastructure may include the service, service regulator(s) and meters.

Zinfra would anticipate that approximately $5,000,000 (on top of the base costs for augmentation of the gas network to cater for the redevelopment scenarios) would be incurred.

Implications for Electricity Network

CitiPower has reported that there is limited fault level capacity in the electricity network. The possibility of co / tri generation connected to the electricity network will depend on the amount of fault level contribution and the associated cost to augment the network. This could be very location specific so needs discussion with AEMO and CitiPower in detail for any proposal.

There are many advantages in connecting on-site generation to the grid. This connection allows excess power to be exported, and also ensures security of supply to customers, and maintains the quality of supply parameters to all customers. CitiPower has reported that on-site generation connected to the grid will increase fault levels and may initiate unplanned augmentation at all voltage levels including the shared 220kV network. The level of planned co / tri generation fault level contribution will determine the level of augmentation required.
As a result, any advantage such as the deferral of augmentation works may be offset by augmentation requirements due to fault level mitigation works. However, as the requirements for embedded generation are likely to increase, the investment required in the network to facilitate these embedded generator connections can be viewed as a necessary feature of future precinct developments.

**Newport Gas-Fired Power Station**

The electricity grid has been designed to cope with the existing Newport Gas-Fired Power Station being synchronised. There could be an opportunity to utilise this asset to increase electricity supply from lower carbon intensity fuels.

This electricity generation facility is owned and operated by TRUenergy. TRUenergy is a gas and electricity retailer with generation and retail assets.

AEMO has the power to call upon the Newport Gas-Fired Power Station for maintaining power system security if the power station is physically available for dispatch at times when it is required.

9. **Shell and BP Pipelines**

9.1 **Responsible Authorities**

The Shell Company of Australia Ltd (Shell) and BP Australia Pty Ltd (BP) operate a number of high pressure licensed pipelines in Victoria. These pipelines contain either crude oil, or refined petroleum products like diesel, petrol, LPG or aviation fuel.

9.2 **Existing Conditions**

The existing 24” Shell WAG Fuel pipeline located parallel to APA GasNet’s gas transmission pipeline crossing the south western corner of the Wirraway Precinct is shown in Appendix F. Note that the map contained in Appendix F indicates that the pipeline is a 4” pipeline but Shell has confirmed that the pipeline diameter is 24”.

BP has indicated that there may be an impact on BP pipelines and that they would need to be consulted at conceptual design stage to ensure that there is no impact on their assets.

9.3 **Redevelopment Scenarios**

9.3.1 **General**

Shell requests that detailed submissions, preferably at the concept stage, of any proposed redevelopment works are submitted to the Shell Pipeline Manager.

To ensure that land use planning, development and subdivision works do not jeopardise the integrity of the Shell pipeline, the safety of the public and the environment, it is critical that land use planners, developers, owners and operators, construction organisations and the general public should take into account the presence of the pipeline in their activities.

Recoating or other asset protection works may be required depending on the proximity and type of redevelopment proposed in the Fishermans Bend Precinct in the vicinity of the pipeline, such including any amendments to the road network. Protection works may include additional protection in the form of a concrete slab cover, increasing the depth or varying the route of the pipeline. The cost of these works would be borne by those initiating the works.

9.3.2 **Spatial Requirements**

**Easements**

Changes in current land use such as amendments to the layout of the road network within the Fishermans Bend Precinct may result in easements being granted in favour of Shell and BP to protect their assets.

The minimum practical width for access and maintenance of pipelines is 6.1 metres but 12 metres is considered by Shell to be a more appropriate easement width.

Any future easement required may be able to be a combined services easement containing the adjacent parallel gas transmission and sewer trunk mains, potentially minimising the land required.

**Clearances**

Clearances to fuel pipelines need to be maintained for asset integrity reasons, but also in the interest of public safety.
10. Telecommunications

As part of this assessment NBNCo and Telstra were consulted in relation to future growth of the telecommunications network in the Fishermans Bend Precinct.

10.1 Responsible Authorities

Traditionally, telecommunications services were delivered by a progression of Government owned organisations, from the Postmaster-General's Department (PMG) through Telecom to Telstra, which we have today. With the advent of mobile telecommunications, plus the introduction of other companies to the fixed line market, there is now a highly competitive Telecommunications industry.

Telstra remains the dominant telecommunications provider, particularly in the fixed line market however, the introduction of the National Broadband Network (NBN) is likely to change that. NBNCo is wholly Government owned, with the role to design, build and operate the NBN. NBNCo will become the wholesale provider of fixed line telecommunications through a network of fibre optic cables to be rolled out over the next 10 or so years.

The key component of the NBN is that it is to be an open access network. This will allow any Retail Service Provider to enter into an access agreement with NBN Co, and ultimately to sell services to consumers. The network is to be a combination of fibre to the premises, fixed wireless and satellite services. The fixed wireless and satellite services are intended for areas where the rollout of fibre optic cable is uneconomical. This represents approximately 7% of premises.

10.2 Existing Conditions

Existing Telstra assets are shown in Appendix B. There is an extensive network of Telstra assets throughout the Fishermans Bend Precinct.

Telstra requests the following clearances be maintained from their assets:

- 600 mm from Telstra assets in road reserves
- 1.5 metres from Telstra assets in unformed reserves and terrain
- If construction work is parallel to Telstra plant, then careful hand digging or using non-destructive water jet method (pot-holing) at least every 5 metres is require to establish the location of all plant, hence confirming nominal locations before work can commence
- Maintain the following minimum clearance between construction activity and the actual location of Telstra plant:
  - Jackhammers / pneumatic breakers: Not within 1 metre
  - Vibrating plate or wacker packer compactor: Not within 500 mm
  - Boring equipment: Not within 2 metres
  - Heavy vehicle traffic (over three tonnes): 600 mm cover required
  - Mechanical excavators and tree removal: Not within 1 metre

Telstra’s mobile broadband network, Telstra Next G (TM) network, provides mobile broadband coverage to 99% of Australians. The download speeds associated with the mobile broadband network in the Fishermans Bend Precinct are typically 2 to 40Mbps.
10.3 Planned Works

On 29 March 2012 NBNCo announced Stage 1 of their large-scale rollout of the National Broadband Network. The Fishermans Bend Precinct is not within the three year rollout. The nearest estate to the Fishermans Bend Precinct where work has commenced to install the NBN is Tiara Apartments in Southbank. However, the suburbs to the north west of the Fishermans Bend Precinct across the Yarra River, including Yarraville, Seddon and Footscray are within Stage 1 of NBNCo’s planned rollout.

NBNCo has advised that the rollout to the Fishermans Bend Precinct is likely to occur in the medium term. NBNCo believe the NBN will address insufficient capacity in Telstra’s existing network.

The rollout will be staged, with approximately 3200 premises connected to the NBN in each stage. Each stage is likely to be rolled out over a twelve to fifteen month period.

10.4 Redevelopment Scenarios

NBN Co is responsible for installing fibre at all broad acre developments and at infill developments with 100 or more premises and as such, will likely be responsible for servicing any development of the Fishermans Bend Precinct.

Telstra remains responsible for providing infrastructure (primarily copper) to infill developments with less than 100 premises and are unlikely to have any further involvement with development of this land beyond works that impact upon their existing network infrastructure.

A temporary service provision could be made to service up to 1600 premises dependent upon timing of the rollout.

“The NBN roll-out will significantly enhance telecommunications capacity and hence service levels”

NBNCo

It is likely that NBN would require break-out points in the Telstra network, thus requiring Telstra and NBN to collaborate to determine an appropriate telecommunications solution for this site.

Discussion with NBNCo has indicated that the scale of development expected in the Fishermans Bend Precinct may result in the area being granted priority in future rollout planning. In addition, future high density development may cause NBNCo to allocate greater capacity to the area. The staging and timing of development in the Fishermans Bend Precinct will affect the rollout planning and design. NBNCo would be keen to obtain greater information relating to the scale and timing of development in the area so that the fibre capacity allocated to the area can meet the demand.

A fibre access node (FAN) site is typically required to house active equipment in order to service a fibre servicing area. Given that the Fishermans Bend Precinct is not part of the three year rollout a Temporary Fibre Access Node (TFAN) may be deployed in the interim to support redevelopment. TFANs are typically located in a Council owned road reserve which would be decided through collaboration between NBN and Councils. Cables would be located within Telstra owned conduits provided there is sufficient space and in accordance with the definitive agreements activated in March 2012.

In the event that there is no available space in Telstra’s conduits, NBN would install their own conduits. NBN would adhere to required clearances and offsets from other services. Access requirements to the TFAN for maintenance would be determined in collaboration with Council and the developer, dependant on the site layout of the development. NBN has specialists for medium and high density apartment developments who are able to meet with the developer during the design process to allow NBN infrastructure to be accommodated.

The Fishermans Bend Precinct is located adjacent to the Port Melbourne FAN site. There is no FAN within the Fishermans Bend Precinct, but NBN Co notes that in the low, medium and high density redevelopment scenarios, an additional FAN site to the one located in Port Melbourne would be required.

NBN Requirements

Applications to the network are processed online (www.nbnco.com.au) and if NBN’s criteria are met, NBN will provide a Developer Agreement. The developer would be required to provide floor plans to NBN as well as include a spatial allowance within their communications room for the fibre distribution hub (FDH). NBN installs all cabling and associated infrastructure including reticulation from the Fibre Distribution Hub (FDH) to each apartment. This differs from the previous Telstra approach whereby Telstra would bring a cable into the building but require the developer to provide reticulation to each apartment.

Works are typically within existing Telstra alignments.

To be eligible to receive NBN Co fibre infrastructure, developers need to complete the following steps:

- Register all requests for NBN Co fibre infrastructure via NBNCo’s online application form
- Sign and return the Developer Agreement
- Provide NBN Co with pit and pipe design for the development
- Provide NBN Co with notification of practical completion and as built documentation

NBN Co cannot reticulate fibre into a new development until a Developer Agreement is in place and the above steps have been completed. Typically, fibre is reticulated to a new development nine to twelve months after the Developer Agreement is in place.

According to NBNCo’s Multi Dwelling Unit (MDU) Building Design Guide for New Developments, the developer is responsible for the following:

- Design of pit and pipe infrastructure to NBN Co specifications and standards and submission of drawings to NBN Co for review prior to installation
- Installation of pit and pipe infrastructure to NBN Co specifications and standards, including:
  - Provision of a suitable building entrance facility (lead-in) from the street network to the building entrance, through to any area designated for telecommunications services. Where diversity or other special needs exist, an alternative entry location may also be required
  - Provision of suitable space and access for the installation, maintenance and repair of all NBNCo network elements up to and including the Network Termination Unit (NTU) and Power Supply Unit (PSU)
  - Provision of a minimum of P20 (23mm nominal inside diameter) communications conduit, racks and cable trays, from either the telecommunications room or riser/closet location to each NTU location
- Transfer of ownership of pit and pipe infrastructure to NBNCo

NBN Co is responsible for:
The cabling, installation and maintenance of all network elements up to and including the Network Termination Unit (NTU) is the responsibility of NBNCo. NBNCo requires at least three months’ notice prior to the commencement of construction/civil works to ensure NBNCo has adequate time to plan the installation of fibre. The three month timeline commences from the date that NBNCo receives the signed Developer Agreement.

The cabling, installation and maintenance of all network assets up to and including the network termination unit and power supply unit would be the responsibility of NBN and the developer would not be responsible for costs associated with those items.

