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Shaping the Future

PLANS AND DOCUMENTS
referred to in the ULDA
APPROVAL dated 16 / 5 / 12

RIPLEY VALLEY
SECONDARY URBAN CENTRE EAST – PRECINCT A
Infrastructure Servicing Report
Appendix F to the Town Planning Report

Project Number: 7901/47-012

Prepared for AMEX Corporation Pty Ltd

29 September 2011

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APPENDICES

1 INTRODUCTION

This report assesses the infrastructure required to service Precinct A of the proposed Ripley Valley Secondary Urban Centre East (SUCE) development.

The infrastructure strategy outlines the requirements to develop the SUCE whilst not compromising the networks and external servicing for roads, potable water, recycled water and wastewater, energy and communications and the future flexibility in the context of ongoing assessment by Ipswich City Council (ICC) and Queensland Urban Utilities.

The strategy addresses the following:

- Ipswich City Council's Planning Scheme Policies 3 and 12 which identify the standards for various aspects of the design of the road network infrastructure;
- Ipswich City Council's Planning Scheme Policy 5 which identifies the infrastructure required to service the growing City; and
- Ipswich City Councils' Part 15 of Ripley Valley Master Planned Area Structure Plan of the Planning Scheme (P15).

The water and sewer elements have been developed in general accord with the P15 Integrated Water Cycle Management strategies and thereby addressadditional relevant State and Local Government strategies and policies including the following:

- The South East Queensland Regional Water Supply Strategy (SEQRWSS) which identifies a range of initiatives to manage SEQ's water supply in the long term;
- Water Amendment Regulation (No 6) 2006 which mandates a series of initiatives to secure the region's water supply. Key initiatives of relevance are:
  - The Southern Regional Water Pipeline which will form a 2-way link between Brisbane City Council's Mt Crosby Water Treatment Plant and the SEQ (Gold Coast) Desalination Facility at Tugun; and
  - The Western Corridor Recycled Water Scheme which will provide recycled water to several major industrial customers (currently power stations only) and may ultimately provide purified recycled water to Wivenhoe Dam;
- The Queensland Development Code which mandates the use of rainwater tanks, dual reticulation or stormwater harvesting to achieve a saving per household of 70kL/year and mandates the installation of water efficient appliances and fittings;

Water supply and sewerage analysis has previously been developed for the wider SUCE area and is provided in Appendix C and Appendix D (supplementary) for reference.

Specific traffic impacts and transport strategies and targets are detailed in Appendices G and H of the Town Planning Report and these have informed preliminary design of roads and associated infrastructure.

Energex have been consulted on strategic planning, including initial servicing and longer term planning, for all trunk electrical works.

The infrastructure strategy identifies creditable infrastructure, which has been classified as 'trunk' in acknowledgment of the future benefits for the wider community.

Internal service layouts have been developedfor Precinct A and are provided in Appendix B.

2 BACKGROUND

A part of the SUCE has been declared by the Urban Land Development Authority (ULDA) as an Early Release Precinct (ERP). This incorporates Precinct A. The Precinct A site covers an estimated 12.3 Ha, includes 160 lots, and has an equivalent population (EP) of 400 EP. Figure 1below provides a location plan and Figure 2provides indicative land uses and road configurations for the wider SUCE area.

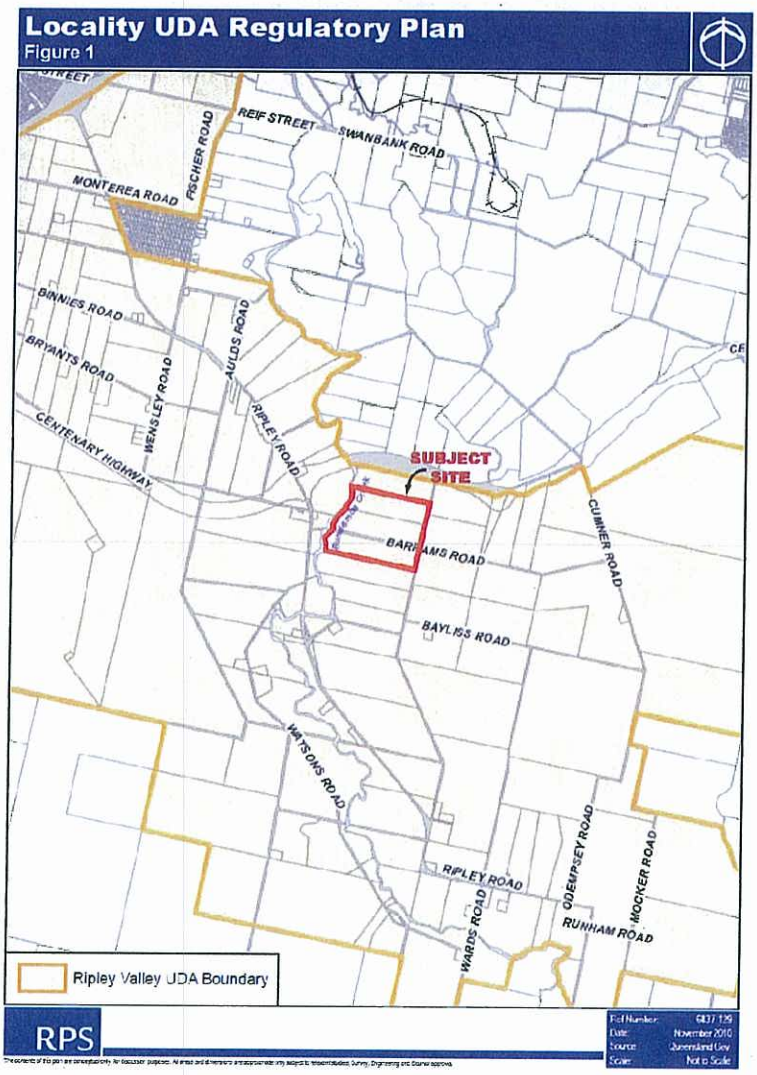
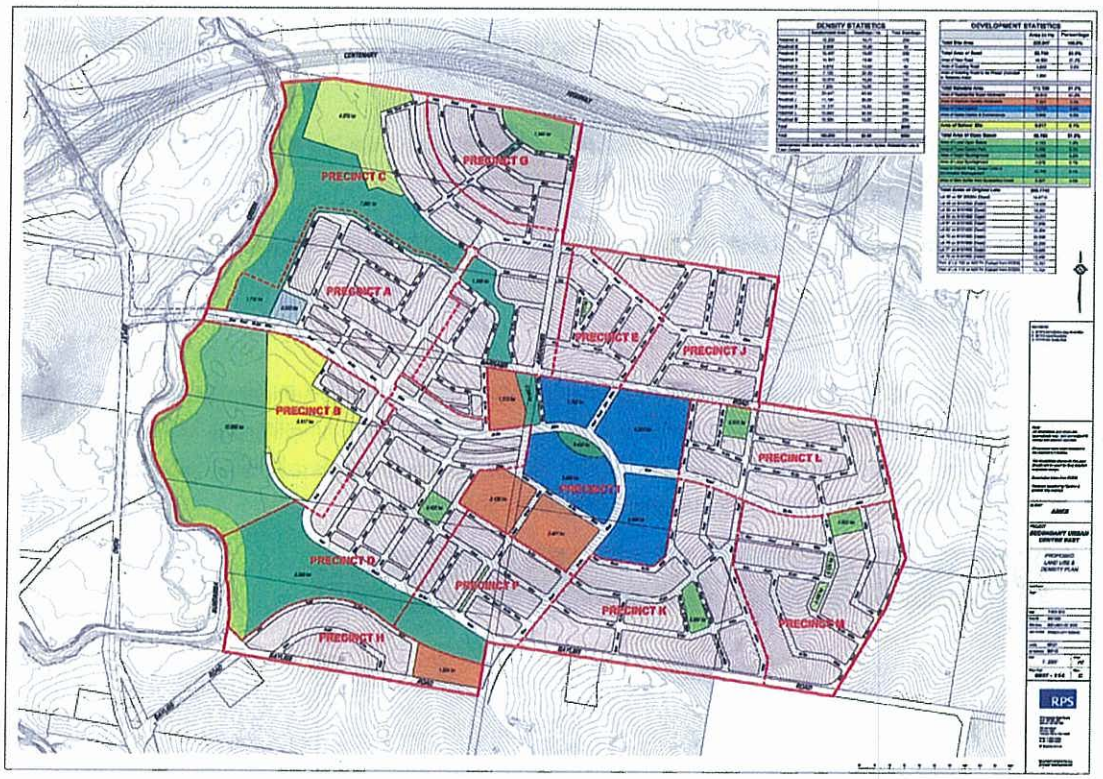


FIGURE 2 – SUCE Land Use Plan, showing proposed Precincts A – M



2.1 WATER SUPPLY

The Ripley area was previously supplied by a pump station (WP35), located at South Station Road. A second supply main, a 375mm diameter off-take from the Southern Regional Water Pipeline (SRWP), has been constructed and is in operation supplying the area.

