Draft Infrastructure Delivery Plan

Ingleside Release Area

89914029

Prepared for
Department of Planning and Environment

3 November 2016

Cardno
Shaping the Future

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Document Information

Prepared for	Department of Planning and Environment
Project Name	Ingleside Release Area
File Reference	160509 - Final Draft Infrastructure Delivery Plan - Issued - Rev 6.docx
Job Reference	89914029
Date	26 May 2016
Version Number	7
Effective Date	26 May 2016
Date Approved:	26 May 2016

Document History

Version	Effective Date	Description of Revision	Prepared by:	Reviewed by:
6	26/05/16	Final – for exhibition	SCP	CEV
7	3/11/17	Updated yield	SDH	CEV

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Executive Summary

Cardno has been engaged by the Department of Planning and Environment to prepare an Infrastructure Delivery Plan to inform a rezoning process for the Ingleside Precinct.

The Ingleside Precinct is located in the Pittwater Council Local Government Area and covers an area of approximately 703 hectares. Preliminary estimates suggest that the Ingleside Precinct could yield approximately 3,907 dwellings.

The Ingleside Precinct comprises of four sub-precincts:

- North Ingleside
- South Ingleside
- Wirreanda Valley
- Bayview Heights.

The Infrastructure Delivery Plan is reliant upon traditional suppliers of utility infrastructure. This approach has been nominated as the preferred approach by the Department of Planning and Environment principally in response to the fragmented land ownership and the potential for the development of the Precinct to be protracted over a period of time. Notwithstanding, developers and land owners have the capacity to seek alternative servicing arrangements within the Ingleside Precinct as part of the Development Application process.

In preparing the Infrastructure Delivery Plan it is confirmed that North Ingleside and South Ingleside sub-precincts can be adequately serviced with potable water, wastewater, telecommunications and electricity. The provision of gas and fibre to the premise services within these sub-precincts would be subject to commercial assessment by Jemena and developers respectively.

The extension of the existing Sydney Water potable water and wastewater networks into the Bayview Heights and Wirreanda Valley sub-precincts is dependent upon the sub-precincts development capacity. It is unlikely that given the development capacity that it would be cost effective for Sydney Water to extend services to Bayview Heights and Wirreanda Valley.

A new potable water reservoir will be needed to service North Ingleside with an estimated capital value of $10,000,000.

Additionally, a new sewer pumping station and rising main will be needed to service North Ingleside with an estimated capital value of $3,840,000. Sydney Water has advised that planning and delivery of the required infrastructure would take at least three years from the date of rezoning.

The provision of adequate servicing infrastructure to the North Ingleside sub-precinct is estimated to be approximately $28,500,000 more expensive than South Ingleside sub-precinct. The variation in costs is primarily due to the need for a new potable water reservoir within the North Ingleside sub-precinct to service the proposed development with potable water. When coupled with the land ownership patterns across the two sub-precincts, it is anticipated that the South Ingleside sub-precinct will be developed first.

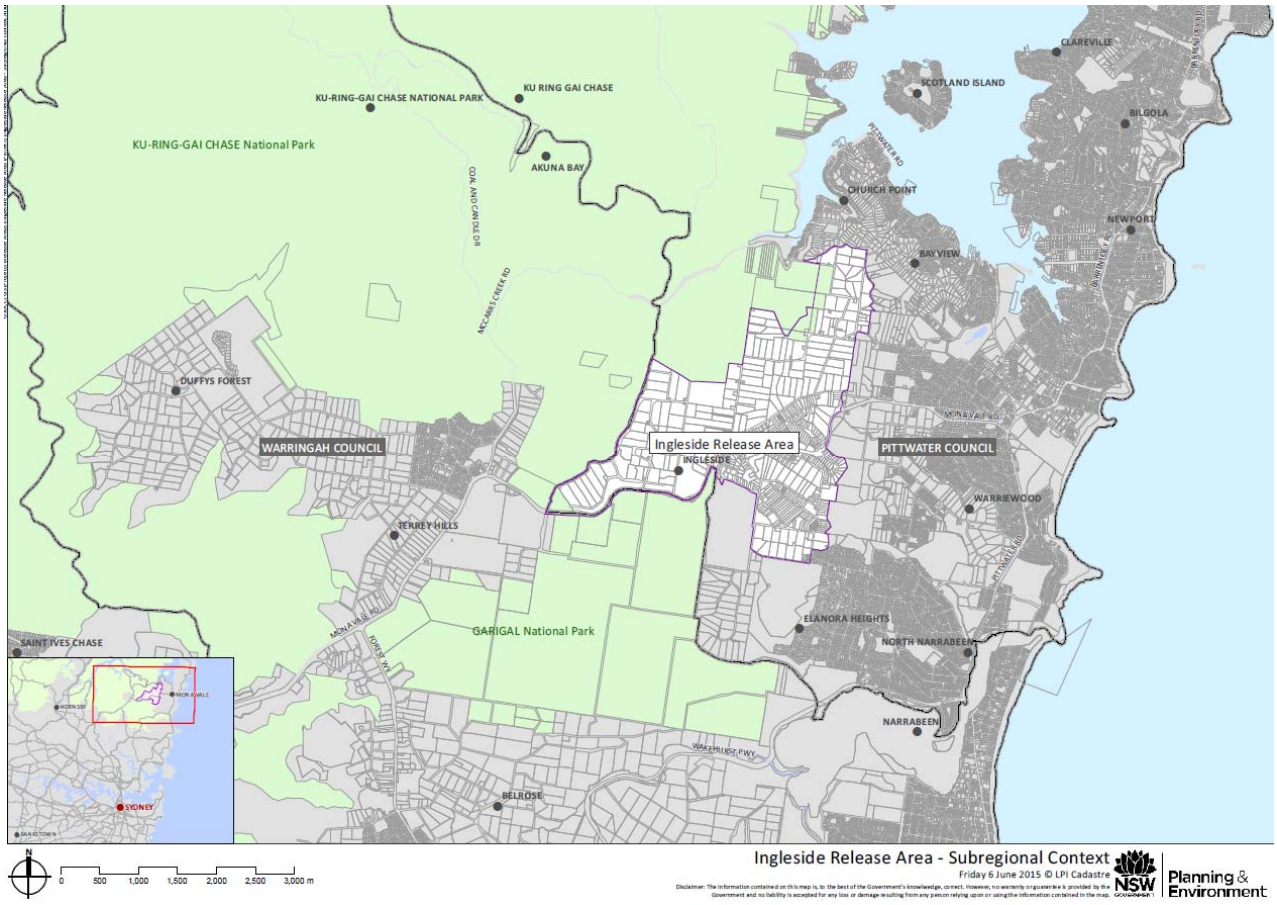
In May 2016 Pittwater Council was merged into a new body, the Northern Beaches Council. As this report was prepare prior to these changes, it makes reference to the former Council. The plans and strategies of the former Council continue to apply to the former Local Government Area until the new Council prepares its own plans and strategies.

1 Introduction

Cardno has been engaged by the NSW Department of Planning and Environment (Planning) to provide engineering services to assist in the preparation of an Infrastructure Delivery Plan (IDP) for the Ingleside Precinct (the Precinct). The primary objective of the IDP is to inform the rezoning process to facilitate the urban development of the Precinct.

The Precinct is located within the Pittwater Council (Council) Local Government Area and covers an area of approximately 703 hectares. The Precinct is bounded by an escarpment known as the Ingleside Chase Reserve to the east, Elanora Country Club, Monash Country Club and the Garigal National Park to the south and the Ku-ring-gai National Park to the west. A site locality plan is included as **Figure 1-1**.

Figure 1-1 Ingleside Precinct Site Locality Plan



To inform the rezoning process, a Structure Plan (SP) has been prepared for the Precinct. The SP is included at **Figure 2-1**.

In preparing the IDP, Cardno has relied upon the SP as a basis of all discussions with utility infrastructure providers, including:

- Sydney Water
- Ausgrid
- Jemena
- NBN Co.

The preparation of the IDP is reliant upon traditional suppliers of utility infrastructure. This approach has been nominated as the preferred approach by Department of Planning and Environment principally in

response to the fragmented land ownership throughout the Precinct and due to the protracted timeframe over which the Precinct could be developed. This approach is reasonable for the purposes of informing a rezoning process and will not preclude alternate servicing options being investigated as part of the development of the Precinct.

In preparing the IDP, a desktop analysis of alternative potable water and wastewater servicing options such as the creation of a decentralised system was undertaken. Based on available literature, the viability of decentralised systems becomes an economically viable servicing option once the proposed development area 'is more than 5 km from existing facilities' based on the paper presented at the 7th Making Cities Liveable Conference, *Water Smart Communities For a Liveable City*, Robert Keessen, (July 2014). Given the proximity of the Precinct to existing Sydney Water assets, decentralised potable water and wastewater servicing options were not explored.

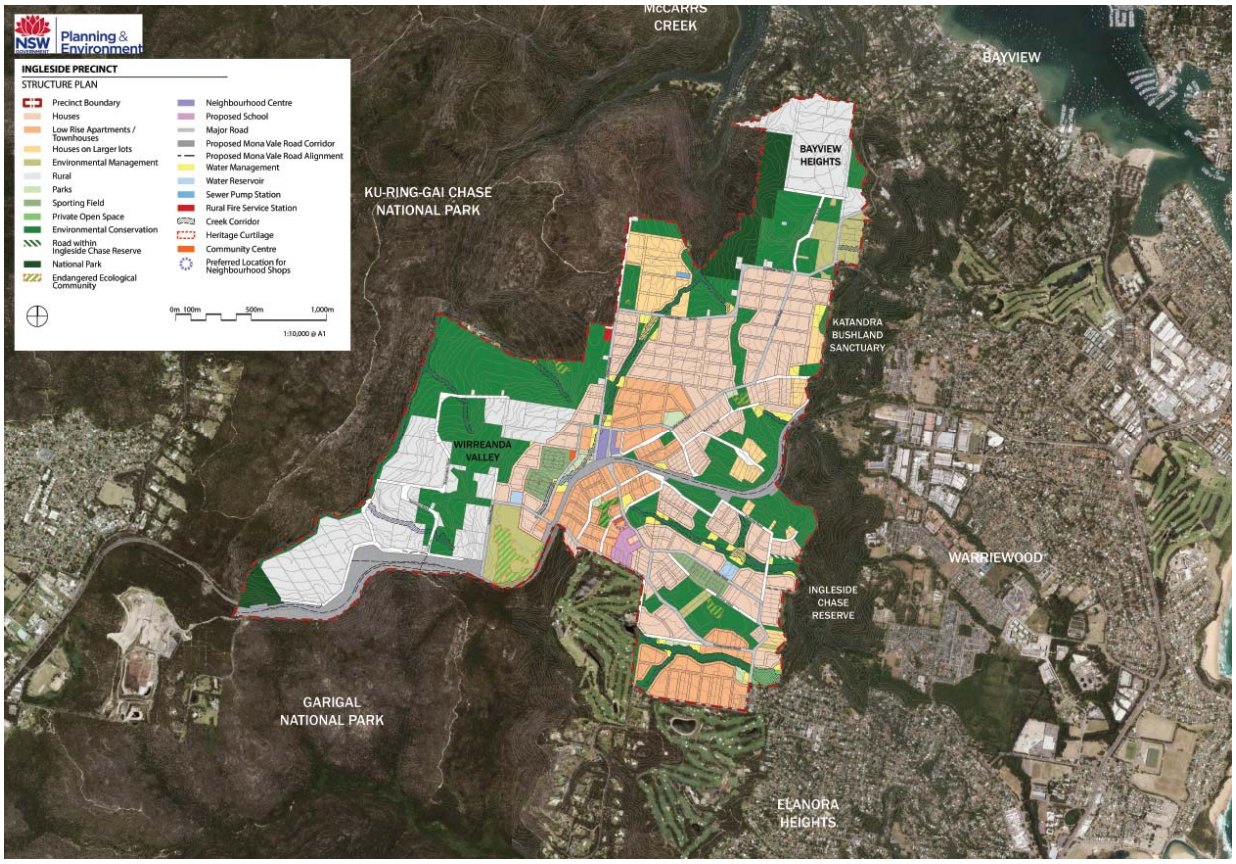
It is important to note that the IDP has not been prepared as a prescriptive document for any future development of the Precinct. Developers seeking to utilise alternative servicing arrangements within the Precinct beyond the aforementioned utility providers have the opportunity to explore, and seek approval for, alternative solutions as part of the Development Application process.

2 Structure Plan

2.1 Overview

The SP is included as **Figure 2-1**. The projected dwelling yield across the Precinct is estimated to be approximately 3,400 lots.

