Townsville

TOWNSVILLE CITY COUNCIL

INFRASTRUCTURE OPERATING COST ANALYSIS REPORT

A COMPARISON OF THE ANNUAL INFRASTRUCTURE OPERATING COSTS FOR DEVELOPMENT LOCATIONS WITHIN THE CITY
2011 TO 2026

AUGUST 2013

Planning Report

STRATEGIC PLANNING

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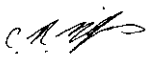
3	2nd August 2013	Updated based on further AECOM Review	C Phillips Executive Manager Strategic Planning	

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Executive Summary

This report takes infrastructure planning data and assesses the additional operating costs that would result from the infrastructure required to service development of a range of identified areas within the Townsville local authority area. The renewal cost of this additional infrastructure has been determined for each identified development study area and is then related back to the number of equivalent lots that are proposed to be developed in each area. The operating costs have then been calculated as a percentage of the renewal costs, allowing for maintenance, operation and the eventual renewal of the infrastructure (depreciation), in accordance with council's asset management plan.

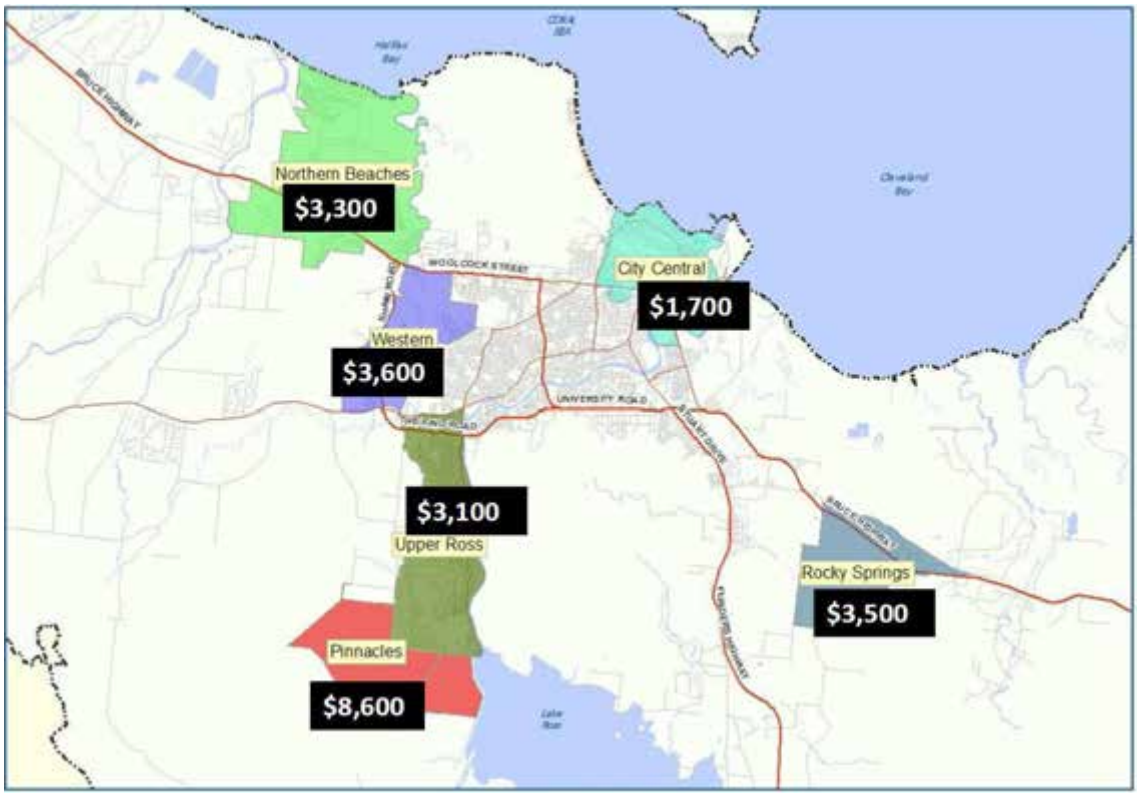
The operating costs identified in this report are based on the additional infrastructure required for each development area. Other operating costs of council such as garbage collection, libraries, events, community facilities, planning, environmental etc., and non-council services such as schools, main roads, health services and alike have not been considered in this report.

The intent of the report is to increase council's understanding of the relative ongoing operating costs of various development fronts including:

- Existing approved greenfield development growth areas
- Infill development areas
- Additional potential development areas outside the existing approved greenfield growth areas – The Pinnacles was the area used as a case study in this assessment.

The estimated annual operating costs per additional lot for each identified area are estimated as per Figure X1.

Figure X1: Estimated annual operating costs per additional lot developed for selected development areas



The key findings from the study include:

- Infill development with density uplift will effectively reduce council's annual operating costs (see City Central area in Figure X1). It is also considered that the results for density uplift specifically are conservative. The results for the City Central area include sewerage infrastructure that is required to meet existing service standards and water infrastructure required for a significant Greenfield development in the form of the ULDA residential development in Oonoonba. It is estimated that for density uplift alone, with no reduction in existing service levels, the operating cost per additional lot could be as low as $1,300.

- Even if the renewal values in the City Central area are increased for sensitivity testing by a multiplier of 2.5 to allow for the difficulty of undertaking renewals under CBD traffic and service conflicts, the infill development is still the lowest impact on council's operating costs, at $2,000 per additional lot.

- Greenfield development areas already approved and planned for generally tend to maintain the status quo with regard to council's annual operating costs (see Northern Beaches, Western & Upper Ross as shown in Figure X1). It is noted that the current council overall operating cost is $3,600 per equivalent lot.

- Greenfield development outside the planned and approved areas and requiring long infrastructure connections back to existing networks are expensive and will result in an increase to council's annual operating costs with associated upward pressure on rates (refer The Pinnacles scenario as an example in the Figure X1).

- The Rocky Springs development has a comparable operating cost per lot to other planned development areas. The key reasons for this is that it has nearby infrastructure with spare capacity (ie Brook Hill reservoir, Alligator Ck trunk water main and the Bruce Highway). The expense of upgrading the Bruce Highway is the subject of an infrastructure agreement between the Department of Transport and Main Roads (DTMR) and the developer and therefore is not at cost to council. It does emphasise the importance of similar work (to this study) being undertaken by other (State) infrastructure providers. In this regard it would be useful for similar analysis to be undertaken by the State Government as it would probably indicate net higher service costs for the Rocky Springs development area because it relies heavily on the State Controlled roads to connect to the broader city's road network.
  Ultimately all annual operating costs, whether they be Federal, State or Local Government are a cost to be met by the community as rates or taxes. It is in the community's interests to have holistic planning that looks at the overall cost burden upon the community

Based on the findings of this report, it is recommended that council:

a) Give consideration to developing strategies to foster and encourage infill development, as it has the lowest operating cost per additional lot.

b) Undertake an operating cost assessment for any future major development application, so that it is informed of the impact on operating costs when considering the addition of more land for urban development within the city

c) Recommend that State Government Departments and other infrastructure providers responsible for infrastructure planning undertake similar studies relating to operating costs of their infrastructure, to allow a co-ordinated overall consideration of operating costs when considering new development areas.

1.0 Introduction

1.1 Purpose

The purpose of this study is to consolidate learning's developed during the preparation of the strategic framework of the new planning scheme for the city (proposed for gazettal 2014). The learnings, in particular, relate to the relative ongoing annual operating cost associated with developing different localities and by default, different development types within Townsville up to the year 2026.

The study builds upon work undertaken by the Priority Infrastructure Plan (PIP) project team that identified the trunk infrastructure needed to support the future development identified in the proposed City Plan up to year 2026. The equivalent future population projections used in the report are the same as the population projections used to determine the trunk infrastructure in the PIP and therefore provides consistency across this cost impact assessment report, the PIP and proposed City Plan.

This report firstly takes the cost involved in establishing the new infrastructure for various development locations and then converts this to a renewal value. The operating cost of that infrastructure is then assigned to determine the relative ongoing annual cost for each development locality. By default, the study included investigation of different types of development, as the redevelopment of the existing city areas is aligned to density uplift such as multiple housing etc.

1.2 Project Scope

Various scenarios, covering a range of selected areas of general development, have been considered to ascertain the relative operating costs of infrastructure for differing types of development. The specific types of development considered were:

- Existing approved growth areas
- Infill development areas
- Additional potential development outside the existing growth areas. The proposed Pinnacles development was the area used as the case study for this development type.

The expenditure of capital to establish new infrastructure results in this infrastructure being added to council's asset register. Therefore, all new infrastructure has been taken into account. Irrespective of how this new infrastructure was initially funded (either as additional trunk infrastructure to be built directly by the developer, as trunk infrastructure to be funded from the collection of infrastructure charges, or as donated assets within each development area) these additional assets then require funding to operate and maintain, and eventually to replace (depreciation) in order to ensure ongoing delivery of service. Any new infrastructure therefore provides an ongoing operating cost to council.

This study does not take into account the operating cost of existing infrastructure. It only considers the additional infrastructure, and hence the additional operating costs to service the proposed development areas. This study recognises that much infrastructure is already in place with spare service capacity available and that it is generally cheaper and more efficient to service those areas that will utilise existing spare capacity (infill development). This existing infrastructure has an ongoing operating cost to council for both its utilised capacity and its spare capacity. To service new areas that require additional infrastructure is not an efficient use of the existing infrastructure.

Also excluded from the study is the incremental roll out of infrastructure combined with the incremental change of population. While a full net present value (NPV) analysis with respect to infrastructure provision at nominated times, based upon demands, will determine the efficiency of provision of infrastructure more accurately, it is not considered that the findings of this study will be significantly different. This study only examines the cost impacts as at 2026 and has not undertaken a net present value assessment.

Sensitivity testing was also undertaken to determine if variable growth rates within a scenario would affect the findings of this study in a development area.

1.3 Assumptions

The sizing of infrastructure has been derived from other planning studies undertaken by council to meet the longer term needs of the city. In all cases, this infrastructure will support proposed development up until year 2026. However, there will be cases where there will be spare capacity in planned infrastructure to support development beyond year 2026, where it is known the development will proceed beyond that point. This is inherent in the planning of a city's infrastructure requirements.

For the Pinnacles development case study where infrastructure planning had not previously been undertaken by Council, an assessment of the trunk infrastructure sizing was completed as part of this study. The required trunk infrastructure sizing is included in the appendices to this report.

The growth assumptions have been derived using the Townsville growth model. This model was peer reviewed in 2010/11 by:-

- Arup Pty Ltd
- Urbis Pty Ltd
- Urban Economics Pty Ltd

A consolidated report entitled "Review of Townsville Growth Model prepared for Townsville City Council (February 2011)" by Urban Economics indicated that "the model was useful in its then current form and would be robust with improvements as per their recommendations". The model is being constantly improved, including the recommendations from Urban Economics and has been rebuilt to incorporate the zonings proposed in the new Town Planning Scheme for Townsville. At the time of preparing population projections from the new Town Planning scheme for Townsville, the scheme was 80% complete, however the densities derived from the proposed zonings were substantially finalised. The integrity of the model is not a subject of this report and the model is merely used as a tool for predicting growth of populations and employments using a consistent base of assumptions that are built into the model.

The Office of Economic and Statistical Research (OESR) population forecasting unit of Queensland Treasury provides population projection for the local authority based upon their research of the existing and potential opportunities within the region. Their projections are provided as high, medium or low growth rates. The growth model uses projected growth rates for the local authority (the medium growth series is assumed and adopted in this report) and distributes the populations to locations where there is identified spare capacity for the proposed zoning of the land under the proposed new planning scheme (80% complete) in accordance with researched market trends for five separate housing market types being urban separate houses, rural residential separate houses, rural separate houses, multiple dwellings (units) and other. The researched trends are based upon building approvals from year 2000 to the census year of 2011.

1.4 Glossary of terms

Capital cost	The amount of money expended to:- • provide a new asset or • Upgrade the capacity of an asset, or • Renew an asset
Operating Cost	The amount of money expended to, operate and maintain a service. This cost would also include depreciation and interest on loans. Operating cost in this report are annual operating costs.
Service	Function undertaken by council for the benefit of the community. Service can require an asset based solution or a non asset based solution (e.g. the service is undertaken by contract)
Renewal	A means of refurbishing an asset to make it capable of providing its originally intended service to the same degree of effectiveness and capacity.
Rehabilitation	A means of renewing an asset.
Reconstruction	A means of renewing an asset.
OESR	Office of Economic and Statistical Research - A Division of the Queensland Treasury and Trade.
Greenfield	Large area sites with no existing development to impede progress.
Brownfield	Infill development or development interspersed amongst existing development.
PIP	Priority Infrastructure Plan
PFTI	Plans For Trunk Infrastructure that are detailed in the Priority Infrastructure Plan
CBD	Central Business District of Townsville
EP	Equivalent Population
DTMR	Department of Transport & Main Roads

2.0 Methodology

The methodology followed for the study included the following steps:

- Separate development areas were identified within existing growth areas for examination. The areas were aligned with growth model zones to enable concordance with population projections. Polygons were included as a layer on the GIS for mapping.

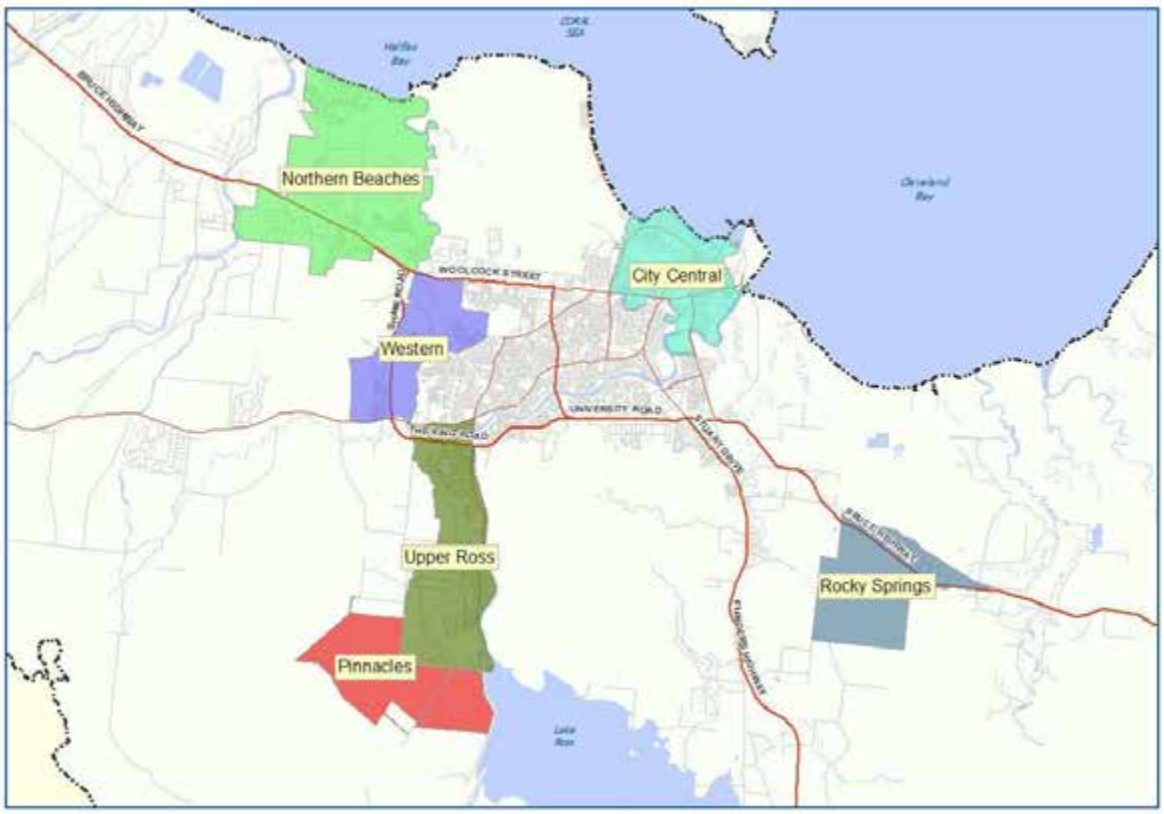
- Additional areas for potential development that are beyond the existing growth boundary were identified. In this category, the proposed Pinnacles development was used as a case study. The area was included on the GIS and mapped.
- GIS was used to overlay the planned future trunk infrastructure and to identify the future infrastructure to provide the required level of service to support each distinct development area. For additional areas not planned, the additional trunk infrastructure required to connect back to an acceptable location on the network that could support the additional loadings was determined and drafted onto the GIS. Future infrastructure was allocated to the respective development areas.
- Where trunk infrastructure will be regional or shared between development areas, this infrastructure was identified separately. This shared infrastructure was allocated appropriately.
- Using the GIS, the tables of future infrastructure supporting the identified development were extracted, including details of attributes such as length, development area, etc.
- Using standard estimating rates for various size and type of infrastructure, the establishment costs of the various infrastructure types for each development area or scenario were determined. Where there is shared or regional infrastructure, the cost to the relative development areas was apportioned. Reservoirs, for example, are shared equally to all users in proportion to demand. On the other hand, a road such as Ingham Road could be shared between several areas but not all areas. This would also be shared in proportion to the estimated demand each selected area places on the item of infrastructure.
- These initial establishment costs were then converted to renewal costs for this infrastructure based upon council's historical data within its asset management system.
- The operating costs were then determined based on a percentage of the renewal cost.
- A comparison summary table was prepared for each relevant infrastructure type to enable comparison of the development areas and the scenarios. The table included the calculated amount of relative additional operating costs for each development area.
- Sensitivity analysis was also undertaken to allow for more expensive renewals in the City Central area.
- A sensitivity analysis was also undertaken to ascertain the impact of development rates for The Pinnacles case study area that requires additional connecting infrastructure.

Results were summarised and are presented in this report, together with recommendations.

3.0 Development Areas and Population Projections

The catchments for development areas are shown in Figure 1

Figure 1: Areas of development under consideration



The population and types of employment used in this study align with the planning assumptions proposed for the Priority Infrastructure Plan, which is part of the City's new planning scheme being prepared for gazettal in 2014. The medium series population projections (total forecasted populations) based upon the May 2011 release from the OESR have been used. The May 2011 release was before the 2011 census and had projected a population of 191,119 persons for 2011. The census concluded there were 180,391 persons in 2011. No new forecasts will be released by OESR until August 2013, therefore the May 2011 release has been used for this analysis, with the 2011 projection of 191,119 persons.

Council has not examined high and low growth rate scenarios. This is an exercise in relativity between all areas and any variation in development rate that is city wide will affect all areas proportionately, when applying a consistent set of growth assumptions equally across the city.

The population increases for each catchment area are detailed in Figure 2 and Table 1.

Figure 2: Relative Population Increases 2011 to 2026

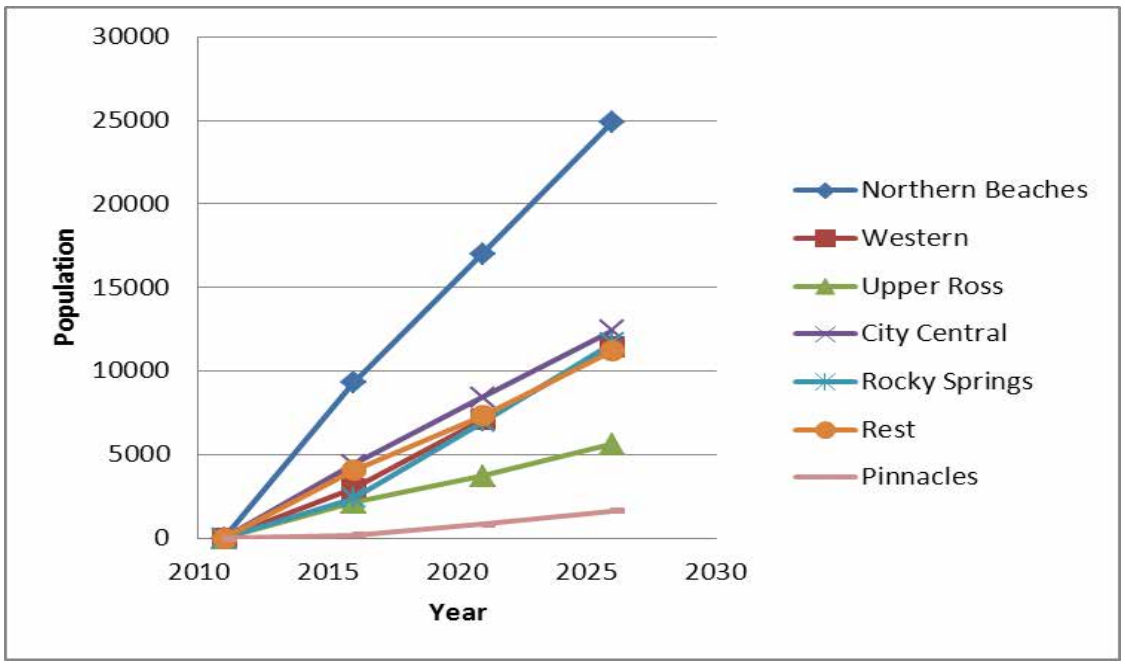


Table 1: Relative Population Increases 2011 to 2026

	2011	**2016**	**2021**	**2026**
Northern Beaches	0	9330	16997	24872
Western	0	2980	7097	11424
Upper Ross	0	2158	3744	5629
City Central	0	4430	8443	12409
Rocky Springs	0	2412	6952	11672
Balance of City	0	4095	7332	11205
Total	**0**	**25405**	**50565**	**77211**
Pinnacles	0	209	856	1638

As an area such as City Central has significant employment opportunities, it is prudent to not only examine population increase, but also employment increases, as both have demands upon infrastructure. For all areas, employees were converted to equivalent populations (EP). The combination of populations and employees has been totalled as equivalent persons, where 1 employee is equal to 20% of a resident person.

This is true for assessing demands on water and sewerage and has therefore been included for the development areas in Table 1. Traffic demands on roads are modelled separately and relate to a more comprehensive set of demographics relating to populations, household numbers, workers, employment types and numbers, school enrolments and even visitors. The employee impact may therefore differ from the 20% figure applied. Nevertheless, to allow consistent analysis, the employment in each area has been converted to equivalent persons by multiplying by 20%.

Figure 3 shows the equivalent population growth and Table 2 shows the relative increase in equivalent populations for the same catchment areas.

Figure 3: Relative Equivalent Population increases 2011 to 2026

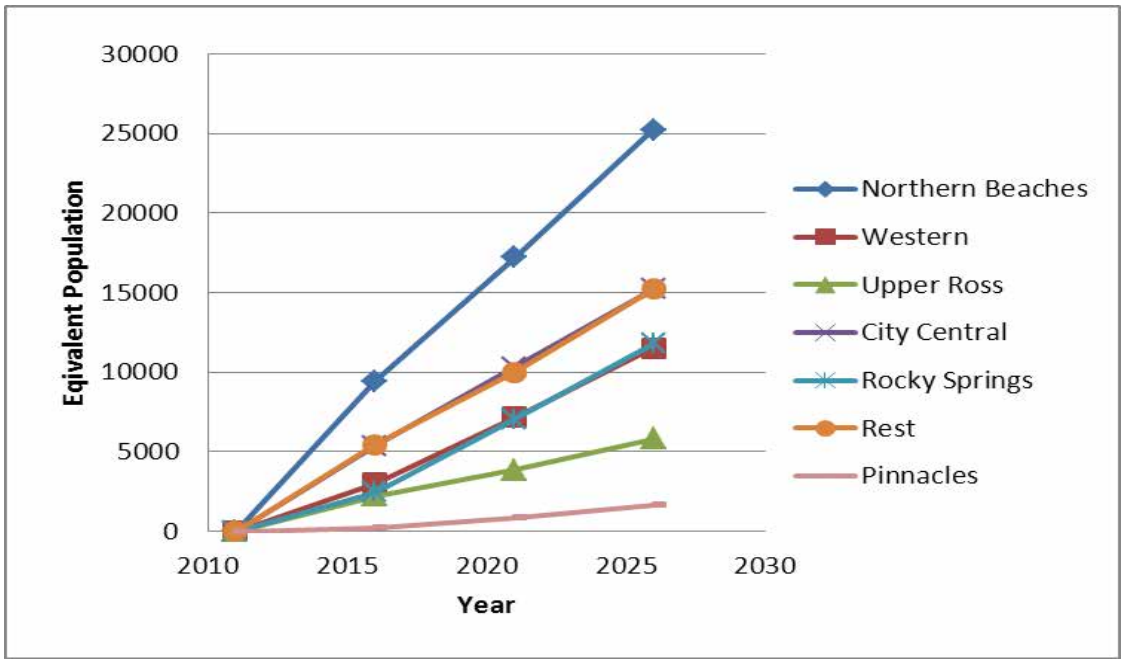


Table 2: Relative Equivalent Population increases 2011 to 2026

	Equivalent Population Increase			
	2011	**2016**	**2021**	**2026**
Northern Beaches	0	9446	17229	25223
Western	0	3014	7165	11526
Upper Ross	0	2223	3872	5820
City Central	0	5379	10324	15213
Rocky Springs	0	2455	7037	11802
Balance of City	0	5430	9994	15211
Total	**0**	**27945**	**55621**	**84795**
The Pinnacles	0	211 (approx.. 75 lots)	865 (approx.. 309 lots)	1654 (approx. 591 lots)

Projections for Townsville in Tables 1 and 2 are exclusive of the proposed Pinnacles development. As a separate scenario, the Pinnacles development was modelled in the Council growth model to determine the rate of growth it would attract. The growth model was used to ensure consistent applications of assumptions to The Pinnacles. Results of this modelling are outlined in Tables 1 & 2 on the row labelled “The Pinnacles”. The values in parenthesis indicate the number of equivalent residential allotments.

4.0 Comparison of cost of additional infrastructure delivery between infrastructure types

All additional infrastructure added to council's asset register adds an ongoing annual operating cost to council's expenditure, through the addition of general operating costs, maintenance costs, and the eventual renewal of the infrastructure (depreciation) costs. Generally, these annual operating costs comprise:

Table 3: Operating costs

Roads	Average Depreciation Rate	3.1% of asset renewal valuation
Roads	Average Operating and Maintenance Cost	2% of asset renewal valuation
Water Supply Infrastructure	Average Depreciation Rate	2.5% of asset renewal valuation
Water Supply Infrastructure	Average Operating and Maintenance Cost	3% of asset renewal valuation
Waste Water (excluding treatment plants)	Average Depreciation Rate	2.4% of asset renewal valuation excluding the Treatment Plants.
Waste Water (excluding treatment plants)	Average Operating and Maintenance Cost	4.2% of asset renewal valuation excluding the Treatment Plants

Source: Vivek Kangesu, Townsville City Council Corporate Asset Manager (25th Jan 2013)

The depreciation, operating and maintenance costs are percentages of the council renewal valuation of each asset. The council renewal valuation is not necessarily the full establishment cost (or construction cost), as not all components in the construction of an asset will depreciate at the same rate.

