Beveridge North West Precinct Structure Plan

Utilities Servicing and Infrastructure Assessment

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Executive Summary

Cardno have been commissioned by the Metropolitan Planning Authority to investigate and report on the feasibility of servicing development within the proposed Beveridge North West Precinct (PSP 1059). Services that were investigated are; main drainage, drinking water, recycled water, sewerage, electricity, gas and telecommunications.

Investigations have determined that the infrastructure required to cater for the proposed development of the Beveridge North West Precinct can be provided based on the strategies prepared for the precinct by the relevant authorities.

The following significant constraints regarding development of the Precinct have been identified for consideration:

- Adjacent road infrastructure is limited to the east and north. Upgrade of existing roads to the south and east is also required to provide access to the Precinct.
- Land required to be reserved for stormwater retarding basins, wetlands and channels.
- Limited existing electrical, sewer and water services within close proximity to provide supply to the precinct in the interim.
- Extensive trunk infrastructure services for sewer, water. and electricity are required to ultimately service the PSP with development limited to 500 lots in the short term.

1 Introduction

The Metropolitan Planning Authority (MPA) is overseeing the preparation of a Precinct Structure Plan for Beveridge North West (PSP 1059). To assist in this process, MPA has engaged Cardno to investigate and report on the requirements for the provision of services infrastructure to cater for new urban development within the Beveridge North West Precinct.

As a part of this investigation, existing services asset information was reviewed and relevant authorities liaised with regarding their proposed servicing strategies to cater for the development of the land in question.

Services assessed are sewerage, potable water, recycled water, electricity, gas, telecommunications, and general stormwater management and drainage. In addition to the ability of infrastructure to service the precinct, any impact on land usage and constraints to development identified during the investigation has been noted where applicable.

This report summarises the outcomes of this investigation.

2 Site Description

The area under consideration for the Precinct Structure Plan is within the Shire of Mitchell. It is defined to the west by Old Sydney Road, to the south by Camerons Lane, to the east by the Hume Freeway and to the north by the current Urban Growth Boundary.

Existing urban development is located to the north in Wallan and to the south in Beveridge Central and the Mandalay Estate currently under construction. The recently approved Lockerbie PSP adjoins the site on the east side of the Hume Freeway.

The Kalkallo Creek runs north south through the western side of the precinct. The majority of the site grades to the south or into Kalkallo Creek forming part of the Kalkallo Creek catchment. The balance of the PSP site grades to the north.

The Beveridge North West Precinct has a gross area of approximately 1,259 hectares and comprises 15 separate properties.

Existing land use is predominately agricultural and grazing.

3 Development Proposal

The Beveridge North West Precinct is located within the North Growth Corridor and will primarily consist of residential development with some landscape elements located along the north and west Boundary. It is expected that the precinct will eventually accommodate approximately 11,000 residential lots.

The North Growth Corridor Plan (GCP) prepared by the Metropolitan Planning Authority, identifies two north south arterial roads and three east west arterial roads located within or along the boundaries of the precinct. These are shown as in Figure 01 below. It is expected that the wider reservation of the Arterial Roads will be utilised to accommodate trunk service infrastructure within the Precinct.

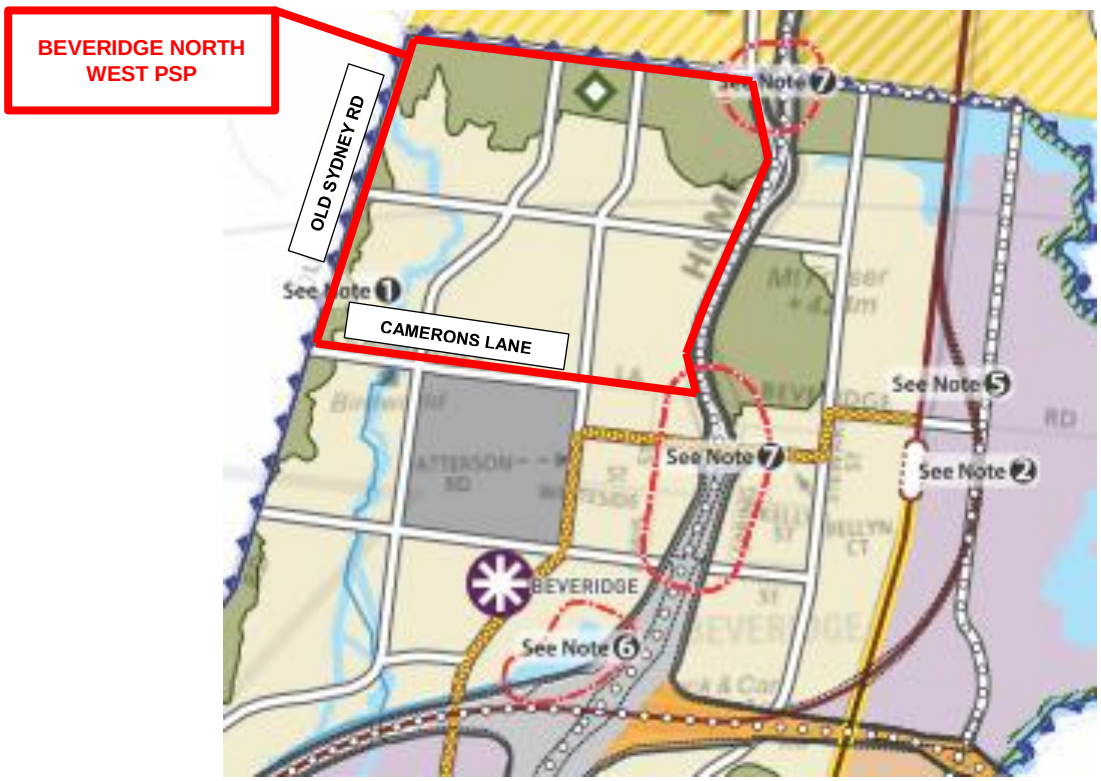


Figure 01 - Extract of the North Growth Corridor Plan, *Extract of MPA North Growth Corridor Plan*

Existing Road infrastructure is limited to Old Sydney Rd and approximately 75% of Camerons Lane. These are sealed and currently configured to rural standard. *The North Growth Corridor Plan* identifies that sections of Camerons Lane will require upgrade to Arterial Standard.

Other than these two roads, there are no other existing roads within the boundary of the PSP, and as such, upgrade and construction of new roads to provide access to the precinct will be required when development commences within the area.

4 Services Infrastructure

Service infrastructure requirements for each service within the Precinct are outlined within the following sections.

The general servicing strategy, infrastructure and the potential requirements for land provision has been identified. The Impact on adjacent development has also been noted where applicable. Otherwise, the local reticulation of services is generally assumed to occur within normal road reservation widths in accordance with standard urban development practice and MPA guidelines.

The preferred location of Trunks Services such as Yarra Valley Water distribution mains (300-375mm diameter) and 22kV HV feeder cables is within any proposed arterial road networks. However, due to the preliminary nature of planning undertaken to date, the service authorities have yet to identify trunk service alignments within the PSP in relation to any proposed road network.

4.1 Main Drainage

Melbourne Water is the responsible authority for the provision of main drainage for the Beveridge North West Precinct.

The majority of the Beveridge North West Precinct lies within the Kalkallo Creek catchment and forms part of the Kalkallo Development Services Scheme. The scheme is currently under review with the status of the scheme listed as preliminary. A copy of the Kalkallo Scheme Plan has been included in Annex 3 for reference. Melbourne Water advised that the scheme is programmed to be finalised by the end of the 2014 financial year.

Three nominated outlets are identified along the southern boundary of the Precinct with the main outlet being located where Kalkallo Creek crosses Camerons Lane. Upgrade of the existing Culverts is required to accommodate the 100 year flood flows. New Culvert and drainage pipe crossings under Camerons Lane are also required at the other two outlets to the west.

Additional Main Drainage elements required within the scheme include 3 retarding basins, drainage channels and underground pipe drains. These elements are shown in Figure 02 and identified in Table 01 below. Melbourne Water has advised that scheme elements are currently undergoing further concept design and hence any size or flow estimates provided are approximate only and subject to confirmation and change.

