# ATTACHMENT 3

STRUCTURAL

CIVIL

ELECTRICAL

MECHANICAL

HYDRAULIC

FIRE

VERTICAL TRANSPORT

SEISMIC

STP CONSULTANTS

# Proposed 28 Unit Development

500-504 ROSS RIVER ROAD, CRANBROOK

## CIVIL ENGINEERING SERVICES AND A SITE BASED STORMWATER MANAGEMENT REPORT

## KAENETTO INVESTMENTS

STP25-0597

## DOCUMENT STATUS

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# 1. Introduction

Urban Space Consulting, on behalf of Kaenetto Investments, has engaged STP Consultants to produce a Civil Engineering Services and a Site Based Stormwater Management Plan Report in support of a Material Change of Use Development Application over the subject site.

This Civil Engineering Services Report focuses on the impact of the development in the following areas:

- Earthworks
- Flood Hazard Assessment
- Stormwater Management
- Stormwater Quality
- Water supply
- Sewerage connection

## 1.1 Limitations

This report provides a desktop assessment of services and stormwater investigation from the information obtained from the following sources.

- Architectural Plans.
- Survey of site provided by Atkinson Surveys.
- Townsville City Council Infrastructure Mapping Information.
- Townsville City Council Flood Map Overlays.
- QUDM 4th Edition 2017
- MUSIC Modelling Guidelines November 2018 (Water by Design)
- Rainfall and Meteorological Data by the Australia Bureau of Meteorology.
- Queensland Globe

# 2. Site Description

The site is located at 500-504 Ross River Road, Cranbrook and described as Lot 2 on SP130958 with a land area of 6,115m2. The site is currently zoned Low Density Residential within the Townsville City Council local government area and currently has three existing buildings/sheds on site.


*Figure 2.1 – Locality Plan, cadastral boundaries and easement (Queensland Globe)*

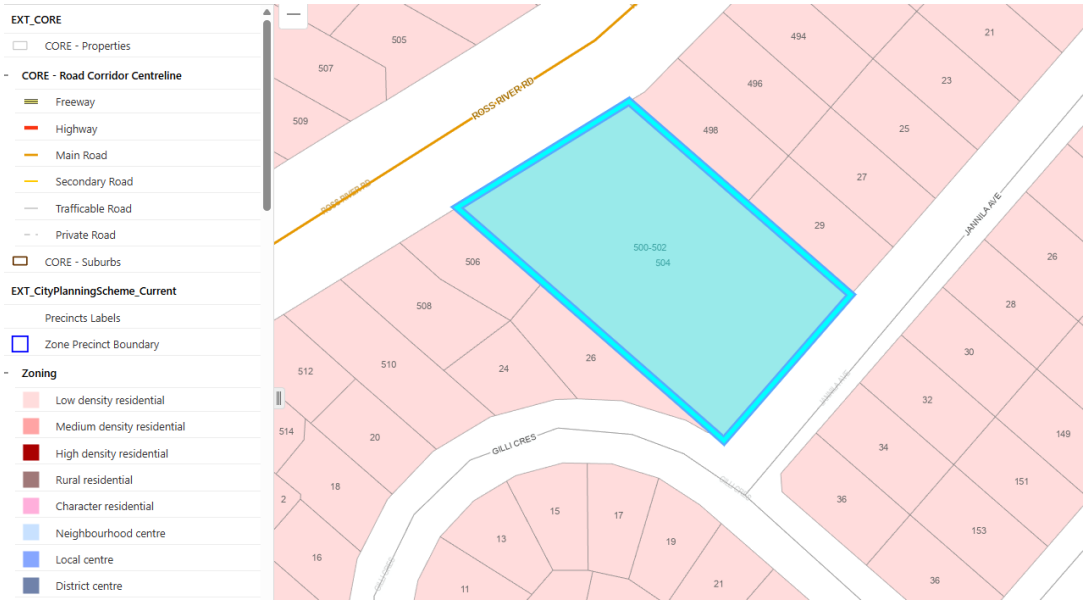



*Figure 2.2 – Planning Zones (Townsville Maps – City Plan)*

## 2.1 Easements

There are currently no easements that encumber the subject allotment.
There are currently no proposed road resumptions over the subject allotment.

## 2.2 Proposed Development

A copy of the Architectural drawings for the proposed development is provided in Appendix A.

The proposed 28 Unit Development consists of the following civil works: -

- minor earthworks for the new building pads, landscape areas, driveway and car parks including retaining walls
- the construction of the new 28 Units
- the construction of the new concrete pavement for the driveway and car parking accessing from Jannila Avenue
- the construction of the site's stormwater drainage system including stormwater quality improvement devices; and
- the construction of the landscaped areas.

# 3. Earthworks

## 3.1 Existing Earthworks

A detailed survey has been undertaken by Atkinson Surveys for the extent of the proposed development area, and a copy is provided in Appendix B.

The subject allotment's lowest level is approximately 13.35m AHD on the southern boundary of the property adjacent to Jannila Avenue and the highest level of approximately 14.20m AHD is approximately 35m in from the northern boundary adjacent to Ross River Road.

Approximately a third of the subject site slopes gently to the north from the ridgeline to Ross River Road. The balance two thirds of the allotment slopes gently south from the ridgeline to Jannila Avenue.

The adjacent allotments on the eastern and western side boundaries of the subject allotment, grade directly to Ross River Road or Jannila Avenue and therefore no provisions for accepting external runoff onto the subject allotment are required.

## 3.2 Proposed Site Earthworks

A copy of the Preliminary Engineering Services drawing for the proposed development is provided in Appendix C.

A Geotechnical Report was not available at the time of preparing this document.

Preliminary earthworks are based on the existing levels surveyed and the preliminary finished surface levels shown on the Preliminary Engineering Services drawing. The proposed levels shown on the drawing, when compared to the surveyed levels, indicate that generally there will be no more than 300mm cut or fill on site for the proposed housing development, driveway, car parks and landscaping, thereby negating the need for significant site earthworks.

The subject allotment is proposed to be developed with a concrete pavement (car parks and aisles) that will generally be provided with 2% crossfalls and longitudinal grading at 0.5% to stormwater drainage pits.

The landscaping buffer zones adjacent to the car parking will need to grade at a minimum of 1% back onto the driveway or kerbing to be collected by the proposed drainage system.

Geotechnical testing for CBR values for pavement design can be undertaken prior to construction commencing to confirm the pavement design.

## 3.3 Minimum Floor Levels

As indicated on the Townsville City Council flooding maps, the site is not subject to inundation from flooding in the defined flood event of 1% AEP. The Defined Flood Event Levels adjacent to the subject site are as follows: -

Ross River Road -

- Western side boundary - AEP 1% Flood – RL13.93m AHD
- Eastern side boundary - AEP 1% Flood – RL13.81m AHD

Janilla Avenue-

- Western side boundary - AEP 1% Flood – RL13.31m AHD
- Eastern side boundary – AEP 1% Flood – RL 13.30m AHD

Habitable floor levels for the units should be set a minimum of 300mm above the relevant Defined Flood Event (DFE).

# 4. Roadworks and Traffic Impacts

A Traffic Impact Assessment report will be provided under separate cover for this MCU Development Application.

# 5. Stormwater Management Plan

## 5.1 Flood Hazard Overlay

In accordance with the Townsville City Plan – Flood Hazard Overlay (OM-06.1) the subject site is just on the edge of a low hazard category due to the coarseness of the grid used to undertake the modelling. The subject site is not subject to flooding in the 1% AEP event as the surveyed levels of the land confirm.

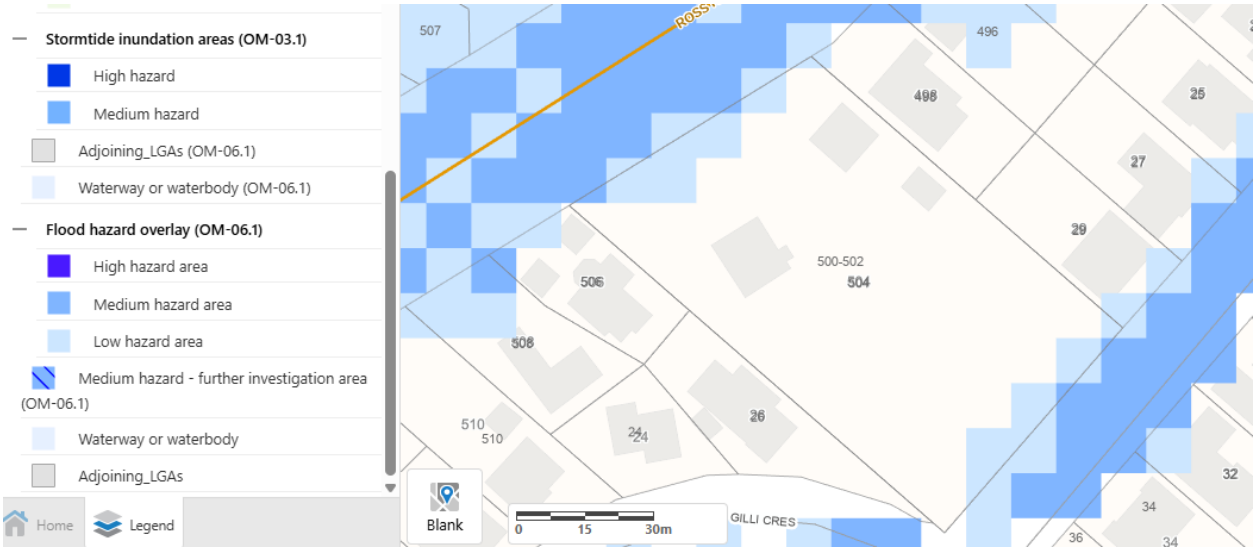



*Figure 5.1 – AEP 1% Flood Hazard Overlay (OM-06.1) (TownsvilleMAPS – Townsville City Plan)*

## 5.2 Coastal Hazard Overlay

In accordance with the Coastal Environment Overlay Code of the Townsville City Council Planning Scheme, the Defined Storm Tide Event (DSTE) level is RL4.5m AHD, within 100m of the coastline or RL3.9m AHD in other areas. Therefore, the subject allotment is not affected by DSTE as the minimum ground level on the site is RL13.3m AHD.

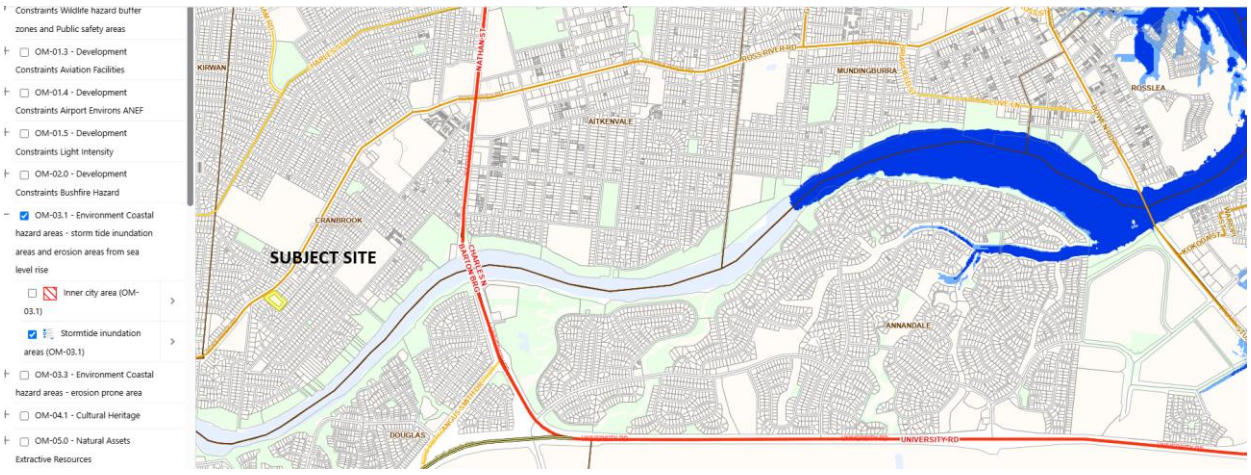



*Figure 5.2 – Environment Coastal hazard areas – Storm Tide inundation (OM-03.1) (TownsvilleMAPS – Townsville City Plan)*

## 5.3 Existing Stormwater Infrastructure

The Lawful Points of Discharge for the subject site will be the Ross River Road and Jannila Avenue road reserves.

There is an existing 375mm dia. reinforced concrete stormwater pipe in Ross River Road with a USIL of 11.92m and a DSIL 11.7m. This stormwater pipe is in the shared parking and bike lane of Ross River Road. The stormwater pipe is connected to a side inlet drainage pit which is adjacent to the western boundary of the subject site. There is an existing stormwater manhole adjacent to the eastern side boundary of the subject site.

There is no existing stormwater infrastructure in Jannila Avenue as the subject allotment is at the top of the stormwater catchment. The first stormwater pit in Jannila Avenue is 140m to the east of the site.

There is an existing stormwater inlet pit in Gilli Crescent with an invert level of 12.12m that discharges into a 375mm stormwater pipe. However, this stormwater pipe services a different stormwater catchment than the subject allotment.

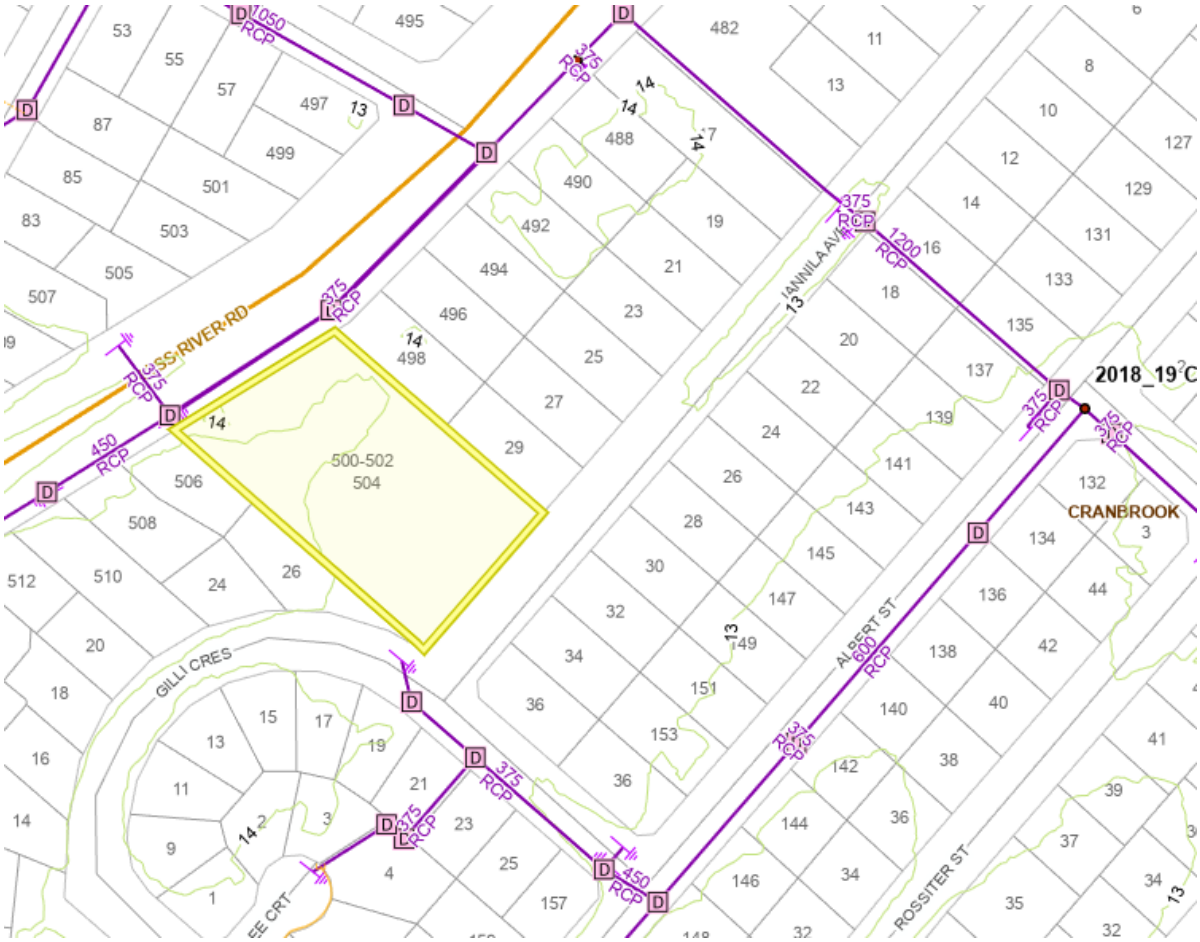



*Figure 5.3 – Existing Stormwater Infrastructure (TownsvilleMAPS - Community)*

There is an existing northern stormwater catchment of 2,285m2 that discharges onto Ross River Road via overland flow and there is an existing southern stormwater catchment of 3,830m2 that discharges onto Jannila Avenue via overland flow.


*Figure 5.4 – Existing Northern and Southern Stormwater Catchments*

## 5.4 Site Stormwater Drainage

The preliminary stormwater drainage layout is illustrated on the Preliminary Engineering Services drawing provided in Appendix C.

The roofs, car parks, driveway and landscaped areas in the northern portion of the development are to be collected in a grated stormwater inlet pits containing Atlan Stormsacks and conveyed via stormwater pipes to an Atlan FlowFilter (1200/3 series) prior to discharging into the back of the existing side inlet pit in Ross River Road.

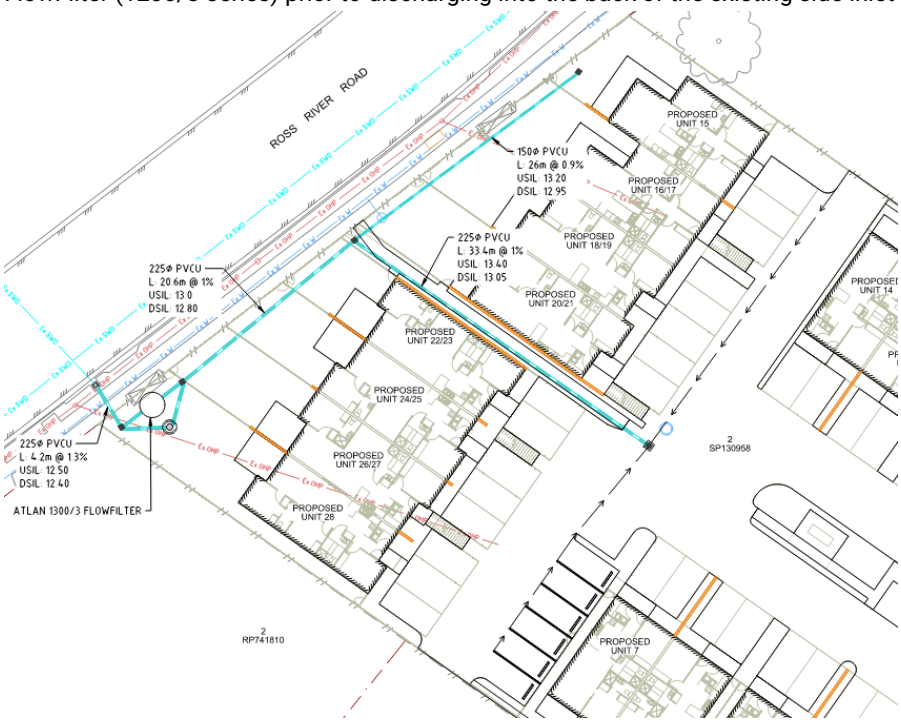



*Figure 5.5 – Northern Catchment – Proposed Stormwater Drainage*

The roofs, car parks, driveway and community areas centrally located within the southern stormwater catchment are to be collected via overland flow into a trench grate containing Atlan FlowGuards and then discharged to the kerb and channel Jannila Avenue via galvanised RHS.