For example, the earthworks in a road construction will retain 100% residual value indefinitely, the pavement will have a 50% residual value at the end of 40 years, meaning that 50% of the cost of the gravel in the pavement contributes to the remaking of the new pavement, and the bitumen will have a zero residual value after 15 years and is completely discarded at the end of this time. By working through all the components that make up a road, it can be established that the council renewal valuation is between 51% and 63% of the establishment cost. This study uses a renewal value equal to 55% of the establishment cost. Estimated establishment costs for roads have been adjusted in value accordingly to determine the renewal costs before applying the percentages in Table 3.

For water and sewerage assets, the full establishment costs for greenfield areas have been taken as the council renewal valuation cost. If anything, it may be more expensive to replace these assets in the future in brown field areas but this will be the case for all the development areas.

Nevertheless, the issue is that the addition of infrastructure to the system will increase council's annual operating costs proportionately, if a consistent level of service is to be retained.

Due to the difference in operating, maintenance and depreciation cost percentages for the various assets, the weighted average rate of 5.39% has been determined for combined assets where the value of the assets cannot be separated. This was calculated from the full value of all roads, water, sewerage, stormwater, parks and pathway assets that are currently on council's asset register as per Table 4.

Table 4: Total capital renewal values and operating cost of Infrastructure on Council records

Infrastructure type	Operating cost combined % for O&M and Depreciation	Total council renewal value of asset type	Total annual operating budget
Roads	5.10%	$1,936,846,309.16	$98,779,161.77
Sewerage	6.60%	$579,998,493.62	$38,279,900.58
Water	5.50%	$1,925,843,225.12	$105,921,377.38
Stormwater	5.00%	$798,798,296.83	$39,939,914.84
Parks	5.00%	$35,012,620.44	$1,750,631.02
Pathways	5.00%	$41,798,232.76	$2,089,911.64
Combined Total	(weighted average) 5.39%	$5,318,297,177.93	$286,760,897.23

Note – The 5% operating cost percentage for stormwater, parks and pathways is an estimate of the cost, however as these infrastructure types are consistent across all the development areas being assessed, the actual percentage does not impact on the outcomes of this report.

The capital costs for all additional infrastructure for each development area were determined, and then the annual operating cost to keep the service operational was calculated on an equivalent lot basis. These equivalent lot costs for the respective development areas can be used as an indicator of the efficiency of the development type currently nominated within each development area. An equivalent lot is equal to an equivalent population of 2.8.based upon the 2011 census results for occupancy rates for Townsville City.

Construction in built up areas will attract higher establishment costs for new augmentations. However this does not affect the flow on to the annual operating costs as the Council valuation is a renewal valuation based upon the infrastructure type and size and therefore at the time of renewal, all areas will be brown field. The argument being that all future renewals will be similarly affected, being in built up areas at the time of renewal.

Some consideration was given to applying higher renewal values to infrastructure assets located within the CBD as it will cost more to replace these at some time in the future, due to the higher cost of asset renewal under traffic and a higher amount of conflicting services.

A sensitivity analysis has been undertaken on the worksheet (Appendix A) whereby the renewal costs are calculated based upon the establishment costs alone i.e. type and size of the infrastructure only. An additional column has been added to the work sheet under the heading of City Central (Sensitivity Analysis) to understand whether a significantly higher renewal cost in the City Central area would affect results. A multiplier of 2.5 was applied to the renewal values of the additional infrastructure located within road reserves in the City Central area and 1.5 for other infrastructure such as pump stations and pump station upgrades which would be built off road. The multiplier of 2.5 is considered high, but the results show that even when an extreme multiplier is applied, the conclusions of the report, with regards to the City Central area, remain unchanged.

Calculations are detailed in the following appendices:-

Appendix A - Summary of Results for each Development Area
Appendix B - Summary of Renewal Values and Operating Costs per lot for each development area
Appendix C1 - Table of Road Establishment Costs
Appendix C2 - Table of Road Costs - Project summary
Appendix C3 - Roads Establishment Unit Rates
Appendix D - Sewerage Rising Mains Renewal Cost
Appendix E - Sewerage Gravity Mains Renewal Costs
Appendix F - Future Sewage Pump Stations Renewal Costs
Appendix G - Future Sewage Pump Station Upgrades
Appendix H - Future Water Mains Renewal Cost
Appendix I1 - Pinnacles Normal Growth – Summary of Establishment and Renewal Costs (Roads)
Appendix I2 - Pinnacles Normal Growth Summary of Renewal Costs (Water and Sewerage)

Maps of infrastructure referred to in the calculations are detailed in the following appendices: -

- Appendix J1 - Northern Beach Area - Map of Infrastructure (3 maps)
- Appendix J2 - Western Area – Map of Infrastructure (3 maps).
- Appendix J3 - Upper Ross Area – Map of Infrastructure (3 maps).
- Appendix J4 - City Central Area- Area - Map of Infrastructure (3 maps).
- Appendix J5 - Rocky Springs Area - Map of Infrastructure (3 maps).
- Appendix J6 - The Pinnacle Area – Map of Infrastructure (1 map)

The annual operating costs for all scenarios and development areas have been estimated using common unit rates to maintain relativity for comparison. Any dispute over estimating rates would necessitate the review of all scenarios to maintain this relativity.

Comments on the different infrastructure types calculations are detailed in the following sections.

4.1 Roads

To complete this exercise, roads identified in the Plans for Trunk Infrastructure (PFTI) for the PIP, which will be required to deliver the desired standard of service for each nominated development area or scenario up until year 2026, have been identified and

costed. These roads have been tagged to the respective development areas to enable summing of the total renewal cost of the road required for each respective area.

Appendix C details the road costs and timings for construction.

In relation to Ingham Rd, the cost of the upgrade cannot be attributed to one development area therefore an apportioning exercise was undertaken.

The duplication of Ingham Road to four lanes in year 2026 at a renewal cost of $21.3M has been distributed to a number of catchments, with an estimated 60% of this cost being apportioned on a per equivalent population basis to the development areas considered in this study. The following table provides a summary of the apportionment of the costs.

Table 5 – Apportionment of Ingham Rd Upgrade Costs to Study Areas

Development Area	Percentage of Population using Ingham Rd	Population of areas	Population using Ingham Rd	Apportionment Factor based on population	Cost apportioned to each area
Northern Beaches	60%	25,223	15,133	67.5%	$8.6M
Western	30%	11,526	3,458	15.4%	$2.0M
City Central	25%	15,213	3,803	16.9%	$2.2M
Subtotal			22,394	100%	$12.8M

The remaining 40% ($8.5M) of the Ingham Rd duplication cost has been allocated to the rest of the city, which is not identified as a development area in this study.

The duplication of the Dalrymple Road Bridge at an establishment cost of $28.2 M by year 2026 has been attributed to the western catchment, although it could be argued that it could partly be attributed to a number of other catchments, such as the balance of the city, Northern Beaches, and even the Upper Ross.

Planning in relation to whether the duplication of Dalrymple Road Bridge and Ingham road will be required by year 2026 is continuing but has been included in this exercise, hence the operating costs for the Northern Beaches, Western & City Central areas could be overstated.

All roads over 6,000 vehicles per day have been included, as per the PIP definition for trunk infrastructure. The Pinnacles and Rocky Springs developments do not have these internal trunk roads identified, so an allowance has been made. This allowance is at the same rate as the costs within the Northern Beaches Area which has had trunk road planning undertaken. The internal trunk roads in the Northern Beaches area amounts to $5,353 renewal value per lot being 55% of the establishment cost of $9,732 per lot.

Additional major connecting roads to link The Pinnacles to the existing trunk networks have been included as a separate line item, being additional to the already identified trunk cost for the PFTI and the internal roads cost.

The DTMR roads are generally regional and do not impinge upon council's operating costs. Accordingly, they have not been included in the differential cost assessment.

All establishment cost values for roads have then had a factor of 55% applied to determine the council renewal valuation. The operating cost of this group of assets is 5.1% of the renewal value as detailed in Table 4.

4.2 Water

Regional establishment costs, including dams, the Burdekin pipeline, treatment plants, major delivery mains and reservoirs, have been applied at the same rate of $8,002 per lot to all equivalent lots created in all development areas. This has been calculated from assessing the amount of regional costs in the current long term Capital Works Program of council (Version 19) and determining an average cost per lot.

All other costs have been calculated by extracting the lengths of each element from the Water PFTI, using GIS, and applying a unit rate for the various sizes and types of pipelines etc.

Appendix H details the future water main costs and timings. The renewal value is equal to the establishment costs detailed above. The operating cost of this group of assets is 5.5% of the renewal value as detailed in Table 4.

4.3 Sewerage

Regional costs, including major rising mains, some pump stations and treatment plants, have been applied at the same rate of $5,732 per lot to all equivalent lots created in all development areas. This has been calculated from assessing the amount of Regional costs in the current long term Capital Works Program of council (Version 19) and determining an average cost per lot.

All other costs have been calculated by extracting the lengths of each element from the Sewerage PFTI, using GIS, and applying a unit rate for the various sizes and types of pipelines, etc.

It is noted that many of the rising mains and pump station upgrades in the City Central area are required in any case due to the current deficiency in level of service. They are included and as a consequence the result will be conservative.

Appendices D, E, F & G detail the future sewerage assets costs and timings

The operating cost of this group of assets is 6.6% of the renewal cost as detailed in Table 4. The renewal value is equal to the establishment costs above.

4.4 General

Localised infrastructure including internal access streets, water reticulation, sewerage reticulation, paths, local parks and stormwater are generally the same for all areas estimated at $26,500 per lot. In areas with existing infrastructure, such as in the CBD & North Ward portions of the City Central area this cost is zero. In this assessment the City Central area does include the greenfield development site of 851 allotments at Idalia for the Urban Land development Authority (ULDA), and so a cost of $26,500 for each of the 851 lots has been included in the City Central area. Note, however, that as ULDA lots tend to be smaller on average than other areas, a value of $15,000 may have been more representative, hence the results for the City Central area could be conservatively high. The remaining development areas and scenarios have also been allocated general costs of $26,500 per lot (assessed at 2.8 EP per lot).

This $26,500 amount has been extracted from the council asset register being the renewal values per lot for existing development for drainage ($6,500), roads ($11,000), sewerage ($2,500), water ($2,000), pathways ($500) & local parks ($4,000). The assumption being that this level of provision of internal infrastructure to development will continue at the same rate. The combined operating cost of all of these local development assets is 5.39% of the renewal cost as detailed in Table 4.

4.5 Miscellaneous Trunk Infrastructure

This group includes regional parks ($5,600 per lot) and regional Pathways ($1,100 per lot). This renewal value is constant across all development areas and so will not affect the relativity of cost to develop any particular area or scenario.

The operating cost of the miscellaneous trunk infrastructure has been assumed at 5% of the renewal value as detailed in Table 4.

5.0 Spare Capacity

Most existing infrastructure has spare capacity to varying degrees. The infrastructure that has spare capacity was generally planned and constructed to meet the demands from future planned development. Based on this, adding new development fronts will:

a) Reapportion population across the city, thus reduce the population available for the existing planned areas and reducing the take up of the current spare capacity; and
b) Create an additional supply of infrastructure with spare capacity until the new developments grow sufficiently to consume that spare capacity.

The existing and additional spare capacity not only has a capital cost but also has an operating cost.

As a result of traffic modelling, it has been established that for one infrastructure type (trunk roads) the current spare capacity in the system is about 70% of the total capacity (Bailey unpublished). This spare capacity was determined as part of detailed traffic modelling of the city and is based on a nominated level of service that is derived from

the ratio of traffic volume to the capacity of each road. If the level of service for roads was changed, the spare capacity would also be altered. However this would be applied to all development areas considered and would therefore not materially change the outcomes of this assessment.

The estimated valuation of trunk roads (council renewal valuation) is $340M, meaning that the value of the spare capacity is currently approximately $240M. This $240M of capital has an ongoing annual operating cost of approximately 5.1% for maintenance and depreciation and amounts to $12.2M.. This shows that there is a lot of current spare capacity in the system that can be utilised to reduce the operating cost per lot. Other infrastructure types will also have spare capacity, although not necessarily to the same extent.

Development that reduces spare capacity and does not need new infrastructure will reduce the operating cost per lot. In general, adding new development areas does not take up existing spare capacity in planned development areas and adds new infrastructure with its own spare capacity. If not prudently located these new development areas will result in a net increase in the spare capacity across the city, thus increasing the operating cost per lot.

6.0 State Government Infrastructure

State Government infrastructure (including schools, main roads, rail etc.) have not been taken into account in this analysis. Where no capacity exists in existing infrastructure then, upgrading of infrastructure will be required at a cost to the State Government.

It is noted that schools have been planned for the Northern Beaches area (primary and secondary), Western Area (at Cosgrove), and Rocky Springs (primary and secondary). This generally accounts for all the existing development areas. Inner city state schools are suffering decline in enrolments due to the ageing population. Any development within the existing urban developed footprint will result in better utilisation of existing schools and other state infrastructure.

Development at The Pinnacles would likely require another secondary school in the Upper Ross/Pinnacles area, as both Thuringowa and Kirwan secondary schools will be at capacity from about year 2030 onwards. The existing public primary schools at Kelso and Rasmussen may be able to cope with the primary school demand.

It would be useful for similar analysis to be undertaken by the State Government as it would probably indicate net higher service costs for the Rocky Springs development area because it relies heavily on the State Controlled roads to connect to the broader city's road network.
Ultimately all annual operating costs, whether they be Federal, State or Local Government are a cost to be met by the community as rates or taxes. It is in the community's interests to have holistic planning that looks at the overall cost burden upon the community.

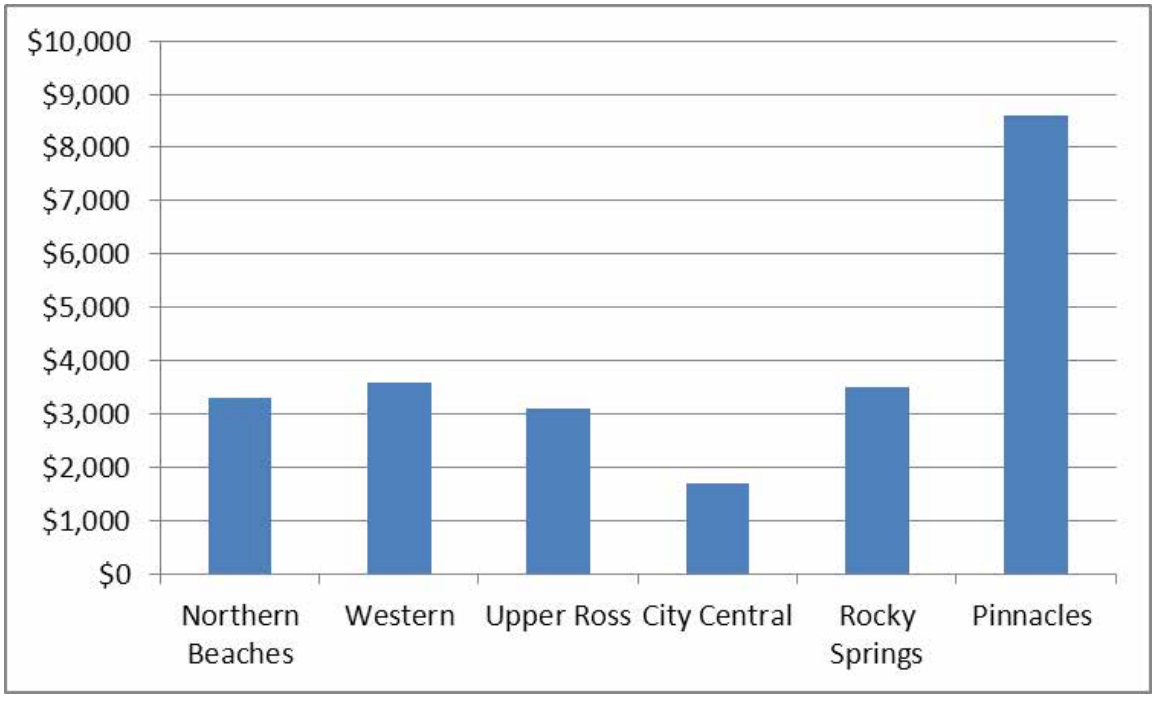
7.0 Annual Operating Cost per Lot developed

The relative additional annual operating costs per lot developed for each development area, due to the new infrastructure required, have been calculated. The results are detailed in Table 6 and are shown in the graph at Figure 4.

Table 6: Estimated annual operating cost per additional lot developed

Development Area Name	Relative Operating cost per lot developed	Ranking
Northern Beaches	$3,300	3
Western	$3,600	5
Upper Ross	$3,100	2
City Central	$1,700	1
Rocky Springs	$3,500	4
Pinnacles	$8,600	6

Figure 4: Relative annual operating cost per additional allotment created for development areas.



All operating costs are based upon current estimated renewal values using consistent rates for all development areas derived from current estimated establishment costs. This exercise indicates that redevelopment of existing areas to higher densities has the distinct advantage of reducing council's ongoing annual operating costs.

The inclusion of a degree of difficulty multiplier for the City Central area of 2.5 for works in road reserves and 1.5 for other works for the renewal costs has not re-ordered the

ranking of the results. In fact, the operating cost per lot only increases from $1700 to $2,000 and is still significantly below the next most cost effective area of $3,100 per lot.

Even with the additional work required to rectify the existing deficiency of the sewerage system in the City Central area, the redevelopment and density uplift option is preferable. It is considered that the City Central area results can only be used as an indication for cost effectiveness of density uplift. It is considered that the results for density uplift specifically would be lower again than those identified in this report for the City Central area. The results for the City Central area include sewerage infrastructure actually required to meet existing service standards (ie the existing infrastructure is undersized for its current population), and water infrastructure needed for a significant Greenfield development in the form of the ULDA Oonoonba development. It is estimated that for density uplift alone (excluding the Oonoonba development), with no reduction in existing service levels, the operating cost per additional lot could be as low as $1,300.

Provision of density uplift and infill to the City Central area is significantly more cost effective than all other development areas considered. This infill development is likely to be in the form of multiple dwellings (units). Demand for multiple dwellings was 15% in 2006 and is projected to be 25% by year 2031.

Northern Beaches, Western, Upper Ross, Rocky Springs and The Pinnacles are typical greenfield development sites.

The Western Area has been planned to allow for greater development across the Bohle Plains than currently identified in the proposed planning scheme. Hence it comes with a premium price, including provision of future “spare capacity” to be taken up by future, as yet unplanned development.

The Upper Ross is an area that has the planned infrastructure already in place with spare capacity and has minimal additional infrastructure needed to fully service the development area. This development area therefore has a minimal increase in operating costs.

Rocky Springs is remote but has a surprisingly low increase in operating cost ($3,500). This is due to earlier planning and construction providing immediate spare capacity in adjacent infrastructures. This nearby infrastructure with spare capacity includes the Brook Hill reservoir, Alligator Ck trunk water main and the Bruce Highway. The expense of upgrading the Bruce Highway is the subject of an infrastructure agreement between the DTMR and the developer and therefore is not at cost to council. It does emphasise the importance of similar work (to this study) being undertaken by other (State) infrastructure providers. The only long lead infrastructure connection required is for the sewerage rising main to an existing point in Stuart.

The Pinnacles development example is not only a greenfield site but requires long lengths of connecting infrastructure that will cost a considerable amount for future maintenance and operations. The Pinnacles development and other similar greenfield development areas will result in significant increases in Council’s operating costs.

7.1 Comparison with the City's operating costs overall

The purpose of this section is to provide a validity check of the order of magnitude of the city's overall operating costs of existing assets.

From council's asset register, the current renewal value of comparative assets is $5.32B (i.e. does not include major community facilities). The existing population of approximately 185,000 results in 66,000 lots. Allowing 20% extra for non-residential development, there are currently approximately 80,000 equivalent lots.

This results in $67K currently invested in similar existing infrastructure per equivalent lot. With an operating cost of 5.39% (weighted average of the roads, water, sewerage, parks and pathway assets) of the capital cost, this equates to an annual operating cost of approximately $3,600 per equivalent lot.

The total operating expenditure for 2012/13 was $392M with this representing approximately $5,370 per equivalent lot. Therefore based upon this annual operating cost of $3,600 per lot, the operating costs of similar existing assets are approximately 67% of council's annual operating budget. This compares well to the 73% that can be derived from the $287M detailed in Table 4. This high percentage of expenditure relating to the operations and maintenance of these selected infrastructure types is a significant portion of the council budget and warrants close monitoring of these activities to prevent escalation of annual rates and charges.

Compared with this $3,600 benchmark, 5 of the 6 development areas analysed are either equal to or below this amount. As this study has been focused on the ***additional*** operating costs required to meet the population demands for year 2026, it is noteworthy that the infrastructure to service these lower cost areas is already in place with sufficient spare capacity to support the additional proposed development. The "Western" scenario that includes some extra infrastructure for additional development on the Bohle Plains is equal to the benchmark cost. Any development exceeding this level will cause upwards pressure upon council's annual rates and charges.

7.2 Sensitivity test – The Pinnacles

This report has considered The Pinnacles as an example of a development area outside the existing approved greenfield growth areas. The assessment of The Pinnacles development in this report has been based on it being included in the Population Growth model and therefore competing with the entire Townsville population growth, as allocated from the OESR medium growth rate series.

To test the sensitivity of the population growth model assumptions, a scenario for the Pinnacles being developed at 200 lots per year has been assessed. Details are incorporated in Appendix K. By year 2026, this scenario has a significantly greater population at the Pinnacles but has also triggered the need for additional infrastructure. The net result is an annual operating cost of $5,800 (cf $8,600) per equivalent lot. While this scenario has a lesser per lot cost outcome than the Pinnacle normal growth scenario, it still has a significantly higher operating cost compared to the baseline value of $3,600 per lot.

The question of completing The Pinnacles by year 2026 and using all the designed infrastructure has been examined in this study. This question was examined because it could be stated that it would not be equitable to compare the Pinnacles at year 2026, which would have excessive spare capacity in its connecting infrastructure at that time. If the Pinnacles had an accelerated development rate of 542 lots per year, it would be fully developed by year 2026 and the additional operating cost per lot would be further reduced to $4,230. This operating cost per lot developed, while lesser than the other Pinnacles growth scenarios, is still well above the next highest development area and the benchmark value of $3,600 per lot. This indicates that when completed, and with no spare capacity in the connecting infrastructure, The Pinnacles development scenario is still significantly more expensive to maintain, operate and replace into the future.

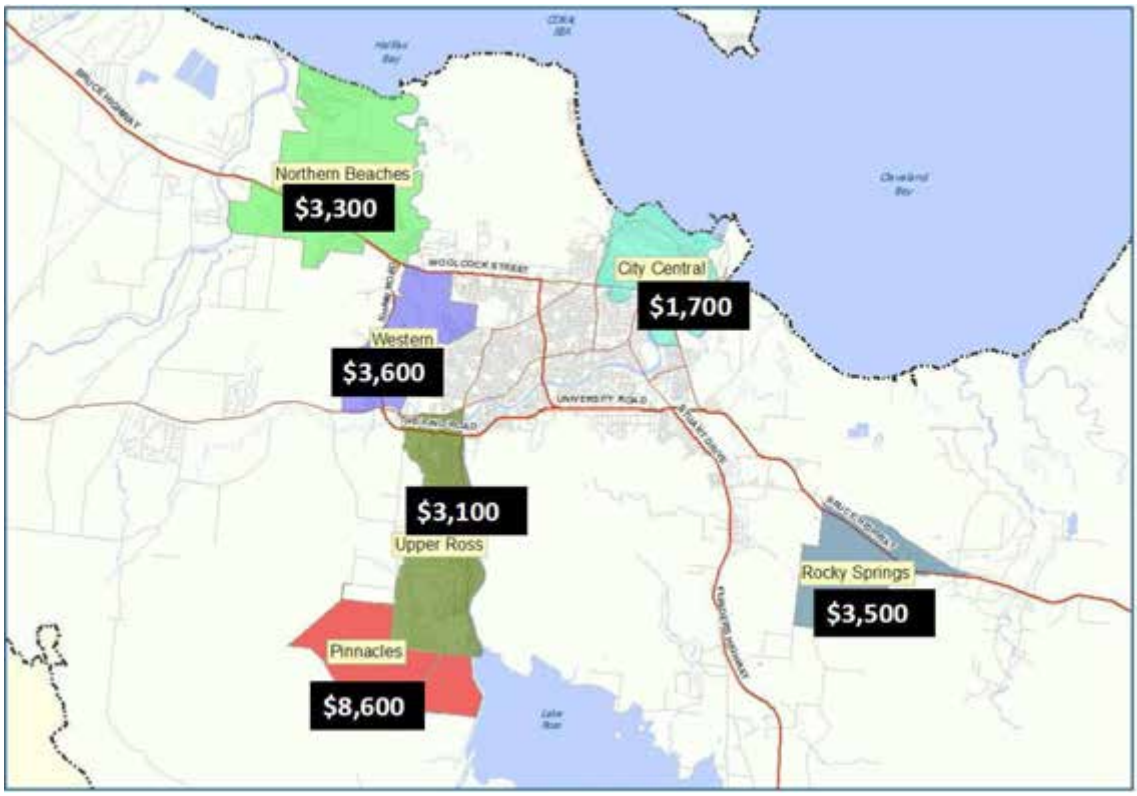
Whilst the sensitivity analysis shows that for higher growth rates at the Pinnacles, the operating cost per lot reduces, the total cost to the community actually increases. The additional operating cost per annum at year 2026 on the community, if the Pinnacles were included into the scheme, would be $3.1M, for the lowest growth scenario, and $6.2M for both of the higher growth rate scenarios. This additional cost is effectively due to the ongoing annual operating cost of the connecting infrastructure only which the other developments do not require.

8.0 Conclusion

This report has examined the relative operating costs for various future development areas up until year 2026. The annual operating cost per lot for these areas are shown in figure X1 and table 6

The operating costs identified in this report relate only to the additional infrastructure required by the developments areas. Other operating costs of council such as garbage collection, libraries, events, community facilities, planning, environmental etc have not been considered in this report.