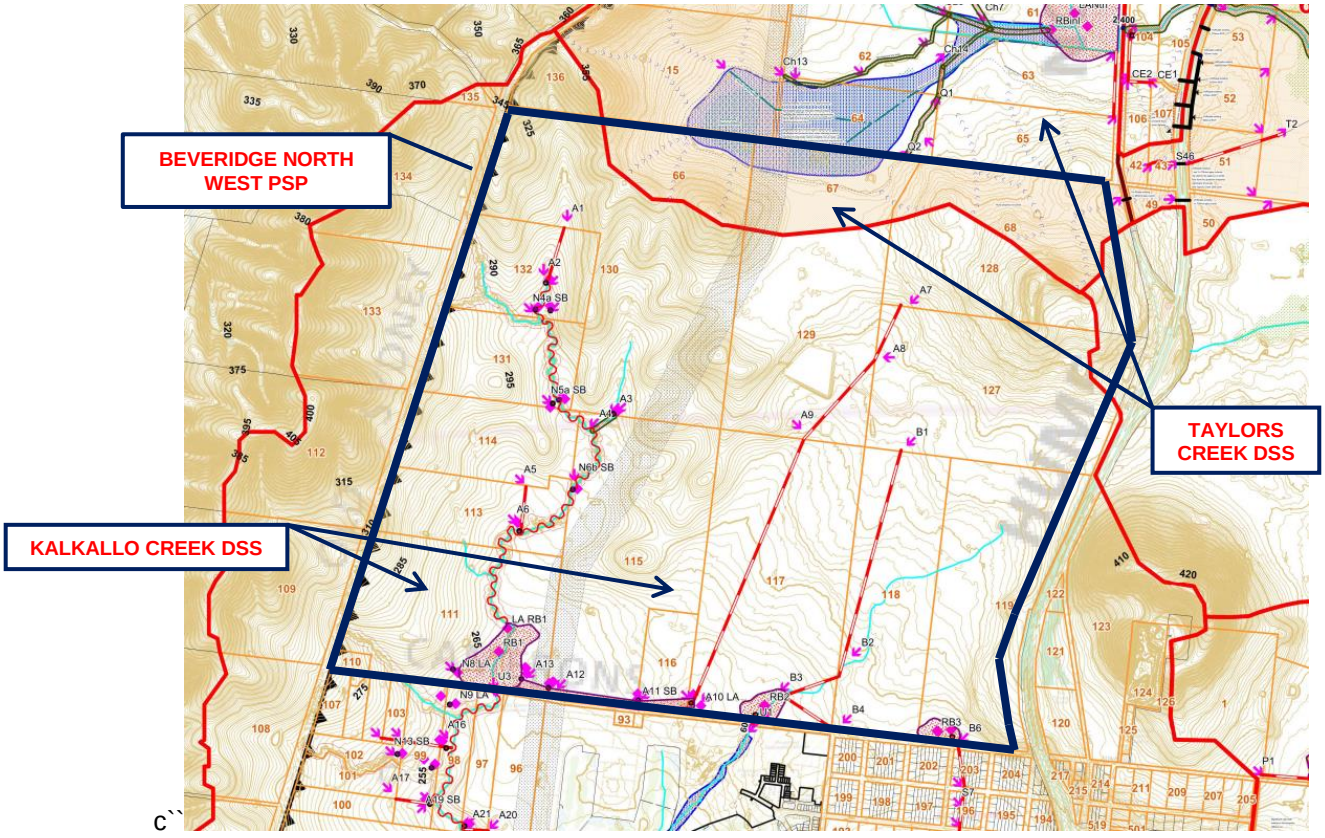


Figure 02 - Melbourne Water Drainage Scheme elements within Beveridge North West, *Extract of Melbourne Water Kalkallo DSS Plan October 2013*

MELBOUNRE WATER KALALLO DEVELOPER SERVICES SCHEME		
Western Waterway Line		
ID	**Description and Maintenance Responsibility**	**Approximate Size or Flow**
A1 – A2	Q5 pipeline - Council	
A1 SB	Sediment Trap – Council	2880m2
N4a SB	Sediment Trap – Council	264m2
N4b SB	Sediment Trap – Council	264m2
N5a SB	Sediment Trap – Council	600m2
N5b SB	Sediment Trap – Council	120m2
A4 SB	Sediment Trap – Council	1800m2
A3 – A4	Channel - Melbourne Water	152m long; Q100 Flow 18.8m3/s
A4 – A6	Stabilisation & Revegetation of Kalkallo Creek including pools & riffles	
N6b SB	Sediment Trap – Council	960m2
A5 – A6	Q5 pipeline - Melbourne Water	
A6 – RB1	Stabilisation & Revegetation of Kalkallo Creek includes pools & riffles	
RB1	Retarding Basin	7.2Ha easement (approximate)
U3 – U4	Culverts under Camerons Lane	Q100 Flow 47.0m3/s
N6a SB	Sediment Trap – Council	264m2
Central Drainage Line to RB1		
A7 – A8	Q5 pipeline - Council	
A8 – A9	Q5 pipeline - Council	
A9 – A10	Q5 pipeline - Melbourne Water	
A10 – A11	Channel – Melbourne Water	Q100 Flow 29.4m3/s
A11 – A12	Channel – Melbourne Water	Q100 Flow 29.5m3/s
A12 – A13	Channel – Melbourne Water	Q100 Flow 34.5m3/s
A10 SB	Sediment Trap – Melbourne Water	3720m2
A11 SB	Sediment Trap – Council	348m2
A12 SB	Sediment Trap – - Melbourne Water	1080m2
A13 SB	Sediment Trap – Council	312m2
Eastern Drainage Line to Retarding Basin 2		
B1 – B2	Q5 pipeline – Melbourne Water	
B2 – B3	Q5 pipeline – Melbourne Water	
RBSB2	Sediment Trap – Melbourne Water	3840m2
RB2	Retarding Basin	1.9 Ha easement
U1	Culverts under Camerons Lane	Q100 Flow 9.6m3/s
B4 – B3	Q5 pipeline – Council	
Retarding Basin 3		
RB3	Retarding Basin	1.3Ha easement
RB2aSB	Sediment Trap – Melbourne Water	3000m2
B6	Culvert under Camerons Lane from RB3	Flow 2.6m3/s

Table 01 - Melbourne Water Drainage Scheme elements within Beveridge North West, *October 2013*

Approximately 5% of the site drains to the northern boundary. This catchment forms part of the Taylors Creek Development Services Scheme (DSS), with a portion of the land identified as flood prone and subject to inundation as shown in Figure 02. This area is shown as being excluded from Development on the Melbourne Water plans due to the flooding. The area subject to inundation is currently proposed as regional open space so the impact of the flooding should be minimal. As the

area is relatively small, a change in land use back to residential development would typically require filling of allotments to 600mm above the 100 year flood level and overland flows would typically be conveyed along any proposed road network or flood channels into the downstream catchment. No infrastructure elements of the Taylors Creek DSS fall within the Beveridge North West Precinct.

This northern area of the Beveridge North West PSP was zoned rural when the Taylors Creek DSS was established. Any development of this area as residential allotments may be restricted by the downstream stormwater outlet requiring a review of the scheme to consider any increase in flows. Alternatively, additional retarding facilities and land take within the PSP may be required. However, as previously identified, a small portion of this area is shown as subject to flooding and having habitat value in the Melbourne Water Scheme plan. Additionally, the majority of the balance of this catchment is marked as proposed Regional Open Space in the North Growth Corridor Plan (refer Figure 01). With development already constrained by these factors, any further restriction on development due to a change in zoning is considered unlikely.

A small area in the north east corner of the site is not located within any current Melbourne Water Development Services Scheme. This section of the precinct drains to the east towards the Hume Freeway in the vicinity of the Northern Highway interchange. No formal outlet has been identified and 1 to 2 new culvert crossings under the Hume Freeway or onsite retarding may be required subject to the approval of VicRoads. Portions of this catchment have also been marked as possible Regional Open Space mitigating potential requirements for additional outfall works.

