

APPENDIX 6. INVESTIGATIONS – INFRASTRUCTURE AND SERVICING REPORT

Preliminary Infrastructure and Services Report

Goolwa North - Proponent Initiated Code Amendment

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Preliminary Infrastructure and Servicing Report

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1 Introduction

Ambo Pty Ltd has initiated an amendment to the Planning and Design Code for the future growth areas of Goolwa North. The Goolwa North Code Amendment was approved by the Minister of Planning on 4 May, 2023, allowing Ambo Pty Ltd to undertake investigations to rezone the identified land for the future urban expansion of the Goolwa Township, anticipated to be developed over the next 20 years or more.

GREENHILL has undertaken a preliminary infrastructure analysis to identify potential infrastructure needs including stormwater management, waste water, electrical, gas, telecommunications, water supply and road networks in order to identify any potential issues that may affect the future development. This will assist in determining the proposed development staging strategies and to consider, address and suggest physical and funding solutions to any issues identified by the infrastructure investigation.

This investigation includes the following:

- Identification of the existing services surrounding the site including;
 - A Before You Dig Australia (BYDA) enquiry was made to obtain information on the existing infrastructure in the study area from Service Authorities;
 - Review of existing services and easements within and adjacent the proposed Affected Area including: electrical, telecommunications, potable water, sewer, gas and stormwater requirements; and
 - Liaison with service authorities (SA Water, SAPN, AGIG, Telstra, NextGen, NBN Co. and Alexandrina Council).

This report outlines:

- The nature and approximate location of the existing service infrastructure;
- The servicing requirements of the proposed residential expansion; and
- Any substantial constraints that the existing infrastructure may have upon the proposed Code Amendment.

In reading this report please note:

- The proposed additional infrastructure or improvements are based upon preliminary assessment and schematic concept information.
- Relies upon the information and advice provided by the relevant authorities, or assumptions based upon current practice of authorities;
- Any investigations or assessment that have not been described or mentioned in the report below have not been considered, such as social infrastructure requirements, landscaping, etc.
- Traffic engineering and assessment is not included in this report.

2 Background

GREENHILL has been engaged by the Ambo Pty Ltd to undertake preliminary engineering assessment of infrastructure required for the anticipated residential development of the Affected Area (shown below). The anticipated residential development is for approximately 2,500 to 3,000 residential and associated non-residential uses.



Figure 1: Proposed Affected Area

It is noted that several potential development scenarios have been identified, ranging from 8 dwellings per hectare, up to 23 dwellings per hectare. While market forces will determine the ultimate development yield, for the purposes of this report a development rate of 12 dwellings per hectare have been assumed (Scenario B). Development Yield Assumption plan provided by Future Urban is included in Appendix A.

On this basis, we have assumed that the proposed residential development will include:

- Approximately 241 hectares of land comprising in the order of 2,500 to 3,000 dwellings;
- In general, the residential allotments are expected to be Torrens-Titled with varied allotment size mix, as follows:
 - 20% of allotments - 300 m²
 - 60% of allotments - 600 m²
 - 20% of allotments - 800 m²
- There is expected to be retail and social infrastructure such as a supermarket and potentially a school provided within the Affected Area.

3 Previous Investigations

In June 2020, GREENHILL undertook a preliminary infrastructure and servicing investigation for the proposed Goolwa North urban growth area for the Alexandrina Council. The investigation included a review of existing services infrastructure, servicing requirements and any constraints that the existing infrastructure may have on a proposed Affected Area to inform a proposed development plan amendment. The Affected Area of that investigation was for an area of approximately 565 ha, and included land parcels to the north and south-west of the current Affected Area.

A review of the investigations previously undertaken has been completed for a portion of the area previously considered (approximately 240 ha).

4 Infrastructure Review and Assessment

The following provides a summary of the existing infrastructure and advice in relation to likely new infrastructure required for the purpose of servicing the Affected Area. Combined existing infrastructure plan is included in Appendix C.

Further discussion is required with authorities to confirm infrastructure assumptions once more detail on the anticipated development is confirmed. A response to our request for information was not received from all service authorities within the timeframe and our assumptions have been noted below.

4.1 Existing Infrastructure

Information in relation to the existing infrastructure has been obtained by a BYDA enquiry and by enquiry directly with the relevant authorities.

The existing infrastructure includes the following:

- Sewer (Alexandrina Council);
- Potable water (SA Water);
- Road & stormwater (Alexandrina Council);
- Telecommunications (NextGen, NBN Co and Telstra); and
- Electrical (SAPN).

BYDA information of the above services is available upon request.

4.2 Topography & Soils

4.2.1 Topography

In general, the natural site topography of the Affected Area generally falls from north to south with a high-point located approximately at Corio Terrace near Alexandrina Road. This effectively divides the Affected Area in to two catchments. The south western portion, beyond Corio Terrace falls to the west and the eastern portion falls towards Byrnes Road to a low point located between North Road to Boston Street. The western portion has a grade of approximately 0.5% and the eastern portion varies from 0.6% to 0.8%.

Additionally, within the Affected Area there is a high-point near the most north-western land parcel of the affected area, which grades away from Goolwa to the north, towards Currency Creek.

We have assumed that road grades, gravity sewer and stormwater will follow the natural topography of the land. This will minimise the volume and scope of earthworks required for development.

We note the most north-western parcel may require pumped systems for gravity services to enable connection of the Affected Area to new development infrastructure to the south.

It is envisioned that excess material from basin and pond construction, trench spoil, swales, etc., can be reused for shaping and filling as required.

4.2.2 Underlying Soils

A review of publicly available soil information and previous geotechnical reports undertaken within adjacent areas of Goolwa by GREENHILL, suggest that the underlying soils would comprise of the following:

- Sand / sandy soils over clay;
- Sand over clay / calcrete;
- Calcrete capping layers;
- Silty sand;
- Poor structural clay.

In general, soils are anticipated to be more “clayey” away from the riverside and transitioning to sandy soils approaching the riverside. The soils may also include sparse layers of calcrete.

Our investigation does not include an assessment of environmental or geotechnical conditions within the development area. We recommend environmental and geotechnical investigations be undertaken to understand any constraints associated with the underlying soils; including identification of topsoil depth, groundwater level, areas of unstable soils, uncontrolled fill, extent of calcrete and strength of underlying subgrade (CBR testing) for pavement design purposes.

4.3 Stormwater Drainage

The Affected Area is part of two large rural catchments that are upstream of the existing Goolwa township. The catchments are divided by Corio Terrace, and for the purposes of this investigation they are referred to as the “western” and “eastern” catchments.

Figure 2 below, illustrates the natural valleys and the topographical information (including contours), north of the existing Goolwa township.

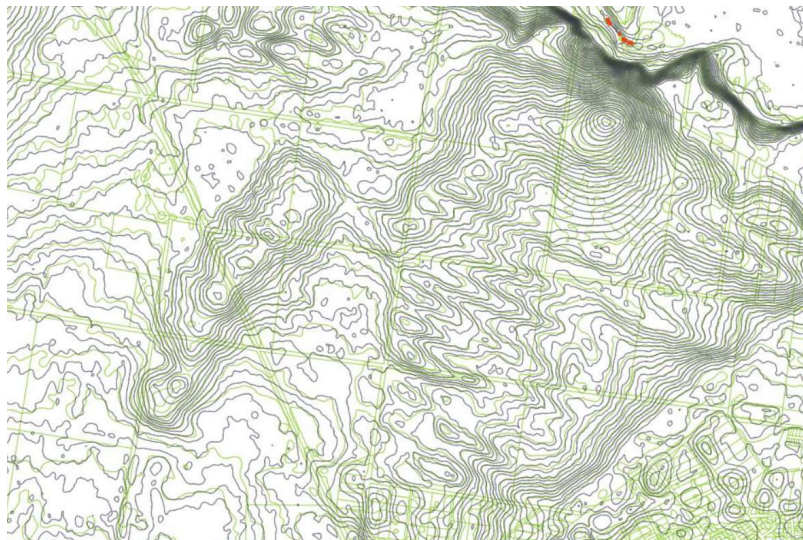


Figure 2: Natural Valleys and Topographical Information

Stormwater runoff in the two eastern valleys will flow towards the existing stormwater detention and wetland system, located south of Byrnes Road.

The western valley has a large upstream rural catchment that falls towards Alexandrina Road, apart from the northern most portion, that falls to the north towards Currency Creek.