Figure X1: Estimated annual operating costs per additional lot developed for selected development areas



The key findings of this study include::

- The most efficient form of providing for future development with infrastructure solutions is by infill of existing urban areas. This development type not only requires little new infrastructure but also consumes existing spare capacity. This type of development will mainly be in the form of multiple dwellings.
- The City Central area operating costs per lot can only be used as an indication for the cost effectiveness of density uplift. It is considered that the results for density uplift specifically could be lower again than those identified in this report due to the inclusion of infrastructure upgrades actually required for the existing community to meet existing service standards, and additional water infrastructure to service the ULDA Oonoonba development. It is estimated that for density uplift alone, with no deficit in existing service levels, that the operating cost per additional lot could be as low as $1,300.
- The next most efficient form of development is greenfield development within the urban growth boundary where infrastructure has already been constructed and has spare capacity to service the existing vacant land.
- Growth fronts contiguous with existing development are the next most efficient form of development with respect to provision of infrastructure. Some new infrastructure is required and the spare capacity in the system is probably retained at existing levels.
- The most inefficient form of development with regard to infrastructure provision is remote greenfield development with extensive infrastructure costs for the long distance connections back to existing networks. The Pinnacles scenario is an example of such a development. This type of development can result in

additional annual operating costs of up to 2 to 3 times more than other planned greenfield development areas.

9.0 Recommendations

Based on the findings of this report, it is recommended that council:

d) Give consideration to developing strategies to foster and encourage infill development, as it has the lowest operating cost per additional lot.

e) Undertake an operating cost assessment for any future major development application, so that it is informed of the impact on operating costs when considering the addition of more land for urban development within the city

f) Recommend that State Government Departments and other infrastructure providers responsible for infrastructure planning undertake similar studies relating to operating costs of their infrastructure, to allow a co-ordinated overall consideration of operating costs when considering new development areas..

Appendix A - Summary of Results for each Development Area

Table of renewal values of additional infrastructure to that already provided for which would be required to support development in various areas across our City until 2026

	Development Area	1	2	3	4	4a	5	6		Comments	O&M and Depreciation %
	Development Area Name	Northern Beaches	Western	Upper Ross	City Central	City Central (Sensitivity Analysis)	Rocky Springs	Pinnacles	Average $ /lot		
Water Supply											
	Regional Network Infrastructure, including Dams, Burdekin Pipeline, Treatment Plants, Reservoirs and Delivery Mains	$72,087,261	$32,940,273	$16,634,348	$43,478,313	$43,478,313	$33,729,037	$4,728,033	$8,002	Council's current Capital Works Plan through to 2026 has identified $242.3M of Regional trunk infrastructure cost for Townsville (version 19). This equates to approximately $8,000 per lot. This is the same in all areas.	
	Local Trunk Infrastructure generally within the development area including Distribution mains & small local reservoirs	$20,574,000	$3,924,220	$4,947,430	$5,708,320	$14,270,800	$24,831,580	$1,472,980	$2,493	Council's current Capital Works Plan through to 2026 has identified $75.5M of localised trunk infrastructure cost within the existing development areas of Townsville (version 19). This equates to almost $2,500 per equivalent lot. This rate has been applied to the Pinnacles, as the network hasn't been designed.	
	Additional major or connecting Mains							$15,990,000		This is the cost to connect a development area to the regional network. These costs for Rocky Springs are included in the localised trunk infrastructure costs above. All other areas are already connected to the regional network.	
	Sub-Total Water Supply	$92,661,261	$36,864,493	$21,581,778	$49,186,633	$57,749,113	$58,560,617	$22,191,013			**5.50%**
Sewerage											
	Regional Network Infrastructure, including Outfall Pipelines, Treatment Plants, Major Mains & Pump Stations	$51,638,993	$23,596,438	$11,915,850	$31,145,258	$31,145,258	$24,161,460	$3,386,879	$ 5,732	Council's current Capital Works Plan through to 2026 has identified $173.6M of Regional trunk infrastructure cost for Townsville (version 19). This equates to approximately $5,700 per lot. This is the same in all areas.	
	Localised Trunk Infrastructure generally within the development area including Rising Mains, Gravity Mains & Pump Stations										
	PIPs Sewer Rising Mains	$8,656,280	$8,994,400	$3,646,940	$5,581,470	$13,953,675	$9,235,980			Council's current Capital Works Plan through to 2026 has identified $142M of local trunk infrastructure cost within the existing development areas of Townsville (version 19). This equates to almost $4,700 per equivalent lot. This rate has been applied to the Pinnacles, as the network hasn't been designed.	
	PIPs Sewer Gravity Mains	$4,677,330	$1,894,760	$5,023,700	$1,364,580	$3,411,450	$2,600,700				
	PIPs Future Sewerage Pump Stations	$15,500,000	$5,800,000	$1,000,000	$4,400,000	$6,600,000	$4,400,000				
	PIPs Sewer Pump Stations Upgrades	$8,053,000	$0	$2,860,000	$7,400,000	$7,400,000	$0	$2,770,373	$ 4,689		
	Additional Major or connecting Item							$15,300,000		This is the cost to connect a development area to the regional network. These costs for Rocky Springs are included in the localised trunk infrastructure costs above. All other areas are already connected to the regional network.	
	Sub-Total Sewerage	$88,525,603	$40,285,598	$24,446,490	$49,891,308	$62,510,383	$40,398,140	$21,457,253			**6.60%**
Roads											
	Regional Roads (all DTMR Roads)	$0	$0	$0	$0	$0	$0	$0		DTMR roads haven't been included in this exercise, as we are only considering the operational cost impact on Council.	
	Localised Trunk Roads generally within the development area including Roads with traffic > 6,000vpd excluding Ingham Road	$48,217,219.05	$58,292,601.64	$0	$2,156,567.11	$5,391,417.78	$22,560,441	$3,162,453	$ 5,353	The localised trunk roads within a development area is estimated at $9,732 establishment costs ($5,353 renewal value) per lot. This rate has only been applied to the Pinnacles & Rocky Springs, as the network hasn't been analysed, however this rate is potentially lower than that of the actual network costs applied to the other greenfield areas. This may need further review, as it may be understating the operating cost impact of the Pinnacles Development and Rocky Springs	
	Share of Ingham Road (in PIPs)	$8,652,710	$1,976,928	$0	$2,174,478	$2,174,478	$0	$0		(Ingham road duplication in 2026 Redistributed to area 1,2 , 4 and the rest of the city (other than areas 3,5 & 6.	
	Additional Major or Connecting Roads						$7,590,389	$24,218,504		This is the cost to connect a development area to the regional network. Existing growth front areas are already connected to the regional network.	
	Sub-Total Roads	$56,869,929	$60,269,529	$0	$4,331,045	$7,565,896	$30,150,830	$27,380,957			**5.10%**
Miscellaneous Trunk Infrastructure											
	Parks	$50,446,219	$23,051,400	$11,640,614	$30,425,855	$30,425,855	$23,603,371	$3,308,648	**$ 5,600**	Theses values are common to all development and will not	
	Pathways	$9,909,079	$4,527,954	$2,286,549	$5,976,507	$5,976,507	$4,636,377	$649,913	**$ 1,100**	affect the relativity of different scenarios	
	Sub Total Miscellaneous	$60,355,298	$27,579,353	$13,927,163	$36,402,362	$36,402,362	$28,239,748	$3,958,561		Operating assumed as 5.0% of the capital value	**5.00%**
General (normal donated assets)											

	Internal distribution networks (Access Street, parks, water main and sewers etc.)	$238,718,715	$109,082,516	$55,085,049	$22,551,500	$22,551,500	$111,694,526	$15,656,995	**$ 26,500**	**There is a cost of $26,500 per lot for greenfield development areas for the very localised smaller non-trunk infrastructure. In relation to the City Central area, this cost would only apply to the 851 lots at ULDA site. Estimates include: Drainage $6,500-; Roads $11,000; Sewers $2,500; Water $2,000, Pathways $500 & Parks $4,000**	**5.39%**
	Total Renewal cost of Infrastructure	**$537,130,805**	**$274,081,490**	**$115,040,480**	**$162,362,849**	**$186,779,254**	**$269,043,861**	**$90,644,778**			

Summary of Populations for each Development Area

Development Area	**1**	**2**	**3**	**4**		**5**	**6**		**Comments**
Development Area Name	**Northern Beaches**	**Western**	**Upper Ross**	**City Central**		**Rocky Springs**	**Pinnacle**		
Population as at 2026	41,156	15,351	27,549	35,514	35,514	12,411	1,802		
EP Totals as at 2026	41,756	15,509	28,427	43,086	43,086	12,557	1,820		To share the cost of servicing across non-residential development, each employee has been assumed equivalent to 20% of an EP (based on water and sewerage demand data)
Population Increase from 2011 to 2026	24,872	11,424	5,629	12,409	12,409	11,672	1,638		
EP increase from 2011 to 2026	25,223	11,526	5,820	15,213	15,213	11,802	1,654		

Operating cost impacts for each Development Areas per lot

Development Area	**1**	**2**	**3**	**4**		**5**	**6**		**Comments**
Development Area Name	**Northern Beaches**	**Western**	**Upper Ross**	**City Central**	**City Central (Sensitivity Analysis)**	**Rocky Springs**	**Pinnacle**		
Total renewal Cost per EP created	$21,295	$23,780	$19,765	$10,673	$12,278	$22,797	$54,793		
Renewal Cost per equivalent lot	$59,627	$66,584	$55,343	$29,884	$34,377	$63,832	$153,419	2.8 ep/lot	
Relative Operating Cost/eqiv. Lot	**$3,300**	**$3,649**	**$3,111**	**$1,703**	**$1,974**	**$3,525**	**$8,590**		These operating costs are only those associated with the Maintenance, Operations and Depreciation of the new Infrastructure inherited by Council. This assessment assumes all infrastructure is funded by the Developer. Based on Council records this operational cost is

Appendix B - Summary of Renewal Values and operating costs per Lot for each Development Area

Note: This is the additional infrastructure to that already provided for that would be required to support development in various areas across the City over the next 15 years

	Development Area Name	Northern Beaches	Western	Upper Ross	City Central	City Central (Sensitivity Analysis)	Rocky Springs	Pinnacles
Water Supply								
	Regional Network Infrastructure, including Dams, Burdekin Pipeline, Treatment Plants, Reservoirs and Delivery Mains	$8,002	$8,002	$8,002	$8,002	$8,002	$8,002	$8,002
	Local Trunk Infrastructure generally within the development area including Distribution mains & small local reservoirs	$2,284	$953	$2,380	$1,051	$2,627	$5,891	$2,326
	Additional major or connecting Mains	$0	$0	$0	$0	$0	$0	$27,064
	Sub-Total Water Supply	**$10,286**	**$8,956**	**$10,382**	**$9,053**	**$10,629**	**$13,894**	**$37,392**
Sewerage								
	Regional Network Infrastructure, including Outfall Pipelines, Treatment Plants, Major Mains & Pump Stations	$5,732	$5,732	$5,732	$5,732	$5,732	$5,732	$5,732
	Localised Trunk Infrastructure generally within the development area including Rising Mains, Gravity Mains & Pump Stations							
	PIPs Sewer Rising Mains	$961	$2,185	$1,754	$1,027	$2,568	$2,191	$4,689
	PIPs Sewer Gravity Mains	$519	$460	$2,417	$251	$628	$617	
	PIPs Future Sewerage Pump Stations	$1,721	$1,409	$481	$810	$1,215	$1,044	
	PIPs Sewer Pump Stations Upgrades	$894	$0	$1,376	$1,362	$1,362	$0	
	Additional Major or connecting Item	$0	$0	$0	$0	$0	$0	$25,896
	Sub-Total Sewerage	**$9,827**	**$9,787**	**$11,761**	**$9,183**	**$11,505**	**$9,585**	**$36,317**
Roads								
	Regional Roads (all DTMR Roads)	$0	$0	$0	$0		$0	$0
	Localised Trunk Roads generally within the development area including Roads with traffic > 6,000vpd	$6,313	$14,642	$0	$797	$1,393	$6,313	$6,313
	Share of Ingham Road (in PIPs)	$961	$480	$0	$400		$0	$0
	Additional Major or Connecting Roads	$0	$0	$0	$0	$0	$1,801	$40,991
	Sub-Total Roads	**$6,313**	**$14,642**	**$0**	**$797**	**$1,393**	**$8,114**	**$47,304**
Miscellaneous Trunk Infrastructure								
	Parks	$5,600	$5,600	$5,600	$5,600	$5,600	$5,600	$5,600
	Pathways	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100
	Sub Total Miscellaneous	$6,700	$6,700	$6,700	$6,700	$6,700	$6,700	$6,700
General (normal donated assets)								
	Internal distribution networks (Access Street, parks, waterman and sewers etc.)	$26,500	$26,500	$26,500	$4,151	$4,151	$26,500	$26,500
	Total Infrastructure	**$59,627**	**$66,584**	**$55,343**	**$29,884**	**$34,377**	**$64,792**	**$154,213**
	Annual Operating Costs	**$3,300**	**$3,649**	**$3,111**	**$1,703**	**$1,974**	**$3,574**	**$8,629**

Appendix C1 - Table of Road Establishment Costs

Road Element Type	Road ID	Road Name	Development Area (Locality)	Project Number	Length	Construction Date	Existing Standard	Existing Standard Lookup Code	Exist Establishment Costs $	Proposed Standard	upgrade Standard Lookup Code	Estimated Establishment Cost $	Net change of Establishment Cost $
Road	R298	ABATTOIR ROAD	2	C1	973	2014	None	n.a.	0	Subarterial with 2 lanes, table drains and no median	2STN	6462196	6462196
Road	R299	BAYSWATER ROAD	2	C10	1317	2021	None	n.a.	0	Subarterial with 2 lanes, table drains and no median	2STN	8746878	8746878
Road	R301	DARCY DRIVE	7	C5	618	2016	None	n.a.	0	Major Collector with 2 lanes, table drains and no median	2MTN	3717558	3717558
Road	R302	GARLAND LINK ROAD	1	C11	1803	2021	None	n.a.	0	Subarterial with 2 lanes, table drains and no median	2STN	11974656	11974656
Road	R303	GARLAND ROAD	1	C12	1025	2021	None	n.a.	0	Subarterial with 2 lanes, table drains and no median	2STN	6807555	6807555
Road	R308	LIBERTY DRIVE	2	C14	2623	2021	None	n.a.	0	Subarterial with 2 lanes, table drains and no median	2STN	17420700	17420700
Road	R309	LIONEL TURNER DRIVE	1	C6	1854	2016	None	n.a.	0	Subarterial with 2 lanes, table drains and no median	2STN	12313373	12313373
Road	R310	NORTH SHORE BOULEVARD	1	C7	1022	2016	None	n.a.	0	Arterial with 2 lanes, table drains and no median	2ATN	7027565	7027565
Road	R313	ROCKY SPRINGS NORTH ACCESS	5	C15	1827	2021	None	n.a.	0	Arterial with 2 lanes, table drains and no median	2ATN	12562976	12562976
Road	R316	WATERWAY DRIVE	1	C8	1600	2016	None	n.a.	0	Major Collector with 2 lanes, table drains and median	2MTM	11789483	11789483
Road	R19	BALLS LANE	7	C2	453	2016	Subarterial with 2 lanes, kerbs and no median	2SKN	2542330	Subarterial with 4 lanes, kerbs and no median	4SKN	3273184	730853
Road	R32	NORTH SHORE BOULEVARD	1	C17	1652	2026	Arterial with 2 lanes, table drains and no median	2ATN	11359626	Arterial with 4 lanes, table drains and median	4ATM	16604739	5245113
Road	R70	CROSS STREET	7	C3	115	2016	Subarterial with 2 lanes, kerbs and no median	2SKN	645404	Subarterial with 2 lanes, table drains and no median	3SKN	856543	211139
Road	R71	CROSS STREET	7	C3	112	2016	Subarterial with 2 lanes, kerbs and no median	2SKN	718916	Subarterial with 4 lanes, table drains and no median	3SKN	834198	115283
Road	R72	DALRYMPLE ROAD	2	C4	2082	2016	Arterial with 2 lanes, table drains and no median	2ATN	14316429	Arterial with 4 lanes, table drains and median	4ATM	20926796	6610367
Road	R78	DALRYMPLE ROAD	2	C4	535	2016	Arterial with 2 lanes, table drains and no median	2ATN	3678813	Arterial with 4 lanes, table drains and no median	4ATM	4959702	1280889
Road	R79	DALRYMPLE ROAD	2	C18	1461	2026	Arterial with 2 lanes, table drains and no median	2ATN	10046255	Arterial with 4 lanes, table drains and median	4ATM	14684942	4638687
Road	R138	INGHAM ROAD	8	C19	601	2026	Subarterial with 2 lanes, table drains and no median	2STN	3991552	Subarterial with 4 lanes, table drains and median	4STM	5829183	1837632

Road Element Type	Road ID	Road Name	Development Area (Locality)	Project Number	Length	Construction Date	Existing Standard	Existing Standard Lookup Code	Exist Establishment Costs $	Proposed Standard	upgrade Standard Lookup Code	Estimated Establishment Cost $	Net change of Establishment Cost $
Road	R139	INGHAM ROAD	8	C19	767	2026	Subarterial with 2 lanes, table drains and no median	2STN	5094044	Subarterial with 4 lanes, table drains and median	4STM	7439241	2345197
Road	R140	INGHAM ROAD	8	C19	418	2026	Subarterial with 2 lanes, table drains and no median	2STN	2776154	Subarterial with 4 lanes, table drains and median	4STM	4054241	1278087
Road	R141	INGHAM ROAD	8	C19	200	2026	Subarterial with 2 lanes, table drains and no median	2STN	1328303	Subarterial with 4 lanes, table drains and median	4STM	1939828	611525
Road	R142	INGHAM ROAD	8	C19	453	2026	Subarterial with 2 lanes, table drains and median	2STM	3375741	Subarterial with 4 lanes, table drains and median	4STM	4393711	1017970
Road	R145	INGHAM ROAD	8	C19	259	2026	Subarterial with 2 lanes, kerbs and median	2SKM	1765902	Subarterial with 4 lanes, table drains and median	4STM	2512077	746175
Road	R146	INGHAM ROAD	8	C19	3338	2026	Subarterial with 2 lanes, kerbs and median	2SKM	22759002	Subarterial with 4 lanes, table drains and median	4STM	32375731	9616729
Road	R147	INGHAM ROAD	8	C19	885	2026	Subarterial with 2 lanes, kerbs and median	2SKM	6034067	Subarterial with 4 lanes, kerbs and median	4SKM	7461893	1427826
Road	R159	KINGS ROAD	7	C2	92	2016	Subarterial with 2 lanes, kerbs and median	2SKM	627270	Subarterial with 4 lanes, kerbs and median	4SKM	775700	148429
Road	R194	NORTH SHORE BOULEVARD	1	C17	462	2026	Arterial with 2 lanes, table drains and no median	2ATN	3176844	Arterial with 4 lanes, table drains and median	4ATM	4643698	1466854
Road	R195	NORTH SHORE BOULEVARD	1	C17	777	2026	Arterial with 2 lanes, table drains and no median	2ATN	5342875	Arterial with 4 lanes, table drains and median	4ATM	7809856	2466981
Road	R196	NORTH SHORE BOULEVARD	1	C17	802	2026	Arterial with 2 lanes, table drains and no median	2ATN	5514782	Arterial with 4 lanes, table drains and median	4ATM	8061138	2546356
Road	R197	NORTH SHORE BOULEVARD	1	C17	1198	2026	Arterial with 2 lanes, table drains and no median	2ATN	8237792	Arterial with 4 lanes, table drains and median	4ATM	12041451	3803660
Road	R198	NORTH SHORE BOULEVARD	1	C17	450	2026	Arterial with 2 lanes, table drains and no median	2ATN	3094329	Arterial with 4 lanes, table drains and median	4ATM	4523083	1428754

Road Element Type	Road ID	Road Name	Development Area (Locality)	Project Number	Length	Construction Date	Existing Standard	Existing Standard Lookup Code	Exist Establishment Costs $	Proposed Standard	upgrade Standard Lookup Code	Estimated Establishment Cost $	Net change of Establishment Cost $
Road	R269	THE STRAND	4	C9	200	2016	Major Collector with 2 lanes, kerbs and median	2MKM	804024	Major Collector with 2 lanes, kerbs and median	2MKM	1285375	481351
Road	R271	THE STRAND	4	C9	67	2016	Major Collector with 2 lanes, kerbs and median	2MKM	484648	Major Collector with 4 lanes, kerbs and median	4MKM	538696	54048
Road	R283	WEBB DRIVE	7	C16	578	2021	Major Collector with 2 lanes, kerbs and median	2MKM	3950219	Major Collector with 4 lanes, kerbs and no median	4MKN	3950219	0
Road	R285	WICKHAM STREET	4	C9	200	2016	Major Collector with 2 lanes, kerbs and median	2MKM	804024	Major Collector with 2 lanes, kerbs and median	2MKM	1285375	481351
Road	R154	KING STREET	4	C9	112	2016	Major Collector with 2 lanes, kerbs and median	2MKM	450253	Major Collector with 2 lanes, kerbs and median	2MKM	719810	269557
Road	R98	FLINDERS STREET	4	C9	179	2016	Major Collector with 2 lanes, kerbs and median	2MKM	719601	Major Collector with 2 lanes, kerbs and median	2MKM	1150410	430809
Road	R327	ROCKY SPRINGS NORTH ACCESS	5	C28	2007	2021	Arterial with 2 lanes, table drains and no median	2ATN	0	Arterial with 2 lanes, table drains and no median	2ATN	13800708	13800708
Rail Xing	X12	GARLAND ROAD	1	C24	7.5	2016	Rail Crossing with 2 lanes	2	1350189	Rail Crossings with 6 lanes	6	1538088	187900
Rail Xing	X14	INGHAM ROAD	8	C19	8.3	2026	Rail Crossing with 2 lanes	2	1343409	Rail Crossings with 6 lanes	6	1530018	186609
Bridge	B4.1	NORTHSHORE BOULEVARD CULVERT	1	C17	29	2026	Culvert with 2 lanes	BCUL2	2466612	Culvert with 4 lanes	BCUL4	3972128	1505515
Bridge	B11.1	NORTHSHORE BOULEVARD SAUNDERS CREEK BRIDGE	1	C17	62.8	2026	Bridge with short spans with 2 lanes	BS2	3515840	Bridge with short spans with 4 lanes	BS4	7031680	3515840
Bridge	B15.1	NORTHSHORE BOULEVARD CULVERT	1	C17	13.1	2026	Culvert with 2 lanes	BCUL2	1378821	Culvert with 4 lanes	BCUL4	1838168	459347
Bridge	B35.1	NORTHSHORE BOULEVARD CULVERT	1	C17	19	2026	Culvert with 2 lanes	BCUL2	1629849	Culvert with 4 lanes	BCUL4	2600343	970494
Bridge	B38.1	NORTHSHORE BOULEVARD CULVERT	1	C17	30	2026	Culvert with 2 lanes	BCUL2	2550289	Culvert with 4 lanes	BCUL4	4059489	1509201
Bridge	B41.1	NORTHSHORE BOULEVARD STONY CREEK BRIDGE	1	C17	67.6	2026	Bridge with short spans with 2 lanes	BS2	3769280	Bridge with short spans with 4 lanes	BS4	7538560	3769280
Bridge	B46	NORTHSHORE BOULEVARD MOUNT LOW DRAIN	1	C7	45.2	2016	None	n.a.	0	Bridge with short spans with 2 lanes	BS2	2586560	2586560
Bridge	B47	BLAKEYS CROSSING	8	C19	290	2026	Bridge with short spans with 2 lanes	BS2	15512000	Bridge with short spans with 4 lanes	BS4	31024000	15512000

Road Element Type	Road ID	Road Name	Development Area (Locality)	Project Number	Length	Construction Date	Existing Standard	Existing Standard Lookup Code	Exist Establishment Costs $	Proposed Standard	upgrade Standard Lookup Code	Estimated Establishment Cost $	Net change of Establishment Cost $
Bridge	B53	DALRYMPLE ROAD OVER BOHLE RIVER	2	C18	250.1	2026	Bridge with long spans with 2 lanes	BL2	15806240	Bridge with long spans with 4 lanes	BL4	31612480	15806240
Bridge	B53.1	DALRYMPLE ROAD OVER BOHLE RIVER	2	C21	250.1	2016	None	n.a.	0	Bridge with long spans with 2 lanes	BL2	15806240	15806240
Bridge	B54	DALRYMPLE ROAD OVER BOHLE RIVER BYWASH	2	C18	230.1	2026	Bridge with short spans with 2 lanes	BS2	12349280	Bridge with short spans with 4 lanes	BS4	24698560	12349280
Bridge	B54.1	DALRYMPLE ROAD OVER BOHLE RIVER BYWASH	2	C21	230.1	2016	None	n.a.	0	Bridge with short spans with 2 lanes	BS2	12349280	12349280
Bridge	B56	LIBERTY DRIVE OVER TCHOORATIPPA CREEK	2	C14	45	2021	None	n.a.	0	Bridge with short spans with 2 lanes	BS2	2576000	2576000
Bridge	B58	BLAKEYS CROSSING	8	C19	50	2026	Bridge with short spans with 2 lanes	BS2	2840000	Bridge with short spans with 4 lanes	BS4	5680000	2840000
Intersection	I12	Dalrymple Road Golf Links Drive Liberty Drive	2	C25	n.a.	2012	4 way Signalised intersection with 4, 6, 4, 5 lanes	4S22241324	2126605	4 way Signalised intersection with 6, 6, 4, 5 lanes	4S24242223	2090253	-36352
Intersection	I14	Kern Brother Drive Dalrymple Road	2	C4	n.a.	2016	3 way Signalised intersection with 5, 4, 5 lanes	3S231323	1647627	3 way Signalised intersection with 5, 5, 5, lanes	3S232323	1624760	-22868
Intersection	I18	Ingham Road Weston Street	8	C19	n.a.	2026	4 way Uncontrolled intersection with 2, 3, 2, 3 lanes	4U11121112	496139	4 way Signalised intersection with 2, 4, 2, 4 lanes	4U11221122	394320	-101819
Intersection	I50	Ingham Road Duckworth Street	8	C19	n.a.	2026	4 way Signalised intersection with 3, 6, 6, 5 lanes	4S21243323	2112645	4 way Signalised intersection with 3, 6, 6, 6 lanes	4S21243333	1879827	-232819
Intersection	I60	Bayswater Road Pilkington Street	7	C27	n.a.	2021	4 way -1 lane Roundabout	4R11111111	711236	4 way Signalised intersection with 2, 3, 2, 2 lanes	4R11211111	734944	23708
Intersection	I63	Pilkington Street Ingham Road	8	C19	n.a.	2026	4 way Signalised intersection with 4, 6, 5, 5 lanes	4S22241423	2346884	4 way Signalised intersection with 3, 6, 6, 6 lanes	4S21243333	2081904	-264980
Intersection	I70	Ingham Road Meenan Street	8	C19	n.a.	2026	3 way -2 Lane Roundabout	3R111111	754436	3 way Signalised intersection with 2, 2, 4, lanes	3R111122	1504764	750327
Intersection	I80	Kings Road Balls Lane Fulham Road	7	C2	n.a.	2016	3 way -2 Lane Roundabout	3R111111	754436	3 way Signalised intersection with 4, 4, 4, lanes	3R222222	1860890	1106453
Intersection	I85	MacArthur Drive William Angliss Drive	7	C26	n.a.	2014	4 way -1 lane Roundabout	4R11111122	711236	4 way Signalised intersection with 3, 3, 5, 4 lanes	4S12122322	1704057	992820
Intersection	I124	Flinders Street Wickham Street	4	C9	n.a.	2021	4 way -2 Lane Roundabout	4R20021122	711236	4 way Signalised intersection with 2, 4, 2, 4 lanes	4R11221122	1460124	748887
Intersection	I125	The Strand Wickham Street	4	C9	n.a.	2021	3 way Uncontrolled intersection with 2, 2, 2 lanes	3U200211	363000	3 way Signalised intersection with 2, 2, 2, lanes	3R111111	779584	416584