Table 15 Indicative NBN Requirements

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead in from the street network to the building entrance</td>
<td>1 per building</td>
</tr>
<tr>
<td>Provision of a minimum of P20 (23mm nominal inside diameter)</td>
<td></td>
</tr>
<tr>
<td>communications conduit from either the telecommunications room or riser/closet location to each network termination unit</td>
<td>1 per apartment (lengths variable dependent on length from apartment)</td>
</tr>
</tbody>
</table>

Telstra requirements

At the completion of any construction or redevelopment works, existing Telstra pits and manholes should ideally be located a minimum of 1.2 metres from the back of kerb. All Telstra conduits should have the following minimum depth of cover from the surface level at completion of works:

- Footway 450 mm
- Roadway 450 mm at drain invert and 600 mm at road centre crown

Should there be a requirement for relocations of existing Telstra assets in the Fishermans Bend Precinct, Telstra would need to be engaged and consulted with to facilitate these works. Relocations would occur at the expense of the property developer or owner.

It would be beneficial to advise Telstra of the undergrounding of electricity cables to maximise the possibility of co-location between electricity and telecommunications assets.

Telstra is not obliged to create easements. Telstra’s powers and immunities under the Telecommunications Act, in a legal sense, provide a statutory form of tenure as an alternative to easements or lease.

11. Roads & Tram Infrastructure

11.1 Responsible Authorities

Yarra Trams is the responsible authority for tram infrastructure in the Fishermans Bend Precinct.

VicRoads is the responsible authority for declared or arterial roads in the Fishermans Bend Precinct. City of Melbourne (CoM) and City of Port Phillip (CoPP) are responsible for local roads within their municipalities. The condition of local roads has not been considered in this assessment.

The Department of Transport (DoT) is responsible for planning and coordinating a safer, fairer and greener transport system for all Victorians to create a more prosperous and connected community. DoT has not been consulted as part of this assessment.

Public Transport Victoria (PTV) is the statutory authority that administers Victoria’s train, tram and bus services. PTV has not been consulted as part of this assessment.

There will be a number of significant transport requirements that will need to be considered to enable the sustainable and orderly planning and development of this precinct. The Minister for Planning has noted that this will be considered and addressed within the structure planning stage of the project and will involve the key agencies and stakeholders in the process.

11.2 Existing Conditions

Existing road and tram infrastructure are shown in Appendix B.

11.2.1 Yarra Trams Infrastructure

Yarra Trams reports that the tram network condition is excellent, with recent renewal of the track in 2010 of the Port Melbourne Light Rail corridor and a project nearing completion for the upgrading and expansion of Southbank Tram Depot.

The track junction at the Clarendon Street / Whiteman Street intersection is in poor condition and requires urgent renewal. This is a key feed into this area.

Track is rated based on a ranking of A (Excellent) to D (Poor). Port Melbourne and St Kilda lines are both ranked A. The track junction at the Clarendon / Whiteman Street intersection would be ranked D.

The condition of overhead electricity supply is considered fair. The overhead supply is much older than the tracks themselves as it has been converted from infrastructure formerly used for the heavy-rail system.

11.2.2 VicRoads Infrastructure

Road pavement condition surveys are conducted bi-annually on declared roads, except for a selected sample of roads that are surveyed annually to provide a benchmark for assessment of annual changes in condition in different parts of the State. A road pavement condition survey for the declared roads within the Fishermans Bend Precinct was conducted in 2011. A map of the precinct showing road condition has been included in Appendix G.

Condition surveys include reporting on surface type, as well as inspection and rating of the following core criteria:

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In the medium term, it is unknown whether upgrade works would be required. Yarra Trams expects that there will be heavy maintenance works and possible upgrading of the overhead electricity supply in the long term. These works are likely to be triggered by asset condition. Maintenance and renewal works for Yarra Trams infrastructure is funded by the State Government.

11.1.2 VicRoads Infrastructure

Generally, VicRoads does not like activity centres to straddle arterial roads due to safety concerns for pedestrians. VicRoads has also noted that the noise generated by the West Gate Freeway should be considered in redevelopment of the Fishermans Bend Precinct, particularly in any medium or high density residential towers located in the vicinity of this road. VicRoads has received complaints from residents in new apartment blocks in Lorimer Street due to noise from the Freeway.

Planned Works

VicRoads has no planned pavement resurfacing works in the Fishermans Bend Precinct in 2012/13. There may be some asphalt patches but these are yet to be determined by VicRoads. The works program for 2013/14 will be determined once inspections and testing have been completed.

VicRoads has reported that coordination of utility upgrades would be of benefit in the Fishermans Bend Precinct, to avoid a situation where VicRoads resurfaces a road and then a utility agency rips up a section or strip of the road in order to undertake a utility upgrade, duplication, installation or maintenance works. This type of situation is a poor outcome for both the amenity and the integrity of the road pavement.

The only VicRoads project in the vicinity of the Fishermans Bend Precinct is the road extension from Dockside Road to the roundabouts located on Todd Road (refer Melways Map 56 Reference F2 for proposed alignment). This road is not expected to have a significant impact on traffic movement within the Fishermans Bend Precinct.

VicRoads SmartMaps

VicRoads prepares ‘SmartMaps’ for all municipalities within their region, showing tram, bus, bicycle and pedestrian priority routes as well as preferred and future traffic routes. The SmartMaps for the City of Melbourne and the City of Port Phillip have been included in Appendix H.

Within the Fishermans Bend Precinct:

- Williamstown Road is a designated bus and bicycle priority route.
- Ingles Street is a designated bicycle route
- Plummer Street and Todd Road are future preferred traffic routes

The implications to the redevelopment of the Wirraway Precinct due to the designation of Plummer Street and Todd Road as future preferred traffic routes would need to be assessed and considered by Places Victoria and VicRoads in determining a transport strategy for the precinct that will be amenable to the planned redevelopment and land use.

Table 16 Typical Surface Condition Ratings

<table>
<thead>
<tr>
<th>Extent / severity of surface damage</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>0</td>
</tr>
<tr>
<td>Minor</td>
<td>1</td>
</tr>
<tr>
<td>Moderate</td>
<td>3</td>
</tr>
<tr>
<td>Extensive</td>
<td>5</td>
</tr>
</tbody>
</table>

For the Fishermans Bend Precinct, the majority of the VicRoads network has a rating of good or minor (0 or 1). The following roads have moderate (3) ratings for cracking, stone loss, and patching for sections of the road pavement:

- Todd Road
- Graham Street
- Normanby Road
- Plummer Street
- Montague Street
- Williamstown Road

In addition, there is a section of Todd, Williamstown and Normanby Roads and Lorimer Street that has a rating of extensive (5) for stone loss.

11.1 Planned Upgrades

The impact of the four redevelopment scenarios on the road and tram networks has not been considered in this assessment. Planned upgrades, as outlined in the following sections, have been reported to GHD by the relevant authorities. Transport requirements to support redevelopment of the Fishermans Bend Precinct would be determined as part of a transport strategy.

11.1.1 Yarra Trams Infrastructure

The area around the junction at the Clarendon Street / Whiteman Street intersection is planned to be remodelled to provide enhanced capacity and operational flexibility, including installation of an accessible stop and provision for the Restaurant Trams. These works are likely to occur in the short term.
12. Summary

This assessment provides a high level initial review of infrastructure requirements and impacts of the proposed Fishermans Bend Precinct redevelopment scenarios on existing infrastructure as established through consultation with key external utility service providers.

12.1 Key Findings

Key findings of the investigation are outlined by sector below:

**General**

Ongoing consultation with key utility provider and asset owner stakeholders throughout the master planning, design and construction phases is recommended.

Co-ordination of construction of utility assets with other underground services may reduce project costs and the opportunity for shared trenching in the Fishermans Bend Precinct should be considered. To ensure shared trenching translates to cost efficiencies, all utility assets need to be installed in a co-ordinated manner.

Relocations of major transmission and trunk assets, if required are generally directly attributable to developers and could prove prohibitive due to the high likely costs. This is particularly important in the incremental and low density growth scenarios.

**Utility Easements**

Major and trunk infrastructure in the Fishermans Bend Precinct is not in all cases protected by easements. To ensure the integrity of key infrastructure and achieve safety requirements of the various agencies, the same restrictions and conditions that would normally be imposed within an easement should be considered even when assets are located in privately owned land, municipal or road reserves.

Where there are changes in current land use such as amendments to the layout of the road network within the Fishermans Bend Precinct easements will likely be required in favour of utility owners for protection of their assets.

**Stormwater Drainage and Flooding**

The flat and low lying nature of the Fishermans Bend Precinct constrains the municipal and Melbourne Water stormwater drainage networks. Contaminated ground conditions are likely to increase costs associated with upgrade and asset duplication works.

New Special Building Overlays are being prepared by CoPP and MWC and are anticipated to be in place by mid 2013 subject to the timing and feedback from public consultation. Typically, a freeboard level of 0.3m above the flood level is required for habitable space and 0.15m above the flood level is required for non-habitable space.

CoPP believes that there are constraints to their stormwater drainage network due to the MWC drainage outfalls. MWC has no planned works in the Fishermans Bend Precinct. CoPP has some minor works planned to address Flood Hot Spots in the Montague Precinct.

CoM has reported there are no major flooding issues in the Lorimer Precinct and has no planned works. However, the extent of flooding, particularly within existing overlays in 5 year storm events, may not be considered acceptable to developers.

The following initiatives would be supported by CoM and CoPP as conditions on redevelopment within the Fishermans Bend Precinct:

- On-site stormwater detention systems to ensure no net increase in pre-development levels
- Rainwater harvesting for re-use
- Habitable room levels set above flood level, including an appropriate level of freeboard
- No groundwater discharge to stormwater drains though sealing basements and carparks against groundwater
- Protection from floodwater through measures such as ramped entries to basements and carparks
- Permeable / pervious pavements
- Water Sensitive Urban Design

MWC would like to see no impact on stormwater flows due to any increase in impervious areas for established areas.

MWC suggests that stormwater harvesting should be considered as part of a wider Integrated Water Strategy for the Fishermans Bend Precinct.

The scale and risk of inundation due to the effects of climate change in the Fishermans Bend Precinct is not certain but MWC, CoPP and CoM are likely to consider climate change and risk mitigation measures in their planning for future scenarios.

**Water Supply**

There are no MWC trunk water supply assets in the Fishermans Bend Precinct. The existing SE Water network in Fishermans Bend has sufficient capacity to supply current requirements and the incremental growth scenario.

In the medium term, SE Water is upgrading a section of the existing water main located in Cecil Street that provides water supply to the Fishermans Bend Precinct from the nearest MWC trunk main located in Punt Road.

The timing of the upgrade works may be impacted by the density and the timing of redevelopment in the Fishermans Bend Precinct. Generally, the higher the growth intensity in a specific infill area the more likely it is to trigger a system upgrade.

An additional connection to a MWC transfer main may be required for the low, medium and high density redevelopment scenarios.

There are generally high costs associated with works in infill areas.

SE Water is developing an Integrated Water Management (IWM) Strategy. An IWM strategy may limit the loading on the water supply system which may allow SE Water to defer augmentation works as well as reduce the demand on water resources.

**Sewerage**

The recent upgrade of the MWC Melbourne Main Sewer and the planned MWC Hobsons Bay Main Yarra Crossing Rehabilitation and Duplication project are expected to provide adequate capacity in the trunk sewerage network to support each of the redevelopment scenarios considered for the Fishermans Bend Precinct.

SE Water expects that there will be some reticulation upgrades in the medium term to support redevelopment but that in general, it is unlikely that there will be any major works required.

New reticulation pipelines and ancillary infrastructure may be more expensive to install than in other areas due to the contaminated and poor ground conditions, particularly deep assets.
Integrated Water Management
City of Port Phillip, City of Melbourne, South East Water and Melbourne Water are all supportive of an Integrated Water Management strategy being developed for the Fishermans Bend Precinct.