Stormwater runoff from the western portion of the Affected Area will flow towards Alexandrina Road, where it continues west, overland to north of the existing WWTP through rural areas and will flow towards a local depression, located near Traegers Earthmoving and Transport, at Port Elliot Road. Any overflow from the local depression will flow to the mangrove reserve area, and then to the coastal zone, and ocean.

Within the existing built-up areas of the Goolwa township, stormwater runoff is managed by several stormwater detention basins, most of which discharge directly into the Goolwa Channel.

Stormwater runoff within the existing Goolwa Township captured by the Murray Smith Reserve is pumped to the former wastewater lagoons, for storage and reuse. The former waste water lagoons are located east of the recently constructed WWTP and wastewater lagoons, on Kessel Road. The stormwater captured for reuse is available for irrigation of the Goolwa oval and other public open spaces, as described further in Section 4.6.

Stormwater runoff from the Affected Area is proposed to be managed as outlined below:

- Individual land development allotments are to drain into a road drainage system within the proposed road network.
- The road drainage system will flow into stormwater swales, channels, or flood-ways, within public road, linear reserves or public open space areas.
- A network of stormwater channels will convey the stormwater flows towards stormwater detention basins and stormwater quality treatment system.
- Water Sensitive Urban Design (WSUD) principles are to be incorporated in the drainage network to meet with the established WSUD stormwater management policy objectives.

Stormwater runoff from the western catchment of the Affected Area is proposed to be directed to a large stormwater detention basin, located just east of Alexandrina Road at a localised low area. The stormwater detention basin is also required to include stormwater quality treatment measures. The detention basin is proposed to detain peak flows to estimated pre-development flow rates and discharge the stormwater runoff, along existing downstream flow paths.

Stormwater runoff from the eastern catchment is proposed to be directed to a large stormwater detention basin located directly north of Byrnes Road, via a network of open channels. The open channel systems together with the large stormwater detention basin, will detain the stormwater runoff from the Affected Area to below the estimated pre-development flow rates and outlet to the existing stormwater detention basin system, located south of Byrnes Road, which flows to the Goolwa Channel. The stormwater detention basin is also anticipated to include stormwater treatment measures prior to outlet to the downstream stormwater management systems.

In addition to the above, Alexandrina Council have expressed the need for any stormwater detention systems to also provide additional stormwater detention storage to reduce flows to meet with the estimated predevelopment flow rates, to address deficiencies in the existing catchment drainage systems, immediately downstream of the Affected Area. (This was identified as the Lagoon 3 - Catchment, in the Goolwa Stormwater Management Plan (SWMP), prepared by Tonkin Consulting, May 2010 for the Alexandrina Council). The catchment area contributing to the Eastern Valleys drain and the Byrnes Road basins, described in the Tonkin SWMP for Goolwa is lower in elevation than the proposed Affected Area

basin. The Lagoon 3 Catchment can therefore not be discharged to the proposed basins as part of the Affected Area, unless a pumped system is provided. Solutions to address the management of the deficiencies in the existing stormwater system downstream of the Affected Area have not been considered as part of this investigation, but may be investigated further if required.

The basins in each system are proposed to detain the post-development major storm (1% Average Recurrence Interval (AEP)) flows to pre-development major storm stormwater flows. Preliminary stormwater modelling has been undertaken using DRAINS to determine the detention storage requirements to reduce post-development flows to pre-development.

The pre-development and post-development flows were estimated using the following hydrological models:

- The pre-development peak flow was estimated using the DIT rational method, with a pervious C10 value of 0.15.
- The post-development peak flow from the Affected Area was estimated using an ILSAX type model to simulate an initial loss of 45 mm and continuing loss of 3 mm/hr from pervious areas.

Four detention basins are proposed at each of the low areas of each major catchment. Refer to the catchment plan included in Appendix D. The drainage modelling resulted in the following detention storage requirements in each basin:

- The south-western catchment requires approximately 4,000 m³ of detention storage, and allowing for freeboard is likely to have a footprint of approximately 5,000 m².
- The mid- western catchment requires approximately 2,000 m³ of detention storage, and allowing for freeboard is likely to have a footprint of approximately 3,000 m².
- The northern catchment requires approximately 5,500 m³ of detention storage, and allowing for freeboard is likely to have a footprint of approximately 7,000 m².
- The eastern catchment requires a total of approximately 50,000 m³ of detention storage, and allowing for freeboard is likely to have a footprint of approximately 6 Ha.

The above detention storage estimates are preliminary, and sizes will vary depending upon the detail of the proposed plan for development. For the purposes of this assessment, it has been assumed the stormwater detention basins will have a maximum ponding depth in the order of 1.5 m in the 1% Annual Exceedance Probability (AEP) rainfall event.

The north-western portion of the Affected Area, the stormwater runoff falls away from the Goolwa township, towards Currency Creek across rural lands. We have assumed a detention basin will be required to detain stormwater flows to the pre-development flow rates, with flows to discharge via existing roadside swales or valleys, and ultimately to Currency Creek.

For the above systems, we have also undertaken preliminary stormwater quality modelling in MUSIC to consider the stormwater treatment measures likely to be required to meet the WSUD stormwater quality treatment objects, prescribed by the Environment Protection Authority (EPA).

Stormwater from the future dwelling roof area is assumed to be captured by on-site rainwater tanks, before overflow to the catchment wide treatment system. Stormwater not captured by the roof area is

assumed to directly discharge to the road drainage system and then flow into the proposed underground drainage system.

Reuse has been assumed to be based on an average allotment area of 700 m² with a rainwater roof catchment area of approximately 175 m² area connected to a rainwater tank. A 1 kl retention tank to each allotment has been assumed as per the Building Code of Australia, Mandatory plumbed rainwater tanks for Class 1 buildings.

The average household water consumption for toilet flushing has been based on the Water Sensitive SA, South Australian MUSIC Guidelines, Table 8.1: Estimated domestic indoor water demand breakdown with a demand of 28 L per person, per day. An average of 2.4 people per dwelling has been assumed.

The stormwater treatment is anticipated to include a proposed network of vegetated swales. (The vegetated swales are also important for stormwater drainage, given the gentle topographical gradients of the Affected Area). The vegetated swales require a minimum base width of 1 m and a depth of 1 m. Vegetation of 150 mm in the base of the basin has been assumed with infiltration rate of 0.36 mm/hr for sandy clay. The vegetated swales will require planting and maintenance with grasses or other suitable vegetation to provide effective stormwater quality treatment. The conceptual MUSIC modelling indicated that the swales proposed as shown on the stormwater layout plan will meet with the EPA stormwater quality guidelines.

Alternatively, biofiltration or stormwater treatment ponds may be provided for stormwater quality treatment.

The difference in yield scenarios has marginal impact on percentages of impervious areas within the catchment and does not affect the proposed stormwater detention or water quality treatment measures proposed above.

The proposed development of the Affected Area may be designed to manage stormwater runoff to meet with all of the key principles and objectives of the Planning and Design Code. That includes the incorporation of measures to retain and detain stormwater runoff from roads and allotments so that stormwater flows are not increased above the existing stormwater runoff from the Affected Area land. Roadside kerb and water-table together with an underground drainage system, meeting with the requirements of Alexandrina Council is to be provided. However, the site topography and size of the proposed development of the Affected Area will necessitate a network of swales or open channels to direct stormwater runoff to stormwater retention and detention basins. Indeed, that will enable the key principles and objectives for water sensitive urban design to be met.

A recycled water scheme, such as that incorporated into Mawson Lakes is contingent upon the provision of, or availability of large water storages, whether that be a managed aquifer recharge scheme or large water storage reservoir. As Alexandrina Council has noted it may be possible to detain stormwater and deliver to the existing Council Recycled Water Ponds. That would enable security of water supply through periods with little or no rainfall (typically the summer period) by capturing treated stormwater runoff during periods of low demand for recycled water (typically during the winter period). Alternatively treated waste water may also be considered for a recycled water scheme. It should be noted however that a scheme such as that implemented for Mawson Lakes, delivering recycled water for domestic water needs is not economically attractive. A scheme to provide recycled water for open space or large individual users may be viable and be considered. Apart from the capital cost, the ongoing maintenance cost, and identification of a water entity to own and manage will be required.

Mandatory on-site stormwater capture and reuse in the form of rainwater tanks that are plumbed into dwellings for toilet flushing and laundry use is an option that reduces the demand for potable water, at the same time retaining stormwater on-site.

