GLADSTONE
REGIONAL COUNCIL

Tannum / Boyne / Benaraby / Wurdong Water Supply Scheme Strategic Plan

16 March 2010

Amendment Table

AMENDMENT DESCRIPTION	VERSION	DATE
Adopted	1	16 March 2010

EXECUTIVE SUMMARY

The Tannum Boyne Benaraby Wurdong Water Strategic Plan has been prepared to enable Council and the Development Industry to understand the required Water infrastructure for development to occur in the Tannum Boyne Benaraby Wurdong locality, whilst still enabling Council to ensure that Standards of Service are maintained to the residents.

The plan is based on assumed growth rates, and sequential development occurring within the Declared Service Areas. Any 'out of sequence' or leapfrog development may require temporary, alternate infrastructure to be installed at the developer's cost.

Depending upon the actual growth rates, it covers the Trunk infrastructure needs of the locality in excess of 50years. That is a future population in excess of 50,000EP.

The identified infrastructure required includes the continued utilisation of the GAWB Bulk Water (including Treatment) facilities in serving the Tannum, Boyne, Benaraby, Wurdong area.

The Bulk & Trunk Infrastructure required has been listed, including the number of equivalent tenements (ET) available until the trunk infrastructure is triggered, as well as an estimated year when the infrastructure is required.

A number of items have also been included which are Pre-Requisites for various development nodes to occur.

Due to the size and layout of this water network, 2 Bulk Water and 5 Distribution subzones have been utilised in the development of the funding plan.

Table of Contents

List of Figures

List of Maps

List of Tables

1 INTRODUCTION

1.1 BACKGROUND TO THE STRATEGIC PLAN

The Region of Tannum Sands / Boyne Island / Benaraby / Wurdong Heights (TBBW) historically has experienced an irregular development growth pattern. This pattern has generally been dictated by the industrial boom and bust periods of the region.

The last detailed assessment of the required strategic water infrastructure undertaken was completed in 1994, as part of Council's Total Management Plan for Water Services.

In order to ensure that the infrastructure constructed in the Service Area is appropriately sized and timed, and the funding for this infrastructure is fairly and equitably raised, the previous Plan was required to be reviewed.

This plan has been prepared over a period of some 24 months. Accordingly, some data such as preliminary graphs of Average Daily Flow, and population equivalency, are current for the period when the modelling was commenced.

1.2 DESCRIPTION OF STRATEGIC PLAN

This strategic plan is the documented summary of Council's process of proactively defining and making decisions on its infrastructure requirements and allocating its resources to pursue the strategy resulting from increased development.

This strategic plan is an adaptive long-term statement, outlining equitable and timely solutions to the urban and industrial needs of the TBBW region. Through a coordinated approach, the strategy has been tailored to achieve optimum social, environmental and economic outcomes for the Council and its constituents.

Together, the elements of this strategy will provide a basis for allocating and managing the TBBW Regions Water Infrastructure for the next 50 years and beyond.
As this plan is a long term document, and it is recognised that development, particularly in this region, is very fluid, this Strategic Plan is intended to be a flexible document that will be monitored and reviewed to ensure it remains relevant in the years ahead.

The scope of this Strategic Plan is the Water Supply System for the TBBW region, and comprises all infrastructure downstream of the South Gladstone Reservoir, excluding the GAWB assets of South Gladstone Reservoir and Golegumma and Lake Awoonga Bulk Assets.

This infrastructure includes Bulkwater (Treatment, Pumping, Storage,) and Distribution (Distribution and Reticulation) systems referred to herein as the TBBW Water Supply Scheme.

1.2.1 Objectives of the Plan

The primary objectives of the Strategic Plan are to:

- Identify the area of the Tannum Sands / Boyne Island / Benaraby / Wurdong Heights Region which is to be declared the Declared Water Service Area (DWSA).
- Define Maximum Service Levels (MSL) within the DWSA.
- Identify long term capital infrastructure requirements for:
  - Reservoirs, and reservoir sites
  - Pumping stations
  - Rising mains / Distribution
  - Trunk Reticulation Mains
- Identify pre-requisite infrastructure (if applicable).
- Identify infrastructure trigger points (if applicable).
- Prepare a Capital Funding Plan.
- Prepare a 15 year Capital Works Plan for the TBBW Declared Water Service Area.
- Provide basis for the development of appropriate Developer Charges to adequately fund the Capital Works Program.

1.3 PURPOSE OF STRATEGIC PLAN

A strategy is required to address the following key issues:

- Urban growth and industrial development in the region of Tannum Sands / Boyne Island / Benaraby / Wurdong Heights.
- Reduce the creation of duplicated infrastructure
- Encourage development in a fiscally astute manner

This strategic plan, in combination with other relevant plans, assists in setting the path for the future development of the region.

This Strategic plan does not undertake detailed analysis or design of the 'non-trunk' reticulation infrastructure, but identifies the Bulk and Trunk infrastructure required:

a) To meet the Desired Standards of Service within the planning scheme policy;
b) To be shared by a number of users;
c) To provide a system function that is generally trunk, which may not necessarily be related to its size or capacity.
d) By the overall planned demands including those partially generated by a development permit.

All identified infrastructure is to be clarified / refined by the more detailed analysis and design as part of masterplanning or individual subdivision applications.

1.4 STRATEGIC PLAN AREA

This Strategic Plan covers the immediate area of the Tannum Sands and Boyne Island Townships, and the Rural Residential Environ generally referred to as Wurdong / Benaraby. This area is located approximately 15km South

East of Gladstone CBD. The development of the Strategic Plan has resulted in the identification of the Declared Water Service Area for TBBW.

The Strategic Plan area is indicated on Map 1 - Tannum Boyne Benaraby Wurdong Strategy Area

1.5 DECLARED WATER SERVICE AREA

The Declared Water Service Area (DWSA) is the area of land identified via extensive modelling, which can be provided with a water service to Councils Service Standard requirements, subject to controlled development and the construction of appropriate infrastructure.

The DWSA includes a large portion of land which is not zoned as 'Urban' or 'Rural Residential' (URR), and is not currently serviced by any water infrastructure. The Town Planning Scheme includes the requirement that the rezoning of land to URR is to have a water supply connected.
It is a requirement of any 'rezoning' to URR status, that the required water infrastructure to service the premises is constructed, at the cost of the proponent.
The declaration of a Service Area is a legislative requirement of Chapter 2, Part 5, of the Water Supply (Safety and Reliability) Act 2008.

The primary purpose of the DWSA is to set identifiable areas which can ultimately be appropriately serviced by the proposed water infrastructure. This includes that all properties within the area can be connected to the water network at a level which will guarantee the necessary Level of Service.

This declared area, then enables the full system to be modelled and appropriately sized.

The DWSA itself is based on areas of subdivisional interest, new applications and areas adjacent to the existing system and takes into account geographical limitations including elevation, slope, flooding, remanent vegetation and the existing water network.

Whilst the intention of the DWSA is not to prohibit external 'Urban' development, it is likely that small scale development outside the DWSA will be discouraged in the short term due to significant delays and costs associated with reassessing the model and supporting documentation.
This is not considered unreasonable, however, since the DWSA has an ultimate capacity of approximately 52,400EP and a potential development life in excess of 50 years.

The Declared Water Service Area is identified in Map 2 - Declared Water Service Area

1.6 PREPARATION OF STRATEGIC PLAN

The Tannum Boyne Benaraby Wurdong DWSA has been developed in consultation with Council's Planning Department and includes areas of subdivisional interest, new applications and areas adjacent to the existing system that have a reasonable expectation of being connected to the potable water system.

The model assumes that residential development will occur in all zones. Whilst this is not consistent with the existing Calliope Shire Council Town Planning Scheme, it has been necessary to make some assumptions beyond the current scope of the town plan. In addition, flood levels, based on the Boyne River flood study, recent Main Roads Concept plans, and the latest remanent vegetation maps have also been considered in the development of this plan.