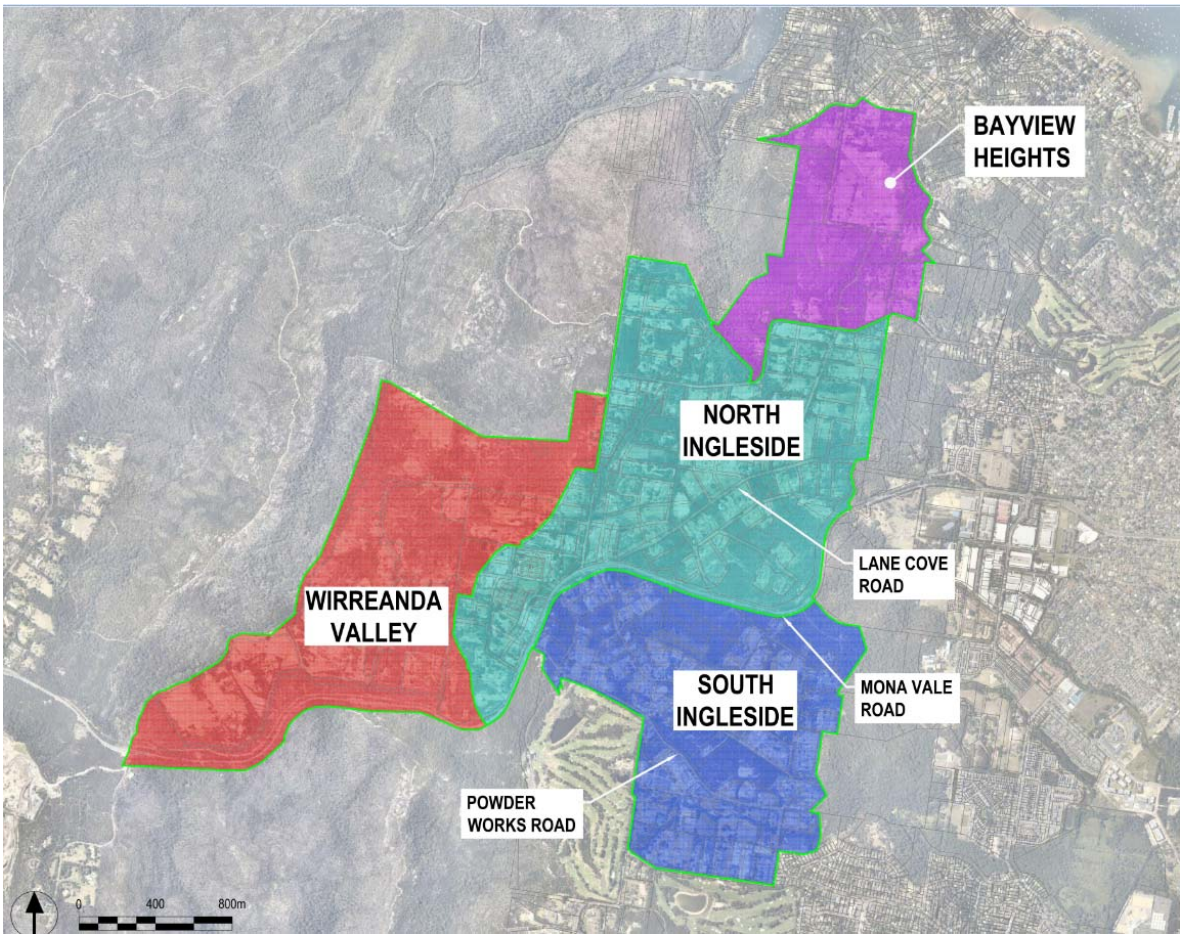
Figure 2-1 Ingleside Precinct Structure Plan



2.2 Sub-Precincts

The Precinct has been broken down into four sub-precincts which are illustrated in **Figure 2-2** and outlined under the relevant sub-headings below.

Figure 2-2 Sub-Precinct Plan



2.2.2 South Ingleside

The South Ingleside sub-precinct covers an area of approximately 173 hectares and is bounded by Mona Vale Road to the north and west, the escarpment known as the Ingleside Chase Reserve to the east, and Monash and Elanora Country Clubs to the south.

Areas of low and medium density development are estimated to yield 12.5 and 25 dwellings (minimum) per hectare respectively. Additionally, South Ingleside also contains a potential school site and playing fields.

2.2.3 North Ingleside

The North Ingleside sub-precinct covers an area of approximately 229 hectares and is bounded by the Bayview Heights sub-precinct to the north, the eastern Precinct boundary, Mona Vale Road to the south and a ridgeline to the west.

Areas of low and medium density development are estimated to yield 12.5 and 25 dwellings (minimum) per hectare respectively. North Ingleside also contains large lot residential land which has an estimated yield of 5 dwellings per hectare, a proposed neighbourhood retail centre, potential school site, a community node and playing fields.

2.2.4 Bayview Heights

The Bayview Heights sub-precinct covers an area of approximately 88 hectares and is bounded by the northern, eastern and western Precinct boundaries and the North Ingleside sub-precinct to the south.

2.2.5 Wirreanda Valley

The Wirreanda Valley sub-precinct covers an area of approximately 213 hectares and is bounded by the northern and western Precinct boundaries, an existing ridgeline to the east and Mona Vale Road to the south. Currently the Wirreanda Valley sub-precinct includes an existing school and the Bahai Temple.

2.3 Staging

There are a number of considerations that must be taken into consideration when identifying the preferred staging strategy for the rezoning of the development of the Precinct.

With regards to the IDP, the provision of potable water and wastewater services has the greatest influence on the proposed development of the Precinct. At present, the Precinct forms part of *Growth Servicing Plan July 2014 – June 2019*, Sydney Water, 2014. Sydney Water has completed the high level servicing strategy for potable water and wastewater services to the Precinct. The strategy is not yet optimised but does provide an indicative solution and cost for servicing the likely demands of the Precinct. Detailed planning will determine the infrastructure staging of servicing across the Precinct and would be reliant upon development staging information within the sub-precincts.

The proximity of the South Ingleside sub-precinct to existing infrastructure, compared to other sub-precincts, will likely result in it being developed first. It is anticipated that the development of North Ingleside would occur after South Ingleside is sufficiently advanced.

Given the likelihood that South Ingleside will be developed first, a high level servicing strategy for South Ingleside has been prepared and documented within **Section 5**.

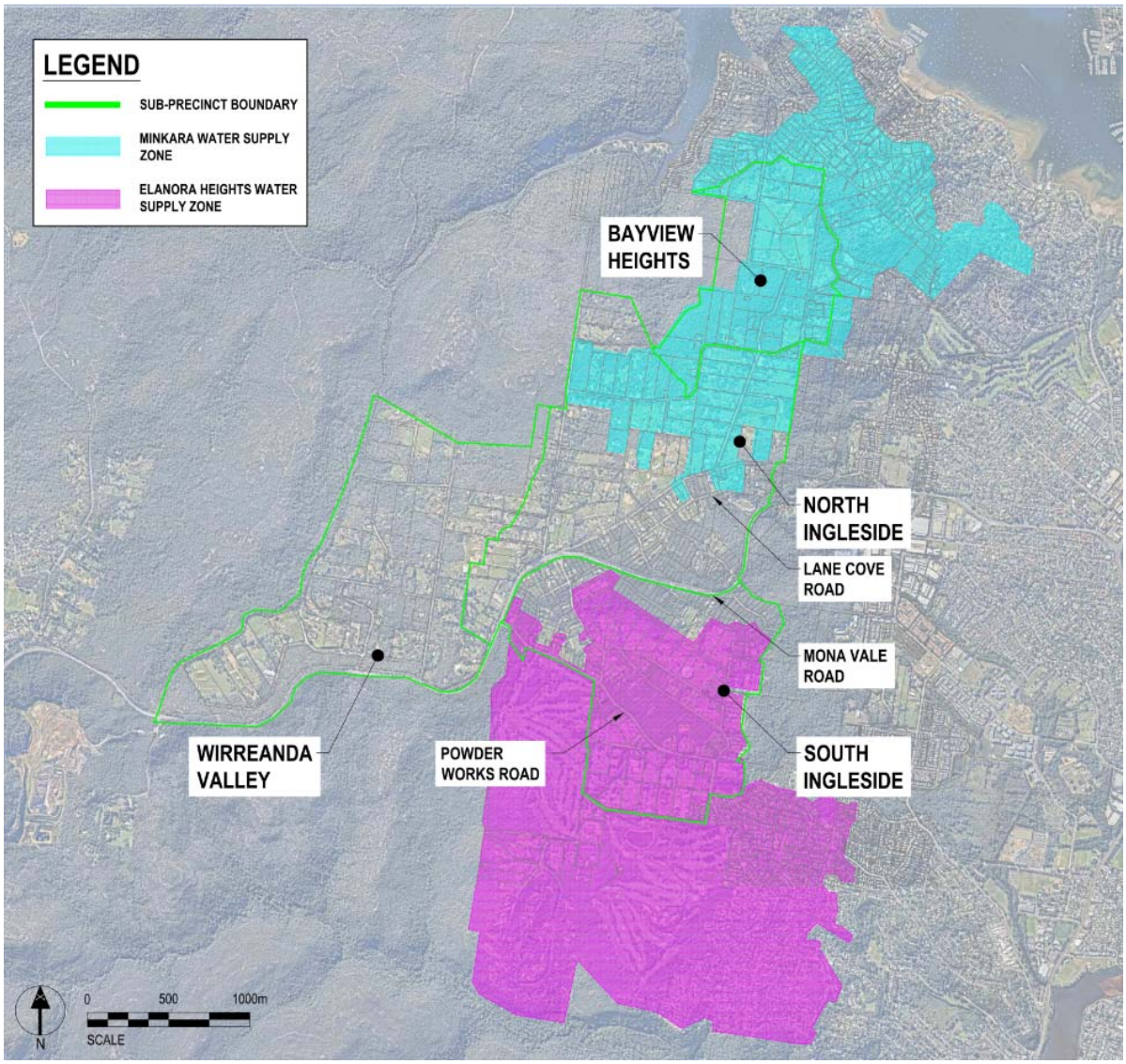
3 Existing Utility Infrastructure

3.1 Potable Water

The water supply zones[1] available for servicing the Precinct are the Elanora Heights and Minkara water supply zones. The preferred servicing option will be identified as part of the detailed planning phase.

An illustration of the relevant water supply zones is included as **Figure 3-1**.

Figure 3-1 Water Supply Zones



Under existing conditions, a portion of the Precinct is located within the Minkara and Elanora Heights water supply zones. The Wirreanda Valley sub-precinct and portions of both the South and North Ingleside sub-precincts do not contain Sydney Water potable water infrastructure. It is understood that these properties rely upon on-site rainwater tanks.

[1] Water supply zones represent areas that are serviced by existing Sydney Water potable water infrastructure and are typically identified by the primary reservoir source.

There is an existing potable water reservoir (referred to as the “Ingleside Park Reservoir”) located within the South Ingleside sub-precinct. The Ingleside Park reservoir services existing properties outside of the Precinct boundary. The existing potable water reservoir is located on Wattle Road and the reservoir location is included in **Figure 3-2**.

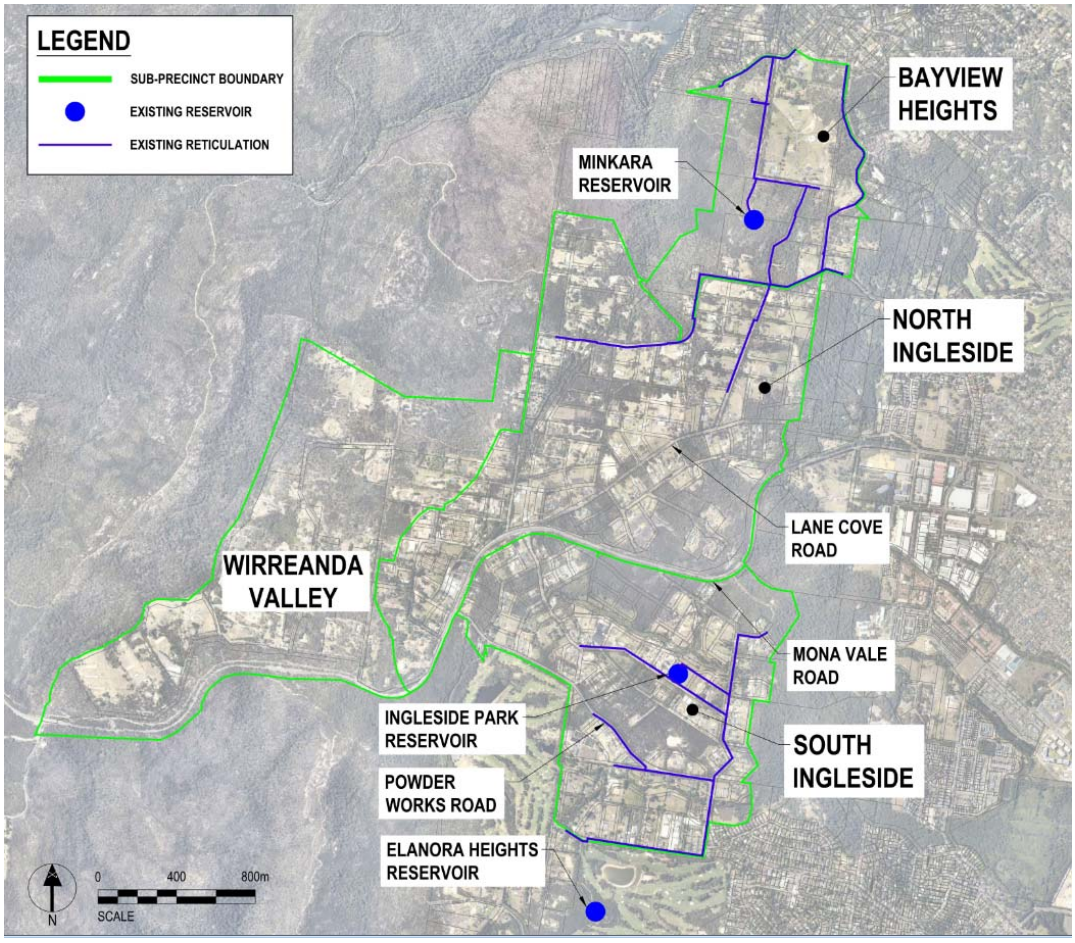
There is an existing potable water reservoir (referred to as the “Minkara Reservoir”) located within the North Ingleside sub-precinct which provides potable water to a selection of properties within the Precinct. The Minkara Reservoir is located off Walter Road and the reservoir location is included in **Figure 3-2**.