As mentioned in the above, there is existing stormwater runoff from the Affected Area land, that either flows to the existing township area and road drainage systems, or overland to the north and ultimately to Currency Creek. Stormwater management systems incorporated into the proposed development may restrict stormwater runoff so that additional capacity in downstream systems is not required. If the existing downstream systems are deficient and not able to accommodate the existing stormwater runoff then they will require consideration for upgrade in any case.

4.4 Sewer

The Alexandrina Council were requested to provide information on the capacity of the existing sewer systems and serviceability of the Affected area for sewer services. The Alexandrina Council were unable to provide advice within the specified timeframe. Below is a summary of the previous investigation undertaken in 2020, which is assumed to still be relevant.

There is currently no SA Water sewer in Goolwa and the existing sewerage system is owned, managed, and operated by the Alexandrina Council. All of Goolwa's wastewater enters the Waste Water Treatment Plant (WWTP), located near the intersection of Skewes Road and Kessell Road. The WWTP treats the wastewater to Class B classification, which is stored in the new lagoons and pumped for irrigation reuse at the turf farms in Boettcher Road and Goolwa Oval, described further in Section 4.7. Council have recently constructed additional lagoon storage at the turf farms in Boettcher Road. Refer to Figure below for locality of the existing lagoons.

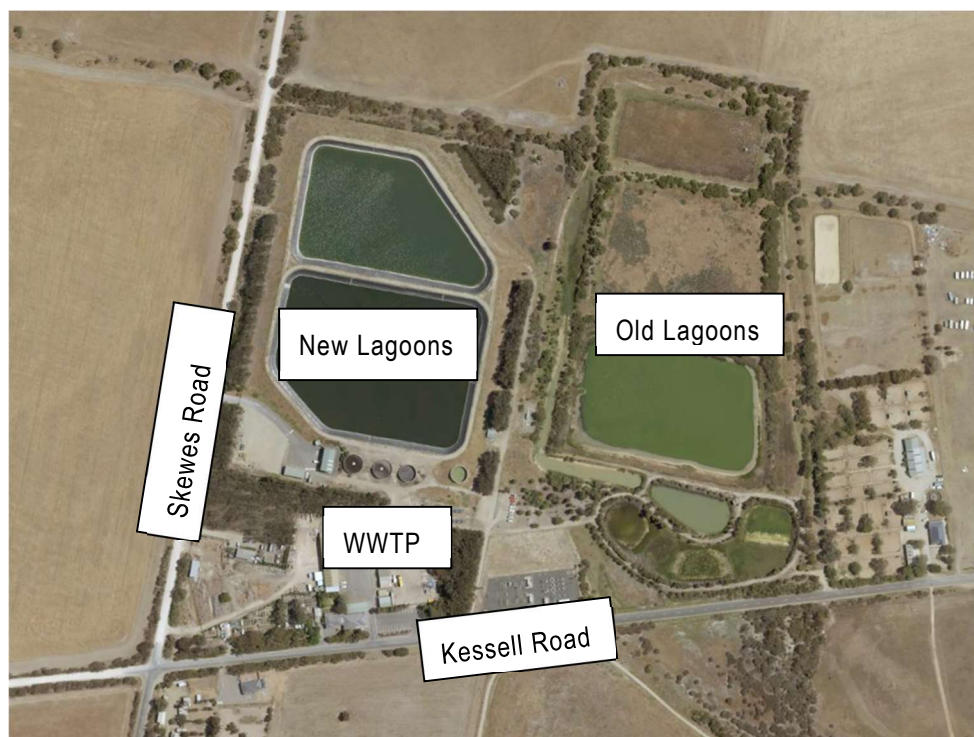


Figure 3: Locality of Lagoons

A portion of the wastewater treated by the WWTP is pumped via a vacuum pump station located at the intersection of Byrnes Road and Boston Street, Goolwa North. The vacuum pump station was designed by Flovac and is operated by the Alexandrina Council.

In 2016, 400 allotments were serviced by the vacuum pump station. It is understood that there has only been a small additional development since then. The vacuum pump station had a capacity to serve 2,000 allotments hence it may have the capacity to cater for in the order of an additional 1,500 allotments. The suction radius of the vacuum pump station is 3 km.

The Affected Areas will generate additional wastewater that will have to be catered for within the WWTP. We have used the Water Service Association of Australia (WSA) Sewerage Code of Australia, to estimate the Average Dry Weather Flow (ADWF) anticipated to be generated from development within the Affected Area. The ADWF does not account for peak dry weather flow, groundwater infiltration or the peak inflow and infiltration into the sewerage system.

We have used the Yield Analysis plan shown in Appendix A to estimate the Equivalent Populations (EP) generated by the Affected Area assuming residential development at 3.5 EP per dwelling.

As prescribed by the WSA Sewerage Code, an average daily sanitary flow of 180 L/d/EP was applied to the anticipated EP generated from the Affected Area for residential development only. This resulted in an ADWF of 1.88 ML/day in the Affected Area. Non-Residential uses are calculated based the size of the anticipated demand which is currently unknown and has not been considered at this time.

WGA (consulting engineer for Alexandrina Council), had previously advised that the wastewater generated by the Affected Area may be treated by the existing WWTP by upgrading the reactors or may require a new WWTP to be constructed. The new WWTP can be constructed in an alternative location, and does not have to be adjacent to the existing WWTP. For the purpose of this investigation, we have assumed the new WWTP would be built adjacent to the existing as is it is sufficient distance from existing or proposed residential areas. The Alexandrina Council have been unable to provide advice on the capacity of the existing WWTP and what will trigger an upgrade.

The western wastewater catchment will fall by gravity directly to the existing WWTP. The eastern catchment will be collected by the existing vacuum pump station.

The existing vacuum pump station has insufficient capacity to cater for approximately half of the anticipated development within the Affected Area and will be required to be upgraded to cater for the total anticipated development within the Affected Area. An upgrade to the Vacuum Pump Station will be triggered once 1,500 additional allotments are connected to the vacuum pump station. The 3 km radius of the vacuum pump station covers the entire Affected Area, however it is noted that a portion west of the Affected Area grades away from the vacuum sewer pump station and has therefore been assumed to connect via gravity to the existing WWTP to the south west.

Flovac (Vacuum Sewer System Supplier) previously advised a vacuum sewer pump station upgrade may be provided, with the construction of a supplementary external tank or by increasing the pump flow capacity to the WWTP.

We have based the gravity sewer trunk main sizes on the recommendations set out in the WSA Sewerage Code of Australia up to 300 mm diameter. WSA does not provide recommendations for larger pipe sizes and they have been assumed based on equivalent pipe diameter. Pipes within roads of lower hierarchy have not been considered.

All pipe size and expected flows assumed in this section are conceptual and are based on the assumptions outlined above.

Alternatively, a private waste water treatment plant may be provided and an operator of the plant would need to be sourced. The size of the plant will depend on the requirements for which the wastewater will be treated. Treated wastewater will be required to be stored in tanks or lagoons and a reuse source

determined in order to dispose of the treated waste water. The size of the lagoons will depend on the reuse opportunities or if evaporation is the only method of disposal.

Wastewater treatment plants are required to be located sufficient distance from residential development to meet with prescribed buffer zones for noise and odour. Wastewater treatment plants are subject to approval from the EPA and the Department of Health. It would be anticipated that the wastewater treatment plant would need to be located to the northern extents of the Affected Area to achieve the required buffer. This may limit development opportunities around the wastewater treatment plant. A pump station would be required in the south of the Affected Area to deliver sewerage to the wastewater treatment plant for treatment.

Given the Goolwa township has an existing waste water treatment system, a private wastewater treatment system in this case may not be required, but is subject to further investigation.

4.5 Potable Water Supply

The existing potable water mains in the existing Goolwa township include:

- Alexandrina Road – 100 mm diameter (from the intersection of Corio Terrace and Glendale Grove) and 80 mm diameter AC pipe (at the intersection of Liddell Road).
- Byrnes Road – 80 mm diameter pipe at the intersection of North Road and Byrnes Road.

There is also a 450 mm diameter pipe that is connected from Port Elliot Road and passes through Gardiner Street and Byrnes Road up to the intersection of Byrnes Road with Clark Street.

We have contacted SA Water to seek preliminary assessment of their network and provide advice on the serviceability of the Affected Area.

SA Water have been unable to provide detailed advice within the requested timeframe, due to unprecedented level of demand currently being assessed.

SA Water had previously advised that the Affected Area will be supplied from a 'Limited Supply' area. As such, for the number of dwellings anticipated, SA Water expect significant augmentation works to be required. At this time, a gazetted Water augmentation fee per allotment for the Goolwa area does not exist.