The roofs of the units and the landscaped areas at the rear of the units (eastern and western boundaries) located within the southern stormwater catchment are to be collected via overland flow into a kerb and channel containing Atlan FlowGuards and then discharged to the kerb and channel in Jannila Avenue via galvanised RHS.


*Figure 5.6 – Southern Catchment – Proposed Stormwater Drainage*

Full hydraulic design in accordance with QUDM will be undertaken during the detailed design phase for all the proposed stormwater infrastructure.

## 5.5 Stormwater Runoff and Detention

The Townsville City Plan, *Schedule 6.4 Development Manual Planning Scheme Policy, SC6.4.9.3 Major and Minor system design,* prescribes the design parameters of an Urban Residential development to be 2-year ARI event for a Minor system and to be 100-year ARI for the Major system.

The 1-hour rainfall intensity for the 10-year ARI at the subject location in Townsville is 74mm/h.

In accordance with QUDM clause 4.6.4 the Standard Inlet for the developed catchment is unchanged for the pre-development (low density residential) and the post development (medium density residential) proposed Housing Development – 10 minutes.

The Townsville City Plan, *Schedule 6.4 Development Manual Planning Scheme Policy, Table SC6.4.9.2 – Fraction impervious for Land Use Zones,* prescribes the fraction impervious for Low Density Residential zoning of 0.65 and for a fraction impervious of 0.70 for a Medium Density Residential zoning.

With reference to the Architectural drawings 'Area Schedule for Landscaping' the grassed areas and garden beds make up 32% of the land area, giving a fraction impervious for the subject site 68%, which is slightly less than assigned 70% for a Medium Density Residential zoned site in accordance with the Townsville City Council Planning Scheme.

The pre-development (low density residential) Coefficient of Discharge ($C_{10}$) for the subject site, in accordance with QUDM Table *4.5.3 – Table of $C_{10}$ Values,* based on a fraction impervious of 0.65 is 0.83.

The post-development (medium density residential) Coefficient of Discharge ($C_{10}$) for the subject site, in accordance with QUDM Table *4.5.3 – Table of $C_{10}$ Values,* based on a fraction impervious of 70% is 0.84.

The post development northern stormwater catchment of 2,241m2 will discharge via pits and pipes, directly into the existing stormwater system in Ross River Road during minor events. During major events the excess runoff will discharge onto Ross River Road via overland flow.

The post development southern stormwater catchment of 3,874m2 will discharge via overland flow in kerbs and concrete pavement, be collected in trench grates and pits, and discharged directly into the existing kerb and channel in Jannila Avenue during minor events. The southern catchment will be split into four smaller catchments to ensure at no time during the minor event is more than 30l/s discharged into the kerb and channel at one location. During major events the excess runoff will discharge onto Jannila Avenue via overland flow.

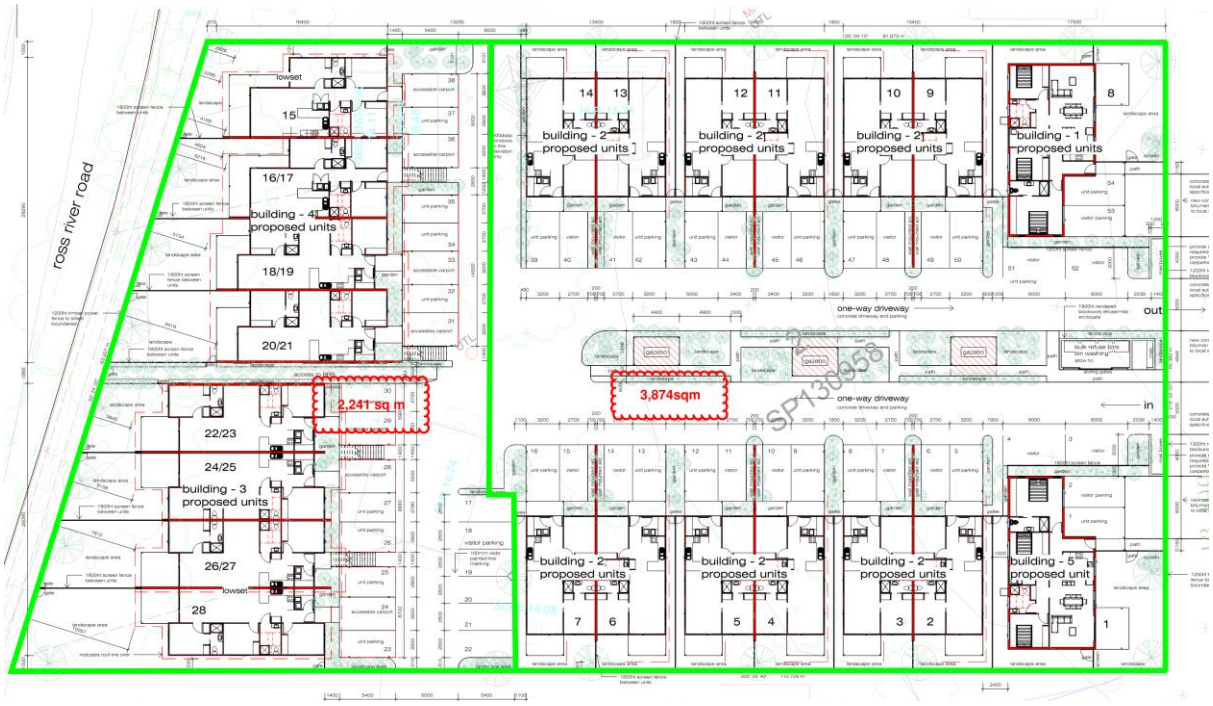



*Figure 5.5 – Post Development - Northern and Southern Stormwater Catchments*

Based on the above information the pre-development and post-development discharge volumes from the subject site are provided below: -

Northern Catchment Pre-Development and Post-Development

| Northern Catchment - Predevelopment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Area ($m^2$) | (ha) | Impervious Area (%) | | $C_{10}$ | Time of Concentration (min) | | |
| 2285 | 0.229 | 0.65 | | 0.83 | 10 | | |
| | $C_1$ | $C_2$ | $C_5$ | $C_{10}$ | $C_{20}$ | $C_{50}$ | $C_{100}$ |
| | 0.664 | 0.7055 | 0.7885 | 0.83 | 0.8715 | 0.9545 | 0.996 |
| | $I_1$ | $I_2$ | $I_5$ | $I_{10}$ | $I_{20}$ | $I_{50}$ | $I_{100}$ |
| | 89.5 | 102 | 140 | 164 | 187 | 215 | 236 mm/hr |
| | $Q_1$ | $Q_2$ | $Q_5$ | $Q_{10}$ | $Q_{20}$ | $Q_{50}$ | $Q_{100}$ |
| | 0.038 | 0.046 | 0.070 | 0.086 | 0.103 | 0.130 | 0.149 $m^3/s$ |

| Northern Catchment - Post-development | | | | | | | |
|---|---|---|---|---|---|---|---|
| Area ($m^2$) | (ha) | Impervious Area (%) | | $C_{10}$ | Time of Concentration (min) | | |
| 2241 | 0.224 | 0.7 | | 0.84 | 10 | | |
| | $C_1$ | $C_2$ | $C_5$ | $C_{10}$ | $C_{20}$ | $C_{50}$ | $C_{100}$ |
| | 0.672 | 0.714 | 0.798 | 0.84 | 0.882 | 0.966 | 1 |
| | $I_1$ | $I_2$ | $I_5$ | $I_{10}$ | $I_{20}$ | $I_{50}$ | $I_{100}$ |
| | 89.5 | 102 | 140 | 164 | 187 | 215 | 236 mm/hr |
| | $Q_1$ | $Q_2$ | $Q_5$ | $Q_{10}$ | $Q_{20}$ | $Q_{50}$ | $Q_{100}$ |
| | 0.037 | 0.045 | 0.070 | 0.086 | 0.103 | 0.129 | 0.147 $m^3/s$ |

With reference to the above stormwater runoff calculations for the northern catchment, it is noted that there is a decrease in post development runoff from the site of 1.0l/s in the minor event (2-year ARI) or a 2% decrease.

In the major event (100-year ARI) it is noted that there is a decrease in the post development runoff of 2.0l/s from the site or a 1.5% decrease.

As there is no increase in runoff from the proposed development in the northern catchment, stormwater detention measures are not required, as the peak discharges from the site are slightly less than that of pre-development.

Southern catchment Pre-Development and Post-Development

| Southern Catchment - Pre-development | | | | | | | |
|---|---|---|---|---|---|---|---|
| Area ($m^2$) | (ha) | Impervious Area (%) | | $C_{10}$ | Time of Concentration (min) | | |
| 3830 | 0.383 | 0.65 | | 0.83 | 10 | | |
| | $C_1$ | $C_2$ | $C_5$ | $C_{10}$ | $C_{20}$ | $C_{50}$ | $C_{100}$ |
| | 0.664 | 0.7055 | 0.7885 | 0.83 | 0.8715 | 0.9545 | 0.996 |
| | $I_1$ | $I_2$ | $I_5$ | $I_{10}$ | $I_{20}$ | $I_{50}$ | $I_{100}$ |
| | 89.5 | 102 | 140 | 164 | 187 | 215 | 236 mm/hr |
| | $Q_1$ | $Q_2$ | $Q_5$ | $Q_{10}$ | $Q_{20}$ | $Q_{50}$ | $Q_{100}$ |
| | 0.063 | 0.077 | 0.117 | 0.145 | 0.173 | 0.218 | 0.250 $m^3/s$ |

| Southern Catchment - Post-development | | | | | | | |
|---|---|---|---|---|---|---|---|
| Area ($m^2$) | (ha) | Impervious Area (%) | | $C_{10}$ | Time of Concentration (min) | | |
| 3874 | 0.387 | 0.7 | | 0.84 | 10 | | |
| | $C_1$ | $C_2$ | $C_5$ | $C_{10}$ | $C_{20}$ | $C_{50}$ | $C_{100}$ |
| | 0.672 | 0.714 | 0.798 | 0.84 | 0.882 | 0.966 | 1 |
| | $I_1$ | $I_2$ | $I_5$ | $I_{10}$ | $I_{20}$ | $I_{50}$ | $I_{100}$ |
| | 89.5 | 102 | 140 | 164 | 187 | 215 | 236 mm/hr |
| | $Q_1$ | $Q_2$ | $Q_5$ | $Q_{10}$ | $Q_{20}$ | $Q_{50}$ | $Q_{100}$ |
| | 0.065 | 0.078 | 0.120 | 0.148 | 0.177 | 0.223 | 0.254 $m^3/s$ |

With reference to the above stormwater runoff calculations for the southern catchment, it is noted that there is an increase in post development runoff from the site of just 1.0l/s in the minor event (2-year ARI) or a 1.3% increase.

In the major event (100-year ARI) it is noted that there is an increase in the post development runoff from the site of just 4.0l/s or a 1.6% increase.

Given the increase in stormwater runoff from the southern catchment is minimal and the stormwater runoff must discharge into the kerb and channel in Jannila Avenue, as there is no existing stormwater infrastructure, stormwater detention measures are not considered necessary for this development.

## 6. Stormwater Quality Management

In accordance with the requirements of the State Planning Policy – July 2017, the Assessment Benchmarks for Water Quality, the proposed development site is greater than 2,500m2 in size and will result in 6 or more dwellings. Therefore, the proposed development site exceeds the criteria for requiring permanent methods of stormwater quality control.

### Assessment benchmarks – water quality

**These performance outcomes apply to the following development applications, to the extent the SPP has not been identified in a local planning instrument as being appropriately integrated.**

**For receiving waters, a development application for:**

(1) a material change of use for an urban purpose that involves premises 2500 metres² or greater in size and;

(a) will result in six or more dwellings; or

(b) will result in an impervious area greater than 25 per cent of the net developable area; or

(2) reconfiguring a lot for an urban purpose that involves premises 2500 metres² or greater in size and will result in six or more lots; or

(3) operational works for an urban purpose that involves disturbing a land area 2500 metres² or greater in size.

**For water supply buffer areas, a development application:**

(4) located wholly outside an urban area and relating to premises that is within, or partly within, a water supply buffer area, that involves:

(a) a material change of use for the intensive animal industry, medium and high-impact industry, noxious and hazardous industry, extractive industry, utility installation that involves sewerage services, drainage or stormwater services, waste management facilities, or motor sport facility; or

(b) reconfiguring a lot to create five or more additional lots if any resultant lot is less than 16 hectares in size, and any of the lots created will rely on on-site wastewater treatment.

**The following requirements are assessment benchmarks for the development:**

(1) Development is located, designed, constructed and operated to avoid or minimise adverse impacts on environmental values arising from:

(a) altered stormwater quality and hydrology

(b) waste water

(c) the creation or expansion of non-tidal artificial waterways

(d) the release and mobilisation of nutrients and sediments.

(2) Development achieves the applicable stormwater management design objectives outlined in tables A and B (appendix 2)

(3) Development in a water supply buffer area avoids adverse impacts on drinking water supply environmental values.

Further information in relation to these requirements is detailed in the water quality guidance material.

*Figure 6.1 – State Planning Policy – Assessment Benchmarks*

An Erosion and Sediment Control Plan (ESCP) for the site will be required during construction to minimise the risk of soil leaving the site. The ESCP and associated devices will be required to be implemented/installed prior to commencement of the new building and associated infrastructure until the landscaping is completed.

## 6.1 Pollutants of Concern

The Townsville City Council Development Manual, SC6.4.10 Stormwater Quality, provides guidance on the types of pollutants likely to be generated from different developments. The pollutants most likely to be of concern for Commercial/Industrial developments are identified in the table below.

| Pollutant | Development Phase | |
|---|---|---|
| | Construction | Operation |
| Litter | ✓ | ✓ |
| Sediment | ✓ | unlikely |
| Hydrocarbons (including oil and grease) | ✓ | ✓ |
| Toxic materials (e.g. cement slurry, asphalt primer, solvents) | ✓ | unlikely |
| pH altering substances (e.g. cement slurry and wash waters) | ✓ | unlikely |
| Oxygen demanding substances (organic and chemical matter) | possibly | unlikely |
| Nutrients (nitrogen and phosphorus) | ✓ | ✓ |
| Pathogens / Faecal coliforms (bacteria and viruses) | unlikely | unlikely |
| Heavy metals (often associated with fine sediment | unlikely | unlikely |
| Surfactants (e.g. detergents from car washing) | unlikely | possibly |
| Thermal pollution (heat) | unlikely | unlikely |
| | | |

*Table 6.1 Pollutants likely to be of most concern*

## 6.2 Design Objectives for Water Management

The Water Quality Objectives for the proposed development in Townsville are listed in the table below.

| Parameter | Statistic | Load Based Reduction | Water Quality Objectives |
|---|---|---|---|
| Total Suspended Solids (TSS) | Mean Range | 80% | Less than 5mg/L |
| Total Phosphorous (TP) | Mean Range | 65% | Less than 0.01 to 0.05mg/L |
| Total Nitrogen (TN) | Mean Range | 40% | Less than 0.2 to 0.5mg/L |
| Gross Pollutants | - | 90% | Retention of litter greater than 50mm for flows up to the 3-month ARI peak flow |
| PH | Mean Range | - | Between 7 and 8 |

*Table 6.2 Water Quality Objectives for Townsville City Council – Dry Tropics (TCC Development Manual SC6.4.10.2(3)*

## 6.3 Proposed Stormwater Treatment Train analysis

The proposed 28 Unit development site has sufficient area available to dedicate to stormwater quality improvement devices.

Northern Catchment

The roofs, car parks, driveway and landscaped areas in the northern portion of the development are to be collected in a grated stormwater inlet pits containing Atlan Stormsacks and conveyed via stormwater pipes to an Atlan FlowFilter (1200/3 series) prior to discharging into the back of the existing side inlet pit in Ross River Road.

Southern Catchment

The roofs, car parks, driveway and community areas centrally located within the southern stormwater catchment are to be collected via overland flow into a trench grate containing Atlan FlowGuards and then discharged to the kerb and channel Jannila Avenue via galvanised RHS.

The roofs of the units and the landscaped areas at the rear of the units (eastern and western boundaries) located within the southern stormwater catchment are to be collected via overland flow into a kerb and channel containing Atlan FlowGuards and then discharged to the kerb and channel in Jannila Avenue via galvanised RHS.

The proprietary stormwater treatment devices included above in the design solutions, have been independently verified by Stormwater Australia SQIDEP (Verification Certificate) and the certified performance metrics are reflected in the MUSIC modelling.

## 6.4 Music Model Parameters

### 6.4.1 Model Parameters

| Input | Data Used |
|---|---|
| Rainfall Station | 32040 TOWNSVILLE |
| Rainfall Period | 01/01/1995 – 31/12/2005 |
| Mean Annual Rainfall (mm) | 976mm |
| Evapotranspiration | 1201mm |
| Model Timestep | 6 minutes |

*Table 6.3 - Basic MUSIC Model Parameters*

### 6.4.2 Rainfall & Runoff Parameters

| Parameter | Roof/ Road/Ground Level |
|---|---|
| Rainfall Threshold (mm/day) | 1 |
| Soil Storage Capacity (mm) | 400 |
| Soil Initial Storage (% of Capacity) | 10 |
| Field Capacity (mm) | 200 |
| Infiltration Capacity coefficient - a | 211 |
| Infiltration Capacity exponent - b | 5.0 |
| Initial Depth (mm) | 50 |
| Daily Recharge Rate (%) | 28 |
| Daily Baseflow Rate (%) | 27 |
| Daily Deep Seepage Rate (%) | 0 |

*Table 6.4 - Water by Design recommended MUSIC Rainfall – Runoff Parameters (Urban Residential SEQ - Table A1.2) – adopted for Townsville*

### 6.4.3 Pollution Generation

In MUSIC, stormwater quality is characterised by event mean concentrations (EMC) for storm flows and base flows. In this study, the EMC's were adopted from Water by Design MUSIC Modelling Guidelines. The pollutants of concern that were assessed include total suspended solids (TSS), total phosphorous (TP) and total nitrogen (TN). The quality of stormwater runoff is characterised by inputting event mean concentrations (EMC) for storm flow and base flow conditions as well as the standard deviation of each EMC.

Pollutant concentrations are based on Urban Residential land use parameters.

| Flow Type | Surface Type | TSS ($log_{10}$ values) | | TP ($log_{10}$ values) | | TN ($log_{10}$ values) | |
|---|---|---|---|---|---|---|---|
| | | Mean | Std Dev. | Mean | Std Dev. | Mean | Std Dev. |
| Urban Residential | Baseflow | 1.00 | 0.34 | -0.97 | 0.31 | 0.20 | 0.20 |
| | Stormflow | 2.18 | 0.39 | -0.47 | 0.32 | 0.26 | 0.23 |

*Table 6.5 Water by Design MUSIC Modelling Pollutant Export Parameters for Lumped Catchment Land Uses – MUSIC Modelling Guidelines - Table 3.8*

### 6.4.4 Results

Northern Catchment

The indicative layout of the MUSIC model, treatment train parameters and results for the northern catchment are shown below.