There is an existing potable water reservoir (referred to as the “Elanora Heights Reservoir”) located approximately 400 meters to the south of the Precinct. The Elanora Heights Reservoir is located off Mirbelia Parade and the reservoir location is included in **Figure 3-2**.

Existing potable water infrastructure services existing rural customers within the Elanora Heights and Minkara Water Supply Zones. The existing trunk infrastructure has sufficient capacity to service the South Ingleside sub-precinct, however substantial augmentations are required to service the other sub-precincts.

The extent of the existing potable water network within the Precinct is illustrated in **Figure 3-2**.

Figure 3-2 Existing Potable Water Network



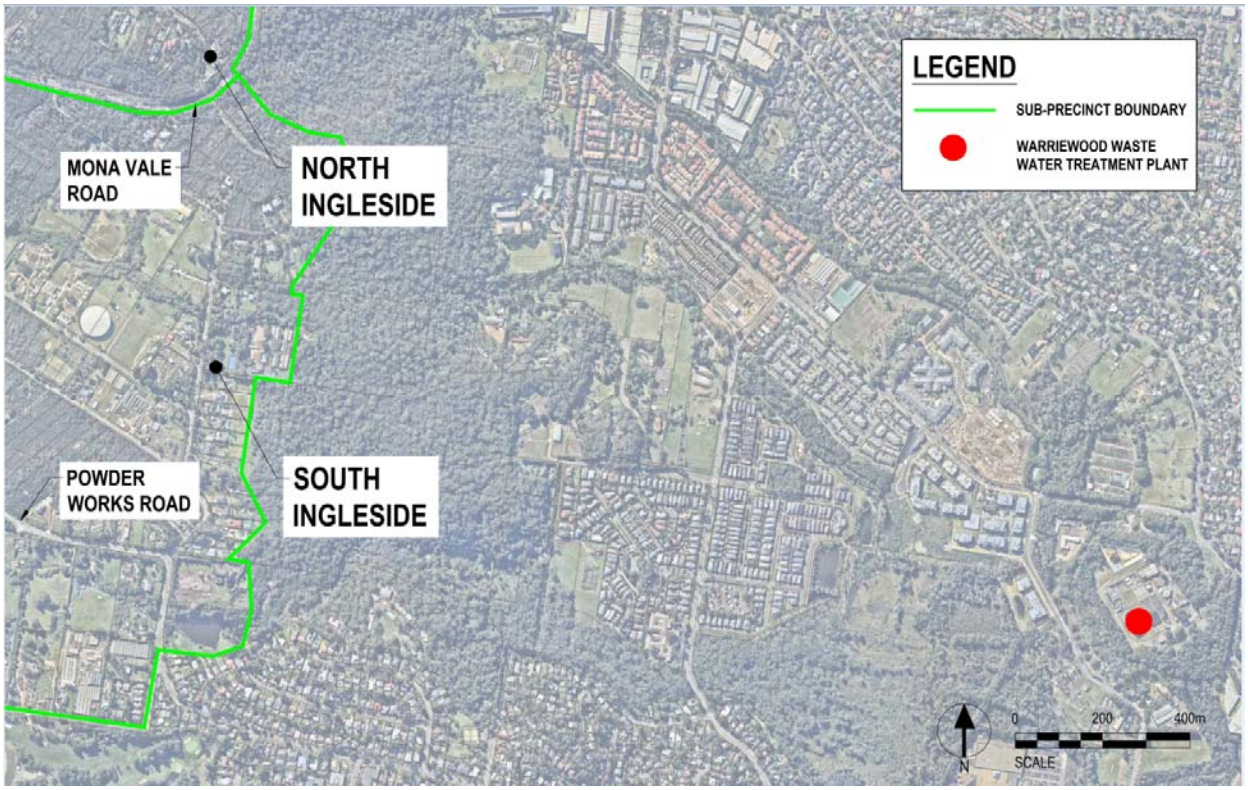
3.2 Wastewater

A significant majority of the Precinct is not connected to the Sydney Water wastewater network and those existing land uses rely on privately owned and operated on-site disposal systems.

The closest Sydney Water Wastewater Treatment Plan (WWTP) is the Warriewood WWTP which is located approximately 2 kilometres east of the eastern Precinct boundary. The location of the Warriewood WWTP in relation to the Precinct is illustrated in **Figure 3-3**.

Treatment capacity is available at the Warriewood WWTP to service the likely development of the Precinct. The existing trunk infrastructure has sufficient capacity to service the South Ingleside sub-precinct, however substantial augmentations are required to service the other sub-precincts.

Figure 3-3 Warriewood STP Location



3.3 Electricity

Under existing conditions, the Precinct is serviced via a combination of three existing zone substations that are located outside of the Precinct. The zone substations are owned and operated by Ausgrid and are identified as follows:

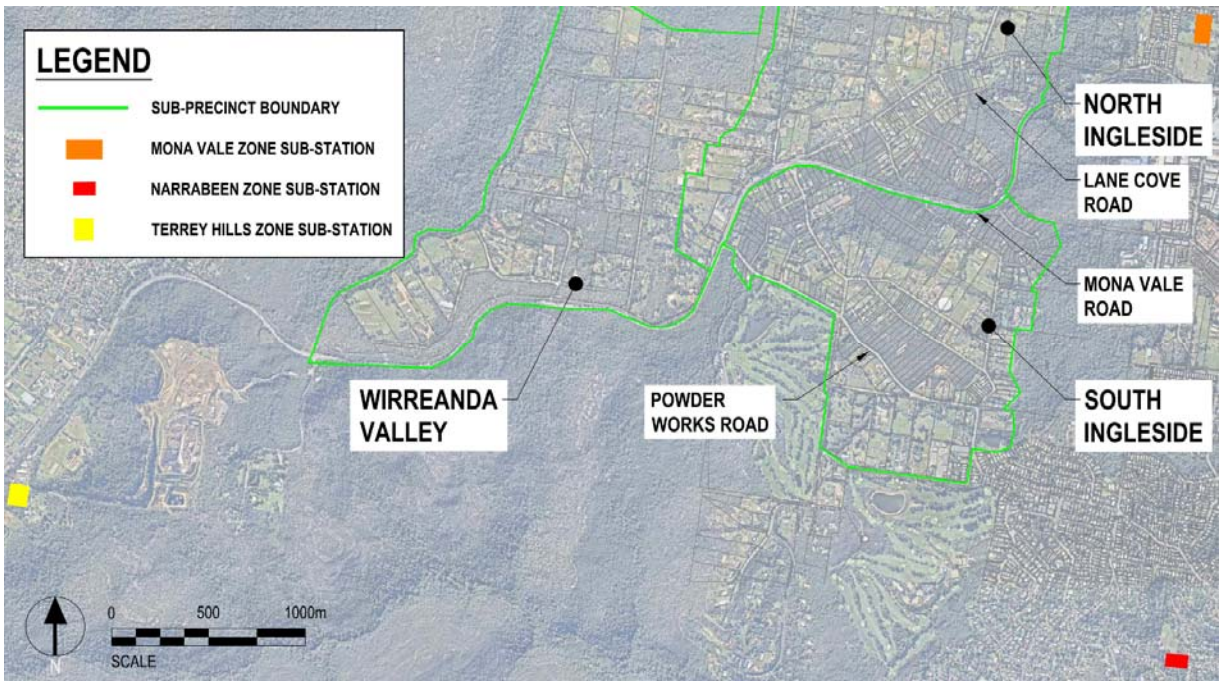
- Mona Vale 33 / 11 kV Zone Substation located on Samuel Street (approximately 1.4 km from Precinct)
- Terrey Hills 33 / 11 kV Zone Substation located on Mona Vale Road (approximately 4.8 km from Precinct)
- Narrabeen 33 / 11 kV Zone Substation located on Nareen Parade (approximately 2.1 km from Precinct)

The location of the zone substations relative to the Precinct are illustrated in **Figure 3-4**.

Under existing conditions, the Precinct contains a network of overhead power lines and pole mount and pad mount substations.

The existing electrical infrastructure within the Precinct would not have sufficient capacity to service the proposed development of the Precinct.

Figure 3-4 Existing Zone Substations



3.4 Telecommunications

Under existing conditions, the Precinct contains an overhead telecommunications network. In addition to the overhead network, a fibre optic cable traverses the Precinct within the Mona Vale Road and Lane Cove Road road reserves.

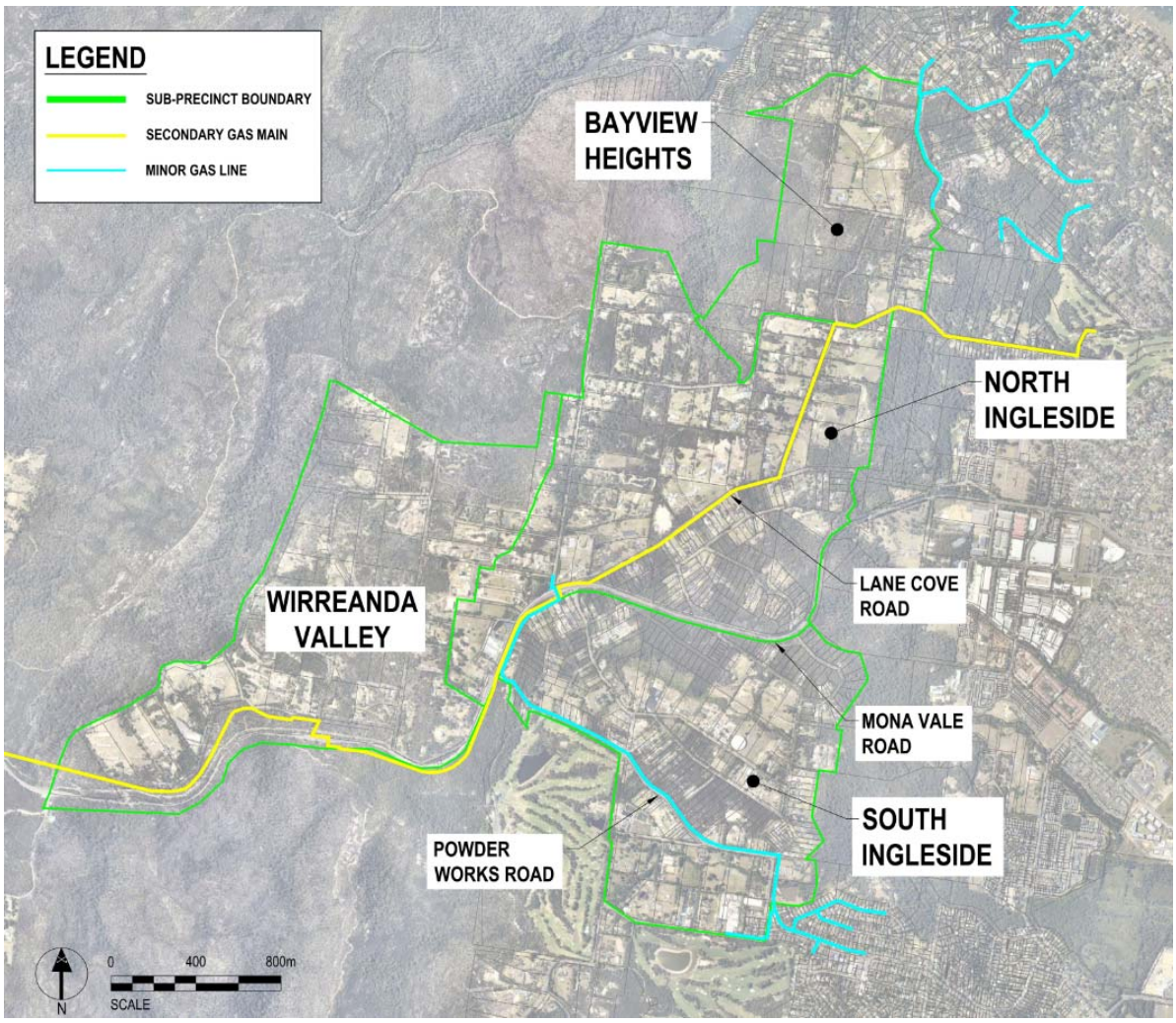
NBN is not currently available within the Precinct.