An augmentation charge per allotment is likely to be the funding strategy implemented for the augmentation works. At this stage SA Water cannot provide an approximate augmentation charge.

Within the Affected Areas water mains of varied size (100 mm to 450 mm) are anticipated to be required (refer to water layout plan for preliminary sizing).

The difference in yield scenarios is expected to have marginal impact on water main sizing within the Affected Area. Non-residential uses will require to be located adjacent larger mains (i.e. 150 mm or larger) depending on the type of non-residential development.

Discussions with SA Water will continue in order to understand the full extent of any headworks to service the affected area.

4.6 Recycled Water

As mentioned in Sections 4.4 the Alexandrina Council utilise treated wastewater and stored stormwater for irrigation purposes. There is a recycled water system that pumps towards the turf farms located on Boettcher Road, and also towards Council reserves and oval located throughout the Goolwa township.

All of the treated wastewater is currently being re-used for irrigation. Stored stormwater is re-used where possible, and if the storage capacity is exceeded it is pumped directly into the Goolwa Channel.

We understand from advice received from Alexandrina Council that there is may be some spare capacity in the existing lagoons for storage of treated stormwater from the wetland. The storage lagoons will require a new pump system to serve the Affected Area. We also understand that Alexandrina Council have recently constructed a 100 ML lagoon storage facility near the turf farms that could also be available for stormwater storage.

The difference in yield scenarios or non-residential development is not anticipated to affect recycled water supply networks. Non-residential uses may present an opportunity for greater reuse of recycled water i.e. for irrigation of school ovals.

4.7 Electrical Supply

SAPN have an existing network of 11 kV overhead high voltage electrical power supply lines in Alexandrina Road, North Road, and underground 11 kV high voltage cables in Corio Terrace, Banfield Road and Boston Street.

SAPN have provided preliminary advice, that the required electrical infrastructure will be contingent upon how the development of the Affected Area will proceed. They have advised that:

- This development will need to be designed at 6 kVA per lot, in addition the design will need to include high voltage 11 kV loop feed throughout the development and it may also require the upgrading of the existing overhead 11 kV mains.
- The existing high voltage feeder that would supply this development is nearing capacity. SAPN may be able to include part of stage 1 on the existing feeder but the majority of this development will need to be connected to a new 11 kV feeder from Goolwa substation.
- Master planning will be required to be undertaken to determine the anticipated high voltage network and staging for delivery of anticipated electrical infrastructure.

The above advice is dependent on further investigation, which SAPN's Network Planning group can undertake for a scoping fee upon engagement by Ambo Pty Ltd.

SAPN have advised that a standard augmentation charge will apply to the development (subject to annual increases). Additional substation augmentation is addressed through application with SAPN and included in a development approval condition. A deed is not usually required. An additional substation augmentation charge may apply if the development exceeds the substation capacity of 2,500 kVA within a 7-year rolling period. Exceedance of the substation capacity will depend on the rate of development. Based on a demand of 6 kVA per residential allotment, a development rate of less than 60 residential dwellings per annum over a 7-year period would be required to avoid exceeding the substation capacity. Non-residential development within the Affected Area that also occurs during that period will reduce the residential development rate or may require additional augmentation works and associated costs.

SAPN noted that the above-mentioned advice is subject to a feeder analysis, and that dependent on the outcomes of the analysis additional headworks or augmentation may apply.

New electrical infrastructure for the Affected Area is assumed to be installed as an underground electrical reticulation and lighting scheme as part of a common services trench along with telecommunications and gas services as required.

The difference in yield scenarios or non-residential development is expected to have marginal impact on supply of electrical infrastructure within the Affected Area but will impact augmentation charges. Augmentation for commercial or non-residential development in the Affected Area will be dependent on the EMD (Estimate Maximum Demand) and ADMD (Average Diversity Maximum Demand). A direct high voltage bulk supply is the most suitable connection for development, which will directly contribute to more demand from the feeder of the substation. Additional augmentation rates will apply if the demand exceeds

the Zone Substation capacity by more than 10%. An analysis of the substation capacity will be required to be undertaken by SAPN.

SAPN have advised they will need to be provided with the proposed staging and where anticipated development will commence to enable provision of advice of foreseeable headworks infrastructure. These discussions commonly occur when the land is master planned, i.e. when expected yields and land uses are known.

4.8 Telecommunication Supply

There are existing NBN, Telstra and Nextgen infrastructure within Alexandrina Road and other minor roads located generally adjacent the Affected Area to the south.

NBN Co. have advised that the Affected Area is adjacent to existing NBN fixed line network and they are able to service the proposed Affected Area with residential grade connections and Fibre to the Premises (FTTP) as shown in the image below. NBN have also indicated they may also be able to provide enterprise Grade 1 Gbps ethernet services.

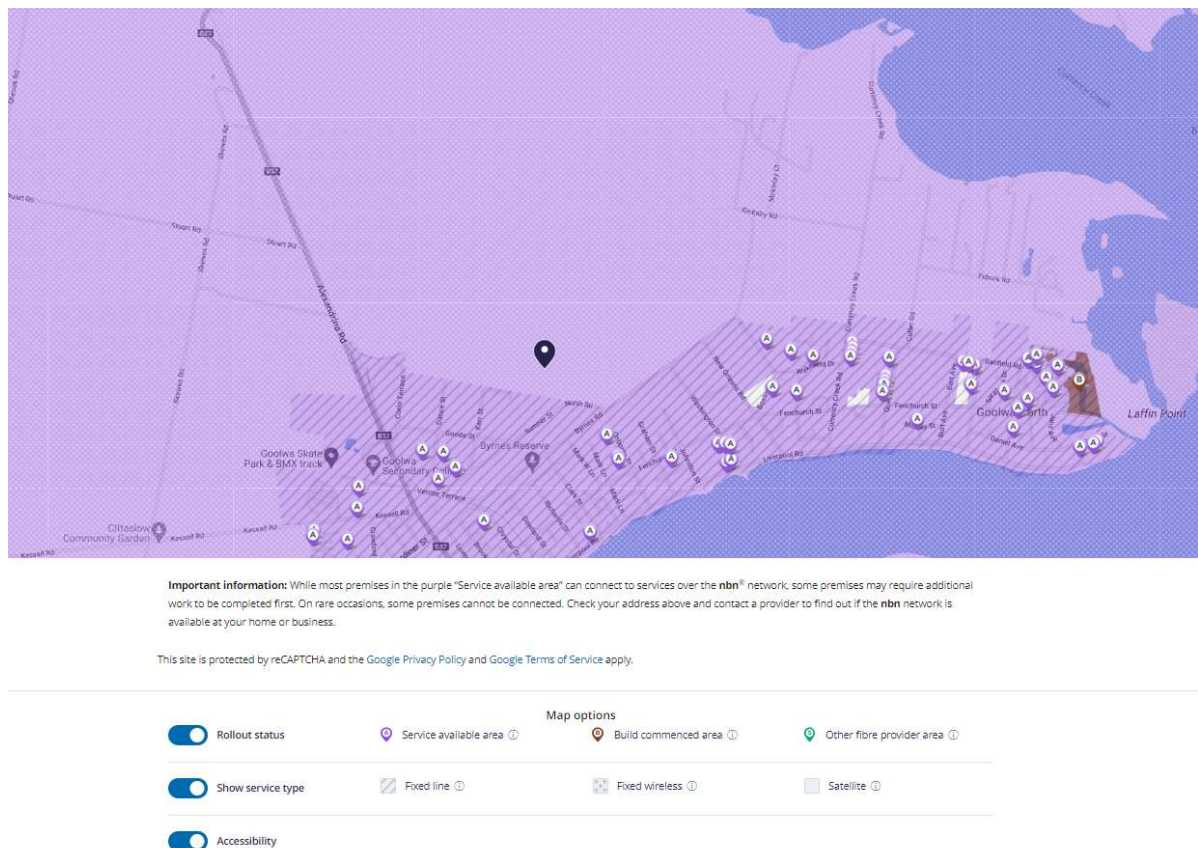


Figure 4: NBN Fixed Line Network and Service Availability
Courtesy www.nbnco.com.au

NBN have advised that there would likely be no backhaul or augmentation fees but this will be contingent upon how development is to proceed in the Affected Area.

A typical underground pit and pipe system for telecommunications infrastructure is assumed to be required for the development.