There is also an existing substantial trunk main network within the zone (i.e. water supply mains in excess of diameters over 300mm) delivering flow to the reservoir complex and the network. A new 600mm diameter main along Binnies Road (from Wensley Road to Lakeview Drive) has also been installed to improve supply to the area.

The area is currently primarily serviced by a 10ML reservoir beyond the southern end of Wensley Road. The reservoir has a bottom water level (BWL) of approximately 102.8mAHD. A 16ML reservoir was recently constructed adjacent to the existing 10ML reservoir, creating a combined reservoir capacity of 26ML. Analysis of the model has indicated that no further storage would be required in the first 10 years to meet the Desired Standards of Service (DSS).

Only areas below 75mAHD to 80mAHD are able to be serviced from the existing reservoir and meet Council's DSS (e.g. minimum pressure of 22m at maximum hour). The Precinct A site has a maximum elevation below the 70m AHD contour.

The existing supply arrangement can service development in the Ripley Valley up to approximately 6,000EP (i.e. equivalent to more than 5 years growth at an average of 1,000EP or 400ET per annum). Beyond the 6,000EP triggers an augmentation of the connection from the SRWP.

2.2 SEWERAGE

Consideration has previously been given to several options regarding the discharge point of the proposed sewerage network. Discharge to the Bundamba Wastewater Treatment Plant (WWTP) via the existing Bundamba trunk sewer is detailed in PSP5. The ultimate external sewerage infrastructure requirements are currently under investigation by Queensland Urban Utilities (QUU). However, it has been agreed with QUU that in the interim it is likely that the preferred strategy will involve a local pump station and rising main for the SUCE connecting to a pump station and rising main from the Urban Core that will pump to a proposed connection to the Bundamba Creek trunk sewer at Robertson Road.

2.3 RECYCLED WATER

Currently there is an existing recycled water main servicing Swanbank Power Station from the Bundamba Advanced WWTP.

2.4 ROADS

The Ripley Valley is bisected from east to west by the Centenary Highway Extension (CHE), which forms the major thoroughfare route for the Ripley Valley. Ripley Road provides north-south connectivity with Ipswich CBD, and intersects the CHE via an at-grade intersection.

2.4.1 Site Details

The SUCE Precinct A is located south-east of the Centenary Highway and Ripley Road intersection as shown in the SUCE Land Use Plan, see Figure 1 (above). Significant traffic capacity exists on the recently constructed Centenary Highway Extension (CHE) north of the site,see the Traffic Report; Appendix G to the Town Planning Report.

Precinct A is accessed via Barrams Road, which is currently a gravel road that provides access to existing rural lots. At present, the creek crossing for Barrams Road at Bundamba Creek is via a causeway at the low flow level of the creek, and hence is subject to regular flooding.

2.5 ENERGY AND COMMUNICATIONS

2.5.1 Electricity

Electricity is currently provided to the area however it is expected that this would need to be augmented with extensions to the existing high voltage network from Swanbank. Energex is responsible for planning of the electricity network through their Strategic Plan, which includes the Ripley Valley. Energex has identified two potential substation sites near the SUCE which would provide electricity supply to future development. These are proposed to be staged in line with future development and are not required to service Precinct A which can be serviced from existing low voltage supplies.

2.5.2 Gas

No natural gas supply networks currently exist within the Ripley Valley.

2.5.3 Data

Communication infrastructure in the Ripley Valley consists predominately of copper phone/data lines. The rollout of the federal governments' National Broadband Network (NBN) mayimpact on planning forincorporating copperlines into Precinct A.At this time a decision has not been reached and is subject to further discussions with the ULDA and government authorities to determine the necessary requirements. Provision for future services is included in proposed reticulateducting, see section 4.4.3.

3 TRUNK SERVICING

All necessary supporting utilities infrastructure, including trunk water supply, sewerage services, electricity and telecommunications networks,and additional capacity for future broadband networks and gas mains,will be provided to the development. This infrastructure will be implemented on a staged basis to align infrastructure roll out with development growth. This provides the flexibility to respond to changes in demands and opportunities for the adoption of best practices in future augmentations of the system.

3.1 WATER SUPPLY

The SRWP to Ripley Reservoir trunk main is proposed to act as a combined inlet/outlet main with connections to the existing network. To manage turnover in the reservoir a Pressure Reduction Valve (PRV) or control valve at Binnies Road will be introduced to maintain sufficient hydraulic grade to supply the top water level (TWL) of the Ripley Reservoirs (i.e. 110m AHD) and to ensure turnover in the reservoirs.

The primary connection to Precinct Ais a proposed 300mm main from the existing 450mm bulk supply main along Wensley Road. This will provide sufficient capacity to service up to 2400 dwellings prior to the need for further augmentation. This trunk main will be constructed concurrently with the road upgrades to Ripley Rd and Barrams Rd, and as such the main will cross the Bundamba Creek corridor within the easement of the proposed Barrams Rd Bridge. Given the efficiencies that can be gained from constructing the water main concurrently with Ripley Road construction works, it is assumed that the Ripley Road water main north of the Centenary Highway will be constructed prior to commencement of construction of Precinct A. The route of the water main acrossthe Centenary Highway road reserve at the Ripley Road Junction will be determined after discussionswith the Department of Transport and Main Roads (DTMR).As such, coordination is needed with the Urban Land Development Authority (ULDA), DTMR and Sekisui House Development Services (SHDS) to determine the final water main alignment.

As future stages are released, the 300mm main will form part of an extensive supply network supplied by low and high level reservoirs and the SRWP, see Appendix C.

3.2 SEWERAGE

The proposed trunk sewer servicing strategy includes a pumping station and rising main, which will collect sewerage (via gravity sewers) tothe north-west of the Precinct A site, and pump to the proposed Urban Core (UC) pump station and then on to the Bundamba trunk gravity sewer at Robertson Road via Fischer Road (see Appendix A). QUU have confirmed that planned augmentations to the existing gravity sewer main north of Robertson Road will provide sufficient capacity to service approximately 5 years growth in Ripley Valley as a whole. QUU assessment in ongoing to determine future staging requirements.

The proposed initial stage of the rising mains from the SUCE to the UC (150mm dia main) will provide capacity to service 1300 dwellings (approx 3300 EP) i.e. sufficient capacity up to and beyond Precinct A. The route alignment of the rising main has yet to be confirmed, and is subject to discussions with DTMR and other stakeholders, see Appendix F for sewer rising main route options.

Initial servicing of the Precinct A development will be via a tankering solution from the proposed pump station well. This is required to avoid low-flow septicity health hazards, cavitations in the mains and pump burnout when flows are minimal. Tankering may service up to the first year of population growth. A temporary access track is proposed for initial servicing (see Appendix E), and future access for maintenance will be via the new road network that forms part of the future Precinct C.

The gravity sewer trunk main adjacent to the Bundamba creek buffer zone will ultimately be a 750mm dia main. To manage septicity issues, it isproposed to install a nominal 300mm main adjacent to the proposed ultimate main alignment. Implementing the 750mm dia main from day 1 remains an option. Further discussions with QUU would be required with regards to operational flushing requirementsprior to executing this alternative strategy.

The pump well and trunk gravity sewer main will provide sufficient emergency storage capacity to provide a minimum 18hr emergency storage capacity for the entire SUCE area in the event of pump station breakdown. Therefore it follows that there will besufficient capacityto provide well in excess of 24hrs emergency storagefro Precinct A.

3.3 RECYCLED WATER

There are no short termrequirements for the supply of recycled water (purple pipe) to Precinct A. Phasing of services to the Valley will be subject to clarification of regional policy by the new water authority Queensland Urban Utilities. There are no technical impediments to incorporating trunk mains for recycled water to service open space south of the CHE, as envisaged byP15.

3.4 ROADS

Precinct A will be serviced by a functional road hierarchy including trunk arterial rand sub-arterial roads. Traffic impacts are assessed in the Traffic Report, refer to Appendix G of the Planning Report.

3.4.1 External Trunk Roads

Ripley Road between the upgraded Barrams Road/Ripley Road junction and the existing CHE intersection will be realigned vertically to improve sight lines and widened on the road shoulder to provide cycle lanes (see Drg No 790147012-SK070 to SK073. in Appendix H). No resumptions are required for the Ripley Road construction works south of CHE. Future realignments of Ripley Road will be staged to align with upgrades to the CHE intersection as the intersection reaches capacity. The timing and extent of these works will be informed by the current DTMR modelling and will not be impacted on by the SUCE Precinct A development.

3.4.2 Internal Trunk Roads

Internal trunk roads include Barrams Road to the south and the loop road to the east of Precinct A. It is proposed to only construct the first two lanes of Barrams Road which in the ultimate scenario includes 4 traffic lanes and 2 bus/cycle lanes. Preliminary design is provided in Appendix HDrg No. 790147012-SK070 to SK073. Typical cross sections are provided in Appendix I.