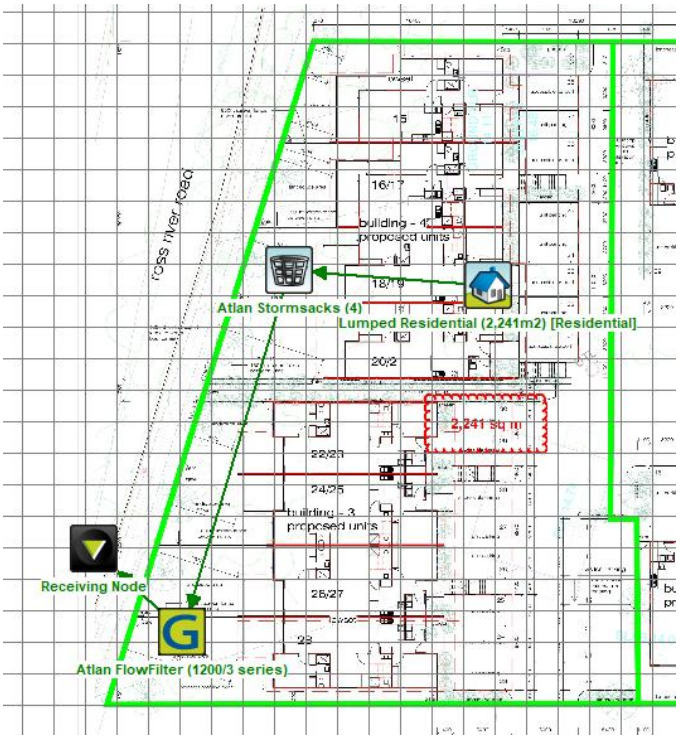



*Figure 6.2 MUSIC Model (Northern Catchment)*

| | Sources | Residual Load | % Reduction |
|---|---|---|---|
| **Flow (ML/yr)** | 1.7 | 1.7 | 0 |
| **Total Suspended Solids (kg/yr)** | 376 | 52.4 | 86.1 |
| **Total Phosphorus (kg/yr)** | 0.755 | 0.267 | 64.7 |
| **Total Nitrogen (kg/yr)** | 3.58 | 1.33 | 62.7 |
| **Gross Pollutants (kg/yr)** | 31.5 | 0.033 | 99.9 |

*Figure 6.3 MUSIC Modelling – Treatment Train Effectiveness (northern catchment)*

The proposed treatment train for the northern catchment consists of 4 Atlan Stormsacks (one in each proposed inlet pits) and an Atlan FlowFilter (1200/3) containing 3 cartridges capable of processing 4l/s each or 12l/s total with a high flow bypass.

Southern Catchment

The indicative layout of the MUSIC model, treatment train parameters and results for the southern catchment are shown below.

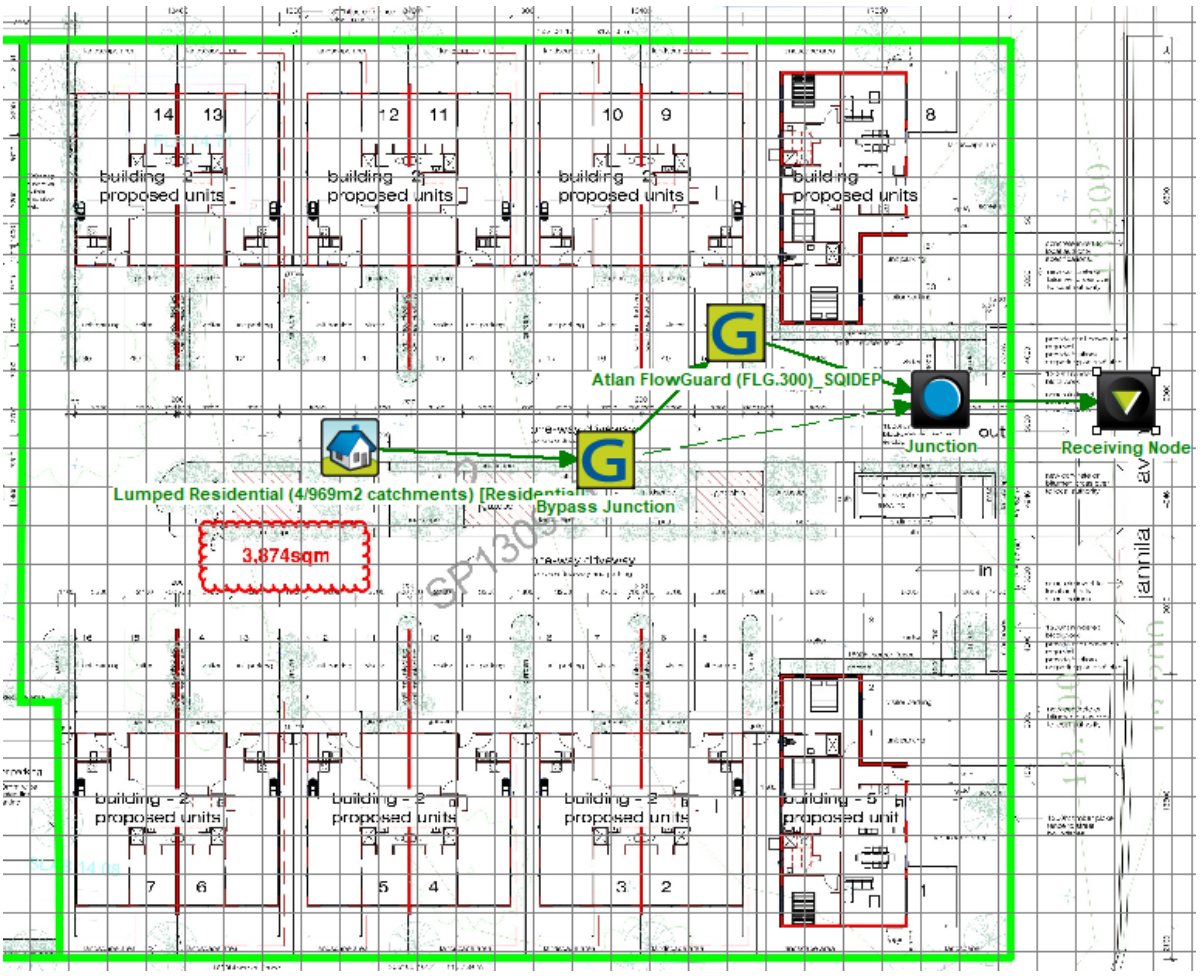



*Figure 6.4 MUSIC Model (Southern Catchment)*

| | Sources | Residual Load | % Reduction |
|---|---|---|---|
| **Flow (ML/yr)** | 2.94 | 2.94 | 0 |
| **Total Suspended Solids (kg/yr)** | 642 | 124 | 80.6 |
| **Total Phosphorus (kg/yr)** | 1.29 | 0.477 | 63.1 |
| **Total Nitrogen (kg/yr)** | 6.28 | 2.44 | 61.2 |
| **Gross Pollutants (kg/yr)** | 54.3 | 0.765 | 98.6 |

*Figure 6.5 MUSIC Modelling – Treatment Train Effectiveness (southern catchment)*

The proposed treatment train for the southern catchment consists of 84m of Atlan FlowGuard (300mm) which will be separated into 4 separate catchments (21m of FlowGuard in each catchment).

While the modelled treatment trains indicate that the stormwater quality outcomes for Townsville City Council can be achieved for the proposed 28 Unit development, equivalent alternative proprietary products may be investigated and adopted during detailed design, provided the required outcomes are achieved.

The proposed treatment trains will reduce pollutant loadings to the extent specified by the Townsville City Council Stormwater Quality Guidelines.

# 7. Water and Sewerage

## 7.1 Water Connection

In accordance with the information provided on TownsvilleMAPS – Community, the subject site is serviced by an existing DN20mm water service on the northern boundary which in turn is connected to the existing DN300mm water main in Ross River Road.

During the detailed design phase of the project, the Hydraulic Consultant will confirm the size of the larger water connection required for the proposed housing development based on the actual site water demands.

A fire hydrant exists on the 300mm water main in the verge of Ross River Road and is generally central to the subject allotment.

Another fire hydrant exists on the 100mm reticulation main on the opposite side of Jannila Avenue and is slightly west of central to the subject allotment.

The location of the existing water connection and fire hydrants is provided on the Preliminary Engineering Services drawing provided in Appendix C.

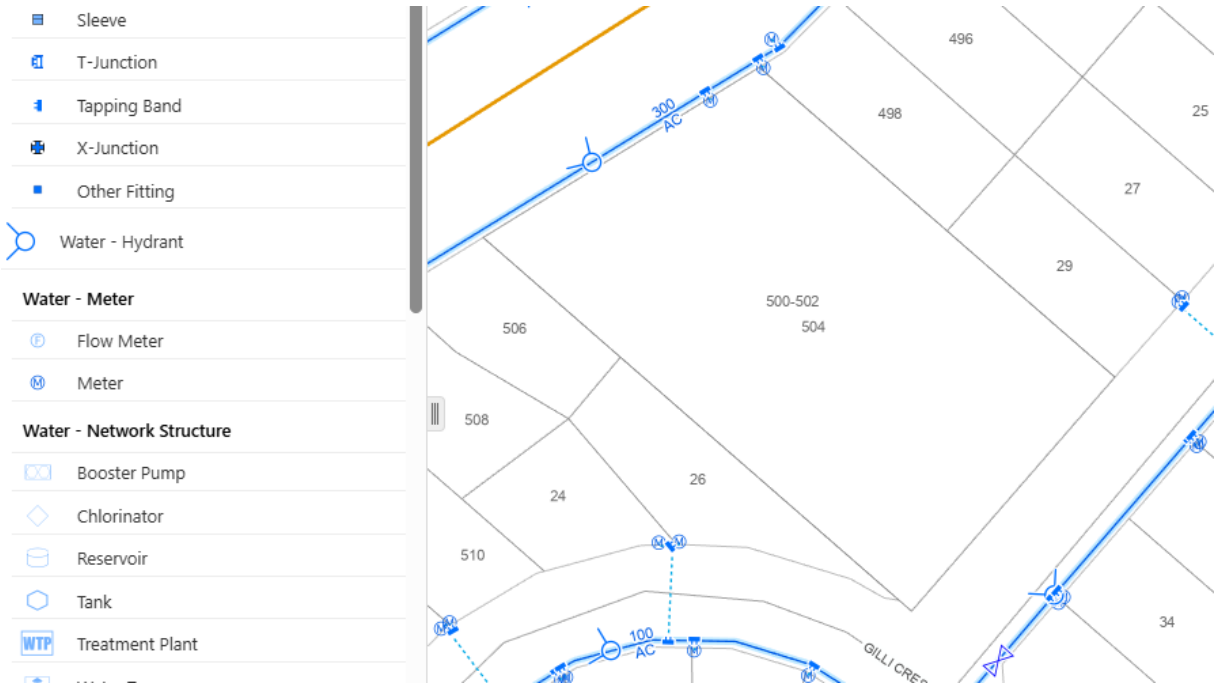



*Figure 7.1 – TownsvilleMAPS existing water layout*

A water network analysis has been undertaken for the proposed development in accordance with SC6.4.11 of the Townsville City Plan and the analysis demonstrates that the existing water network infrastructure has sufficient capacity to cope with the proposed development. The water network analysis is provided in Appendix D.

## 7.2 Sewer Connection

In accordance with the information provided on the TownsvilleMAPS - Community, the subject site is currently serviced from a 100mm house connection from the existing sewer manhole 3/L1A1C which is contained in the adjacent easterly allotment which fronts onto Jannila Avenue.

Sewer manhole 3/L1A1C is the top of the sewer catchment and connects to an existing 150mm AC/FRC sewer with an USIL of 11.884m.

A new 150mm dia. stub connection is required to service the proposed housing development and will replace the existing 100mm house connection.

Given the minimum Finished Floor Level of RL13.60 for the proposed houses adjacent to Jannila Avenue and the invert level of the new 150mm sewer connection will be IL 11.94m, there is sufficient depth to grade the internal sewers at 1 in 60 to the proposed new sewer connection.

The Hydraulic Consultant will determine the final layout of the internal sewers to service the proposed housing development during the detailed design phase of the proposed development.

The location of the existing sewer, the existing sewer manhole 3/L1A1C and the proposed new sewer connection are provided on the Preliminary Engineering Services drawing provided in Appendix C.


*Figure 7.2 – TownsvilleMAPS existing sewerage layout*

A sewer network analysis has been undertaken for the proposed development in accordance with SC6.4.11 of the Townsville City Plan and the analysis demonstrates that the existing sewer network infrastructure has sufficient capacity to cope with the proposed development. The sewer network analysis is provided in Appendix D.

## 8. Discussion / Conclusion

As demonstrated within the Report, the proposed Housing development can be undertaken, and a summary of the requirements are as follows: -

- The subject site is not affected by the Defined Flood Event.
- The subject allotment is not affected by the Defined Storm Tide Event (DSTE) – 3.9m.
- The Housing development minimum finished floor levels (FFL) are: -
  - Houses fronting Ross River Road – 13.93m + 0.3m = 14.23m.
  - Houses fronting Jannila Avenue – 13.31m + 0.3m = 13.61m.
- The Minor Design Event is ARI 2 year.
- The Major Design Event is ARI 100 year.
- No detention is required.
- The site does require Stormwater Quality Treatment as per the State Planning Policy.
- The Legal Points of Discharge is Ross River Road and Jannila Avenue road reserves.
- The existing water and sewer networks have sufficient capacity to accommodate the proposed development.

Based on our investigative works, we consider that Council has no impediment to the approval of this development within the context of engineering issues. We therefore recommend that Council approves the application subject to reasonable, relevant, equitable and justifiable conditions.

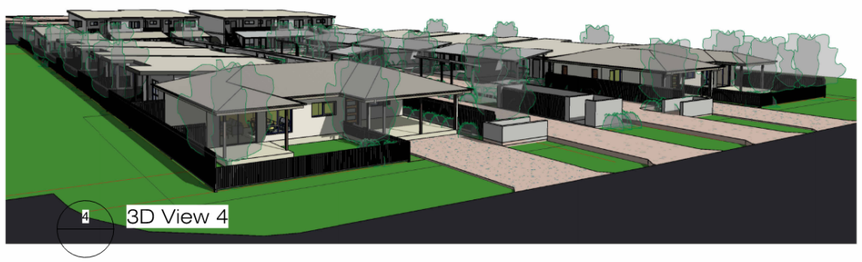
# APPENDIX A – Architects - Proposed Development Layout

1 3D View 1

2 3D View 2

3 3D View 3

5 3D View 5



4 3D View 4

| Sheet List | | |
|---|---|---|
| Count | Sheet Number | Sheet Name |
| 1 | sk_01 | Title page |
| 1 | sk_02 | Site plan |
| 1 | sk_03 | Site area layout |
| 1 | sk_04 | Aerial image & detail survey |
| 1 | sk_05 | Building - 1- floor plan & elevations |
| 1 | sk_06 | Building - 2 - floor plan & elevations |
| 1 | sk_07 | Building - 3 - floor plans |
| 1 | sk_08 | Building - 3 – elevations |
| 1 | sk_09 | Building - 4 - floor plans |
| 1 | sk_10 | Building - 4 – elevations |
| 1 | sk_11 | Gazebo |

Grand total: 11

sheet size = A1

Preliminary
not to be used for construction purposes

URBAN SPACE CONSULTING

RJG BUILDERS
YOUR CHOICE FOR A PROFESSIONAL BUILD

NOTES:
THIS DRAWING IS ONLY INTENDED TO OBTAIN A LOCAL AUTHORITY BUILDING PERMIT.
COMPLY WITH ALL RELEVANT AUTHORITY REG. & BSA. FIGURED DIMENSIONS TO TAKE PRECEDENCE OVER SCALED MEASUREMENTS. VERIFY ALL ON SITE DIMENSIONS & LEVELS PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION.

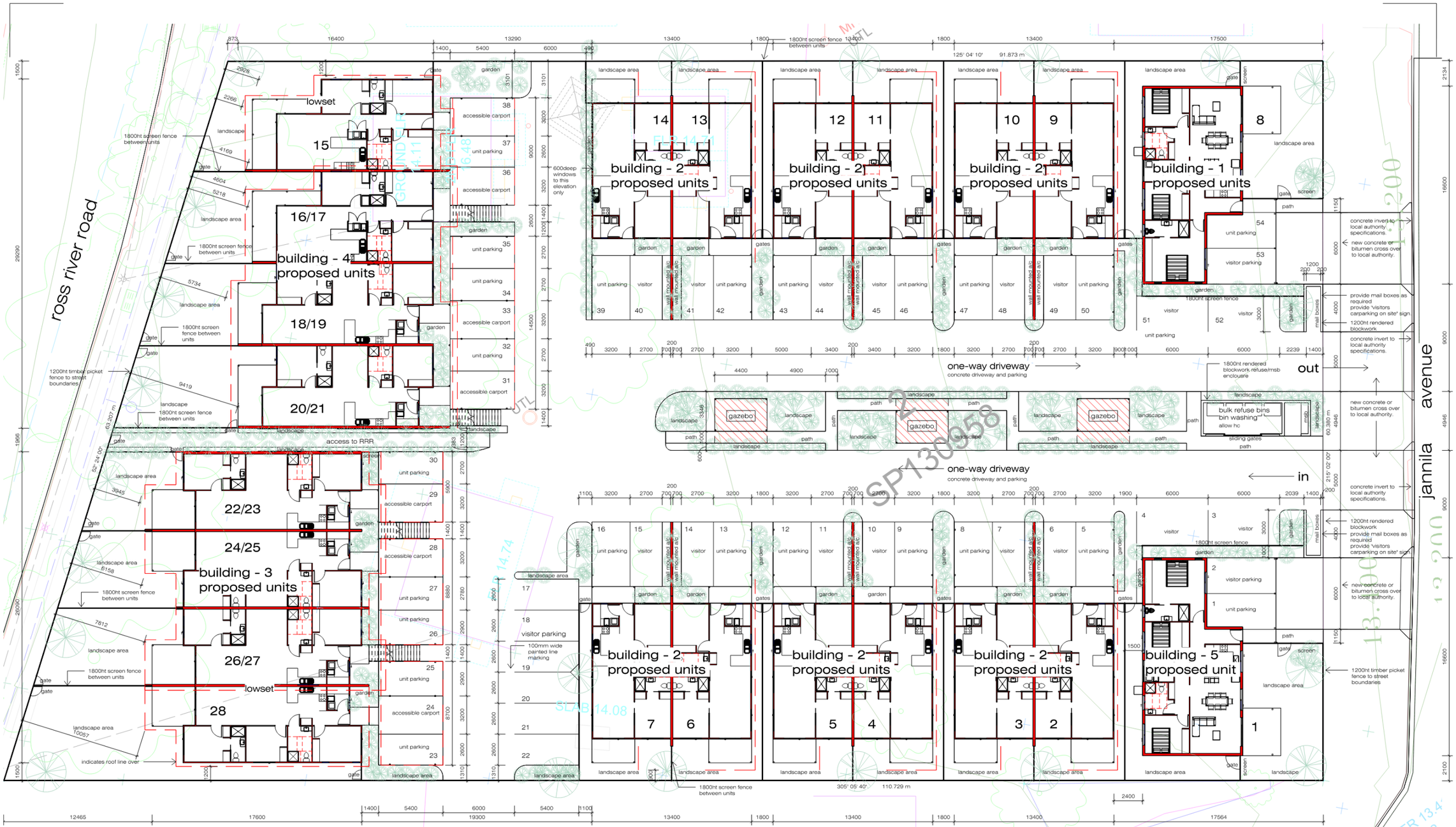
Revision Schedule

| No | Description | Date |
|---|---|---|
| 1 | revised site plans | 23.07.20 |

concepts Building Design
tel: 07 4728 3228

project:
Proposed Multiple Dwellings
for:
Kaenetto Invesments P/L
at:
500-505 Ross River Road
Cranbrook

| | |
|---|---|
| Issue Date | 05/2016 |
| Drawn | Author |
| scale | |
| sheet | sk_01 |
| | 25-022 |
| printed | 9/02/2026 3:48:26 PM |