The model is based on equivalent connections (Equivalent Tenements) for long term accuracy (as discussed in Strategic Planning Assumptions below) rather than population predictions. Estimated time lines however, are necessary for preparing the 15 year plan which will need reviewing on an annual basis. Equivalent Person (EP) estimates are used only for comparative purposes and are not used in the model itself.

Long term modelling has been adopted to ensure that current and short term decisions are informed and based on long term strategic goals. This is particularly important for the development of the pumping and storage components of the system.

The model assumes that development will occur near existing infrastructure and progressively extend to the extremities of the DWSA as major infrastructure is provided (Sequentially). Out of sequence development will no doubt occur as well and may require interim solutions and/or bring forward costs associated with major infrastructure in the Capital Infrastructure Plan. (See Section 5.1 Sequential Development).

The Strategic Plan assumes that all infrastructure listed in the Capital Infrastructure Plan will be funded through developer contributions

It is identified in the Capital Funding Plan that substantial borrowings are required to ensure that the infrastructure is fully funded.

Naturally, if the rate of development changes dramatically from that which is identified in the Growth Predictions, the level of income and capital expenses will alter, as will any required borrowings.

Infrastructure "trigger points" are used in the Capital Funding Plan to assess the capacity of the fund to finance capital components over the life of the plan.

2 ASSUMPTIONS, MODEL CRITERIA & METHODOLOGY

The model has been developed using MWHSoft H_20MAP Water software in accordance with Department of Natural Resources & Mines Planning Guidelines for Water Supply and Sewerage (the guidelines), although generic data has been replaced with more accurate data where available.

Modelling validation suggests that a Peak Day factor of 2 (for EP > 5000) provides the best representation of the actual system.

The modelling scenarios shown in Table 2-1 Modelling Scenarios have been applied to the system as a whole although some of these scenarios (eg Fire flows and residual pressures) do not apply to the bulk water system.

Table 2-1 Modelling Scenarios

Scenario	Required Performance Criteria	Comment
1. Three (3) days at Mean Day Maximum Month	All reservoirs to have a positive net inflow at the end of each day	Commence reservoir level at 90% full at midnight (i.e. start of day 1)
2. Scenario 1 to be followed by 3 peak days	No reservoir should have failed during period of analysis	Scenarios 1&2 could be run using Peak Week if historical data available, rather than 3 peak days
3. Fire flow	12m residual pressure minimum at hydrant	Refer to section 5.7 of the guidelines

2.1 CONSUMPTION AND DEMAND LEVELS

Water consumption data used in the model is based on monthly bulk water usage as measured at the outlet to Boyne Island reservoir divided by the total connections. The available historical data suggests that a Design Average Consumption of 558 L/EP/day (1,450 L/ET/day) is appropriate for modelling purposes since the system must be capable of handling peak loadings.

The Design Average Consumption should not be confused with the annual bulk water average of 420 l/EP/day which is used for general growth projections.

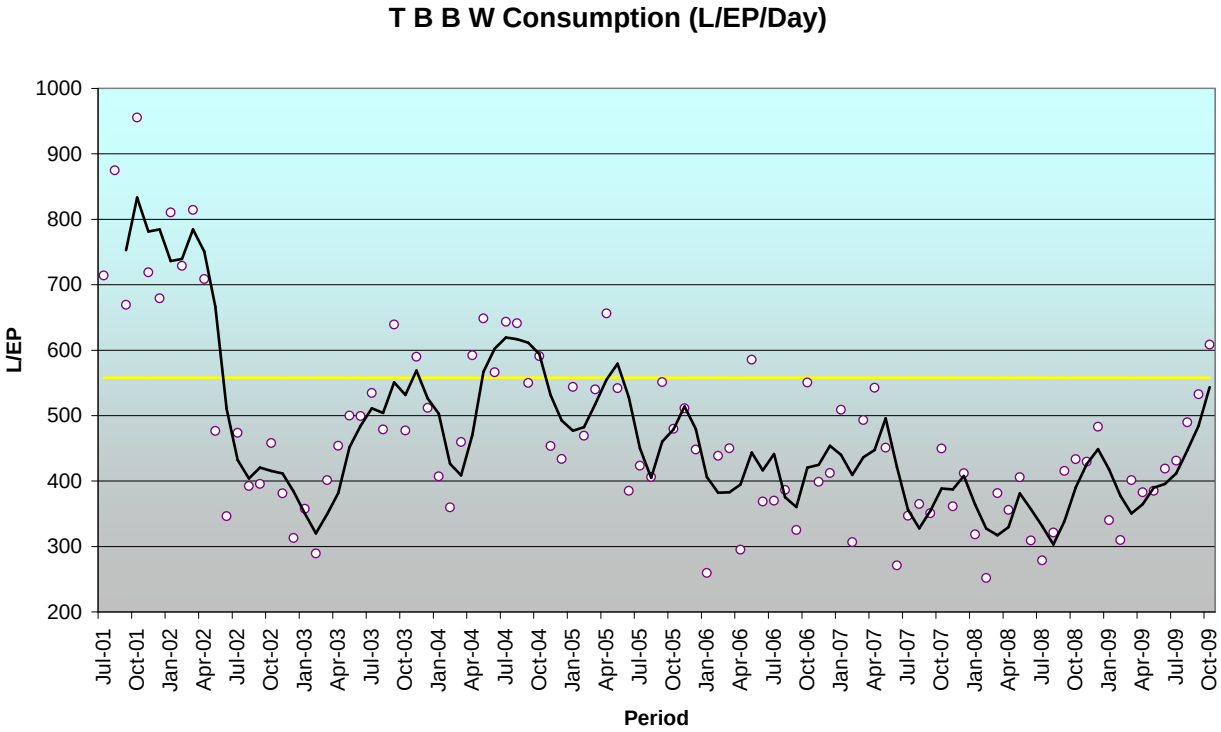


Table 2-2 Demand Levels

		Litre/EP/Day
Average Day Flow per EP (AD)		**558**
Mean Day Max Month (MDMM)		**837**
Max Day (MD)		**1,116**
Max Hour (MH)		**93**

2.2 DEVELOPMENT ASSUMPTIONS

- 2.6 Equivalent People (EP) per Equivalent Tenement (ET)
- Av Daily flow (AD) = 530 KL/ET/year used in model
- Residential Development Density = 10 Lots per ha
- Residential "B" Development Density = 16 Lots per ha
- Max Rural Residential Development Density = 1.7 lots per ha
- Model uses highest RL on land parcel chosen, if higher than Max Service level (MSL), then MSL limit used.
- Town planning scheme, in particular Flood Inundation, Remanent Vegetation maps, were used for identifying undevelopable land.

2.3 CAPACITIES

2.3.1 Reservoirs

Ground level storages are the only type of storage considered as there is suitable elevated land located within the Study area for these storages; hence booster pumps are not considered a suitable solution.

The required storage capacity of these facilities complies with Chapter 7, Section 5.4.4 Planning Guidelines for Water Supply and Sewerage. The Fire fighting capacity is determined from Planning Guidelines for Water Supply and Sewerage, Chapter 6, Section 5.7.6.

2.3.2 Rising Main Capacity

As per Chapter 7, Section 5.4.4 Planning Guidelines for Water Supply and Sewerage;

> Trunk mains feeding ground level storage should be designed to carry future mean day maximum month demand in 20 hours for pumped supplies and 24 hours for gravity supplies.

The majority of supplies to Councils ground level storage reservoirs are pump station fed, for calculation purposes 20 hour filling time limit shall apply.

2.4 MAXIMUM SERVICE LEVELS

Although existing development levels have been taken into account, the service levels ultimately adopted in this plan have been a balance between desirable maximum elevations, the extent of developable land above the maximum service levels and the cost of infrastructure needed to service development at these levels.

Service Levels are a direct result of the relativity of Reservoir Elevation and Elevation of the subject site. The use of Booster Pumps (or Mechanically Pressurised Systems) has not been assessed, as they are not considered an appropriate solution to an elevation problem.

The following Service levels have been adopted in this Strategic Plan.

