BARKER RYAN STEWART

Water Servicing Assessment

Request for Planning Proposal
1055 Bruxner Highway, Goonellabah

Prepared by: Engeny
Prepared for: Nimble Estates Pty Ltd

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1 Introduction

1.1 Background and Scope

This Water Servicing Report has been prepared by Engeny (with support from Barker Ryan Stewart) to accompany a Request for Planning Proposal (Planning Proposal) to amend the *Lismore Local Environmental Plan 2012* (**LLEP**) to enable mixed use development of land referred to as 1055 Bruxner Highway, Goonellabah (**the site**) comprising residential, employment and public open space lands.

Given the location of the development, treated, drinking water will be supplied to the site from the Lismore City Council (LCC) Holland Street Water Supply Zone which is supplied from the Holland Street Reservoir. The following report documents an options assessment of water supply strategies for the proposed development, including high-level description and cost estimates.

1.2 Site Location

The site at 1055 Bruxner Highway has an area of approximately 76ha and is located adjoining existing urban development on the eastern fringe of Goonellabah. The site comprises two allotments being Lot 42 DP868366 and Lot 1 DP957677 and benefits from frontages to the Bruxner Highway to the north and Oliver Avenue to the west. The site is zoned RU1 Primary Production and has been used for many years for grazing purposes and is largely cleared of vegetation except for remnant trees dispersed across the site. The property is bisected by Tucki Tucki creek with several minor watercourses feeding into it. The site is free from extensive flooding other than waters confined within Tucki Tucki Creek.

Figure 1: Subject site location – 1055 Bruxner Highway Goonellabah

1.3 Proposal

The Planning Proposal seeks to amend the LLEP as follows:

- Rezone the site from RU1 Primary Production to the following mix of land use zones:
    - R1 General Residential.
    - B4 Mixed Use.
    - RE1 Public Recreation.
    - IN1 General Industrial.
- Amend the Lot Size Map (Sheet LSZ_005 and Sheet LSZ_006) to remove the current minimum lot size requirement of 40ha and 20ha and impose the following minimum lot sizes:
    - R1 zoned land: a minimum lot size of 300m2
    - B4 zoned land to the north of Tucki Tucki creek: a minimum lot size of 300m2
    - B4 zoned land to the south of Tucki Tucki creek: a minimum lot size of 1,500m2
    - IN1 zoned land: a minimum lot size of 1,500m2
- Amend the LLEP 2012 Height of Building Map (Sheet HOB_005 and Sheet HOB_006) to impose the following maximum height of building control (excluding the RE1 and IN1 zoned land):
    - B4 zoned land to the north of Tucki Tucki creek: maximum building height of 13.5m
    - R1 zoned land: maximum building height of 8.5m

Changes to the planning controls facilitate the potential development of the site to accommodate a diversity of new housing, employment, and public open space opportunities in an environmentally and socially sustainable environment.

An Indicative Layout Plan (**ILP**), informed by detailed technical investigations into the characteristics of the site and adjoining land along with available servicing and community infrastructure, confirms the capacity to accommodate urban development comprising the following:

- Approximately 346 residential and mixed use zoned allotments capable of accommodating a variety of housing forms and densities with an estimated population of over 855 residents.
- Approximately 105 allotments zoned industrial and mixed use capable of supporting a variety of employment generating and service activities with an associated potential 2,614 direct jobs.
- Provision of over 14ha of the site to open space comprising land zoned and utilised for public recreation along with riparian corridors and landscape buffers.

2 Design Basis

2.1 Key Inputs

The following key inputs were used to investigate options for water supply the study area.

- Site Topography (elevations) – provided by Urbis Consulting
- Proposed Lot Layout, Staging and Land Use – provided by Urbis Consulting
- InfoWater Network Hydraulic Model (inclusive of existing and future demands to 2060) –updated by Engeny as part of the recent LCC Water Supply Network Master Plan Project.
- Planning Criteria – as detailed below

2.2 Planning Criteria

The following water supply network planning criteria have been used to guide the development of water supply options. A memo documenting the key criteria was submitted to LCC and has subsequently been accepted (acceptance email received 26/08/2022 from LCC).

NOTE: a total of 364 residential lots has been used in this assessment so it is additionally conservative.