3 site notes
1 : 100

**note**

1. provide hard standing area for bulk refuse or wheelie bins provide hose cock & hose
2. a/c condensers are to be located below fence lines and not located on the frontage of the buildings or on balconies and must not be visible from the street frontage or from adjoining properties.

landscaping - refer landscape consultant plans for details

PROPERTY DESCRIPTION
LOT No: Lot 2
PLAN No: SP 130958
SITE AREA: 6114M2
ASSES No: 2636028

sheet size = A1

Preliminary
not to be used for construction purposes

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Revision Schedule

| No | Description | Date |
|---|---|---|

concepts Building Design
tel: 07 4728 3228

project:
Proposed Multiple Dwellings
for:
Kaenetto Invesments P/L
at:
500-505 Ross River Road
Cranbrook

| | |
|---|---|
| Issue Date | dec 2025 |
| Drawn | Author |
| scale | As indicated |
| sheet | sk_02 |

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**Gross Area Schedule**

building

| Count | Name | Area | % |
|---|---|---|---|
| 1 | building - 1 | 156.24 m² | 3% |
| 1 | building - 1 | 156.24 m² | 3% |
| 1 | building - 2 | 152.76 m² | 3% |
| 1 | building - 2 | 152.76 m² | 3% |
| 1 | building - 2 | 152.76 m² | 3% |
| 1 | building - 2 | 152.76 m² | 3% |
| 1 | building - 2 | 152.76 m² | 3% |
| 1 | building - 2 | 152.76 m² | 3% |
| 1 | building - 3 | 364.79 m² | 6% |
| 1 | building - 4 | 365.69 m² | 6% |
| 10 | | 1959.52 m² | 32% |

**Gross Area Schedule**

hardstand

| Count | Name | Area | % |
|---|---|---|---|
| 1 | driveway/parking | 1989.12 m² | 33% |
| 1 | driveway/parking | 23.50 m² | 0% |
| 1 | driveway/parking | 23.69 m² | 0% |
| 1 | path | 4.04 m² | 0% |
| 1 | path | 4.04 m² | 0% |
| 1 | path | 2.10 m² | 0% |
| 1 | path | 5.04 m² | 0% |
| 1 | path | 5.04 m² | 0% |
| 1 | path | 5.04 m² | 0% |
| 1 | path | 8.06 m² | 0% |
| 1 | path | 5.04 m² | 0% |

**Gross Area Schedule**

| Count | Name | Area | % |
|---|---|---|---|
| 1 | path | 3.60 m² | 0% |
| 1 | path | 3.76 m² | 0% |
| 1 | path | 3.76 m² | 0% |
| 1 | path | 3.74 m² | 0% |
| 1 | path | 3.92 m² | 0% |
| 1 | path | 5.04 m² | 0% |
| 1 | path | 5.04 m² | 0% |
| 1 | path | 5.04 m² | 0% |
| 1 | path | 5.04 m² | 0% |
| 1 | path | 5.04 m² | 0% |
| 1 | path | 10.75 m² | 0% |
| 1 | path | 5.04 m² | 0% |

**Gross Area Schedule**

| Count | Name | Area | % |
|---|---|---|---|
| 1 | path | 5.04 m² | 0% |
| 1 | path | 8.10 m² | 0% |
| 1 | refuse bins/msb | 27.60 m² | 0% |
| 26 | | 2175.22 m² | 36% |

landscape

| | | | |
|---|---|---|---|
| 1 | gazebo | 12.08 m² | 0% |
| 1 | gazebo | 12.08 m² | 0% |
| 1 | gazebo | 12.08 m² | 0% |
| 1 | landscaping | 367.18 m² | 6% |
| 1 | landscaping | 171.17 m² | 3% |
| 1 | landscaping | 6.86 m² | 0% |
| 1 | landscaping | 16.13 m² | 0% |
| 1 | landscaping | 9.47 m² | 0% |

**Gross Area Schedule**

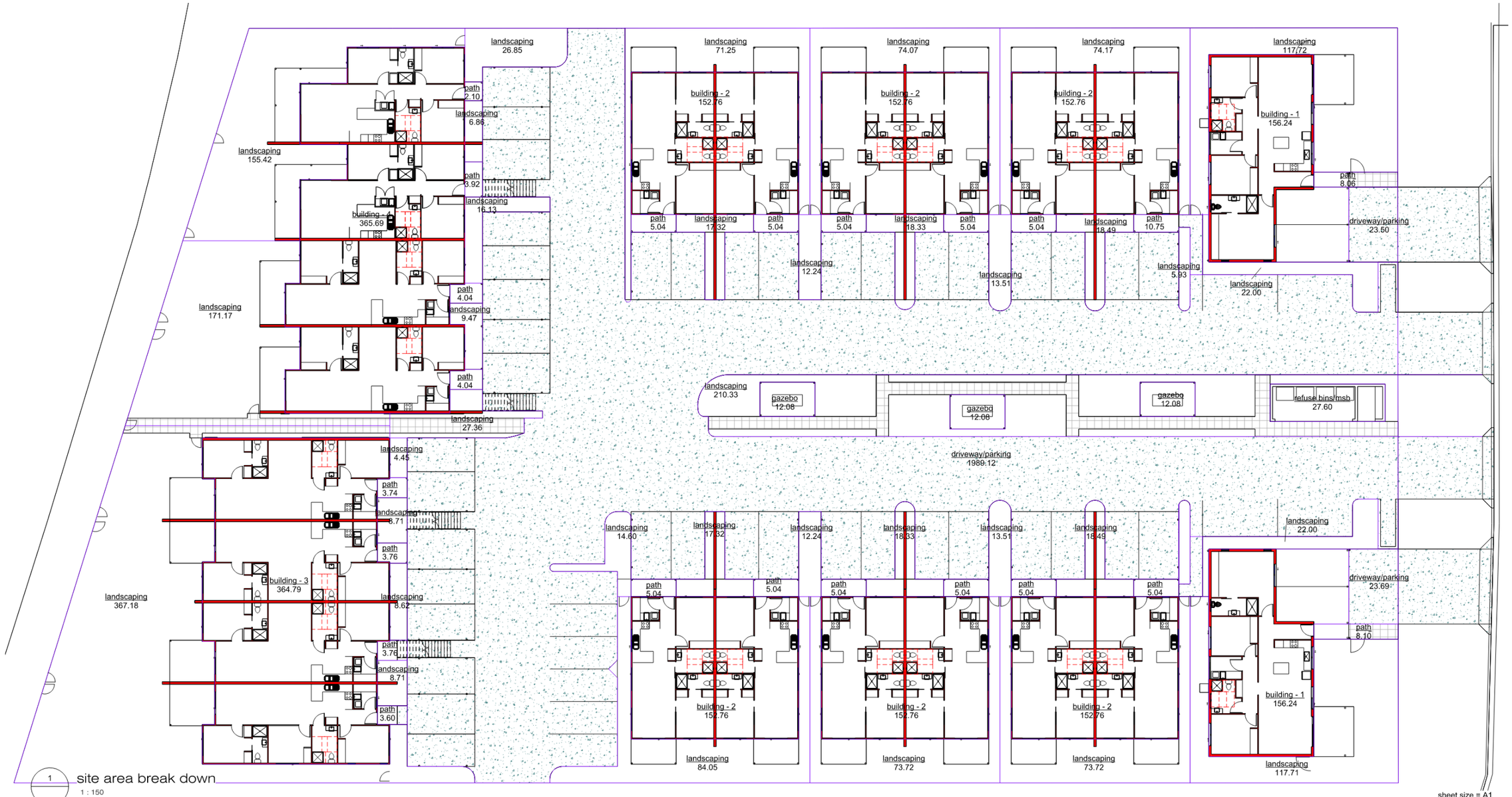
| Count | Name | Area | % |
|---|---|---|---|
| 1 | landscaping | 27.36 m² | 0% |
| 1 | landscaping | 4.45 m² | 0% |
| 1 | landscaping | 8.71 m² | 0% |
| 1 | landscaping | 8.62 m² | 0% |
| 1 | landscaping | 8.71 m² | 0% |
| 1 | landscaping | 71.25 m² | 1% |
| 1 | landscaping | 74.07 m² | 1% |
| 1 | landscaping | 74.17 m² | 1% |
| 1 | landscaping | 117.72 m² | 2% |
| 1 | landscaping | 22.00 m² | 0% |
| 1 | landscaping | 18.49 m² | 0% |
| 1 | landscaping | 5.93 m² | 0% |
| 1 | landscaping | 13.51 m² | 0% |

**Gross Area Schedule**

| Count | Name | Area | % |
|---|---|---|---|
| 1 | landscaping | 18.33 m² | 0% |
| 1 | landscaping | 12.24 m² | 0% |
| 1 | landscaping | 17.32 m² | 0% |
| 1 | landscaping | 210.33 m² | 3% |
| 1 | landscaping | 17.32 m² | 0% |
| 1 | landscaping | 14.60 m² | 0% |
| 1 | landscaping | 12.24 m² | 0% |
| 1 | landscaping | 18.33 m² | 0% |
| 1 | landscaping | 13.51 m² | 0% |
| 1 | landscaping | 18.49 m² | 0% |
| 1 | landscaping | 73.72 m² | 1% |
| 1 | landscaping | 73.72 m² | 1% |

**Gross Area Schedule**

| Count | Name | Area | % |
|---|---|---|---|
| 1 | landscaping | 84.05 m² | 1% |
| 1 | landscaping | 117.71 m² | 2% |
| 1 | landscaping | 155.42 m² | 3% |
| 1 | landscaping | 26.85 m² | 0% |
| 1 | landscaping | 22.00 m² | 0% |
| 38 | | 1968.23 m² | 32% |
| 74 | | 6102.97 m² | 100% |




1 site area break down
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sheet size = A1

Preliminary
not to be used for construction purposes

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NOTES:
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Revision Schedule

| No | Description | Date |
|---|---|---|
| 1 | revised site plans | 23.07.20 |

concepts Building Design
tel: 07 4728 3228

project:
Proposed Multiple Dwellings
for:
Kaenetto Invesments P/L
at:
500-505 Ross River Road
Cranbrook

| | |
|---|---|
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| Drawn | Author |
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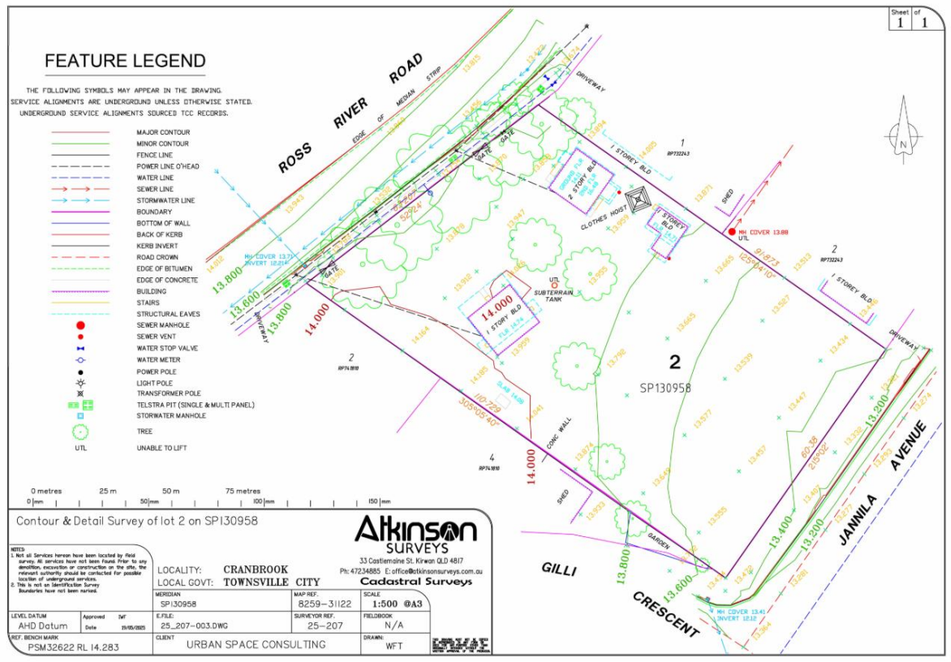



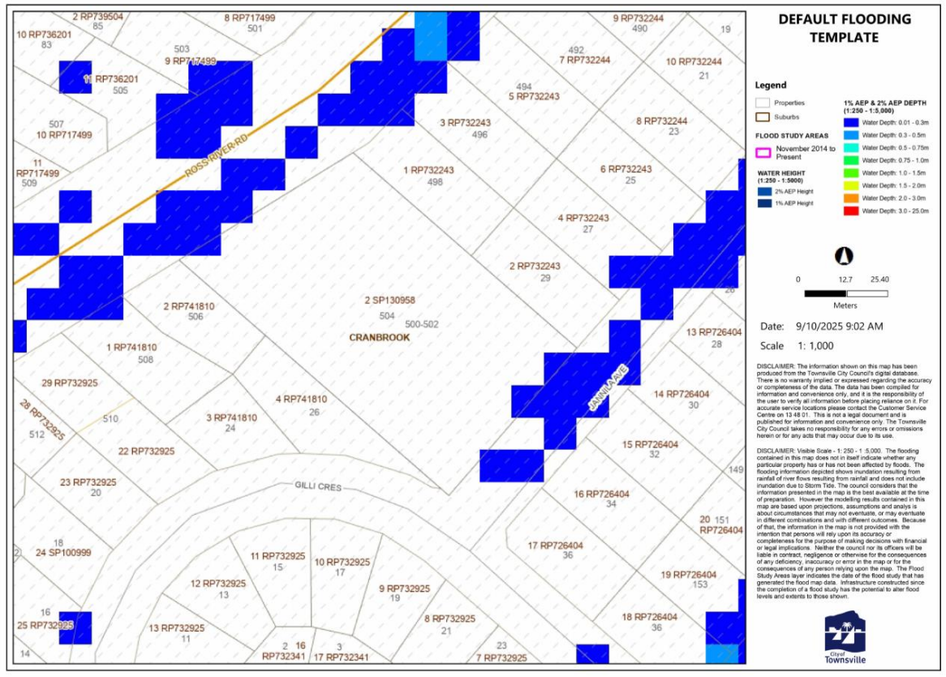


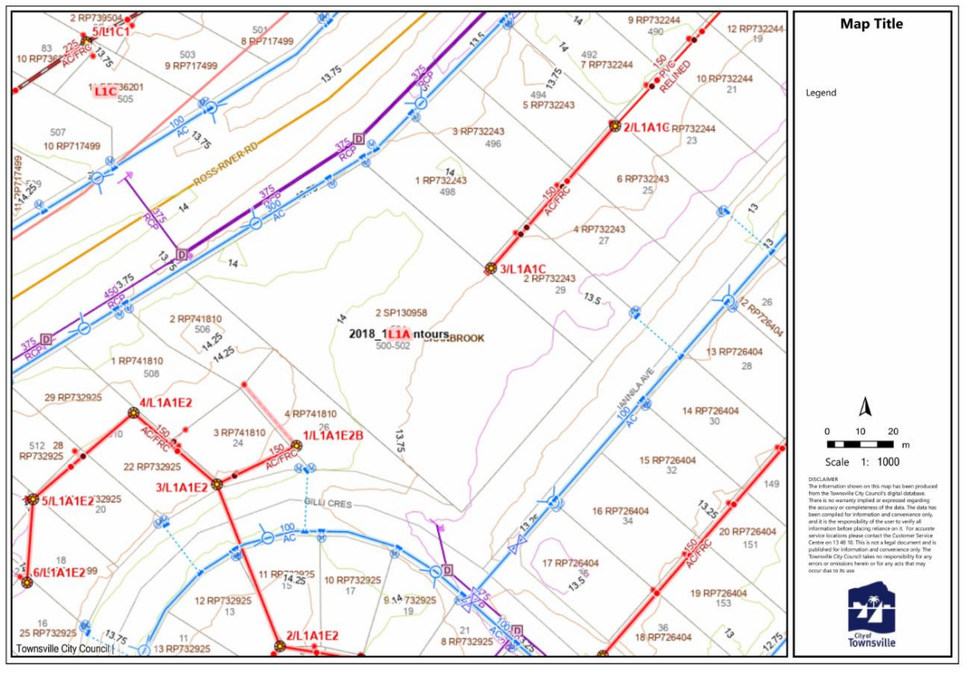


sheet size = A1

Preliminary
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Revision Schedule

| No | Description | Date |
|---|---|---|

concepts Building Design
tel: 07 4728 3228

project: Proposed Multiple Dwellings
for: Kaenetto Invesments P/L
at: 500-505 Ross River Road Cranbrook

| | |
|---|---|
| Issue Date | 01/22/23 |
| Drawn | Author |
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| sheet | sk_04 |