It is recommended that The Office of Living Victoria (OLV) and City West Water (CWW), as well as both Councils, MWC and SE Water are consulted as part of the conceptual and feasibility stages of the Fishermans Bend Precinct.

South East Water believes there are opportunities for synergies with the Southbank and Docklands precincts which may make an IWM approach to servicing more viable.

Constraints in the water supply network and the deferral of system augmentation would support the implementation of a IWM approach in the Fishermans Bend Precinct.

An IWM approach may also result in reductions to the depth of new sewer assets which would be of benefit in the Fishermans Bend Precinct due to the likely unstable and contaminated ground conditions.

Electricity
Planned works include:

- Replacement of one 220/66 kV transformers at Fishermans Bend Terminal Station (FBTS) together with a 220 kV circuit breaker and some 66 kV circuit breakers
- Installation of a fourth transformer at the FBTS and replacement of circuit breakers
- The older Port Melbourne and E Zone substations need to be rebuilt and their feeder system converted from the old 6.6kV voltage to 11kV or 22kV.

In general, CitiPower believes that high growth could be accommodated within its network, provided there is sufficient time to plan for the development. Redevelopment may trigger:

- New 11kV feeders and local substations to match the load generated by redevelopment
- Conversion of the E Zone and Port Melbourne substations to an 11kV zone substation
- The standby transformer at the FBTS being placed on load and a fourth transformer being added to the FBTS

Redevelopment of the Wirraway precinct may impact approximately 2km of the existing 220 kV FBTS – NPSD/BLTS double circuit tower line. Relocation works are likely to be costly and would be attributable to the developer that requests the works.

There are no planned undergrounding works in the Fishermans Bend Precinct. The majority of electricity assets within the Fishermans Bend Precinct are overhead, with the exception of underground lines in Litorne Street. The costs associated with undergrounding electricity lines are expected to be borne by developers.

Gas Supply
Zinfra reported that the establishment of a overall servicing strategy for the Fishermans Bend Precinct as early as possible would maximise efficiency of construction for required gas assets and reduce long term costs.

In the short to medium term, the gas networks will progressively change, with more high pressure gradually expanding due to new customer connections and becoming better able to support any large loads that may be connected.

Wholesale upgrading of existing low and medium pressure mains to high pressure as part of Zinfra’s upgrade programme is unlikely in the short to medium term unless heightened maintenance imperatives reach a level at which this becomes cost effective, a situation that is deemed unlikely.

The commitment of a single very large applicant, or concentration of many applicants effectively acting as one, could cause a complete revision of strategic augmentation plans for the entire Fishermans Bend Precinct. Depending on the location and timing of such a large connection, this could either alleviate or augment the costs associated with subsequent applications.

The 750mm diameter APA GasNet transmission main is a critical asset and clearances to this pipeline should be maintained for asset integrity and public safety reasons. Pipeline protection works may be required.

Energy Initiatives
Zinfra and CitiPower have suggested that energy efficiency and innovative opportunities could be considered for the Fishermans Bend Precinct.

The impacts of a co or tri generation scheme on the electricity and gas networks should be considered for any building or precinct wide distributed energy systems.

An Integrated Demand Management (IDM) Scheme would be one way to maintain electricity network augmentation costs to supply some increasing loads.

Shell and BP Pipelines
A 24" WAG Shell fuel pipeline in located parallel to the gas transmission pipeline in the easement crossing the south west corner of the Wirraway Precinct.

Clearance of three metres is required to gas and fuel pipelines under Section 120 of the Pipelines Act 2005. In practice, a clearance distance of six metres is considered by Shell to be more appropriate where this can be achieved.

Telecommunications
Clearances to Telstra assets are required to be maintained in redevelopment scenarios. There are likely to be significant costs associated with the relocation of existing Telstra assets, if required.

The Fishermans Bend Precinct is not within NBNCo’s three year rollout plan therefore a temporary solution may be required to support redevelopment prior to the rollout of the permanent network.

Discussion with NBNCo has indicated that the scale of development expected in the Fishermans Bend Precinct may result in the area being granted priority in future rollout planning. In addition, the scale and density of future redevelopment may cause NBNCo to allocate greater capacity to the area.

Roads and Tram Infrastructure
The road and tram infrastructure in the Fishermans Bend Precinct is generally in good condition.

Yarra Trams reports that the tram network condition is excellent with the exception of the track junction at the Clarendon Street / Whitean Street intersection which is in poor condition and requires urgent renewal. The condition of overhead electricity supply is considered fair. Upgrade works are considered likely to be triggered by asset condition, rather than redevelopment.

The condition of the VicRoads declared road network was assessed in 2011 and is generally considered to be in good condition, with some sections of road having minor surface damage. In
some sections, moderate or extensive damage have been reported for six roads within the Fishermans Bend Precinct, however there are no planned pavement resurfacing works for 2012/13.

The impact of the four redevelopment scenarios on the road and tram networks has not been considered in this assessment.

VicRoads noted that they prefer that activity centres do not straddle arterial roads.

Additionally, they consider that noise generated from the freeway should be considered in the design of buildings located proximate to the West Gate Freeway to avoid complaints from future residents.

The implications to the redevelopment of the Wirraway Precinct due to the designation of Wirraway and Todd Road as future preferred traffic routes would need to be considered in master planning for the Fishermans Bend Precinct.

### 12.2 Recommended Actions

For the next stage of planning for the proposed redevelopment the following actions are recommended for implementation:

- Conduct an opportunities assessment to determine best practice sustainability precinct planning in collaboration with relevant utility providers
- Review of master plan yield and/or Gross Floor Area (GFA) projections once progressed as part of the master planning stage
- Determination of utility loadings based upon yield / GFA projections
- Determination of potential system augmentation required through collaboration with relevant authorities and service providers and cost estimates for required works
- Determination of costs and authority requirements in relation to specific asset relocations
- Consultation with utility providers and assets owners to ensure offsets, clearances and other requirements are incorporated into the master plan to limit the risk of amendments to the master plan at a later stage of planning or design
- Engagement with NBNCo Multi Dwelling Unit (MDU) specialist and brownfields rollout department to ensure that adequate capacity is provided for the anticipated redevelopment
- Consideration of precinct wide integrated energy and water strategies
- Consideration of other developments in and around the Fishermans Bend Precinct in parallel with studies being performed by Places Victoria
- Land Ownership Assessment and consideration of staging of development throughout the Fishermans Bend Precinct
- Consultation with relevant stakeholders to enable greater understanding of impact of all development upon networks and allow opportunity for creation of Developer Contributions Plans (DCP) if viable. Approach to be determined and agreed with Places Victoria
- Development of preliminary cost estimates in collaboration with utility providers and asset owners

A breakdown of the variation in upgrade requirements in each of the incremental, low, medium and high density redevelopment scenarios is provided in Table 17.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Redevelopment Scenario</th>
<th>Upgrade Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stormwater Drainage &amp; Flooding</td>
<td>Incremental</td>
<td>The level of augmentation works required to the stormwater drainage network is more dependent on the impervious surface area than the density of development.</td>
</tr>
<tr>
<td></td>
<td>Low Density</td>
<td>Melbourne Water is moving towards lot scale solutions and provisions that reduce the impact of redevelopment on existing networks as opposed to costly upgrade works.</td>
</tr>
<tr>
<td></td>
<td>Medium Density</td>
<td>Works required for flood protection in the long term due to the impacts of Climate Change are unknown due to the inherent uncertainty of estimating the scale and risk of inundation.</td>
</tr>
<tr>
<td></td>
<td>High Density</td>
<td></td>
</tr>
<tr>
<td>Water Supply</td>
<td>Incremental</td>
<td>SE Water water reticulation network upgrades and extensions may be required to support growth. Could be supplied from existing distribution infrastructure.</td>
</tr>
<tr>
<td></td>
<td>Low Density</td>
<td>SE Water water reticulation network upgrades and extensions may be required to support growth. Additional supply likely to be required. Options include new SE Water 600mm pipeline from MWC transfer main in Punt Road or augmentation of CW network to increase supply from MWC Footscray transfer main in the CBD.</td>
</tr>
<tr>
<td></td>
<td>Medium Density</td>
<td>SE Water water reticulation network upgrades and extensions may be required to support growth. Additional supply likely to be required. Options include new SE Water 600mm pipeline from MWC transfer main in Punt Road or augmentation of CW network to increase supply from MWC Footscray transfer main in the CBD. A 17ML underground storage tank may also be required.</td>
</tr>
<tr>
<td></td>
<td>High Density</td>
<td>SE Water water reticulation network upgrades and extensions may be required to support growth. Additional supply likely to be required. Options include new SE Water 800mm pipeline from MWC transfer main in Punt Road or augmentation of CW network to increase supply from MWC Footscray transfer main in the CBD. A 25ML underground storage tank may also be required.</td>
</tr>
<tr>
<td>Sewerage</td>
<td>Incremental</td>
<td>SE Water sewerage reticulation network upgrades and extensions may be required to support growth.</td>
</tr>
<tr>
<td></td>
<td>Low Density</td>
<td>Due to significant upgrade works undertaken in MWC's trunk sewerage network, it is not expected that major...</td>
</tr>
<tr>
<td>Sector</td>
<td>Redevelopment Scenario</td>
<td>Upgrade Requirements</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Electricity</strong></td>
<td>Low Density</td>
<td>Works will be required to support redevelopment under any of the four growth scenarios. In the long term, planned rehabilitation / duplication works planned for MWC’s Hobson’s Bay Main would take into account growth.</td>
</tr>
<tr>
<td></td>
<td>Medium Density</td>
<td>New 11kV feeders and local substations will be required. Supply from existing zone substations. Standby transformer at the FBTS likely to be placed on load.</td>
</tr>
<tr>
<td></td>
<td>High Density</td>
<td>New 11kV feeders and local substations will be required. Supply from existing zone substations with some upgrading required. Standby transformer at the FBTS likely to be placed on load.</td>
</tr>
<tr>
<td></td>
<td>Incremental</td>
<td>New 11kV feeders and local substations will be required. E Zone substation likely to be converted into an 11kV substation. Standby transformer at the FBTS likely to be placed on load and a fourth transformer added.</td>
</tr>
<tr>
<td></td>
<td>Medium Density</td>
<td>New 11kV feeders and local substations will be required. E Zone substation likely to be converted into an 11kV substation. Standby transformer at the FBTS likely to be placed on load and a fourth transformer added.</td>
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<td></td>
<td>High Density</td>
<td>New 11kV feeders and local substations will be required. E Zone and Port Melbourne zone substations likely to be converted into 11kV substations. Standby transformer at the FBTS likely to be placed on load and a fourth transformer added.</td>
</tr>
<tr>
<td></td>
<td>Incremental</td>
<td>Mains augmentations are likely to be necessary for all four redevelopment scenarios. A connection to MultiNet’s sub transmission main in Bay Street, Port Melbourne may be required to increase supply.</td>
</tr>
<tr>
<td></td>
<td>Low Density</td>
<td>Typically, for redevelopment, network extensions are Economic Feasibility Tested and some cost may be attributable to applicants. Network augmentation works are typically funded by the asset owner.</td>
</tr>
<tr>
<td></td>
<td>Medium Density</td>
<td>The type of fixtures and facilities in redevelopment can have a greater impact on the augmentation works required and ability of the network to supply new applicants than density of development.</td>
</tr>
<tr>
<td></td>
<td>High Density</td>
<td>The commitment of a single very large applicant, or concentration of many applicants effectively acting as one, could cause a complete revision of augmentation plans for the entire Fishermans Bend Precinct.</td>
</tr>
<tr>
<td><strong>Gas Supply</strong></td>
<td>Low Density</td>
<td>New 11kV feeders and local substations will be required. Supply from existing zone substations with some upgrading required. Standby transformer at the FBTS likely to be placed on load.</td>
</tr>
<tr>
<td></td>
<td>Medium Density</td>
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<td>High Density</td>
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</tr>
<tr>
<td><strong>Telecommunications</strong></td>
<td>Incremental</td>
<td>Discussion with NBNCo has indicated that the scale of development expected in the Fishermans Bend Precinct may result in the area being granted priority in future rollout planning. In addition, the scale and density of future redevelopment may cause NBNCo to allocate greater capacity to the area.</td>
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<th>Sector</th>
<th>Redevelopment Scenario</th>
<th>Upgrade Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Roads &amp; Tram Infrastructure</strong></td>
<td>Low Density</td>
<td>The impact to the road and tram infrastructure in the Fishermans Bend Precinct was not considered as part of this assessment.</td>
</tr>
<tr>
<td></td>
<td>Medium Density</td>
<td>However, asset condition, rather than densification was generally reported as the trigger for upgrade works.</td>
</tr>
<tr>
<td></td>
<td>High Density</td>
<td></td>
</tr>
</tbody>
</table>

58 | GHD | Report for Places Victoria - Fishermans Bend Infrastructure Assessment, 3129142

59 | GHD | Report for Places Victoria - Fishermans Bend Infrastructure Assessment, 3129142
A. Land Use Maps
B. Maps of Existing Infrastructure
© 2012. Whilst every care has been taken to prepare this map, GHD (and DATA CUSTODIAN) make no representations or warranties regarding its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential) incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.