Table 1: Water Supply Network Planning Criteria

Parameter	Planning Criteria	Basis
Minimum pressure	• Minimum pressure of 200 kPa (20m) for standard supply areas while supplying peak hour demands	Northern Rivers – Local Government Water Supply Code
Maximum pressure	• The desirable maximum pressure is 780 kPa (80m)	Northern Rivers – Local Government Water Supply Code
Population Model	Residential • Standard Residential (600 m²) – 1 ET • Smaller Residential (200 m²) – 0.8 ET Non – Residential (Industrial and Commercial • Industrial and Commercial – 15 ET/ha	Water Directorate (2017) – Section 64 Determinations of Equivalent Tenements Guidelines
Water distribution	• Mains feeding service reservoirs shall be designed to carry peak daily demands over 24 hours in the case of gravity mains and 22 hours in the case of rising mains. • Distribution main should transfer larger of Peak Instantaneous Demand or firefighting flow • Desirable pipe velocity 2.5 m/s, up to 4 m/s in special circumstances (e.g., during a fire-fighting event) • Desirable maximum head loss: - Main ≤ 150 mm, 5 m/km - Main > 150 mm, 3 m/km	Northern Rivers – Local Government Water Supply Code WSA-03, 2011 Water Supply Code

Demand (for new development)	For existing model demand – Lismore Water Supply Network Report • Average Day Demand (Res/Non-Res) – 685 L/ET/d • Peak Day (Res/ Non-Res) Peaking Factor (PD/AD) – 2.07 • Peak Hour (Res) Peaking Factor (PH/AD) – 4.4 • Peak Hour (Non-Res) Peaking Factor (PH/AD) – 3.0 For new residential development lots – Northern Rivers – Local Government Water Supply Code • Peak Instantaneous Demand (Peak Hour) – 0.15 L/s/tenement shall be used except that when supplying more than 1000 tenements, a demand of 0.10 L/s/tenement shall be used For new non-residential (commercial and Industrial) development lots – Lismore Water Supply Network Report • Average Day Demand (Non-Res) – 685 L/ET/d • Peak Day (Non-Res) Peaking Factor (PD/AD) – 2.07 • Peak Hour (Non-Res) Peaking Factor (PH/AD) – 3.0	Lismore Water Supply Network Report Northern Rivers – Local Government Water Supply Code
Fire fighting	Residential • Fire-fighting pressure shall be 150 kPa at the Hydrant under fire fighting flow at 11 l/s. Non – Residential • Fire-fighting pressure shall be 150 kPa at the Hydrant under fire fighting flow at 30 l/s. Background Demand • To be 2/3 Peak hour demand (residential), Peak Hour demand (non-residential) – Background demand based on the Lismore Water Supply Network Report demand	Northern Rivers – Local Government Water Supply Code (Residential Fire Flow) SEQ D&C Code (Non-Residential Fire Flow and Background Demand)
Reservoir storage	Ground Storage – Sydney Water Approach • Based in Peak Day Demand, Operating storage = 1/3 PDD, Reserve Storage = 1/3 PDD	Sydney Water Standards
Pump servicing	Pressure booster: • Duty pump should deliver flows up to Peak Instantaneous Demand and fire-fighting flows and meet minimum pressure limits • Standby pump should match maximum duty pump	Northern Rivers – Local Government Water Supply Code

2.3 Population Model and Demand

Water supply demands for the 1055 Bruxner development have been determined using the equivalent tenement (ET) population model, average day unit demands and peaking factors outlined in Table 1. The ET's attributed to each stage and the associated peak hour demands are summarised below in Table 2.

Table 2: Network Demand

	Proposed Development Staging		
Parameter	**Stage 1**	**Stage 2**	**Stage 3**
Equivalent Tenement (ET)			
North	115.8	245.0	315.6
South	116.0	214.8	390.5
Total	**231.8**	**459.8**	**706.1**
Peak Hour Demand (L/s)			
North	16.5	35.6	46.2
South	4.3	7.7	13.8
Total	**20.8**	**43.3**	**60.0**

2.4 Reservoir Sizing Review

As stated above, it is proposed that the 1055 Bruxner development is to be supplied from the Holland Street Reservoir. The required storage volume for the reservoir to supply existing and future demands (2060), with and without the new development are presented in Table 3. As shown, the Holland Street Reservoir has sufficient storage to accommodate the additional demand from the 1055 Bruxner development and to supply each demand scenario.