3.5 TRUNK INTERSECTIONS, JUNCTIONS AND BRIDGES

3.5.1 Centenary Highway Extension / Ripley Road Intersection

The existing at-grade intersection (2 lane roundabout) on the Centenary Highway currently provides access to Ripley Road.

Significant traffic capacity exists on the recently constructed CHE/Ripley Road intersection. Given the low levels of traffic generation from Precinct A, this intersection provides sufficient capacity to service the Precinct A site. Further traffic modelling of the intersection at this stage is not considered necessary or appropriate.

3.5.2 Ripley Road / Barrams Road Junction

Given the low volumes of existing daily traffic on Ripley Road (<100vpd), an un-signalised junction at Ripley/Barrams Roads will be sufficient for the Precinct A development, with priority retained on Ripley Road. Drg No 790147012-SK072 provides a preliminary layout for an un-signalised intersection that has been configured for upgrading to a signalised junction.

3.5.3 Barrams Road / Loop Road Junction

A preliminary design has been undertaken and ultimate land requirements identified – see Appendix 6 Drg No. 790147012-SK074. Kerb radii will be 3m in accordance with ICC's proposed part 12 of the planning scheme.

3.5.4 Barrams Road Bridge

The principle access route for Precinct A will initially be a 2-lane bridge over Bundamba Creek.The proposed Barrams Road Bridge will be 100m in length (4x25m spans) with 3 piers/columns (approximately 5-7m in height) being located in the flood plain. The first stage of the crossing will be approximately 15m wide with a 2nd stage, approximately 12m, being constructed alongside the first when required to accommodate increased road traffic volumes. Either side of the bridge, banks of box culverts approx 2.5m high and totalling up to 25m in width will be required (see Flooding Report).

This 'gateway' to the new development will also provide capacity to service future stages. The 2 lane bridge will have sufficient capacity to meet at least 10 years growth. The timing of the bridge widening is interdependent with the level of commitment to invest early in dedicated bus lanes between the major centres in the valley.

3.6 ENERGY AND COMMUNICATIONS

3.6.1 Electricity

Energex has two proposed major projects to augment their 11kV network and enhance the reliability of supply. These directly impact on the initial stage of development. The initial project must be complete to supply electricity to Precinct A and involves upgrading the 11kV network to 3 phase along Ripley Road to the Barrams Road intersection.

The second project involves upgrading the single phase to three phase 11kV along Barrams Rd east, turning north into Abrahams Rd and extending further north to make another 11kV connection. Where affected by the development this overhead line will be realigned and undergrounded through the development for each stage as required. Stage 1A of the development requires coordination with Energex for their 11kV upgrade works including provision of additional conduits for Energex future requirements and integration with the Bundamba Creek crossing. Sizing and quantity of conduits will be determined during the detailed design phase and is subject to future discussions with Energex.

3.6.2 Gas

The supply of natural gas to Precinct A has not yet been confirmed and is subject to discussions with the ULDA, Ipswich City Council and relevant energy suppliers. As such, no backhaul allowance has been allowed forwith respect to connection to atrunk supply network. However, provisions for gas supply to allotments havebeen provided in the road reserve, see section 4.4.2 below.

3.6.3 Data

The rollout of the federal governments' National Broadband Network (NBN) is dependent on the provision back-haul services to the main trunk networks ie. toSpringfield data centre or Ipswich CBD. This is subject to further consultation and is not allowed for in the Precinct A application.

4 INTERNAL SERVICING

4.1 WATER SUPPLY

Water Supply within Precinct A has been developed to include a potable water source and an alternative source in line with the Queensland Development Code (QDC) – Dec 06. For all Class 1 buildings, rainwater tank water has been included in the modelling. Rainwater tanks will be implemented in accordance with the QDC. The QDC also mandates the use of water efficient appliances for all new homes and this is accounted for in the water model.

Lots will be serviced internally by a network of smaller diameter water supply pipes, typically ranging from 100mm to 250mm.Proposed 200mm and 250mm internalmains form part of the ultimate trunk water supply network.

Road typologies include provision on one side of the streetscape for water servicing with cross spurs (see Appendix B & I). The internal supply network has been configured to minimise pipe and connection lengths and hence unnecessary storage volumes.

4.2 SEWERAGE

Proposed lots will be serviced by PE pipe (NuSewer) gravity sewers, as required by QUU.

The internal sewerage configuration is governed by proposed ground levels, natural contours in the Bundamba Creek corridor and QUU design requirements, and has been designed accordingly as shown in Appendix B.

4.3 ROADS

4.3.1 Road Network

The precinct road network has been designed to function as a 'grid' to provide enhanced thoroughfare permeability and route selection.Precinct A road typologies include access roads and edge (singularly loaded) roads and laneways for rear loaded lots. Kerb radii are at 6m to minimise kerb mounting. Road typologies have been designed to service vehicular, cycle, transit and pedestrian traffic.Typical cross sections are provided in Appendix I.

4.3.2 Barrams Road / Precinct A - Access Junctions

Access to Precinct A from Barrams Road in the ultimate scenario will be via two local road junctions, one being a left in/ left out only and the other an un-signalised junction with a break in the central median. These junctions will both provide full access to Barrams Road in the interim, i.e. left and right turning in and out of the subdivision, with kerb radii at 3m.

4.4 ENERGY AND COMMUNICATIONS

4.4.1 Electricity

Provisions for shared trenching for electrical and communication conduits have been allowed for in the road reserve as in accordance with Ipswich City Council standard drawings. Refer road cross sections, attached as Appendix I, for details.

4.4.2 Gas

Provisions for natural gas have been provided in the road reserve (see section 3.6.3) to allow for the future connection of gas mains. The location of the reticulated mains are detailed on service layout (Appendix B) and in the typical road cross sections (Appendix I).

4.4.3 Data

Provisions have been allowed for in the proposed road reserve, see 4.4.1. These conduits provide capacity to cater for copper or future optical fibreservice networks. The precise nature of NBN requirements is not yet known.

5 CONCLUSIONS

From this investigation the following conclusions can be drawn:

- The proposed water supply infrastructure is generally in accordance with Ipswich City Councils' planning scheme policy part 15, and consideration has been given to QUU requirements.
- The proposed 300mm trunk water main and Pressure Reducing Valve from Wensley Road to SUCE Precinct A development will provide sufficient capacity to and beyond the first 160 lots.
- Precinct trunk 200mm, 250mm and 300mm water supply mains will form part of the future ultimate supply network. The proposed network is more refined than Ipswich City Council's Planning Scheme Policy 5 which does not include all trunk mains in Ripley Valley.
- A tankering solution will provide sewer servicing for the early lot development in Precinct A(up to 1-2 years).
- A 150-200mm trunk sewer rising main and pump station solution will provide sufficient capacity to effectively service the SUCE Precinct A development and will connect to a proposal pump station in Aulds Road constructed by others.
- 225 to 300mm trunk gravity mains will service Precinct A and supplement emergency storage capacity in conjunction with the pump station well.An alternative option to provide a 750mm ultimatemain requires further consultation with QUU.
- No recycled water infrastructure is required in the short term.
- The proposed road hierarchy is generally in accordance with Ipswich City Councils' planning scheme policies, and as such includes provisions for the ultimate road infrastructure for the Ripley Valley.
- Trunk infrastructure has been identified and will form part of the Ripley Valley trunk infrastructure network.
- Precinct A requires new bridge and embankment works to provide access across Bundamba Creek. This provides significant capacity to service future stages, as envisaged by the Ripley Valley Structure Plan.
- Electrical servicing requirementshave been identified for Precinct A and include proposed upgrades byEnergex.
- Natural gas servicing requirements have not been confirmed; however, provisions exist within the proposed road reserves for future services.