New telecommunications infrastructure for the Affected Area is assumed to be installed as an underground scheme as part of a common services trench along with electrical and gas services as required.

The difference in yield scenarios or non-residential development within the Affected Area is expected to have marginal impact telecommunications infrastructure.

4.9 Gas Supply

There is currently no gas infrastructure within the study area or surrounding land.

Australian Gas Network (AGN) were contacted and advised they would consider implementing an alternate gas reticulation network to be installed for the new development, such as:

- LPG;
- Substitute natural gas or synthetic natural gas (SNG);
- Hydrogen; or
- Compressed natural gas.

We have received the following advice from AGN:

- *Gas piping could be reticulated throughout the subdivision (generally at no-charge subject to formal evaluation).*
- *A gas inlet and meter could be installed at each dwelling if requested by a builder (generally a connection charge of approximately \$800 would apply to each connection chargeable to the builder).*
- *The developer would need to provide an area to house an LPG tank farm. The area required for a tank farm would need to be assessed, however as an indication the area to house the LPG tanks at AGN's Glenlea facility at Mount Barker is 20 metres by 14 metres.*
- *With this system there would be one gas retailer that would manage gas accounts for homeowners. At AGN's Glenlea facility Elgas is the gas retailer.*

Further discussions would need to be held with AGN to select an appropriate alternative gas type if required. Alternatives to reticulation of natural gas would be opportunistic or discretionary. They would be contingent upon the Developer or Developers, the nature and rate of development and a business case evaluation of alternative suppliers. New gas infrastructure for the Affected Area is assumed to be installed as an underground scheme as part of a common services trench along with electrical and telecommunications services as required.

The difference in yield scenarios or non-residential development within the Affected Area is expected to have marginal impact provision of gas infrastructure.

5 Conclusion

An investigation has been undertaken in to the serviceability for anticipated development in the Affected Area. Infrastructure upgrades and extension will be required to supply essential services such as electricity, potable water, and sewer services to the Affected Area.

In order to minimise infrastructure headworks costs to service the affected area development would be most efficient to occur closest to the southern extents of the Affected Area adjacent the extent of the current township. This will allow for direct connection and extension to existing roads and services.

Further investigation would be required to develop a stormwater management plan for stormwater infrastructure for the Affected Area. Given the flat grades of the existing land it is anticipated that grassed swales/channels would be the most appropriate form of stormwater infrastructure as it would be difficult to achieve minimum grade on stormwater pipes.

All stormwater pathways/corridors will require detailed investigation to ensure future capacity is provided for a developed catchment.

It is anticipated that any development within the Affected Area would be required to meet with the Environmental Protection Authorities (EPA) water quality reduction targets. Water quality measures may include grasses swales, biofiltration systems, and water treatment ponds. Opportunities for storage and reuse may also be considered if the need is of a scale that would be beneficial.

Consideration of catchment wide solutions such as detention should be made at key locations to reduce the reliance on individual land parcels individual stormwater management systems. This will provide the opportunity for less constrained developable land within the Affected Area. Stormwater runoff from the Affected Area is anticipated to be managed as outlined below:

- Individual land development allotments are to drain into a road drainage system within the proposed road network.
- The road drainage system will flow into stormwater swales, channels, or floodway, within public road or public open space areas.
- A network of stormwater channels will convey the stormwater flows towards a detention basin and water treatment system.
- WSUD principles are to be incorporated in the drainage network in accordance with best engineering practice

It is anticipated that Alexandrina's waste water network may be extended to service the development and may require a system of gravity, pumped and vacuum network solutions. The vacuum sewer system may accommodate in the order of 1,500 additional residential allotments before triggering an upgrade of the vacuum pump station. Further discussions are continuing with Alexandrina Council to confirm the capacity of the existing waste water treatment plant and determine when anticipated development will require upgrade of the existing WWTP. Alternatively, a private waste water management system may be provided.

It is anticipated that SA Waters potable water network may be extended to service the development. Discussions with SA Water will continue in order to confirm the requirements for potable water networks to service the Affected Area and the level at which development may require headworks or upgrades to the existing network.

It is anticipated that SAPN's electricity network may be extended to service the Affected Area. Discussions with SAPN will continue in order to confirm the requirements for electricity networks to service the Affected Area. The cost of new electricity infrastructure that is provided by development may be rebated by SAPN if it will benefit other uses and would be determined at the time of application.

Any additional substation augmentation is addressed through application with SAPN and not addressed through a development application or deed. Standard SAPN Augmentation charges for residential and non-residential uses will apply to the anticipated development as applications are made for development. In the order of 60 residential allotments may be serviced per annum over a 7-year rolling period before the substation capacity is exceeded which will trigger a zone-substation augmentation charge. Non-residential development within the same rolling period will reduce the rate at which residential development may proceed if occurring in that same period. Additional augmentation rates will apply if the demand exceeds the Zone Substation capacity by more than 10%.

New electrical infrastructure for the Affected Areas is assumed to be installed as an underground electrical reticulation and lighting scheme as part of a common services trench along with telecommunications and gas services as required.

It is anticipated that a telecommunications network may be readily extended to service the Affected Area. Discussions with NBN Co. or other service providers will continue in order to confirm the requirements for telecommunications networks to service the Affected Area. Such is commonly determined at land division stage.

It is anticipated that a gas network may be provided to service the Affected Area. Further information is required to be provided by AGN/APA to confirm the requirements for gas networks to service the Affected Area.

Due to the scale and anticipated timing of development it is anticipated authorities will address development through individual site investigation as parcels of land within the Affected Area proceed to development.

Appendix A – Development Yield Assumption Plan

SCENARIO	A	B
Stage 1	971 yield	1190 yield
Stage 2	686 yield	842 yield
Stage 3	780 yield	958 yield
TOTAL	2437	2990

* And also assumes less land will be used close to Alexandrina Rd to cater for a buffer, road upgrade etc.