Table 3: Holland Street Reservoir Sizing Review

Demand Scenario	Reservoir Volume (ML)	Required Storage Volume (ML)	
		Without Bruxner Development	With Bruxner Development
Current	10	2.43	Current
Future (2060)	10	4.76	Future (2060)

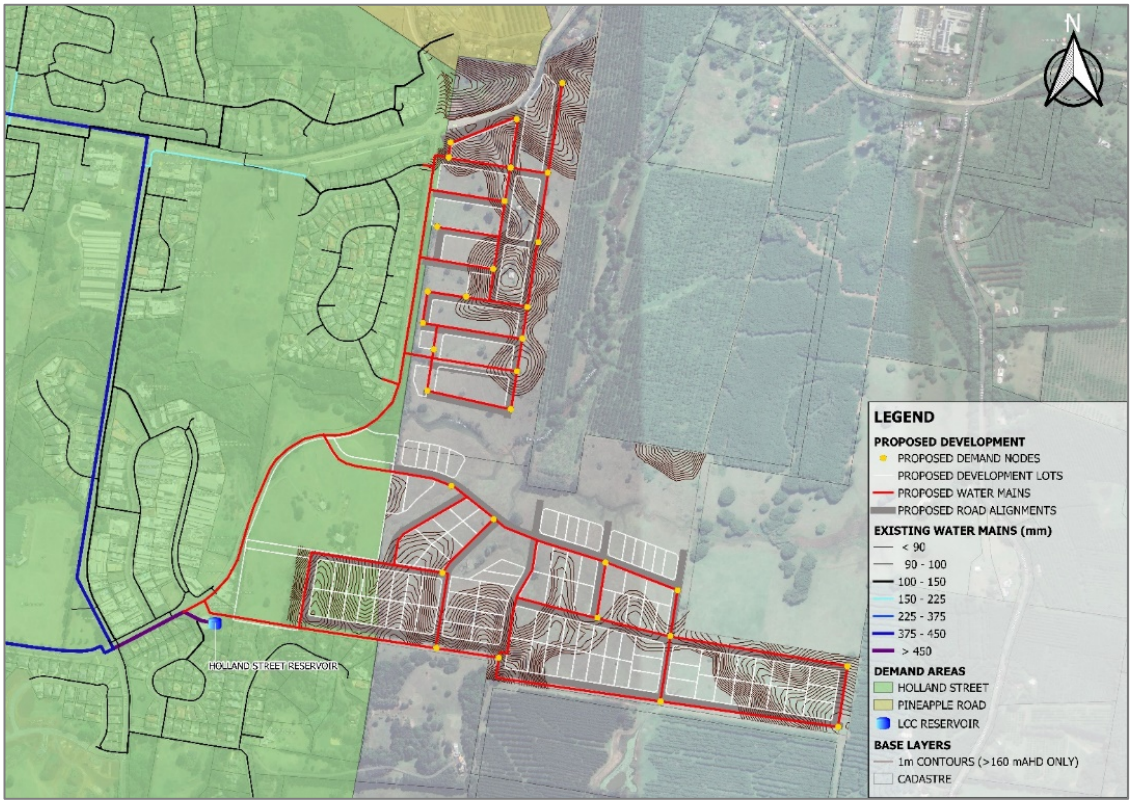
3 Water Supply Servicing Strategy Options Assessment

3.1 Overview

Figure 1 illustrates a preliminary reticulation pipe layout and network nodes (representing the demand distribution) to service the 1055 Bruxner development. These elements have been included in the LCC network model to underpin the assessment. Preliminary analysis demonstrates that gravity supply from the Holland Street Reservoir (minimum operating level of 184.6 m AHD), to the entire 1055 Bruxner development site will not achieve the adopted LCC water supply network planning criteria due to some high elevation areas across the development.

Figure 1 illustrates development areas with contours greater than 160m overlaying the lot layout. Lot elevations of 160 m AHD and above cannot be supplied by gravity from Holland Street Reservoir, while still maintaining the minimum supply pressure requirement of 20m (assuming pipeline friction losses of approximately 4 – 5m). As shown, there are several lots with elevations that exceed this threshold, demonstrating that an alternative solution incorporating pumping is required to service the entire development area.

Figure 1: Proposed Water Supply Network Overview



Based on the outcomes from the preliminary assessment, the following pumping options have been investigated:

- Option 1 – Convert the proposed development into a boosted zone.
- Option 2 – Pump to ground storage, gravity feed to proposed development

At this stage, pipe sizes and pressure class have not been determined for the reticulation network and will be confirmed following confirmation of the preferred water supply servicing strategy. Additionally, staging opportunities for the water servicing strategy have not been explored at this stage of the study.