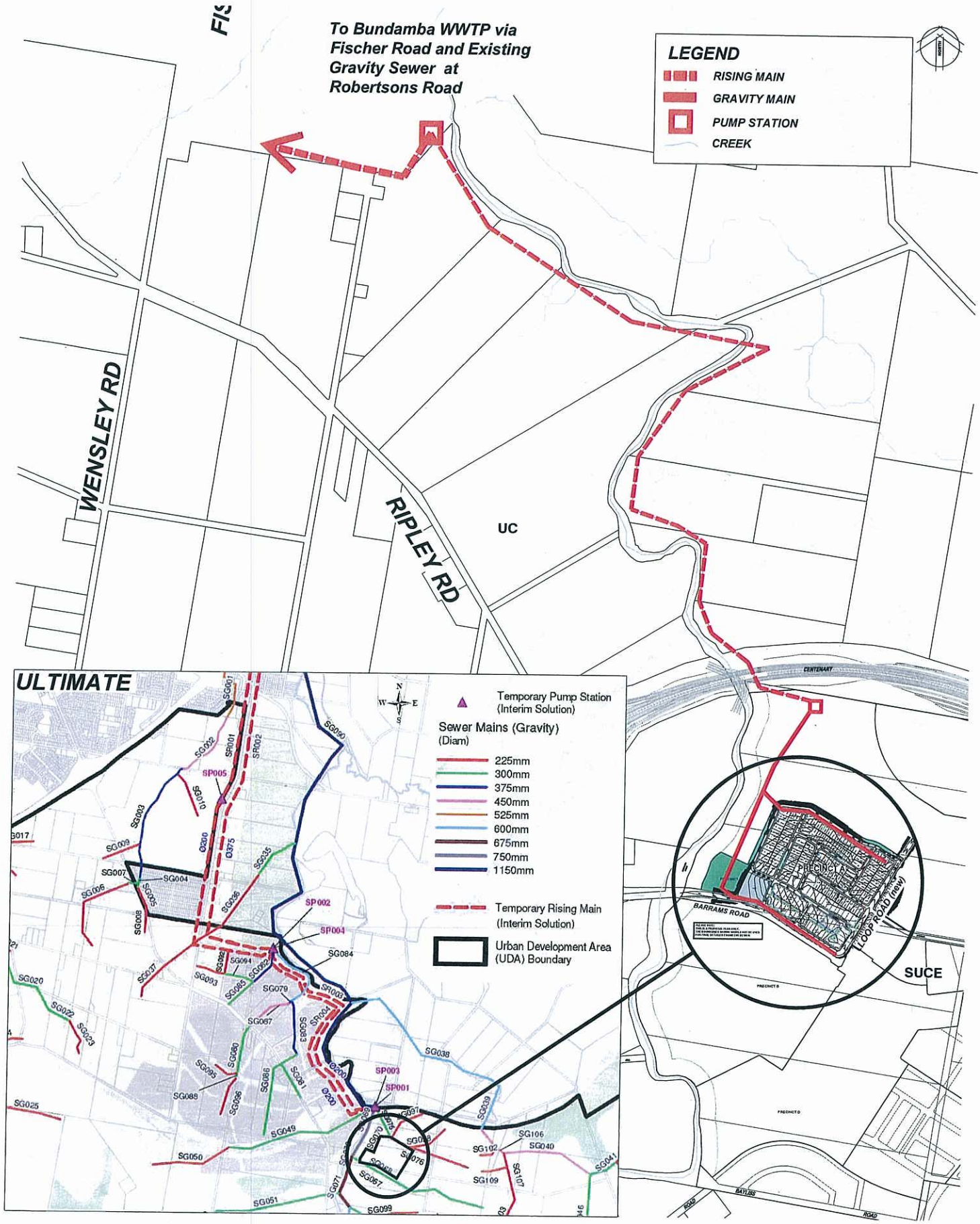
- Communications (data) infrastructure requirements have not yet been defined. Provisions exist within the proposed road reserves for copper or optical fibre mains.

Appendix A

Precinct A Water Supply and Sewerage Servicing Plans

790147/012-SK008.W

790147/012-SK008.S



Ripley Valley - SUCE Precinct A

Proposed Trunk Sewer Infrastructure

NOT TO SCALE

The contents of this plan are conceptual only. All areas and dimensions are approximate and subject to relevant studies, Survey, Engineering and Council approval.

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Ref Number: 7901-47/012/SK008.S
Date: 12/10/2010

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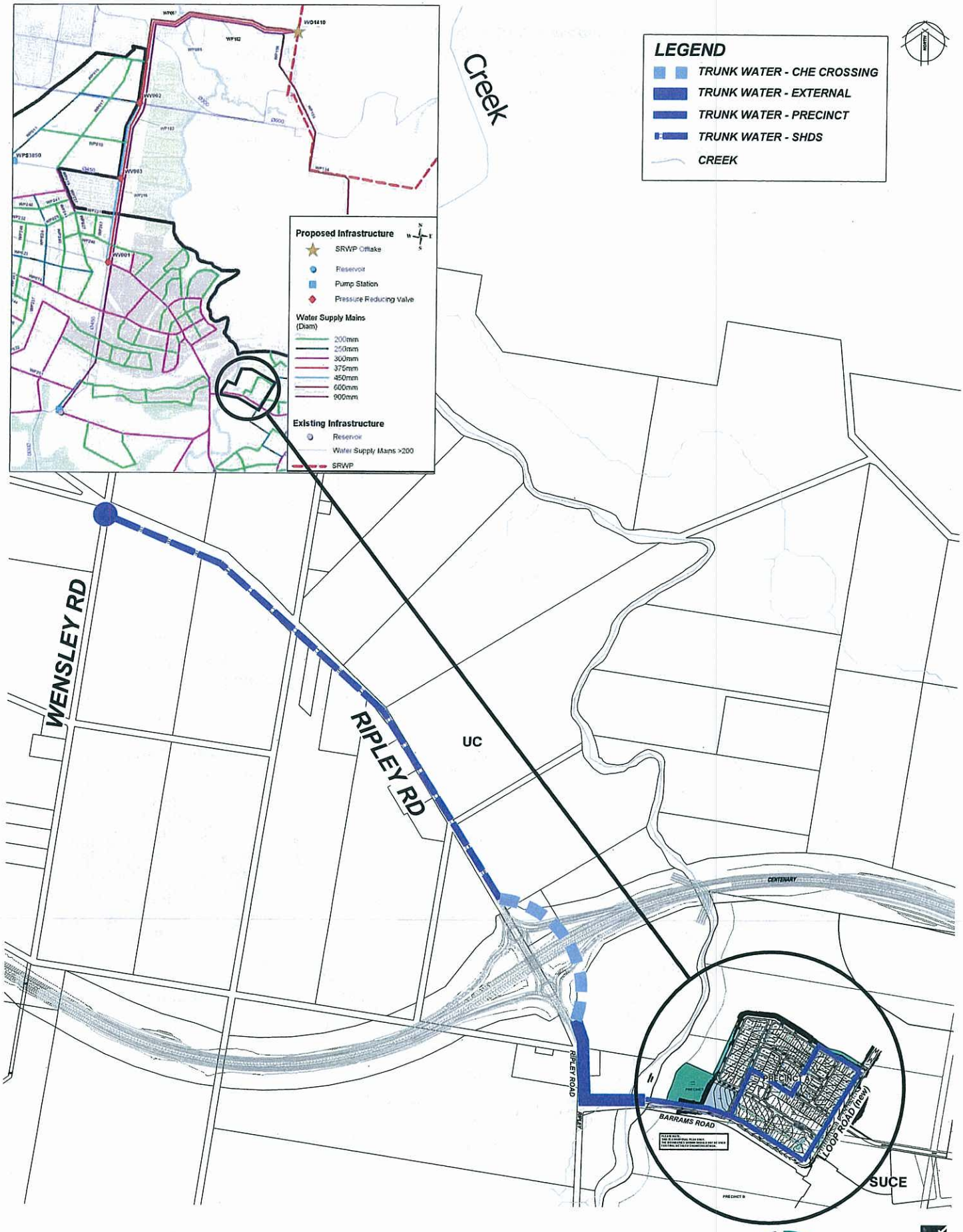

Ripley Valley - SUCE Precinct A

Proposed Trunk Water Infrastructure

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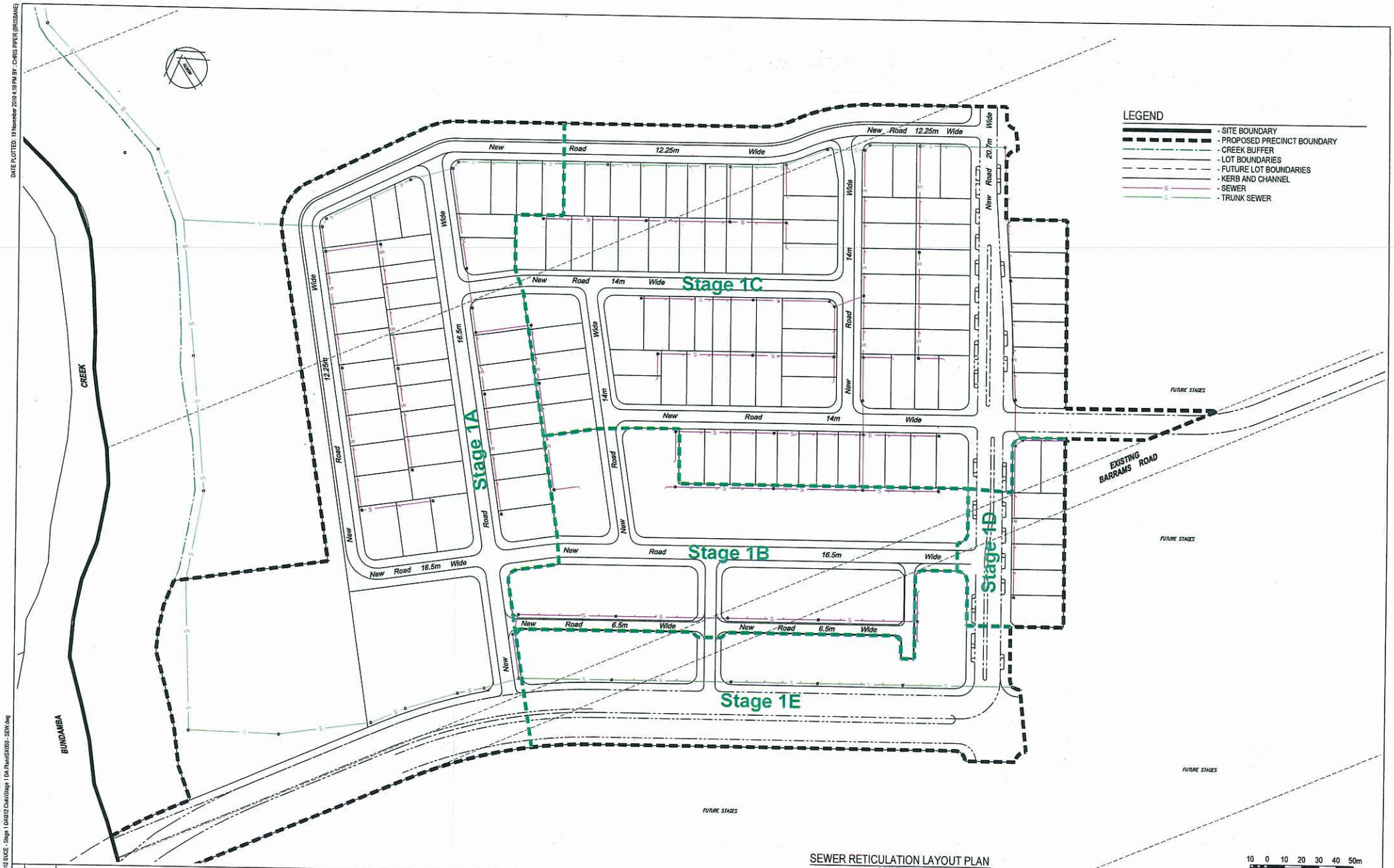
Appendix B