4.2 Yarra Valley Water Strategy

Yarra Valley Water (YVW) is the responsible authority for the provision of sewerage, potable and recycled water services for the Beveridge North West Precinct. There are no current YVW sewerage or water assets within the Precinct other than an existing 300mm diameter recycled water main within Camerons Lane.

YVW is currently in the process of finalising interim and long term servicing strategies for sewerage and water supply for the entire North (Hume Highway) Corridor of which Beveridge North West forms a part.

The timing of the construction of the various elements will be determined in part by development demand and part by YVW's Water Plans that provide budgets and a programme of works for each 5 year period e.g. 2013-2017, 2018-2023 etc.

Major assets when constructed as part of ultimate servicing strategies are classified as "shared assets" and therefore YVW funded. However, Incremental Financing Costs (bring forward costs) will be charged and levied on the developer where the assets are required ahead of YVW Infrastructure Works Programme as outlined under each 5 year Water Plan. Assets classified as being interim or temporary are typically expected to be funded by developers as required.

In summary, full development of this and adjoining precincts will require very extensive capital works by Yarra Valley Water partly funded by developers. Works will require coordination with the YVW development programme.

4.2.1 Potable Water

No potable water supply is currently available for the Beveridge North West Precinct. Planned infrastructure to the site will supply water in two separate pressure zones; a low pressure zone in the southern portion of the site located below the 285m contour line and a high pressure zone in the north above the 285m contour line.

The southern low pressure zone can initially be serviced by the construction of the Hazelwynde South Main, a 375mm diameter Distribution Main, as shown in the Potable Water Infrastructure Plan Figure 03. The Hazelwynde South Main is a non-tapping distribution main and where it is located in future road reserves an additional reticulation main is required to service allotments.

The Hazelwynde South Main connects to an existing Pressure Reducing Valve (PRV) located in Lithgow St adjacent the Hume Freeway. The main will then extend along Lithgow St. and Malcom St. prior to heading west along the Southern Boundary of the Precinct in Camerons Lane.

The total length of the Hazelwynde South Main is estimated at 2950m and as a shared asset it will be designed, constructed and paid for by Yarra Valley Water. The timing of construction will be as required for development; however, YVW has budgeted for the installation of the main in the 2018-2023 Water Plan.

As a single feed, construction of the Hazelwynde Main will allow for the development of 500 lots within the Precinct. Development beyond this limit will require the construction of Stage 1 of the Mandalay Internal Loop main and a link extended to the Hazelwynde South Main as shown in Figure 02 The Mandalay Loop Main is a 225mm diameter main approximately 1000m long and will be designed, constructed and paid for by YVW. It is currently budgeted for construction within the 2018-2023 Water Plan.

Development within the Precinct requiring early construction of the Hazelwynde South Main and or the Mandalay Loop Main prior to the programmed time frame of 2018-2013, would attract bring forward charges payable to YVW in order to help finance the cost of construction.

Development of the southern low pressure zone beyond 500 lots is limited to a maximum total development of 4000 lots within broader Beveridge – Wallan area. The Beveridge - Wallan area is supplied solely by the M656 Potable Transfer Main and to ensure continuity of supply beyond the 4000 lot limit, extensive external infrastructure is required as listed below and shown in Annex 3. As these assets are external, any land take requirements will not impact on the PSP.

- Bald Hill Potable Reservoir
- Bald Hill North Water Pump Station (WPS)
- Mt Fraser Potable Reservoir
- Mt Fraser Inlet Main (Bald Hill WPS to Mt Fraser Reservoir)
- Northern Highway to Beveridge Main

Addtionally to the above, the following three mains are also required internally and are also a requirement to service the high pressure zone in the north of the Precinct.

- Hazelwynde Central Main
- Hazelwynde North Main
- Gilbo Land Main

All these assets have not been planned for construction until after 2022. They are non-tapping mains and additional reticulation mains would be required to service allotments where the distribution mains are located within road reservations. This potentially requires the provision of an additional 0.5-1.0m in width to road reservations depending on the location and presence of any other trunk service assets.

Any development beyond the total 4000 lot limit in the Beveridge – Wallan area, would require these assets to be constructed and would attract significant bring forward costs.

4.2.2 Recycled Water

No Recycled Water is currently available to the Precinct and similar to potable supply, the Precinct will be serviced in a low and high pressure zone delineated by the 285m contour line.

The existing 300mm diameter Mandalay Distribution main , has been installed part way along Camerons Lane. To service the Precinct an additional 1200m of the Hazelwynde South main is required to be constructed. The Hazelwynde South Main will allow initial development in the southern low pressure zone to a limit of 500 lots from this single source of supply.

Further development of the precinct requires the provision of a second source of supply and can be achieved by installing a link into the proposed 225mm diameter Mandalay Internal Loop Main.

Both the Hazelwynde South Main and Mandalay Internal Loop Main are deemed to be shared assets and will be designed constructed and paid for by YVW. They are currently programed for construction in Water Plan 4, between 2018 and 2023. Development within the precinct necessitating these mains to be installed prior to the programmed dates would require the relevant developer to pay bring forward costs to help finance the early cost of construction.

Development of the Preinct beyond 500 lots is restricted to a limit of 4000 lots in the broader Beveridge – Wallan area. Further development requires key external and internal infrastructure as identified below and in Figure 04.

- Mt Fraser Recycled Reservoir (external)
- Mt Fraser Outlet Main (external)
- Hazelwynde Link Main (internal)
- Hazelwynde Main (internal)
- Hazelwynde Central Main (internal)
- Hazelwynde North Main (internal)
- Hazelwynde West Main (internal)

Assets marked as external have no land take on the Precinct, whilst those mains marked as internal could potentially require an additional provision of 0.5-1.0m to road reservation widths to accommodate the mains.

These assets are also required for the northern high pressure zone of the precinct and are not planned for construction until post Water plan (no earlier than 2022). Any development beyond the 4000 lot limit for the Beveridge – Wallan area would require early construction of these assets and attract significant bring forward costs.

4.2.3 Sewerage Reticulation

Yarra Valley Water's proposed sewerage strategy for the North Growth Corridor includes provision for the Beveridge North West precinct. The Precinct will be serviced internally by the construction of the Kalkallo Creek Branch Sewer and three other gravity Branch Sewers (BS); Kalkallo Creek North BS, Hazelwynde BS and Beveridge North BS. None of these assets are planned with the current Yarra Valley Water 5y Water Plan strategy for 2013-2017, and early construction would attract bring forward costs offset against any reimbursement from Yarra Valley Water.

All Internal sewers will gravity feed to the southern boundary of the Precinct. The ultimate sewer outlet for the Precinct will be the Kalkallo Creek Main Sewer (Stage 3) that will extend to the south eastern boundary of the Precinct and will convey sewerage south from the precinct into the Kalkallo Sewer Treatment Plant (STP). However, the Kalkallo Main Sewer is currently not scheduled for construction for at least another 15-20 years. As such, YVW are proposing to service the Precinct in a 3 stage process outlined below and shown in Annex 5.

4.2.3.1 Interim Stage 1 – Servicing Prior to 2021

The existing Sewer Pump Station (SPS) in Mandalay Estate and Temporary Rising Main (TRM) located in Camerons Lane has already had their capacity allocated to the Mandalay Development and the Beveridge Central PSP. Yarra Valley Water has advised that they will accept sewer Eduction up to a limit of 500 lots for any planned development of the Beveridge North West Precinct. Further development beyond 500 lots prior to 2021. Development beyond 500 will require the construction of a new temporary sewer pump station and rising main.

The new Beveridge North West SPS will be located in the south western corner of the Precinct on land owned by Yarra Valley Water. Sewerage will then be conveyed from the pump station via a rising main to the Wallan STP. The Beveridge North West TRM will follow the alignment of the existing Mandalay TRM along Camerons Lane under the Hume Freeway to the Melbourne Sydney rail line

and then North to the Wallan STP, a total distance of approximately 8800m. The new rising main will be located within existing and proposed Road Reserves and a 6m Yarra Valley Water Easement adjacent to the Melbourne Sydney rail line.