Development Yield Assumptions

LEGEND

— — — — — Affected area boundary

— Collector road
↔ Future roads

○ Intersection to
Alexandrina Road

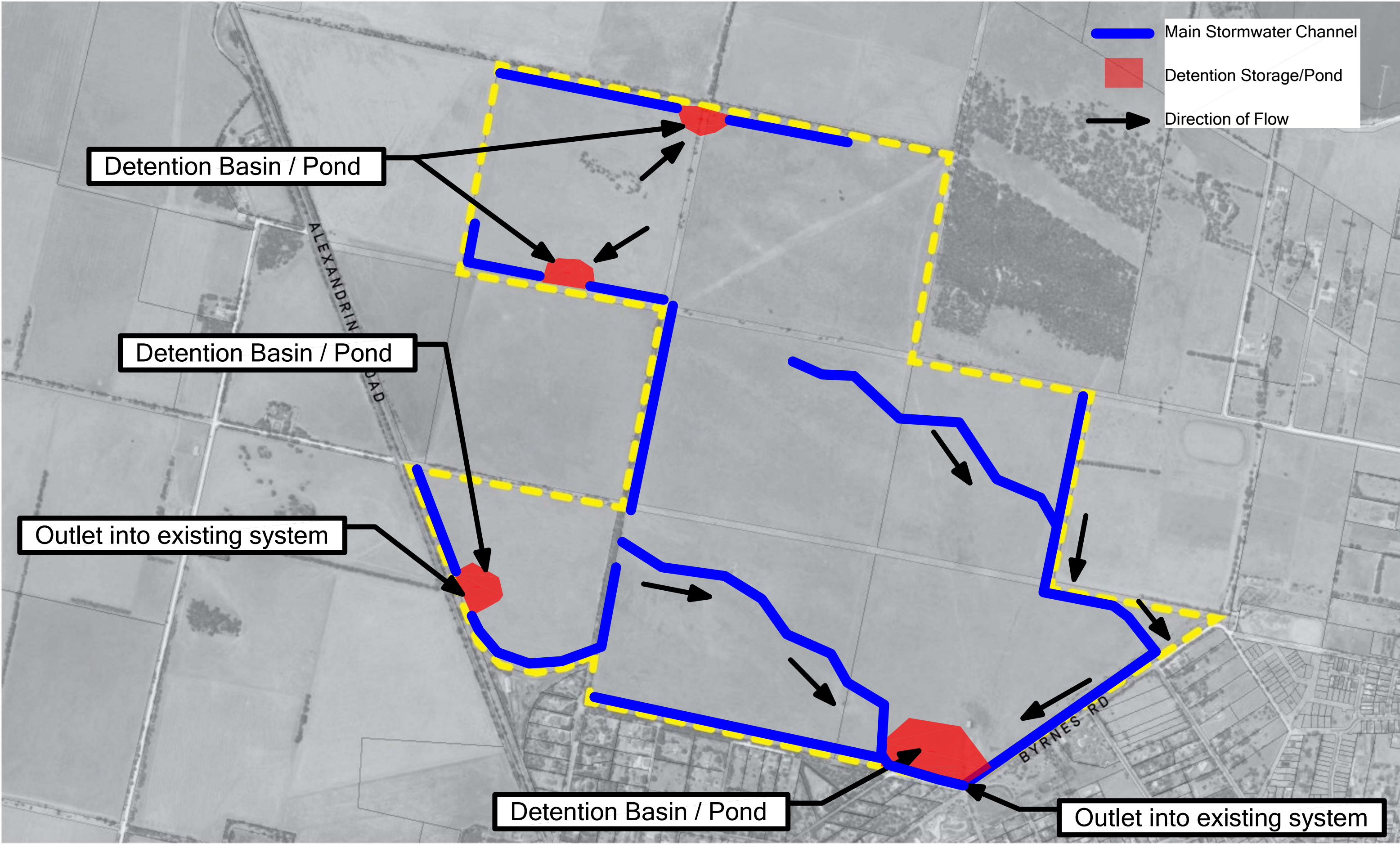
○ Activity Centre

— — — — — Allotment
boundary

— — — — — Stage
boundary



Appendix B – Proposed Stormwater Infrastructure Plan



Plan Production Date: 07.10.2022

Appendix C – Combined Existing Infrastructure Plan



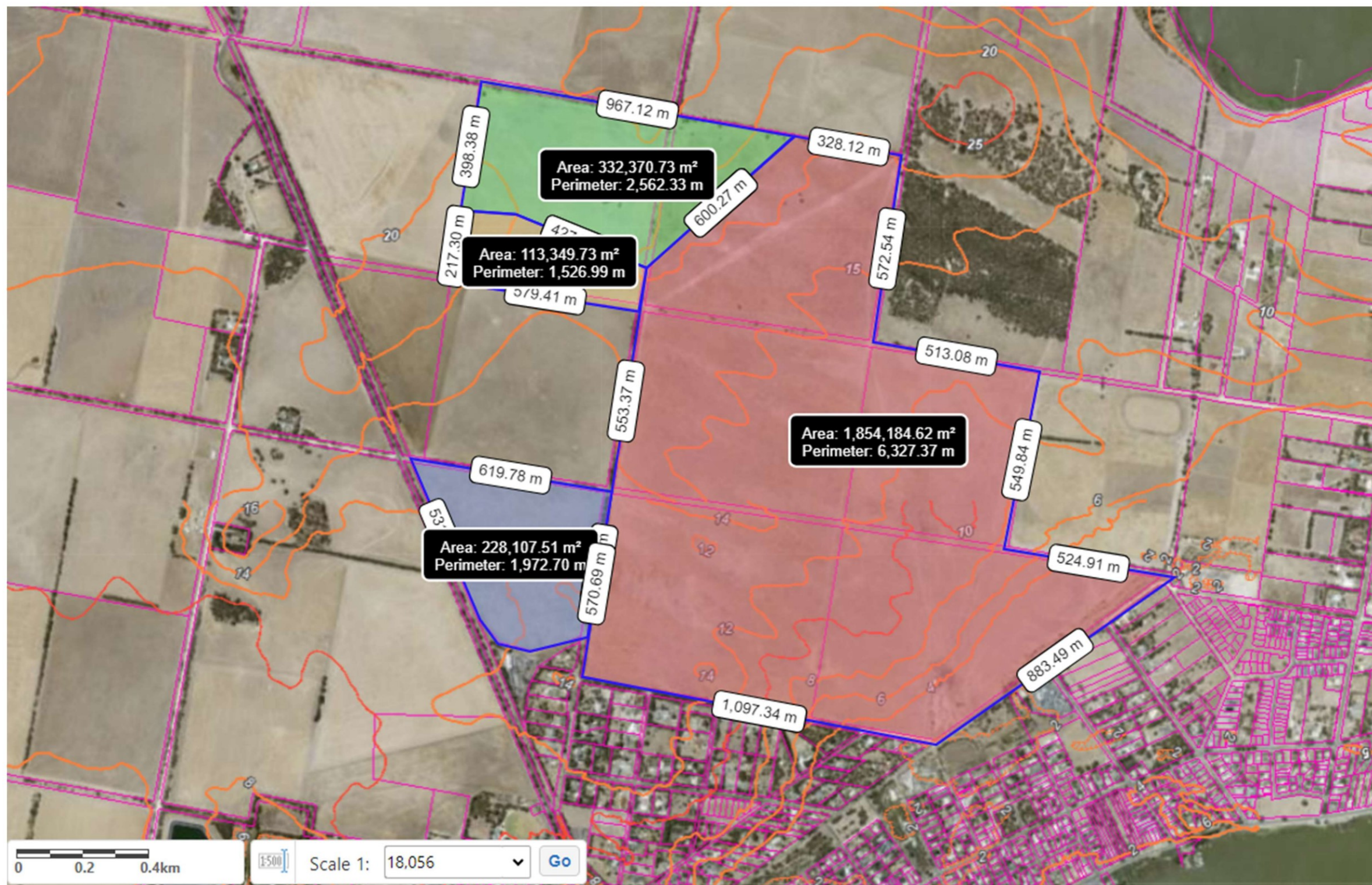