LEGEND
- Precincts
- Melbourne Water Drainage Assets
- City of Port Phillip Drainage Assets
- City Of Melbourne Drainage Assets
- Planning overlay
- Special Building

Stormwater Drainage Infrastructure

Places Victoria
Fishermans Bend Infrastructure Assessment
Job Number: 31-29142
Revision: B
Date: 07 Sep 2012

180 Lonsdale Street Melbourne VIC 3000 Australia
T: 01 3 8687 9300 F: 01 3 8687 9111 E: melmail@ghd.com W: www.ghd.com

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

1:10,000
Paper Size A3

0 50 100 200 300 400 500
Metres

VOLUME 3
C. Impacts of Climate Change

The scale and risk of inundation due to the effects of climate change in the Fishermans Bend Precinct is not certain as the nature of forward planning means that the following can only be estimated:

- The exact rise in sea level
- Climatic variation and the associated weather patterns such as storm frequency and intensity and the timing and duration of periods of drought

Currently, the CSIRO and Federal Government expect a sea level rise of 1.1 metres to the year 2100. The State Government of Victoria is currently planning for a sea-level rise of 0.8 metres by the end of the century.

The Intergovernmental Panel on Climate Change (IPCC) is due to release its Fifth Assessment Report next year. This report will provide an update of knowledge on the scientific, technical and socio-economic aspects of climate change. CoM expects that this report will provide a revised sea level rise higher than 1.1 metres.

Regardless of the exact level of sea level rise, it is expected that there will be impacts due to inundation and it makes sense that precinct wide risk mitigation options are considered as part of feasibility planning for the Fishermans Bend Precinct.

In addition, Melbourne Water assumes that there will be a 32% increase in the frequency and severity of storm events between 2008 and 2100. This increase will impact on peak surface water runoff which could exceed the capacity of the underground drainage system.

Extensive modelling has been undertaken by CoM to determine the risks that are faced within their municipality due to predicted inundation caused by sea level rise, tidal movement and extreme storm events. CoM considers it is possible there will be twice daily flooding in Southbank by 2040 due to high tide and sea level rise.

Although the Fishermans Bend Precinct is adjacent to Southbank, it is located on slightly higher ground and is not a former water way, therefore CoM engineers expect that the flooding caused by sea level rise will be less severe than what is anticipated for Southbank. The area most at risk of inundation is the eastern portion of the Lorimer Precinct.

“Serious challenges will be faced in Fishermans Bend prior to 2040 based on conservative sea level rise estimates”

City of Melbourne, 2nd July 2012

Based on initial calculations, CoM expects that the sea level rise associated with climate change will result in some flooding and that this flooding is likely to be retained within the roadways. Development would need to take this into account through:

- Implementing measures to ensure underground basements / car parks which would be protected from frequent inundation
- If basements / car parks are constructed, installing entrances to car park that ramp up, to protect them from surface water entering buildings and / or installing pump systems inside buildings to ensure floodwater is discharged to the surface

As well as engineering solutions to lessen the likelihood or impacts of inundation, there are also design and community measures that could be considered. The level of risk that a community is willing to face in order to live in a certain location is important to consider as part of a methodology to lessen the impacts of flooding. A community may be prepared, for example, to not park their cars in a certain area that is at risk of flooding prior to a certain type of storm event. Design measures may include requirements imposed on new buildings such as electrical outlets being above a certain height.

Engineering measures could be implemented within precincts to store tidal and flood waters and release this water at an appropriate time. Rotterdam, in the Netherlands, is considered by CoM to be successfully addressing climate change through their Adaptation Strategy.

The Rotterdam Adaptation Strategy aims to make Rotterdam “100% climate proof” through focussing on the following key aims:

- Flood safety
- Accessibility
- Adaptive building
- Urban water system
- City climate

CoM recommends that an inundation study is undertaken for Fishermans Bend to identify the flooding risks associated with the area in the long term.

This modelling and risk identification could pave the way for determination of mitigation strategies for the area and identification of funding model options. In an area such as Fishermans Bend, there is an opportunity to implement a precinct wide approach where the onus is on developers to incorporate risk mitigation into new development, or to contribute to a strategy implemented by Government.

Any inundation study would need to compare the economic benefit of occupying the Fishermans Bend Precinct against the cost of climate change adaptation measures required to support occupation in the long term. The timing of risk mitigation measures would also need to be considered as part of economic modelling.

The Flood Management Plan (March 2012) prepared by CoPP and MWC states that climate change has the potential to increase flood risk within the Port Phillip and Westernport region and hence the Port Phillip municipality. While the latest predictions are for a long-term reduction in catchment yield (i.e. a reduction in runoff volumes) it is likely that the intensity of extreme rainfall events will increase. The change in rainfall patterns is likely to lead more frequent flash flooding and overland flow events associated with localised storm activity. At the same time, sea levels are expected to rise resulting in additional flooding pressures within the municipality.

Even a smaller sea level rise, which may occur over the medium (i.e. 2025 to 2045) term, is likely to impact on the drainage system within the City of Port Phillip.

Potential impacts of climate change have been detailed in CoPP’s ‘Climate Adaptation Plan - Climate Adapt City’.

Urban Heat Island Effect

The urban heat island effect (UHI) is a common phenomenon in cities worldwide that occurs when densely built urban areas become warmer than nearby suburban and regional areas, particularly after dark.

Intergovernmental Panel on Climate Change website at www.ipcc.ch retrieved 2 July 2012

As well as increased likelihood of inundation, climate change is also likely to increase the heat island effect due to higher incidence rates of heat waves. The biggest economic and social impact due to the heat island effect is the impact on health, particularly on vulnerable members of the community.

CoM and CoPP have undertaken studies relating to risks and mitigation strategies associated with the heat island effect within their municipality. CoM studies undertaken include:

- Economic Heat Island Analysis
- Hot and Cool Spot Analysis
- Urban Forest Strategy
- Cool Roofs

**Economic Heat Island Analysis**

CoM undertook this assessment to understand the broader economic impacts associated with heat waves in inner Melbourne. This study analysed the economics of heatwaves on health, transport, energy supply and a variety of other impact areas.

**Urban Forest Strategy**

Both CoM and CoPP have Urban Forest Strategies.

CoM’s Urban Forest Strategy aims to:

- Adapt our city to climate change
- Mitigate the urban heat island effect by bringing our inner-city temperatures down
- Create healthier ecosystems
- Become a water-sensitive city
- Engage and involve the community

CoM has determined that maintaining a healthy ‘urban forest’ will impact positively on the liveability of their municipality as pressure is placed on existing infrastructure and services due to the combined impacts of urban growth and climate change.

The Fishermans Bend Precinct, as a predominantly industrial/manufacturing precinct, does not presently have a focus on the provision of green spaces. CoM perceives that redevelopment of the Fishermans Bend Precinct to a more residential and mixed use precinct, presents an opportunity to promote and implement their urban forest strategy. There are a multitude of environmental, social and economic benefits associated with urban forests including: Reduction in stormwater flows and nutrient loads, Provision of shade and reduction of heat related illnesses, Creation of a local identity, Reduced energy costs, Increased property values.

**Cool Roofs**

Cool roofs include white and green roofs. White roofs are painted white as the name suggests, as this colour reflects the sun’s heat and absorbs and transfers less heat to the building. For commercial buildings, CoM estimates that there is approximately a 3% saving in energy costs.

A green roof supports plant growth and has the following benefits:

- Reduced heating and cooling requirements
- Reduced stormwater runoff
- Alleviation of urban heat islands

**Climate Change Risk Mitigation Options**

CoM suggests that the types of strategies that could be considered to address flood risk due to climate change in the Fishermans Bend Precinct include:

- Increase community awareness and develop targeted engagement strategies to enhance preparedness for local flood events, including guidance for residents, businesses and visitors in consultation with the State Emergency Service (SES)
- Incorporate consideration of inundation issues in relevant planning checklists
- Increase capacity of Council staff to understand inundation risks and responses to help them engage their stakeholders
- Require property owners to disclose flood risk at time of leasing

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17 City of Melbourne ‘Urban Forest Strategy: Making a great city greener 2012 – 2032"
19 City of Melbourne ‘Urban Forest Strategy: Making a great city greener 2012 – 2032"
D. SPI PowerNet Guidelines for Subdivision and Development of Land Affected by Transmission Lines Easements

- Introduce maintenance and design standards to address increased exposure to saline water
- Alter maintenance programs to account for salt removal
- Ensure planting of saline tolerant vegetation
- Extend current boundary of LSIO. Revised flood extents taking future flood risk into account could be incorporated into local planning controls
- Upgrade local drainage assets and pumping stations (including installation of backflow valves)
- Install an elevated walkway along the Yarra River to form a protective levee / flood protection wall along the south bank of the Yarra from Princess Street Bridge to Wurundjeri Way Bridge
- Assess and relocate critical assets that cannot be protected
- Elevate key transport routes (including City Road, Sturt Street, Kavanagh, Clarendon and Whiteman Streets)
- Re-direct drainage from the Yarra River to Port Phillip Bay
- Construct a dam for the Yarra River
- Install flood gates on the Yarra River
- With consideration of streetscapes, transition to elevating infrastructure above flood levels over time (e.g. floating or bridging structures)
GUIDELINES FOR SUBDIVISION AND DEVELOPMENT OF LAND AFFECTED BY TRANSMISSION LINE EASEMENTS

For the purposes of this document, all reference to SPI PowerNet means SP AusNet. SPI PowerNet is the electricity transmission company operating under the SP AusNet brand name. SP AusNet also has an electricity distribution business (SPI Electricity) and a gas distribution business (SPI Networks).

Information for use by land owners, planners and developers in the planning and implementing of subdivisions, consistent with SPI PowerNet requirements for high voltage, overhead power line easements.