- Zone 1 (Boyne Island) – RL 40.0
- Zone 2 (Tannum) – RL 40.0
- Zone 3 (Benaraby) – RL 45.0
- Zone 4 (Wurdong) – RL 45.0*

*Some lots in the high level area of Wurdong only receive a minimum of 18m of operational pressure in the water mains and a minimum of 2.5L/s fire flow during a maximum day at maximum hour (18:00hrs).

2.5 CURRENT LOADING

Table 2-3 Population Statistics shows the loading in Equivalent Tenements (ET's) and Equivalent People (EP) utilised for the Tannum/Boyne and Benaraby/Wurdong areas base scenario. The Equivalent Population is based on current ABS statistics of 2.6 EP/ET as a state average.

Table 2-3 Population Statistics

Area	**Current ET's**	**EP**
Boyne Island	1,775	4,935
Tannum Sands	2,225	5,785
Tannum/Boyne	**4,000**	**10,720**
Benaraby	350	910
Wurdong	130	338
Benaraby/Wurdong	**480**	**1,248**
Total	**4,480**	**11,968**

2.6 ULTIMATE LOADING

Table 2-4 Future Development Statistics shows the loading in Equivalent Tenements (ET's) and Equivalent People (EP) utilised for the Tannum/Boyne and Benaraby areas future ultimate development scenario.

Table 2-4 Future Development Statistics

Area	**Current ET's**	**New ET's**	**Total ET's**
Zone 1	1,775	4,260	6,035
Zone 2	2,225	9,375	11,600
Zone 3	350	1,355	1,705
Zone 4	130	680	810
Total (ET's)	**4,480**	**15,670**	**20,150**
(EP's)	**11,648**	**40,742**	**52,390**

2.7 DEVELOPMENT STRATEGY

The development strategy adopted in this plan maximizes the use of existing infrastructure to expand the capacity of the system and where possible staging future infrastructure over a greater time period to increase the availability of headworks contributions to fund the works.

A development strategy spaning some 50 years (assuming a varied growth rate up to 4%) has been used although it should be emphasized that the

water supply construction process / timeline is based on actual loadings rather than growth rate projections. This will ensure that infrastructure requirements will remain current over the longer term unless there are significant changes in development density or the defined water supply area. It will however be necessary to review the projected growth rates on a regular basis to reassess time related outputs like Priority Infrastructure Plans (15 years) and 10 year construction plans.

It became apparent in the early stages of developing the overall water supply strategy that despite the system having the same water supply source, a multi-network (3 separate and distinct networks from 1 point source) approach was necessary to avoid any reliance on developer activity being the driver for the provision of infrastructure that might be needed to support development in other areas.

It was also clear that the Toolooa Booster is a natural fulcrum for the multi-network approach, enabling the overall system to be split into the Tannum, Boyne, Benaraby and Wurdong systems. In the short term, it would simply involve separating pipelines but in the longer term, Toolooa Booster would contain 3 separate pumping stations independently delivering water to the storages at Boyne Island, Broadacres and Wurdong/Benaraby.

In all cases, the networks and pumping sets can be designed to service each area independently of the level of activity in the others.

2.7.1 Zones and Sub-Zones

The region covered by this Strategic Plan has been separated into 4 separate zones, and numerous subzones.

The zones are as follows:

Zone 1	Greater Boyne Island Area
Zone 2	Greater Tannum Sands Area
Zone 3	Greater Benaraby Area
Zone 4	Greater Wurdong Heights Area

MAP 3 - Water Zone Areas shows the areas covered by each zone.

The sub zones have been identified by the separation of different pressure areas, areas separated by existing development and distribution network options.

2.7.2 Growth Rates

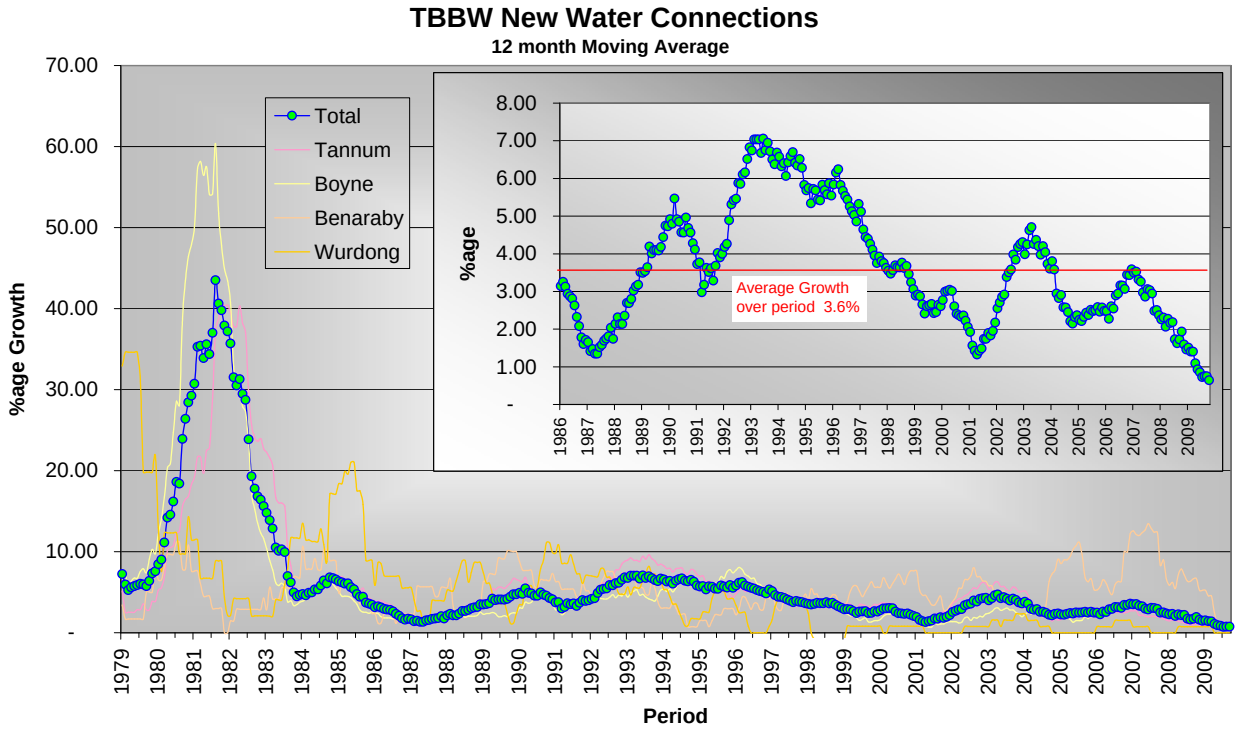
It is recognised that the Planning Information and Forecasting Unit (PIFU) of the Department of Infrastructure and Planning have identified future growth rates (2009 publication), as increasing at decreasing rates over the next 25yrs. The history of development in the area of this plan is typically

boom/bust following the development phases of the mining & minerals economic cycles.

The PIFU figures released in May 2009 (*Population and Housing Fact Sheet*), have included low, medium and high growth rate scenarios, which is reflective of the figures produced in the *"Queensland's future population - 2008 edition"*. In comparing the publication *"Household Projections - Queensland Local Government Areas 2007"*, released by PIFU, with the Population and Housing Fact Sheet, the Household growth rate adopted is very similar to the High Growth scenario of the Population and Housing Fact Sheet. It is therefore taken that the high growth rate scenario should be utilised.

The actual growth rate of this Plan area (based on new water meter installations) has varied between 1.3% and 7.1% over the last 22 years, with an average rate increase of 3.7%, or an average of 96 ET per year.

Figure 2-2 Water Connections Growth Rate



It is recognised that there will still be booms and bust periods, however it is expected that due to the larger population base, the percentage increase will most likely be proportionally lower than historical values, and follow the pattern identified in Table 2-5 Population Growth Rates.