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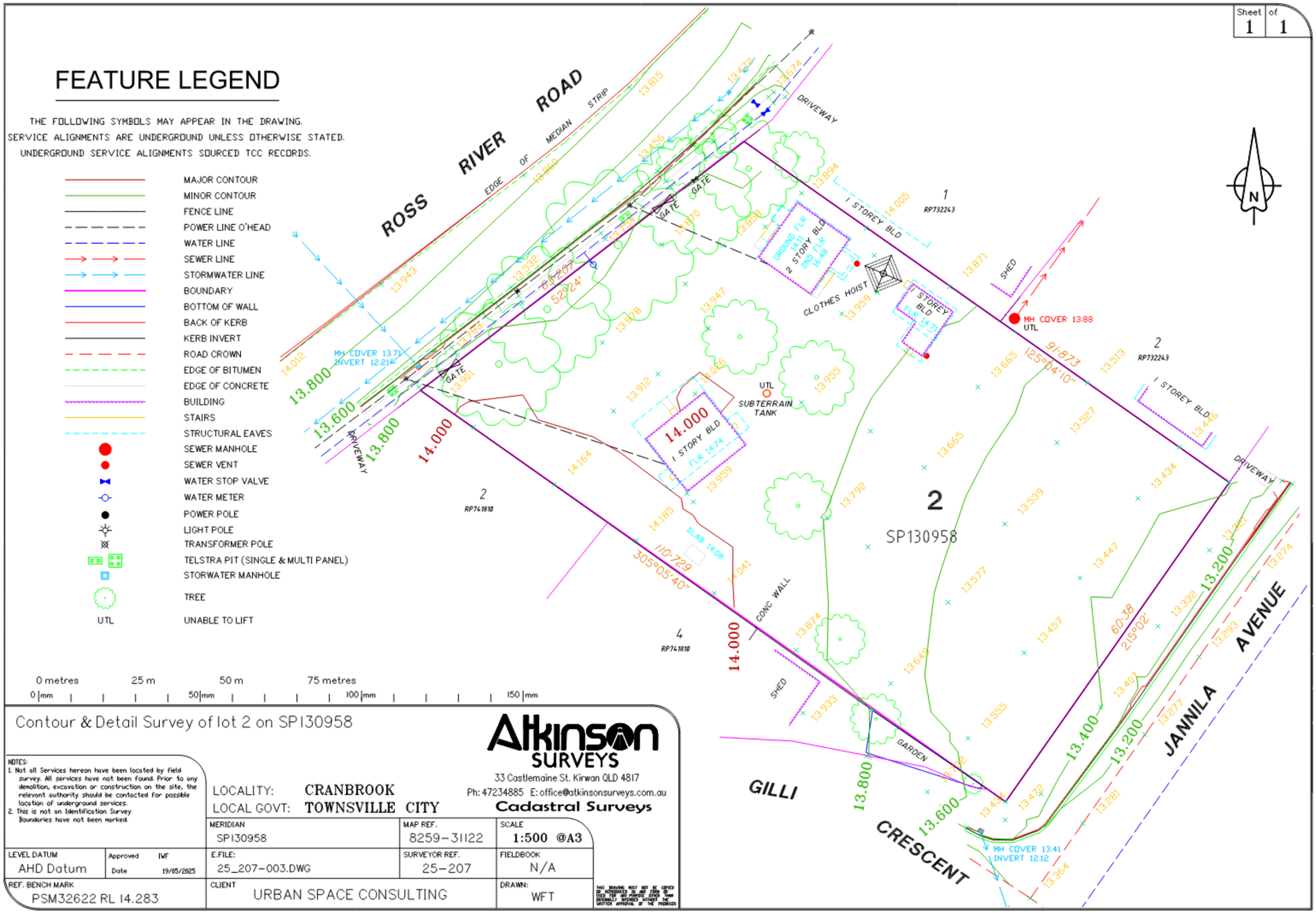
# APPENDIX B – Detailed Survey

Sheet 1 of 1

# FEATURE LEGEND

THE FOLLOWING SYMBOLS MAY APPEAR IN THE DRAWING.
SERVICE ALIGNMENTS ARE UNDERGROUND UNLESS OTHERWISE STATED.
UNDERGROUND SERVICE ALIGNMENTS SOURCED TCC RECORDS.

- MAJOR CONTOUR
- MINOR CONTOUR
- FENCE LINE
- POWER LINE O'HEAD
- WATER LINE
- SEWER LINE
- STORMWATER LINE
- BOUNDARY
- BOTTOM OF WALL
- BACK OF KERB
- KERB INVERT
- ROAD CROWN
- EDGE OF BITUMEN
- EDGE OF CONCRETE
- BUILDING
- STAIRS
- STRUCTURAL EAVES
- SEWER MANHOLE
- SEWER VENT
- WATER STOP VALVE
- WATER METER
- POWER POLE
- LIGHT POLE
- TRANSFORMER POLE
- TELSTRA PIT (SINGLE & MULTI PANEL)
- STORWATER MANHOLE
- TREE
- UTL — UNABLE TO LIFT




Contour & Detail Survey of lot 2 on SP130958

Atkinson SURVEYS
33 Castlemaine St. Kirwan QLD 4817
Ph: 47234885 E: office@atkinsonsurveys.com.au
Cadastral Surveys

NOTES:
1. Not all Services hereon have been located by field survey. All services have not been found. Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of underground services.
2. This is not an Identification Survey Boundaries have not been marked.

| | | | |
|---|---|---|---|
| LOCALITY: CRANBROOK | | | |
| LOCAL GOVT: TOWNSVILLE CITY | | | |
| MERIDIAN SP130958 | | MAP REF. 8259-31122 | SCALE 1:500 @A3 |
| LEVEL DATUM AHD Datum | Approved IWF Date 19/05/2025 | E.FILE: 25_207-003.DWG | SURVEYOR REF. 25-207 | FIELDBOOK N/A |
| REF. BENCH MARK PSM32622 RL 14.283 | | CLIENT URBAN SPACE CONSULTING | | DRAWN: WFT |

# APPENDIX C – Preliminary Engineering Services Drawing


## NOTES:

FOR OVERARCHING NOTES REFER PROJECT NOTES.

## LEGEND:

- EXISTING OVERHEAD ELECTRICITY
- EXISTING UNDERGROUND TELECOMMUNICATIONS
- EXISTING WATER MAIN
- EXISTING STORMWATER DRAINAGE
- EXISTING SEWER MAIN
- EXISTING LOT BOUNDARY
- EXISTING ROAD CENTRELINE
- EXISTING EDGE OF BITUMEN
- EXISTING FENCE
- EXISTING BUILDING
- PROPOSED OVERLAND FLOW
- PROPOSED BUILDING
- PROPOSED STORMWATER DRAINAGE, REFER STORMWATER LAYOUT PLAN FOR DETAILS
- PROPOSED EXTERNAL WALL REFER STRUCTURAL DRAWING FOR DETAILS
- PLXX.XX — SPOT LEVEL AT PAVEMENT
- ExXX.XX — SPOT LEVEL AT EXISTING
- BKC — PROPOSED BARRIER KERB AND CHANNEL

## HATCHING LEGEND:

- EXTENT OF CONCRETE PATHWAY, REFER PROJECT NOTES FOR DETAILS.
- EXTENT OF CONCRETE PAVEMENT - MEDIUM DUTY, REFER PROJECT NOTES FOR DETAILS.
- EXTENT OF LANDSCAPING AREA, REFER TO ARCHITECTS PLANS FOR DETAILS.
- EXTENT OF PROPOSED BUILDING, REFER ARCHITECTS PLANS FOR DETAILS.

## MINIMUM FINISHED FLOOR LEVELS:

ROSS RIVER ROAD SIDE:
300mm ABOVE THE 1% AEP FLOOD LEVEL.
13.930m + 0.300m = 14.230m AHD

JANILLA AVENUE SIDE:
300mm ABOVE THE 1% AEP FLOOD LEVEL.
13.310m + 0.300m = 13.610m AHD

ATTENTION: FOR BEST RESULTS AND ACCURATE UNDERSTANDING OF THESE DRAWINGS, PLEASE PRINT IN COLOUR

## LEVEL DATUM

PSM32622
LEVEL DATUM RL14.283 AHD DERIVED
SITE COORDINATES E473479.212 N7864859.714

**AMENDMENTS**

| Rev: | Date: | Description: | By: | Appd: |
|---|---|---|---|---|
| A | 06.03.26 | REVISED SD ISSUE | LJM | PP |

IN ASSOCIATION WITH

**KAENETTO INVESTMENTS**

**500 ROSS RIVER ROAD CRANBROOK**
500 - 504 ROSS RIVER RD, CRANBROOK

**GENERAL ARRANGEMENT**

STP CONSULTANTS
BRISBANE CAIRNS ROCKHAMPTON
TOWNSVILLE MACKAY WHITSUNDAYS
www.stpconsultants.com.au 07 3539 8300

Design: PP
Drawn: LJM
Approved: PP
RPEQ No: 13231

1:250 0 2.5 5 7.5 10 12.5m A1

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR AND IS REQUIRED TO BE PRINTED IN COLOUR.



**CIVIL**

| Job No: | Drawing No: | Rev: |
|---|---|---|
| STP25-0597 | C103 | A |

**NOT FOR CONSTRUCTION**

File Path: C:\Project Files\STP25\STP25-0597 500 Ross River Road Cranbrook\Drawings\STP25-0597-04.dwg


## NOTES:

FOR OVERARCHING NOTES REFER PROJECT SPECIFICATIONS.

## LEGEND:

- EXISTING UNDERGROUND ELECTRICITY
- EXISTING OVERHEAD ELECTRICITY
- EXISTING UNDERGROUND TELECOMMUNICATIONS
- EXISTING UNDERGROUND NBN
- EXISTING WATER MAIN
- EXISTING STORMWATER DRAINAGE
- EXISTING SEWER MAIN
- EXISTING LOT BOUNDARY
- EXISTING LOT EASEMENT
- EXISTING OVERLAND FLOW
- EXISTING TOE OF BATTER
- EXISTING TOP OF BATTER
- EXISTING ROAD CENTRELINE
- EXISTING EDGE OF BITUMEN
- EXISTING FENCE
- EXISTING BUILDING
- PROPOSED OVERLAND FLOW
- PROPOSED TOE OF BATTER
- PROPOSED TOP OF BATTER
- PROPOSED BUILDING
- PROPOSED STORMWATER DRAINAGE, REFER STORMWATER LAYOUT PLAN FOR DETAILS
- PROPOSED WATER MAIN
  REFER HYDRAULIC DRAWINGS FOR DETAILS
- PROPOSED SEWER MAIN, REFER SEWER RETICULATION DRAWINGS FOR DETAILS.
- DENOTES CONCRETE GRATED INLET PIT
  REFER MISCELLANEOUS DRAWINGS FOR DETAILS
- DENOTES POLYPROPYLENE (PE) GRATED INLET PIT
  REFER MISCELLANEOUS DRAWINGS FOR DETAILS
- DENOTES CATCHMENT BOUNDARY
- X/X 0.000ha — DENOTES CATCHMENT LABEL
- X/X — DENOTES PIT NUMBER

ATTENTION: FOR BEST RESULTS AND ACCURATE UNDERSTANDING OF THESE DRAWINGS, PLEASE PRINT IN COLOUR.

## LEVEL DATUM

PSM32622
LEVEL DATUM RL14.283 AHD DERIVED
SITE COORDINATES E473479.212 N7864859.714

**AMENDMENTS**

| Rev: | Date: | Description: | By: | Appd: |
|---|---|---|---|---|
| A | 26.06.25 | SD ISSUE | LJM | PP |
| B | 06.03.26 | REVISED SD ISSUE | LJM | PP |

IN ASSOCIATION WITH

**KAENETTO INVESTMENTS**

**500 ROSS RIVER ROAD CRANBROOK**
500 - 504 ROSS RIVER RD, CRANBROOK

**STORMWATER DRAINAGE PLAN**

STP CONSULTANTS
BRISBANE CAIRNS ROCKHAMPTON TOWNSVILLE MACKAY WHITSUNDAYS
www.stpconsultants.com.au 07 3539 8300

Design: PP
Drawn: LJM
Approved: PP
RPEQ No: 13231

1:250 0 2.5 5 7.5 10 12.5m A1

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR AND IS REQUIRED TO BE PRINTED IN COLOUR.



**CIVIL**

| Job No: | Drawing No: | Rev: |
|---|---|---|
| STP25-0597 | C501 | B |

**NOT FOR CONSTRUCTION**

File Path: G:\Project Files\STP25\STP25-0597 500 Ross River Road Cranbrook\Drawings\STP25-0597-0900.dwg

# APPENDIX D – Water and Sewer Network Analysis


# 500-504 ROSS RIVER RD, CRANBROOK UNIT DEVELOPMENT

## WATER SUPPLY & SEWERAGE PLANNING REPORT

**Date: 4 March 2026**
**(Revision A)**

## TABLE OF CONTENTS



## APPENDICES



| REPORT AUTHORISATION | | | | |
|---|---|---|---|---|
| **Revision** | **Revision Date** | **Details** | **Prepared by** | **Signature** |
| A | 04/03/2026 | Original Report | Desmond Moseley (RPEQ 7565) |  |

# 1 INTRODUCTION

A residential unit development is proposed at 500 to 504 Ross River Rd, Cranbrook. This site is located on the south/eastern side of Ross River Rd and near the intersection with Louise St. The southern boundary of the site has a frontage on Jannila Ave.

The site is illustrated on the extract from Queensland Globe below.


**Figure 1.1 – Development Site Location**

The proposed residential unit development will have a combination of single and two story residential units. There is proposed to be a total of 28 residential units on the development site. Figure 1.2 below illustrates the proposed development layout. The development plans are provided in Appendix A.

To ensure the development can be adequately serviced with a potable water supply and sewage system in accordance with Council standards, an assessment of the system capacities have been undertaken. This report summarises the assessment of the existing water and sewerage network with this illustrating:

- The water modelling shows the existing DN300 PVC water main along the southern side of Ross River Rd and the frontage of the development site is adequately sized to service the development. The assessment has been based on the water supply being off the existing DN300 water main on the Ross River Rd frontage of the development site. This is because the existing water service connection to the site and the other adjacent residential properties are already off the existing DN300 water main.
- There is an existing DN150 gravity sewer that services the development site. The existing DN150 sewer extends to the north east before increasing to a DN300 sewer that continues

onto existing PS L1A (Barellan St). The SewerGEMS network modelling illustrates that the existing gravity sewer system has sufficient capacity to service the development.

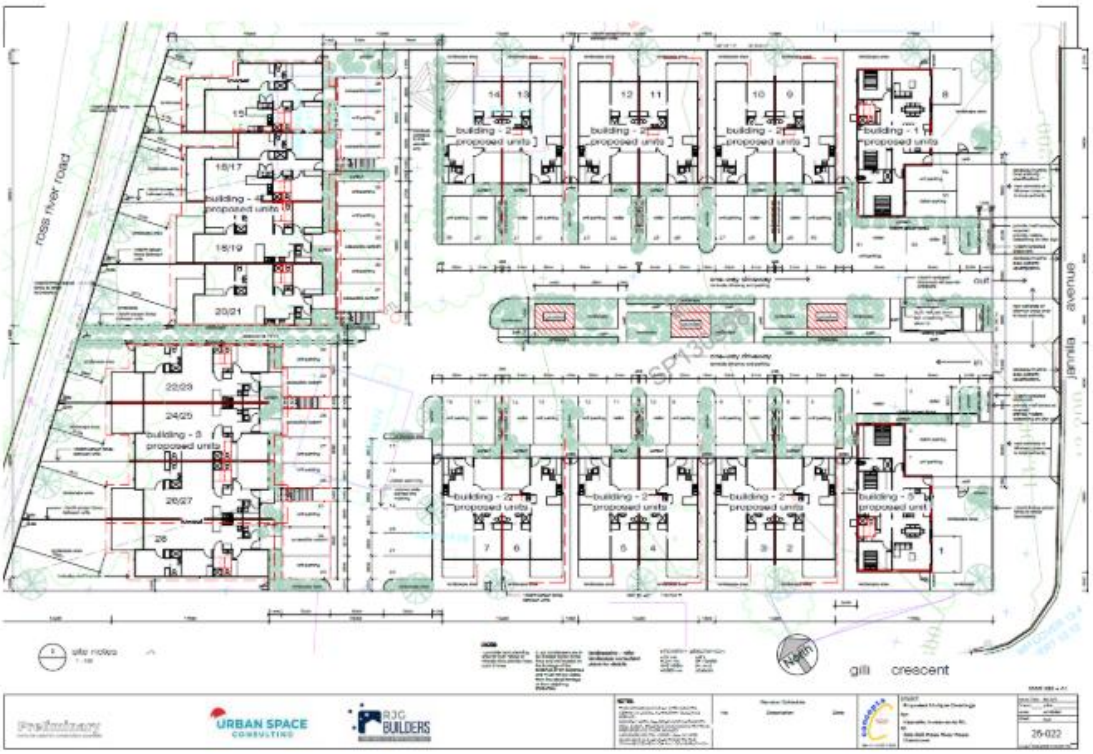



**Figure 1.2 – Development Layout Plan**

The water network modelling and sewer system capacity assessment undertaken for the proposed residential unit development is summarised in the following report sections.

## 2 POPULATION ASSESSMENT

The following Table 2.1 provides the equivalent population assessment for the proposed residential unit development on 500 to 504 Ross River Rd. The equivalent population for each residential unit is in accordance with the CTM Code.

**Table 2.1 –Population Assessment**

| | Number | Rate | EP |
|---|---|---|---|
| Residential Units | 28 units | 1.8 EP/lot | 50.4 EP |

The above equivalent has been used in the water & sewer infrastructure capacity assessment.

# 3 WATER SUPPLY PLANNING

## 3.1 Water Demand

Water demands have been calculated in accordance with Townsville City Council planning scheme and CTM Code. The following table provides the "residential" water demand parameters from the CTM Code for each equivalent person (EP).

**Table 3.1 - Water Supply Unit Demand Parameters**

| Parameter | Unit Demand | Peaking Factor |
|---|---|---|
| Average Day (AD) | 600 L/day/EP | |
| Mean Day Max Month (MDMM) | 900 L/day/EP | 1.5 AD |
| Peak Day (PD) | 1125 L/day/EP | 1.25 MDMM |
| Peak Hour (PH) | 0.033 L/s/EP | 2.56 PD |

The peak hour residential water demands have been applied to the proposed unit development, giving a peak water demand of 50.4 EP x 0.033 l/s/EP = 1.68 l/s.

In addition to the above, as the development is residential, the 15 l/s residential fire flow is applicable in accordance with the CTM Code. This fire flow has been used to assess the theoretical performance of the water network.

## 3.2 Water Supply Assessment & Network Modelling

The existing site for the proposed residential unit development is on the south of Ross River Rd in Cranbrook. The existing water infrastructure that services the site includes:

- A 300 AC water main along the southern footpath of Ross River Rd. This is along the frontage of the proposed development.
- The DN300 AC water main on Ross River Rd transitions to a DN300 CI trunk water main that continues along the southern side of Ross River Rd.
- The existing DN300 CI water main extends to the intersection of Nathan St where it connects to a DN600 AC water main that runs along Nathan St.
- The DN600 AC trunk water main is supplied water from the 2 x 40 ML Douglas 1A/1B reservoirs.

The following extract from the Council GIS illustrates the existing water infrastructure that services the Ross River Rd and Nathan St area of Cranbrook.

The water assessment has been based on the water supply to the residential unit development being off the existing DN300 water main on the Ross River Rd frontage of the development site. This is because the existing water service connection to the site and the other adjacent residential properties are already off the existing DN300 water main.


**Figure 3.1 – Council GIS Plot**

Theoretical water network modelling has been performed to assess the capacity of the existing reticulation network. The modelling was undertaken using the Council's WaterGEMS network model for both the peak hour demands and fire flows.