Road Element Type	Road ID	Road Name	Development Area (Locality)	Project Number	Length	Construction Date	Existing Standard	Existing Standard Lookup Code	Exist Establishment Costs $	Proposed Standard	upgrade Standard Lookup Code	Estimated Establishment Cost $	Net change of Establishment Cost $
Intersection	I126	The Strand King Street	4	C9	n.a.	2021	3 way Uncontrolled intersection with 3, 2, 2 lanes	3U122002	466320	3 way Signalised intersection with 4, 4, 2, lanes	3R222211	1504764	1038444
Intersection	I129	North Shore Boulevard Waterway Drive	1	C17	n.a.	2026	3 way Signalised intersection with 3, 3, 3 lanes	3S121212	1253349	3 way Signalised intersection with 5, 5, 3, lanes	3S232312	1406727	153378
Intersection	I133	Northshore Boulevard Mount Low Parkway	1	C7	n.a.	2016	4 way Signalised intersection with 6, 5, 5, 0 lanes	4S24232300	2071105	4 way Signalised intersection with 6, 5, 5, 4 lanes	4S24232313	2385144	314039
Intersection	I134	North Shore Boulevard Lionel Turner Drive	1	C17	n.a.	2026	3 way Signalised intersection with 3, 3, 3, lanes	3U111100	1295127	3 way Signalised intersection with 5, 5, 3, lanes	3S232312	1568960	273832
Intersection	I135	Garland Link Road North Shore Boulevard	1	C17	n.a.	2026	3 way Signalised intersection with 3, 3, 3, lanes	3U110011	1295127	3 way Signalised intersection with 5, 5, 3, lanes	3S232312	1406727	111600
Intersection	I136	Garland Link Road Waterway Drive	1	C11	n.a.	2021	None	3S000000	0	3 way Signalised intersection with 3, 3, 3, lanes	3S121212	1295127	1295127
Intersection	I137	Garland Link Road Garland Road	1	C11	n.a.	2021	None	3U000000	0	3 way Signalised intersection with 2, 3, 3, lanes	3U111212	535307	535307
Intersection	I139	Abattoir Road Bayswater Road	2	C10	n.a.	2021	None	4U00000000	0	4 way Signalised intersection with 3, 3, 3, 3 lanes	4U12121212	703884	703884
Intersection	I140	Bayswater Road Weston Street	2	C10	n.a.	2021	None	3U111100	0	3 way Signalised intersection with 3, 3, 3, lanes	3S121212	1295127	1295127
Intersection	I151	Ingham Road Mather Street	8	C19	n.a.	2026	4 way Signalised intersection with 3, 3, 3, 3 lanes	4S12121212	1313169	4 way Signalised intersection with 3, 5, 4, 5 lanes	4S12231323	1569580	256411
Intersection	I152	Ingham Road Webb Drive	8	C19	n.a.	2026	3 way Uncontrolled intersection with 3, 3, 3 lanes	3U121212	621359	3 way Signalised intersection with 5, 5, 5, lanes	3S232323	1462527	841169
Intersection	I153	Ingham Road Enterprise Street	8	C19	n.a.	2026	3 way Uncontrolled intersection with 3, 3, 3 lanes	3U121212	621359	3 way Signalised intersection with 3, 5, 5, lanes	3U122323	753671	132312
Intersection	I154	Mount Low Parkway Lionel Turner Drive	1	C6	n.a.	2021	4 way -1 lane Roundabout	4R11111111	711236	4 way Signalised intersection with 5, 3, 3, 4 lanes	4S23121213	1730882	1019645
Intersection	I134.1	North Shore Boulevard Lionel Turner Drive	1	C6	n.a.	2016	None	3U111100	0	3 way Signalised intersection with 3, 3, 3, lanes	3S121212	1295127	1295127
Intersection	I135.1	Garland Link Road North Shore Boulevard	1	C11	n.a.	2021	None	3U110011	0	3 way Signalised intersection with 3, 3, 3, lanes	3S121212	1295127	1295127

Appendix C2 - Table of Costs - Projects summary

Establishment Costs

Date	Project Description	Road Length	Net change of Establishment Cost	Development Area (Locality) (see table below)	Project Number
2014	Construct Abbattoir Road for Cosgrove.	973	6,462,196	2	C1
2021	Extension of Bayswater Road to Abattoir Road and Liberty Drive through Cosgrove.	1,317	10,745,890	2	C10
2021	Construction of Garland Link Road through North Shore	1,803	15,100,217	1	C11
2021	Construction of Garland Road	1,025	6,807,555	1	C12
2021	Construction of Liberty Drive through Liberty Rise to connect through to Abattoir/Bayswater Roads.	2,668	19,996,700	2	C14
2021	Northern access from Bruce Highway to Rocky Springs Internal Roads*	1,827	12,562,976	5	C15
2021	Duplication of Webb Drive from 2 Lanes to 4 lanes (Ingham Road to Lorna Court	578	0	7	C16
2026	Duplication of North Shore Boulevard from Aquatic Centre to Lionel Turner Drive	5,563	29,226,206	1	C17
2026	Duplication of Dalrymple Road from Liberty Drive to access to Greater Ascott.	1,941	32,794,207	2	C18
2026	Duplication of Ingham Road from Woolcock Street to Meenan Street.	7,269	38,800,350	8	C19
2016	Duplication of Balls Lane Fulham and Kings Road from Ross River Road to Fulham Road.	545	1,985,736	7	C2
2016	Construction of Bridges over Blakeys Cross and Pee Wee Creek	0	0	8	C20
2016	Construction of Bridges over Bohle River and By wash for Dalrymple Road	480	28,155,520	2	C21
2016	Upgrade of Rail Crossing on Garland Road for associated intersection works (non PIPs)	8	187,900	1	C24
2012	Construction of Intersection of Dalrymple Road Golf Links Drive and Liberty Drive	0	-36,352	2	C25
2014	Upgrade of Roundabout to signals at MacArthur Drive and William Angliss Drive	0	992,820	7	C26
2021	Upgrade of Intersection at Pilkington Street and Bayswater Road.	0	23,708	7	C27
2021	Northern access from Bruce Highway to Rocky Springs external Roads*	2,007	13,800,708	5a	C28
2016	Rearrangement of traffic for Cross Street, 1 lane North Bound and 2 lane southbound.	227	326,421	7	C3
2016	Duplication to 4 Lanes Dalrymple Road between Thuringowa Drive and Golf Links Drive	2,617	7,868,388	2	C4
2016	Extend Darcy Drive through to Stuart Drive	618	3,717,558	7	C5
2016	Extend Lionel Tuner Drive through to North Shore Boulevard and upgrade the intersection of Lionel Turner Drive to Mount Low Parkway.	1,854	14,628,146	1	C6
2016	Extend North Sore Boulevard from Mount Low Parkway to Sanctum internal Road.	1,067	9,928,164	1	C7
2016	Extend Waterway Drive though to Garland Link Road	1,600	11,789,483	1	C8
2016	Rearrange traffic on The Strand Wickham Terrace,Kings Street and Flinders Street East to two Drections.	758	3,921,031	4	C9
	Total		269,785,527		

Summary of road Establishment Costs and Renewal Values for Development Areas				
Area	Area Name	Net Change in Establishment cost	Renewals Value Reduction factor	Net Change in Renewal Value
1	Northern Beaches	87667671	55%	48217219
2	Western	105986548.4	55%	58292602
4	City Central	3921031.113	55%	2156567
5	Rocky Springs(Internal)*	12562975.89	55%	6909637
5a	Rocky Springs (External)*	13800707.51	55%	7590389
7	Rest of City	7046242.923	55%	3875434
8	Ingham Road	38800349.92	55%	21340192
	Total	269785526.8		148382040

* Note only the external connecting roads for Rocky have been carried forward and added to the summary tables as the internal roads are include under the item for localised trunk roads.

Appendix C3 Roads Establishment Unit Rates

Description of Code					
Lookup Code	Rate.M	No Lanes	Hierarchy	Kerb/Table Drain	Median
2ATM	$8,437.93	2	Arterial	Table Drain	Yes
2ATN	$6,876.29	2	Arterial	Table Drain	No
2MKM	$6,426.87	2	Major Collector	Kerb	Yes
2MTM	$7,368.43	2	Major Collector	Table Drain	Yes
2MTN	$6,015.47	2	Major Collector	Table Drain	No
2SKM	$6,818.16	2	Subarterial	Kerb	Yes
2SKN	$5,612.21	2	Subarterial	Kerb	No
2STM	$8,085.78	2	Subarterial	Table Drain	Yes
2STN	$6,641.52	2	Subarterial	Table Drain	No
3SKN	$6,418.89	3	Subarterial	Kerb	No
4AKM	$8,431.52	4	Arterial	Kerb	Yes
4ATM	$10,051.29	4	Arterial	Table Drain	Yes
4ATN	$8,489.65	4	Arterial	Table Drain	No
4MKM	$8,040.24	4	Major Collector	Kerb	Yes
4MKN	$6,834.29	4	Major Collector	Kerb	No
4SKM	$8,431.52	4	Subarterial	Kerb	Yes
4SKN	$7,225.57	4	Subarterial	Kerb	No
4STM	$9,699.14	4	Subarterial	Table Drain	Yes
4STN	$8,254.88	4	Subarterial	Table Drain	No
6AKM	$10,044.88	6	Arterial	Kerb	Yes
6ATM	$11,664.66	6	Arterial	Table Drain	Yes

Bridge Unit Rates		
Code	Deck Cost per metre	Abuttment costs per bridge
BCUL4	$124,160.00	$80,000.00
BL2	$62,400.00	$200,000.00
BL4	$124,800.00	$400,000.00
BL6	$163,280.00	$600,000.00
BS2	$52,800.00	$200,000.00
BS4	$105,600.00	$400,000.00
OBLS6	$140,160.00	$10,200,000.00
OL2	$48,880.00	$5,000,000.00
OL4	$87,360.00	$10,000,000.00

Rail Xing Unit Rates	
No Lanes	Cost
2	$1,400,000.00
4	$1,500,000.00
6	$1,600,000.00

All intersection estimated from 1st principles

Appendix D Sewerage Rising Mains Renewal Costs

PIPE ID	Development Area (locality)	PIPE SIZE	Date Required	Length (m)	Renwal Value Rate $	Council Renewal Value $	Comment
1707	1	100	2018	562	80	$44,960.00	
1708	1	150	2015	1187	140	$166,180.00	
1709	1	100	2018	870	80	$69,600.00	
1705	1	300	2011	116	370	$42,920.00	
1736	1	150	2011	321	140	$44,940.00	
1481	1	100	2015	352	80	$28,160.00	
1490	1	150	2015	224	140	$31,360.00	
1504	1	300	2016	827	370	$305,990.00	
1508	1	375	2016	909	550	$499,950.00	Includes a river crossing
1509	1	100	2017	694	80	$55,520.00	
1531	1	375	2016	560	550	$308,000.00	Includes crossing of Bruce Hwy
1532	1	100	2016	1333	80	$106,640.00	
1538	1	200	2015	1791	200	$358,200.00	Along an existing rural road
1540	1	100	2022	721	80	$57,680.00	
1543	1	100	2016	34	80	$2,720.00	
1544	1	150	2013	231	140	$32,340.00	
1545	1	150	2017	691	140	$96,740.00	
1546	1	100	2021	404	80	$32,320.00	
1548	1	150	2019	732	140	$102,480.00	
1549	1	150	2014	441	140	$61,740.00	
1564	1	150	2026	321	140	$44,940.00	
1578	1	450	2025	1911	750	$1,433,250.00	
1579	1	600	2025	2664	1200	$3,196,800.00	Along NSB but well off the carriageway
1791	1	375	2023	2787	550	$1,532,850.00	
1711	2	150	2018	152	140	$21,280.00	
1712	2	100	2020	47	80	$3,760.00	
1713	2	150	2016	101	140	$14,140.00	
1771	2	600	2016	6940	1200	$8,328,000.00	Includes some road crossings
1737	2	150	2018	366	140	$51,240.00	
1601	2	225	2012	216	200	$43,200.00	
1765	2	200	2012	1066	200	$213,200.00	
1502	2	100	2018	473	80	$37,840.00	
1517	2	250	2012	252	270	$68,040.00	
1519	2	150	2017	723	140	$101,220.00	
1602	2	150	2018	224	140	$31,360.00	
1501	2	100	2016	412	80	$32,960.00	
1518	2	150	2015	344	140	$48,160.00	
1699	3	450	2016	4648	750	$3,486,000.00	Along an existing open drain and crossings of a number of streets.
1484	3	150	2011	47	140	$6,580.00	
1756	3	100	2012	485	80	$38,800.00	
1489	3	250	2012	428	270	$115,560.00	Along existing streets
1749	4	300	2012	48	370	$17,760.00	
1376	4	375	2011	737	550	$405,350.00	Through railway land and under QR line & Boundary St
1598	4	300	2007	21	370	$7,770.00	
1611	4	200	2017	492	200	$98,400.00	
1612	4	250	2017	450	270	$121,500.00	Along Sir Leslie Thiess Drv
1613	4	500	2017	1531	900	$1,377,900.00	Includes a bored crossing of Ross Ck and constructed along Strand and South Townsville
1618	4	250	2011	110	270	$29,700.00	Included crossing of Ross Ck via existing footbridge
1619	4	200	2016	299	200	$59,800.00	In new development area
1781	4	300	2017	2067	370	$764,790.00	Through North Ward (PVC)
1782	4	450	2017	1035	750	$776,250.00	Along the Strand
1784	4	375	2018	3495	550	$1,922,250.00	Along Woolcock St Drain and Boundary St
1794	5	300	2015	7704	370	$2,850,480.00	Along Bruce Hwy so additional traffic management
1741	5	450	2021	8514	750	$6,385,500.00	Likely rock and along Flinders Hwy and under a number of roads so additional traffic management etc.
						$36,115,070.00	

Normal Rates (including allowances for design, doc, tender, construction supervision along with scours, line valves, air releases etc.)		
Diameter (mm)	Renewal Rate	Description
100	80	PVC
150	140	PVC
200	200	PVC
250	270	PVC
300	370	PVC/DICL
375	550	DICL
450	750	DICL
500	900	DICL
600	1200	DICL

Summary	
Locality	Council Renwal Value $
1	$8,656,280.00
2	$8,994,400.00
3	$3,646,940.00
4	$5,581,470.00
5	$9,235,980.00
Total	$36,115,070.00

Appendix E - Sewerage Gravity Mains Renewal Costs

PIPE ID	Development Area (locality)	PIPE SIZE	Date Required	Length (m)	Renewal Rate $	Council Renewal Value $	Comment
876	1	500	2025	477	1200	$572,400.00	
881	1	450	2015	161	900	$144,900.00	
794	1	450	2011	209	900	$188,100.00	
967	1	300	2014	314	440	$138,160.00	
1003	1	300	2011	88	440	$38,720.00	
1731	1	450	2025	317	900	$285,300.00	
763	1	225	2025	465	300	$139,500.00	
765	1	225	2015	298	300	$89,400.00	
767	1	300	2018	478	440	$210,320.00	
768	1	375	2018	337	650	$219,050.00	
784	1	225	2015	280	300	$84,000.00	
786	1	375	2025	487	650	$316,550.00	
787	1	300	2025	750	440	$330,000.00	
788	1	300	2024	702	440	$308,880.00	
790	1	225	2016	321	300	$96,300.00	
791	1	300	2016	160	440	$70,400.00	
792	1	375	2019	331	650	$215,150.00	
1732	1	375	2025	610	650	$396,500.00	
997	1	375	2011	510	650	$331,500.00	
797	1	500	2023	353	1200	$423,600.00	
833	1	225	2013	262	300	$78,600.00	
872	2	300	2012	294	440	$129,360.00	
942	2	225	2020	474	300	$142,200.00	
1715	2	300	2013	280	440	$123,200.00	
1714	2	300	2018	226	440	$99,440.00	
780	2	300	2012	540	440	$237,600.00	
847	2	300	2015	146	440	$64,240.00	
848	2	225	2015	674	300	$202,200.00	
851	2	300	2015	460	440	$202,400.00	
1728	2	300	2016	508	440	$223,520.00	
943	2	375	2013	724	650	$470,600.00	
936	3	450	2011	37	900	$33,300.00	
982	3	600	2025	3119	1600	$4,990,400.00	
856	4	300	2018	289	440	$127,160.00	
857	4	300	2011	185	440	$81,400.00	Along existing streets
1735	4	300	2012	570	440	$250,800.00	
1736	4	225	2017	454	300	$136,200.00	
1737	4	225	2015	460	300	$138,000.00	
1757	4	300	2014	211	440	$92,840.00	
1758	4	225	2015	274	300	$82,200.00	
1759	4	300	2017	572	440	$251,680.00	
1760	4	225	2017	681	300	$204,300.00	
1738	5	150	2022	339	200	$67,800.00	
1739	5	150	2022	1034	200	$206,800.00	
1740	5	150	2019	433	200	$86,600.00	
1741	5	300	2017	527	440	$231,880.00	
1742	5	300	2019	794	440	$349,360.00	
1743	5	300	2021	1034	440	$454,960.00	Along existing streets
1745	5	450	2023	227	900	$204,300.00	Along existing streets
1746	5	450	2021	1110	900	$999,000.00	
						$15,561,070.00	

Normal Rates (including allownaces for design, doc, tender, construction supervision along with manholes)		
Diameter (mm)	Renewal Rate $	Description
150	200	PVC
225	300	PVC
300	440	PVC/DICL
375	650	DICL
450	900	DICL
500	1200	DICL
600	1600	DICL

Summary	
Locality	Council Renewal Value$
1	$4,677,330.00
2	$1,894,760.00
3	$5,023,700.00
4	$1,364,580.00
5	$2,600,700.00
Totals	$15,561,070.00

Appendix F - Future Sewage Pump Stations Renewal Costs

REF NO	Development Area Locality	TYPE	Date Required	Council Renewal Value $
P/S BP11	2	Pump Station	2016	$500,000.00
P/S BP12	2	Pump Station	2018	$500,000.00
P/S WB6	1	Pump Station	2026	$500,000.00
P/S WB10	1	Pump Station	2016	$500,000.00
P/S C31	3	Pump Station	2012	$500,000.00
P/S C34A	3	Pump Station	2012	$500,000.00
P/S WD8	1	Pump Station	2015	$500,000.00
P/S BU09	1	Pump Station	2017	$500,000.00
P/S BP21	2	Pump Station	2018	$500,000.00
P/S 5A6F	4	Pump Station	2015	$500,000.00
P/S 5A6G	4	Pump Station	2017	$500,000.00
P/S R1	5	Pump Station	2022	$900,000.00
P/S BP07	2	Pump Station	2015	$500,000.00
P/S BP08	2	Pump Station	2017	$500,000.00
P/S ML8	1	Pump Station	2023	$3,000,000.00
P/S BU08	1	Pump Station	2016	$500,000.00
P/S ML15	1	Pump Station	2018	$500,000.00
P/S J3	1	Pump Station	2022	$500,000.00
P/S J2	1	Pump Station	2018	$500,000.00
P/S J1	1	Pump Station	2015	$500,000.00
P/S ML5	1	Pump Station	2025	$500,000.00
P/S ML6	1	Pump Station	2024	$500,000.00
P/S BU4	1	Pump Station	2014	$500,000.00
P/S BU5	1	Pump Station	2011	$500,000.00
P/S BU6	1	Pump Station	2019	$500,000.00
P/S L17A1	2	Pump Station	2018	$500,000.00
P/S 5A6E	4	Pump Station	2012	$500,000.00
P/S 5A6D	4	Pump Station	2014	$500,000.00
P/S ML15	1	Pump Station	2016	$500,000.00
P/S ML14	1	Pump Station	2013	$500,000.00
P/S ML12	1	Pump Station	2017	$500,000.00
P/S ML11	1	Pump Station	2021	$500,000.00
P/S ML13	1	Pump Station	2018	$3,000,000.00
P/SLR1	2	Pump Station	2012	$800,000.00
P/SLR2	2	Pump Station	2017	$500,000.00
P/SLR3	2	Pump Station	2018	$500,000.00
P/SL17A	2	Pump Station	2014	$500,000.00
P/SL17A2	2	Pump Station	2020	$500,000.00
P/S J0	1	Pump Station	2018	$500,000.00
P/S R4	5	Pump Station	2015	$500,000.00
P/S 24	4	Pump Station	2020	$500,000.00
P/S 22	4	Pump Station	2016	$600,000.00
P/S 21	4	Pump Station	2011	$800,000.00
P/S 23	4	Pump Station	2018	$500,000.00
P/S R10	5	Pump Station	2021	$3,000,000.00
				$31,100,000.00

Summary	
Locality	Council Renewal Value $
1	$15,500,000.00
2	$5,800,000.00
3	$1,000,000.00
4	$4,400,000.00
5	$4,400,000.00
Total	$31,100,000.00

Appendix G - Future Sewage Pump Station Upgrades

Development Area (Locality)	REF NO	TYPE	Date Required	Council Increase in renewal value $	Comments
1	P/S WB7	Pump Station	2015	$ 613,000	Overflow Storage Chamber
1	P/S BU07	Pump Station	2024	$ 240,000	Pump & electrical upgrade
1	P/S ML21	Pump Station	2019	$ 3,600,000	New major PS & Control room to replace existing temp PS
1	P/S BU3	Pump Station	2016	$ 3,600,000	New major PS & Control room to replace existing temp PS
3	P/S 33	Pump Station	2016	$ 60,000	
3	P/S 6CB	Pump Station	2016	$ 2,800,000	
4	P/S 7A	Pump Station	2017	$ 4,100,000	New PS & Land Purchase to replace existing
4	P/S 6	Pump Station	2018	$ 1,800,000	New PS to replace existing
4	P/S 2A	Pump Station	2019	$ 200,000	Electrical upgrades
4	P/S 8B	Pump Station	2015	$ 100,000	Electrical upgrades
4	P/S A1A	Pump Station	2017	$ 1,200,000	Replacement PS
				$ 18,313,000	

All estimates are site specific.