3.5 Gas

Under existing conditions a secondary gas main traverses the Precinct. The alignment of the secondary gas main generally follows Cabbage Tree Lane, Walter Road, Lane Cove Road and Mona Vale Road. In addition to the secondary gas main, existing gas infrastructure is located in close proximity to the South Ingleside sub-precinct. All existing gas infrastructure is owned and operated by Jemena. The extent of the existing gas infrastructure is included in **Figure 3-5**.

Through the extension of the existing gas infrastructure there is the potential to service the Precinct with gas. Appropriate pressure reducing stations would be required at strategic locations throughout the Precinct.

Figure 3-5 Existing Gas Infrastructure



4 Precinct Utility Infrastructure Servicing Strategy

4.1 Potable Water

Sydney Water has been consulted to determine the likely configuration of the potable water servicing strategy for the Precinct. The high level strategy outlined below is based on advice provided by Sydney Water through its Growth Servicing Strategy and preliminary advice on the specific infrastructure requirements of the Precinct based on the draft SP and the estimated development yields. Further detailed planning is required to determine the infrastructure and staging of servicing to the Precinct.

The South Ingleside sub-precinct can potentially be serviced via lead-in main connections to the Elanora Heights water supply zone that is in reasonable proximity to the Precinct. Preliminary investigations undertaken by Sydney Water indicate that the Elanora Heights reservoir would have capacity to service the South Ingleside sub-precinct.

The proposed connection of lots to the Elanora Heights reservoir indicates that development within the South Ingleside sub-precinct is likely to commence earlier than other sub-precincts.

It is unlikely that the North Ingleside sub-precinct could be serviced via the extension of lead-in main connections from the Elanora Heights reservoir. This is primarily due to the substantial elevation changes across the Precinct.

A new potable water reservoir will be needed to service North Ingleside. Sydney Water has advised that the planning and delivery of the new potable water reservoir would take approximately three years from the date of rezoning.

There is a portion of the area north of Cicada Glen Road within the North Ingleside sub-precinct that is not currently serviced by Sydney Water for potable water. Sydney Water has confirmed that it has the capacity to service all areas north of Cicada Glen Road within the North Ingleside sub-precinct with potable water.

It is unlikely that it would be cost effective for Sydney Water to extend services to the Wirreanda Valley sub-precinct based on the likely development capacity.

The potable water servicing strategy for the Precinct is illustrated in **Figure 4-1**.

A preliminary opinion of probable costs has been prepared for the North Ingleside and South Ingleside sub-precincts and is provided in **Appendix C**. An overview is provided in **Table 4-1**.

Table 4-1 Potable Water Preliminary Opinion of Probable Costs

	Opinion of Probable Costs (Excluding GST)
North Ingleside	$23,400,000
South Ingleside	$8,300,000
Total	$31,700,000

Based on the current high level servicing strategy for the Precinct, the provision of potable water infrastructure to the North Ingleside sub-precinct is likely to be more expensive compared to the South Ingleside sub-precinct. This is due to the potential need for a new potable water reservoir and water pumping station to service the North Ingleside sub-precinct.

Detailed planning would need to be carried out to identify the preferred servicing option, infrastructure required and staging of services to the Precinct.

Under Sydney Water's *Funding Infrastructure to Service Growth* policy, Sydney Water would fund the design and construction of trunk potable water infrastructure. Developers of land would be required to connect to trunk infrastructure by constructing the necessary lead-in works and reticulated network to meet the demands of the proposed development.

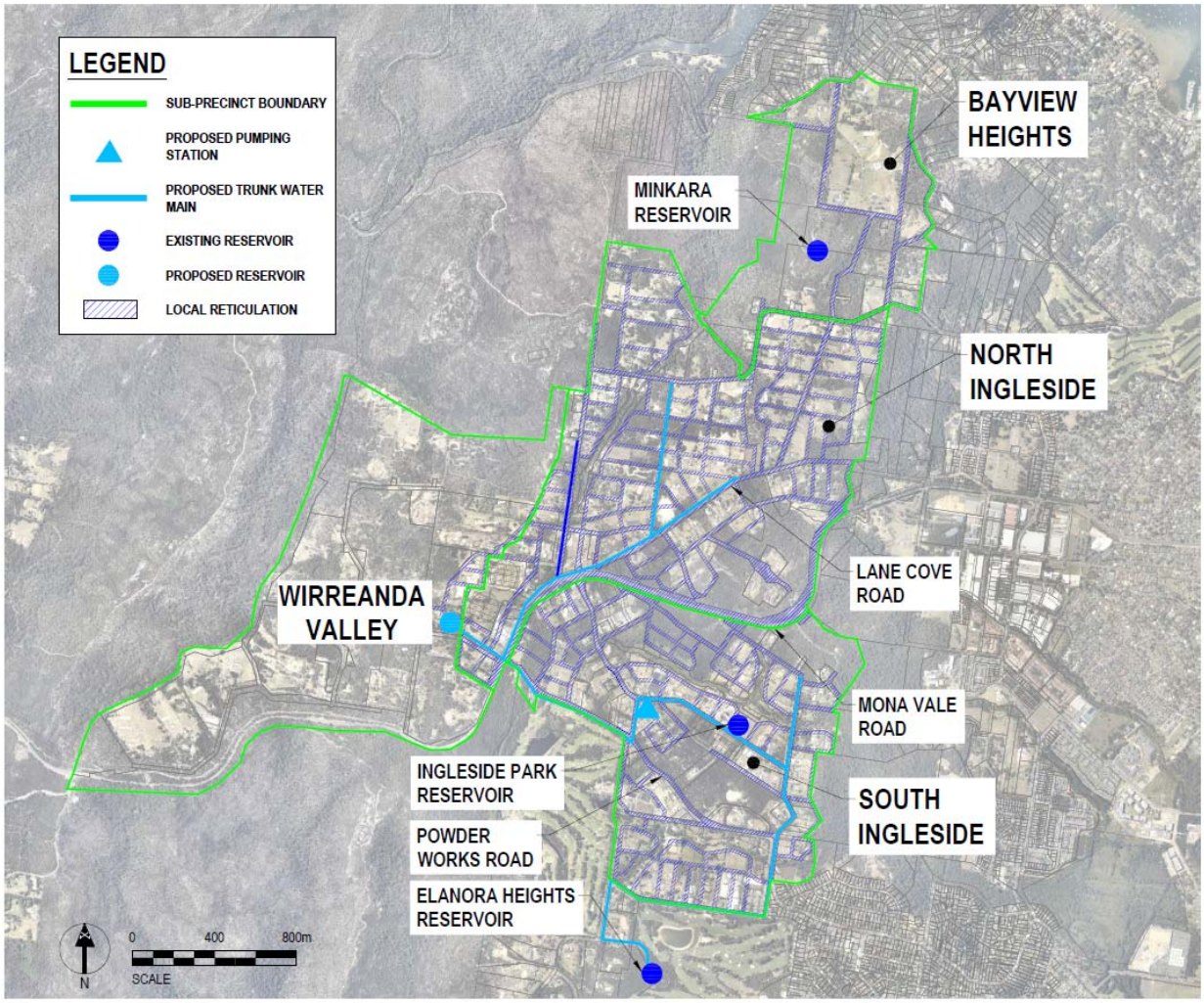
Developers may have the opportunity to accelerate the delivery of trunk infrastructure by negotiating a commercial agreement with Sydney Water. The preparation of a commercial agreement would require consolidation or agreement between a large number of land owners.

The strategy for servicing put forward by Sydney Water has been reviewed by Cardno as part of this scope of work and it can be confirmed that the Sydney Water strategy for servicing the Precinct is considered to be reasonable and feasible based on the information currently available.

The strategy will be subject to evolution and refinement as details regarding the development occupation forecast of the Precinct are more clearly understood. Detailed planning would be required to establish the preferred servicing option for the Precinct.

Correspondence from Sydney Water is included in **Appendix A**.

Figure 4-1 Ingleside Potable Water Servicing Strategy



4.2 Wastewater

Sydney Water has been consulted to determine the likely configuration of the wastewater servicing strategy for the Precinct. The high level servicing strategy outlined below is based on the advice provided by Sydney Water and is subject to further detailed planning.

The Warriewood Wastewater Treatment Plant and ocean outfall has sufficient capacity to accommodate the increased loads associated with the proposed development of the Precinct. Trunk infrastructure will need to be extended to the Precinct to connect it to Sydney Water's existing network. A number of sewer pumping stations are likely to be required to overcome the topographical challenges present within the Precinct.

Importantly, the South Ingleside and North Ingleside sub-precincts are separated by Mona Vale Road which acts as a point of delineation between the two sub-precincts with respect to connection points to existing wastewater infrastructure. Based on preliminary advice provided by Sydney Water on the nature and extent of the required lead-in works, the development of the South Ingleside sub-precinct first is preferred given its proximity to existing infrastructure and smaller lead-in infrastructure costs relative to the other sub-precincts.

Sydney Water has confirmed that is has the capacity to extend wastewater infrastructure to the area north of Cicada Glen Road within the North Ingleside sub-precinct.

North Ingleside and South Ingleside have sufficient development capacity to justify the capital expenditure of extending the existing wastewater network to service the likely development of these sub-precincts. However, the Wirreanda Valley and Bayview Heights sub-precincts will require additional assessment when development capacity of each sub-precinct is confirmed. At this stage it is unlikely that it would be cost effective for Sydney Water to extend wastewater services to Wirreanda Valley and Bayview Heights sub-precincts based on the likely development capacity of each sub-precinct.

A desktop analysis has been conducted on the possibility of utilising decentralised wastewater systems within the Precinct. Current literature indicates that connection to existing wastewater infrastructure is more viable than decentralised systems when existing infrastructure is located within 5 km from existing facilities, *Water Smart Communities For a Liveable City*, Robert Keesen, (July 2014). Additionally, the inclusion of a decentralised wastewater system would require substantial irrigation areas to dispose of treated effluent. Based on the likely development arrangement within the Precinct there would be a shortage of appropriate open spaces to dispose of treated effluent.

The wastewater servicing strategy for the Precinct is illustrated in **Figure 4-2**. This is based on a high level servicing strategy for the Ingleside Release Area, as identified in Sydney Water's *Growth Servicing Strategy*. A detailed assessment to identify the preferred servicing option will be carried out in the detailed planning phase.

A preliminary opinion of probable costs has been prepared for the North Ingleside and South Ingleside sub-precincts and are provided in **Appendix C**. An overview is provided in **Table 4-1**.

Table 4-2 Wastewater Preliminary Opinion of Probable Costs

	Opinion of Probable Costs (Excluding GST)
North Ingleside	$31,500,000
South Ingleside	$20,300,000
Total	$51,800,000

Lead-in wastewater services could be constructed to the South Ingleside sub-precinct in a more accelerated fashion due to its proximity to existing infrastructure.

The North Ingleside sub-precinct would require the design and construction of a sewer pumping station and rising main. The timeframe for delivering the sewer pumping station would vary depending on the size and complexity of the station. Sydney Water have provided a preliminary indication that the planning and delivery of the sewer pumping station would be at least three years from the date of rezoning.

Sydney Water would fund the design and construction of trunk wastewater infrastructure. Developers of land would be required to connect to trunk infrastructure by constructing the necessary lead-in works and reticulated network to meet the demands of the proposed development.