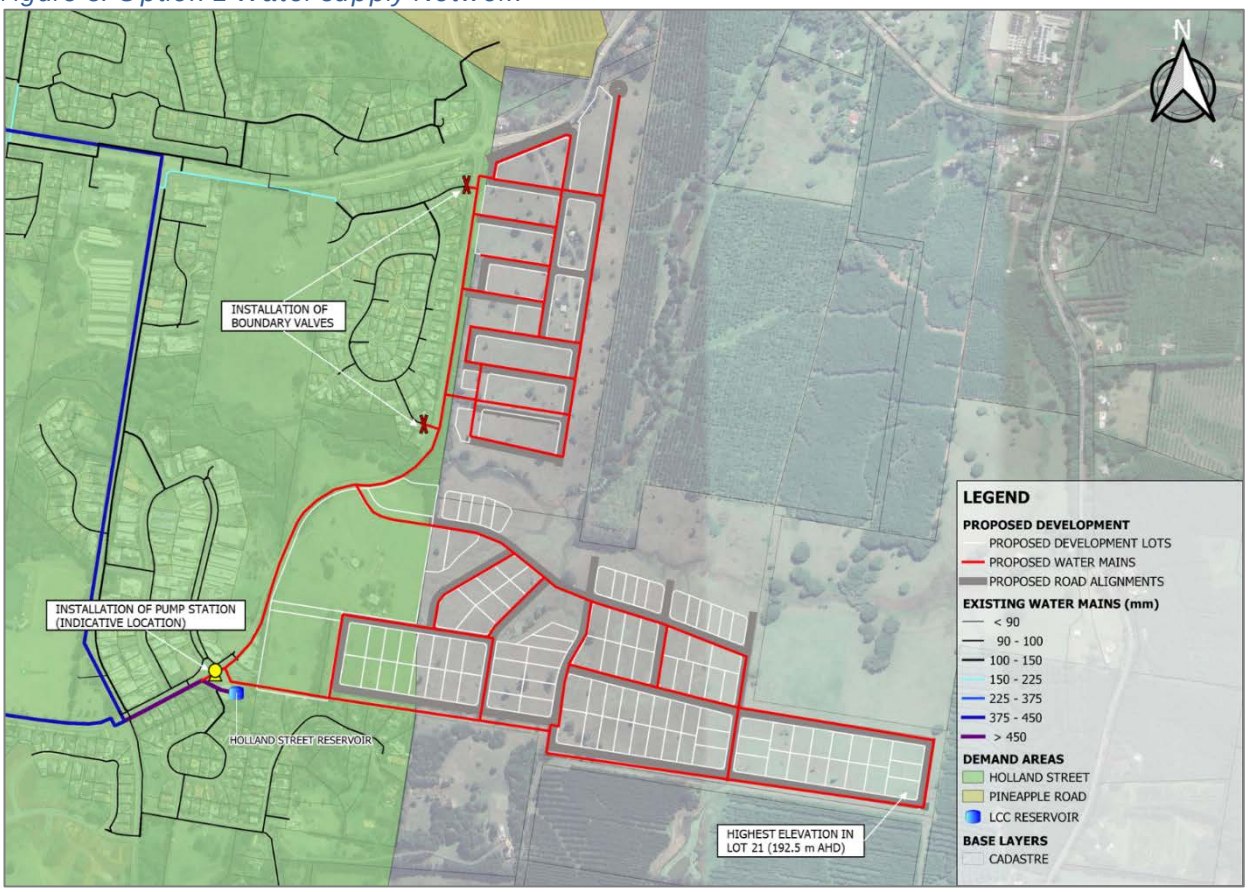
3.2 Option 1 – Boosted Zone

3.2.1 Option Description

Option 1 proposes to supply the 1055 Bruxner development via a new booster pump station located adjacent to the Holland Street Reservoir. The development would be converted into a separate, dedicated boosted zone with (normally closed) boundary valves installed at cross connections to the existing network to provide a contingency supply, when required. Figure 3 illustrates this option and includes an indicative location for the booster pump and boundary valves. The key details for the booster pump are described below.