Summary	
Locality	Council Increase in RenewalValue $
1	$8,053,000.00
2	$0.00
3	$2,860,000.00
4	$7,400,000.00
5	$0.00
Total	$18,313,000.00

Appendix H Future Water Mains Renewal Costs

PIPE ID	Development Area (locality)	Pipe Size	Date Required	length (m)	Rate $	Council Renewal Value $	Comment
255	1	500	2020	448	900	$403,200	
256	1	250	2020	912	270	$246,240	
259	1	200	2015	345	200	$69,000	
260	1	250	2011	187	270	$50,490	
272	1	300	2015	557	370	$206,090	
275	1	300	2016	1,250	370	$462,500	
284	1	300	2014	545	370	$201,650	
285	1	150	2016	183	140	$25,620	
290	1	500	2020	584	900	$525,600	
291	1	375	2020	334	550	$183,700	
292	1	300	2019	413	370	$152,810	
293	1	300	2016	875	370	$323,750	
299	1	300	2016	94	370	$34,780	
300	1	250	2012	253	270	$68,310	
303	1	600	2022	1,138	1,200	$1,365,600	
307	1	250	2012	398	270	$107,460	
309	1	250	2014	1,219	270	$329,130	
348	1	250	2012	269	270	$72,630	
362	1	450	2026	1,606	750	$1,204,500	
363	1	375	2014	952	550	$523,600	
371	1	300	2016	1,238	370	$458,060	
372	1	375	2011	871	550	$479,050	
375	1	250	2016	302	270	$81,540	
390	1	200	2017	570	200	$114,000	
394	1	300	2014	109	370	$40,330	
395	1	250	2015	654	270	$176,580	
396	1	675	2020	834	1,200	$1,000,800	
397	1	300	2016	613	370	$226,810	
398	1	250	2015	364	270	$98,280	
400	1	600	2015	1,102	1,200	$1,322,400	
401	1	375	2016	726	550	$399,300	
402	1	300	2020	191	370	$70,670	
403	1	500	2018	516	900	$464,400	
404	1	500	2015	458	900	$412,200	
405	1	750	2024	1,086	1,700	$1,846,200	
406	1	600	2024	2,032	1,200	$2,438,400	
407	1	500	2025	1,157	900	$1,041,300	
416	1	375	2011	127	550	$69,850	
417	1	450	2024	1,533	750	$1,149,750	
419	1	300	2014	509	370	$188,330	
421	1	375	2014	465	550	$255,750	
447	1	300	2012	946	370	$350,020	
639	1	250	2015	314	270	$84,780	
640	1	600	2020	669	1,200	$802,800	
415	1	300	2012	969	370	$358,530	
637	1	250	2012	323	270	$87,210	
241	2	250	2021	695	270	$187,650	
244	2	375	2020	767	550	$421,850	
288	2	300	2025	1,300	370	$481,000	
289	2	500	2015	1,084	900	$975,600	
379	2	250	2015	1,206	270	$325,620	
385	2	375	2013	286	550	$157,300	
387	2	250	2015	417	270	$112,590	
388	2	300	2016	604	370	$223,480	
389	2	375	2016	570	550	$313,500	
418	2	375	2021	662	550	$364,100	
420	2	250	2016	1,339	270	$361,530	
247	3	250	2012	406	270	$109,620	
251	3	300	2019	405	370	$149,850	
252	3	450	2020	1,090	750	$817,500	Along Beck Drv
253	3	200	2020	132	200	$26,400	
269	3	500	2020	1,483	900	$1,334,700	Along Gouldian Ave
270	3	375	2019	446	550	$245,300	
304	3	300	2013	274	370	$101,380	
311	3	500	2020	1,426	900	$1,283,400	Along Gouldian Ave
426	3	300	2018	722	370	$267,140	
427	3	375	2014	190	550	$104,500	
628	3	300	2014	526	370	$194,620	
652	3	300	2014	543	370	$200,910	
653	3	300	2025	303	370	$112,110	
315	4	300	2017	561	370	$207,570	Along existing urban streets

PIPE ID	Development Area (locality)	Pipe Size	Date Required	length (m)	Rate $	Council Renewal Value $	Comment
316	4	450	2016	363	750	$272,250	Along existing urban streets
317	4	500	2015	906	900	$815,400	Along existing urban streets
318	4	500	2018	549	900	$494,100	Along existing urban streets
319	4	450	2016	803	750	$602,250	Along existing urban streets
320	4	450	2022	441	750	$330,750	Along existing urban streets
369	4	250	2014	301	270	$81,270	Along existing urban streets
370	4	250	2014	496	270	$133,920	Along existing urban streets
381	4	500	2016	686	900	$617,400	Along existing urban streets
382	4	750	2016	427	1,700	$725,900	Along existing urban streets
383	4	600	2018	408	1,200	$489,600	Along existing urban streets
386	4	375	2014	859	550	$472,450	Along Railway Service Ave
641	4	300	2022	565	370	$209,050	Along existing urban streets
642	4	300	2017	693	370	$256,410	Along existing urban streets
359	5	300	2023	681	370	$251,970	
361	5	450	2022	729	750	$546,750	
525	5	600	2026	538	1,200	$645,600	
526	5	450	2025	945	750	$708,750	
527	5	300	2023	662	370	$244,940	
530	5	500	2019	785	900	$706,500	
531	5	450	2021	701	750	$525,750	
536	5	375	2025	932	550	$512,600	
537	5	375	2023	1,069	550	$587,950	
539	5	600	2021	3,364	1,200	$4,036,800	
540	5	500	2021	704	900	$633,600	
542	5	600	2015	800	1,200	$960,000	
543	5	300	2016	349	370	$129,130	
547	5	300	2025	900	370	$333,000	
624	5	450	2022	838	750	$628,500	
625	5	600	2017	1,416	1,200	$1,699,200	
661	5	300	2023	2,962	370	$1,095,940	
510	5	900	2021	2,789	2,300	$6,414,700	
514	5	900	2021	1,813	2,300	$4,169,900	
						$59,985,550	

Normal Rates (including allownaces for design, doc, tender, construction supervision along with scours, line valves, air releases etc)		
Diameter (mm)	Renewal $	Description
100	80	PVC
150	140	PVC
200	200	PVC
250	270	PVC
300	370	PVC/DICL
375	550	DICL
450	750	DICL
500	900	DICL
600	1200	DICL
750	1700	DICL/MSCL
900	2300	DICL/MSCL

Summary	
Locality	Council Renewal Value $
1	$20,574,000.00
2	$3,924,220.00
3	$4,947,430.00
4	$5,708,320.00
5	$24,831,580.00
Total	$59,985,550.00

Appendix I1 Pinnacles Normal Growth - Summary of Establishment and Renewal Costs (Roads)

Road	Description	Comment	Map Node Location	Metric	Units	Existing Standard Lookup Code	Standard Description	Existing Rate $	Existing amount$	Date Pinnacle Normal Growth	Upgrade Standard Lookup Code	Standard Description	Upgrade Rate $	Upgraded Amount $	Net increase in establishment value	Net change in Renewal Value (x55%)
Allambie Lane	South Beck to Sterritt	Improve road	5 to 7	Metres	1615	2MTN	2 way 2 lane Rural major collector	6015	$9,714,976.38	2015	2STN	Two Lane two way Sub arterial with Table Drains	6642	10726050	$1,011,073.98	$556,090.69
Allambie Lane	Bohle River Bridge	Provide new 500 m bridge	node 6	Each	1	nil	nil	0	$0.00	2015	Bridge	Bridges 500meter long 2 lanes	17610261	17610261	$17,610,260.66	$9,685,643.36
Sterritt Road	Allambie to Bend	New Connection	4 to 5	Metres	717	nil	nil	0	$0.00	2015	2STN	Two Lane two way Sub arterial with Table Drains	6642	4761968	$4,761,967.87	$2,619,082.33
Sterritt Road	Bend To Laudberg Road	New Connection	3 to 4	Metres	242	nil	nil	0	$0.00	2015	2STN	Two Lane two way Sub arterial with Table Drains	6642	1607247	$1,607,247.17	$883,985.95
Laudberg Road	Sterritt to Sanbeck	New Connection	2 to 3	Metres	1292	nil	nil	0	$0.00	2015	2STN	Two Lane two way Sub arterial with Table Drains	6642	8580840	$8,580,840.29	$4,719,462.16
Laudberg Road	Sanbeck to Moncrieff	New Connection	1 to 2	Metres	656	nil	nil	0	$0.00	2015	2STN	Two Lane two way Sub arterial with Table Drains	6642	4356835	$4,356,835.32	$2,396,259.42
Laudberg Road	Moncrieff to end	New Connection	0 to 1	Metres	692	nil	nil	0	$0.00	2015	2STN	Two Lane two way Sub arterial with Table Drains	6642	4595930	$4,595,929.94	$2,527,761.47
Allambie Lane	Intersection with Sterritt Road	New Intersection	node 5	Each	1	nil	nil	0	$0.00	2015	3U111111	Roundabout 3 legs	420975	420975	$420,974.78	$231,536.13
South Beck Drive	Gollogly to Feeney	Upgrade connection to dual carriageway	9 to 10	Metres	356	2STN	Two Lane two way Sub arterial with Table Drains	6642	$2,364,380.14	2020	4STM	Dual Carriageway Sub arterial with Table Drains	9699	3452894	$1,088,513.88	$598,682.63
South Beck Drive	Intersection with Feeney	Upgrade Intersection	node 9	Each	1	3U111111	Roundabout 3 legs	420975	$420,974.78	2020	3U111111	Roundabout 3 legs	420975	420975	$0.00	$0.00
South Beck Drive	Feeney To Santal	Upgrade connection to dual carriageway	8 to 9	Metres	1597	2STN	Two Lane two way Sub arterial with Table Drains	6642	$10,606,503.05	2028	4STM	Dual Carriageway Sub arterial with Table Drains	9699	15489527	$4,883,024.33	$2,685,663.38
South Beck Drive	Santal to Allambie	Upgrade connection to dual carriageway	7 to 8	Metres	1086	2STN	Two Lane two way Sub arterial with Table Drains	6642	$7,212,687.73	2028	4STM	Dual Carriageway Sub arterial with Table Drains	9699	10533267	$3,320,578.85	$1,826,318.37
Allambie Lane	South Beck to Sterritt	Upgrade connection to dual carriageway	5 to 7	Metres	1615	2STN	Two Lane two way Sub arterial with Table Drains	6642	$10,726,050.36	2028	4STM	Dual Carriageway Sub arterial with Table Drains	9699	15664112	$4,938,061.55	$2,715,933.85
Allambie Lane	Bohle River 2nd Bridge	provide 2nd Bridge	node 6	Each	1	Nil	nil	0	$0.00	2028	Bridge	Bridges 500meter long 2 lanes	17610261	17610261	$17,610,260.66	$9,685,643.36
Sterritt Road	Allambie to Bend	Upgrade connection to dual carriageway	4 to 5	Metres	717	2STN	Two Lane two way Sub arterial with Table Drains	6642	$4,761,967.87	2028	4STM	Dual Carriageway Sub arterial with Table Drains	9699	6954284	$2,192,315.87	$1,205,773.73
Sterritt Road	Bend To Laudberg	Upgrade connection to dual carriageway	3 to 4	Metres	242	2STN	Two Lane two way Sub arterial with Table Drains	6642	$1,607,247.17	2028	4STM	Dual Carriageway Sub arterial with Table Drains	9699	2347192	$739,944.83	$406,969.65
Laudberg Road	Sterritt to Sanbeck	Upgrade connection to dual carriageway	2 to 3	Metres	1292	2STN	Two Lane two way Sub arterial with Table Drains	6642	$8,580,840.29	2028	4STM	Dual Carriageway Sub arterial with Table Drains	9699	12531290	$3,950,449.24	$2,172,747.08
Laudberg Road	Sanbeck to Moncrieff	Upgrade connection to dual carriageway	1 to 2	Metres	656	2STN	Two Lane two way Sub arterial with Table Drains	6642	$4,356,835.32	2028	4STM	Dual Carriageway Sub arterial with Table Drains	9699	6362636	$2,005,800.85	$1,103,190.47
Laudberg Road	Moncrieff to end	Upgrade connection to dual carriageway	0 to 1	Metres	692	2STN	Two Lane two way Sub arterial with Table Drains	6642	$4,595,929.94	2028	4STM	Dual Carriageway Sub arterial with Table Drains	9699	6711805	$2,115,875.29	$1,163,731.41
South Beck Drive	Intersection with Santal Drive	Upgrade Intersection	node 8	Each	1	3R111111	Roundabout 3 legs	724152	$724,152.17	2028	3R221222	Roundabout 3 legs	1451186	1451186	$727,034.02	$399,868.71
South Beck Drive	Intersection with Allambie Lane	Upgrade Intersection	node 7	Each	1	3U122211	Roundabout 3 legs	578425	$578,425.29	2028	3R222222	Roundabout 3 legs	1705113	1705113	$1,126,688.18	$619,678.50
Allambie Lane	Intersection with Sterritt Road	Upgrade Intersection	node 5	Each	1	3U111111	Roundabout 3 legs	420975	$420,974.78	2028	3U112222	Roundabout 3 legs	506219	506219	$85,244.69	$46,884.58
									Total						$87,728,922.25	$48,250,907.24

Unit Rates - Look up Table

Description	Code	Amount $
2 way 2 lane Rural major collector	2MTN	6,015.47
Two Lane two way Sub arterial with Table Drains	2STN	$ 6,641.52
Roundabout 3 legs	3R111111	724152.17
Roundabout 3 legs	3R221222	1451186.19
Roundabout 3 legs	3R222222	1705113.47
Roundabout 3 legs	3U111111	420974.78
Roundabout 3 legs	3U111112	420974.78
Roundabout 3 legs	3U112222	506219.47
Roundabout 3 legs	3U121111	420974.78
Roundabout 3 legs	3U122211	578425.29
Roundabout 3 legs	3U231123	578425.29
Roundabout 3 legs	3U231223	578425.29
Roundabout 3 legs	3U232311	578425.29
Roundabout 4 legs 2lane two way approaches	4R11111111	678941.77
Roundabout 4 legs 2lane two way approaches	4R22112211	1324599.13
Dual Carriageway Sub arterial with Table Drains	4STM	$ 9,699.14
Bridges 500meter long 2 lanes	Bridge	17610261
nil	nil	0

Appendix I2 Pinnacles Normal Growth Summary of Renewal Costs (Water and Sewerage)

Sewerage Options

Scenario		Description	Unit	Quantity	Rate $	Amount $	Stage Value $	EP	Year (normal)	Option Renewal Cost $
Option 1 – Two Parallel Rising Mains	Stage 1	Pump Station 1	Each	1.00	3,000,000.00	3,000,000.00	15,300,000.00	0.00	2015	$31,350,000.00
		DN450 DICL Pipe	Metre	16,400.00	750.00	12,300,000.00				
	Stage 2	Pump Station 2	Each	1.00	3,000,000.00	3,000,000.00	16,050,000.00	9,000.00	2041	
		DN450 DICL Pipe	Metre	17,400.00	750.00	13,050,000.00				
Option 2 – Three Parallel Rising Mains	Stage 1	Pump Station 1	Each	1.00	3,000,000.00	3,000,000.00	12,020,000.00	0.00	2015	$33,610,000.00
		DN375 DICL Pipe	Metre	16,400.00	550.00	9,020,000.00				
	Stage 2	DN375 DICL Pipe	Metre	16,400.00	550.00	9,020,000.00	9,020,000.00	6,000.00	2038	
	Stage 3	Pump Station 2	Each	1.00	3,000,000.00	3,000,000.00	12,570,000.00	13,000.00	2043	
		DN375 DICL Pipe	Metre	17,400.00	550.00	9,570,000.00				
Option 3 – Four Parallel Rising Mains	Stage 1	Pump Station 1	Each	1.00	3,000,000.00	3,000,000.00	9,068,000.00	0.00	2015	$37,096,000.00
		DN300 DICL Pipe	Metre	16,400.00	370.00	6,068,000.00				
	Stage 2	DN375 DICL Pipe	Metre	16,400.00	550.00	9,020,000.00	9,020,000.00	3,000.00	2030	
	Stage 3	$3 M– Pinnacles Major PS	Each	1.00	3,000,000.00	3,000,000.00	9,438,000.00	9,000.00	2041	
		DN300 DICL Pipe	Metre	17,400.00	370.00	6,438,000.00				
	Stage 4	DN375 DICL Pipe	Metre	17,400.00	550.00	9,570,000.00	9,570,000.00	14,000.00	2044	

Mains and PS above are additional to Trunk mains and are not creditable as headworks.

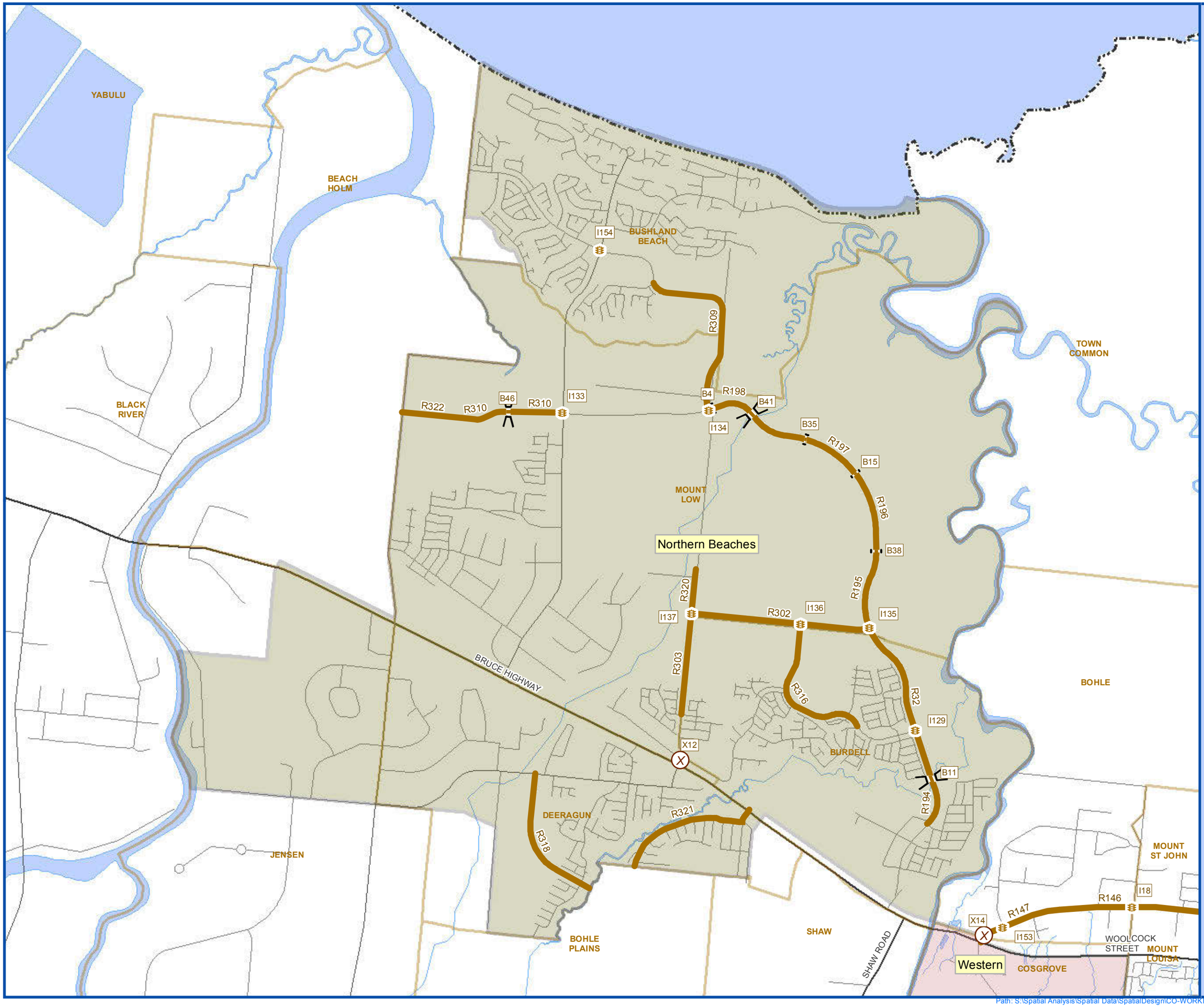
Water Supply Options

Scenario		Description	Unit	Quantity	Rate $	Amount $	Stage Value $	EP	Year (normal)	Option Renewal Cost $
Option 1 – Two Parallel Water Mains	Stage 1	Booster Pump Station	Each	1.00	1,500,000.00	1,500,000.00	15,990,000.00	0.00	2015	$30,480,000.00
		DN500 DICL Pipe	Metre	16,100.00	900.00	14,490,000.00				
	Stage 2	DN 500 DICL Pipe	Metre	16,100.00	900.00	14,490,000.00	14,490,000.00	9,000.00	2041	
Option 2 – Three Parallel Water Mains	Stage 1	Booster Pump Station	Each	1.00	1,500,000.00	1,500,000.00	10,355,000.00	0.00	2015	$31,285,000.00
		DN375 DICL Pipe	Metre	16,100.00	550.00	8,855,000.00				
	Stage 2	DN450 DICL Pipe	Metre	16,100.00	750.00	12,075,000.00	12,075,000.00	5,000.00	2036	
	Stage 3	DN375 DICL Pipe	Metre	16,100.00	550.00	8,855,000.00	8,855,000.00	13,000.00	2043	

Mains and PS above are additional to Trunk mains and are not creditable as headworks.

Reservoir Storage is considered as Headworks Pinnacles to pay via Infrastructure Charges

TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
Northern Beaches
ROADS



LEGEND

- Rail Crossing
- Intersection
- Future Bridge
- Future Road

N

0 440 880 1,320

Meters

Strategic Planning Department
PLANNING AND DEVELOPMENT

Date: 3/07/2013
Drawn By: rm9
Digital File: DevelopmentCosts_Roads

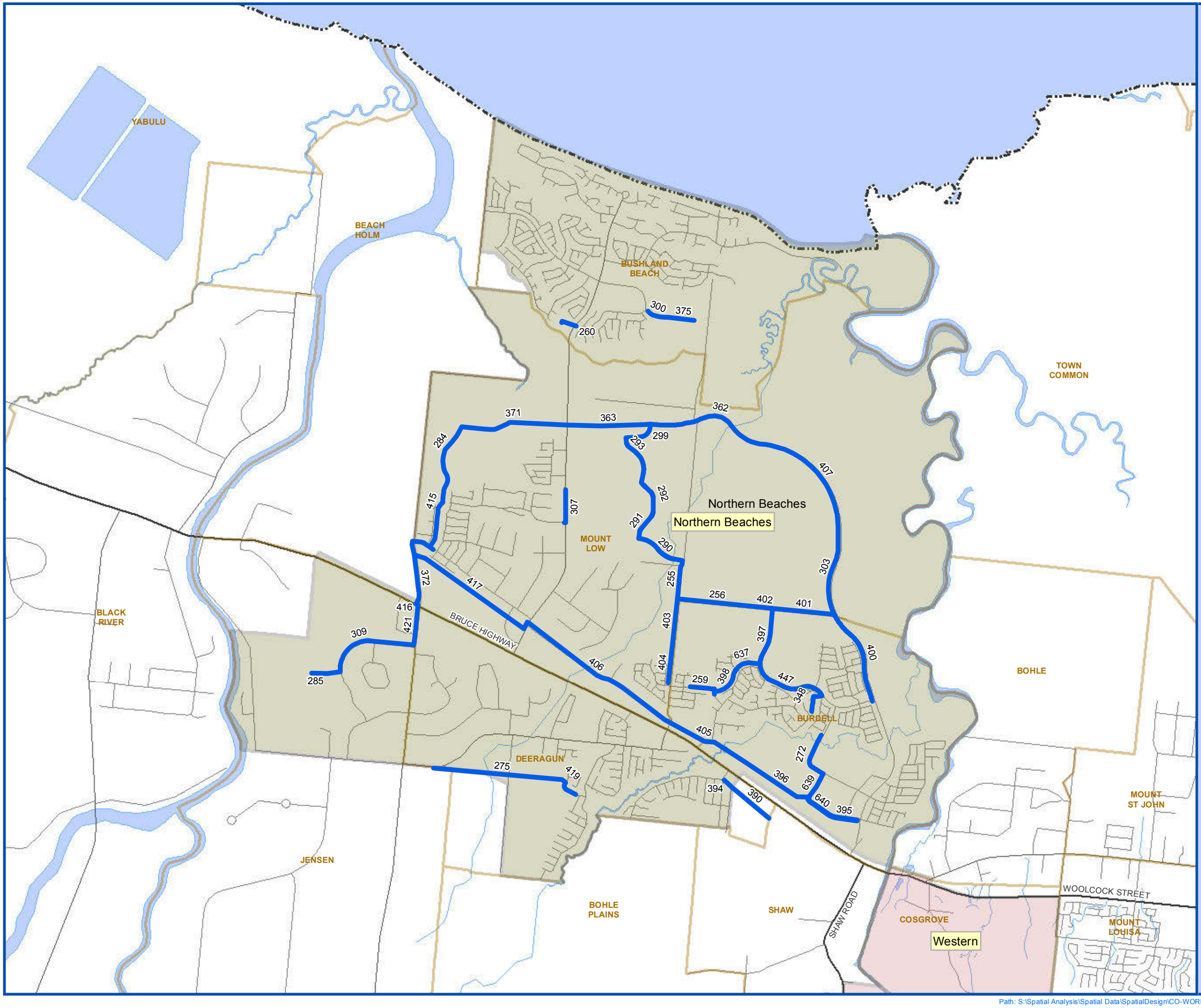
Appendix J1 - A

Path: S:\Spatial Analysis\Spatial Data\SpatialDesign\CO-WORKERS\Col\Development_Costs\Maps\DevelopmentCosts_Roads.mxd

TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
Northern Beaches
WATER

LEGEND

Future Water Main



N

0 510 1,020 1,530

Meters

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Strategic Planning Department
PLANNING AND DEVELOPMENT

Date: 3/07/2013
Drawn By: rm9
Digital File: DevelopmentCosts_Water

Appendix J1 - B

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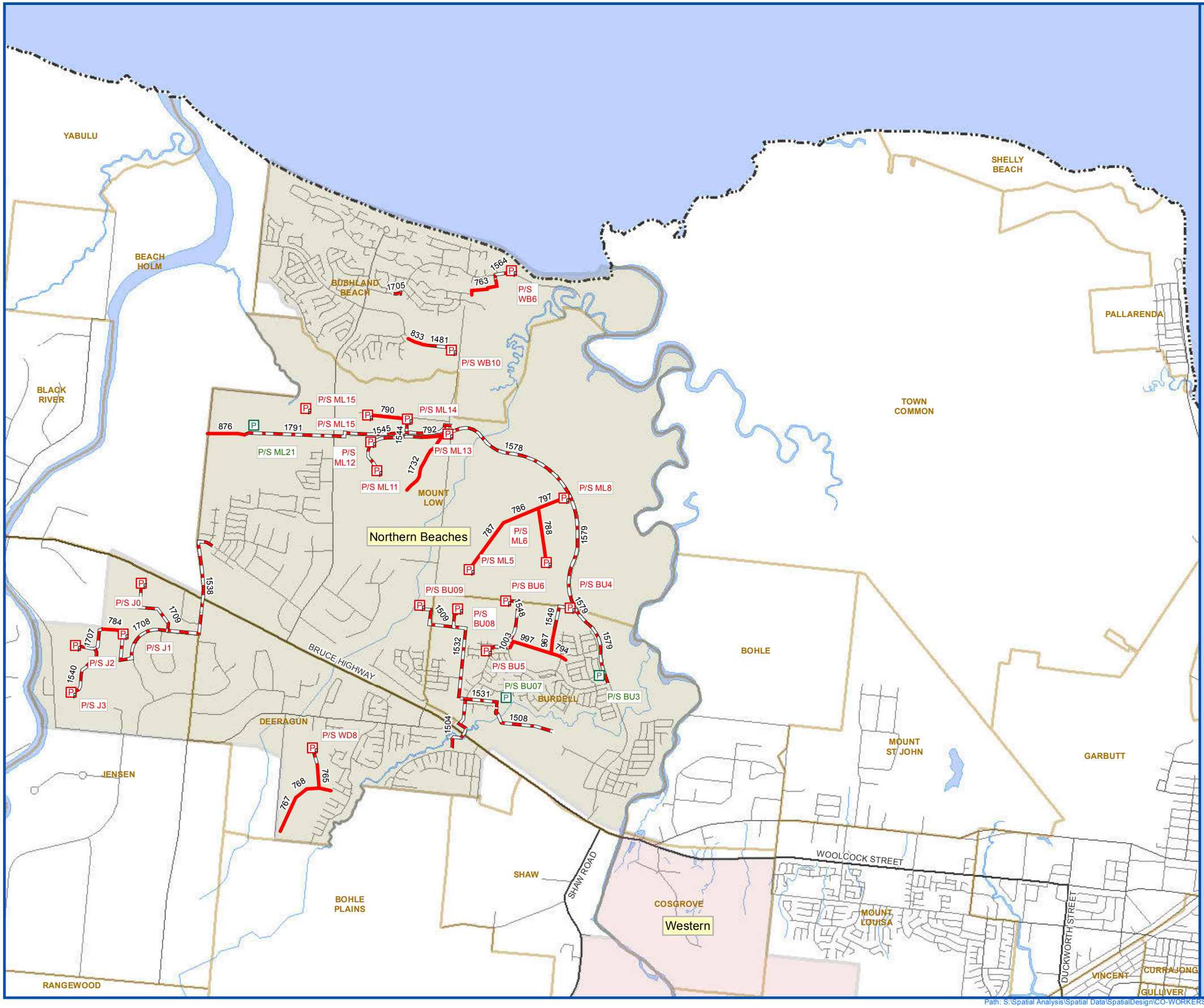
TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
Northern Beaches
SEWERAGE