16/2/2006

SP AusNet
Business Services
Property Group
GUIDELINES FOR SUBDIVISION AND DEVELOPMENT OF LAND AFFECTED BY EASEMENTS

1. INTRODUCTION

1.1 Purpose of Guidelines

SPI PowerNet Pty Ltd has a statewide network of overhead high voltage power lines, operating at voltages of 220,000 volts (220kV) up to 500,000 volts (500kV). These are generally steel lattice tower lines constructed within easements, which are recorded on the Certificate of Title of each affected property. The width of the easement is largely dependent on the number of existing and provision for future lines and their voltages. Some lines within SPI PowerNet’s easements operate at lower voltages up to 69kV and are supported on smaller steel towers or wood or concrete poles. Whilst these lower voltage lines are located on SPI PowerNet’s easements, they are operated and maintained by the local electricity distribution company.

SPI PowerNet does not own the land affected by the easement, but has the right to enter and use the easement for line construction, operation, patrol and maintenance purposes and to restrict activities carried out on the easement by others so that the initial high public safety, line reliability and bushfire prevention standards are maintained.

These guidelines provide information concerning SPI PowerNet requirements where subdivision and development of land subject to high voltage power line easements is proposed. It has been produced to assist with the planning and implementing of subdivisions, consistent with the SPI PowerNet’s easement rights and the responsibility to protect people living, working and playing near the high voltage lines against electrical or other hazards that could cause serious injury or death.

Subdivision Planning Permit and Certification applications and Engineering design drawings that clearly comply with the requirements stated by these guidelines can be readily approved by SPI PowerNet. Proposals that do not clearly comply will require early consultation to determine whether approval can be given.

Landowners and developers are welcome to discuss the requirements with SPI PowerNet’s Assets Department, on:

Telephone 9695 6000

Early and confidential consultation, prior to a Planning Permit application or drafting of detailed design drawings, would enable a subdivision layout to be optimised in the shortest practicable time.

1.2 Preliminary Planning for Subdivision

Preliminary planning for subdivision of property with an overhead power line easement should take into consideration the general information given in Appendix A concerning permitted and prohibited uses of high voltage line easements.

Planners should also be aware that the way in which land affected by high voltage power line easements is subdivided can have a significant effect on factors such as:

- Visual amenity of the area;
- Costs for fencing and servicing allotments (particularly electricity, street lighting, telephone, gas and water), consistent with prudent public safety requirements;
- Inconvenience and costs to SPI PowerNet and allotment owners caused by requirements for vehicle access for line construction, patrol and maintenance; and
- Public perception of possible adverse health effects from the electric and magnetic fields (EMFs) coming from the power lines.

Subdivision planners have an obligation to consider community values and attitudes to the visibility and safety of high voltage power lines when laying out allotments and roads. Since it is appropriate that the visibility aspects of planning be controlled by the developer and by the planning authority, it is not considered further by these guidelines.

The question of whether or not exposure to EMFs causes adverse health effects is unresolved. There is worldwide scientific consensus that such effects have not been established, but that more research should be undertaken. SPI PowerNet keeps the issue under close scrutiny, takes advice from health authorities and participates in EMF research.

1.3 Process for Approval of Subdivision Planning Applications

As a Referral Authority under the current legislation (Planning and Environment Act 1987), SPI PowerNet is consulted by the Responsible Authority (usually the appropriate Municipal Council) concerning its requirements for each subdivision planning permit application, whenever a high voltage power line easement is affected.

The steps involved in gaining approval of proposed subdivisions are:

- Issue of a Planning Permit by the Municipality. Permit conditions requested by SPI PowerNet and other Referral Authorities could normally be expected for any permit issued.
- Certification of the final, fully dimensioned Plan of Subdivision by the Municipality, following approval by the Referral Authorities.
- Issue of a Statement of Compliance by the Municipality, following advice from the Referral Authorities that the permit conditions have been satisfied, to enable registration of the Plan of Subdivision by the Land Titles Office.

For subdivisions affecting high voltage power line easements, the following SPI PowerNet requirements would normally be included as Planning Permit conditions:

- Written agreement to the final plan of subdivision must be obtained from SPI PowerNet prior to certification;

and, if roads or installation of services are proposed on the easement:

- Written approval of detailed construction plans (Engineering design drawings) for the proposed works must be obtained from SPI PowerNet prior to issue of the Statement of Compliance.

The SPI PowerNet response to a Planning Permit application may include comments concerning issues identified that must be considered in finalising the subdivision layout for Certification. Objection to an application would generally be made only if the amendments required would significantly affect the nature of the proposed subdivision.

SPI PowerNet consent to Certification of the final Plan of Subdivision is dependent on supply of full and satisfactory dimensional information showing the easement satisfactorily located in relation to the power line(s).
SPI PowerNet consent to issue of the Certificate of Compliance is dependent on prior approval of the Engineering design drawings, including satisfactory provision for the requirements outlined by these guidelines.

SPI PowerNet requirements for approval of Subdivision Planning Permit applications are stated in Section 2 of these guidelines.

1.4 Process for Approval of Construction Works

SPI PowerNet requires to approve all proposals for construction works affecting power line easements, including those for which Planning Permits are required, to ensure that public safety and SPI PowerNet’s easement rights are preserved.

Approval is generally a two-stage process, as follows:

(i) Engineering design drawings of proposed construction works, or any proposed alterations to previously approved designs, must be submitted to and be approved by SPI PowerNet prior to commencement of the works.

Applications for approval of design drawings are required to be submitted to:

Property Group
SP AusNet
Locked Bag 14051
MELBOURNE MAIL CENTRE VIC 8001

Information concerning SPI PowerNet requirements for approval of Engineering design drawings is given in Section 3 of these guidelines.

(ii) The contractor performing the work on site must also contact SPI PowerNet at least five working days prior to any work commencing, so that the proposed construction works methods can be reviewed and any safety precautions deemed necessary can be taken.

However, the prior notice period becomes at least ten working days should there be a requirement for use of vehicles, machinery or other equipment exceeding 3 metres maximum operating height, or any equipment with an elevating component. The use of such equipment in the vicinity of power lines must be in accordance with the requirements of the Electricity Safety (Network Assets) Regulations 1998.

The factors considered by SPI PowerNet for approval of construction works are outlined in Section 4 of these guidelines.

1.5 Costs for Evaluations, Asset Relocations and Line Outages

There are no fees payable to SPI PowerNet for evaluation of Planning Applications or for supply of asset location information, such as record plans required for preparation of detailed construction design drawings.

However, SPI PowerNet will recover all of its costs in cases where SPI PowerNet assets require relocation, protection or modification in some way or where a significant design input is required for assessment of Engineering design drawings for a construction project. In such cases, SPI PowerNet will advise the party initiating the work of the intention to recover costs, the extent of costs involved and timing of the work, so that a funding agreement can be established prior to the commencement of the SPI PowerNet design work.

Costs for assessment of required equipment operating constraints and for any line outages required to carry out the work, including temporary earthing of the conductors, will also be recovered from the constructor.
2. PLANNING APPROVAL OF SUBDIVISIONS

2.1 Summary of SPI PowerNet Requirements

PowerNet requirements for approval of subdivision planning applications that include land affected by high voltage power line easements are summarised as follows. Further information, including the basis of each requirement, is provided in the following Sub-sections 2.2 to 2.7:

- **Easement Verification and Adjustment**

  Plans of subdivision submitted for certification and referred to SPI PowerNet will not be approved unless the easement as shown on the plan accords with the actual position of the power line(s) as verified by survey connections and computation.

- **Allotment Size**

  SPI PowerNet advises that the unencumbered portion of lots affected by a high voltage power line easement should have a similar area to the area of nearby lots not affected by the easement.

- **Allotment Boundary Locations**

  Plans of Subdivision submitted for Certification and referred to SPI PowerNet will not be approved if proposed lot boundaries are located within 4 metres of existing or planned future tower leg steel or poles.

  However, the following larger separation distances and other dimensional requirements should be provided where practicable:

  - For urban residential subdivisions with wood fences, lot boundaries should be located 15 metres from any face of a steel tower base where practicable. Not less than 4 metres clearance is permitted between any tower face and the boundary.
  
  - Lot boundaries for industrial, rural and rural residential subdivisions that generally have metallic fences (including post and wire fences) should not exceed 100 metres in length on the easement or 250 metres in length on and within 20 metres of the easement. They should also be located at least 30 metres from the centre of existing and proposed towers, unless a reduced distance is advised by SPI PowerNet (Refer Appendix B).

- **Roads Crossing Easements**

  Plans of Subdivision submitted for Certification and referred to SPI PowerNet will not be approved if proposed road reserve boundaries are located within 30 metres of the nearest tower centre, unless prior consultation satisfactory to SPI PowerNet has occurred.

  Engineering design drawings for proposed works on the easement, including surface level changes, heights of lighting poles and locations of services need to be approved by SPI PowerNet before agreement can be given to the issue of the Statement of Compliance for the subdivision.

  Height restrictions on the operation of vehicles and construction equipment must be carefully considered in planning the subdivision, since significant cost implications for installation of roadside services may be involved.

- **Roads Within and Alongside Easements**

  Planning permit applications and/or plans of subdivision referred to us that include proposed roads will not be approved by SPI PowerNet where the total length of the road reserve clearly exceeds the 100/250 metre length limits stated in Appendix B, unless prior agreement by SPI PowerNet has been obtained concerning the arrangements made for installation of services and road lighting and for protection of towers.

  As for roads crossing easements, height restrictions on operation of vehicles and construction equipment on the easement must be carefully considered and SPI PowerNet approval of Engineering design drawings for works on the easement is required prior to issue of the Statement of Compliance.

- **Provision of Services to Allotments**

  SPI PowerNet approval of Engineering design drawings for all works on the easement is required prior to issue of the Statement of Compliance.

2.2 Easement Verification and Adjustment

There is a need for accurate definition of power line easements, given the land use restrictions required for safe and reliable operation of the power lines.

The area shown on the Certificate of Title as “easement to the SECV (i.e. SPI PowerNet) for transmission of electricity” is intended to cover a specific corridor of land overlaying the route of the transmission line. This corridor is dimensioned by computation of electrical safety clearance distances appropriate to the design of the line and it’s operating parameters and is positioned by survey connection to title of the proposed power line centreline. Modern title re-establishment surveys sometimes reveal that the recorded easement location does not coincide precisely with the actual position of the existing power lines in the way originally intended.

There are a number of reasons why this may be the case. These relate to the nature of land title boundary definition, the age of the line and the nature of easement creation surveys:

- Differences over time in the position of adopted title boundaries due to the nature of title re-establishment. This is most likely to happen in areas that have not been re-surveyed since the early days of land subdivision;

- Early power line easements were surveyed using methods and equipment less sophisticated than they are now. As the land affected was predominantly rural, accepted tolerances were greater than what is now required for residential and commercial/industrial subdivisions; and

- Easement creation surveys are generally not as comprehensive as surveys for subdivision of land and so are subject to amendment when a difference is revealed.

It is important that the consulting surveyor contacts SPI PowerNet as early as possible in the development process so that any need for easement variation can be identified before detailed design of the subdivision is started. This is especially relevant when lot or reserve boundaries are proposed to be based on the easement boundary.

The location of the easement boundaries will be re-computed using the consulting surveyor’s re-establishment of the title. Connections from the re-establishment survey to the power line centreline as defined by the towers or poles are necessary for this computation. This process should be discussed with SPI PowerNet. The new easement dimensions and connections to title will be provided to the developer’s surveyor for inclusion in the plan of subdivision.
An appropriate adjustment to the easement location is generally achieved on the plan of subdivision without the need for new easement creation or surrender procedures under the Transfer of Land Act. SPI PowerNet can provide details covering the notations required for the plan and on receipt of the plan showing the amended easement, will provide a letter authorising the variation addressed to the Registrar of Titles.