Internal Water Supply and Sewerage Layout

790147/012/SK050

790147/012/SK060



SEWER RETICULATION LAYOUT PLAN
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A	12.11.10	ORIGINAL ISSUE - DEVELOPMENT APPROVAL	AVT	AS

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		Date
Drawn	CP	19.11.10
Checked	AS	19.11.10
Designed	CP	11.11.10
Verified	AS	19.11.10
Approved	AS	RPEQ: 7946 Date 19.11.10

Client: AMEX CORPORATION PTY LTD
RIPLEY VALLEY - DEVELOPMENT APPLICATION
SUCE - PRECINCT A
SEWER RETICULATION LAYOUT PLAN

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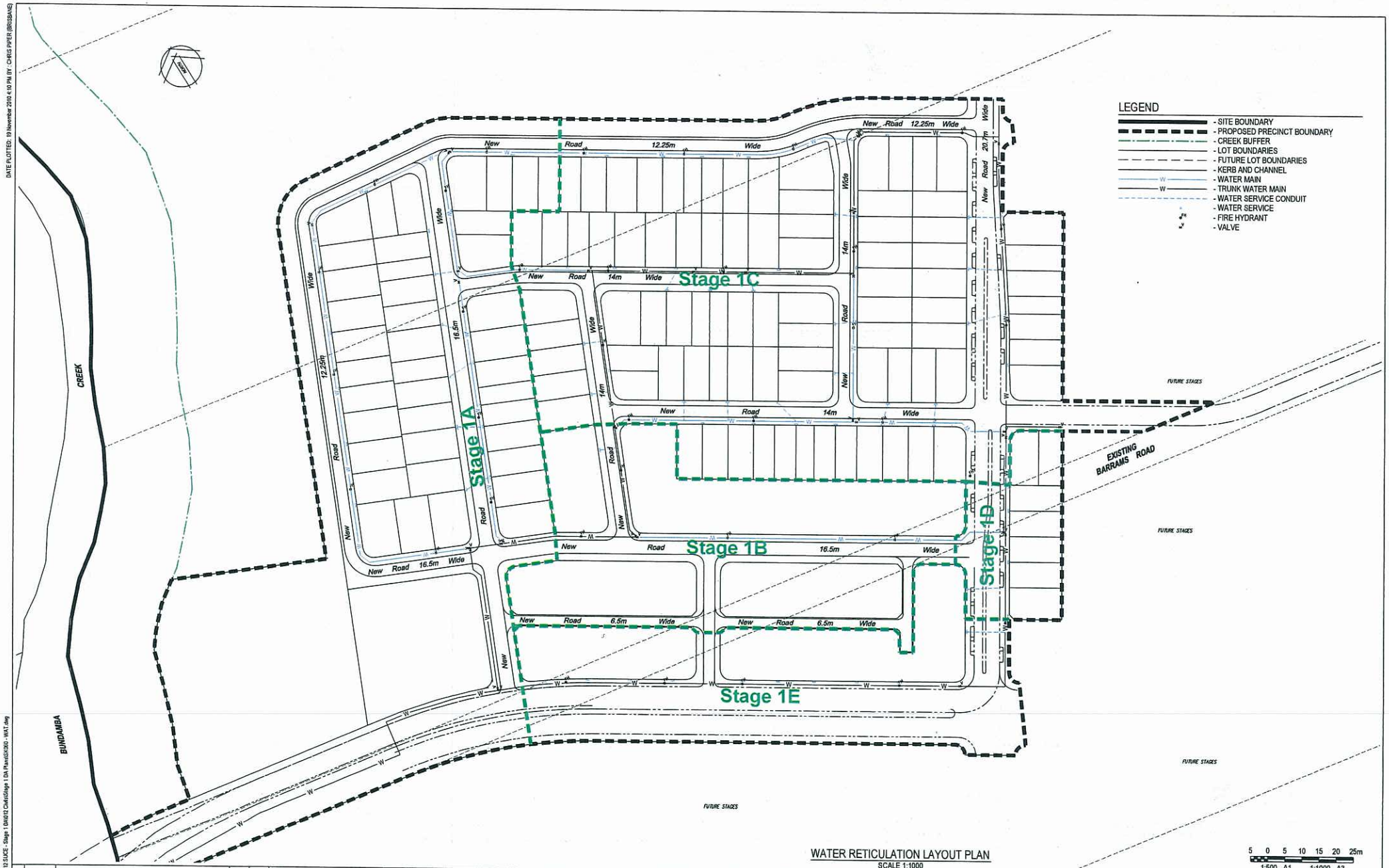

WATER RETICULATION LAYOUT PLAN
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RIPLEY VALLEY - DEVELOPMENT APPLICATION
SUCE - PRECINCT A

WATER RETICULATION LAYOUT PLAN

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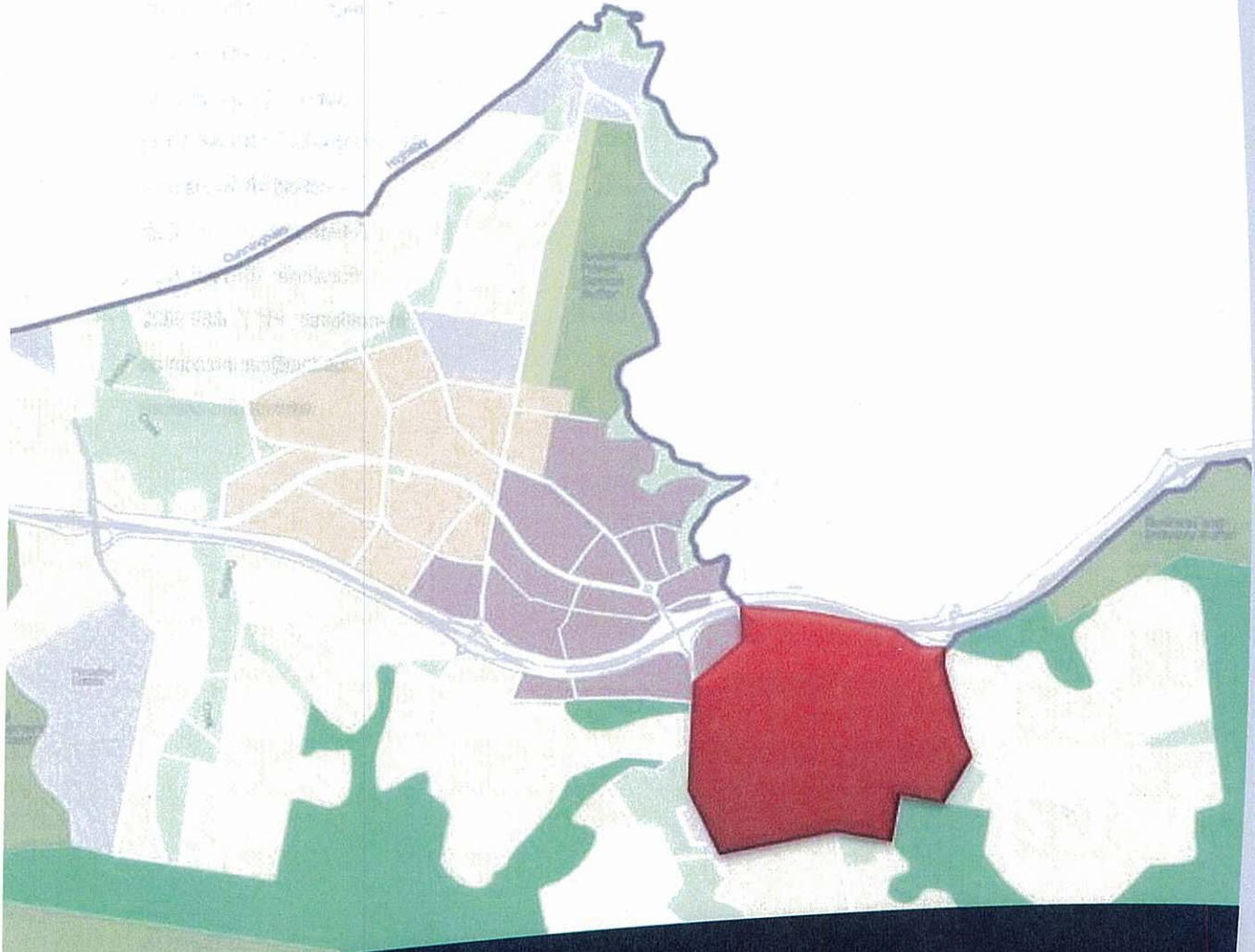
Appendix C