It is also acknowledged that the 'land locking' of the Boyne Tannum area will affect the development considerably. That is, the current zoning, ownership and state planning instruments in place on the land surrounding the Boyne Tannum area is such that development will most likely only occurs with State approval, when and if this occurs.
The growth rates utilised for this plan are as listed in Table 2-5 Population Growth Rates.

Table 2-5 Population Growth Rates

Year Range	Average Yearly Increase Rate
2008 - 2011	3.810%
2011 – 2016	3.011%
2016 – 2021	2.888%
2021 – 2026	2.861%
2026 - 2031	2.721%
2031 - 2065	2.500%

Extracted from *Queensland's future population - 2008 edition* Appendix E

From these growth rates, the expected population in each zone and developmental area is predicted, and included in Table 2-6 Predicted Population by Zone. This table also indicates the years at which each zone will reach its ultimate development capacity.

Table 2-6 Predicted Population by Zone

Year	Total Lots	Cumulative	1	1(H)	2	2(T)	Cumulative BW	Benaraby	Wurdong
2008	4,480	4,000	1,773		2,227		480	348	132
2011	5,012	4,325	1,839	12	2,474		687	528	159
2016	5,915	5,048	2,038	122	2,888		867	671	196
2021	6,836	5,835	2,212	297	3,326		1,001	771	230
2026	7,875	6,722	2,385	517	3,820		1,153	885	268
2031	9,030	7,708	2,511	827	4,280	90	1,322	1,011	311
2041	11,609	9,909	2,715	1,597	5,122	475	1,700	1,293	407
2051	14,860	12,683	2,895	2,643	5,675	1,470	2,177	1,646	531
2053	15,613	13,325	2,895	2,926	5,704	1,800	2,288	1,705	583
2055	16,403	13,999	2,895	3,140	5,764	2,200	2,404	1,705	699
2057	17,233	14,718	2,895	3,140	5,893	2,790	2,515	1,705	810
2059	18,106	15,591	2,895	3,140	6,060	3,430	2,515	1,705	810
2064	20,150	17,635	2,895	3,140	6,060	5,540	2,515	1,705	810

lot development at ultimate

lot development reaches ultimate

2.8 MODEL VALIDATION

Modelling for the bulk water delivery system has been calibrated using actual performance data supplied by the GAWB.

Figure 2-4 Modelling Data (Maximum Daily Flow)

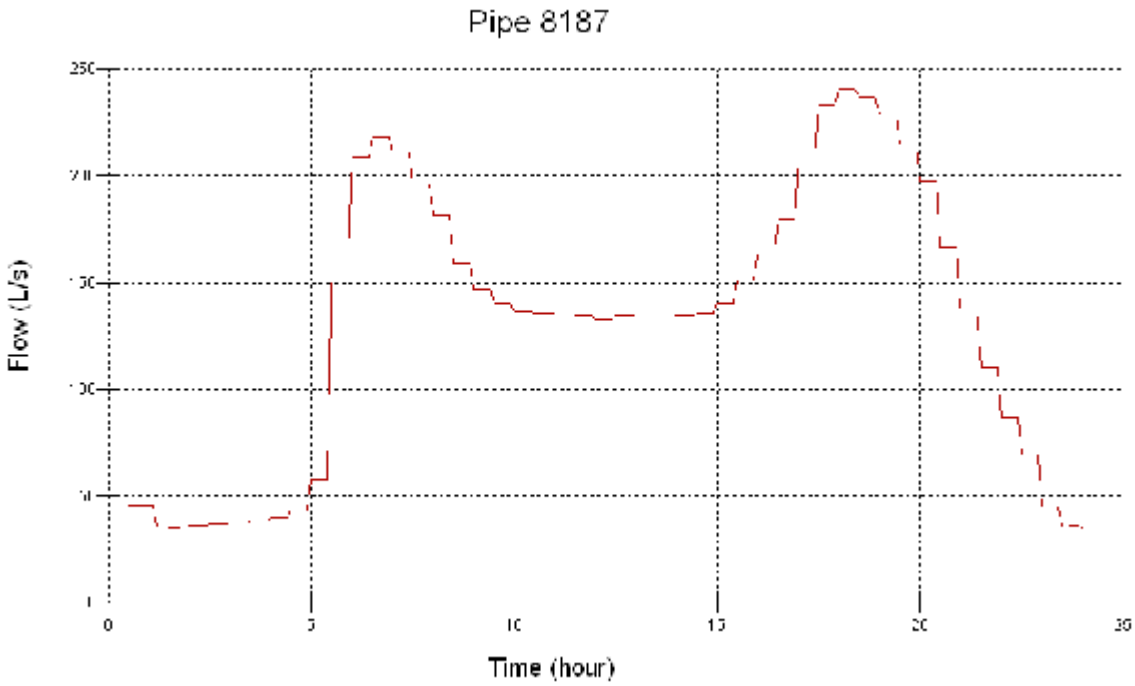


Figure 2-4 Modelling Data (Maximum Daily Flow) suggests that the model provides a realistic representation of the actual system demand profile with flows rates occurring at approximately the same as recorded on the 14th April 2007.

Modelling of the existing Glen Eden Booster system has been validated against data supplied by GAWB in December 2007 which showed that the 300NB main was capable of delivering up to 65L/sec under gravity flow conditions and 125L/sec with one of the Glen Eden booster pumps online.

The model confirms that Glen Eden Booster could produce a “potential” discharge rate of 125 l/s in the old 300NB main with one pump on duty.

3 BULK WATER SYSTEM

3.1 CURRENT STATUS AND LIMITATIONS

For the purposes of this Strategic Infrastructure Plan, the Bulk Water system has been broken into the Boyne/Tannum and the Benaraby/Wurdong systems. The extent of these existing bulk water systems is shown on

3.1.1 Gladstone Area Water Board

Currently, the Gladstone Area Water Board (GAWB) supplies all bulk treated water to nominated supply points within the TBBW Water Area. As such, detailed interaction between Council and GAWB is required in order to appropriately facilitate the commissioning of the required works in a timely manner.
This plan, in particular the funding components, generally assumes that GAWB retain control of the supply to the existing supply points, and therefore has the responsibility of providing the necessary infrastructure to supply the required demand.

3.1.2 Tannum Sands / Boyne Island / Broadacres

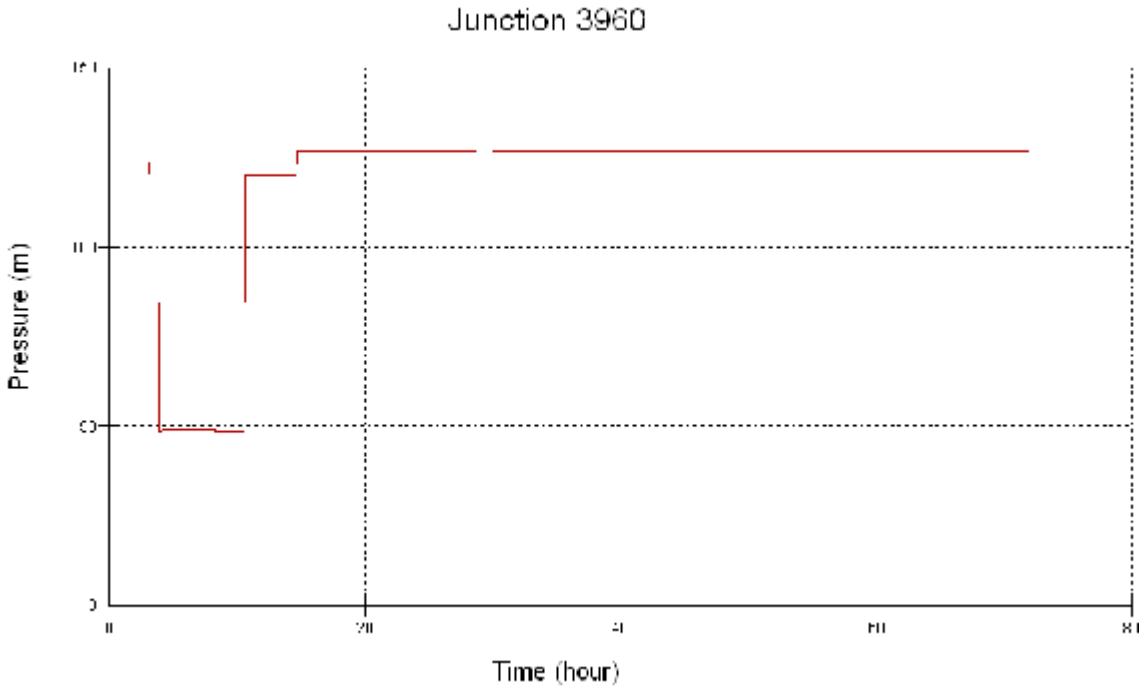
The existing Tannum/Boyne bulk water system consists of a 300NB and combination 600/450/375NB trunk mains in parallel from South Gladstone Reservoir to Toolooa and 375NB main from Toolooa to Boyne Island Reservoir. These two parallel mains provide a dual feed to the Toolooa Bends Station. From this point, the Tannum/Boyne system is separated from the Benaraby Wurdong system.
The metered outlet of the Boyne Island Reservoir is the supply point for this system.