The WaterGEMS network modelling results with the inclusion of the water demands from the proposed development shows:

- The existing DN300 AC water main along Ross River Rd frontage of the development site is shown to be adequately sized to service the development with peak hour and fire flows.
- The peak hour pressures at 6:30 pm (ie the peak residential demand period) are reduced to 376 kPa. This meets the minimum pressure requirement of 220 kPa.
- The velocity along the DN300 PVC water main for peak hour demands is up to 0.37 m/s. This achieves the CTM Code standard of being less than 2.5 m/s. The headloss gradient along the existing DN300 PVC water main is up to 0.001 m/m. These meet the requirements of being less than 0.005 m/m.
- With the inclusion of the 15 l/s "Residential" fire flow the water pressures are reduced to 363 kPa within the water main. This is the pressure at 6:30 pm and is concurrent with the peak residential demand period and meets the minimum pressure requirement of 120 kPa.
- The velocity along the DN300 PVC reticulation main on the Ross River Rd frontage of the development site with the including of the 15 l/s residential fire flow is up to 0.52 m/s. This velocity is well within the CTM Code standard of a maximum of 4.0 m/s for fire flows.
- The WaterGEMS figure and results table are provided in Appendix B.

The above theoretical water network modelling shows that the proposed development is able to be serviced with a reticulated water supply that meets Council's standards with no upgrades required.

The following figure illustrates the peak hour demands and residual water pressure at the proposed residential unit development site.

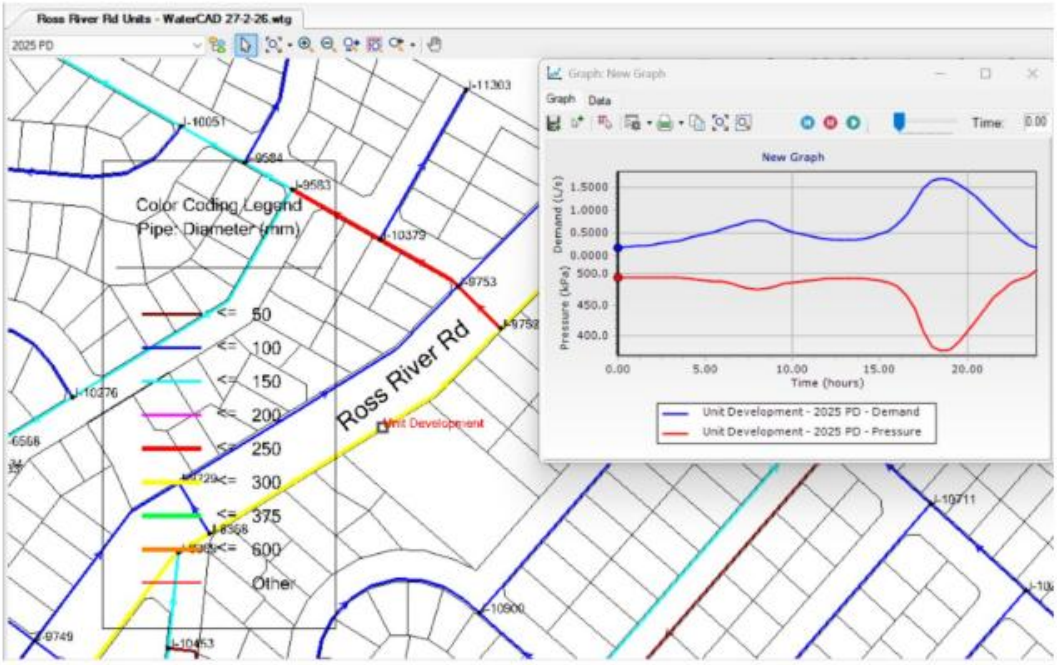



**Figure 3.2 – Peak Hour Water Demand & Pressures**

The following figure illustrates the water pressure at the development site with the inclusion of the 15 l/s residential fire flows.

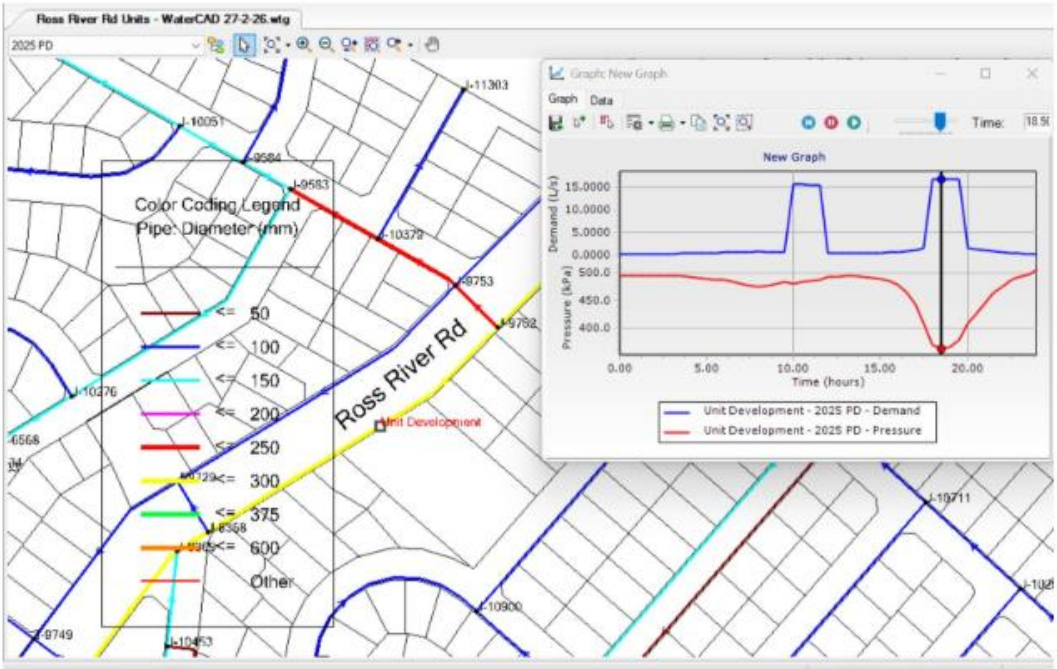



**Figure 3.3 – Residential Fire Flow Water Demand & Pressures**

# 4 SEWAGE SYSTEM PLANNING

The existing site for the proposed residential unit development is currently serviced with a reticulated gravity sewer system. The existing gravity sewer system consists of:

- A DN150 AC sewer is located on the north eastern boundary of the development site. Existing MH 3/L1A1C is located on the DN150 AC sewer and within the development site. The DN150 sewer extends to the north east to MH 5/L1A1.
- The sewer increases to a DN300 sewer which extends to the north east (parallel to Ross River Rd) through to PS L1A (Barellan) that is located opposite the intersection of Jandera St and Barellan St. PS L1A pumps sewage to the east to discharge into a trunk sewer in the catchment of PS L14A.

Figure 4.1 below is a plot from the Council GIS that illustrates the existing DN150 & DN300 sewer system that services the development site. The capacity of the existing sewer system is provided in the following report sections.

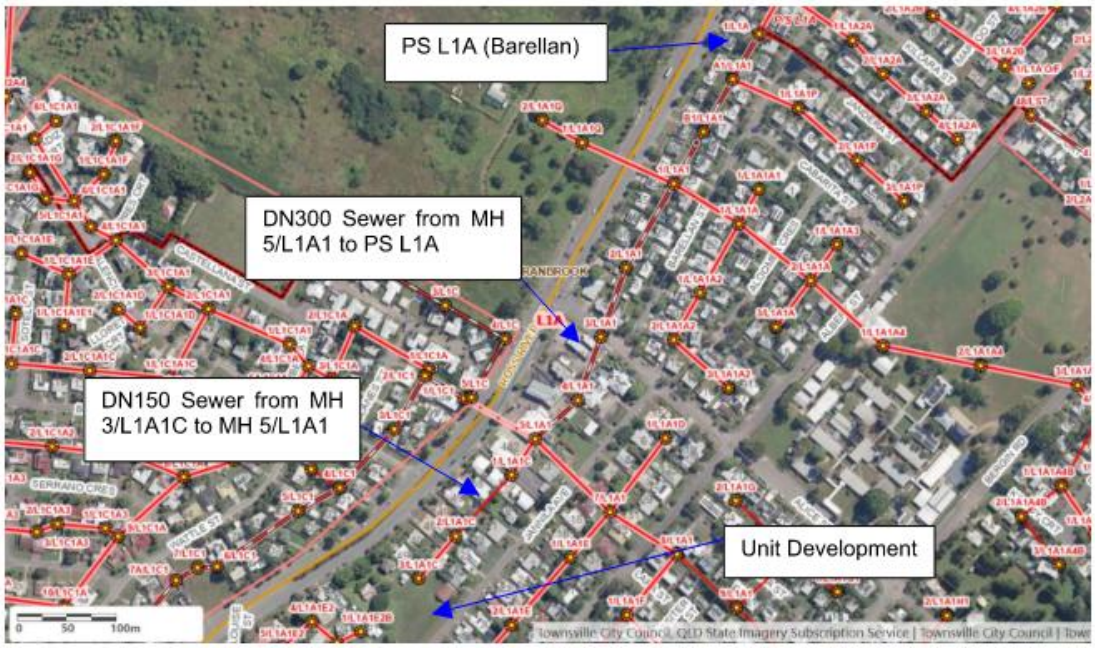



**Figure 4.1 – GIS Plot of Existing Sewer System**

The capacity and performance of the existing gravity sewer system to service the unit development is provided in the following section.

## 4.1 Sewage Infrastructure Capacity

The capacity of the existing gravity sewer system to cater for the proposed residential unit development was assessed using the SewerGEMS model developed for the Louisa suburbs of Townsville.

The SewerGEMS model includes the existing reticulation and trunk gravity sewer system from the development site through to existing PS L1A (Barellan St). The additional residential equivalent population has been added to MH 3/L1A1C which is located within the proposed development site.

The additional residential equivalent population loading on MH 3/L1A1C is illustrated in the extract from the SewerGEMS model on Figure 4.2 below.

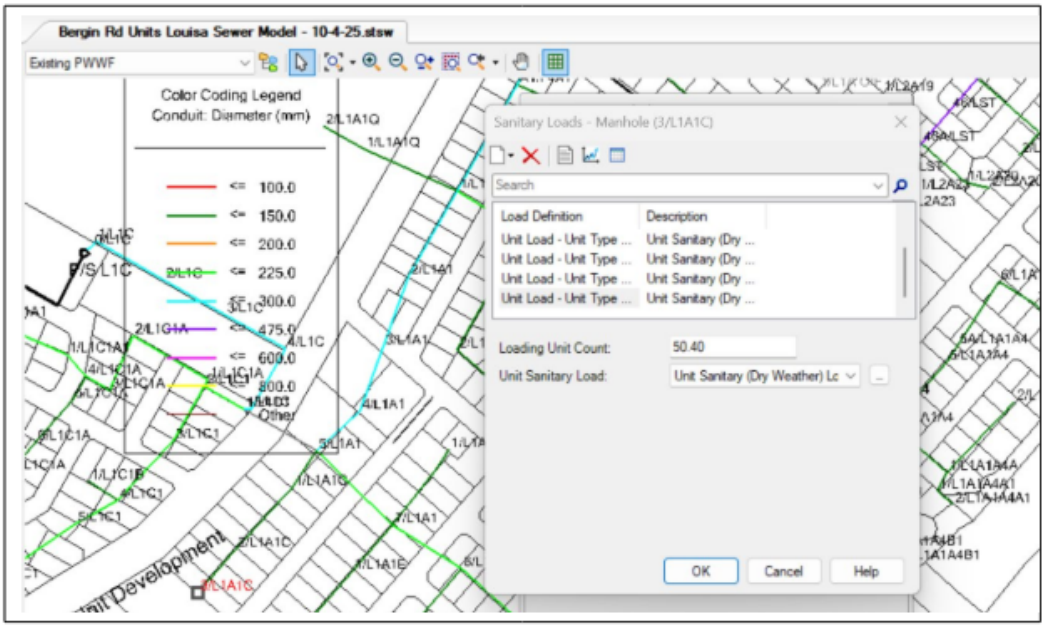



**Figure 4.2 – Additional Residential Loading on MH 3/L1A1C**

With the inclusion of the additional equivalent population loading on the existing gravity sewer system, the SewerGEMS model has illustrated:

- The existing DN150 sewer from MH 3/L1A1C to MH 5/L1A1 (being the reticulation gravity sewer that will service the development site) flows up to 21% full for the peak wet weather flows.
- The existing DN300 sewer from MH 5/L1A1 to MH 1/L1A (being the trunk sewer that runs to the north-east near Ross River Rd) flows up to 46% full for the peak wet weather flows.
- The final section is an existing DN300 trunk sewer that runs from MH 1/L1A into PS L1A flows up to 41% full for the peak wet weather flows.
- All the existing sewers easily flow less than 75% full which is the maximum value allowable in the CTM code.

The following Figure 4.3 provides the flows and performance of the existing gravity sewer system with the inclusion of the additional loading from the proposed residential unit development. A larger version of the modelling results is provided in Appendix C.

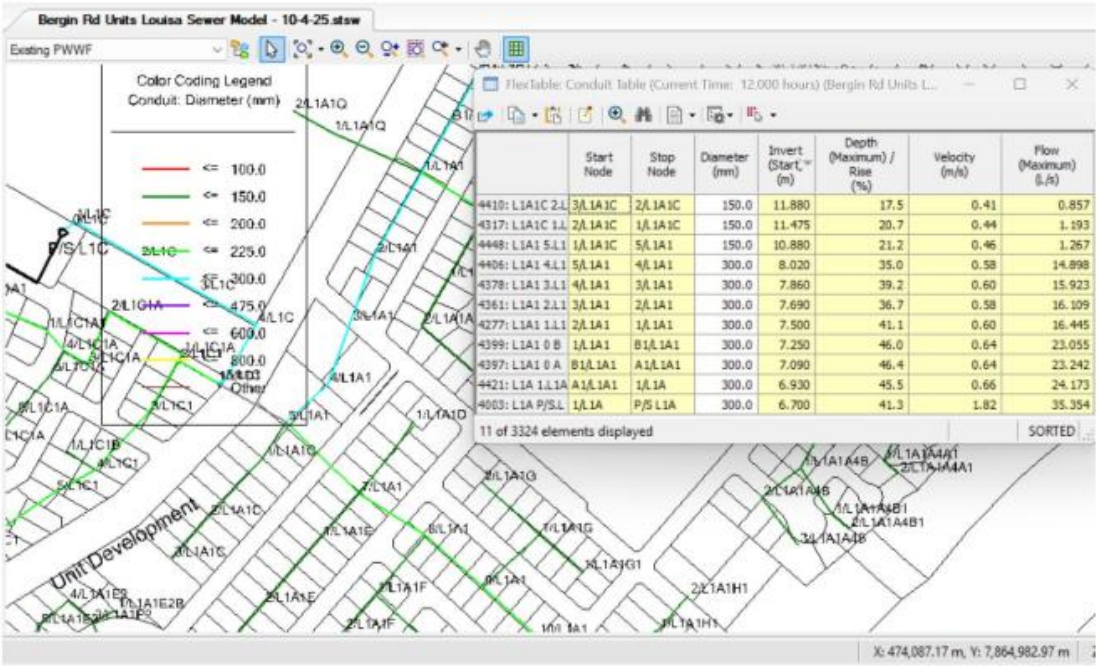



**Figure 4.3 – SewerGEMS Modelling Results**

The above assessment illustrates the existing gravity sewer system has sufficient capacity to cater for the proposed residential unit development at No 500 Ross River Rd, Cranbrook.

# APPENDIX A
# 500 ROSS RIVER RD DEVELOPMENT PLANS

Gross Area Schedule

| Count | Name | Area | % |
|---|---|---|---|
| building | | | |
| 1 | building - 1 | 156.24 m² | 3% |
| 1 | building - 1 | 156.24 m² | 3% |
| 1 | building - 2 | 152.76 m² | 3% |
| 1 | building - 2 | 152.76 m² | 3% |
| 1 | building - 2 | 152.76 m² | 3% |
| 1 | building - 2 | 152.76 m² | 3% |
| 1 | building - 2 | 152.76 m² | 3% |
| 1 | building - 2 | 152.76 m² | 3% |
| 1 | building - 3 | 364.79 m² | 6% |
| 1 | building - 4 | 365.69 m² | 6% |
| 10 | | 1959.52 m² | 32% |

Gross Area Schedule

| Count | Name | Area | % |
|---|---|---|---|
| hardstand | | | |
| 1 | driveway/parking | 1989.12 m² | 33% |
| 1 | driveway/parking | 23.50 m² | 0% |
| 1 | driveway/parking | 23.69 m² | 0% |
| 1 | path | 4.04 m² | 0% |
| 1 | path | 4.04 m² | 0% |
| 1 | path | 2.10 m² | 0% |
| 1 | path | 5.04 m² | 0% |
| 1 | path | 5.04 m² | 0% |
| 1 | path | 8.06 m² | 0% |
| 1 | path | 5.04 m² | 0% |

Gross Area Schedule

| Count | Name | Area | % |
|---|---|---|---|
| 1 | path | 3.60 m² | 0% |
| 1 | path | 3.76 m² | 0% |
| 1 | path | 3.76 m² | 0% |
| 1 | path | 3.74 m² | 0% |
| 1 | path | 3.92 m² | 0% |
| 1 | path | 5.04 m² | 0% |
| 1 | path | 5.04 m² | 0% |
| 1 | path | 8.04 m² | 0% |
| 1 | path | 5.04 m² | 0% |
| 1 | path | 5.04 m² | 0% |
| 1 | path | 10.75 m² | 0% |
| 1 | path | 5.04 m² | 0% |

Gross Area Schedule

| Count | Name | Area | % |
|---|---|---|---|
| 1 | path | 5.04 m² | 0% |
| 1 | path | 8.10 m² | 0% |
| 1 | refuse bins/msb | 27.60 m² | 0% |
| 26 | | 2175.22 m² | 36% |
| landscape | | | |
| 1 | gazebo | 12.08 m² | 0% |
| 1 | gazebo | 12.08 m² | 0% |
| 1 | gazebo | 12.08 m² | 0% |
| 1 | gazebo | 12.08 m² | 0% |
| 1 | landscaping | 367.18 m² | 6% |
| 1 | landscaping | 171.17 m² | 3% |
| 1 | landscaping | 8.86 m² | 0% |
| 1 | landscaping | 16.13 m² | 0% |
| 1 | landscaping | 9.47 m² | 0% |