SUCE Water Supply and Sewerage Report

Report No: 790065-025-SUCE-004

Dec 2009

Cardno
Shaping the Future



Ripley Valley: Secondary Urban Centre East (SUCE) Neighbourhood Master Plan

Water Supply and Sewerage Report

Report No: 790065-025-SUCE-004

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1. INTRODUCTION

Amex Corporation (Amex) commissioned Cardno to undertake an analysis of the water supply and sewerage infrastructure required to service the proposed Secondary Urban Centre East (SUCE) development within the Ripley Valley.

The SUCE development within the Ripley Valley represents the initial stages of a master planned community for the Ripley Valley. It is proposed that the SUCE will comprise of three (3) main transect zones and significant recreational open space areas. The total development area of the SUCE is approximately 327 hectares.

Ripley Valley development had previously been analysed in terms of water supply and sewerage infrastructure for the preparation of the Ripley Valley Structure Plan prepared for Ipswich City Council (ICC). Additionally, Section 15 of the Ipswich City Council Planning Scheme details the requirements for servicing Ripley Valley for both water and sewer.

This report utilises the previous work undertaken for Ripley Valley development as the basis for the analysis of the SUCE development.

2. SUCE PROFILE

The SUCE represents the initial stages of the Ripley Valley master planned development and is located to the south of the Centenary Highway Extension (CHE). The site varies in elevation from approximately 45m AHD to 85m AHD and covers an estimated total area of 327 hectares. The location of the SUCE is included on Figure 1, Appendix A.

The development within the site is proposed to comprise of three (3) transect development zones: Urban Centre, General Urban and Suburban. Open Space areas will constitute a significant portion of the site.

The preliminary projected population for the site was supplied via Conics (25/09/2009). The development densities supplied for the SUCE varied from seven dwellings per hectare to 42 dwellings per hectare. Proposed maximum densities are defined in the planning scheme policy. A range of population projections for the SUCE have been prepared based on the supplied Conics figures and using three different approaches as follows:

1. Based on an average density of 2.5 people per dwelling as indicated by Conics;
2. Based on the Equivalent Person (EP) densities for water and sewerage planning adopted by Ipswich City Council in Planning Scheme Policy 5 (PSP 5). For residential lots greater than 450m^2 a density of 3.3 EP/dwelling has been assumed, where the residential lot is less than 450m^2 a density of 2.7 EP/density has been assumed. Non residential lots are typically calculated as an EP based on gross floor areas (GFA). The breakdown of non residential GFA is currently unknown for the SUCE development.
3. Based on an assumed dwelling density per hectare for the Urban Centre and General Urban area based on the Planning Scheme Policy to take account of the potential water and sewerage load from the non-residential component.

The calculated EP for the SUCE ranges from 11,238 to 13,375. A population of 12,218EP was adopted in this analysis as the total EP for the site as the median of the three.

Table 1 below details the projected water and sewerage population within the SUCE development.

Table 1 SUCE Development Density and Forecast Population

Calculation Method	Transect Zone	Area	Dwelling Density per hectare[1]	Population per Dwelling	Population (EP)
1. Conics Density	Urban Centre	10.9	18.4	2.5	501
	General Urban	121.6	18.4	2.5	5,594
	Suburban	111.8	18.4	2.5	5,143
	TOTAL	**244.3**	**18.4**	**2.5**	**11,238**
2. Conics Dwelling density with Ipswich Water EP per dwelling	Urban Centre	10.9	18.4	2.7	541
	General Urban	121.6	18.4	2.7	6,040
	Suburban	111.8	18.4	3.3	6,794
	TOTAL	**244.3**			**13,375**

Calculation Method	Transect Zone	Area	Dwelling Density per hectare[1]	Population per Dwelling	Population (EP)
3. Urban Centre and General Urban density per ha from PSP-5	Urban Centre	10.9	75	1	815
	General Urban	121.6	38	1	4,610
	Suburban	111.8	18.4	3.3	6,794
	TOTAL	**244.3**			**12,218**

Note: The Dwelling Density represents the average density across the whole developable area.

2.1 Growth Profile

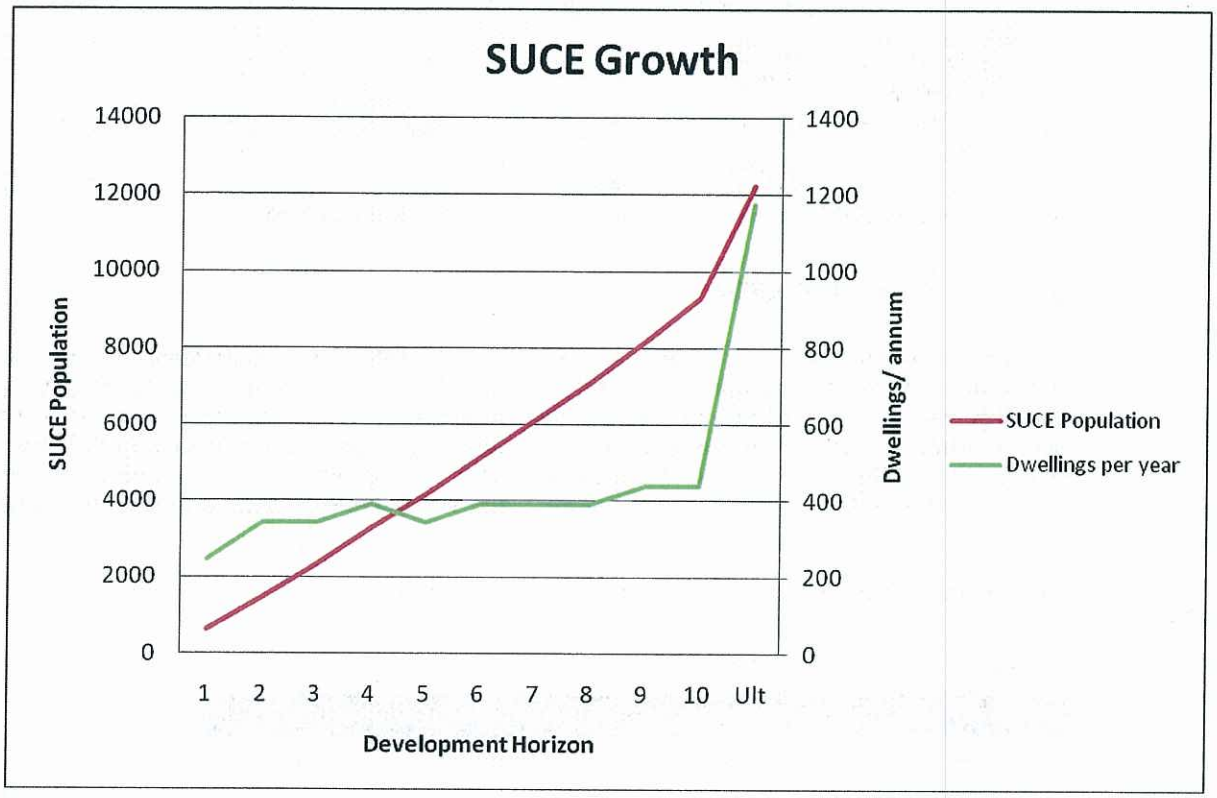
In order to assess the water supply and sewerage infrastructure requirements it has been necessary to assume a growth profile for the SUCE. An average growth of approximately 422 dwellings per annum has been assumed based on almost complete development of the SUCE over 10 years. The growth profile over the 10 years has been assumed to vary with lower growth rates at the start and end of the development. The growth per annum and cumulative EP assumed is shown in Table 2 and Figure 1 and varies between 225 to 500 dwellings per annum.

The assumed transect zone sequencing is shown on Figure 5.