LEGEND

- Pump Stn Upgrade
- Future Pump Stn
- Future Gravity Main
- Future Rising Main

N

0 570 1,140 1,710

Meters

Strategic Planning Department
PLANNING AND DEVELOPMENT

Date: 3/07/2013
Drawn By: rm9
Digital File: DevelopmentCosts_Sewerage

Appendix J1 - C

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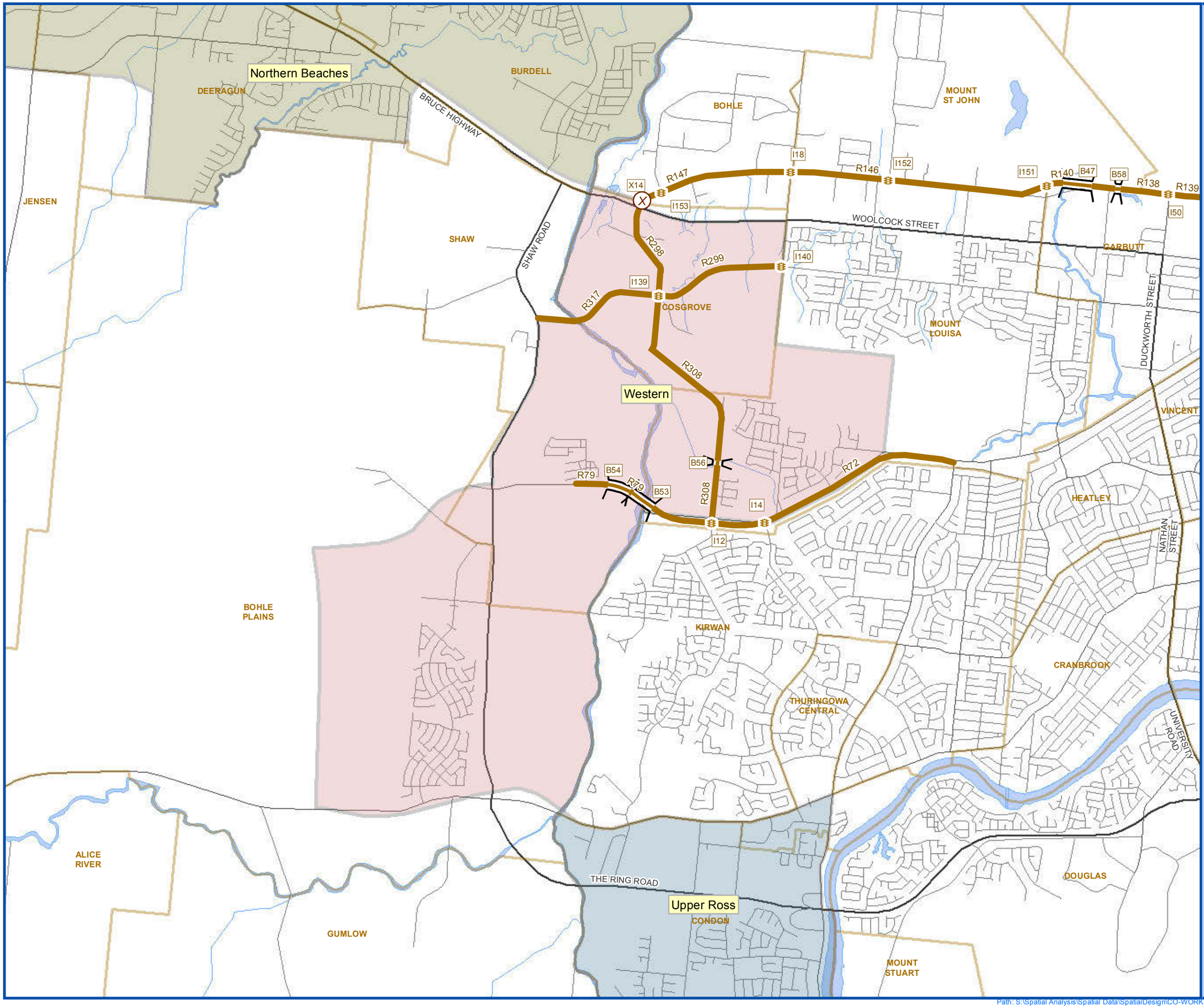
TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
Western
ROADS



LEGEND

- Rail Crossing
- Intersection
- Future Bridge
- Future Road

N

0 440 880 1,320
Meters

Strategic Planning Department
PLANNING AND DEVELOPMENT

Date: 3/07/2013
Drawn By: rm9
Digital File: DevelopmentCosts_Roads

Appendix J2 - A

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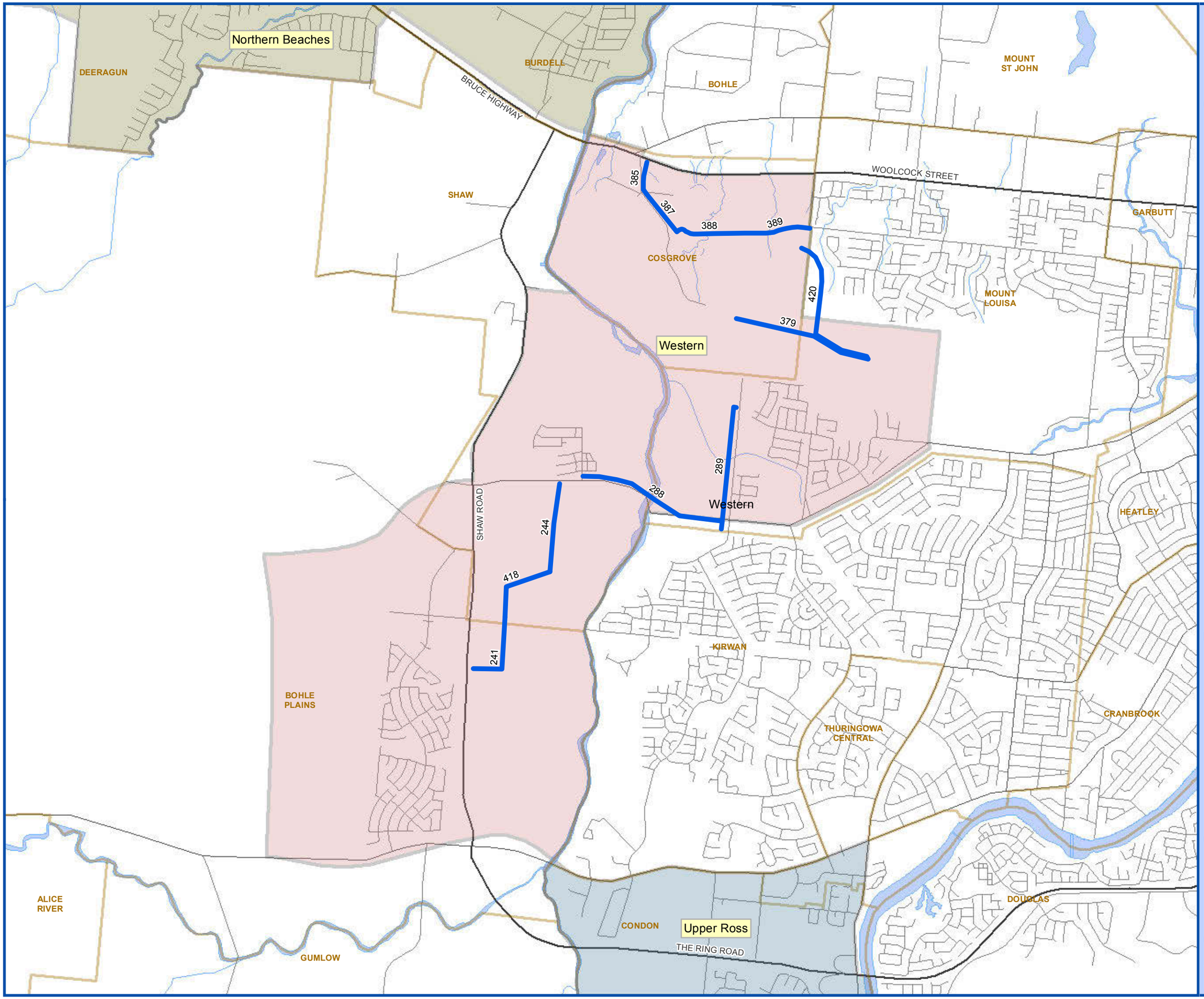

TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
Western
WATER

LEGEND

Future Water Main

N

0 380 760 1,140
Meters

SCALE: 1:30,000 @ A3

Strategic Planning Department
PLANNING AND DEVELOPMENT

Date: 3/07/2013
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Digital File: DevelopmentCosts_Water

Appendix J2 - B

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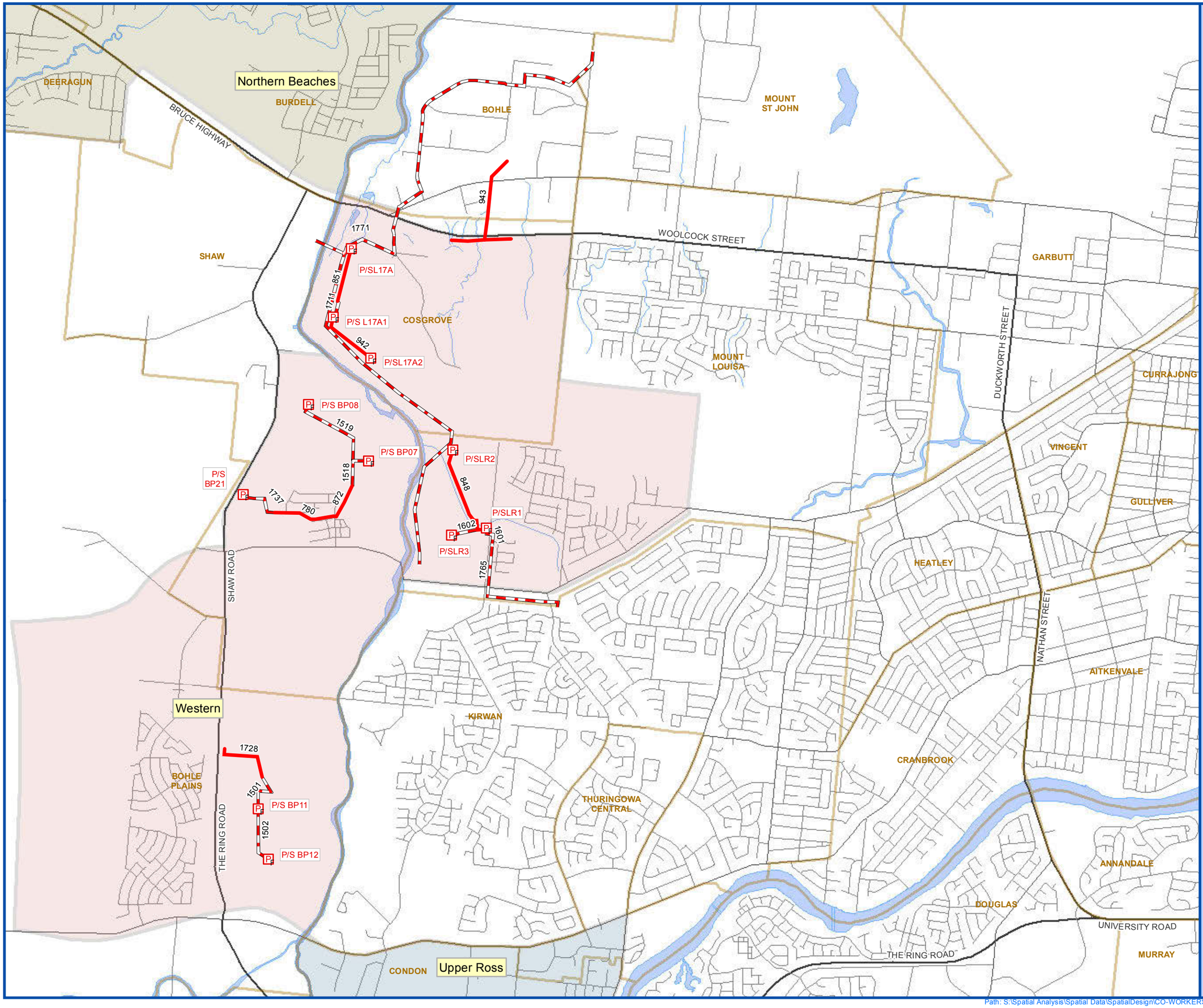
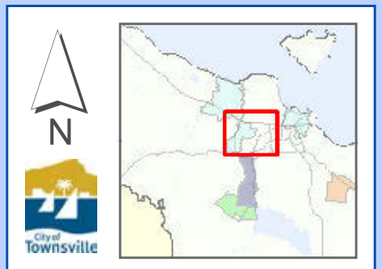
TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
Western
SEWERAGE



LEGEND

- Pump Stn Upgrade
- Future Pump Stn
- Future Gravity Main
- Future Rising Main



Strategic Planning Department
PLANNING AND DEVELOPMENT
Date: 3/07/2013
Drawn By: rm9
Digital File: DevelopmentCosts_Sewerage

Appendix J2 - C

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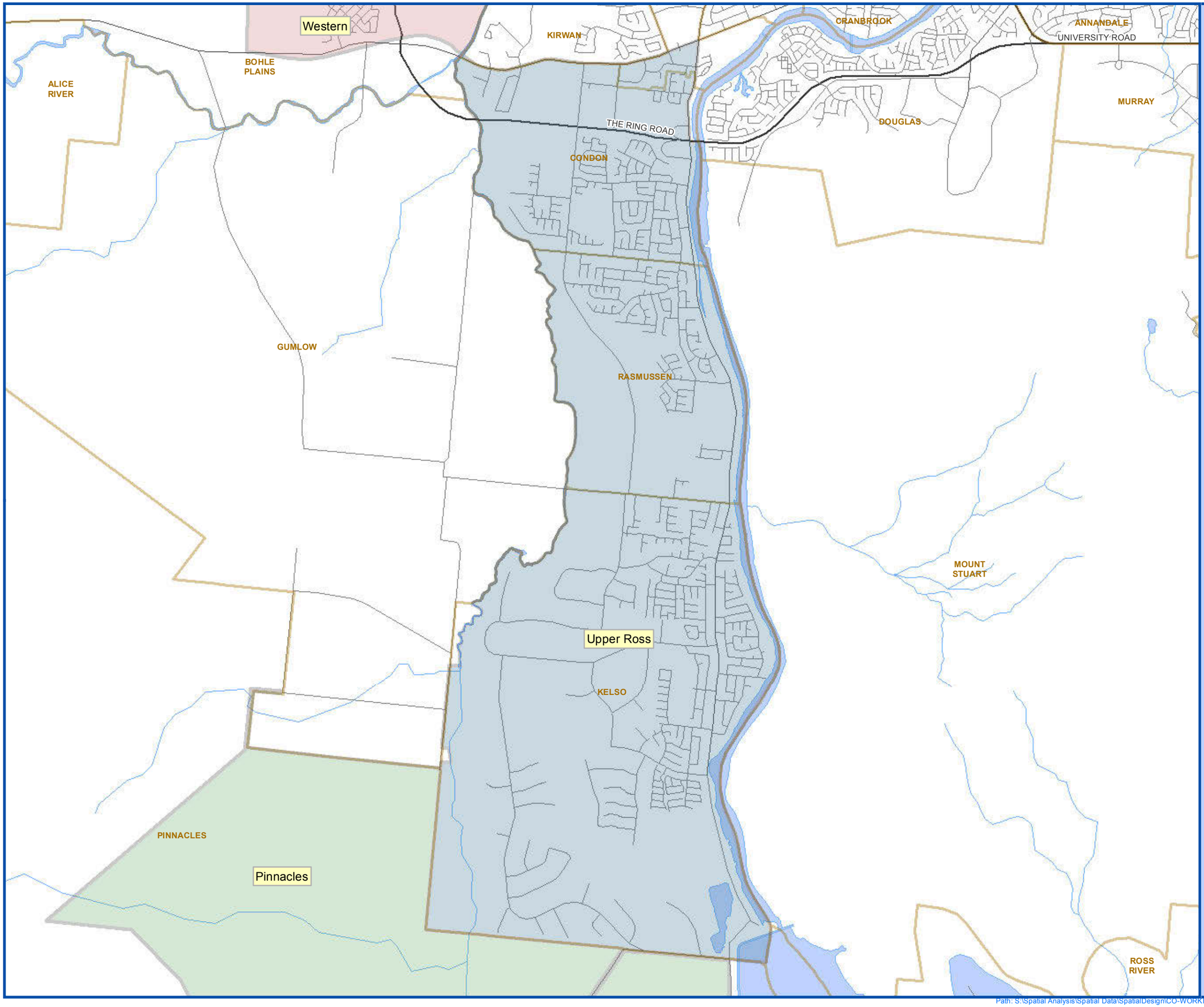


TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
Upper Ross
ROADS

LEGEND

- Rail Crossing
- Intersection
- Future Bridge
- Future Road

0 510 1,020 1,530

Meters

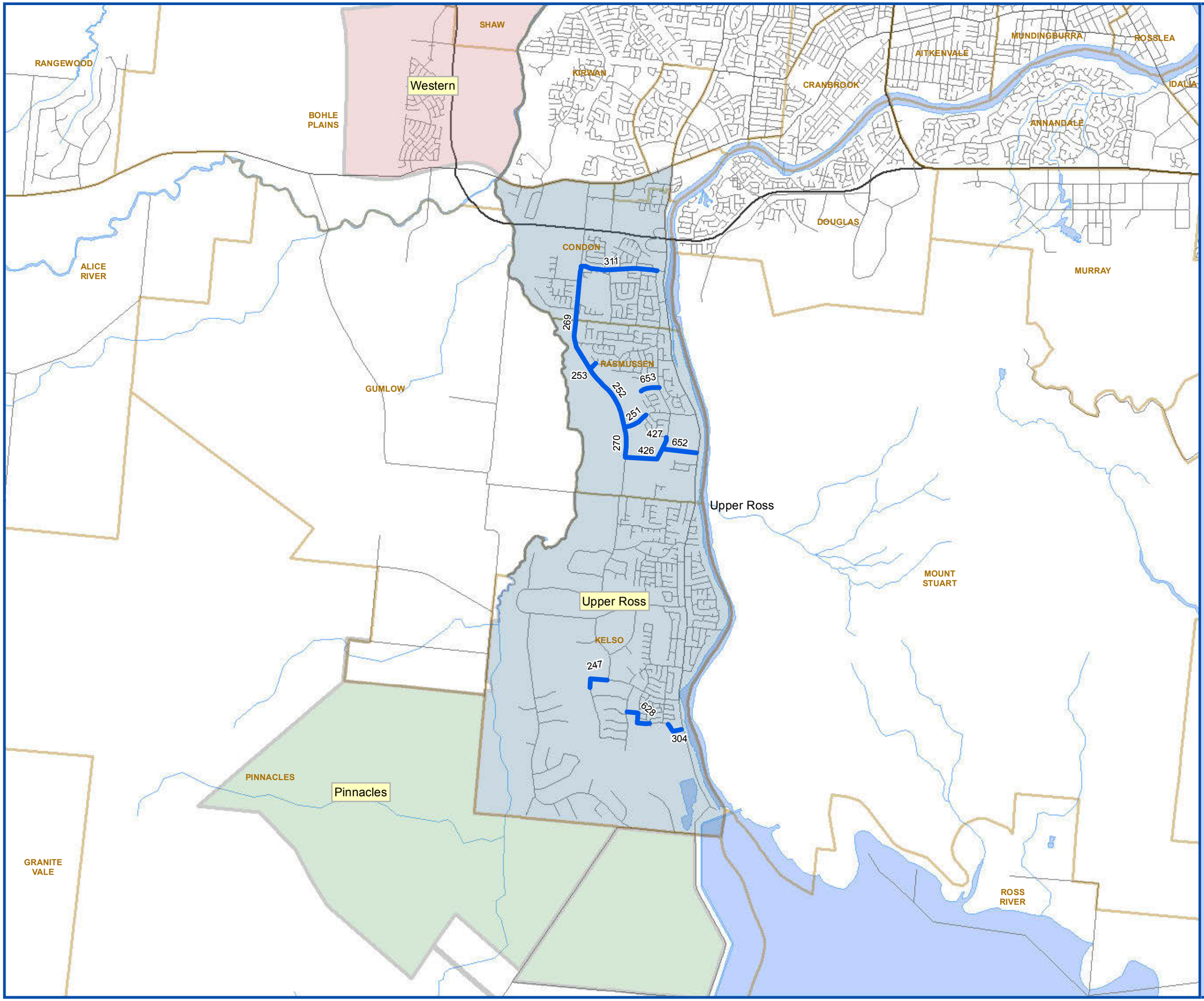
Strategic Planning Department
PLANNING AND DEVELOPMENT

Date: 3/07/2013
Drawn By: rm9
Digital File: DevelopmentCosts_Roads

Appendix J3 - A

Path: S:\Spatial Analysis\Spatial Data\SpatialDesign\CO-WORKERS\Col\Development_Costs\Maps\DevelopmentCosts_Roads.mxd

TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
Upper Ross
WATER



LEGEND

Future Water Main

SCALE: 1:55,000 @ A3

Strategic Planning Department
PLANNING AND DEVELOPMENT

Date: 3/07/2013
Drawn By: rm9
Digital File: DevelopmentCosts_Water

Appendix J3 - B

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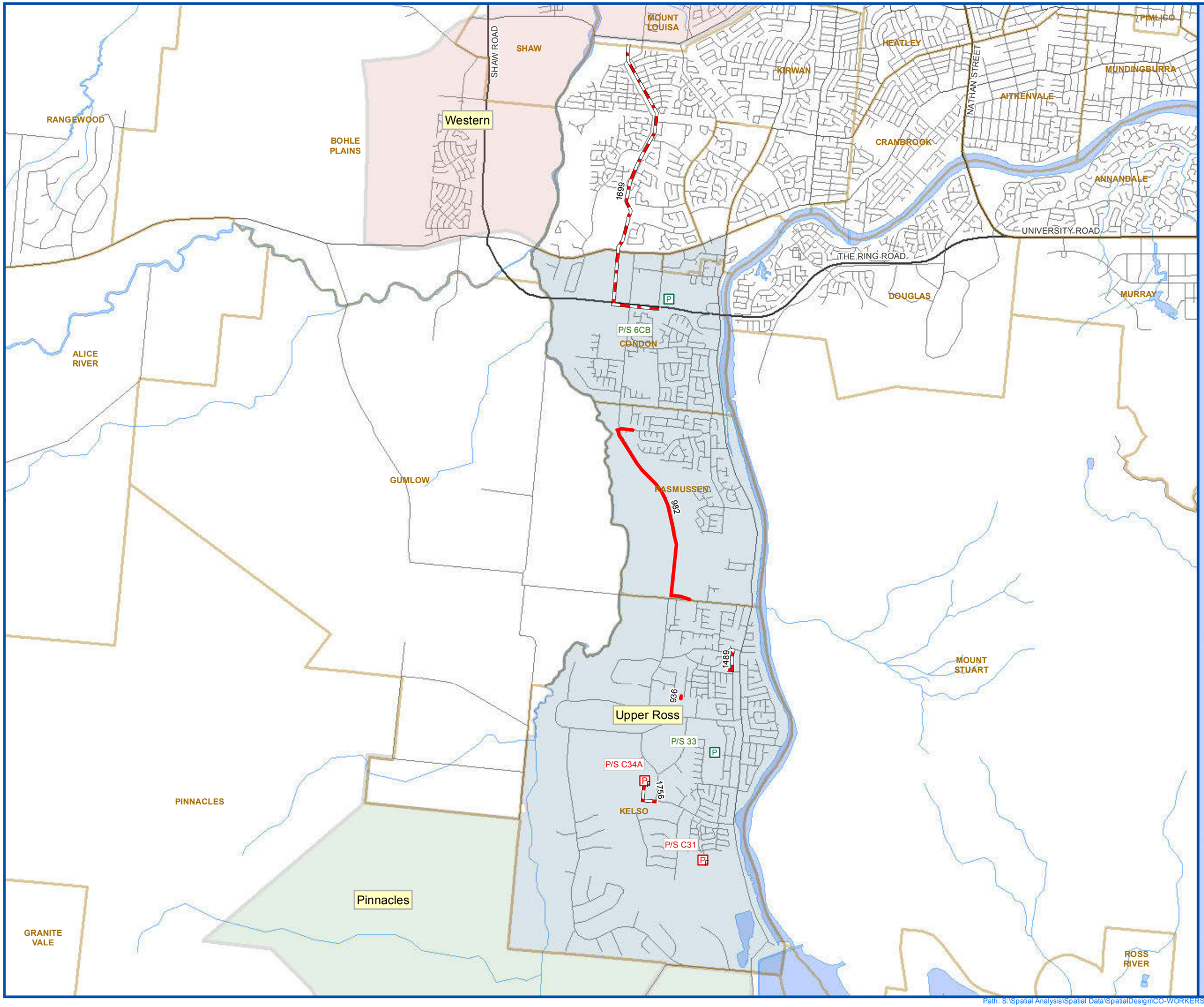
TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
Upper Ross
SEWERAGE



LEGEND

- Pump Stn Upgrade
- Future Pump Stn
- Future Gravity Main
- Future Rising Main

N

0 640 1,280 1,920

Meters

Strategic Planning Department
PLANNING AND DEVELOPMENT

Date: 3/07/2013
Drawn By: rm9
Digital File: DevelopmentCosts_Sewerage

Appendix J3 - C

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TOWN COMMON
ROWES BAY
BELGIAN GARDENS
NORTH WARD
CASTLE HILL
GARBUTT
TOWNSVILLE CITY
SOUTH TOWNSVILLE
City Central
WEST END
CURRAJONG
HYDE PARK
RAILWAY ESTATE
PIMLICO
HERMIT PARK
STUART
GULLIVER
MYSTERTON
OONOONBA
AITKENVALE
MUNDINGBURRA
ROSSLEA
IDALIA
CLUDEN

I125
R269
I126
R285
R98
R271
R154
I124

TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
City Central
ROADS

LEGEND

- Rail Crossing
- Intersection
- Future Bridge
- Future Road

N

City of Townsville

0 325 650 975
Meters

Strategic Planning Department
PLANNING AND DEVELOPMENT
Date: 3/07/2013
Drawn By: rm9
Digital File: DevelopmentCosts_Roads

Appendix J4 - A

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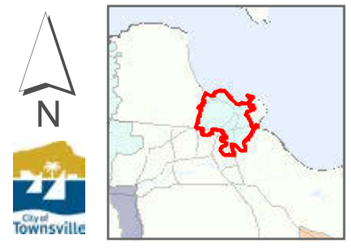
TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
City Central
WATER

LEGEND

Future Water Main



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Strategic Planning Department
PLANNING AND DEVELOPMENT

Date: 3/07/2013
Drawn By: rm9
Digital File: DevelopmentCosts_Water

Appendix J4 - B

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TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
City Central
SEWERAGE