- Location: Adjacent to the Holland Street Reservoir
- Pump operating mode: Variable Speed Drives operating to achieve a downstream pressure setpoint (includes duty/standby pumps as required)
- Pump likely to require back-up diesel generator (for power outages) and pressure vessel to accommodate low demand periods
- Pump Duty: 60 L/s @ 35 m (to deliver Stage 3 firefighting requirement/peak hour flows to the highest elevation lot in the development)

Figure 3: Option 1 Water Supply Network



3.3 Option 2 – Pump to Ground Storage

3.3.2 Option Description

Option 2 proposes to pump water from the Holland Street Reservoir to a new ground storage at an elevated location to supply the 1055 Bruxner development by gravity. Similar to Option 1, this option would require converting the development area into a separate, high-level supply zone with (normally closed)

boundary valves installed at cross connections to the existing network to provide a contingency supply, when required. Figure 4 illustrates the pump location, dedicated trunk main to the new ground storage and the reticulation pipe layout.

As shown, the proposed ground storage is located within the south-eastern boundary of the development on the highest elevation lot which has an elevation of 192.7 mAHD. Assuming a minimum operating water level of approximately 195 mAHD, properties with elevations below 170 mAHD can be supplied by gravity, while the small number properties above this threshold will require individual booster pumps to provide minimum pressures. Contours above 170 mAHD are also included in Figure 4, overlaying the lot layout. As shown, there are a limited number of lots that require an individual booster pump.

The key transfer details for this option are summarised below:

Pump Station

- Location: Adjacent to the Holland Street Reservoir
- Pump operating mode: Duty/ Standby
- Pump Duty (sized to deliver peak day demand over 22 hours to the new ground storage): 13 L/s @ 40 m