Table 2 SUCE Growth Profile

Year	Dwellings	Population (EP)	Cumulative EP
1	244	611	611
2	342	855	1,466
3	342	855	2,321
4	391	977	3,299
5	342	855	4,154
6	391	977	5,132
7	391	977	6,109
8	391	977	7,087
9	440	1100	8,186
10	440	1100	9,286
Ult	1173	2932	12,218
TOTAL	**4,887**		**12,218**

Figure 1 ***SUCE Growth Profile***



3. DESIGN CRITERIA

The following design criteria were adopted for this study in accordance with the *Ipswich Planning Scheme: Planning Scheme Policy 3 – General Works; Part 4 Water Reticulation* (June 2007).

3.1 Water

3.1.1 Demand and Peaking Factors

- Average Day Consumption (AD) = 320L/EP/day
- Mean Day Maximum Month/Average Day (MDMM:AD) = 1.5
- Maximum Day/Average Day (MD:AD) = 2
- Maximum Hour Demand (MH)
  - Residential = 53.5L/EP/hr

3.1.2 Storage

- Ground Level Storage = 3 × (MD - MDMM)

3.1.3 Fire Fighting

- Fire Flow = 15 L/s at 2 hours (for residential)
  = 30 L/s at 4 hours (for commercial / industrial)
- Minimum Residual Pressure
  = 12 m (for residential, commercial / industrial)

3.1.4 Residual Pressures

- Minimum pressure = 22 m
- Minimum pressure (localised elevated areas) = 16m (subject to approval)
- Maximum pressure = 80 m

3.1.5 Hazen-Williams Coefficient

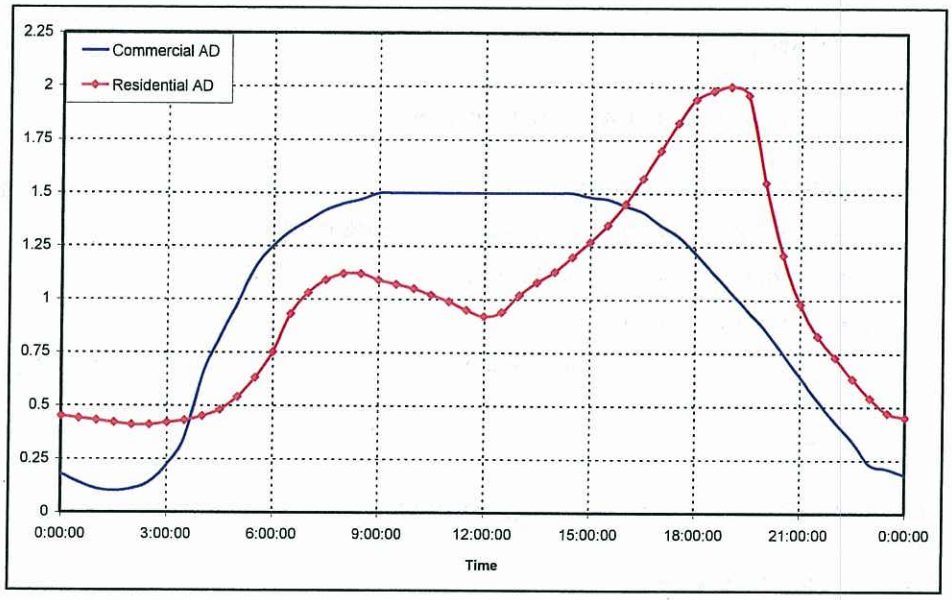
The following Hazen Williams Roughness Coefficients were adopted:

Pipe Diameter (mm)	Adopted Hazen Williams Friction Coefficient "C" for uPVC
<=150	120
200 – 300	125
>375	130

3.1.6 Diurnal Pattern

The diurnal patterns used for various categories of demand are illustrated below.

Diurnal Patterns



3.2 Sewerage

3.2.1 Demand and Peaking Factors

- Average Dry Weather Flow (ADWF) = 230L/EP/day
- Peak Dry Weather Flow (PDWF) = 2 x ADWF
- Peak Wet Weather Flow (PWWF – design flow) = 5 x ADWF

3.2.2 Gravity Sewer Design

- Flow Equation = Manning's
- Manning's Friction Factor (n) = 0.013
- 150mm Sewer Capacity = 0.5 full (1/2 d)
- 225-450mm Sewer Capacity = 0.75 full (3/4 d)
- 450mm and greater Capacity = pipe full

3.2.3 Pump Stations

- Single Pump Operation = PDWF
- Dual Pump Operation = PWWF

- Wet Well Sizing = $\frac{(0.9 \times PDWF)}{N}$

  Where:
  Single pump capacity measured in L/s;
  N= 12 starts/hour for <30 kW motor;
  N= 8 starts/hour for 30 to 50 kW motor; &
  N= 5 starts per hour for > 50 kW motor

- Emergency Storage = 4 Hours ADWF

3.2.4 Rising Main Design

- Minimum Velocity (fixed single speed) = 0.75m/s
- Minimum Velocity (low speed, dual speed pumps) = 0.6m/s
- Maximum Velocity (single pump) = 1.5m/s
- Maximum Velocity (dual pumps) = 2.0m/s

4. SUCE FLOW PROJECTIONS

The projected water supply demand based on the population estimate in section 2 and design criteria in section 3 is detailed in Table 3 and Table 4.

Table 3 SUCE Projected Water Supply Demand per Development Horizon

Horizon	EP	AD (L/s)	MDMM (L/s)	MD		MH (L/s)
				(ML/d)	(L/s)	
0-5 Years	5,132	19.0	28.5	3.3	38.0	76.0
5-10 Years	9,286	34.39	51.59	5.94	68.79	137.48
10+ Years	12,218	45.3	67.9	7.8	90.5	180.9

Table 4 SUCE Projected Water Supply Demand per Development Zone

Stage	EP	AD (L/s)	MDMM (L/s)	MD		MH (L/s)
				(ML/d)	(L/s)	
Urban Centre	815	3.0	4.5	0.5	6.0	12
General Urban	4,610	17.1	25.6	3.0	34.1	68
Suburban	6,794	25.2	37.7	4.3	50.3	101
TOTAL	**12,218**	**45.3**	**67.9**	**7.82**	**90.51**	**181**

The projected sewage flow based on the population estimate in section 2 and design criteria in section 3 is detailed in Table 5.

Table 5 SUCE Projected Sewage Flow

Stage	EP	ADWF		PWWF	
		(L/s)	(ML/d)	(L/s)	(ML/d)
Urban Centre	815	2.2	0.2	10.8	0.9
General Urban	4,610	12.3	1.1	61.4	5.3
Suburban	6,794	18.1	1.6	90.4	7.8
TOTAL	**12,218**	**32.5**	**2.8**	**162.6**	**14.1**

5. INFRASTRUCTURE REQUIREMENTS

This section details the water supply infrastructure required for the SUCE development to meet Ipswich City Council's Desired Standards of Service (DSS) including peak hour and commercial/industrial fire flow events.

The water supply analysis was undertaken using the latest H_20MAP model provided by Ipswich Water on the 1st October 2009. The model supplied by Ipswich Water is their master planning modelling and is setup with:

- Model scenarios for 2006, 2011, 2016, 2021, 2041 and ultimate design horizons;
- Ripley demands occurring in 2041;
- No connection from the Southern Regional Water Pipeline (SRWP) in the model until development in Ripley occurs in 2041 even though an existing 375mm connection has been established as indicated in Figure 1, Appendix A;

For the purposes of this report, the following planning horizons within the supplied hydraulic model have been utilised as the basis for all planning and analysis:

- 2011 for SUCE development between zero and five years;
- 2016 for SUCE development between five and ten years;
- 2021 for SUCE development to ultimate (i.e. ten years plus);

All model scenarios have included the recently constructed 375mm connection from the SRWP.

5.1 Water Supply Infrastructure

5.1.1 Existing Ripley Water Supply Zone

The Ripley area was previously supplied by a pump station (WP35), located at South Station Road. A second supply main, a 375mm diameter offtake from the SRWP has recently been constructed and is in operation supplying the area. A larger diameter main to service Ripley is ultimately proposed as shown on Figure 2, Appendix A. There is also an existing substantial trunk main network within the zone (i.e. water supply mains in excess of diameters over 300mm) delivering flow to the reservoirs and the network.

The area is currently primarily serviced by a 10ML reservoir beyond the southern end of Wensley Road. An additional 16ML reservoir has been constructed at the same location to supply ultimate demands in Ripley Valley. The reservoirs have a bottom water level (BWL) of approximately 102.8mAHD. Therefore, generally, only areas below 75mAHD to 80mAHD are able to be serviced from the existing Reservoirs and meet Council's DSS (e.g. minimum pressure of 22m at maximum hour).

A new DN600mm diameter main along Binnies Road (from Wensley Road to Lakeview Drive) has also recently been installed to improve supply to the area.

In order to provide the SUCE with a water supply network sufficient to meet the Desired Standards of Service, both the water supply mains external to the site and the internal supply mains have been analysed. Whilst not part of the SUCE submission, the potential infrastructure needs for the Ripley Valley Urban Core located to the north of the SUCE development have been considered in the analysis.