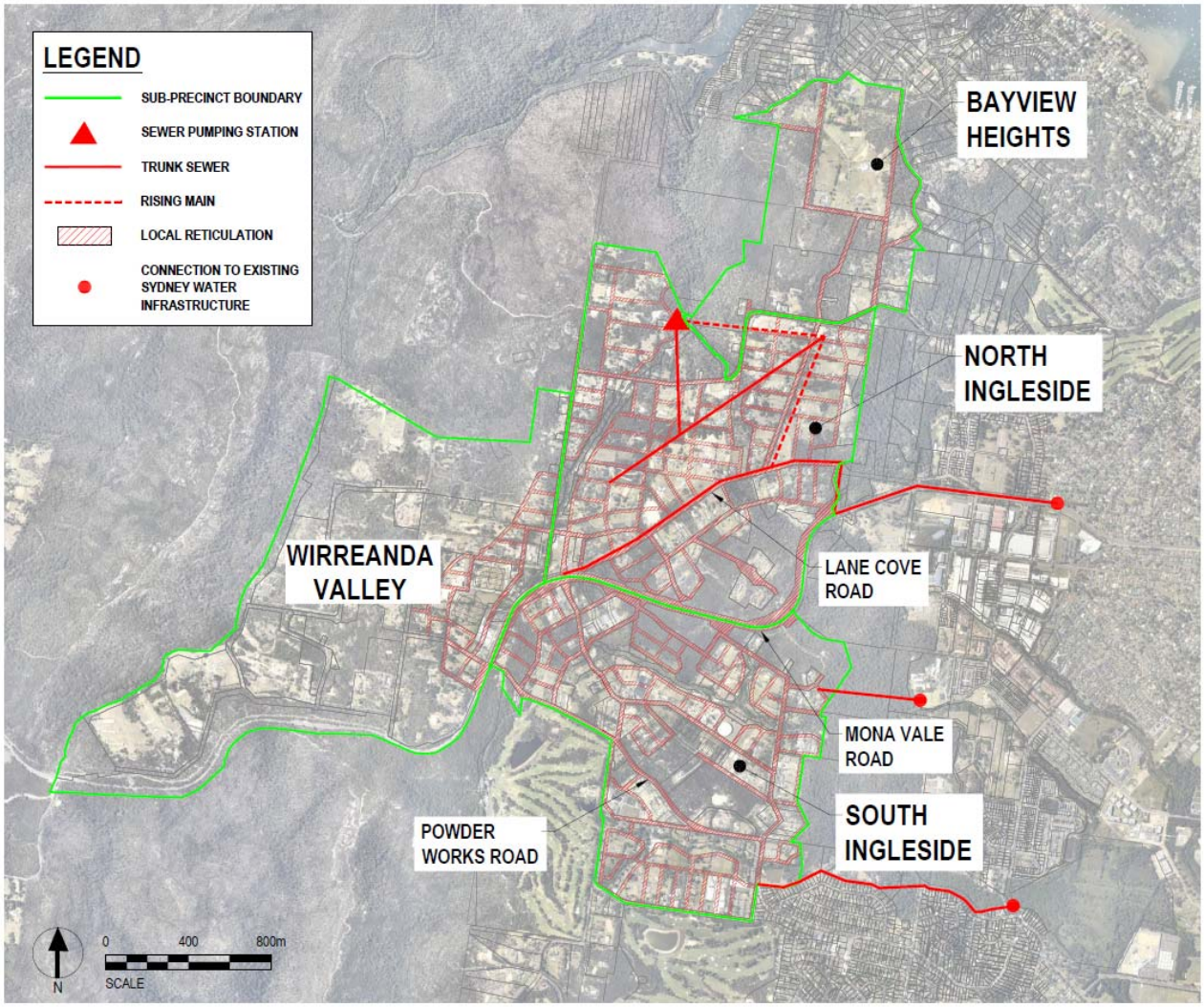
Developers may have the opportunity to accelerate the delivery of trunk infrastructure by negotiating a commercial agreement with Sydney Water. Typically, a commercial agreement would see the developer fund the delivery of trunk infrastructure to be reimbursed at agreed milestones on the delivery of lots. The preparation of a commercial agreement would require consolidation or agreement between a large number of land owners.

The strategy for servicing put forward by Sydney Water has been reviewed by Cardno as part of this scope of work and it can be confirmed that the Sydney Water strategy for servicing the Precinct is considered to be reasonable and feasible based on the information currently available.

Detailed planning will need to be carried out to confirm the preferred servicing option, the infrastructure required and the staging of servicing to the Precinct.

Correspondence from Sydney Water is included at **Appendix A**.

Figure 4-2 Ingleside Wastewater Servicing Strategy



4.3 Electricity

Ausgrid has been consulted to determine the likely configuration of the electricity servicing strategy for the Precinct. The strategy detailed below is based upon the advice provided by Ausgrid and is subject to evolution and refinement as details regarding the development staging of the Precinct are better understood.

Based on the proposed lot yield, Ausgrid has estimated that the load required from the Precinct would be approximately 14 MVA. Ausgrid has been able to confirm that, under current lot yield projections the Precinct could be wholly supplied by the Mona Vale Zone Substation via the installation of a minimum of two new 11 kV feeders leading into the Precinct. Feeders would need to extend from the existing Mona Vale Zone Substation to the Precinct.

The Mona Vale Zone Substation is located off Samuel Street, Mona Vale and is approximately 1.4 km from the eastern boundary of the Precinct via the existing road network.

The installation of the feeders would not be expected to occur as part of the planned Mona Vale Road upgrades. However, there would be the potential for the inclusion of ducts below ground as part of the works to accommodate the feeders required to service the Precinct. This would circumvent additional trenching works along Mona Vale and limit disruption associated with construction works. It is recommended that engagement with Roads and Maritime Services (RMS) occur to understand the possibility of RMS undertaking, and potentially funding, the installation of the electrical ducts.

Current best practice will likely result in the lead-in infrastructure and local reticulation being located underground in a shared services trench which would also be used for gas and telecommunications services. The installation of ducts and feeders would not be funded by Ausgrid and would need to be funded by developers.

The development of the Precinct would not be dictated by the lead-in requirements associated with electrical works. However, it should be noted that development commencing near the boundaries of the Precinct would be preferable to developers as it would reduce the extent of required lead-in infrastructure.

The electrical servicing strategy for the Precinct is illustrated in **Figure 4-3**.

A preliminary opinion of probable costs has been prepared for the North Ingleside and South Ingleside sub-precincts and are included in **Appendix C.** An overview is provided in **Table 4-3**.

Table 4-3 Electricity Preliminary Opinion of Probable Costs

	Opinion of Probable Costs (Excluding GST)
North Ingleside	$17,800,000
South Ingleside	$15,200,000
Total	$33,000,000

The provision of electrical services to the North Ingleside and South Ingleside sub-precincts is similar and the costs associated with the delivery of electrical services is not considered to be a significant differentiator between the two sub-precincts.

During consultation, Ausgrid has stated that the proposed servicing strategy is based upon the capacity currently available within the network and is subject to change as a result of future customer connections and/or future Ausgrid capital projects.

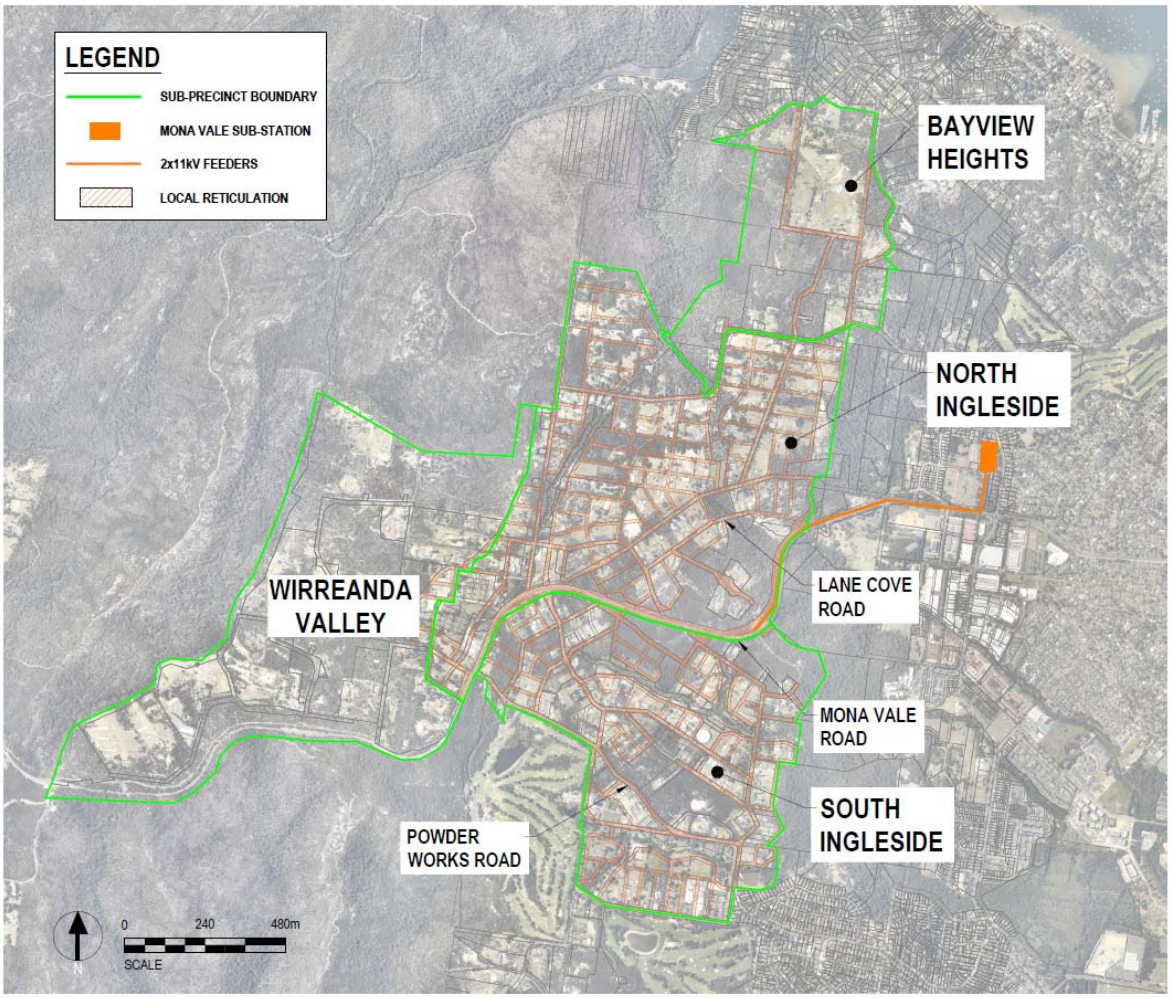
It should also be noted that Ausgrid will not allocate available capacity to customers until a formal application to connect is received.

In the instance where the existing capacity of the Mona Vale Zone Substation is allocated to customers outside of the Precinct, Ausgrid has identified the following alternative strategies:

1. Upgrading of the Mona Vale Zone Substation.
2. Partial supply from the Mona Vale and Terrey Hills Zone Substations.
3. Partial supply from the Mona Vale and Narrabeen Zone Substations.
4. Construction of a new Zone Substation within the Precinct (a provisional area of approximately 1 ha would need to be provided for within the Precinct to accommodate a new zone substation).

Correspondence from Ausgrid is included at **Appendix B**.

Figure 4-3 Ingleside Electrical Servicing Strategy



4.4 Telecommunications

As a minimum, telecommunication infrastructure will be provided to the Precinct under the *Telecommunications Act (1997)*.

Recent changes to the Australian Federal Government policy, *Telecommunications Infrastructure in New Developments*, (December 2014) will result in the provision of fibre throughout the Precinct being subject to competition between potential providers. Whilst preferable, the provision of fibre to the premise is not essential infrastructure required to substantiate a rezoning.

It is important to note that the changes to the policy have impacted the funding mechanism for NBN Co. If developers choose supply through the NBN, the developers will now be responsible for funding the lead-in works and local reticulation for the NBN.

4.5 Gas

The extension of the existing gas network throughout the Precinct will be subject to a commercial assessment undertaken by Jemena.

The premise of the commercial assessment will be the capital expenditure to extend the network relative to the capability to recuperate the investment through an increased customer base. In the instance where Jemena determines that there are commercial grounds for the extension of the network, the provision of gas

infrastructure will be funded by Jemena and as such does not form part of the Preliminary Opinion of Probable Costs (refer **Table 4-4**).

In the unlikely event that Jemena determines that the outcomes of the commercial assessment are unsatisfactory, then the developer could chose to extend the network at its own cost.

It is likely that the extension of the existing network would extend off the existing infrastructure located within the Precinct with suitable pressure reducing stations installed as required.

4.6 Opinion of Probable Costs

Preliminary opinion of probable costs (refer **Table 4-4**) has been prepared for the provision of utility infrastructure throughout the Precinct. The estimates are preliminary only and account for the full supply of services throughout the Precinct and are based on the preliminary advice provided by utility providers. Infrastructure cost estimates should be reviewed as design evolves.

Infrastructure cost estimates for gas have not been included as they will be funded by Jemena pending the outcomes of a commercial assessment to establish if servicing the Precinct with gas is commercially feasible.

Infrastructure cost estimates for telecommunications have not been included as they would be funded by the developer and would vary depending upon the preferred provider and the service sought.

Complete preliminary opinion of probable costs for North Ingleside and South Ingleside are included at **Appendix C**.

Table 4-4 Precinct Preliminary Opinion of Probable Costs

Service	Sub-Precinct	Opinion of Probable Costs (Excluding GST)
Potable Water	North Ingleside	$23,400,000
	South Ingleside	$8,300,000
	Total	$31,700,000
Wastewater	North Ingleside	$31,500,000
	South Ingleside	$20,300,000
	Total	$51,800,000
Electricity	North Ingleside	$17,800,000
	South Ingleside	$15,200,000
	Total	$33,000,000

5 South Ingleside Utility Infrastructure Servicing Strategy

In developing the preliminary servicing strategy for the Precinct it is apparent that the South Ingleside sub-precinct is more cost effective to service with utility infrastructure and that more investigation works have been completed by service providers to plan for the requirements of the sub-precinct, in particular Sydney Water.