Glen Eden Booster Station (GAWB)

The Glen Eden Booster pumps are installed on the existing 300NB main only. In August 2005, as part of the installation of the new 450DICL main, physical field trails were conducted, which indicated that the Glen Eden Booster pumps were not required as part of the existing system. As such, the Glen Eden Booster pumps are technically available, but have not been used since August 2005.

As a consequence of GAWB not connecting the pump into the new main, if the pumps are used, the modelling suggests that the operation of the Glen Eden Booster pumps will generate pressures downstream of the pump station in the old 300NB main exceeding the 780 to 900 kPa limitations imposed by the Board. Figure 3-1, from modelling, shows the pressures expected to be experienced would be well over 1000kPa (100m head).

Figure 3-1 Discharge Pressure in 300mm Main with Single Pump Operation - Glen Eden Booster



Boyne Island Reservoir (GAWB)

This reservoir is 6ML capacity, and in combination with the inlet pipe configuration, the system can support the existing 4,000 ET loading under average daily demand conditions as shown in Figure 3-2 but very quickly fails under 3 day maximum demand conditions as shown in Figure 3-3.

Figure 3-2 Boyne Island Res – 3 Day Average Daily Flow

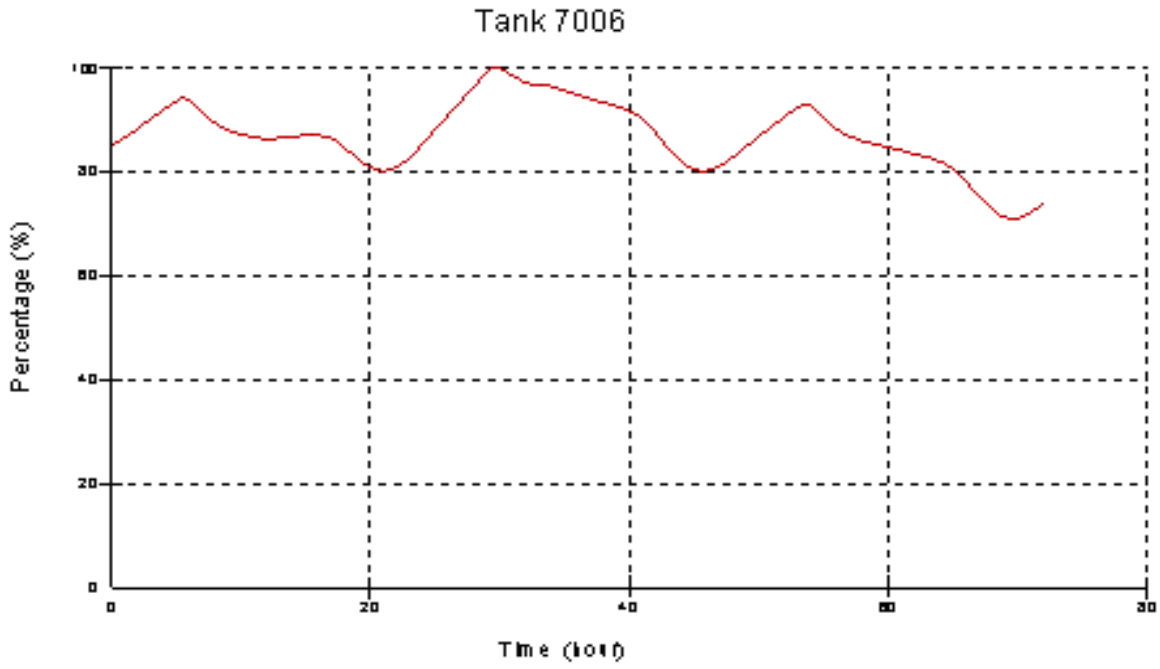
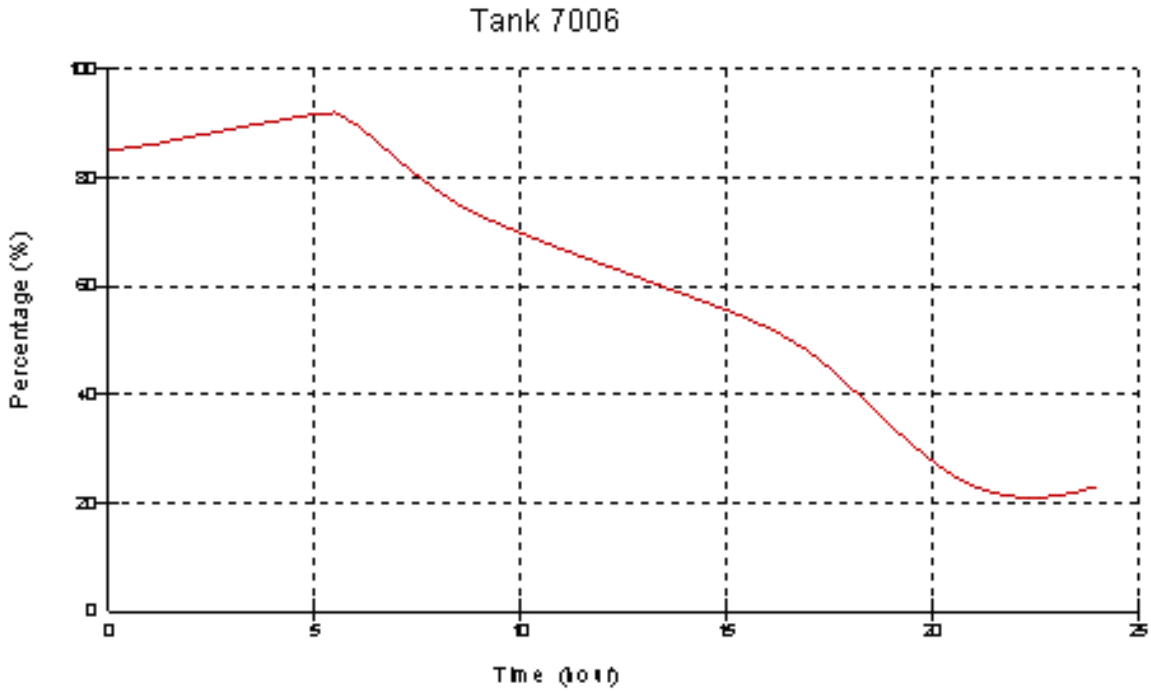


Figure 3-3 Boyne Island Res - 3 Day Max Demand



Coronation Drive Pump Station (Council)

The southern end of Tannum Sands including Pacific Ranch and the Broadacres area is serviced from Broadacres Reservoir which is filled via the Coronation Drive pump station. This pump station is the limiting factor on the capacity of this sub-zone. The Coronation Drive pump station operating at 15.9 l/s cannot be upgraded to support further growth in the southern Tannum Sands area, since it draws its supply directly from the Tannum/Boyne reticulation system. A direct link is now required from the bulk water system upstream of Boyne Island Reservoir, however modelling suggests that without Glen Eden Booster, Boyne Island Reservoir would quickly fail.