### 2.3 Allotment Size

Since buildings and structures, including swimming pools, are not permitted on high voltage power line easements, except for limited concessions regarding domestic outbuildings on 220 kV line easements, residential lots that are not large enough to accommodate a house, garage, swimming pool, etc. on land clear of the easement will be less useable than allotments of the same size that are not affected by the easement.

The expectations of a purchaser to be able to develop their land to a level comparable with that of neighbouring allotments that are unaffected by the easement is considered by SPI PowerNet to be an important consideration in planning a subdivision.

Similarly, planning of industrial lots should take into account the requirements that generally prohibit the storage of materials and the parking, loading and unloading of large trucks on the easement.

Therefore, as a general principle, SPI PowerNet considers that the unencumbered portion of lots affected by a high voltage power line easement should be similar in area to the whole area of nearby lots planned for comparable use that are not affected by the easement.

However, since lot size is primarily a matter for control by the developer and by the Responsible Authority, SPI PowerNet does not normally object to a subdivision based on a comparative land use disadvantage for lots affected by easement.

### 2.4 Allotment Boundary Locations

Lot boundaries on transmission line easements should be located in consideration of prudent public safety measures, SPI PowerNet requirements for vehicle access to and between towers and the associated inconvenience caused to SPI PowerNet and to lot owners.

Installation of gates in fences on the easement is required where direct access to tower sites from public roads is not available. The number of gates, safety requirements (including special design of metallic fences) and the level of inconvenience is influenced by the number of lot boundaries intersecting the access route provided by the subdivision and on the separation distances provided between lot boundary fences and towers. Established SPI PowerNet access tracks should be preserved, unless a satisfactory alternative is agreed.

The minimum and preferred separation distances between allotment boundaries and towers stated in Section 2.1 are based on the following fencing issues:

(i) Minimum of 4 metres between fences and the nearest face of the steel tower base - to provide for reasonable access around the tower base and permit use of standard electrical safety procedures by SPI PowerNet line maintenance personnel;

(ii) Requirements for access gates to enter adjacent allotments for normal line maintenance activities are minimised where fences are located at least 15 metres from the nearest face of 500 kV and 330 kV towers, or 10 metres from 275 kV, 220 kV and 66 kV towers;

(iii) The increased separation distances to towers and length limits for industrial, rural and rural residential subdivision lot boundaries stated in Appendix B, Tables 1 and 2, are based on avoiding the need for earthing and sectionalising of metallic fences, in accordance with Section 3.2 of these guidelines.

SPI PowerNet’s requirements for working space around towers is explained further in Section 3.7 of these guidelines.

### 2.5 Roads in the Vicinity of Easements

Roads in the vicinity of transmission lines can potentially have an adverse effect on maintaining existing high standards of safety and security of the lines.

Roads within transmission line easements that run parallel or cut at an angle of less than 45 degrees to the power line/s are generally not permitted. Proposed roads that are adjacent to an existing or future transmission line, but outside the easement, and are shorter than the maximum lengths as stated in Appendix B, Table 1, are generally acceptable, subject to SPI PowerNet approval of Engineering design drawings for works prior to issue of the Statement of Compliance for the subdivision.

Controls on road lengths in close proximity to high voltage power lines are required to limit the voltages that can be induced in roadside metallic objects and services to safe values.

The visibility of the line, exposure of towers to damage, hazards to SPI PowerNet maintenance personnel from road vehicles and the need to control service extensions for further subdivision development and later service upgradings or replacement works are additional factors requiring consideration.

Therefore, SPI PowerNet agreement to roads in the vicinity of high voltage transmission line easements is dependent on the total length of road proposed near the easement and satisfactory advice from the developer concerning the design provisions made that will limit induced voltages in metallic objects and services to safe values.

While it may prove possible, in some locations, to vary the maximum road and metallic service lengths stated in Appendix B, Table 1, this would be dependent on satisfactory results of detailed site investigations and calculations by SPI PowerNet based on the electrical design parameters of the affected line. Pre-payment by the developer of a fixed price for the study would normally be required and the response time would be dependent on other SPI PowerNet works commitments at the time.

- **Construction Equipment Height Restrictions**
  - The cost implications of height restrictions for vehicles and construction equipment required to be used on the easement are potentially more significant for roads along easements than for roads crossing easements and must also be carefully considered in planning the subdivision.

### 2.6 Roads Crossing Easements

- **Proximity to Towers and Poles**
3. APPROVAL OF ENGINEERING DESIGN DRAWINGS

The requirement for SPI PowerNet to approve all proposals for construction works affecting high voltage power line easements results from the responsibility to maintain and protect the following:

- Safety of the general public, contractors and SPI PowerNet personnel;
- Security of SPI PowerNet assets and continuity of electricity supply;
- Vehicle access to SPI PowerNet assets at all times and in all weather conditions;
- Provision reserved within existing easements for planned future lines; and
- Potential for redevelopment of the easement for future power supply purposes.

Because of the variety of ways in which construction works can affect SPI PowerNet assets there is a need for close review by SPI PowerNet of both the design and construction method aspects of proposed developments.

The following additional information to that stated in Appendix A, concerns requirements selected as more relevant to subdivision proposals and is provided to assist with detailed planning and design.

3.1 Buildings and Structures

Buildings and structures, including swimming pools, are not permitted on high voltage power line easements, except for limited concessions regarding domestic outbuildings on 220 kV line easements, as outlined in Appendix A.

3.2 Fences

- Earthing Requirements

  Long metallic fences close to high voltage power lines, for example farm type (post and wire) and chainwire mesh types, can have a voltage induced in the metallic (that is, electrically conductive) components. To limit the induced voltages to safe values, either the length must be restricted to the maximum values stated in Appendix B, Table 1, or the fence must be earthed to SPI PowerNet requirements.

  Typical earthing requirements for post and wire fences would involve connection of the horizontal strain wires to earth spikes driven into the ground at intervals not exceeding 30 metres. For a fence using bare metal mesh or wire supported on bare metal posts, no additional earthing would generally be required.

- Sectionalising Requirements

  An additional consideration relates to fences in the vicinity of steel towers and concrete poles. Under extraordinary operating conditions, typically during line faults, the ground voltage in the vicinity of the tower or pole can rise relative to the surrounding area.

  To prevent any electrical hazard, the voltage occurring must not be transferred via fences (or other conductive objects) to areas remote from the tower or pole.
Accordingly, fences must be either kept clear of towers and poles by the minimum distances stated in Appendix B, Table 2, or sectionalised by insertion of an insulating section at each location where the fence enters the zone around each tower or pole extending to the appropriate Table 2 distance.

On request, SPI PowerNet can provide further advice and clarification of earthing and sectionalising requirements for particular fence designs and arrangements.

### 3.3 Roadside and Allotment Services

Similar requirements to those stated above for metallic fences apply to the total lengths and proximity to towers of buried metallic services, including water, drainage, sewerage and gas pipes, telephone cables and low voltage electricity supply cables, except that earthing and sectionalising may either not be practicable or involve a significant cost penalty.

In many situations, the most practical solution will be to locate the services well clear of the power line easement, as stated in Appendix B.

Roadway lighting poles proposed on the easement are also subject to height restrictions depending on the available clearances to the high voltage power line conductors and they must lower to the ground for servicing, including lamp replacement.

The length of non-metallic pipes (such as PVC and earthenware) is not restricted on the easement and reinforced concrete pipes are permitted provided that they are not located closer to towers and poles than the minimum distances stated in Appendix B, Table 2.

### 3.4 Ground Surface Level Changes

**Clearances to Line Conductors**

No variation to existing ground surface levels under high voltage power lines is permitted without prior SPI PowerNet approval. Approval is subject to confirmation that the clearances to the line conductors will not be reduced below the required minimum design clearances under the conditions of maximum conductor sag (corresponding to the maximum line operating temperature) and the maximum design wind.

Because of the variety of line voltages, configurations, maximum operating temperatures and the effects of wind on the horizontal displacement of the conductors, SPI PowerNet must be contacted to provide advice on all aspects of conductor clearances.

A brick or timber sound wall or other roadside feature that can be climbed, providing a closer approach to the overhead lines, is generally not permitted in locations where only the minimum design clearance is provided.

**Requirements Near Towers and Poles**

From consideration of SPI PowerNet requirements for the movement of personnel and vehicles and the handling of materials in the vicinity of towers and poles, the creation of uneven or poorly drained sites is unacceptable.

Lowering of surface levels in the vicinity of towers and poles is generally unacceptable to SPI PowerNet because of the detrimental effects on the stability of the structures.

A further consideration is that tower foundations, above ground members and pole stay wires have been installed with corrosion protection appropriate to the existing surface levels.

Where surface levels are proposed to be raised in the vicinity of towers or pole stay wires, the corrosion protection systems are required to be extended to cover the new height. The fill placement method and type of fill material must be controlled to ensure that no damage to members or protective coatings occurs and that no potential for long term damage is created from either fill settlement or chemical action.

For constructions that involve significant ground surface level changes over a wide area of easement, SPI PowerNet generally requires accurate survey measurements of the final surface levels to be undertaken by the Constructor for amendment of the power line design records. Alternatively, SPI PowerNet could undertake the survey work at cost to the Constructor.

### 3.5 Tree Plantings

Trees and shrubs with a mature growth height not exceeding 3 metres are permitted on high voltage power line easements. Taller species (generally limited to 6 metres maximum mature height) may be acceptable, subject to SPI PowerNet approval of the planting layout to verify that sufficient clearances to the conductors will be provided and that this can be readily assessed by SPI PowerNet line patrols. Other specific requirements are that the vegetation will not endanger the line in the event of vegetation fires and will permit satisfactory SPI PowerNet vehicle access to and around towers for line patrol and maintenance purposes.

Initial planting of approved species and locations, with regular vegetation maintenance, including removal of inappropriate regrowth, will eliminate the need for corrective action by SPI PowerNet and minimise the possibility of unavoidable damage during line maintenance works.

Vegetation density is generally restricted to scattered trees or limited area clumps and shelterbelts to control the total quantity of burnable materials on the easement.

Trees that grow to exceed the approved heights may be removed and costs charged to the property owner. Tall growing species will be removed at the earliest opportunity.

A tree clear area of 20 metres minimum radius is generally required at tower sites for line maintenance purposes. Closer trees may be permitted in some locations, where the interference caused to access and essential line maintenance is acceptable. A larger tree clear area is required at future tower sites to provide for construction of the new transmission line. Section 3.7 includes further comment on the requirement, to provide reasonable working space around towers.

To assist in the selection of appropriate tree/vegetation species, SPI PowerNet has an information booklet available on request.

### 3.6 Protection of Line Support Towers and Poles
Regular line patrol and maintenance activities can typically include monthly inspections. In an emergency situation, work could be undertaken at night or day over extended periods. Vehicle access by SPI PowerNet is required to existing and future tower and pole sites at 3.7 Access for Line Maintenance and Construction

Construction works are not to affect the structural performance of SPI PowerNet assets. Where earthworks are proposed in the vicinity of poles or towers SPI PowerNet must be convinced that the performance of existing structure footings (particularly for uplift or overturning forces) is not compromised.

Also, the introduction of higher groundwater levels to footings not designed for the changed conditions would be unacceptable.

3.7 Access for Line Maintenance and Construction

Vehicle access by SPI PowerNet is required to existing and future tower and pole sites at all times for line patrol, maintenance and construction purposes. For many easements, gates 4.6 metres in width will be required in boundary fences to permit vehicle access along the easement. For property security purposes, provision is required for fitting of SPI PowerNet padlocks to gates.

In an emergency situation, work could be undertaken at night or day over extended periods and in extreme weather conditions.