As the Beveridge North West SPS and TRM are considered temporary assets by Yarra Valley Water the cost of construction will be financed by Developers. Should others benefit, Yarra Valley Water may consider and arrangement to reimburse the Developer that funds these works the cost of the rising main over time by levying a special charge in addition to the standard sewer contributions for other benefitting developments within the Precinct. These additional contributions would then be reimbursed to the Developer financing the rising main construction.

The Beveridge North West SPS will be sized to service 3000 lots with a pump capacity of 120L/s and will require construction of emergency storage in addition to the pumps and wet wells.

To cater for the temporary increase in flows from the Beveridge North West PSP and other adjacent PSPs, the Wallan STP will also require an upgrade. These works will be undertaken at Yarra Valley Water's costs.

4.2.3.2 Interim Stage 2 – Servicing 2021 to 2026

Yarra Valley Water proposes to design and construct the Lockerbie Main Sewer in 2021. This new sewer will service the main eastern catchment of the North Growth Corridor and will extend north from the Kalkallo STP into the Lockerbie PSP where it follows the alignment of the Melbourne to Sydney rail line.

Once Stage 3 of Lockerbie Main Sewer is constructed, the Beveridge North West TRM will be redirected to discharge to the Lockerbie Main Sewer. These works will be undertaken at the cost of Yarra Valley Water.

Development will still be restricted to a maximum of 3000 lots until the ultimate gravity sewer outfall is constructed post 2026.

4.2.3.3 Ultimate Stage 3 – Servicing beyond 2026

Construction of the Kalkallo Creek Main Sewer is required to provide full service to the entire Precinct beyond the 3000 lot limit catered for under the interim strategies. Once Stage 3 of the sewer is complete, flows into the Beveridge North West SPS will be re-directed to the Kalkallo Main Sewer.

4.3 Electricity Supply

SP Ausnet is the responsible authority for the provision of electricity supply facilities to Beveridge North West.

In 2011 SP Ausnet issued their 30 year Distribution Network Development plan. The Beveridge North West Precinct in located within the North Service Corridor and would be supplied from the new Kalkallo Zone Substation (KLO) located in Beveridge as shown in Figure 06.

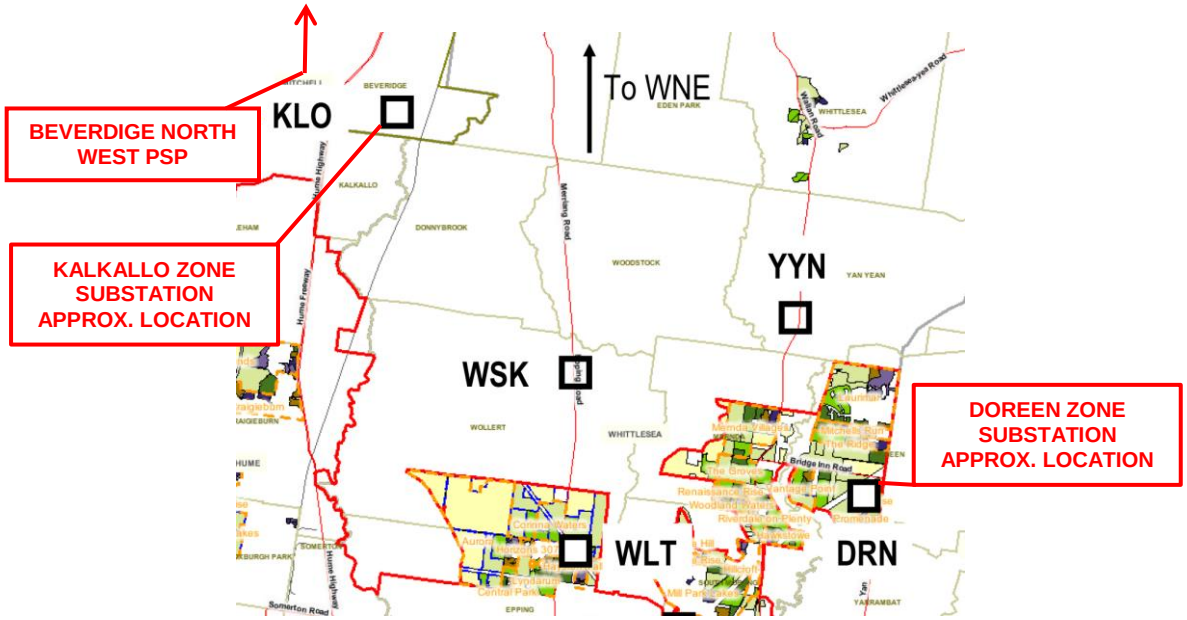


Figure 06 – SP Ausnet North Service Corridor Zone Substation Locations, *Extract of SP-Ausnet 30 year Distribution Network Development Plan*

There is no current ability to directly service the site from adjacent SP Ausnet assets. Existing rural overhead HV lines are located along Old Sydney Rd, Camerons Lane and along the Urban Growth Boundary to the North as shown in Figure 07. SP-Ausnet has advised that these would require re-conducting in order to service any development in the interim. Extension of the HV lines between the existing sections may also be required as shown. Cost of the re-conducting would be at developer's expense and is estimated at $150,000 per kilometre. The re-conducting of the cables could be installed underground with no additional land take required as the cables could be accommodated within the existing footprint of the overhead lines.

Due to the limitation of existing infrastructure, SP Ausnet has advised that initial development within the precinct would be limited to approximately 500 lots.

Further development of the precinct requires the extension of at least 2-4 No. 22kV feeders to the site from the Kalkallo zone substation. Each 22kV feeder is typically allocated a maximum number of 2000-2500 customers with additional feeders installed as development increases to meet the growing demand. The extension of 22kV feeders would be financed at the developers cost less a contribution from SP-Ausnet based on their anticipated revenue generated from connecting the new customers to the network.

The Feeders would most likely be extended either via the Hume Freeway or the proposed Arterial Roads identified within the North Growth Corridor Plan. Sufficient width within the road reservations will need to be allowed for in addition to normal HV/LV cable arrangements. This additional width is typically in the order of 0.5-1.0m dependent on the presence and location of other services within the road reserve.

The Kalkallo zone substation is supplied via a radial 66kV line off the 66kV feeder between the South Morang Terminal Station and Kilmore South Zone Substation. A SP Ausnet report "*Network Consultation – Maintain reliability of supply to Kalkallo Zone Substation customer's, 2013"* identifies problems with the radial 66kV feeder supplying the Kalkallo Zone Substation (KLO). Two sustained outages and nine momentary outages have occurred over a period of fifteen months due to redundancy in supply to the KLO site being via ageing 22kV feeder lines and the South Morang – Kilmore line being in an aged condition.

To address this issue SP Ausnet has proposed to install a new 66kV feeder from Kalkallo to the Doreen zone substation. SP Ausnet advise these works have recently been given budget approval with detailed design works to commence and construction works to be completed late 2014 to 2015. As significant development within the precinct is not expected to commence inside of this time frame, this issue is not seen as a major risk or constraint subject to the works occurring as programed.

Ultimate supply from the KLO site is not seen as an issue. A third transformer is programmed for installation at KLO in 2031 to match increases in demand as development occurs within the surrounding area. A new zone substation is also planned for installation at Wallan East in 2034 that may also have capacity to provide redundancy in supply to the Precinct. A tentative location of the Wallan East zone substation is to the east of Wallan and the Hume Freeway and as such any land take on the Precinct is considered unlikely.

Local service within the development will be via a network of underground high voltage cables typically located within road reserves and kiosk substations located in small reserves (typically 8 metres by 4.2 metres). These will extend across the precinct to provide the backbone of the electricity network within the Precinct.