Gross Area Schedule

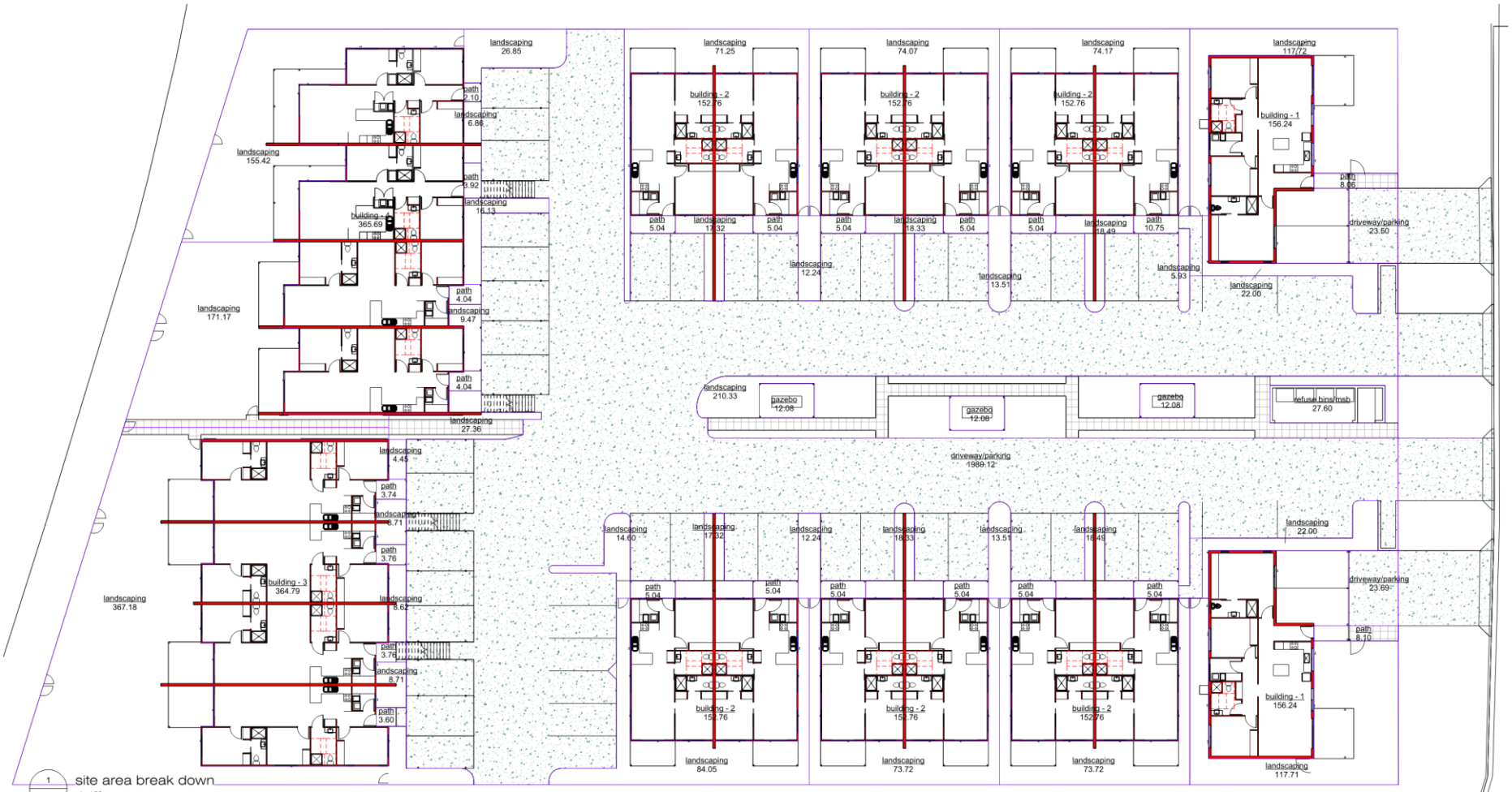
| Count | Name | Area | % |
|---|---|---|---|
| 1 | landscaping | 27.36 m² | 0% |
| 1 | landscaping | 4.45 m² | 0% |
| 1 | landscaping | 8.71 m² | 0% |
| 1 | landscaping | 8.62 m² | 0% |
| 1 | landscaping | 8.71 m² | 0% |
| 1 | landscaping | 71.25 m² | 1% |
| 1 | landscaping | 74.07 m² | 1% |
| 1 | landscaping | 74.17 m² | 1% |
| 1 | landscaping | 117.72 m² | 2% |
| 1 | landscaping | 22.00 m² | 0% |
| 1 | landscaping | 18.49 m² | 0% |
| 1 | landscaping | 5.93 m² | 0% |
| 1 | landscaping | 13.51 m² | 0% |

Gross Area Schedule

| Count | Name | Area | % |
|---|---|---|---|
| 1 | landscaping | 18.33 m² | 0% |
| 1 | landscaping | 12.24 m² | 0% |
| 1 | landscaping | 17.32 m² | 0% |
| 1 | landscaping | 210.33 m² | 3% |
| 1 | landscaping | 17.32 m² | 0% |
| 1 | landscaping | 14.60 m² | 0% |
| 1 | landscaping | 12.24 m² | 0% |
| 1 | landscaping | 18.33 m² | 0% |
| 1 | landscaping | 13.51 m² | 0% |
| 1 | landscaping | 18.49 m² | 0% |
| 1 | landscaping | 73.72 m² | 1% |
| 1 | landscaping | 73.72 m² | 1% |

Gross Area Schedule

| Count | Name | Area | % |
|---|---|---|---|
| 1 | landscaping | 84.05 m² | 1% |
| 1 | landscaping | 117.71 m² | 2% |
| 1 | landscaping | 155.42 m² | 3% |
| 1 | landscaping | 26.85 m² | 0% |
| 1 | landscaping | 22.00 m² | 0% |
| 38 | | 1968.23 m² | 32% |
| 74 | | 6102.97 m² | 100% |




1 site area break down
1 : 150

sheet size = A1

Preliminary
not to be used for construction purposes

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COMPLY WITH ALL RELEVANT AUTHORITY REQ. & BSA. FIGURED DIMENSIONS TO TAKE PRECEDENCE OVER SCALED MEASUREMENTS. VERIFY ALL ON SITE DIMENSIONS & LEVELS PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION.

Revision Schedule

| No | Description | Date |
|---|---|---|
| 1 | reviewed site plans | 23.07.20 |

concepts
tel: 07 4728 3228

project: Proposed Multiple Dwellings
for: Kaenetto Invesments P/L
at: 500-505 Ross River Road Cranbrook

25-022

Issue Date 11/0/07
Drawn Author
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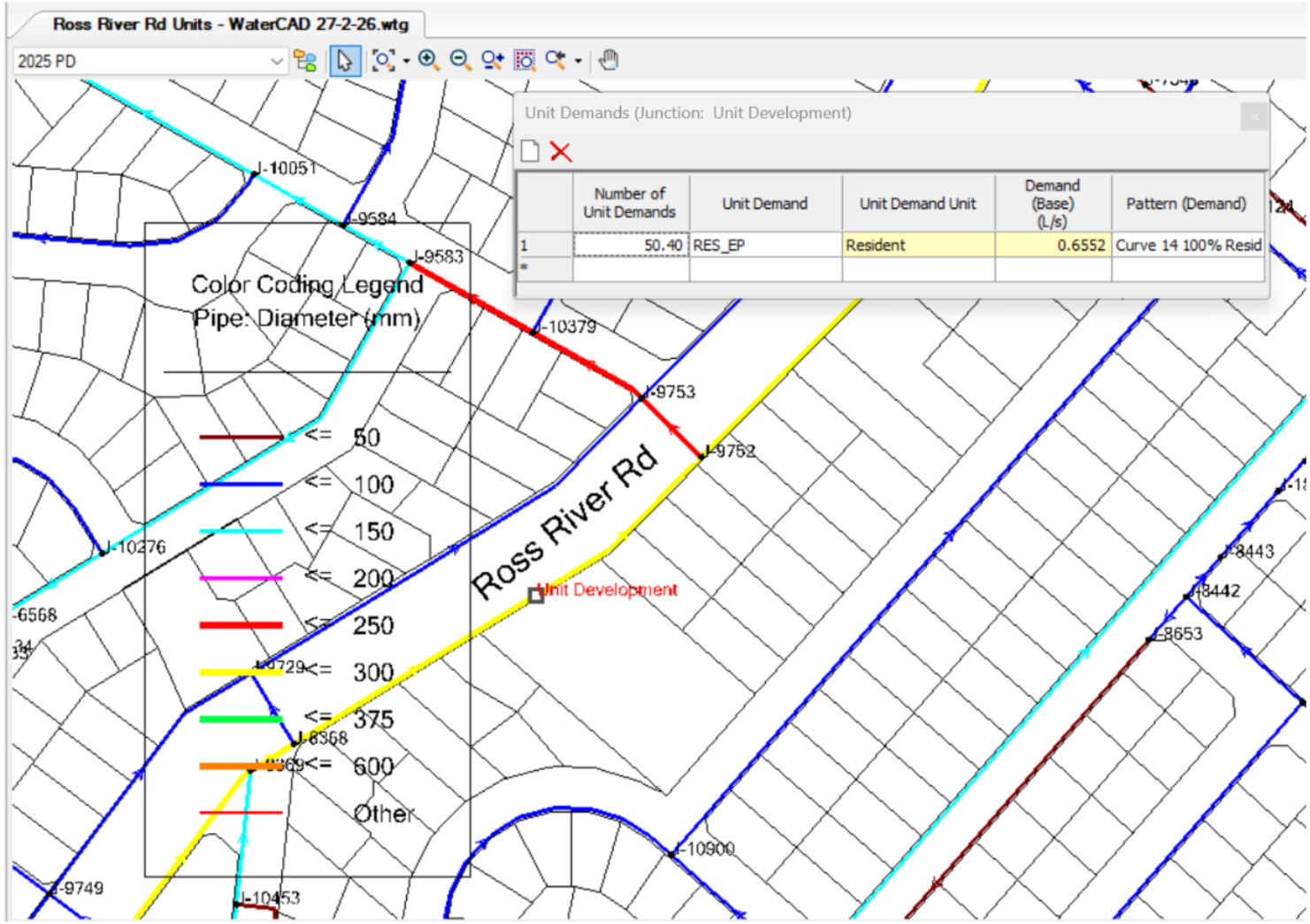
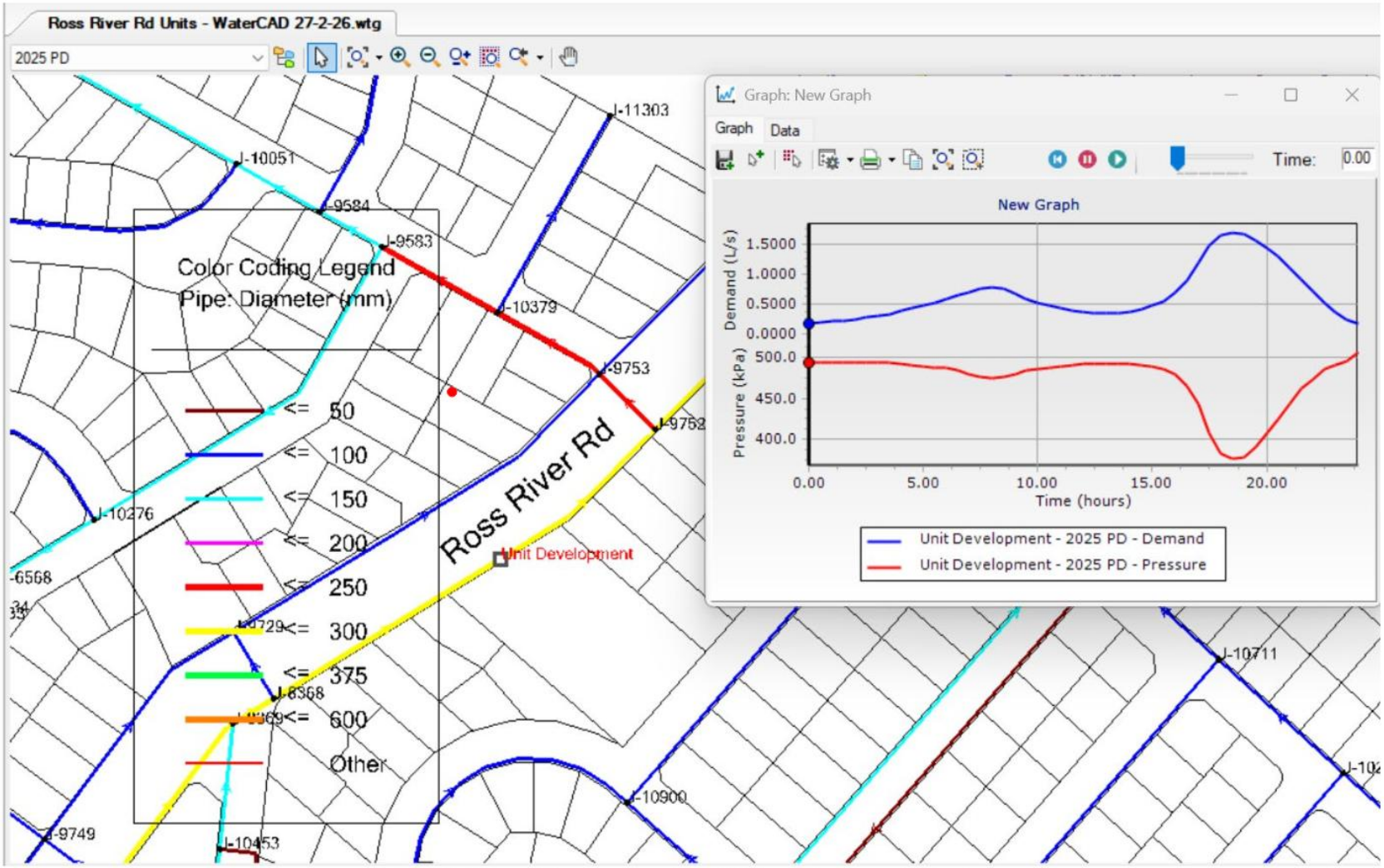
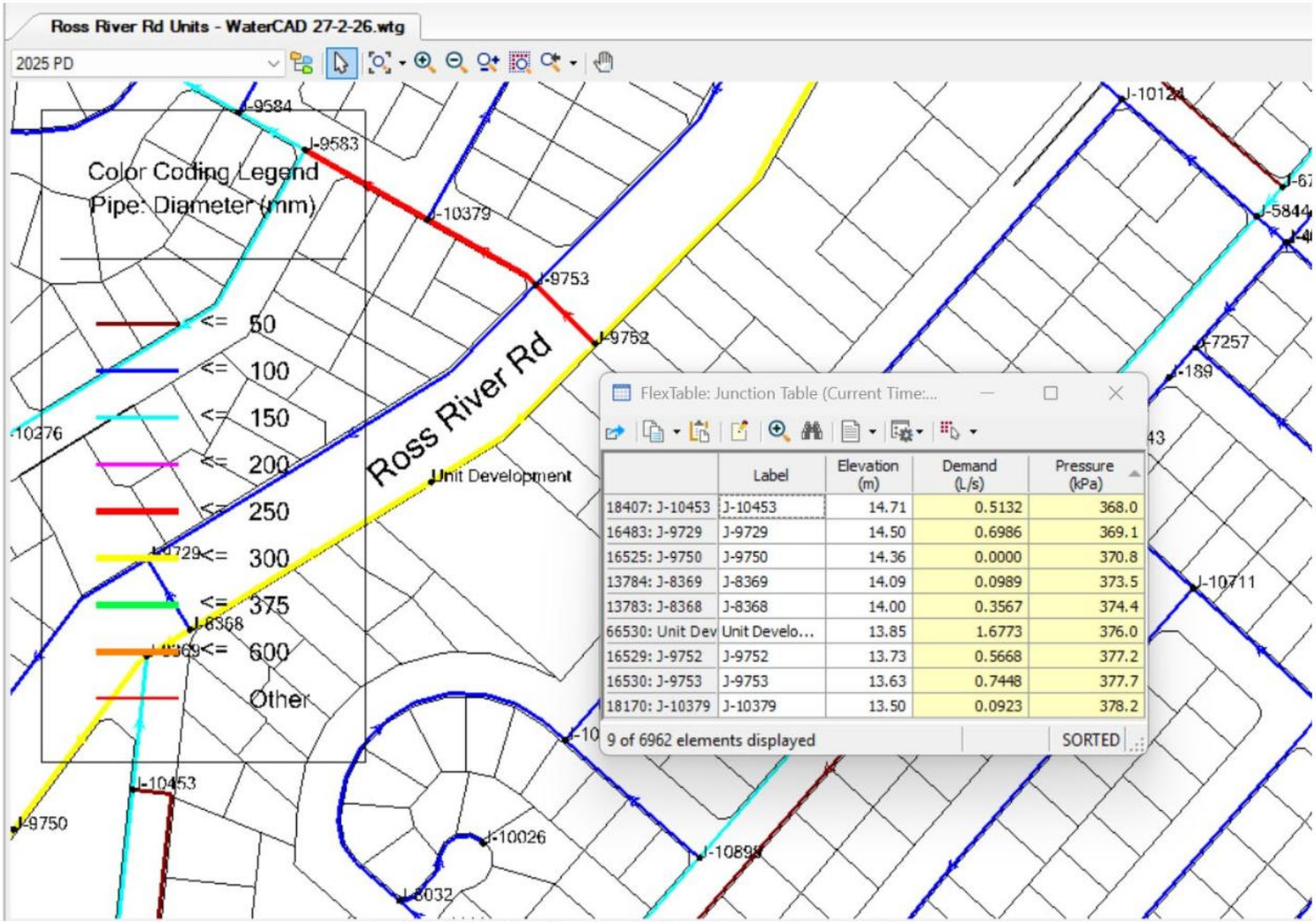
# APPENDIX B
# WATERGEMS MODELLING RESULTS