Plan Production Date: 07.10.2022

Affected Area

LEGEND

Affected area boundary

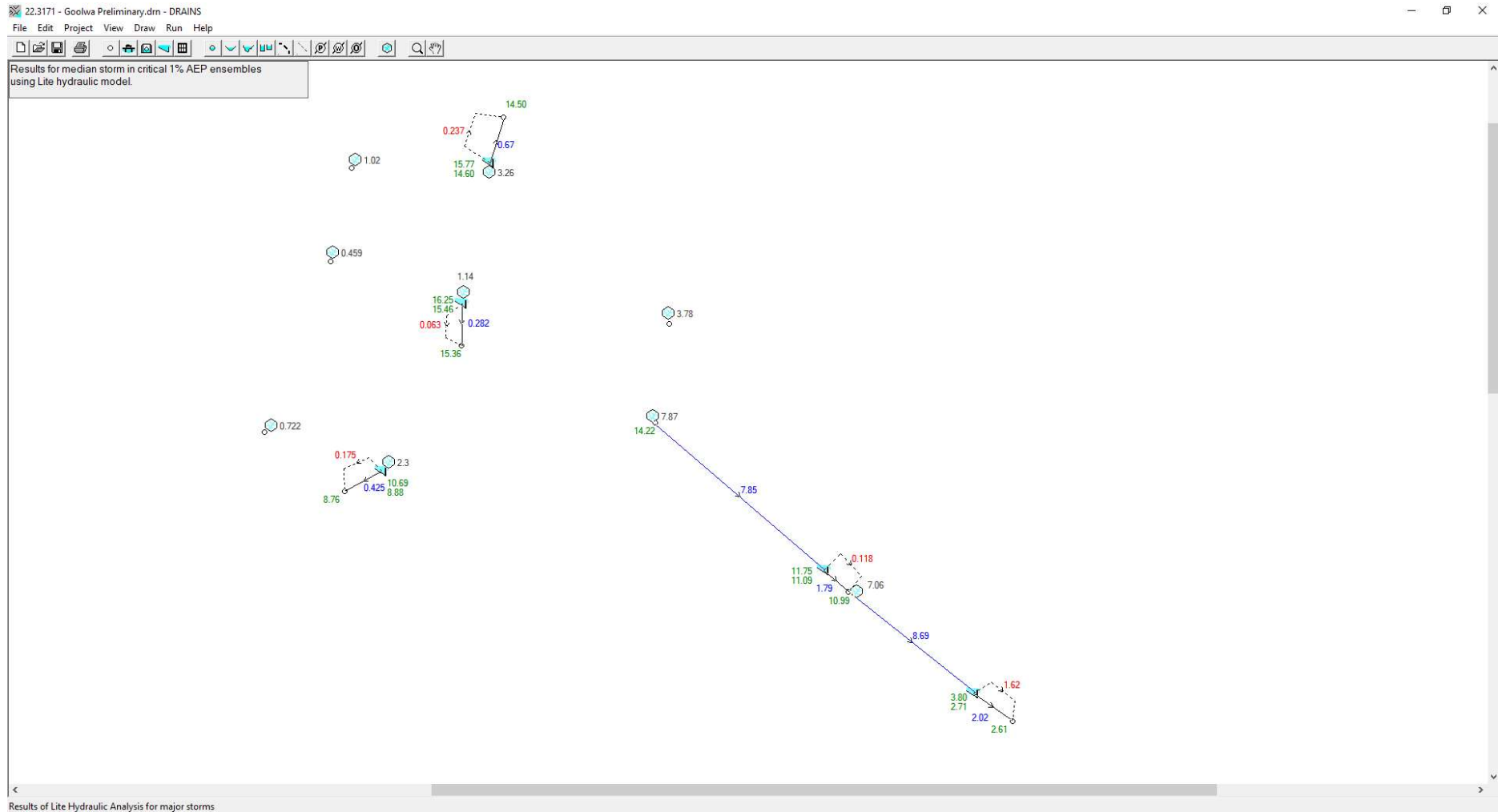
Appendix D – DRAINS Analysis



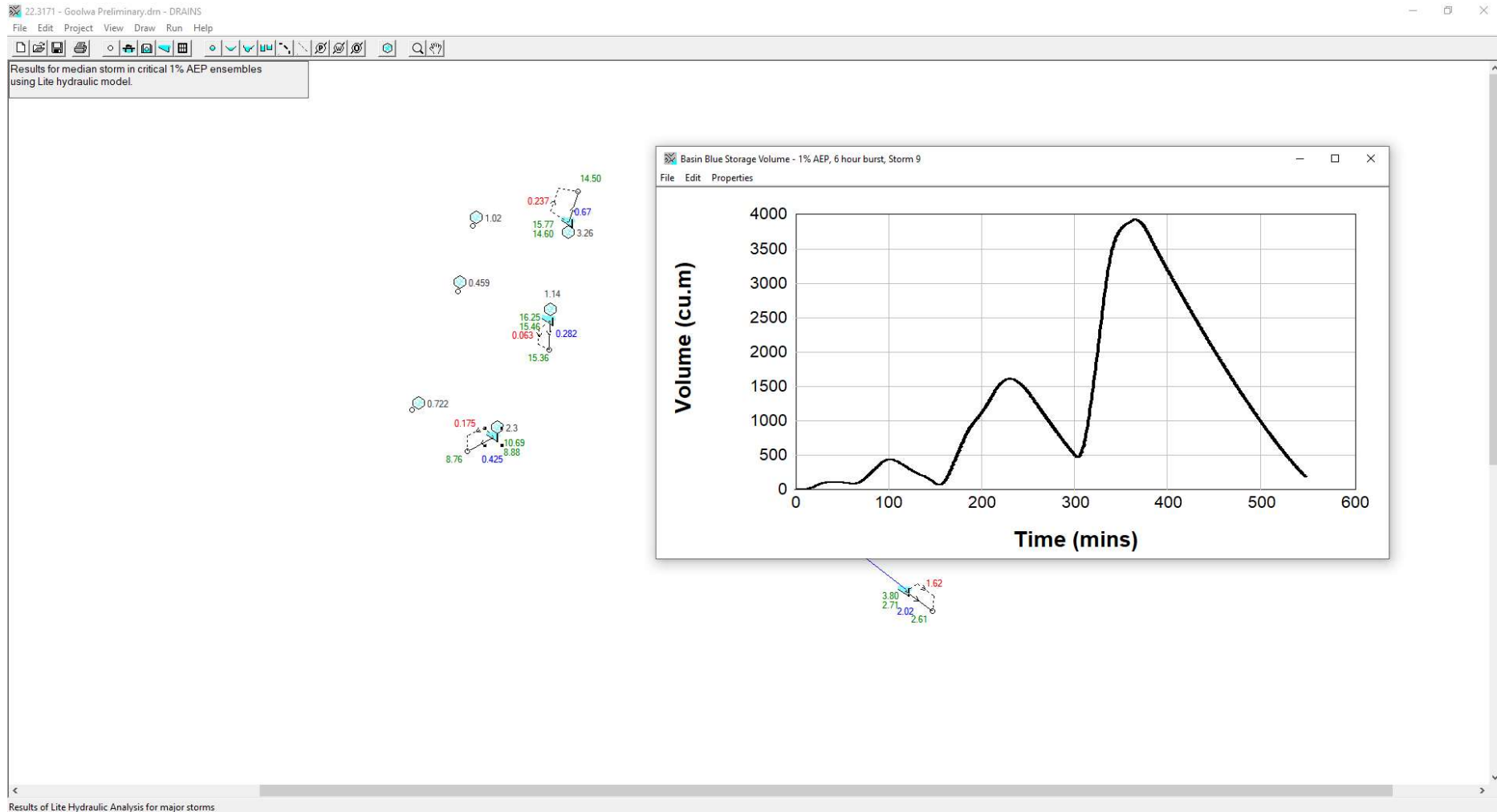
22.3171 - Goolwa North Proponent Initiated Code Amendment

Catchment Plan

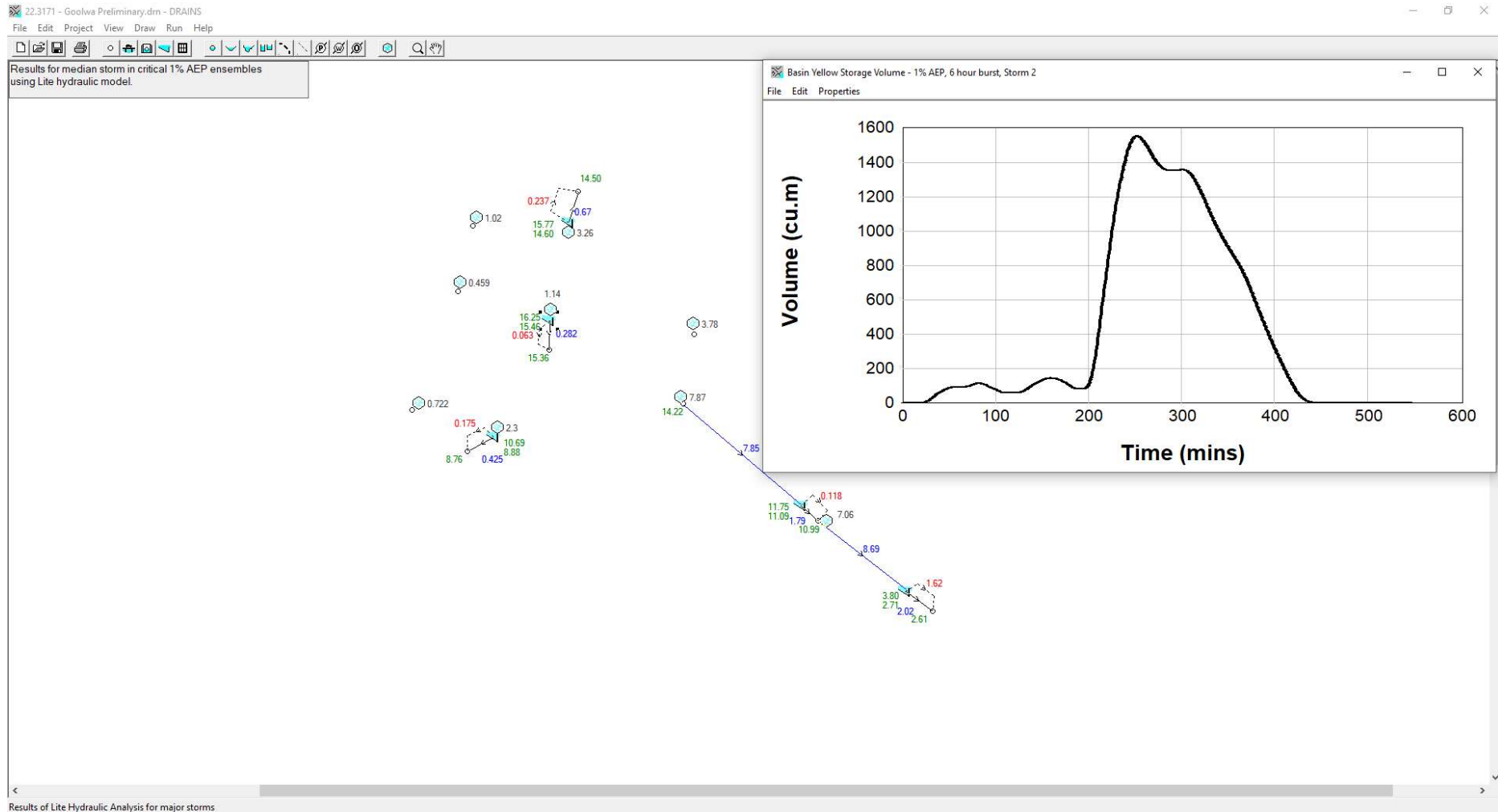
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NAME: GOOLWA NORTH – PROPONENT INITIATED CODE AMENDMENT
PRELIMINARY DRAINS ANALYSIS