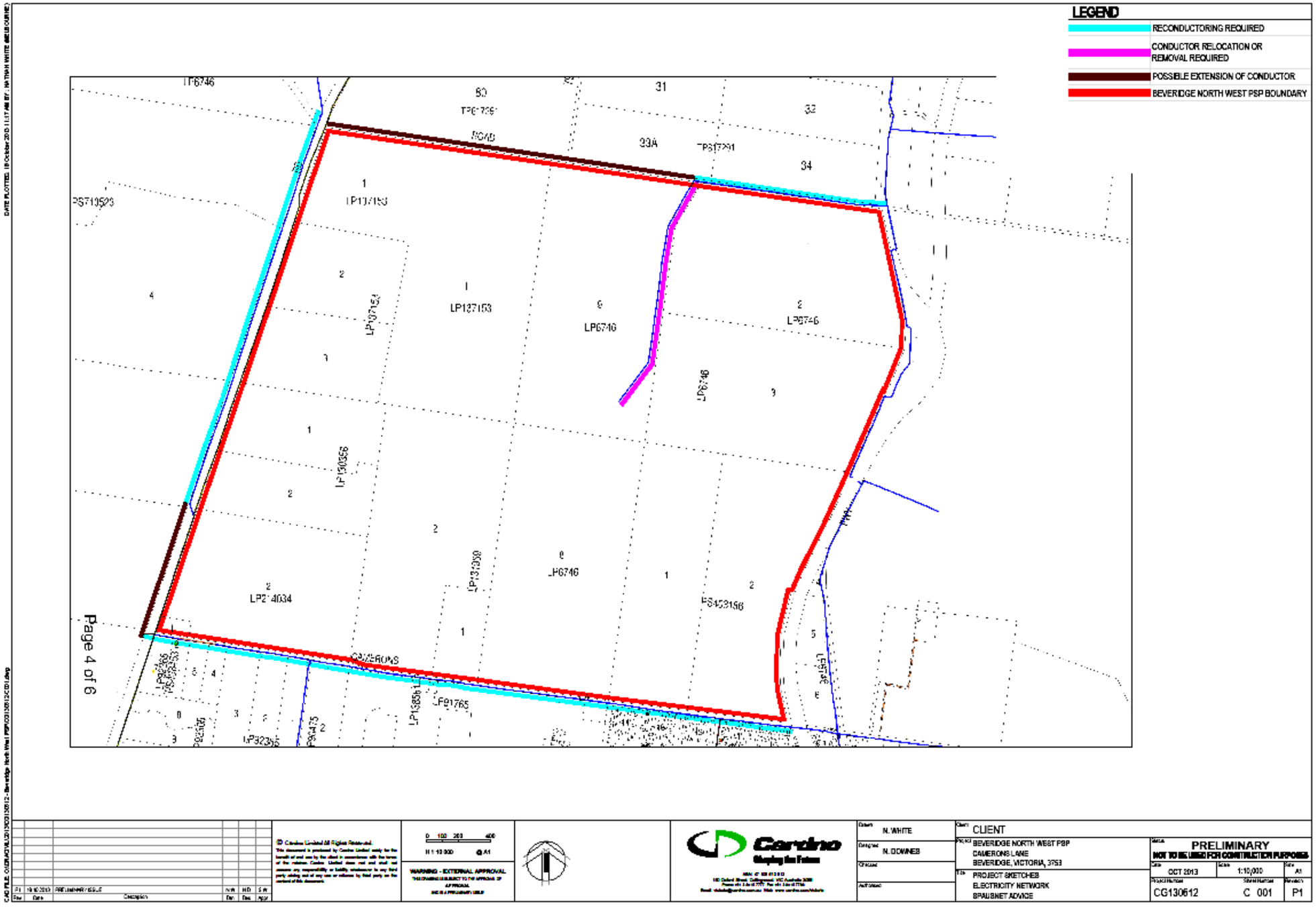


Figure 07 – SP Ausnet existing assets and upgrade requirements, *SP Ausnet servicing advice, October 2013*

4.4 Gas Supply

APA Group is the responsible authority for the provision of gas supply facilities to the Beveridge North West Precinct.

An existing APA 300mm diameter transmission gas main is located on the east side of the Hume Freeway. Gas mains have been extended from here to service the Wallan Township to the north and the Mandalay Estate to the south as shown in Figure 08. APA has advised that development of the precinct could be undertaken on two fronts from the north east and south east.

The installation of new mains extending from existing assets to the boundary of the Precinct represents a significant cost to APA. It is typically expected that the cost of these works would be developer funded. Installation of mains within the precinct would typically be undertaken at APA's cost subject to commercial analysis with developer's providing shared trenching.

APA has advised that there is sufficient capacity to service the development from the existing networks to the south and north in the short to mid-term time frame. The southern network is identified as having greater spare capacity and with large areas of the Precinct to the north identified as potential Regional Open Space; supply from the south is the most viable option.

Development in the long term and the possibility of augmentation works could not be determined at this point in time and would be subject to the speed and extent of development of the surrounding area as well as within the precinct.

APA current servicing strategy identifies no transmission pipelines or other major infrastructure requiring easements or land acquisition within the extents of the precinct.

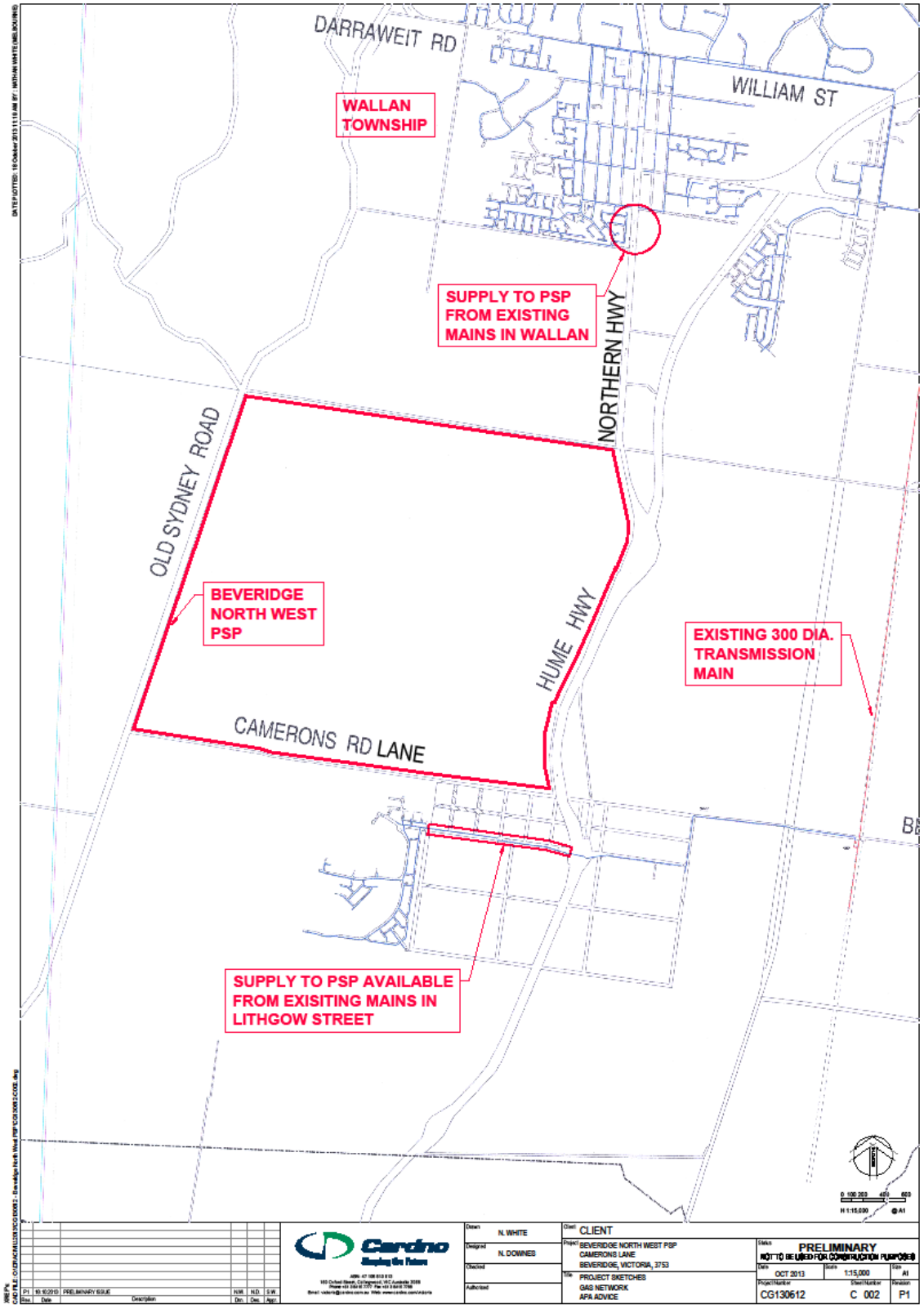


Figure 08 – APA existing gas assets and locality, *APA GIS output*

4.5 Telecommunications

NBN Co. will be the provider of last choice for the provision of telecommunications facilities to the Precinct. Beveridge North West is identified as being within the NBN 'fibre footprint' and it is expected that individual development sites should exceed their minimum service requirement of 100 premises. NBN Co does not release planning information except in response to specific development applications.