5.1.2 External Trunk Infrastructure

The previous supply arrangement with only a supply from the South Station Road pumps could only service minimal development in Ripley (i.e. approximately 1,500 EP). The 375mm diameter offtake from the SRWP as shown on Figure 1, Appendix A together with the existing South Station Road pumps can service development in Ripley of approximately 6,000EP equivalent to more than 5 years growth at an average of 1,000EP or 400ET per annum.

The existing 375mm diameter offtake and 300mm main on Reif Street connection starts to experience high head losses once development in Ripley Valley exceeds approximately 6,000EP. This triggers a requirement for an augmentation of the offtake/connection from the SRWP as shown on Figure 2 and Figure 5.

The 2041 planning horizon, in the model supplied by Ipswich Water, indicates a 900mm to 750mm diameter main would ultimately be required from the offtake location, travelling along Fischer Road and Wensley Road towards the reservoirs. This is consistent with previous planning as part of the Ripley Valley Structure Plan and the Planning Scheme Policy. However, it is proposed to stage this augmentation subject to physical site considerations (i.e. space constraints). The first stage augmentation from the SRWP to Binnies Road for various growth forecasts for the first 10 years is discussed below.

The existing 375mm diameter offtake and 300mm main on Reif Street connection starts to experience high head losses once development in Ripley Valley exceeds approximately 6,000EP (i.e. currently forecast after approximately 5 years). This triggers a requirement for an augmentation of the offtake/connection from the SRWP as shown on Figure 2

- To service development up to the 10 year horizon forecast in this report (i.e. approximately 12,300EP) a 375mm diameter augmentation from the SRWP offtake and along Fischer Road to Binnies Road is required;
- For a demand of approximately 16,000EP a 450mm diameter augmentation from the offtake to Binnies Road would be required; and
- For demands exceeding 16,000EP a 600m diameter augmentation from the SRWP offtake to Reif Street and a 450mm from Reif Street to Binnies Road are required.

Further staging of the SRWP to Ripley Reservoir main (i.e. beyond the 10 years growth forecast in this report) will be considered in future reports as refined growth forecasts become available. However, the ultimate 900mm and 750mm required is likely to be provided by a combination of no more than two pipes given potential physical space constraints and pipe hydraulics. Therefore, future augmentations between the SRWP and Binnies Road (i.e. beyond that proposed for the first ten years in this report) will likely require replacement and upsizing of the existing 375/300mm main to achieve the required equivalent hydraulic diameter. Approximate pipe combinations based on nominal diameters to achieve an equivalent hydraulic diameter of a 900mm and 750mm are shown in Table 6. For example, this indicates the existing 375mm/300mm would require replacement with a nominal diameter of approximately 675mm to achieve an equivalent hydraulic diameter of 750mm if a 450mm was provided in this first stage.

Table 6 Equivalent Hydraulic Pipe Diameter Combinations

Pipe Diameter Combination (mm)	Equivalent Hydraulic Diameter (mm)
DN375 / DN675	726
DN375 / DN750	794
DN450 / DN600	695
DN450 / DN675	755
DN450 / DN750	820

	DN450 / ID800	863
	DN600 / DN600	781
	DN600 / DN750	887

Notes:
Diameter Nominal (DN)
Internal Diameter (ID)

Additionally, three (3) connections to the existing mains along Fischer Road from the trunk main linking the SRWP and the Ripley Reservoirs are planned. Pressure reducing valves (PRVs) located at Reif Street and Montera Road would need to be set to provide a hydraulic grade of 60m to ensure adequate pressures are maintained in the network.

The SRWP to Ripley Reservoir trunk main is proposed to act as a combined inlet/outlet main. To manage turnover in the reservoir the supply from the SRWP into the network will need to be controlled.

The proposed PRV or control valve at Binnies Road on the final section of existing 450mm trunk main along Wensley Road between Binnies Road and the reservoir will need to be controlled to maintain sufficient hydraulic grade to supply the top water level (TWL) of the Ripley Reservoirs (i.e. 110m AHD) and to also ensure turnover in the reservoirs.

5.1.3 Reservoirs

The existing Ripley Reservoirs have a combined reservoir volume of 26ML. Analysis of the model has indicated that no further storage would be required in the first 10 years to meet the DSS.

A second feed is proposed to service ultimate development south of the CHE and ensure security of supply as discussed in section 5.1.4 below. An alternative to this main would be to bring forward the proposed eastern low level Ripley Reservoir near Bayliss Road. In the Ipswich Water model this is proposed as a 21ML reservoir with a similar BWL and TWL as the existing 10ML and 16ML low level Ripley Reservoirs.

The existing high level reservoir (Volume = 0.12ML, TWL = 150m AHD) currently servicing the Deebing Heights area is proposed for augmentation. This augmentation will not be required for the SUCE development in the first 10 years based on the current proposed staging. In the Ipswich Water model this is proposed as a 5ML reservoir in 2041. A 250mm main supplied from the augmented high level Ripley Reservoir has been proposed to service the high level zone in the SUCE once development occurs (currently scheduled to occur after the first 10 years). An alternative to this main would be to construct the eastern high level Reservoir near Bayliss Road. The preferred option will depend on the proposed timing of development above 75mAHD and the potential for development to proceed in the Urban Core and Swanbank. In the Ipswich Water model the proposed eastern high level Ripley Reservoir near Bayliss Road is 18ML.

The projected water supply demand according to the proposed high (i.e. > 75mAHD) and low level (i.e. < 75mAHD) water supply zones is shown in Table 7. The table also indicates the equivalent storage component attributable to the SUCE of the existing and proposed reservoirs.

Table 7 SUCE Projected Water Supply Demand by Water Supply Zone

Water Supply Zone	EP	MDMM		MD		Reservoir Storage
		(L/s)	(ML/d)	(L/s)	(ML/d)	(ML)

High	2,932	16.3	1.4	21.7	1.9	1.41
Low	9,286	51.59	4.5	68.79	5.94	4.46
TOTAL	**67.88**	**5.9**	**90.51**	**7.82**	**180.90**	**5.86**

5.1.4 Internal Supply Infrastructure

An internal network of 300mm to 150mm diameter mains will be required to service the SUCE development. Due to the location of the development site in relation to the existing and proposed trunk main network and the existing Ripley reservoirs, two trunk mains will be required to ensure security of supply until an eastern low level Ripley Reservoir is required. The first main connecting from the Urban Core development is proposed as a 300mm main connecting from the existing 450mm main along Wensley Road then crossing the Centenary Highway Extension (CHE). A second 300mm main from the Ripley reservoir complex, to the west, is required to ensure security and is proposed in year 6 once development in the SUCE exceeds approximately 5,000EP or 2,000ET. Alternatively, a small temporary reservoir could be considered.

Due to the elevations within the development area, both a low level zone and a high level zone will ultimately need to be established with the latter to occur after 10 years. The high level zone will be required to service elevations typically above 75mAHD to 80mAHD because there is insufficient head available from the existing low level Ripley Reservoir (BWL 102.8mAHD) to meet the DSS minimum of 22m.

In the interim, the low level zone is proposed to be supplied from the 300mm diameter mains and consist of a looped trunk network (for the purposes of maintaining commercial fire fighting flows of 30L/s) through the centre of the development whilst radiating outward to a network of 200mm and 150mm diameter mains as shown on Figure 3, Appendix A.

When required (i.e. currently beyond 10 years) the high level zone is proposed to be supplied in the interim from an augmentation of the existing Ripley high level reservoir, via a 250mm diameter main from the west to the high level zone if the eastern high level reservoir has not been built. A network of 300mm to 150mm diameter mains will distribute supply within the network. Depending on the timing of the eastern low level reservoir, the proposed interim second main suppling the low level could become the interim supply main to the high level zone (i.e. in lieu of the proposed 250mm) once the low level reservoir is constructed.

Future planning within the Ripley Valley has considered additional reservoirs, both low level and high level to service future development south of the CHE and east of Ripley Road. Whilst not proposed at this stage of development, the network has been sized to allow connection of future reservoirs once they are online.

The proposed network configuration for the SUCE development is shown on Figures 3 – 5, Appendix A.

5.1.5 Rainwater Tanks

Rainwater tanks have been assumed to be included for each relevant dwelling within the SUCE area in accordance with the Queensland Development Code (QDC). For the SUCE this will primarily apply to the Class 1 buildings, which covers detached residential dwellings. The QDC specifies that where rainwater tanks are installed water reduction savings must achieve 70kL/annum. A detailed breakdown of the expected yield from the rainwater tanks can be found within the *Water Cycle Management- Lake and Wetland Feasibility Report* (Cardno, 2009). This report has assumed that the rainwater tanks will be used for toilet flushing, irrigation and any other approved use in accordance with the Water Supply (Safety and Reliability) Act 2008. However, to maintain fire fighting flows and to allow for a worst case scenario (i.e. tank empty for considerable periods), no significant reduction in water main sizing has been assumed.