Regular line patrol and maintenance activities can typically include monthly inspections using a 4.5 tonne vehicle, a 20 tonne bucket truck and support vehicle for insulator washing yearly and a 40 tonne crane once in ten years (heavy maintenance contingency).

• Protective Barriers

Constructions that include roads or involve the use of vehicles in the vicinity of high voltage power line towers or poles increase the risk of damage to the structures and hazards to SPI PowerNet employees. SPI PowerNet requires Constructors to address this risk by the provision of suitable barriers.

Installation of “New Jersey”, “Armco” or an alternative design of barrier approved by SPI PowerNet as appropriate to the situation is required where a hazard may arise due to errant vehicles or loads. Particular hazards could result from road design factors, such as positioning the outside of a curve near a tower, or surface level differences that would not assist errant vehicles to return to the carriageway (for example, a roadway embankment higher than the natural surface level at the tower base).

The barrier must be located as close as practicable to the kerb, be designed to contain out-of-control vehicles and their loads within the carriageway and preferably not be within 15 metres of steelwork for 500/330 kV towers or 10 metres for 275/220/66 kV towers, to provide for normal line maintenance activities without the need for lane or road closure. The barrier design must also provide for site access by SPI PowerNet vehicles.

Metal and concrete barriers must also be at least 4 metres from the nearest tower leg steel/pole, to permit use of standard electrical safety procedures by SPI PowerNet maintenance personnel.

• Structure Stability Requirements

Construction works are not to affect the structural performance of SPI PowerNet assets. Where earthworks are proposed in the vicinity of poles or towers SPI PowerNet must be convinced that the performance of existing structure footings (particularly for uplift or overturning forces) is not compromised.

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The barrier must be located as close as practicable to the kerb, be designed to contain out-of-control vehicles and their loads within the carriageway and preferably not be within 15 metres of steelwork for 500/330 kV towers or 10 metres for 275/220/66 kV towers, to provide for normal line maintenance activities without the need for lane or road closure. The barrier design must also provide for site access by SPI PowerNet vehicles.

Metal and concrete barriers must also be at least 4 metres from the nearest tower leg steel/pole, to permit use of standard electrical safety procedures by SPI PowerNet maintenance personnel.

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Also, the introduction of higher groundwater levels to footings not designed for the changed conditions would be unacceptable.

• Access around Towers

Towers require a reasonably large working space because of their size and consequently the type of equipment required to be used. The preferred minimum size clear worksite would be a level, compacted area free of obstructions within 20 metre of the tower steel in all directions including a surfaced hard standing rectangular area extending 20 metres from each side of the tower underneath the conductors and 5 metres from each side of the tower beside the conductors. The surfaced hardstand area provides a site for operation of winches, cranes or “bucket trucks” and parking of passenger vehicles and patrol trucks.

It is acknowledged that some towers may already have smaller available worksites than the preferred minimum size, due to existing landforms or obstructions and that the design of construction works may impose further restrictions. There is a requirement for discussion at the design development stage to ensure that the needs of both SPI PowerNet and the Constructor are accommodated.

• Protection of SPI PowerNet Employees

Since SPI PowerNet employees work on the easement on a regular basis, SPI PowerNet has an obligation to provide a safe work place within the definition of the Occupational Health and Safety Authority regulations. SPI PowerNet requires provision of safe access and safe worksites.

For constructions that include roads or involve the use of vehicles in the vicinity of high voltage power line towers or poles, approved barriers or other measures that satisfactorily reduce the risk of injury from errant vehicles or loads must be provided.

SPI PowerNet requires to approve the measures adopted but looks to the Constructor to present appropriate solutions having regard to the factors involved, such as the vehicle speeds, proximity of the road, differences in surface levels and the location of road curves relative to towers and poles.

• Standard of Access

The majority of high voltage power lines have been in use for many years. During this period, SPI PowerNet line patrol and maintenance personnel have established access tracks suitable for their purposes and an environment that is generally readily and inexpensively restored should surface or vegetation damage be unavoidable.

Associated with any proposed development, SPI PowerNet seeks to ensure that freedom of access at all times and under all weather conditions is not restricted, that the potential for damage (and therefore restoration costs) due to SPI PowerNet activities are not increased and that the pattern of existing patrol activities is disrupted to the least extent practicable.

Therefore, consideration needs to be given to the compatibility of proposed constructions (including multi-use pathways, tree planting, landscape mounting and fencing) with SPI PowerNet access requirements. For example, the provision of reinforced access through grassed areas and replacement access tracks having grades and turning radii suitable for movement of long chassis vehicles such as cranes and bucket trucks would be required for developments that significantly alter the access arrangements.

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It is acknowledged that some towers may already have smaller available worksites than the preferred minimum size, due to existing landforms or obstructions and that the design of construction works may impose further restrictions. There is a requirement for discussion at the design development stage to ensure that the needs of both SPI PowerNet and the Constructor are accommodated.
4. APPROVAL OF CONSTRUCTION WORKS

4.1 Conditions on Design Approval

SPI PowerNet approval of Engineering design drawings for construction works affecting high voltage power line easements is normally subject to a number of conditions. When no information is submitted by the Constructor concerning the equipment and construction methods proposed to be used, the following SPI PowerNet requirements are normally advised:

- A 3 metres maximum operating height limit for vehicles, machinery and other equipment used on the easement, with possible additional restrictions for items of plant equipped with an elevating component.
- The Constructor must contact SPI PowerNet at least five working days prior to any work commencing on the easement.

However, should a requirement be identified for use of vehicles, machinery and equipment that either exceed the 3 metres maximum height limit, or are defined as Cranes, the work commencement notice period is increased to at least ten working days to provide for detailed assessment of the safety clearances available to the high voltage conductors and the need for equipment operating limits and/or line outages. In practice, the longer the notice given by the Constructor, the less likelihood of delays to the site works.

Use of Cranes and vehicles, machinery and equipment higher than 3 metres may be acceptable at some work locations where greater than normal clearances to the line conductors are available. However, the required clearances must be determined by SPI PowerNet, since they are line voltage dependent and the line conductor positions can change significantly and without warning with variations in the electrical load, ambient temperature, wind strength and direction. It must also be appreciated that high voltage electricity can arc across distances of several metres, so that even a close approach can be dangerous.

4.2 Control of Construction Works

SPI PowerNet is required to check that the works are in accordance with the approved drawings, review the works procedures and construction equipment proposed to be used against the available clearances and required minimum safety clearances to the high voltage conductors and towers and arrange for any safety precautions deemed necessary to be taken.

An "Application for a Permit to Work Adjacent to SPI PowerNet's Exposed High/Low Voltage Electrical Apparatus" may be required to be signed by the Constructor prior to commencement of the work. SPI PowerNet's Local Lines Team Leader would then arrange for written authorisation entitled "Permit to Work Adjacent to SPI PowerNet's Exposed High/Low Voltage Electrical Apparatus" for the time to be nominated and no work would be permitted without this permit.

Line outages, where required, are subject to operational availability. SPI PowerNet does not accept liability for any delays or costs to the constructor for the safety precautions and line outages required.

Any construction works in the vicinity of SPI PowerNet transmission lines are required to comply with the following statutory regulations designed to protect people and property and prevent interference to SPI PowerNet lines and other assets:

- Occupational Health and Safety (Plant) Regulations.

The Victorian “Code of Practice for Plant No. 19, 1 July 1995” provides guidance to plant users on how to meet the requirements of the OH&S (Plant) Regulations, including identification and control of workplace hazards. For safe operation of Cranes, Australian Standard AS2550.1-1993 Cranes - Safe Use is specified as the appropriate technical standard to be followed.

4.3 Construction Equipment Authorisation

No work is permitted on the easement involving any change in surface levels, use of any vehicle, machinery or equipment exceeding 3 metres in maximum operating height, or defined as a Crane by the OH&S (Plant) Regulations 1995, regardless of the operating height, without the prior approval of SPI PowerNet.

Proposals submitted for construction approval should include reference to the design approval by SPI PowerNet, and a description of the task including the maximum equipment and load reach in both the vertical and horizontal planes, the operating location with respect to the lines and proposed controls on the operation of each item of equipment to maintain statutory clearances.

Full and detailed proposals should be submitted at least ten working days prior to the programmed commencement date. The proposed date and time should be confirmed five working days prior to commencement. A charge may be made for evaluation of proposals.

Australian Standard AS2550.1-1993 Cranes - Safe Use, Clause 7.17, specifies the precautions required to be observed when operating a crane in close proximity to overhead power lines. For transmission lines on towers, a minimum safety clearance of 6 metres is required to be maintained, unless designated otherwise by SPI PowerNet, based on the line voltage. An additional distance must generally be added to allow for possible line conductor movements resulting from changes in the electrical current flow and the weather conditions (ambient temperature, wind strength and direction).

SPI PowerNet will assess submitted equipment operation proposals with consideration to the clearances available and contingent controls and precautions that may be required. Line outages, where required, will be subject to operational availability. Costs for outages will be advised at this time.

Since transmission system security requirements, in conjunction with programmed maintenance works, frequently result in restrictions on the availability and duration of high voltage line outages, any significant cost implications for construction works on easements should be carefully assessed by the Constructor.

Commencement of design approved works that can be achieved within the 3 metres maximum operating height limit must be advised to SPI PowerNet with at least five working days notice.

4.4 Use of Explosives

- No electrical detonation

Electrical detonation of explosives must not be used on the easement as there is a danger that pre-detonation could occur due to the operation of adjacent overhead or underground lines. There is also the added danger that detonation wire may fly and contact overhead conductors.

Electrical detonation of explosives away from the easement may also be affected by power line fields and accordingly the advice of suppliers of explosives must be sought and acted on before electrical detonation is used in the vicinity of high voltage power lines.
• **Proximity limits**

Explosives could affect SPI PowerNet assets in either of three ways:

- Structural damage due to ground movement;
- Damage due to fly rock; or
- Maloperation of sensitive equipment due to ground acceleration.

Because of the range of circumstances in which explosives could be used, SPI PowerNet does not set specific guidelines except that no explosive shall be used within 10 metres of a tower, pole or underground cable without specific SPI PowerNet approval.

The charge size, placement and detonation rates must be determined with regard to the proximity of SPI PowerNet assets. When given sufficient notice, SPI PowerNet will provide advice on the age and likely condition of assets, so that the Constructor can ensure that proposed blasting is carried out without risk of damage.

However, where damage occurs to SPI PowerNet assets, the Constructor responsible for the blasting will be held liable for the cost of restoration.

Where large scale use of explosives is planned, SPI PowerNet requires to be given 6 weeks notice to assess the likelihood of any effect on any sensitive equipment at terminal or substations in the vicinity.

If explosives are used, movement of blast mats must be controlled and care must be taken to prevent damage to SPI PowerNet assets caused by fly rock.

4.5 **Protection of Underground Cables**

• **Identification of Cable Locations**

In locations where SPI PowerNet may have underground cables in the vicinity of proposed works, attention is drawn to the following:

- Location information for SPI PowerNet cables can be obtained by contacting Dial Before You Dig, telephone 1100 (24 hours). At least 48 hours notice prior to commencement of site works is required to provide for identification and on-site marking of affected cable locations;
- Cables are buried at depth to provide protection and safety. No change in depth of cover is permitted without SPI PowerNet approval. An increase in the depth of cover may adversely affect the performance of the cable and also the ability of SPI PowerNet to access and repair it.

The location of any SPI PowerNet underground cables must be determined before proceeding with excavation works, boring or driving of stakes, piles or the like.

• **Work Requirements Near Cables**

Mechanical excavation, boring or pile driving is not permitted within 1.5 metres of the indicated position of cables.