Developers within the precinct will be required to install pit and pipe infrastructure as a part of their subdivisional works with the installation of fibre optic cable to be carried out by NBN Co. including any backhaul works connecting to the external NBN Co. network.

Developers also have the option of alternative arrangements for fibre optic systems with other telecommunication providers.

4.6 Mitchell Shire Council

Mitchell Shire Council is responsible Municipality for the Beveridge North West Precinct.

Council advises there are no evident services or infrastructure within these areas and that Council has no plans to place any major infrastructure in these areas in the foreseeable future.

4.7 Services within Road Reserves

All water mains are required to be installed within designated road reserves. YVW key distribution mains, typically 375mm diameter and above, are not used for allotment servicing and will require an additional reticulation main to provide the property service connections. This could typically require an additional width of 0.5-1.0m to road reserves depending on what other services are present.

Where distribution mains are located within Major Roads, a reticulation main is generally required on both sides of the road reserve where property connection would exceed 30m when crossing the road reserve. This can result in as many as 6 water mains (distribution main and two reticulation mains on each side of the road for both potable and recycled services). The space required to locate these services within the road reserve and satisfy minimum clearances, needs to be carefully considered in both planning and design phases of development but typical additional widths to allow for are in the order of 1.0-2.0m depending on services configurations and road layout.

Additional key trunk services such as the installation of 22kV electrical feeders may also require the provision of additional width to key road reserves in the order of 0.5-1.0m.Of the known road reserve locations, Camerons Lane in particular will require consideration in detail for spatial requirements for proposed services. Sections of the existing road reserve already contain the Mandalay Temporary Rising Main and Mandalay Distribution Main (recycled water). Proposed YVW servicing strategies also show plans for the installation of;

- Beveridge North West Temporary Rising Main (sewerage)
- Beveridge North Branch Sewer
- Hazelwynde South Main

Local reticulation water mains may also be required in addition to those mentioned above. Other main supply feeds for other service authorities may also be required within Camerons Lane such as high voltage 22kV feeder cables and gas mains. Design of these services within Camerons Lane will also need to consider the crossing of l stormwater culverts in at least 3 locations.

5 Staging and Order of Development

For the non-gravity utility services, it is expected that services are more feasible to be provided at the southern boundary along Camerons Lane. Road access is more easily accommodated with access from the Hume Freeway already having been established to Mandalay Estate and Camerons Lane.

For sewerage and drainage, which are gravity controlled, development would best occur along the southern boundary in the vicinity of where Kalkallo Creek crosses Camerons Lane. If this does not occur, sewerage and drainage connections through undeveloped land will be required in advance of development in these areas.

The ability to initiate develop from the north is constrained due to lack of both existing services, existing road access and the costs to bring forward and extend service infrastructure through to this areas. Development would typically await the initial sequencing of downstream works from the south. A small section of this area is also flood prone with the majority of the balance of land in this area marked as potential Regional Open Space.

The western boundary is distant to logical service connections at the south and east, whist the eastern boundary is constrained by the lack of existing access due to the Hume Freeway.

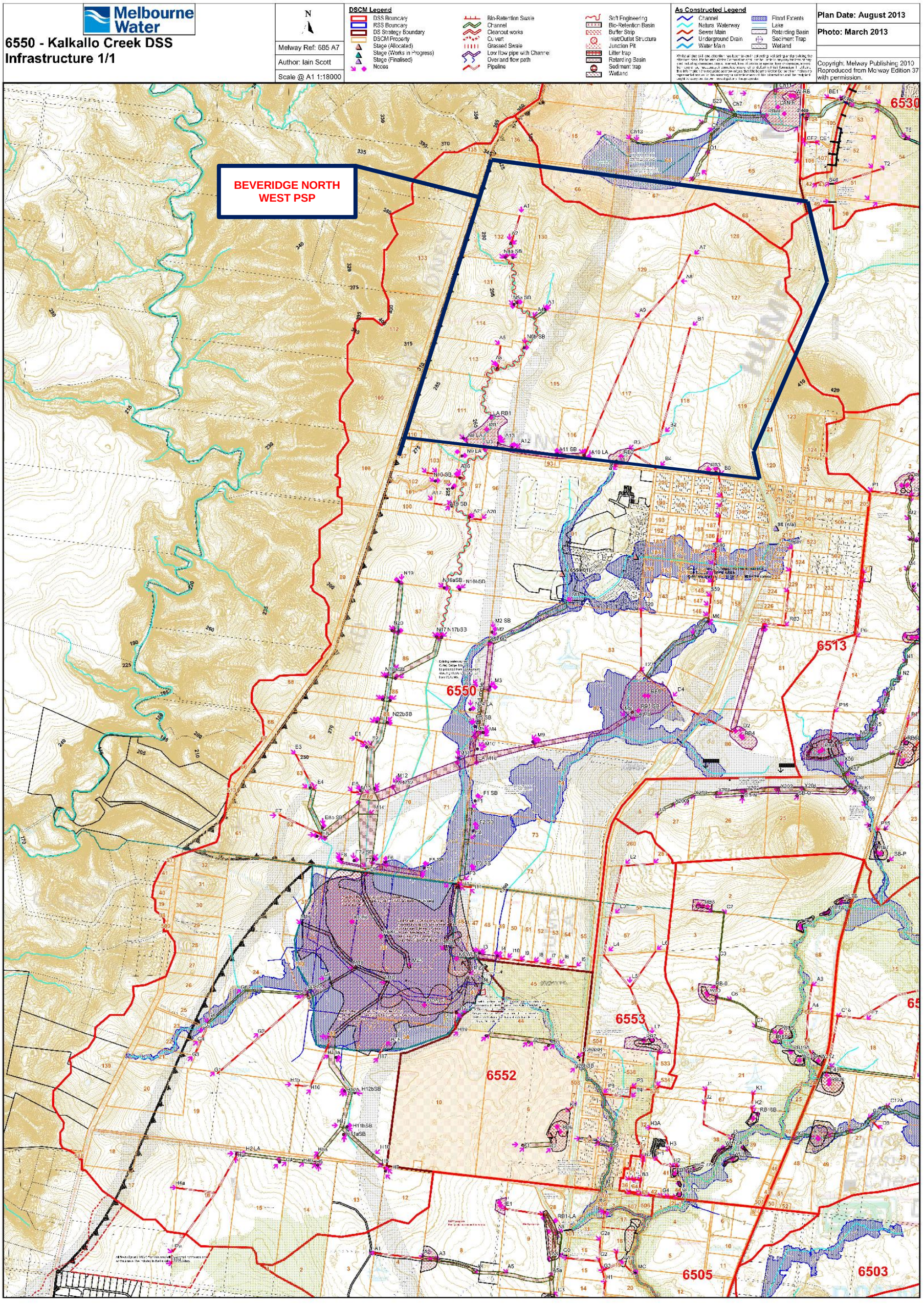
Development staging considerations would be based on the sewer and water constraints, and limited to servicing the projected number of lots following the construction of required Yarra Valley Water infrastructure for the North West region.