LEGEND

- Pump Stn Upgrade
- Future Pump Stn
- Future Gravity Main
- Future Rising Main

ROWES BAY
BELGIAN GARDENS
NORTH WARD
TOWNSVILLE CITY
SOUTH TOWNSVILLE
GARBUTT
CASTLE HILL
City Central
WEST END
CURRAJONG
HYDE PARK
MYSTERTON
GULLIVER
PIMLICO
MUNDINGBURRA
RAILWAY ESTATE
HERMIT PARK
OONOONBA
ROSSLEA
IDALIA
STUART

P/S 8B
P/S 7A
P/S A1A
P/S 24
P/S 23
P/S 2A
P/S 22
P/S 21
P/S 6
P/S 5A6G
P/S 5A6F
P/S 5A6D
P/S 5A6E

1781
1782
1611
1612
1613
1758
1757
1598
1760
1759
857
856
1619
1376
1784
1736
1737
1735

N

0 290 580 870
Meters

Strategic Planning Department
PLANNING AND DEVELOPMENT
Date: 3/07/2013
Drawn By: rm9
Digital File: DevelopmentCosts_Sewerage

Appendix J4 - C

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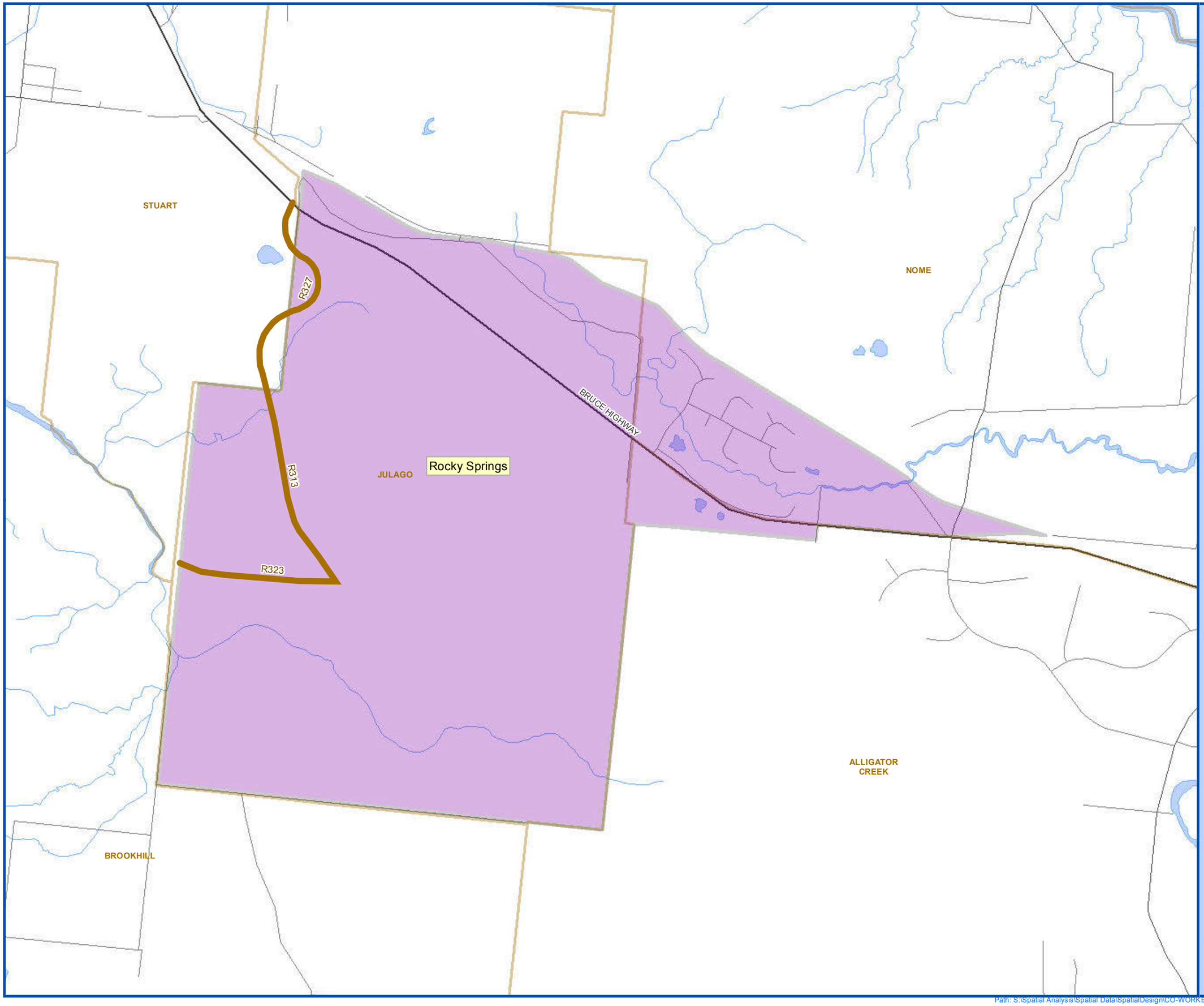


TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
Rocky Springs
ROADS

LEGEND

- Rail Crossing
- Intersection
- Future Bridge
- Future Road

Strategic Planning Department
PLANNING AND DEVELOPMENT
Date: 3/07/2013
Drawn By: rm9
Digital File: DevelopmentCosts_Roads

Appendix J5 - A

Path: S:\Spatial Analysis\Spatial Data\SpatialDesign\CO-WORKERS\Col\Development_Costs\Maps\DevelopmentCosts_Roads.mxd

TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
Rocky Springs
WATER

IDALIA
CLUDEN
WULGURU
STUART
ROSENEATH
MOUNT STUART
NOME
CAPE CLEVELAND
OAK VALLEY
BROOKHILL
ROSS RIVER
ALLIGATOR CREEK
MOUNT ELLIOT
JULAGO
Rocky Springs

539 547 625 540 542 543
536 537 624 530 531
525 526 527 359 361
514
510
66

LEGEND

Future Water Main

N

0 640 1,280 1,920
Meters

SCALE: 1:50,000 @ A3

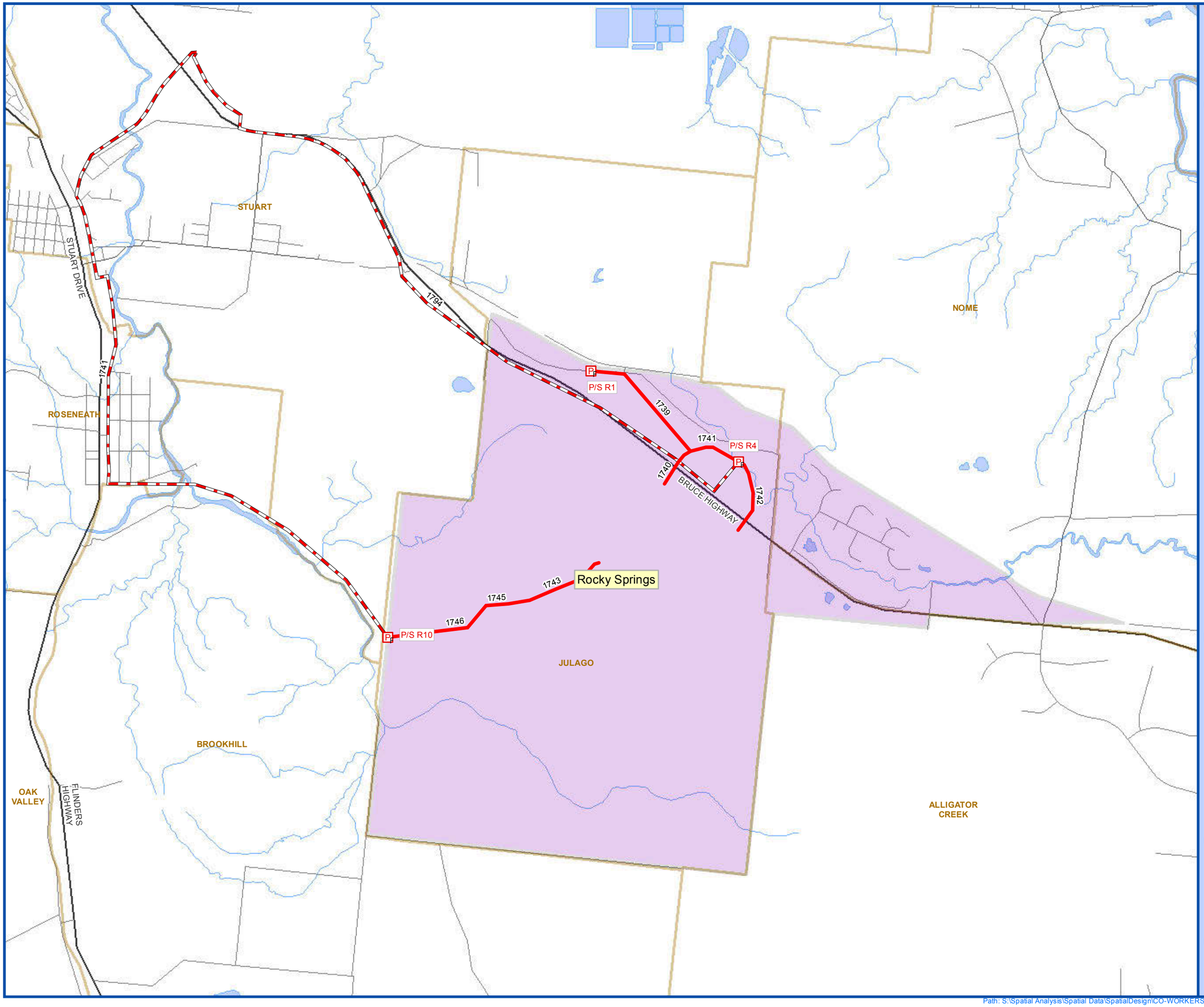
Strategic Planning Department
PLANNING AND DEVELOPMENT

Date: 3/07/2013
Drawn By: rm9
Digital File: DevelopmentCosts_Water

Appendix J5 - B

Path: S:\Spatial Analysis\Spatial Data\SpatialDesign\CO-WORKERS\Col\Development_Costs\Maps\DevelopmentCosts_Water.mxd

TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
Rocky Springs
SEWERAGE



LEGEND

- Pump Stn Upgrade
- Future Pump Stn
- Future Gravity Main
- Future Rising Main

N

0 450 900 1,350
Meters

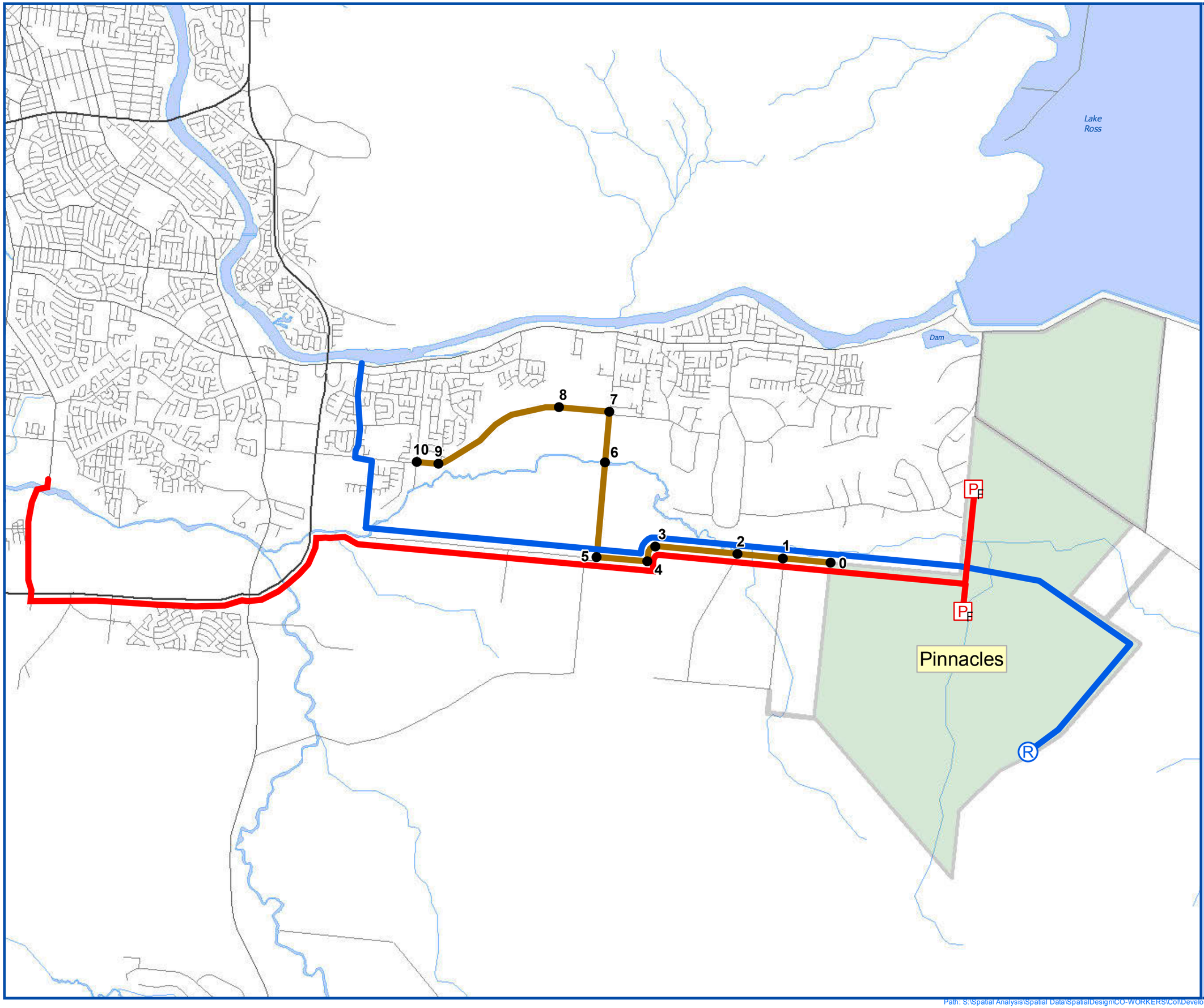
Strategic Planning Department
PLANNING AND DEVELOPMENT

Date: 3/07/2013
Drawn By: rm9
Digital File: DevelopmentCosts_Sewerage

Appendix J5 - C

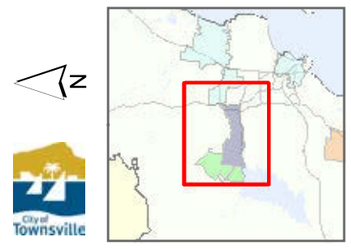
Path: S:\Spatial Analysis\Spatial Data\SpatialDesign\CO-WORKERS\Col\Development_Costs\Maps\DevelopmentCosts_Sewerage.mxd

TOWNSVILLE CITY COUNCIL
Infrastructure Requirements
Pinnacles Infrastructure



LEGEND

- Sewerage Pump Stn
- Water Reservoir
- Nodes
- Future Rising Main
- Future Water Main
- Future Road



Strategic Planning Department
PLANNING AND DEVELOPMENT

Date: 22/05/2013

Drawn By: rm9

Digital File: DevelopmentCosts_Pinnacles_Connectoin

Appendix J6

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Appendix K – The Pinnacles Developing at a Faster Rate

This appendix examines The Pinnacles developing at a rate of 200 lots per year and concurrently providing relative nominated non-residential development. The take up rates for the development are detailed in Table K1 for this scenario. 200 lots per year is considered a possible achievement for a development with one team of designers and contractors, albeit the TCC growth model suggests it would not capture this percentage of the market. The comparative population increases are outlined in Table K2 (residential population increases) and Table K3 (equivalent population increases) under the row labelled Pinnacles 200, and shown in Figures K1 and K2.

Table K1: The Pinnacles development make-up at 200 lots per year

GMZ	2011	2016	2021	2026	2031	2036	2041	2046	2051
Separate Houses (Population)	0	1120	3920	6720	9520	12320	15120	18480	18480
Retail GFA (sq.m.)			5000	5000	10000	10000	11500	11500	11500
Offices GFA (sq.m.)		500	1000	1000	3000	3000	5000	6000	6000
Industrial GFA (sq.m.)		1000	7500	14000	20500	27000	33500	39300	39300
Other (Employees)	0	9	31	54	76	99	121	148	148

Table K2: Population Increases

	2011	2016	2021	2026
Northern Beaches	0	9330	16997	24872
Western	0	2980	7097	11424
Upper Ross	0	2158	3744	5629
City Central	0	4430	8443	12409
Rocky Springs	0	2412	6952	11672
Balance of the City	0	4095	7332	11205
Total	**0**	**25405**	**50565**	**77211**
Pinnacles	0	209	856	1638
Pinnacle 200	0	1117	3915	6712

Figure K1 – Relative Population Growth 2011 to 2026

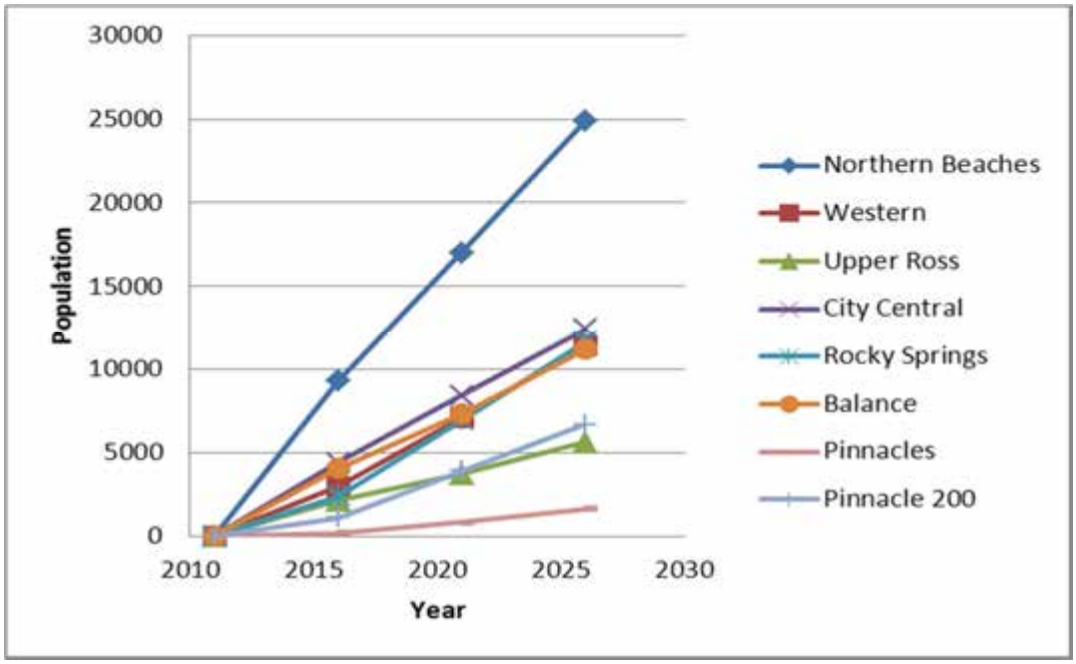
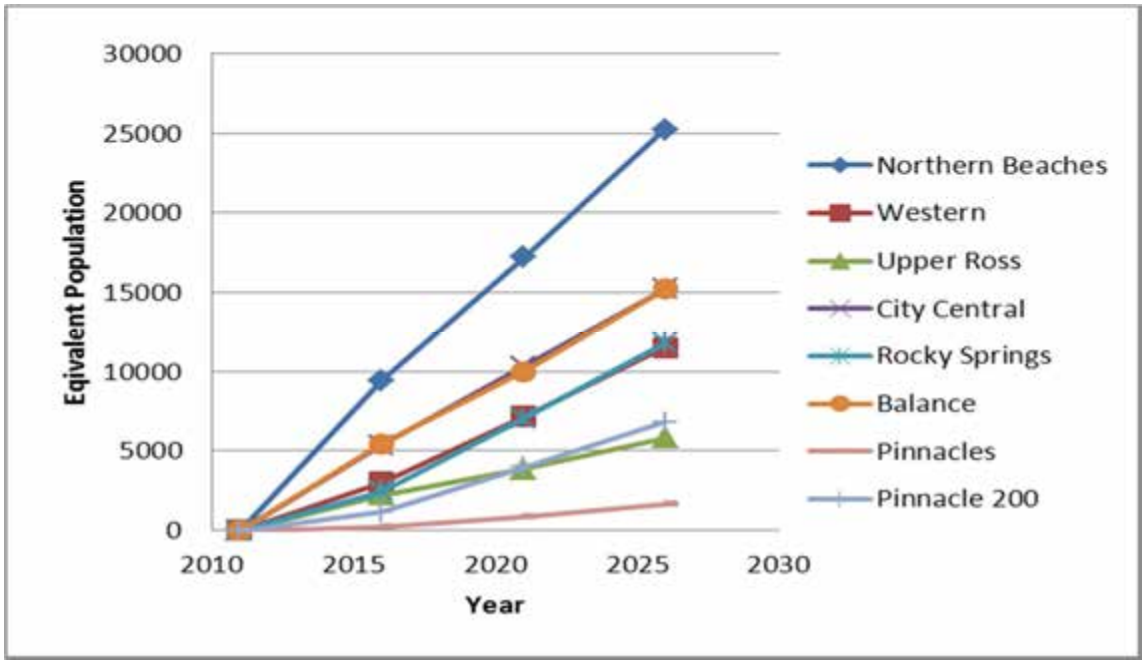


Table K3: Equivalent Population Increase

	2011	**2016**	**2021**	**2026**
Northern Beaches	0	9446	17229	25223
Western	0	3014	7165	11526
Upper Ross	0	2223	3872	5820
City Central	0	5379	10324	15213
Rocky Springs	0	2455	7037	11802
Balance of the City	0	5430	9994	15211
Total	**0**	**27945**	**55621**	**84795**
Pinnacle	0	211	865	1654
Pinnacle 200	0	1128	3986	6809

Figure K2 - Relative Equivalent Population Growth 2011 to 2026



The same infrastructure as detailed in the Table in Appendix I is applied, but at an accelerated rate of uptake. Infrastructure that was previously beyond the 2026 study date is now brought forward to be included in the cost make up for this scenario.

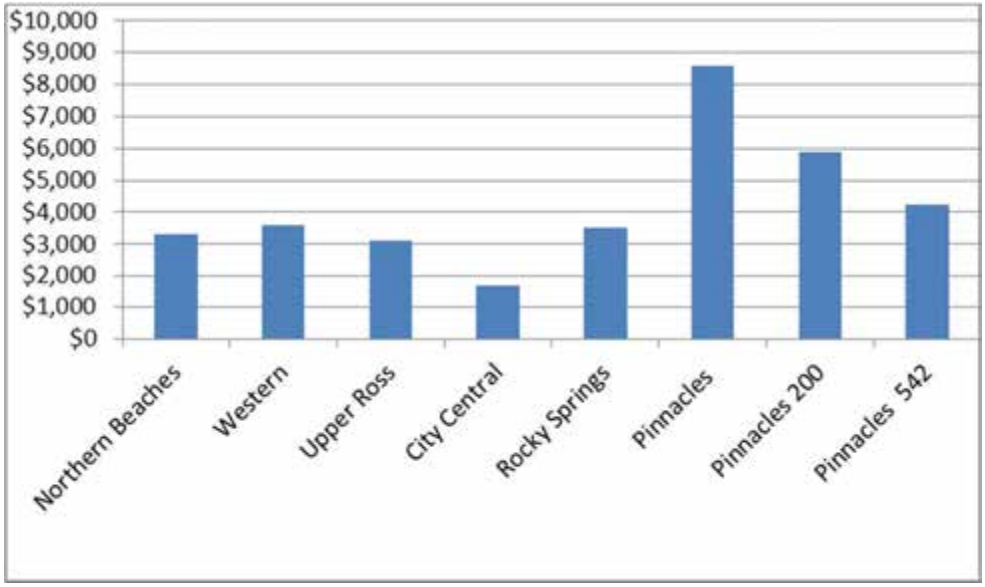
In addition and as an ultimate check the computations were set up to determine the development rate for achieving full development of the Pinnacles by 2026. This scenario would consume all the designed connecting infrastructure that was required to support the standalone development. By examining this scenario it removes the doubt about the impacts of the rate of development on the operating costs that could be attributed to the development rate.

The relative operating cost per lot developed, as detailed in Section 7 of the report, has The Pinnacles 200 scenario added as follows in Table K4, and in Figure K3.

Table K4: Operating cost per lot developed

Development Area Name	Relative Operating cost per lot developed	Ranking
Northern Beaches	$3,300	3
Western	$3,600	5
Upper Ross	$3,100	2
City Central	$1,700	1
Rocky Springs	$3,600	4
Pinnacles	$8,600	6
Pinnacle 200	$5,900	6a
Pinnacle fully developed (542 lots per yr)	$4,230	6b

Figure K3 - Relative operating cost per allotment created for development areas.



It is noted that The Pinnacles developing at 200 lots per year has less operating costs per lot than The Pinnacles included as part of the city's overall growth, i.e. competing with all other developments. It is considered that this scenario would require extremely aggressive marketing strategies to meet the stated development targets. Regardless, while the cost per lot is reduced for this scenario, the total operating costs on council would increase over and above other development areas by an additional $6.2M. i.e. up from $3.1M.

The question of completing the Pinnacles by 2026 and using all the designed infrastructure capacity was also examined. An iterative loop was set up in the calculation that determined that at 542 lots per year the Pinnacles would be completed at 2026. The additional operating cost to council budget remains at an ongoing $6.2M per annum being the operating cost of connecting the infrastructure, however the relative operating cost per lot developed is now reduced to $4230. This operating cost per lot developed, while lesser that the other Pinnacles scenarios is still well above the next highest area of $3600 per lot, indicating that the development, once completed, and with spare capacity in the connecting infrastructure consumed, is still disproportionately expensive to maintain and operate.

The additional annual operating cost per annum at 2026 on the community, if the Pinnacles were included into the scheme, would be $3.1M for the normal growth and $6.2M for both the 200 lots and ultimate growth scenarios . This additional cost is solely the annual operating cost of the connecting infrastructure only, which the other developments do not have.

While The Pinnacles 200 (and ultimate) scenario has a better outcome per lot than The Pinnacles normal growth scenario, it would put greater upwards pressure on rates for the same population increase across the entire city but with the additional ongoing operating costs for the extra connecting infrastructure.