3.1.3 Benaraby / Wurdong Heights / Awoonga Dam

The Wurdong/Benaraby bulk water system extends from Toolooa to Golegumma Reservoir via an 300mm CI main and includes a 3 ML reservoir (Council) and a GAWB Booster Pump Station (Benaraby Booster) at Wurdong Heights. The current system is configured so that Golegumma Reservoir (which is filled using Benaraby Booster Pump Station) directly services Benaraby Township and the Awoonga Dam Recreation.

A metered outlet from the Booster station is the supply point for Wurdong Heights, whilst a metered outlet between the booster station and Golegumma Reservoir is the supply point for Benaraby.

The model suggests that, like the Boyne Island Reservoir, the Golegumma Reservoir will fail under 3 day maximum demand conditions. However, unlike Boyne Island Reservoir the problem relates to pressure limitations in the

300mm pipeline rather than system capacity. The main which joins the booster and the reservoir has had an operational pressure limitation of 750kPa (at the outlet of the Benaraby booster pumps) imposed by GAWB, which results in the optimal maximum flow into the Reservoir being 15l/s (the current level of pumped flow with one pump operating). This flow rate is insufficient to cater for any further development on the Golegumma system.

As a consequence no further development can be permitted in the Benaraby/Wurdong area until the limited flow capacity is rectified.

3.2 TANNUM / BOYNE BULK WATER

3.2.1 Staging Overview

The Tannum / Boyne system has been designed on the basis of a single service level, with all related reservoirs, operating at a top water level of RL73m, and providing appropriate pressure and flow levels to RL40m.

The existing network can be increased in capacity from the existing level to a total population of approximately 46,000 people, via the following staged Bulk Water Infrastructure. This network is to operate as 1 system. ie. interlinking of reticulation between reservoirs.

The current 600/450/375 NB rising main from South Gladstone to Boyne Island can be increased to a flow rate of 175 l/s by connecting it to the current Glen Eden Booster Pumping Station and isolating the old 300NB pipeline from the Boyne Island system altogether. The 300NB pipeline is to be a dedicated feed for the Benaraby / Wurdong Heights System.

Following the construction of a dedicated rising main from the GAWB main at the Handley Drive / Centenary Drive intersection to the Broadacres reservoir site, the recommissioning of the Glen Eden Booster as outlined above would increase the current capacity in the Tannum / Boyne area from 4,000 to 5,220 ET. This infrastructure would also resolve the current demand problems being experienced at the Boyne Island and Broadacres Reservoirs by maintaining appropriate storage levels within the reservoirs under the required 3 day maximum demand scenario.

Whilst these augmentations permit a further 1,220 ET to be developed, they exclude Zones 1A and some of Zone 1B. To adequately provide services to these zones, the construction of a 3 ML reservoir on the southern end of Lilly Hills would be required to support any significant development in these Zones. The additional storage would be constructed at the same TWL as the Boyne and Broadacres reservoirs and increase the total number of potential lots in the Tannum Sands and Boyne Island area to 1,820ET.

Upgrading the pipeline through the QAL Red Mud Dam area to 450NB (in conjunction with the relocation of the existing 375NB main as part of the QAL Red Mud Dam redevelopment project) and increasing the pumping capacity at

Glen Eden Booster to 200l/s increases the capacity of the Tannum / Boyne system to 6,924 ET.

The provision of an additional 15ML storage at the Broadacres Reservoir Site and the relocation of the Glen Eden Booster pumping station to Toolooa Bends (including upgrading its capacity to 250 l/s) secures the maximum capacity from the existing infrastructure. This arrangement provides an increase in the total capacity of the system to 8,953 ET.

Once the demand upon the system is greater than 8,953ET, the capacity of the supply pipeline to the Booster Pump Station is reached. In order to extend the growth potential of the system, the 600/450/375/NB rising main needs to be duplicated. The duplicated pipeline would be 600NB. The construction of this new 600NB delivery main enables all future augmentations down stream to demand potential in excess of 44,000ET.

With the construction of a new 600NB delivery main from Toolooa Bends to a new 10 ML reservoir on Lot 28 P4041 in Zone 1A (adjacent to the Gladstone-Benaraby Road) a total demand of 12,079ET can be supplied. Associated with this infrastructure is the installation of a separate 450 l/s pumping set at Toolooa pump station dedicated to this reservoir.

The provision of this infrastructure would enable the full capacity of the 250 l/s pumping set at Toolooa (8,953 ET), dedicated to the Boyne Island Reservoir, to be utilized to fully service Zones 1B, 1C, 1D, 2A and 2C.

To supply the maximum anticipated demand (5,552ET additional), a new 600NB rising main from the 10ML reservoir in Zone 1A to the 450NB rising main (Boyne to Broadacres) on Boyne Island Road would be required. Associated with this infrastructure is a 400l/s pumping station, dedicated to the supply of water from the 10ML reservoir to the Broadacres reservoir. This enables the full servicing of Zone 2B.

3.2.2 Stage TB1 (5,225 ET)

Current ET's	ET's Provided by Stage TB1	Total ET's at End of Stage TB1
4,000	**1,224**	**5,224**

Required Infrastructure Works:

GAWB Responsibility:

[BG1] Pipe work and valving modifications to isolate the old 300NB main from the newer 450/375/600 main. The 300NB main to be separately connected to the Benaraby / Wurdong system. Effecting a separate and dedicated supply line to Tannum/Boyne and Benaraby/Wurdong.

[BG2] Pipe work and valving modifications to utilize the 450/375/600 main with Glen Eden Booster as part of the Tannum/Boyne system only.

[BT1] Re-commission Glen Eden Booster Pumps (175 l/s @ 75mhd duty).

Council Responsibility:

[BT2] 375NB rising main from GAWB Main at Handley/Centenary intersection to BITS Club.

[BT3] 450NB rising main from BITS Club to Broadacres Reservoir.

[BT4] Remove Coronation Drive pump station. Replace with main link.

[BT5] Remove NRV's (non Return Valve) at Boyne Bridge and Coronation Drive Pump Station site.

[BT6] Remove all closed valves, utilised in current zone separation of Boyne/Tannum.

3.2.3 Stage TB2 (5,825 ET)

ET Capacity of Stage TB1	ET's Provided by Stage TB2	Total ET's at End of Stage TB2
5,224	**600**	**5,824**

Required Infrastructure Upgrades:

Council Responsibility:

[BT7] Acquisition of reservoir site on Lilly Hills.

[BT8] Construction of 3ML Lilly Hills Reservoir.

[BT9] 300NB Rising Main from Handley Drive (375NB Stage TB1 main) to Lilly Hills Reservoir.

[BT10] 300NB Reticulation Main from Lilly Hills Reservoir to 300NB main on Boyne Island Road at Handley Intersection.

3.2.4 Stage TB3 (6,925 ET)

ET Capacity of Stage TB2	ET's Provided by Stage TB3	Total ET's at End of Stage TB3
5,824	**1,110**	**6,924**

Required Infrastructure Upgrades:

GAWB Responsibility:

[BT11] Upgrading and re-aligning the 375NB main passing adjacent the red mud dam to a 450NB.

[BT12] Upgrade Glen Eden booster pumps from 175 l/s to 200 l/s.

3.2.5 Stage TB4 (8,950 ET)

ET Capacity of Stage TB3	ET's Provided by Stage TB4	Total ET's at End of Stage TB4
6,924	**2,029**	**8,953**

Required Infrastructure Upgrades:

GAWB Responsibility:

[BT13] Decommission Glen Eden Booster.

[BT14] New Toolooa Booster Pump Station on Boyne line at 250 l/s.

Council Responsibility:

[BT15] New 15 ML Reservoir at Broadacres.

[BT16] Extend 450NB rising main to new reservoir.

[BT17] New 600NB reticulation main linking 15ML & 6 ML reservoirs at Broadacres.