Due to the proximity of existing potable water infrastructure to the South Ingleside sub-precinct it is reasonable to anticipate development of the South Ingleside sub-precinct first.

The delivery of utility infrastructure to the South Ingleside sub-precinct is outlined under the relevant headings below.

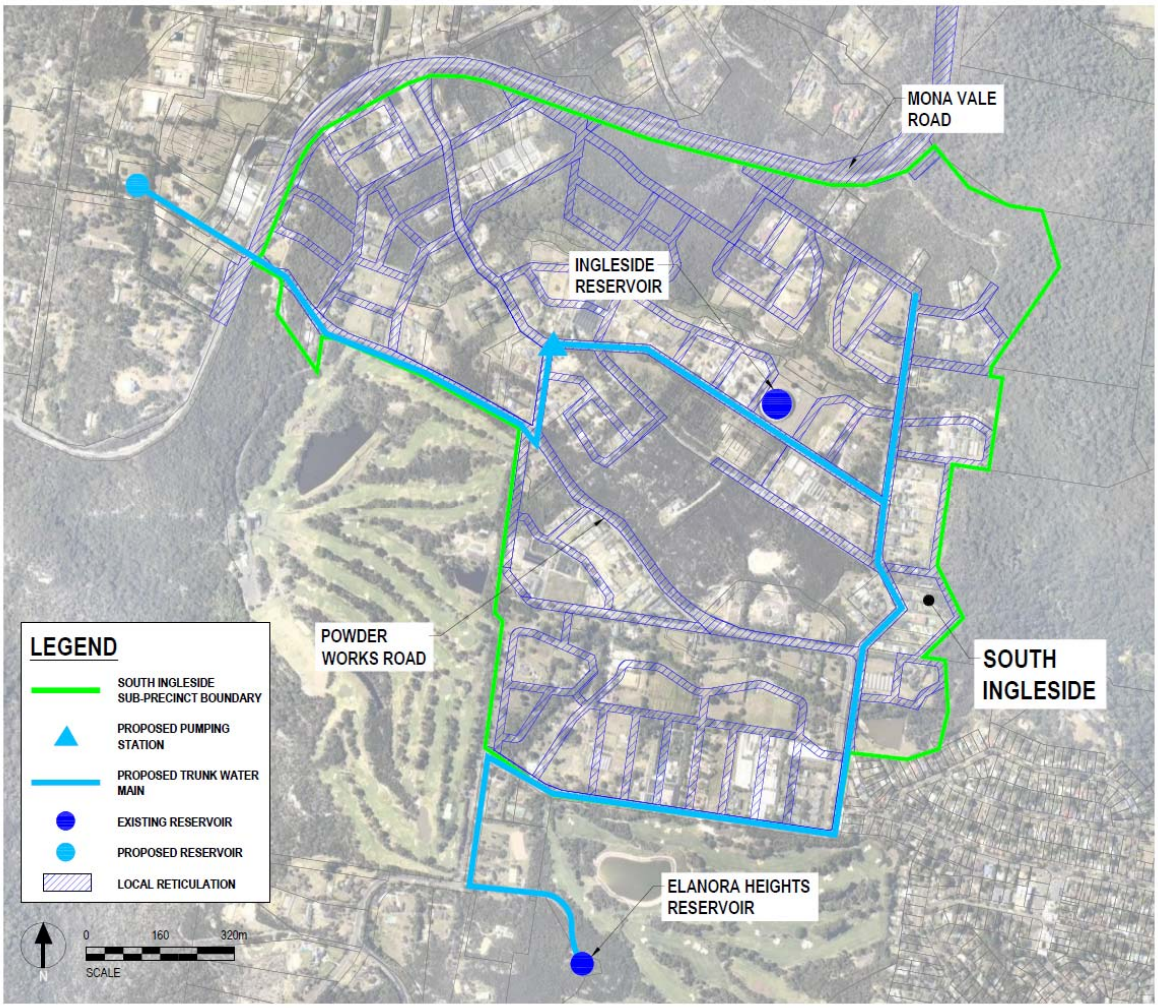
5.1 Potable Water

Sydney Water has advised that South Ingleside can be serviced via new gravity trunk mains from the Elanora Heights Reservoir combined with a booster to service the high elevation areas. Sydney Water has also advised that the following lead-in water mains would be required to meet the forecast demands of the likely development:

- 2.6 km of 250 mm water main on Mirbelia Parade, Wilga Street, Powder Works Road and Ingleside Road; and
- 1.0 km of 200 mm water main on Powder Works Road and Ingleside Road.

An overview of the trunk potable water infrastructure requirements for the South Ingleside sub-precinct is included in **Figure 5-1**. This would need to be confirmed as the optimal servicing strategy during detailed planning.

Figure 5-1 South Ingleside High Level Potable Water Servicing Strategy



5.2 Wastewater

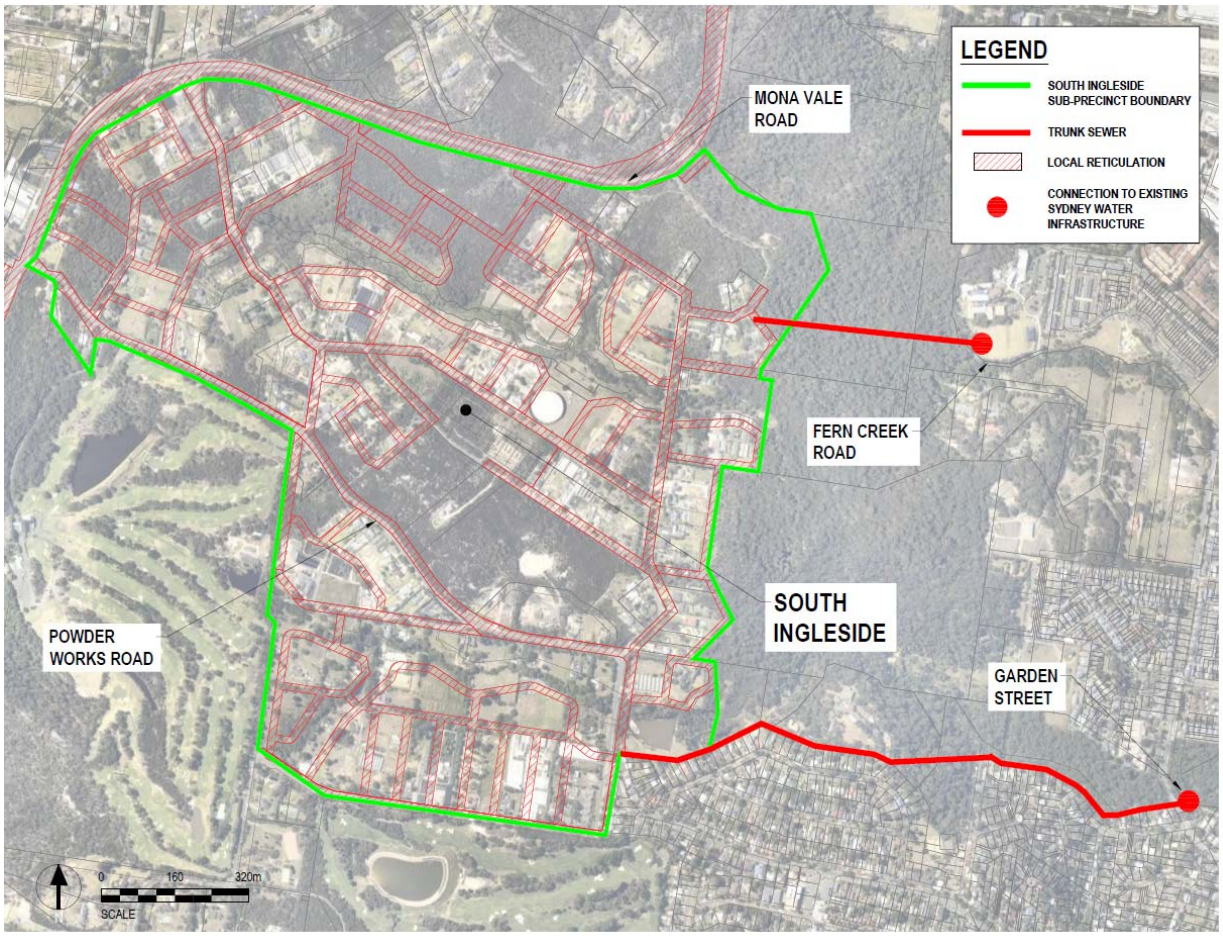
Sydney Water has advised that the topography of the South Ingleside sub-precinct will dictate that two trunk wastewater mains will be required to service the forecast demands of the sub-precinct. The two trunk mains nominated by Sydney Water are as follows:

- 1.5 km 250 mm trunk wastewater main to connect to the Mullet Creek carrier
- 0.5 km 375mm trunk wastewater main to connect to the Ingleside carrier[2].

An overview of the trunk wastewater infrastructure requirements for the South Ingleside sub-precinct is included in **Figure 5-2**. This would need to be confirmed as the optimal servicing strategy during detailed planning.

[2] This trunk main will need to be directionally drilled.

Figure 5-2 South Ingleside High Level Wastewater Servicing Strategy



5.3 Electricity

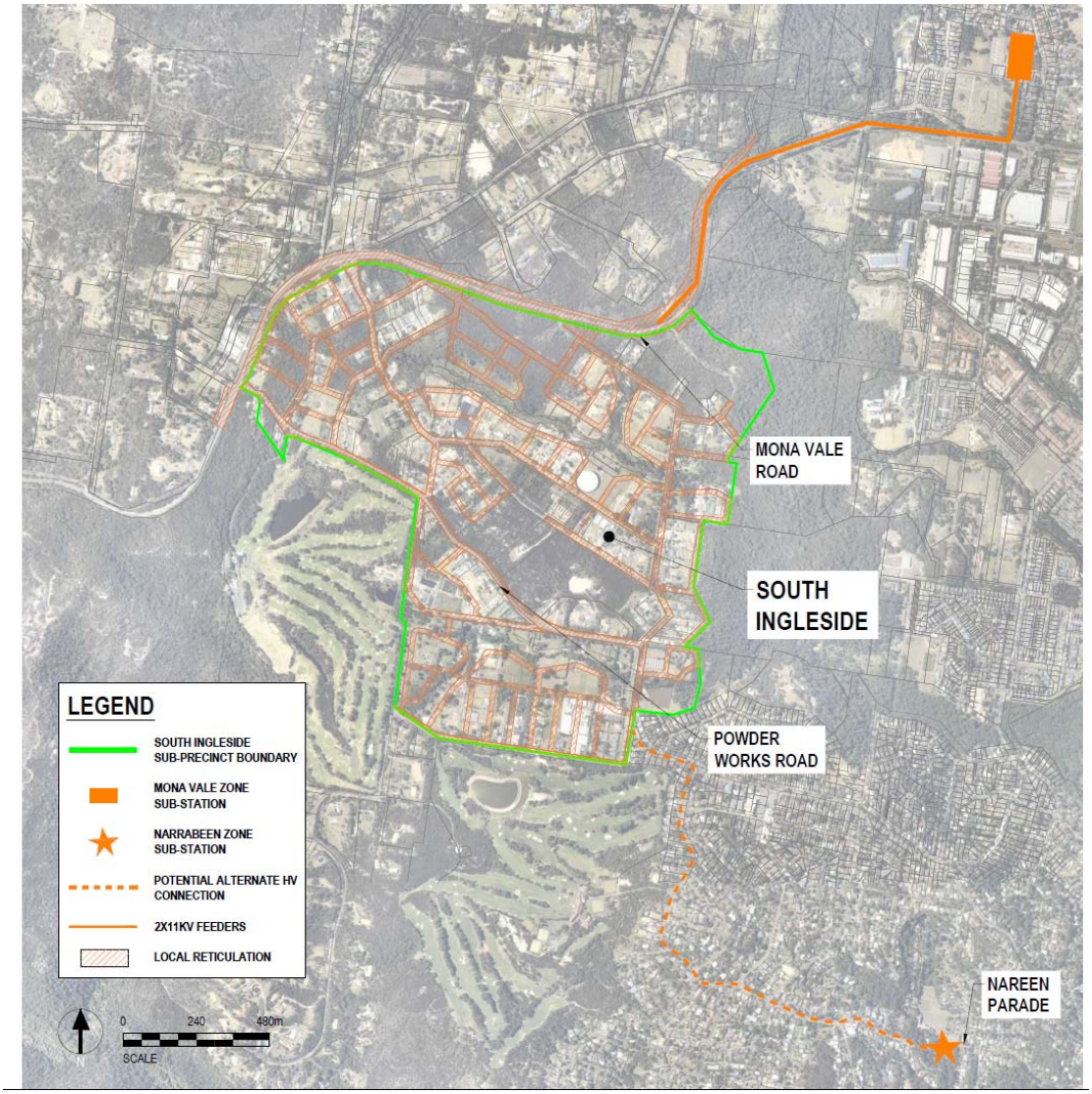
Based on access to existing utilities and knowledge of developer interest, development within the South Ingleside sub-precinct is anticipated to commence in the south-eastern corner in the vicinity of Wilga Street and Wilson Avenue.