Annex 1:
Precinct Plan

MPA – Beveridge North West Precinct Locality Plan

Annex 2:
Melbourne Water

Kalkallo Development Services Scheme Plan



Melbourne Water – Kalkallo Development Services Scheme

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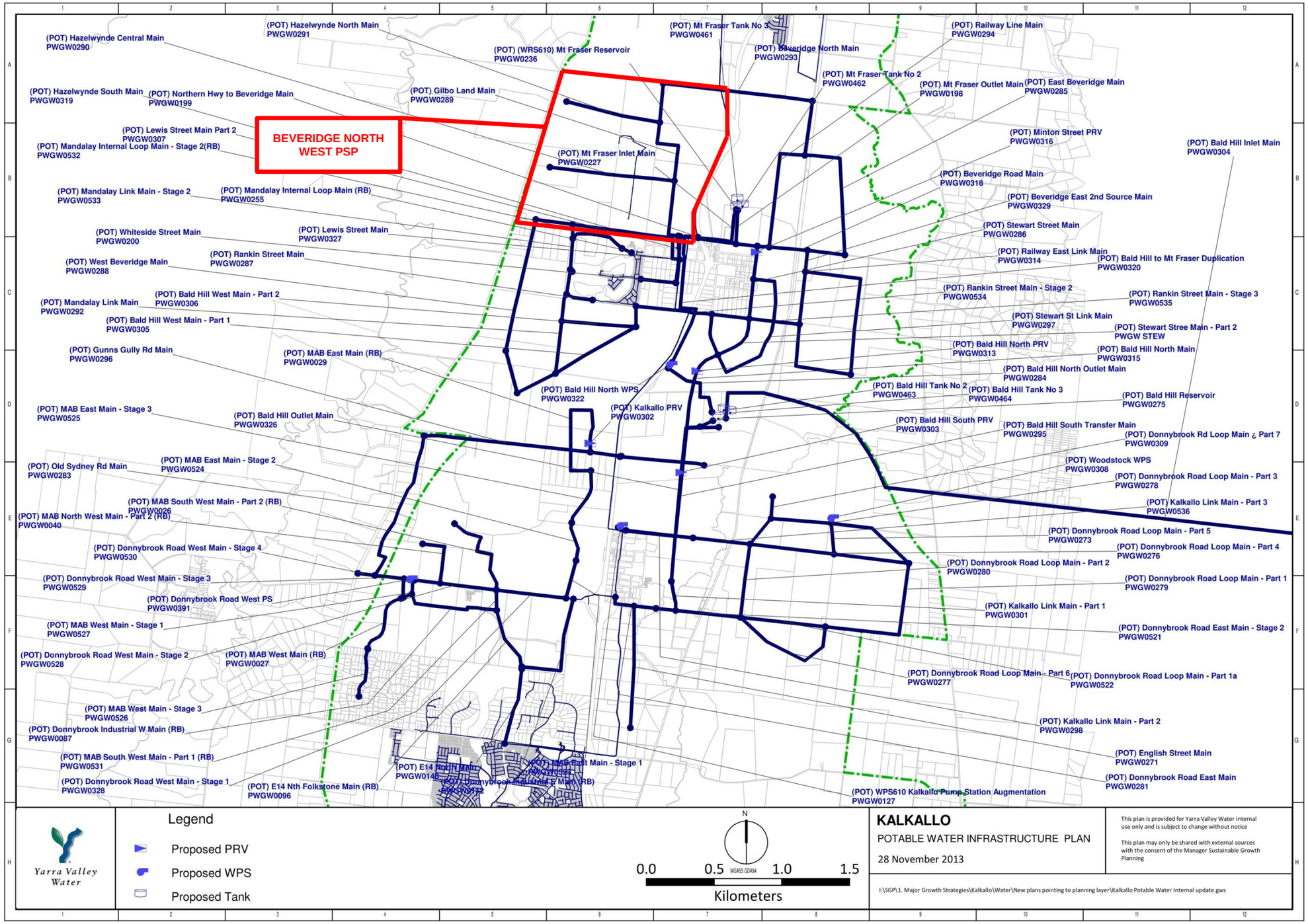
Annex 3:
Yarra Valley Water