3.2.6 Stage TB5 (9,330 ET)

ET Capacity of Stage TB4	ET's Provided by Stage TB5	Total ET's at End of Stage TB5
8,953	**380**	**9,333**

Required Infrastructure Upgrades:

Council Responsibility:

[BT18] Acquire 'Heidelberg' Reservoir site land.

[BT19] New 10ML "Heidelberg" Reservoir on Lot 28 P4041 near Gladstone-Benaraby Road Zone 1A.

[BT20] Recommission existing 200NB rising main between South Trees Inlet and Gladstone-Benaraby Road as interim rising main to new 10ML Reservoir.

[BT21] Construct Temporary Pump Station at BITS to operate at 45 l/s.

[BT22] Construct new 200NB rising main between Reservoir and recommissioned main.

[BT23] Construct new 450NB reticulation trunk main from Reservoir to general reticulation area.

3.2.7 Stage TB6 (12,080 ET)

ET Capacity of Stage TB5	ET's Provided by Stage TB6	Total ET's at End of Stage TB6
9,333	**2,740**	**12,079**

Required Infrastructure Upgrades:

GAWB Responsibility:

[BT24] Upgrade existing South Gladstone to Toolooa 300NB main to a 600NB system parallel to the existing 600/450/375NB main. Including the connection of the 300NB Benaraby/Wurdong main to this new line.

[BT25] Install new 450 l/s pump set (additional) at Toolooa Pump Station to provide dedicated feed to the 10ML 'Heidelberg' Reservoir via the 600NB pipeline [BT26].

[BT26] Install 600NB main and Tee from Toolooa Bends to Hughs Road, to provide GAWB supply point for 'Heidelberg' Reservoir

Council Responsibility:

[BT27] Construct new 600NB rising main from 600NB Tee [BT26] to 10ML 'Heidelberg' Reservoir in Zone 1A.

[BT28] Decommission 200NB rising main and 'BITS' pump station between Broadacres rising main and 'Heidelberg' 10ML Reservoir. [BT28]

3.2.8 Stage TB7 (17,630 ET)

ET Capacity of Stage TB6	ET's Provided by Stage TB7	Total ET's at End of Stage TB7
12,079	**5,552**	**17,631**

Required Infrastructure Upgrades:

Council Responsibility:

[BT29] Construct new 600NB rising main from 10Ml 'Heidelberg' to connect to the 450NB rising main to Broadacres. (boring required under South Trees Inlet)

[BT30] Construct new 400 l/s Pump Station on outlet of 10ML 'Heidelberg' reservoir to service Broadacres and Lilly Hills reservoirs.

[BT31] Construct additional 15ML reservoir at Broadacres site (total 36 ML at this site).

[BT32] Extend 450NB rising main to new reservoir.

[BT33] Extend 600NB reticulation main to link all 3 reservoirs at Broadacres.

3.3 BENARABY / WURDONG BULK WATER

3.3.1 Staging Overview

The current loading on the Benaraby/Wurdong system is 480 ET which comprises 350 ET in Zone 3 and 130 ET in Zone 4. The current system relies on the old GAWB 300NB main (South Gladstone – Toolooa Bends – Benaraby Booster – Golegumma Res), Benaraby Booster, Wurdong Reservoir and Golegumma Reservoir as the primary bulk water delivery system for the Benaraby / Wurdong area.

Significant improvements can be made to the system by using the existing 300NB main from South Gladstone to Benaraby Booster as a primary dedicated gravity main to Wurdong Reservoir. The Golegumma Reservoir would still be feed from the 300NB main, but it becomes a secondary feed. This increases the available inflow to the Wurdong Reservoir from 15 l/s to 33 l/s without impacting on the pressure limitations of the old GAWB pipeline. (Refer Stage TB1).

Whilst this additional spare capacity can be used in Zone 4, none of it can be utilized in Zone 3, until a new pipeline is constructed from Wurdong Reservoir to the 200NB Awoonga Dam Road reticulation main. As the Wurdong to Awoonga Dam Road pipeline is required to ultimately be a rising main, no reticulation or house connections are permitted on it, except for the Awoonga Dam Road connection. This also involves the disconnection of the Golegumma Reservoir, the reservoir feed and the reticulation system (GAWB) from the Benaraby / Wurdong reticulation system. This does not however, remove those connections around the Pike Crossing and Awoonga Dam area from Golegumma Reservoir.

These modifications increase the capacity in Zone 3 from 350 ET to 642 ET and Zone 4 from 130 ET to 303 ET, providing for an ultimate system capacity of 945 ET.

This upgrade enables approximately 292 ET to be utilized in the Benaraby town area. However, 270 ET of this additional capacity is restricted to Zone 3F only, since it does not improve fire flow capabilities to any Zone on the eastern side of the railway line. With the lots already approved for construction in Zone 3D (approx 45 ET), less than 25 in-fill lots could be added in the zones on the eastern side of the railway line without adversely impacting on fire flows.

The Golegumma Reservoir is still needed to service the Awoonga Dam area, although the demand would drop to approximately 100 ET from this Reservoir. As the Benaraby Booster utilizes positive displacement pumps, the station would continue to operate at 15 l/s but over a significantly shorter duration due to the lower demand. As a consequence of the pumping to Golegumma Reservoir, the filling rate for Wurdong Reservoir would periodically drop to 18 l/s while Golegumma reservoir is filling.

By providing a new 2ML reservoir centrally in the Wurdong area in the vicinity of Lot 36, SP121320, with a TWL set to the same as the Wurdong Res (TWL - RL 77.05) and serviced initially off the existing 300NB GAWB rising main, the capacity of Zone 4 is increased to 480 ET. This increase is predominantly in Zone 4B, and is the precursor requirement for Zone 4B to be included in the Defined Water Supply Area, and able to develop at all. This Reservoir does not provide for any increase in capacity for Zone 3, which would remain on 642 ET. The maximum capacity of the system at this point is 1122 ET.

Once the spare capacity in Zone 3F is utilized (270 ET) or the spare capacity of 22ET for the eastern side of the railway line (Zones 3A, 3B, 3C and 3E) is consumed, a new 6 ML reservoir will be required in the Benaraby area, specifically on Lot 1 SP165532. This reservoir is to have the same top water level as the Wurdong Reservoir (TWL - RL 77.05).

The new 6ML reservoir is essential for the further development of Zone 3, particularly on the eastern side of the railway. The provision of the Benaraby reservoir will involve the extension of the 300NB main (from Wurdong reservoir to Awoonga Dam Road) to the proposed Benaraby reservoir and its conversion to a dedicated rising main (no reticulation branches or house connections allowed). It will also require the provision of a 300NB reticulation main from Benaraby reservoir back to the 200NB main in Awoonga Dam Road.

Since all 3 reservoirs can be serviced directly from the Toolooa Booster Station, no additional individual pumping stations would be required.

Once the total demand in the Benaraby / Wurdong area reaches 1,250 ET, the capacity of the existing 300NB main needs to be increased. In order to achieve this, a new 300NB rising main (with standard pressure capacity) and a booster pump would be required. The flow rate is required to be boosted from 33l/s to 65l/s.

This work increases the total capacity of the Benaraby / Wurdong system from 1,250 to 2,515 ET, which is the ultimate development level.

3.3.2 Stage BW1 (945 ET)

Current ET	ET's Provided by Stage BW1	Total ET's at End of Stage BW1
480	**465** ***Zone 3 – 292 (max)*** ***Zone 4 – 173 (max)***	**945**

Required Infrastructure Upgrades:

GAWB Responsibility:

[BG1] Pipe work and valving modifications to isolate the old 300NB main from the newer 450/375/600 main. See Stage TB1 [BG1].

[BG2] Pipe work and valving modifications within Toolooa Pump Station to effect a separate and dedicated supply line to Benaraby / Wurdong from South Gladstone Reservoir. See Stage TB1. [BG2]

[BB1] Decommission GAWB main between Golegumma line and Awoonga Dam Road main.

- Benaraby booster to be retained to operate off the bulk water service to feed Golegumma at 15 l/s.