Appendix K1 PinnaclesDeveloping at a faster Rate - Summary of Establishment and Renewal Costs (Roads)

Road	Description	Comment	Map Node Location	Metric	Units	Existing Standard Lookup Code	Standard Description	Existing Rate $	Existing amount$	Date Pinnacle Normal Growth	Date Pinnacle @200lots/yr	Upgrade Standard Lookup Code	Standard Description	Upgrade Rate $	Upgraded Amount $	Net increase in establishment value	Net change in Renewal Value (x55%)
Allambie Lane	South Beck to Sterritt	Improve road	5 to 7	Metres	1615	2MTN	2 way 2 lane Rural major collector	6015	$9,714,976.38	2015	2015	2STN	Two Lane two way Sub arterial with Table Drains	6642	10726050	$1,011,073.98	$556,090.69
Allambie Lane	Bohle River Bridge	Provide new 500 m bridge	node 6	Each	1	nil	nil	0	$0.00	2015	2015	Bridge	Bridges 500meter long 2 lanes	17610261	17610261	$17,610,260.66	$9,685,643.36
Sterritt Road	Allambie to Bend	New Connection	4 to 5	Metres	717	nil	nil	0	$0.00	2015	2015	2STN	Two Lane two way Sub arterial with Table Drains	6642	4761968	$4,761,967.87	$2,619,082.33
Sterritt Road	Bend To Laudberg Road	New Connection	3 to 4	Metres	242	nil	nil	0	$0.00	2015	2015	2STN	Two Lane two way Sub arterial with Table Drains	6642	1607247	$1,607,247.17	$883,985.95
Laudberg Road	Sterritt to Sanbeck	New Connection	2 to 3	Metres	1292	nil	nil	0	$0.00	2015	2015	2STN	Two Lane two way Sub arterial with Table Drains	6642	8580840	$8,580,840.29	$4,719,462.16
Laudberg Road	Sanbeck to Moncrieff	New Connection	1 to 2	Metres	656	nil	nil	0	$0.00	2015	2015	2STN	Two Lane two way Sub arterial with Table Drains	6642	4356835	$4,356,835.32	$2,396,259.42
Laudberg Road	Moncrieff to end	New Connection	0 to 1	Metres	692	nil	nil	0	$0.00	2015	2015	2STN	Two Lane two way Sub arterial with Table Drains	6642	4595930	$4,595,929.94	$2,527,761.47
Allambie Lane	Intersection with Sterritt Road	New Intersection	node 5	Each	1	nil	nil	0	$0.00	2015	2015	3U111111	Roundabout 3 legs	420975	420975	$420,974.78	$231,536.13
South Beck Drive	Gollogly to Feeney	Upgrade connection to dual carriageway	9 to 10	Metres	356	2STN	Two Lane two way Sub arterial with Table Drains	6642	$2,364,380.14	2020	2015	4STM	Dual Carriageway Sub arterial with Table Drains	9699	3452894	$1,088,513.88	$598,682.63
South Beck Drive	Intersection with Feeney	Upgrade Intersection	node 9	Each	1	3U111111	Roundabout 3 legs	420975	$420,974.78	2020	2015	3U111111	Roundabout 3 legs	420975	420975	$0.00	$0.00
South Beck Drive	Feeney To Santal	Upgrade connection to dual carriageway	8 to 9	Metres	1597	2STN	Two Lane two way Sub arterial with Table Drains	6642	$10,606,503.05	2028	2018	4STM	Dual Carriageway Sub arterial with Table Drains	9699	15489527	$4,883,024.33	$2,685,663.38
South Beck Drive	Santal to Allambie	Upgrade connection to dual carriageway	7 to 8	Metres	1086	2STN	Two Lane two way Sub arterial with Table Drains	6642	$7,212,687.73	2028	2018	4STM	Dual Carriageway Sub arterial with Table Drains	9699	10533267	$3,320,578.85	$1,826,318.37
Allambie Lane	South Beck to Sterritt	Upgrade connection to dual carriageway	5 to 7	Metres	1615	2STN	Two Lane two way Sub arterial with Table Drains	6642	$10,726,050.36	2028	2018	4STM	Dual Carriageway Sub arterial with Table Drains	9699	15664112	$4,938,061.55	$2,715,933.85
Allambie Lane	Bohle River 2nd Bridge	provide 2nd Bridge	node 6	Each	1	Nil	nil	0	$0.00	2028	2018	Bridge	Bridges 500meter long 2 lanes	17610261	17610261	$17,610,260.66	$9,685,643.36
Sterritt Road	Allambie to Bend	Upgrade connection to dual carriageway	4 to 5	Metres	717	2STN	Two Lane two way Sub arterial with Table Drains	6642	$4,761,967.87	2028	2018	4STM	Dual Carriageway Sub arterial with Table Drains	9699	6954284	$2,192,315.87	$1,205,773.73
Sterritt Road	Bend To Laudberg	Upgrade connection to dual carriageway	3 to 4	Metres	242	2STN	Two Lane two way Sub arterial with Table Drains	6642	$1,607,247.17	2028	2018	4STM	Dual Carriageway Sub arterial with Table Drains	9699	2347192	$739,944.83	$406,969.65
Laudberg Road	Sterritt to Sanbeck	Upgrade connection to dual carriageway	2 to 3	Metres	1292	2STN	Two Lane two way Sub arterial with Table Drains	6642	$8,580,840.29	2028	2018	4STM	Dual Carriageway Sub arterial with Table Drains	9699	12531290	$3,950,449.24	$2,172,747.08
Laudberg Road	Sanbeck to Moncrieff	Upgrade connection to dual carriageway	1 to 2	Metres	656	2STN	Two Lane two way Sub arterial with Table Drains	6642	$4,356,835.32	2028	2018	4STM	Dual Carriageway Sub arterial with Table Drains	9699	6362636	$2,005,800.85	$1,103,190.47
Laudberg Road	Moncrieff to end	Upgrade connection to dual carriageway	0 to 1	Metres	692	2STN	Two Lane two way Sub arterial with Table Drains	6642	$4,595,929.94	2028	2018	4STM	Dual Carriageway Sub arterial with Table Drains	9699	6711805	$2,115,875.29	$1,163,731.41
South Beck Drive	Intersection with Santal Drive	Upgrade Intersection	node 8	Each	1	3R111111	Roundabout 3 legs	724152	$724,152.17	2028	2018	3R221222	Roundabout 3 legs	1451186	1451186	$727,034.02	$399,868.71
South Beck Drive	Intersection with Allambie Lane	Upgrade Intersection	node 7	Each	1	3U122211	Roundabout 3 legs	578425	$578,425.29	2028	2018	3R222222	Roundabout 3 legs	1705113	1705113	$1,126,688.18	$619,678.50
Allambie Lane	Intersection with Sterritt Road	Upgrade Intersection	node 5	Each	1	3U111111	Roundabout 3 legs	420975	$420,974.78	2028	2018	3U112222	Roundabout 3 legs	506219	506219	$85,244.69	$46,884.58
									Total							$87,728,922.25	$48,250,907.24

Unit Rates - Look up Table

Description	Code	Amount $
2 way 2 lane Rural major collector	2MTN	6,015.47
Two Lane two way Sub arterial with Table Drains	2STN	$ 6,641.52
Roundabout 3 legs	3R111111	724152.17
Roundabout 3 legs	3R221222	1451186.19
Roundabout 3 legs	3R222222	1705113.47
Roundabout 3 legs	3U111111	420974.78
Roundabout 3 legs	3U111112	420974.78
Roundabout 3 legs	3U112222	506219.47
Roundabout 3 legs	3U121111	420974.78
Roundabout 3 legs	3U122211	578425.29
Roundabout 3 legs	3U231123	578425.29
Roundabout 3 legs	3U231223	578425.29
Roundabout 3 legs	3U232311	578425.29
Roundabout 4 legs 2lane two way approaches	4R11111111	678941.77
Roundabout 4 legs 2lane two way approaches	4R22112211	1324599.13
Dual Carriageway Sub arterial with Table Drains	4STM	$ 9,699.14
Bridges 500meter long 2 lanes	Bridge	17610261
nil	nil	0

Appendix K1a Pinnacles Developing at a faster Rate - Summary of Renewal Costs (Water and Sewerage)

Sewerage Options

Scenario		Description	Unit	Quantity	Rate $	Amount $	Stage Value $	EP	Year (normal)	Year (200 lots/yr)	Option Renewal Cost $
Option 1 – Two Parallel Rising Mains	Stage 1	Pump Station 1	Each	1.00	3,000,000.00	3,000,000.00	15,300,000.00	0.00	2015	2015	$31,350,000.00
		DN450 DICL Pipe	Metre	16,400.00	750.00	12,300,000.00					
	Stage 2	Pump Station 2	Each	1.00	3,000,000.00	3,000,000.00	16,050,000.00	9,000.00	2041	2026	
		DN450 DICL Pipe	Metre	17,400.00	750.00	13,050,000.00					
Option 2 – Three Parallel Rising Mains	Stage 1	Pump Station 1	Each	1.00	3,000,000.00	3,000,000.00	12,020,000.00	0.00	2015	2015	$33,610,000.00
		DN375 DICL Pipe	Metre	16,400.00	550.00	9,020,000.00					
	Stage 2	DN375 DICL Pipe	Metre	16,400.00	550.00	9,020,000.00	9,020,000.00	6,000.00	2038	2023	
	Stage 3	Pump Station 2	Each	1.00	3,000,000.00	3,000,000.00	12,570,000.00	13,000.00	2043	2030	
		DN375 DICL Pipe	Metre	17,400.00	550.00	9,570,000.00					
Option 3 – Four Parallel Rising Mains	Stage 1	Pump Station 1	Each	1.00	3,000,000.00	3,000,000.00	9,068,000.00	0.00	2015	2015	$37,096,000.00
		DN300 DICL Pipe	Metre	16,400.00	370.00	6,068,000.00					
	Stage 2	DN375 DICL Pipe	Metre	16,400.00	550.00	9,020,000.00	9,020,000.00	3,000.00	2030	2019	
	Stage 3	$3 M– Pinnacles Major PS	Each	1.00	3,000,000.00	3,000,000.00	9,438,000.00	9,000.00	2041	2026	
		DN300 DICL Pipe	Metre	17,400.00	370.00	6,438,000.00					
	Stage 4	DN375 DICL Pipe	Metre	17,400.00	550.00	9,570,000.00	9,570,000.00	14,000.00	2044	2036	

Mains and PS above are additional to Trunk mains and are not creditable as headworks.

Water Supply Options

Scenario		Description	Unit	Quantity	Rate $	Amount $	Stage Value $	EP	Year (normal)	Year (200 lots/yr)	Option Renewal Cost $
Option 1 – Two Parallel Water Mains	Stage 1	Booster Pump Station	Each	1.00	1,500,000.00	1,500,000.00	15,990,000.00	0.00	2015	2015	$30,480,000.00
		DN500 DICL Pipe	Metre	16,100.00	900.00	14,490,000.00					
	Stage 2	DN 500 DICL Pipe	Metre	16,100.00	900.00	14,490,000.00	14,490,000.00	9,000.00	2041	2026	
Option 2 – Three Parallel Water Mains	Stage 1	Booster Pump Station	Each	1.00	1,500,000.00	1,500,000.00	10,355,000.00	0.00	2015	2015	$31,285,000.00
		DN375 DICL Pipe	Metre	16,100.00	550.00	8,855,000.00					
	Stage 2	DN450 DICL Pipe	Metre	16,100.00	750.00	12,075,000.00	12,075,000.00	5,000.00	2036	2021	
	Stage 3	DN375 DICL Pipe	Metre	16,100.00	550.00	8,855,000.00	8,855,000.00	13,000.00	2043	2030	

Mains and PS above are additional to Trunk mains and are not creditable as headworks.

Reservoir Storage is considered as Headworks Pinnacles to pay via Infrastructure Charges

Appendix K2 - Summary of Results for each Development Area

Table of renewal values of additional infrastructure to that already provided for which would be required to support development in various areas across our City until 2026

	Development Area	1	2	3	4	4a	5	6	6b	542.263354		Comments	O&M and Depreciation %
	Development Area Name	Northern Beaches	Western	Upper Ross	City Central	City Central (Sensitivity Analysis)	Rocky Springs	Pinnacles	Pinnacles 200	Pinnacle Var.	Average $ /lot		
Water Supply													
	Regional Network Infrastructure, including Dams, Burdekin Pipeline, Treatment Plants, Reservoirs and Delivery Mains	$72,087,261	$32,940,273	$16,634,348	$43,478,313	$43,478,313	$33,729,037	$4,728,033	$19,460,912	$53,573,803	$8,002	Council's current Capital Works Plan through to 2026 has identified $242.3M of Regional trunk infrastructure cost for Townsville (version 19). This equates to approximately $8,000 per lot. This is the same in all areas.	
	Local Trunk Infrastructure generally within the development area including Distribution mains & small local reservoirs	$20,574,000	$3,924,220	$4,947,430	$5,708,320	$14,270,800	$24,831,580	$1,472,980	$6,062,890	$16,690,485	$2,493	Council's current Capital Works Plan through to 2026 has identified $75.5M of localised trunk infrastructure cost within the existing development areas of Townsville (version 19). This equates to almost $2,500 per equivalent lot. This rate has been applied to the Pinnacles, as the network hasn't been designed.	
	Additional major or connecting Mains							$15,990,000	$ 30,480,000	$ 30,480,000		This is the cost to connect a development area to the regional network. These costs for Rocky Springs are included in the localised trunk infrastructure costs above. All other areas are already connected to the regional network.	
	Sub-Total Water Supply	$92,661,261	$36,864,493	$21,581,778	$49,186,633	$57,749,113	$58,560,617	$22,191,013	**$ 56,003,802**	**$ 100,744,288**			**5.50%**
Sewerage													
	Regional Network Infrastructure, including Outfall Pipelines, Treatment Plants, Major Mains & Pump Stations	$51,638,993	$23,596,438	$11,915,850	$31,145,258	$31,145,258	$24,161,460	$3,386,879	$ 13,940,631	$ 38,377,062	$ 5,732	Council's current Capital Works Plan through to 2026 has identified $173.6M of Regional trunk infrastructure cost for Townsville (version 19). This equates to approximately $5,700 per lot. This is the same in all areas.	
	Localised Trunk Infrastructure generally within the development area including Rising Mains, Gravity Mains & Pump Stations												
	PIPs Sewer Rising Mains	$8,656,280	$8,994,400	$3,646,940	$5,581,470	$13,953,675	$9,235,980					Council's current Capital Works Plan through to 2026 has identified $142M of local trunk infrastructure cost within the existing development areas of Townsville (version 19). This equates to almost $4,700 per equivalent lot. This rate has been applied to the Pinnacles, as the network hasn't been designed.	
	PIPs Sewer Gravity Mains	$4,677,330	$1,894,760	$5,023,700	$1,364,580	$3,411,450	$2,600,700						
	PIPs Future Sewerage Pump Stations	$15,500,000	$5,800,000	$1,000,000	$4,400,000	$6,600,000	$4,400,000						
	PIPs Sewer Pump Stations Upgrades	$8,053,000	$0	$2,860,000	$7,400,000	$7,400,000	$0	$2,770,373	$ 11,403,051	$ 31,391,375	$ 4,689		
	Additional Major or connecting Item							$15,300,000	$ 31,350,000	$ 31,350,000		This is the cost to connect a development area to the regional network. These costs for Rocky Springs are included in the localised trunk infrastructure costs above. All other areas are already connected to the regional network.	
	Sub-Total Sewerage	$88,525,603	$40,285,598	$24,446,490	$49,891,308	$62,510,383	$40,398,140	$21,457,253	$56,693,682	$101,118,437			**6.60%**
Roads													
	Regional Roads (all DTMR Roads)	$0	$0	$0	$0	$0	$0	$0	$0			DTMR roads haven't been included in this exercise, as we are only considering the operational cost impact on Council.	
	Localised Trunk Roads generally within the development area including Roads with traffic > 6,000vpd excluding Ingham Road	$48,217,219.05	$58,292,601.64	$0	$2,156,567.11	$5,391,417.78	$22,560,441	$3,162,453	$ 13,016,878	$ 35,834,068	$ 5,353	The localised trunk roads within a development area is estimated at $9,732 establishment costs ($5,353 renewal value) per lot. This rate has only been applied to the Pinnacles & Rocky Springs, as the network hasn't been analysed, however this rate is potentially lower than that of the actual network costs applied to the other greenfield areas. This may need further review, as it may be understating the operating cost impact of the Pinnacles Development and Rocky Springs	
	Share of Ingham Road (in PIPs)	$8,652,710	$1,976,928	$0	$2,174,478	$2,174,478	$0	$0	$0	$0		(Ingham road duplication in 2026 Redistributed to area 1,2 , 4 and the rest of the city (other than areas 3,5 & 6.	
	Additional Major or Connecting Roads						$7,590,389	$24,218,504	$ 48,250,907	$ 48,250,907		This is the cost to connect a development area to the regional network. Existing growth front areas are already connected to the regional network.	
	Sub-Total Roads	$56,869,929	$60,269,529	$0	$4,331,045	$7,565,896	$30,150,830	$27,380,957	$61,267,785	$84,084,975			**5.10%**
Miscellaneous Trunk Infrastructure													
	Parks	$50,446,219	$23,051,400	$11,640,614	$30,425,855	$30,425,855	$23,603,371	$3,308,648	$13,618,626	$37,490,616	**$ 5,600**	Theses values are common to all development and will not	
	Pathways	$9,909,079	$4,527,954	$2,286,549	$5,976,507	$5,976,507	$4,636,377	$649,913	$2,675,087	$7,364,228	**$ 1,100**	affect the relativity of different scenarios	
	Sub Total Miscellaneous	$60,355,298	$27,579,353	$13,927,163	$36,402,362	$36,402,362	$28,239,748	$3,958,561	$16,293,713	$44,854,844		Operating assumed as 5.0% of the capital value	**5.00%**
General (normal donated assets)													
	Internal distribution networks (Access Street, parks, water main and sewers etc.)	$238,718,715	$109,082,516	$55,085,049	$22,551,500	$22,551,500	$111,694,526	$15,656,995	**$ 64,445,284**	**$ 177,410,951**	**$ 26,500**	**There is a cost of $26,500 per lot for greenfield development areas for the very localised smaller non-trunk infrastructure. In relation to the City Central area, this cost would only apply to the 851 lots at ULDA site. Estimates include: Drainage $6,500-; Roads $11,000; Sewers $2,500; Water $2,000, Pathways $500 & Parks $4,000**	**5.39%**
	Total Renewal cost of Infrastructure	**$537,130,805**	**$274,081,490**	**$115,040,480**	**$162,362,849**	**$186,779,254**	**$269,043,861**	**$90,644,778**	**$254,704,267**	**$508,213,495**			

Summary of Populations for each Development Area

Development Area	1	2	3	4		5	6	6b	542.263354		Comments

Development Area Name	Northern Beaches	Western	Upper Ross	City Central		Rocky Springs	Pinnacle	Pinnacle 200	Pinnacle Var.		
Population as at 2026	41,156	15,351	27,549	35,514	35,514	12,411	1,802	6,877	18,645		
EP Totals as at 2026	41,756	15,509	28,427	43,086	43,086	12,557	1,820	6,975	18,910		To share the cost of servicing across non-residential development, each employee has been assumed equivalent to 20% of an EP (based on water and sewerage demand data)
Population Increase from 2011 to 2026	24,872	11,424	5,629	12,409	12,409	11,672	1,638	6,712	18,480		
EP increase from 2011 to 2026	25,223	11,526	5,820	15,213	15,213	11,802	1,654	6,809	18,745		

Operating cost impacts for each Development Areas per lot

Development Area	1	2	3	4		5	6	6b			Comments
Development Area Name	Northern Beaches	Western	Upper Ross	City Central	City Central (Sensitivity Analysis)	Rocky Springs	Pinnacle	Pinnacle 200	Pinnacle Var.		
Total renewal Cost per EP created	$21,295	$23,780	$19,765	$10,673	$12,278	$22,797	$54,793	$ 37,405	$ 27,112		
Renewal Cost per equivalent lot	$59,627	$66,584	$55,343	$29,884	$34,377	$63,832	$153,419	$ 104,735	$ 75,912	2.8 ep/lot	
Relative Operating Cost/eqiv. Lot	**$3,300**	**$3,649**	**$3,111**	**$1,703**	**$1,974**	**$3,525**	**$8,590**	**$5,853**	**$4,228**		These operating costs are only those associated with the Maintenance, Operations and Depreciation of the new Infrastructure inherited by Council. This assessment assumes all infrastructure is funded by the Developer. Based on Council records this operational cost is

Appendix K3 - Summary of Renewal Values and operating costs per Lot for each Development Area

Note: This is the additional infrastructure to that already provided for that would be required to support development in various areas across the City over the next 15 years

	Development Area Name	Northern Beaches	Western	Upper Ross	City Central	Rocky Springs	Pinnacles	Pinnacle 200
Water Supply								
	Regional Network Infrastructure, including Dams, Burdekin Pipeline, Treatment Plants, Reservoirs and Delivery Mains	$8,002	$8,002	$8,002	$8,002	$8,002	$8,002	$8,002
	Local Trunk Infrastructure generally within the development area including Distribution mains & small local reservoirs	$2,284	$953	$2,380	$1,051	$5,891	$2,326	$2,326
	Additional major or connecting Mains	$0	$0	$0	$0	$0	$27,064	$12,533
	Sub-Total Water Supply	**$10,286**	**$8,956**	**$10,382**	**$9,053**	**$13,894**	**$37,392**	**$22,862**
Sewerage								
	Regional Network Infrastructure, including Outfall Pipelines, Treatment Plants, Major Mains & Pump Stations	$5,732	$5,732	$5,732	$5,732	$5,732	$5,732	$5,732
	Localised Trunk Infrastructure generally within the development area including Rising Mains, Gravity Mains & Pump Stations							
	PIPs Sewer Rising Mains	$961	$2,185	$1,754	$1,027	$2,191	$4,689	$4,689
	PIPs Sewer Gravity Mains	$519	$460	$2,417	$251	$617		
	PIPs Future Sewerage Pump Stations	$1,721	$1,409	$481	$810	$1,044		
	PIPs Sewer Pump Stations Upgrades	$894	$0	$1,376	$1,362	$0		
	Additional Major or connecting Item	$0	$0	$0	$0	$0	$25,896	$12,891
	Sub-Total Sewerage	**$9,827**	**$9,787**	**$11,761**	**$9,183**	**$9,585**	**$36,317**	**$23,313**
Roads								
	Regional Roads (all DTMR Roads)	$0	$0	$0	$0	$0	$0	$0
	Localised Trunk Roads generally within the development area including Roads with traffic > 6,000vpd	$6,313	$14,642	$0	$797	$6,313	$6,313	$6,313
	Share of Ingham Road (in PIPs)	$961	$480	$0	$400	$0	$0	$0
	Additional Major or Connecting Roads	$0	$0	$0	$0	$1,801	$40,991	$19,841
	Sub-Total Roads	**$6,313**	**$14,642**	**$0**	**$797**	**$8,114**	**$47,304**	**$26,154**
Miscellaneous Trunk Infrastructure								
	Parks	$5,600	$5,600	$5,600	$5,600	$5,600	$5,600	$5,600
	Pathways	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100
	Sub Total Miscellaneous	$6,700	$6,700	$6,700	$6,700	$6,700	$6,700	$6,700
General (normal donated assets)								
	Internal distribution networks (Access Street, parks, waterman and sewers etc.)	$26,500	$26,500	$26,500	$4,151	$26,500	$26,500	$26,500
	Total Infrastructure	**$59,627**	**$66,584**	**$55,343**	**$29,884**	**$64,792**	**$154,213**	**$105,528**
	Annual Operating Costs	**$3,300**	**$3,649**	**$3,111**	**$1,703**	**$3,574**	**$8,629**	**$5,893**

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2 August 2013

Townsville City Council
PO Box 1268
TOWNSVILLE QLD 4810

Attention: Mr Brian Bailey

Dear Sir

TCC Infrastructure Operational Cost Analysis Peer Review

This letter confirms that at Council's request, AECOM have peer reviewed, provided advice and input into the finalisation of Council's report entitled "Infrastructure Operational Cost Analysis Report, August 2013".

The purpose and intent of the report is to increase council's understanding of the relative ongoing operating costs of various development fronts including:

- Existing approved greenfield development growth areas
- Infill development areas
- Additional potential development areas outside the existing approved greenfield growth areas – The Pinnacles was the area used as a case study in this assessment.

It is considered that the philosophy of using operational costs and the methodology used to assess and compare them as a means of informing Councils growth management strategy are reasonable and relevant, and do provide a meaningful comparison of cost impacts on Councils operational budgets. The determination of the operational costs and the net cost impacts on Council are considered to be technically sound based on the scope and the assumptions that have been adopted in the report.

Yours faithfully
for AECOM AUSTRALIA PTY LTD

Pedro Mendiolea
Associate Director - Water & Infrastructure Services
pedro.mendiolea@aecom.com

2 August 2013
The Chief Executive Officer
Townsville City Council

Attention: Colin Phillips
Executive Manager (Strategic Planning)

Dear Col

INFRASTRUCTURE OPERATING COST ANALYSIS REPORT - PEER REVIEW

Townsville City Council has undertaken a detailed assessment of the ongoing operational costs of various development areas within its local government area. The areas selected include:

- Density uplift in the Townsville CBD and surrounds
- Greenfield residential development expansion in the Northern Beaches
- Greenfield residential development expansion in the Western areas (along the Bohle River in Cosgrove, Kirwan and Bohle Plains).
- Completion of the undeveloped areas in the Upper Ross
- Greenfield development area of Rocky Springs to the south of Townsville
- Greenfield development area to the south of Kelso

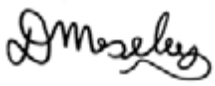
The assessment was undertaken to determine if, and to what extent the potential development of different areas of Townsville will impact on the Council's ongoing operational costs, specifically for the roads, water and sewage infrastructure.

To ensure the assessment provides a robust and accurate reflection of the ongoing operational cost impacts to Townsville City Council, DPM Water Pty Ltd was requested to provide a peer review of the report titled "Infrastructure Operating Cost Analysis Report (Strategic Planning August 2013)".

The DPM Water Pty Ltd review concluded that:

- The report provides a realistic assessment of the relative operational cost impacts of additional infrastructure of the various development areas to Townsville City Council.
- The assessment did not investigate the total community costs (ie State Government operational costs) of the various development areas. Further consideration of the whole of community cost for future development areas should be given as part of any significant greenfield development application.
- The conclusions detailed in the report are accurate in relation to the cost effectiveness of the development areas that were assessed. The density uplift of the City Central area was the most cost efficient followed by the completion of planned greenfield development areas within or immediately adjacent to existing urban areas where infrastructure with spare capacity exists. The least cost efficient development area is new greenfield sites that are not planned and do not have existing trunk infrastructure with spare capacity.

Yours faithfully



Desmond Moseley
Manager/Senior Engineer
DPM Water Pty Ltd