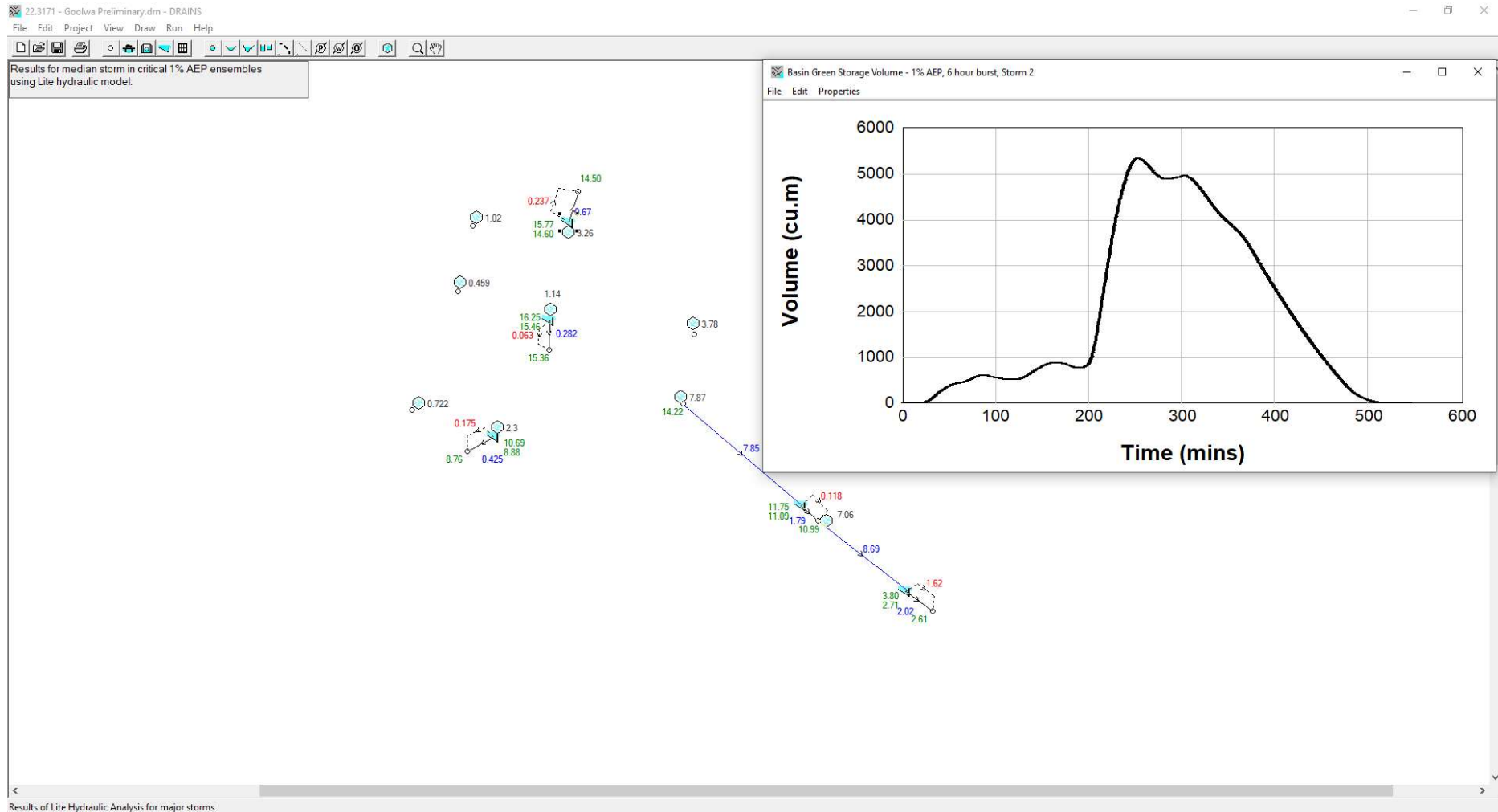
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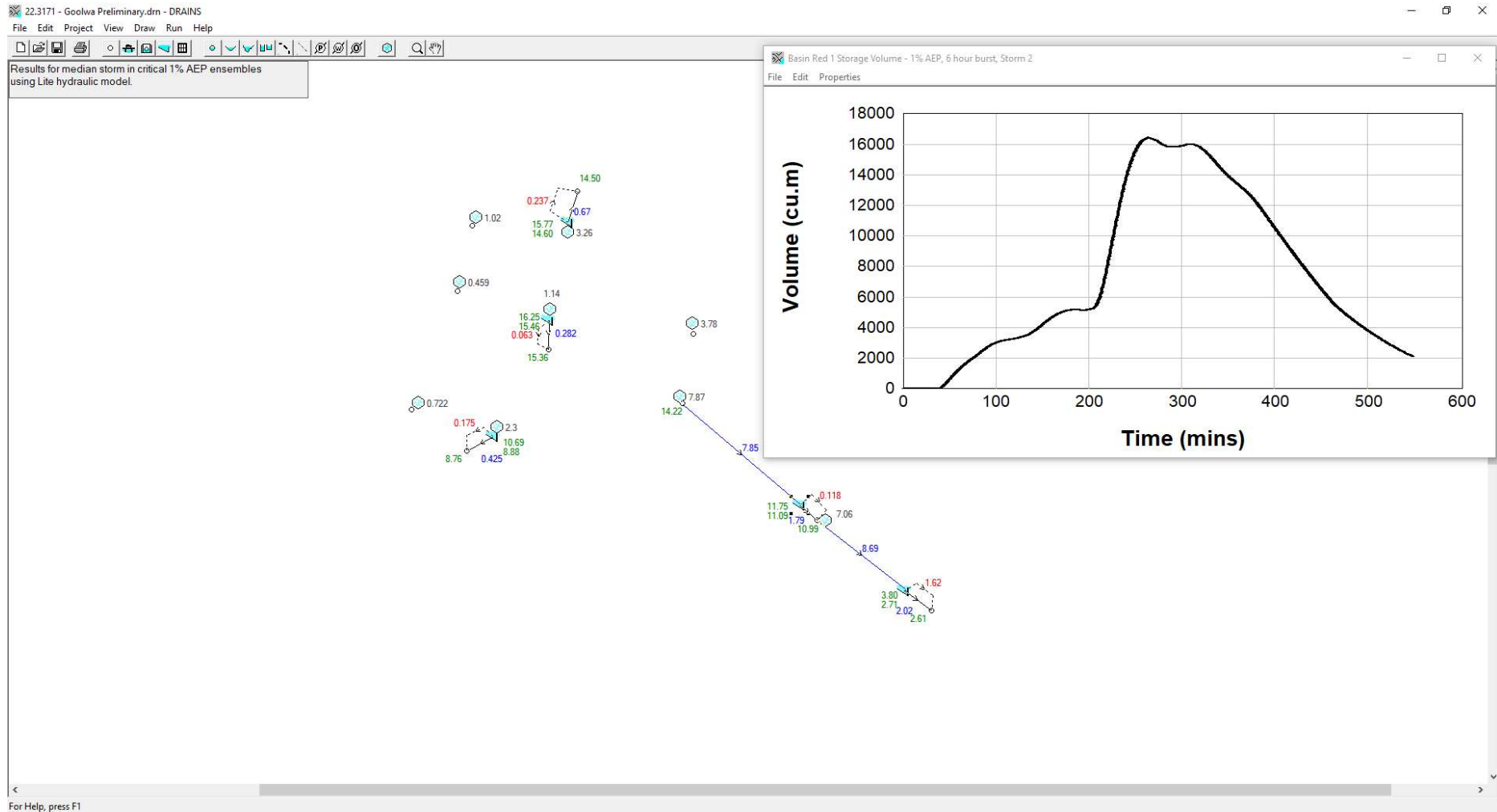
PROJECT: 22.3171
NAME: GOOLWA NORTH – PROPONENT INITIATED CODE AMENDMENT
PRELIMINARY DRAINS ANALYSIS



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