Via the existing road network, this area within the South Ingleside sub-precinct is approximately 3.5 km from the Mona Vale substation. In addition, the Narrabeen Zone Substation, located off Nareen Parade, is approximately 2.0 km from the South Ingleside sub-precinct via the existing road network.

Based on the advice provided by Ausgrid, it can be derived that there is some capacity within the Narrabeen Zone Substation. Given it is approximately 1,500 m closer to the anticipated first stages of development it is likely that it would be more economic for the early stages of the South Ingleside sub-precinct to connect into the Narrabeen Zone Substation with a connection across to the Mona Vale Zone Substation occurring in the future when lead-in works from the Mona Vale Zone Substation become more economic. Confirmation of this being an available option would be required from Ausgrid as part of the application to connect process.

An overview of the trunk electrical infrastructure requirements for the South Ingleside sub-precinct is included in **Figure 5-3**.

Figure 5-3 South Ingleside Electrical Servicing Strategy



5.4 Telecommunications

Telecommunications infrastructure can be delivered to the South Ingleside sub-precinct under the *Telecommunications Act (1997)*.

The provision of fibre to the premise throughout the sub-precinct would need to be funded by the developer.

5.5 Gas

In the instance where the outcome of the commercial assessment is favourable (refer **Section 4.5**) for extending the existing gas network into the South Ingleside sub-precinct, the lead-in works and internal reticulation would be designed and funded by Jemena.

In the unlikely occurrence that Jemena declares that the extension of the network to service the likely development is not commercially feasible, developers could chose to fund the extension of the existing gas network at their own cost.

5.6 Opinion of Probable Costs

Opinion of probable costs (refer **Table 5-1**) have been prepared for the provision of utility infrastructure throughout the South Ingleside sub-precinct. The estimates are preliminary only and are based on the advice provided by utility providers. Infrastructure cost estimates should be reviewed as design evolves.

Table 5-1 South Ingleside Sub-Precinct Opinion of Probable Costs

	Opinion of Probable Costs (Excluding GST)
Potable Water	$8,300,000
Wastewater	$20,300,000
Electricity	$15,200,000
Total	**$43,800,000**

Infrastructure cost estimates for gas have not been included as they would be funded by Jemena.

Telecommunications costs have not been included as they would be funded by the developer.

Complete cost estimates for North and South Ingleside are included at **Appendix C**.

6 Conclusion

The IDP has been prepared based on the likely development of the Precinct. The IDP relies upon the provision of traditional servicing strategies and utility providers. With respect to sewer and water this is considered to be a reasonable approach based on the outcomes of a desktop analysis on the viability of decentralised wastewater and water solutions.

The traditional servicing strategy serves as an appropriate mechanism to facilitate a rezoning of the Precinct to support the likely development. This report demonstrates that the likely development of the North Ingleside and South Ingleside sub-precincts can be serviced adequately for potable water, wastewater electricity and telecommunications.

The IDP has not been prepared as a prescriptive guide on the utility infrastructure required within the Precinct. Rather, it has been prepared to facilitate rezoning and to inform developers of the infrastructure requirements to provide a traditional servicing approach to future development. Alternative servicing strategies can be pursued by developers or land owners at the Development Application stage to assist in the forward progression of their development ahead of programming of traditional servicing infrastructure or where traditional servicing is unavailable. Funding and maintenance of any alternative strategy would be borne by the developer or land owner.

Sydney Water has the capacity to service the likely development of the North Ingleside and South Ingleside sub-precincts with potable water and wastewater. It is likely that the area bound by Wilga Avenue and Wilson Street will be developed first due its proximity to existing services.

Planning and delivery for new infrastructure to service the North Ingleside sub-precinct would take at least three years from the date of rezoning.

The extension of Sydney Water infrastructure into the Wirreanda Valley (wastewater and potable water) and Bayview Heights (wastewater) sub-precincts will require confirmation of the development capacity of both sub-precincts and an evaluation of the capital expenditure to service the likely development within these sub-precincts.

The provision of gas services throughout the Precinct will be subject to a commercial assessment by Jemena.

The provision of fibre to the premise throughout the Precinct will not be funded by NBN Co. Fibre to the premise will need to be funded by the developer. Whilst the provision of fibre to the premise is considered preferable, it is not a requirement of essential infrastructure to justify the proposed rezoning.

From an infrastructure delivery perspective, the South Ingleside sub-precinct is the preferred location to commence development within the Precinct given its proximity to existing infrastructure. A preliminary servicing strategy for South Ingleside has been described within this report.

Ingleside Release Area

APPENDIX A

SYDNEY WATER CORRESPONDENCE

Cardno
Shaping the Future

24 April 2015

Sean Porter
Project Engineer
Cardno
PO Box 19
St Leonards NSW 1590

Re: Servicing Strategy for North Ingleside

Dear Sean,

Thank you for your enquiry on the status of servicing of the North Ingleside sub-precinct within the Ingleside Release Area. Sydney Water supports the staged rezoning of the Ingleside Release Area.

Sydney Water does not expect to have trunk capacity issues in servicing the North Ingleside sub-precinct. However, the servicing strategy is very high level at this stage due to the uncertainty around its development timeframe, dwelling yield and staging.

Detailed planning investigation for water and wastewater servicing of the North Ingleside sub-precinct will be carried out after we receive formal notification of the rezoning dates and yields.

If you require any further information, please contact Harsha Gautam of the Engineering and Environmental Services group on 02 8849 5662 or e-mail harsha.gautam@sydneywater.com.au.

Yours sincerely

Greg Joblin
Manager, Growth Strategy

14 November 2014

Sean Porter
Project Engineer
Cardno
PO Box 19
St Leonards NSW 1590

Re: Servicing Strategy for South Ingleside

Dear Sean

Thank you for your enquiry on the status of servicing of Ingleside as part of the precinct planning for the Ingleside Release Area.

In our latest Growth Servicing Strategy (GSS), Sydney Water has identified the infrastructure required for servicing the growth in South Ingleside; however strategy for servicing North Ingleside is very high level at this stage due to the uncertainty about its development time frame and number of dwellings.

Mona Vale road divides the Ingleside development area into North and South Ingleside and the area south of the Mona Vale road is considered as South Ingleside. South Ingleside will be developed in stages starting from the south. The Infrastructure for water and wastewater required to service the growth in South Ingleside are as follows:

Water

- South Ingleside development will be serviced via gravity from **Elanora Heights Reservoir** combined with booster to service the high elevation areas. No new reservoir will be required. The following new lead-in mains would be required to service the growth in South Ingleside by 2020.
    - Construct 2.65km long 250mm mains on Mirbelia Parade, Wilga St, Powder Works and Ingleside Road (Refer Figure 1) and
    - Construct 950m long 200mm mains on Powder Works Rd and Ingleside Rd

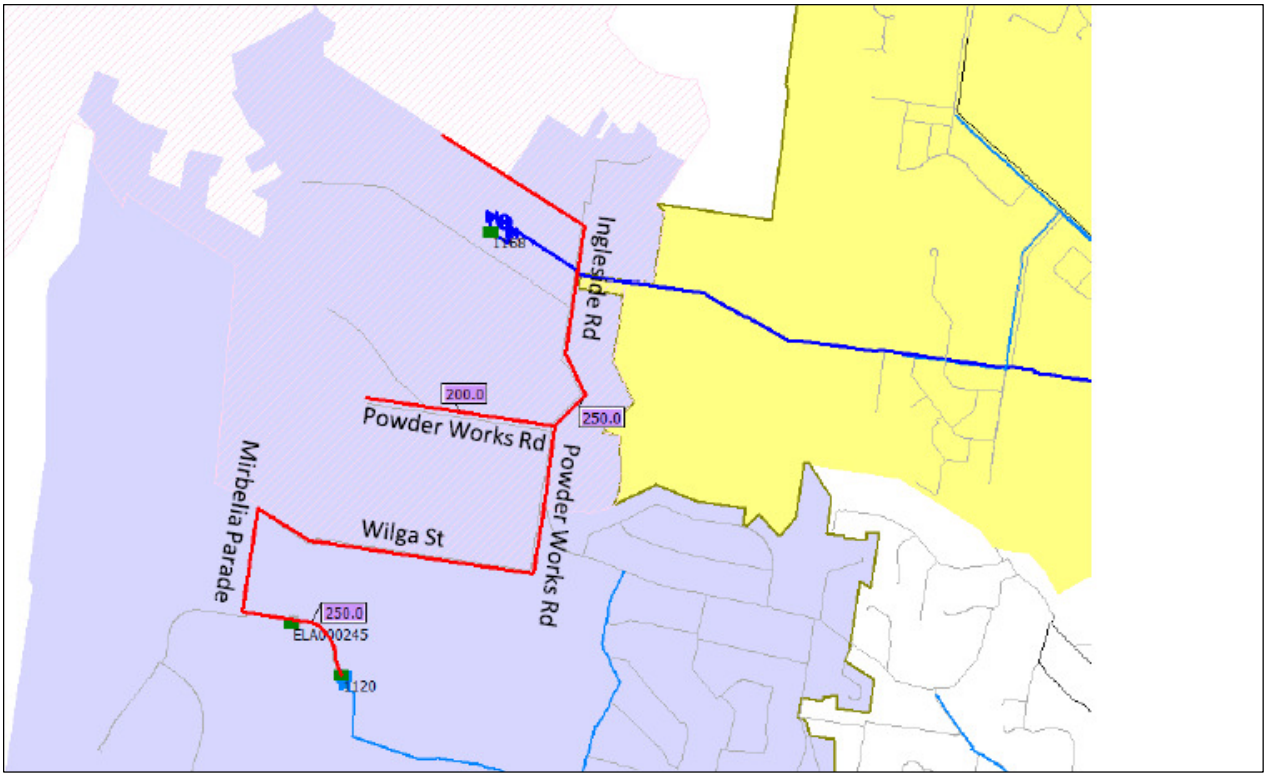


Figure 1 – Infrastructure requirements for water by 2020

Wastewater

1. A ridge in the middle of South Ingleside divides it into approximately two halves. The southern part of South Ingleside will be drained to Mullet Creek carrier and other half (northern part) of it will be drained to Ingleside carrier. Two lead-in mains will require to be constructed to service the south Ingleside.

    - Construct approximately 1.5km 250mm lead-in main to connect Mullet Creek carrier to service the southern part (Refer Figure 2)

    - Construct a 500m long tunnel of 375mm dia to service the northern part to connect to Ingleside carrier. Ingleside carrier has been designed to service the Ingleside growth.

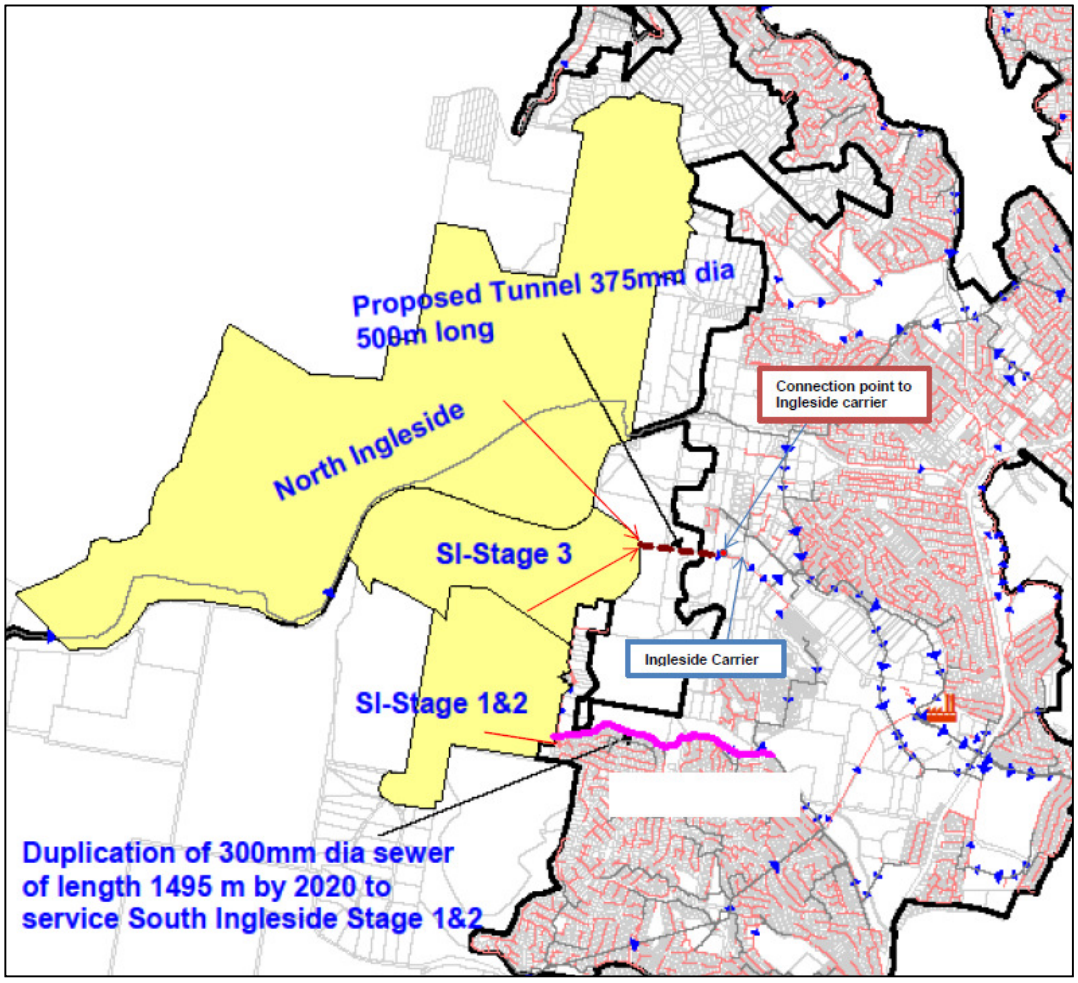


Figure 2 – Infrastructure requirements for wastewater

If you require any further information, please contact Harsha Gautam of the Engineering and Environmental Services Branch on 02 8849 5662 or e-mail harsha.gautam@sydneywater.com.au