Kalkallo

Potable Water Supply Strategy Plan

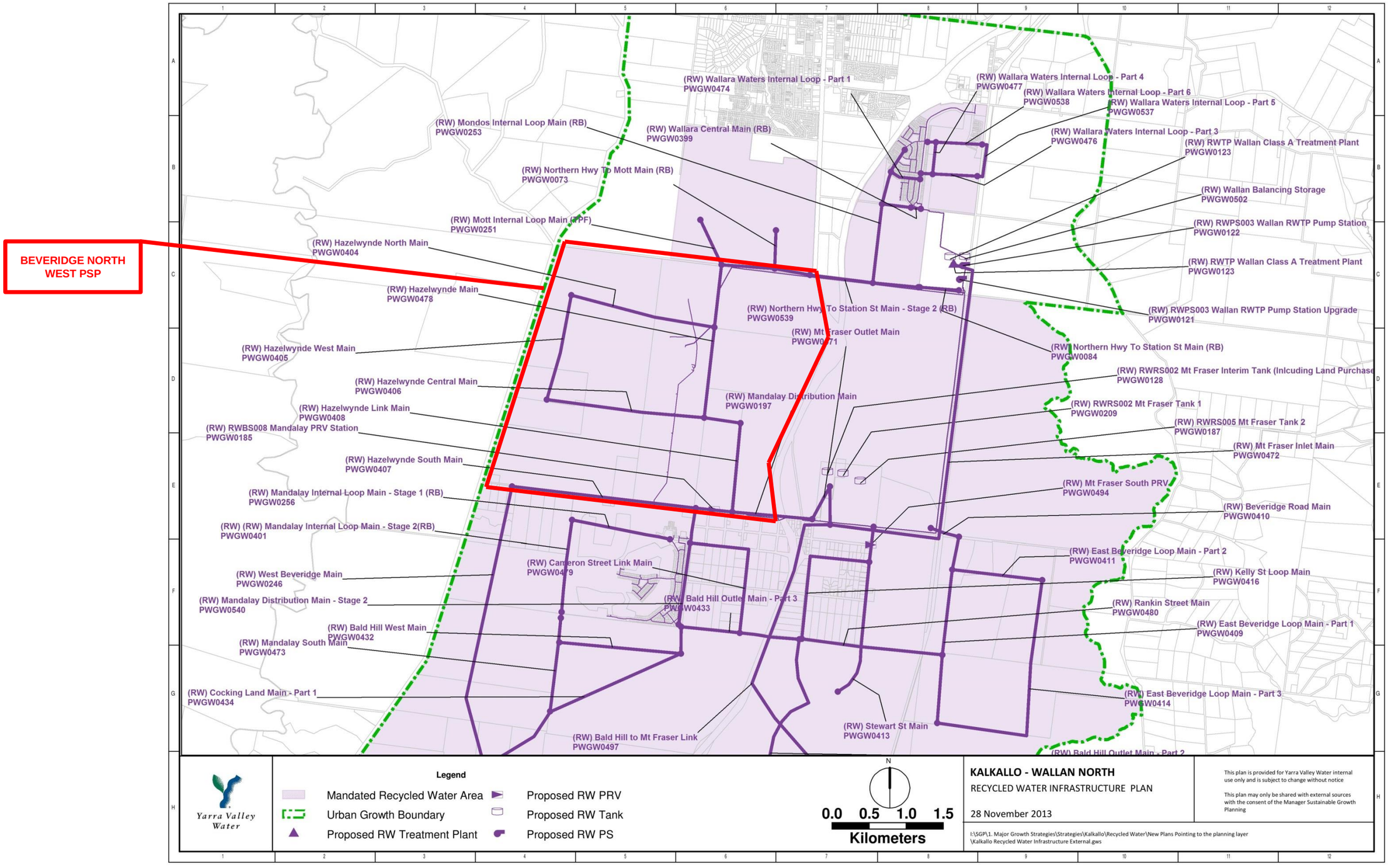


Yarra Valley Water – Kalkallo Potable Water Infrastructure

Annex 4:
Yarra Valley Water

Kalkallo

Recycled Water Infrastructure Plan



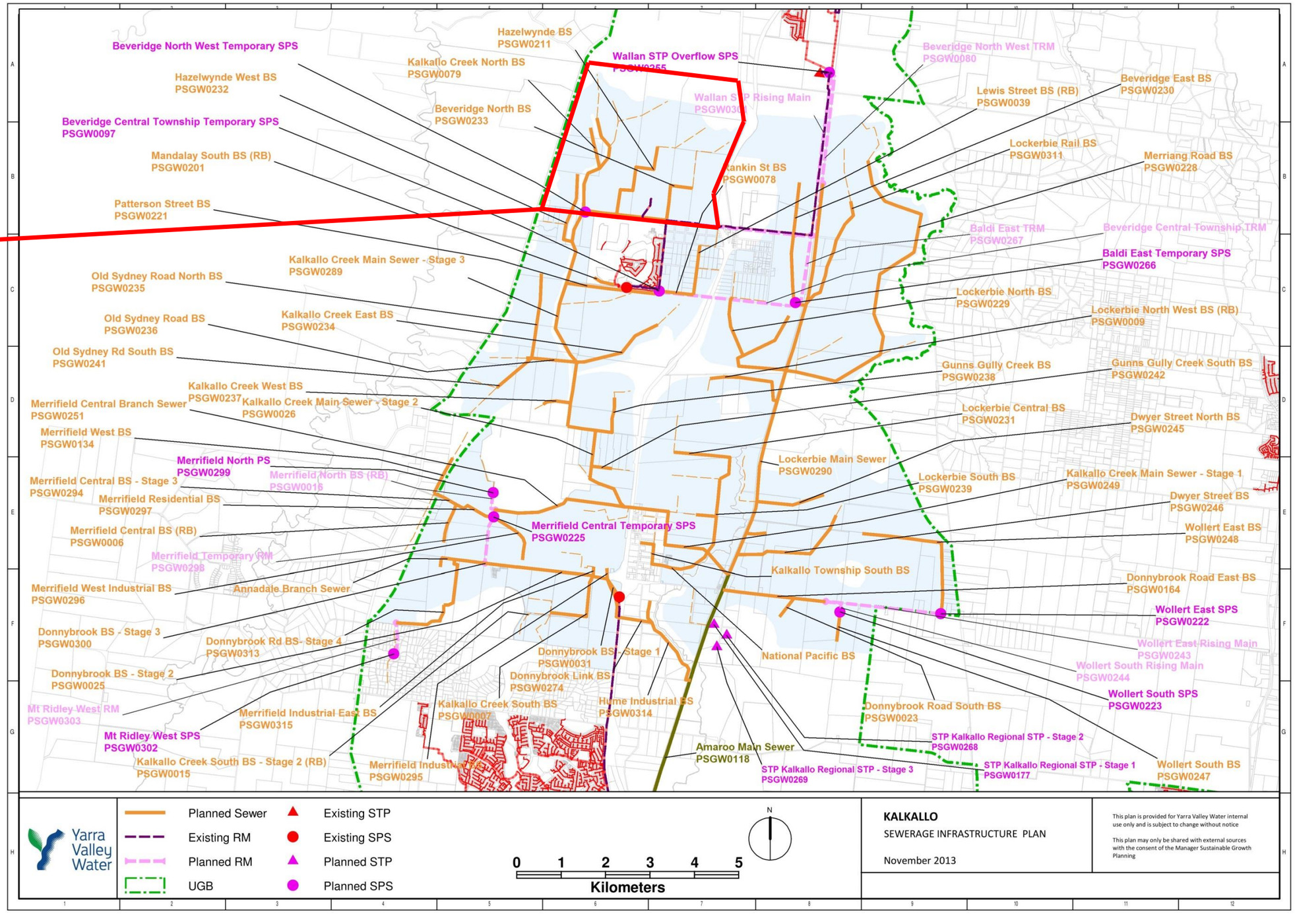
Yarra Valley Water – Kalkallo Recycled Water Infrastructure

Annex 5:
Yarra Valley Water

Kalkallo

Sewerage Infrastructure Plan

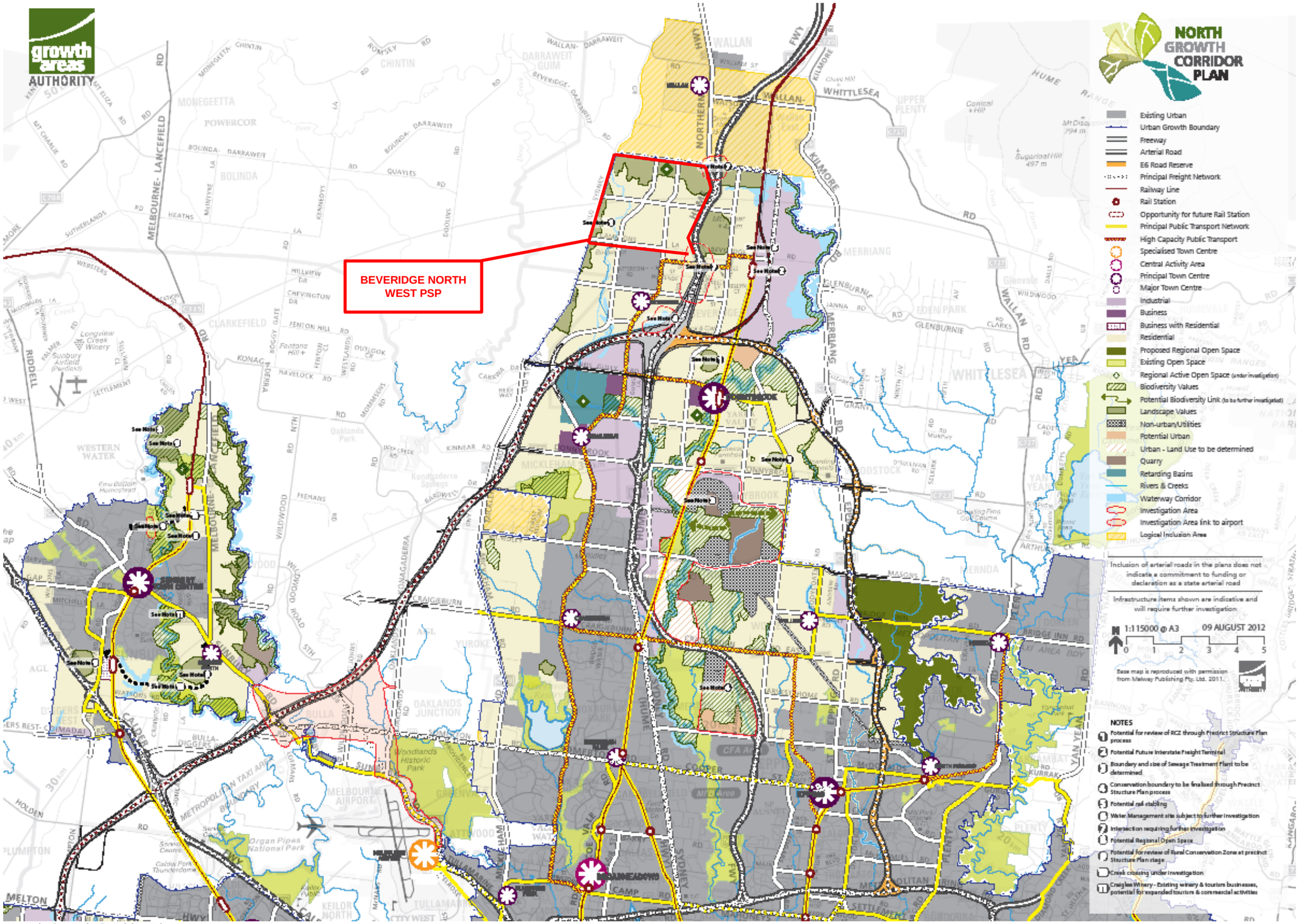
BEVERIDGE NORTH WEST PSP



Yarra Valley Water – Kalkallo Sewer Infrastructure

Annex 6:
MPA

North Growth Corridor Plan



Extract – *MPA North Growth Corridor Plan*