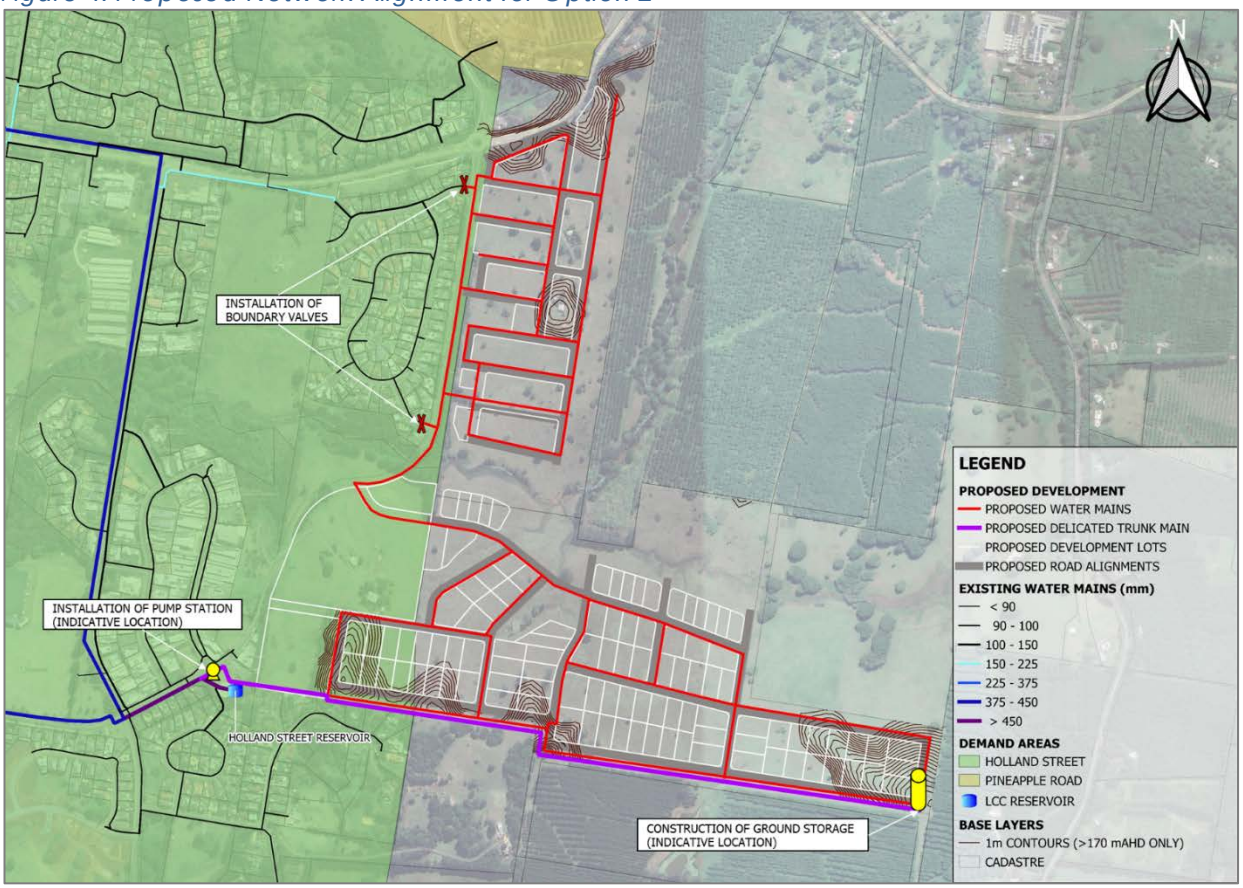
Ground Storage

- Location: South-eastern boundary of the development (Lot 24)
- Storage Volume: 900 kL

Trunk Main (from Pump Station to Ground Storage)

- Length: 1.65 km
- Size: DN200

Figure 4: Proposed Network Alignment for Option 2



4 Budget Cost Estimate

A preliminary, budget cost assessment (+/-50%) has been developed for the water supply servicing options outlined above. Key assumptions and costs exclusions made for water servicing options assessment are as follows.

- Pump Station includes two identical pumps to enable duty-standby operating mode. As noted above, Option 1 will require a Variable Speed Drives, a back-up diesel generator and pressure vessel.
- Budget cost estimates for assets are based on unit construction rates and general assumptions on ground conditions and construction material and methods.
- Preliminary estimates have been provided for planning, survey, investigation and design (SID).
- An allowance of 25% for fittings, 25% for overheads and 100% for contingencies have been added to the capital costs of the asset components.
- No operating costs have been included, including power and asset maintenance costs.
- No costs have been allowed for the reticulation pipework. These shall be sized during the next phase of design.
- Land acquisition costs are excluded, assuming that proposed pump stations and storages are located within the boundary of the development site.
- Bulk water connection cost has not been included, as the costs for both options are likely to be the same.

A summary of preliminary, budget cost estimates developed for water servicing options is presented below in Table 2.

Table 4: Budget Cost Estimates for Water Supply Servicing Options

Item	Option 1 - Boosted Zone	Option 2 – Pump to Ground Storage
Installed Capital Cost		
Dedicated Inlet Trunk Main[1]	-	$850,000
Storage Tank	-	$750,000
Pump Station	$800,000[2]	$165,000
Fittings (25%),	$200,000	$441,250
Overheads (25%)	$200,000	$441,250
Contingency Allowance (100%)	$800,000	$1,765,000
Total Installed Capital Cost	**$2,000,000**	**$4,412,500**
Planning and Design Cost	$100,000	$350,000
Total Costs	$2,100,000	$4,762,500

Notes:
1: Unit cost for a DN200 uPVC pipe adopted and is inclusive of costs associated with material, site excavation and construction difficulty.
2: Inclusive of a backup generator and pressure vessel

5 Additional Considerations

5.1 General

- Infrastructure sizing including pipework, pumps and storage volumes to meet the performance standards will be finalised following confirmation of the preferred water supply strategy and will incorporate peak hour and fire flow assessments.
- Proposed locations for the ground storage and pump stations are to be reviewed considering constructability, land availability and access to power.

5.2 Option 1

- A dedicated booster pump station to supply the development has not been discussed with LCC. Different local government water suppliers have different levels of risk tolerance for dedicated pumping zone and the acceptability of this approach to LCC is currently not understood.

5.3 Option 2

- The proposed location of the ground storage will require land currently allocated to property development to be allocated instead to the reservoir site. This location will mean that a number of properties will be too high to be serviced under gravity flows and will require boosting to be developed. This may not be acceptable to Council.

5.4 Alternative Servicing Strategy

- An alternative supply strategy of building an elevated tower with a dedicated high-lift pump station has not been considered in detail at this stage due to the potential, high capital cost; however, this servicing strategy would enable all properties across the 1055 Bruxner development to be serviced in line with the adopted water supply planning criteria and LCC requirements.

6 Conclusion

The proposed development can be readily serviced for reticulated water following upgrades of the existing water supply network. There are at least two options available, boosted or additional ground storage, both of which can be achieved using land already available to Council and/or the proponents. Depending on the option adopted the cost to provide water supply to the proposed development is expected to be between $2M and $5M.

7 Disclaimer

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