Yours sincerely,

Greg Joblin
A/Manager, Growth Strategy

Ingleside Release Area

APPENDIX B

AUSGRID CORRESPONDENCE

Cardno
Shaping the Future

Ingleside Feasibility Study

January 2015

Ingleside Feasibility Study

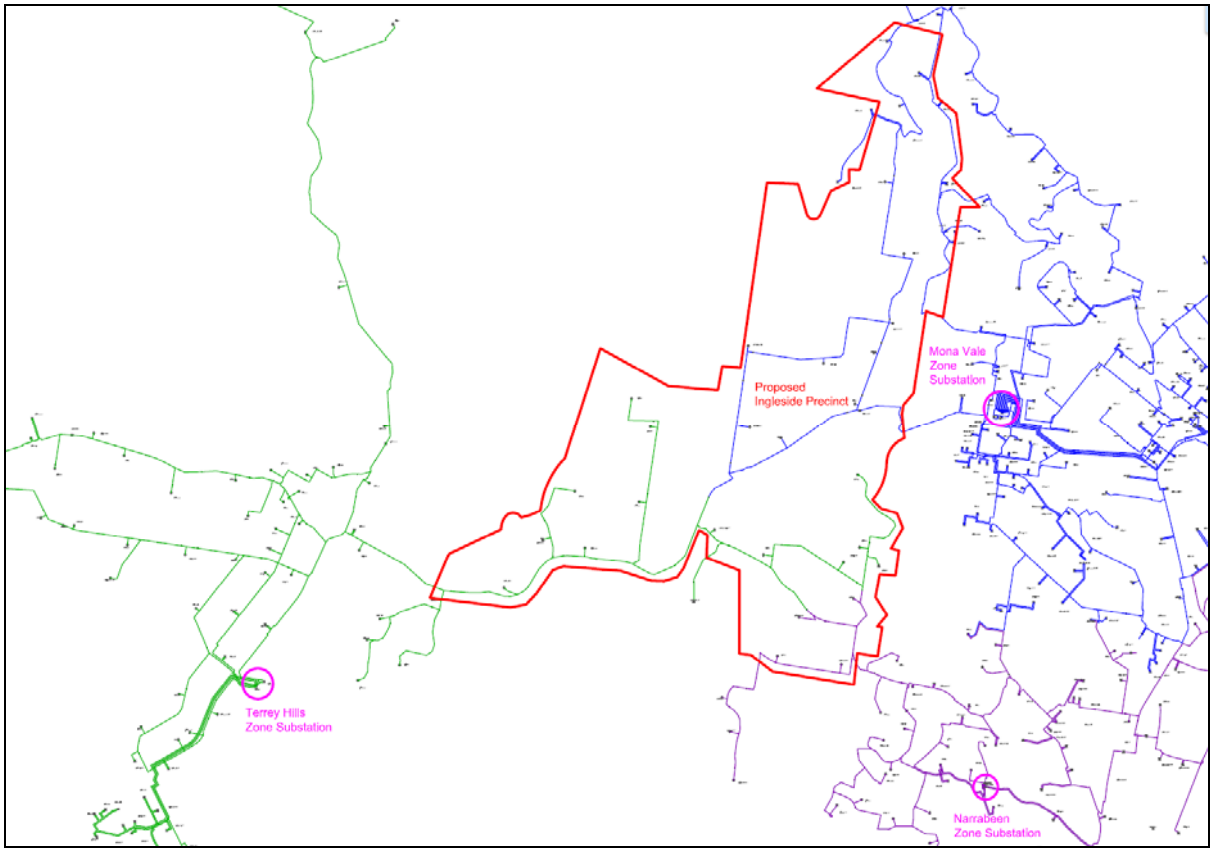
14 January 2015

Contents

1 The Existing 11kV Network

Ingleside is currently supplied from Mona Vale 33/11kV Zone Substation located on Samuel Street, Terrey Hills 33/11kV Zone Substation located on Mona Vale Road and Narrabeen 33/11kV Zone Substation located on Nareen Parade.

1.1 Diagram 1 – Geoschematic overview of the existing 11kV network



- Existing Terrey Hills Zone Substation 11kV network
- Existing Mona Vale Zone Substation 11kV network
- Existing Narrabeen Zone Substation 11kV network
- Proposed Ingleside Precinct

2 Associated Projects

The existing 11kV switchgear at Mona Vale 33/11kV Zone Substation is proposed to be replaced with new 11kV switchgear by September 2016. The construction of the proposed Ingleside development may need to be coordinated with the proposed switchgear replacement works at Mona Vale 33/11kV Zone Substation to ensure the availability of supply.

3 Supply Options

Based on the current network forecast, the entire requested load of 14MVA or approximately 735 11kV amps can be supplied from Mona Vale 33/11kV Zone Substation with a maximum of three new 11kV feeders to the development site. Based on the current network there is the possibility of supplying part of the proposed development using two new 11kV feeders from Mona Vale 33/11kV Zone Substation and augmenting the existing 11kV network to supply the remaining load. There is currently one spare panel and a limited number of double-bankable panels available at Mona Vale 33/11kV Zone Substation.

The capacity currently available is subject to change as a result of future customer connections and/or future Ausgrid capital projects. Ausgrid only allocates available capacity to customers once a formal application to connect is received and therefore the available capacity will need to be reassessed once an official application to connect is received for this proposed development.

In the case that Mona Vale 33/11kV Zone Substation does not have enough capacity to supply this development following receipt of a formal application to connect, the following options may be considered.

Option 1: Upgrade of Mona Vale 33/11kV Zone Substation
This option involves replacing two existing 25MVA 33/11kV transformers with two 33MVA 33/11kV transformers and upgrading two existing 33kV feeders. There will not be any changes required to the 11kV works mentioned above.

Option 2: Partial supply of the requested load from both Mona Vale 33/11kV Zone Substation and Terrey Hills 33/11kV Zone Substation.
This option will require one new 11kV feeder from Terrey Hills 33/11kV Zone Substation and one new 11kV feeder from Mona Vale 33/11kV Zone Substation to the development site as well as augmentation to the existing network to supply the remaining proposed load. There are no spare panels and limited double-bankable panels available in Terrey Hills 33/11kV Zone Substation.

Option 3: Partial supply of the requested load from both Mona Vale 33/11kV Zone Substation and Narrabeen 33/11kV Zone Substation.
This option involves minor upgrading works to increase the capacity of Narrabeen 33/11kV Zone Substation. This option will also require one new 11kV feeder from Narrabeen 33/11kV Zone Substation and one new 11kV feeder from Mona Vale 33/11kV Zone Substation to the development site as well as augmentation to the existing network to supply the remaining proposed load. There are no spare panels and limited double-bankable panels available in Narrabeen 33/11kV Zone Substation.

Option 4: New Zone Substation
This option involves building a new zone substation within the Inglewood development site.

Further work may be required for all options mentioned above to supply the proposed new 11kV feeders from a particular zone where there is found to be no spare panels or double-bankable panels available at the time the formal application to connect is assessed.

Ingleside Release Area

APPENDIX C

OPINION OF PROBABLE COSTS

Cardno
Shaping the Future

INGLESIDE PRECINCT
ELECTRICAL, POTABLE WATER & WASTEWATER INFRASTRUCTURE

Cardno Opinion of Probable Costs
9-May-16

ITEM	DESCRIPTION OF WORK	QTY	UNIT	RATE	AMOUNT	NOTES
1	*POTABLE WATER*					
1.1	South Ingleside					
1.11	Lead-in / Trunk 250 mm main	2,700	m	$ 350	$ 945,000	Construction of 2,700 metre of trunk / lead-in 250 mm main along Mirbelia Parade, Wilga Street, Powder Works Road and Ingleside Road
1.12	Trunk 200 mm main	950	m	$ 300	$ 285,000	Construction of 950 metres of trunk mains along Powder Works Road and Ingleside Road
1.13	Reticulation (150 mm main)	27,360	m	$ 240	$ 6,566,400	Assumes approximately 1.2 times the length of internal road (excluding the roads with trunk mains)
1.14	Water booster	1	Item	$ 500,000	$ 500,000	Booster nominated as part of the Sydney Water servicing strategy for South Ingleside to provide services to higher elevation areas
	Sub-Total				*$ 8,296,400*	
1.2	North Ingleside					
1.21	Pumping station	1	Item	$ 3,000,000	$ 3,500,000	Construction of a pumping station within South Ingleside to service the North Ingleside
1.22	Water rising main	1,500	m	$ 240	$ 360,000	Assumes a location reasonably consistent with Sydney Water planning documents
1.23	Reservoir	1	Item	$ 10,000,000	$ 10,000,000	Construction of a reservoir in the vicinity of the intersection between Powderworks Road and Mona Vale Road
1.24	Lead-in / Trunk 250 mm main	1,700	m	$ 350	$ 595,000	Construction of 1,700 metres of trunk / lead-in 250 mm main along Mona Vale Road and Lane Cove Road (to Walter Road)
1.24	Reticulation (150 mm main)	37,200	m	$ 240	$ 8,928,000	Assumes approximately 1.2 times the length of internal road (excluding the roads with trunk mains)
	Sub-Total				*$ 23,383,000*	
	Potable Water Sub-Total				**$ 31,679,400**	
2	*WASTEWATER*					
2.1	South Ingleside					
2.11	Lead-in 250 mm main to Mullet Creek carrier	1,500	m	$ 700	$ 1,050,000	Based on Sydney Water advice rendered for South Ingleside
2.12	Lead-in 375 mm main to Ingleside Carrier	500	m	$ 4,000	$ 2,000,000	Based on Sydney Water advice rendered for South Ingleside
2.15	Wastewater reticulation	41,040	m	$ 420	$ 17,236,800	Assumes approximately 1.8 times the length of internal road
	Sub-Total				*$ 20,286,800*	
2.2	North Ingleside					
2.21	Trunk 250 mm main (Lane Cove Road)	1,250	m	$ 750	$ 937,500	Based on Sydney Water advice rendered for North Ingleside (preliminary only and currently under investigation)
2.22	Trunk 250 mm main to pump station	1,800	m	$ 750	$ 1,350,000	Based on Sydney Water advice rendered for North Ingleside (preliminary only and currently under investigation)
2.23	Pumping station	1	Item	$ 3,000,000	$ 3,000,000	Based on Sydney Water advice rendered for North Ingleside (preliminary only and currently under investigation)
2.24	Rising main	1,400	m	$ 600	$ 840,000	Based on Sydney Water advice rendered for North Ingleside (preliminary only and currently under investigation)
2.25	Trunk 375 mm main to Warriewood Sub-main	2,000	m	$ 950	$ 1,900,000	Based on Sydney Water advice rendered for North Ingleside (preliminary only and currently under investigation)
2.26	Wastewater reticulation	55,800	m	$ 420	$ 23,436,000	Assumes approximately 1.8 times the length of internal road
	Sub-Total				*$ 31,463,500*	
	Wastewater Sub-Total				**$ 51,750,300**	
3	*Electrical*					
3.1	South Ingleside					
3.11	Lead-in feeder (Narrabeen Zone Substation)	2,100	m	$ 1,200	$ 2,520,000	Assumes that there is adequate capacity in the Narrabeen Zone Substation)
3.12	Electrical reticulation	1,738	lots	$ 7,300	$ 12,687,400	Allowance for LV reticulation, 11 kV kiosk substations and street lighting
	Sub-Total				*$ 15,207,400*	
3.2	North Ingleside					
3.21	Lead-in feeder (Mona Vale Zone Substation)	1,650	m	$ 1,200	$ 1,980,000	Based on advice from Ausgrid
3.22	Electrical reticulation	2,169	lots	$ 7,300	$ 15,833,700	Allowance for LV reticulation, 11 kV kiosk substations and street lighting
	Sub-Total				*$ 17,813,700*	
	Electrical Sub-Total				**$ 33,021,100**	