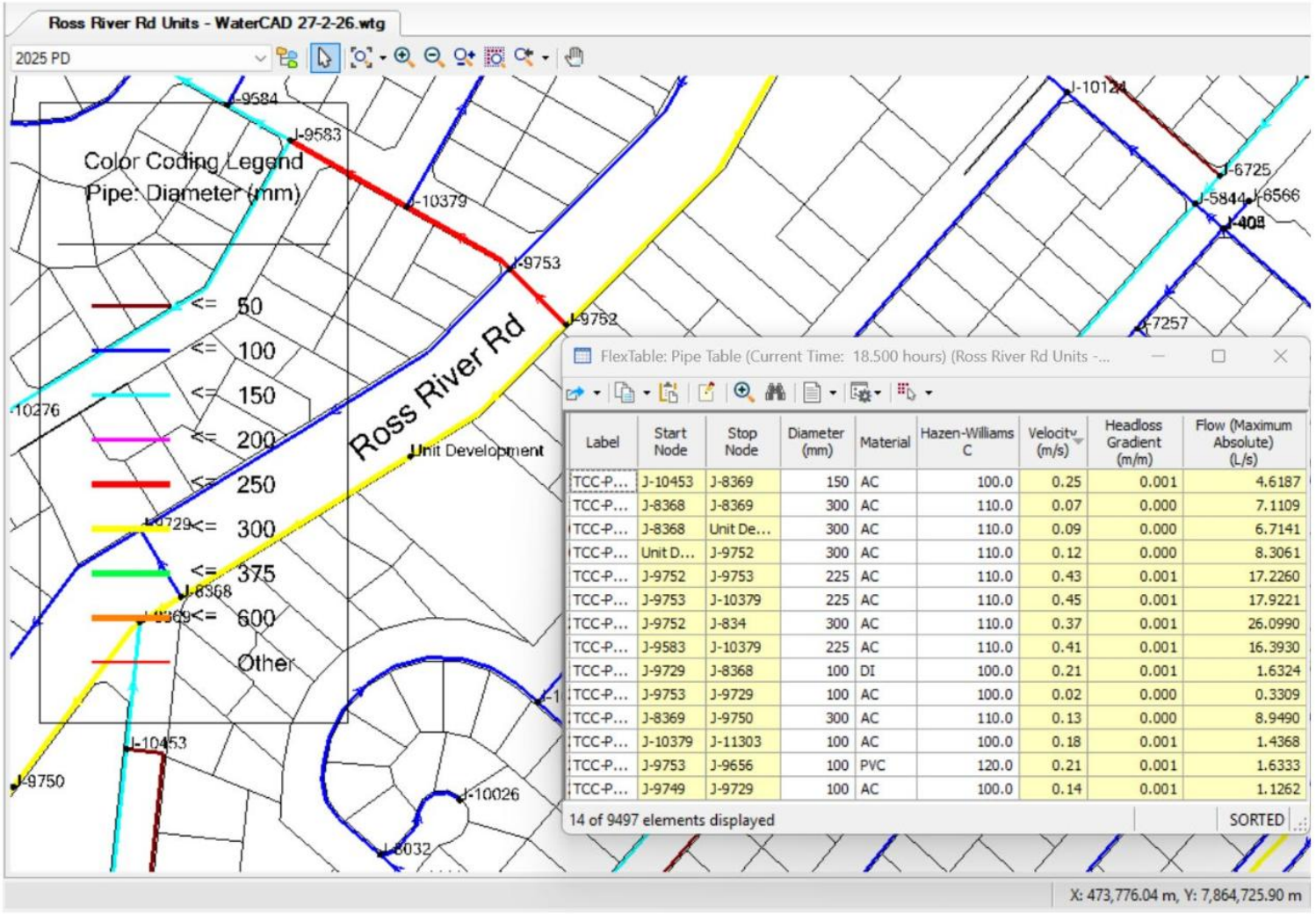

**WATERGEMS Model With Residential Unit Water Demand Added**




**Peak Hour Pressure at Unit Development Node**

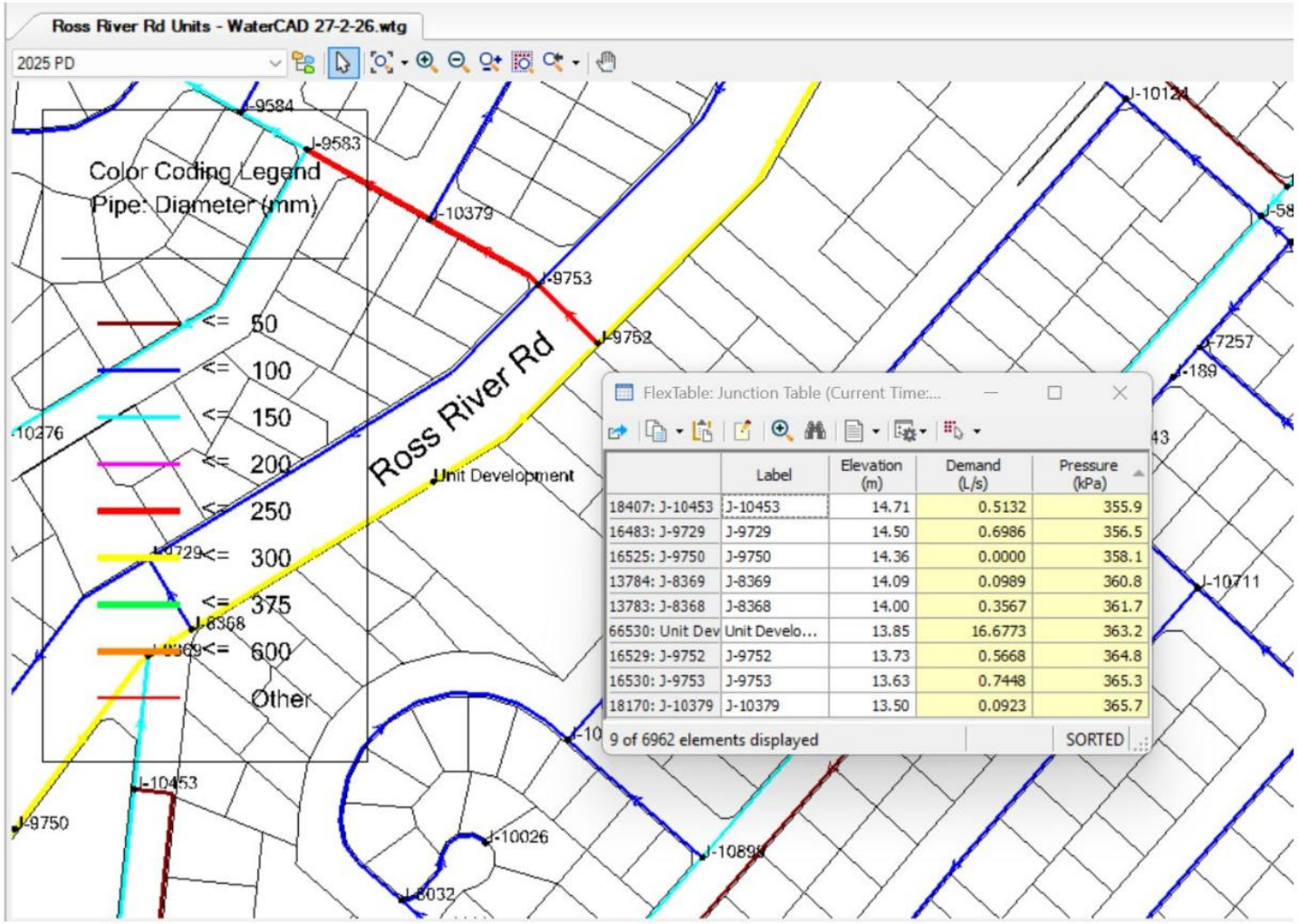



**Peak Hour Node Modelling Results – 6:30 pm**

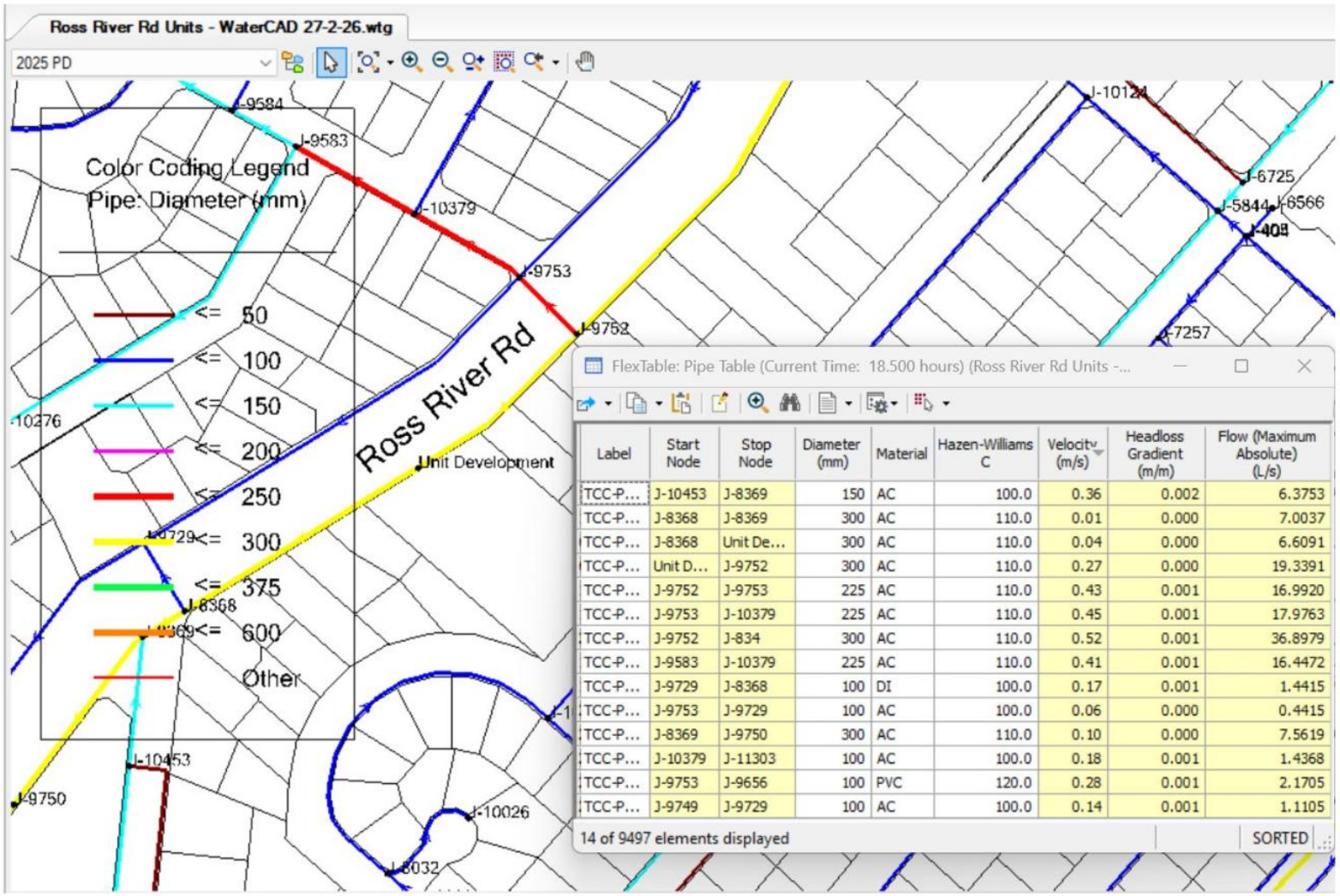



| Label | Start Node | Stop Node | Diameter (mm) | Material | Hazen-Williams C | Velocity (m/s) | Headloss Gradient (m/m) | Flow (Maximum Absolute) (L/s) |
|---|---|---|---|---|---|---|---|---|
| TCC-P... | J-10453 | J-8369 | 150 | AC | 100.0 | 0.25 | 0.001 | 4.6187 |
| TCC-P... | J-8368 | J-8369 | 300 | AC | 110.0 | 0.07 | 0.000 | 7.1109 |
| TCC-P... | J-8368 | Unit De... | 300 | AC | 110.0 | 0.09 | 0.000 | 6.7141 |
| TCC-P... | Unit D... | J-9752 | 300 | AC | 110.0 | 0.12 | 0.000 | 8.3061 |
| TCC-P... | J-9752 | J-9753 | 225 | AC | 110.0 | 0.43 | 0.001 | 17.2260 |
| TCC-P... | J-9753 | J-10379 | 225 | AC | 110.0 | 0.45 | 0.001 | 17.9221 |
| TCC-P... | J-9752 | J-834 | 300 | AC | 110.0 | 0.37 | 0.001 | 26.0990 |
| TCC-P... | J-9583 | J-10379 | 225 | AC | 110.0 | 0.41 | 0.001 | 16.3930 |
| TCC-P... | J-9729 | J-8368 | 100 | DI | 100.0 | 0.21 | 0.001 | 1.6324 |
| TCC-P... | J-9753 | J-9729 | 100 | AC | 100.0 | 0.02 | 0.000 | 0.3309 |
| TCC-P... | J-8369 | J-9750 | 300 | AC | 110.0 | 0.13 | 0.000 | 8.9490 |
| TCC-P... | J-10379 | J-11303 | 100 | AC | 100.0 | 0.18 | 0.001 | 1.4368 |
| TCC-P... | J-9753 | J-9656 | 100 | PVC | 120.0 | 0.21 | 0.001 | 1.6333 |
| TCC-P... | J-9749 | J-9729 | 100 | AC | 100.0 | 0.14 | 0.001 | 1.1262 |

**Peak Hour Pipes Modelling Results – 6:30 pm**



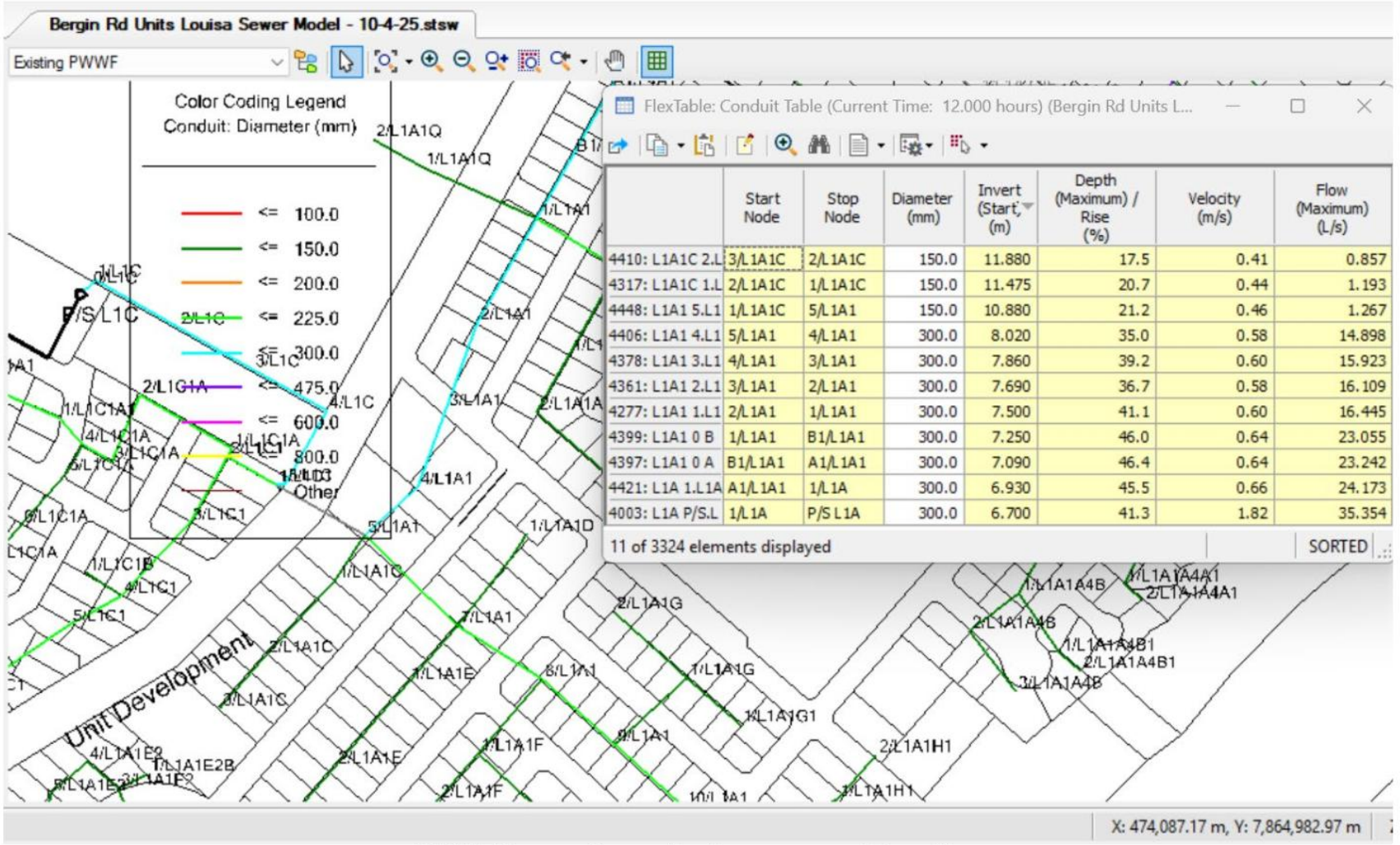

**Peak Hour Node + 15 l/s Residential Fire Flow Results – 6:30 pm**




| Label | Start Node | Stop Node | Diameter (mm) | Material | Hazen-Williams C | Velocity (m/s) | Headloss Gradient (m/m) | Flow (Maximum Absolute) (L/s) |
|---|---|---|---|---|---|---|---|---|
| TCC-P... | J-10453 | J-8369 | 150 | AC | 100.0 | 0.36 | 0.002 | 6.3753 |
| TCC-P... | J-8368 | J-8369 | 300 | AC | 110.0 | 0.01 | 0.000 | 7.0037 |
| TCC-P... | J-8368 | Unit De... | 300 | AC | 110.0 | 0.04 | 0.000 | 6.6091 |
| TCC-P... | Unit D... | J-9752 | 300 | AC | 110.0 | 0.27 | 0.000 | 19.3391 |
| TCC-P... | J-9752 | J-9753 | 225 | AC | 110.0 | 0.43 | 0.001 | 16.9920 |
| TCC-P... | J-9753 | J-10379 | 225 | AC | 110.0 | 0.45 | 0.001 | 17.9763 |
| TCC-P... | J-9752 | J-834 | 300 | AC | 110.0 | 0.52 | 0.001 | 36.8979 |
| TCC-P... | J-9583 | J-10379 | 225 | AC | 110.0 | 0.41 | 0.001 | 16.4472 |
| TCC-P... | J-9729 | J-8368 | 100 | DI | 100.0 | 0.17 | 0.001 | 1.4415 |
| TCC-P... | J-9753 | J-9729 | 100 | AC | 100.0 | 0.06 | 0.000 | 0.4415 |
| TCC-P... | J-8369 | J-9750 | 300 | AC | 110.0 | 0.10 | 0.000 | 7.5619 |
| TCC-P... | J-10379 | J-11303 | 100 | AC | 100.0 | 0.18 | 0.001 | 1.4368 |
| TCC-P... | J-9753 | J-9656 | 100 | PVC | 120.0 | 0.28 | 0.001 | 2.1705 |
| TCC-P... | J-9749 | J-9729 | 100 | AC | 100.0 | 0.14 | 0.001 | 1.1105 |

**Peak Hour Pipes + 15 l/s Residential Fire Flow Modelling Results – 6:30 pm**

# APPENDIX C
# SEWERGEMS MODELLING RESULTS & FIGURES




| | Start Node | Stop Node | Diameter (mm) | Invert (Start, (m) | Depth (Maximum) / Rise (%) | Velocity (m/s) | Flow (Maximum) (L/s) |
|---|---|---|---|---|---|---|---|
| 4410: L1A1C 2.L | 3/L1A1C | 2/L1A1C | 150.0 | 11.880 | 17.5 | 0.41 | 0.857 |
| 4317: L1A1C 1.L | 2/L1A1C | 1/L1A1C | 150.0 | 11.475 | 20.7 | 0.44 | 1.193 |
| 4448: L1A1 5.L1 | 1/L1A1C | 5/L1A1 | 150.0 | 10.880 | 21.2 | 0.46 | 1.267 |
| 4406: L1A1 4.L1 | 5/L1A1 | 4/L1A1 | 300.0 | 8.020 | 35.0 | 0.58 | 14.898 |
| 4378: L1A1 3.L1 | 4/L1A1 | 3/L1A1 | 300.0 | 7.860 | 39.2 | 0.60 | 15.923 |
| 4361: L1A1 2.L1 | 3/L1A1 | 2/L1A1 | 300.0 | 7.690 | 36.7 | 0.58 | 16.109 |
| 4277: L1A1 1.L1 | 2/L1A1 | 1/L1A1 | 300.0 | 7.500 | 41.1 | 0.60 | 16.445 |
| 4399: L1A1 0 B | 1/L1A1 | B1/L1A1 | 300.0 | 7.250 | 46.0 | 0.64 | 23.055 |
| 4397: L1A1 0 A | B1/L1A1 | A1/L1A1 | 300.0 | 7.090 | 46.4 | 0.64 | 23.242 |
| 4421: L1A 1.L1A | A1/L1A1 | 1/L1A | 300.0 | 6.930 | 45.5 | 0.66 | 24.173 |
| 4003: L1A P/S.L | 1/L1A | P/S L1A | 300.0 | 6.700 | 41.3 | 1.82 | 35.354 |

**PWWF Sewer Capacity Assessment Results**

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