Where excavations are required closer than 1.5 metres to a cable, to a greater depth than the cable (such that support of the cable may be compromised) or where the location of the cable may be in doubt, subject to implementation of any special precautions deemed necessary by SPI PowerNet, the location of the cable may be proven using hand tools only.

With the cable alignment thus proven, mechanical plant may be used within 0.5 metres.

For the purposes of pavement construction over cables, with prior SPI PowerNet approval, tracked heavy crawler type equipment may be used with 450 mm of cover over cables.

• **Working Space Required for Cables**

An accessible area of at least 1.5 metres width either side of the cable is required to enable it to be repaired as necessary. In cases where cables are installed through ducts under road surfaces a spare duct should be provided. The spare duct covers the situation where the cable fails within the first duct and the duct is damaged beyond reuse.
APPENDIX A - Permitted and Prohibited Uses of Power Line Easements

The following restrictions and conditions concerning activities in the vicinity of high voltage power lines are required to ensure that public safety is not compromised by incursions within SPI PowerNet's easements and that the reliability of the lines is maintained. Prior approval is also required for any proposed alterations to approved developments on the easement to ensure that the initial high safety standards are maintained.

SPI PowerNet does not accept liability for any damage to the development caused by the operation and maintenance of the line.

Permitted Uses of Power Line Easements Include:

- Grazing and agriculture.
- Market gardens, orchards and horticultural nurseries, excluding buildings.
- Water storage dams, subject to sufficient clearances from the conductors and towers, including effects on water tables at tower sites.
- Trees and shrubs with a mature growth height not exceeding 3 metres. Taller species (generally limited to 6 metres maximum mature height) may be acceptable, subject to SPI PowerNet approval of the planting layout to verify that sufficient clearances to the conductors will be provided. Vegetation density restrictions and tree clear area requirements near towers to permit line maintenance works also apply.
- Landscaping and paving, subject to sufficient clearances to the conductors and towers if alterations to the natural surface levels are proposed.
- Fences up to 3 metres in height, suitably earthed and sectionised if metallic incorporating metallic materials.
- Sewerage, drainage and water pipes constructed of earthenware or plastic materials.
- Parking of sedan and utility types of vehicles. Barriers of an approved design may be required to protect towers from damage by vehicles.
- Tennis courts on 500 kV and 330 kV easements, provided that the net and umpire’s chair are off the easement and the surrounding fence is a minimum of 30 metres from any tower steelwork.
- Tennis courts on 220 kV line easements, provided that metal net posts are used. An umpire’s chair is also permitted, provided that it is of all metal construction, with a metal screen above the seating position. The minimum distance from the surrounding fence to the nearest tower steelwork reduces to 20 metres for 220 kV line easements.
- Ground level sporting activities, such as football, cricket, golf, basketball and netball, subject to special requirements regarding the design of metallic fences, goals and lighting.
- Lighting poles, subject to sufficient clearance from the conductors and towers. The power supply must be underground and the lighting poles must lower to the ground for servicing, including lamp replacement.

Prohibited Uses of Power Line Easements Include:

- Walking and bicycle paths, subject to suitable provision for access by SPI PowerNet vehicles.
- Playground equipment, subject to a 1 metre maximum height limit.
- For 220kV line easements only - car, boat and small trailer sales yards, excluding buildings.
- For 220kV line easements only, domestic garages, carports and garden sheds may be permitted a limited distance onto the easement, subject to a number of requirements including sufficient safety clearance to towers and overhead conductors, 3 metres maximum height, constructed largely of non-flammable materials and not attached to a dwelling.
- Houses, other buildings and structures, including eaves, awnings, canopies, shelters, water tanks, boreholes and windmills.
- Scaffolding.
- Swimming pools, both above ground and below ground types, including filtration equipment.
- Storage of flammable fuels.
- Storage of materials, including waste bins and stockpiling of excavated materials.
- Fueling of and repairs to vehicles.
- Use of vehicles and equipment exceeding 3 metres in operating height. A higher operating height limit is subject to sufficient clearances to the conductors. Possible additional restrictions apply to items of plant defined as a Crane by the Occupational Health and Safety (Plant) Regulations 1995.
- Parking of caravans and trucks.
- Loading, unloading and load adjustment of large trucks.
- Operation of large water spray irrigators of the gun type.
- Metal pipes (including reinforced concrete), electric power cables and other electrically conductive services within 30 metres of any tower steelwork, or exceeding 100 metres in length on the easement or 250 metres in length on and within 20 metres of the easement. For 220 kV easements, this minimum distance from towers reduces to 20 metres.
- Electrical detonation of explosives.
- Excavations to a depth exceeding 0.9 metres within 15 metres of any tower or 0.3 metres within 1.5 metres, without prior written approval.
- Flying of kites and model aircraft controlled by wires within 45 metres of any line.
E. Energy Efficiency Initiatives

Natural Gas Cooling

Natural Gas can be used to cool buildings, which is considered a more environmentally friendly cooling method as it displaces the use of electricity, which is largely produced by coal fired power stations. There are four established technologies that use Natural Gas to cool buildings:\n\[\text{Absorption Chillers (an ideal use of waste heat from co-generation systems)}\]
\[\text{Gas Engine Driven Vapour Compression (GED)}\]
\[\text{Co-generation with absorption cooling (A distributed energy system also known as Building Cooling, Heating and Power (BCHP) with further details provided in Section 0)}\]
\[\text{Desiccant systems}\]

Distributed Energy

Distributed energy is a type of system which involves decentralised power generation, heating and cooling.

This type of system has the potential to produce power, cooling and heating on a building or precinct scale. If the system is synchronised with the electricity grid, there are negative impacts to fault levels as outlined in Section 8.2.

An example of a typical Building Cooling, Heating and Power (BCHP) system is shown in Figure 8. This diagram shows a gas engine supplied by natural gas which drives a generator producing electricity. Waste heat from the gas engine acts as an input to operate an absorption chiller that provides cooling and heating to the building or precinct.

Table 1 - Maximum Parallel Lengths of Metal Fences and Services (Applicable to 66 kV - 500 kV Power Lines)

<table>
<thead>
<tr>
<th>Location of Metal Object</th>
<th>Maximum Length (metres)</th>
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<tbody>
<tr>
<td>On the easement</td>
<td>100</td>
</tr>
<tr>
<td>Within 20 metres of the easement</td>
<td>250</td>
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Table 2 - Minimum Separation Distance (Measured to the Tower or Pole Centre)

<table>
<thead>
<tr>
<th>Line Voltage (kV)</th>
<th>Minimum distance (metres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500, 330 tower</td>
<td>30</td>
</tr>
<tr>
<td>275</td>
<td>25</td>
</tr>
<tr>
<td>220 tower</td>
<td>20</td>
</tr>
<tr>
<td>66 tower</td>
<td>16</td>
</tr>
<tr>
<td>66 pole</td>
<td>3</td>
</tr>
</tbody>
</table>

APPENDIX B - Layout of Subdivisions to Avoid Electric Hazards

Metal objects located close to high voltage power lines are subject to induced voltages caused by electrostatic, electromagnetic and conductive couplings. If required, SPI PowerNet can provide further information concerning the fundamental mechanisms of electric induction.

Subdivision developments typically include installation of the following types of metal objects and allotment services, for which special design measures could be required (depending on their size/length and proximity to the power lines) to limit the induced voltages and any resulting electrical currents to safe values:

- chainwire mesh, or post and wire fences;
- low voltage power cables, including street lighting;
- telephone cables; and
- high pressure gas and water pipelines;

Generally, the best and least cost method of avoiding possible hazards caused by proximity to high voltage power lines is to stay far enough away, so that there is no significant interaction between the metal objects and the power line.

Therefore, the following tables provide guidance concerning the maximum lengths of metal fences and services and the minimum separation distances from towers to avoid any requirement for special design measures:

The drivers for uptake of a distributed energy system include:

- Energy pricing
- Security of supply for customers connected to the distributed energy system (However if works are required to separate the network to cope with fault levels from the distributed energy system, the number of short term outages during reclose time will increase). It should be noted that distributed energy systems are generally not more reliable than the grid, which has reliability of almost 100%
- Reducing carbon emissions and exposure
- Flexibility of supply and demand

Natural Gas vehicle home refuelling

Natural Gas vehicle home refuelling is a relatively new concept for Australia. It involves converting a car’s fuel system and installing a home-compressed natural gas (CNG) refuelling system at a residence, which is supplied from the existing reticulated gas network.

There is a cost saving associated with the use of natural gas as fuel rather than petrol, however it is reported that safety concerns, limited ability to travel long distances and a lack of fuelling stations throughout the country are inhibiting the growth of this technology.

Electric Vehicle Charging Stations

Electric vehicles are powered by electric motors rather than petrol, and use energy stored in rechargeable batteries which are charged from the grid at charging stations.

There are several advantages that electric vehicles have over traditional petrol powered vehicle, as follows:

- Energy efficient
- Environmentally friendly. Electric vehicles emit no tailpipe pollutants, although the power plant producing the electricity may emit them
- Performance benefits. Electric motors provide quiet, smooth operation and stronger acceleration and require less maintenance than traditional petrol powered vehicles
- Reduce energy dependence. Electricity is a domestic energy source.

There are however significant battery-related challenges:

- Driving range
- Recharge time. Fully recharging the battery pack can take 4 to 8 hours. Even a “quick charge” to 80% capacity can take 30 min
- Battery cost
- Bulk & weight of battery packs

Integrated Demand Management (IDM) Scheme

An IDM scheme can be used to reduce the demand on the electricity network which can, in some instances, delay the need for additional substations and other electricity infrastructure to be built or augmentation works undertaken to meet increased demand for power. An IDM scheme assists to provide short term security of power supply by optimising electricity use and balancing electricity supply and demand. An IDM scheme can also provide information so customers can better manage their electricity costs.

This objective can be achieved by tariffs, enabled by smart meters that encourage consumption outside peak usage times, and/or a scheme where the system operator pays customers to reduce load on instruction to balance demand and supply.

Other demand management initiatives such as solar panels and energy efficient features can have an impact on the tariffs customers who don’t have such initiatives pay, as the electricity network still needs to be upgraded to support peak loads (taking into account failure of demand management fixtures). Energy conservation scheme (ECS) to achieve an energy reduction amongst consumers that have high electricity demands.

- Energy Management Programme (EMP) to assist Corporate Customers to enhance energy efficiency
- Solar Water Heating Programme which provides financial incentives for consumers to switch to solar water heating
- Power awareness and communications campaigns
- Energy efficient fixtures

Demand Management Incentive Scheme 2011 – 15

The Australian Energy Regulator (AER) has a Demand Management Incentive Scheme (DMIS) for Victorian Distribution Network Service Providers (DNSP), including CitiPower and SPI PowerNet, which is applicable to the regulatory control period 2011 to 2015.

The objective of the DMIS is to provide incentives for DNSPs to implement efficient non-network alternatives or to manage the expected demand for standard control services in some other way. This scheme has provided funding to CitiPower to conduct a trial demand management scheme where the system operator pays customers to reduce load on instruction to balance demand and supply. CitiPower has an agreement with commercial premises with generators in Richmond and West Melbourne to use the generators for their electricity supply when requested by CitiPower. Initial feedback from CitiPower indicates that the incentive of deferring network upgrade works is not sufficient to make this demand management strategy a likely long term program without AER funding.

25 AER 2009 ‘Demand Management Incentive Scheme 2011 – 15’
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Figure 8 Typical Building Cooling, Heating and Power (BCHP) System


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26 AER 2009 ‘Demand Management Incentive Scheme 2011 – 15’
G. VicRoads existing road network condition
H. VicRoads SmartMaps
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