Council Responsibility:

[BB2] Install new tee at Wurdong Reservoir takeoff for new 300NB reticulation main.

[BB3] Alter the connection at Benaraby Booster to provide reticulation from South Gladstone directly to Wurdong Reservoir using existing 300NB main.

[BB4] A new 300NB trunk reticulation main to be constructed from Wurdong Reservoir takeoff to Awoonga Dam Road (main will ultimately be a rising main to a new Benaraby Reservoir). This main is to have no branches or connections except the connection to Awoonga Dam Road 200NB main.

3.3.3 Stage BW2 (1,122 ET)

ET Capacity of Stage BW1	ET's Provided by Stage BW2	Total ET's at End of Stage BW2
945	**177** ***Zone 3 – 0*** ***Zone 4 - 177***	**1122**

Required Infrastructure Upgrades:

GAWB Responsibilty:

[BB5] Provide metered tee (supply point) in to 300NB GAWB main, to service Reservoir.

Council Responsibility:

[BB6] Acquire land for 1.1ML low Level Reservoir.

[BB7] 1.1ML low level reservoir on Lot 36, SP121320, (TWL - RL 77.05).

[BB8] New 200NB main from tee [BB5] to 'Low Level' Reservoir [BB7].

[BB9] Connection of Reservoir Reticulation with Township.

By installing Stage BW2, the minimum operational pressure in the high level area of Wurdong increases to 19m in the mains and for fire fighting purposes a minimum of 9L/s at 12m residual pressure can be provided (from one hydrant) on a maximum day during the maximum hour (18:00hrs).

3.3.4 Stage BW3 (1250 ET)

ET Capacity of Stage BW2	ET's Provided by Stage BW3	Total ET's at End of Stage BW3
1122	**128** ***Zone 3 – 128*** ***Zone 4 – 0***	**1250**

Required Infrastructure Upgrades:

Council Responsibility:

[BB10] Acquire land for 6ML Benaraby Reservoir, (Lot 1 SP165532).

[BB11] 6ML Benaraby reservoir, TWL RL 77.05m.

[BB12] Extend 300NB rising main from Awoonga Dam Road to new reservoir and modify 300NB pipeline between Benaraby Booster and Benaraby Reservoir to be a dedicated rising main from Wurdong Reservoir.

[BB13] Decommission 300NB connection into 200NB Awoonga Dam Road main.

[BB14] Construct a 300NB reticulation main from Benaraby reservoir back to the 200NB main in Awoonga Dam Road.

[BB15] Construct a 300NB reticulation main from Benaraby reservoir to Leferink Road.

3.3.5 Stage BW4 (2515 ET)

ET Capacity of Stage BW2	ET's Provided by Stage BW3	Total ET's at End of Stage BW3
1250	**1265**	**2515** ***Zone 3 – 1705ET*** ***Zone 4 – 810ET***

Required Infrastructure Upgrades:

GAWB Responsibility:

[BB16] New PS at Toolooa bends (65 l/s operational), GAWB works.

[BB17] Construct new 300NB Rising Main from Toolooa bends to Benaraby Booster. GAWB works.

By installing Stage BW4, the high level area in Wurdong receives full fire flows however still has a minimum operational pressure of 19m in the mains on a maximum day during maximum hour (18:00hr).

3.4 WATER TREATMENT PLANT CAPACITY

This plan has been developed on the basis that the existing Water Treatment Plant, Bruce Street Gladstone, has adequate capacity to treat and supply the necessary quantities of water for future development. As this facility is owned and controlled by GAWB, continued liaison between Council and GAWB is required.

Council has a suitable property in the Wurdong Heights / Benaraby area for a future Water Treatment Plant capable of producing water for the T/B/B/W, Calliope and extended water systems. This site is undeveloped and was identified due to proximity to necessary services and infrastructure.

In the situation whereby, the Gladstone Water Treatment Plant does not have sufficient capacity, nor the ability to develop any further capacity, it is expected that Council will commence works upon the Benaraby Water Treatment Plant.

The commissioning of this plant will require additional bulk water mains to adequately distribute the water to the area. As these mains are not part of this plan, they are required to be included in any planning of the Water Treatment Plant.

Subject to this facility being required, the assessment of funding arrangements may necessitate a review of this plan, and the subsequent funding plans.

4 DISTRIBUTION SYSTEM

The existing reticulation networks for this plan are generally suitable for the current and future growth of the plan area. Generally, the biggest constraint in the supply of water for the plan area is the Bulk Water System (storage and feed capacity).
With the identified Bulk Water upgrades, the existing Reticulation system is able to supply the necessary future demand with very little upgrading works required.

All new development areas are required to install the necessary reticulation network (including any necessary interconnection works), to ensure suitable levels of service to the new properties.

The plan has been developed on the basis that excluded mains (internal mains) are installed at the sole cost of the developer, and include any necessary linkages external to the development, to ensure the proper functioning of the water network.

The following sections, detail the major reticulation infrastructure required to develop the various zones, to the full capacity. The main sizes identified are

based on the ultimate development of the subzones, and it must be noted that due to differing staging arrangement as part of the development process, the actual size of main required may be larger. Any such oversizing of main is at the cost of the developer.

4.1 ZONE 1

Zone 1 covers the existing Boyne Island township serviced by Boyne Reservoir and the undeveloped land in the Heidelberg Development area on the western side of the Boyne River. The ultimate capacity of the zone is 6,000 ET (16,000 EP). Land use in this zone is generally urban or medium density urban.

Although some infill development can occur in the north of Zone 1 (118 ET), any significant development in this Zone (particularly Zones 1A and 1B) is dependant on the provision of the Stage 1 and 2 bulk water system upgrades. (Refer to the Table B-4 Pre-Requisite Infrastructure.)

4.1.1 1A – 200NB Curtis Ave Link Main

The 200NB reticulated main is aligned through the current Unallocated State Land (USL) and follows as an extension of Curtis Ave to Centenary Drive. This link provides a redundancy within the southern network, and as such, it is required to guarantee supply to the existing southern areas of Boyne Island. Currently the southern areas are fed only by the Malpas St main and any disruption to this main cause's the loss of service to many customers.

4.1.2 1B – 300NB Dennis Park Trunk Main– Zone 1A

This 300NB main is required for any development to occur in Zone 1A, (adjacent to the Boyne River), without the construction of the Stage TB5 bulk water infrastructure.

4.1.3 1C – 300NB Dennis Park Trunk Main– Zone 1A

This 300NB main is required as an extension to main 1B, and provides extended service for the developing Zone 1A.

4.1.4 1D –300NB Trunk Main – Zone 1A

This 300NB main is required as an extension to main 1C, and provides service for the developing Zone 1A. This main is the basis of a looped main within the northern part of Zone 1A. It should be noted that development at the southern area of this main, may require the looped main to be installed, in order to achieve the desired level of service.

4.1.5 1E –375NB Trunk Main – Zone 1A

This main is required as a 'connection' main between the Bulk Water Stage TB5 infrastructure (Heidelberg' reservoir) and the northern part of the zone. (It is assumed that this will be developed before the Reservoir is constructed.)

This main, and feed supply, is required in order for the northern part to fully develop.

4.1.6 1F –300NB Trunk Main – Zone 1A

This 300NB main is required as an extension to main 1B and 1D, and provides service for the developing Zone 1A. This main completes the looped main within the northern part of Zone 1A. (See main 1D).

4.1.7 1G –300NB Trunk Main – Zone 1A

This 300NB main is required to service any of the Southern portion of Zone 1A.

4.1.8 1H –250NB Trunk Main – Zone 1A

This 250NB main is required as an extension to main 1G, and provides service for the development of the Southern portion of Zone 1A.

4.1.9 1I –200NB Link – Zone 1A

This 200NB main is required in order to provide service to the area north of the 'Heidelberg' Reservoir and provides a complete loop of trunk infrastructure.

4.2 ZONE 2

Zone 2 is designated as Tannum Sands, Pacific Ranch, Broadacres and adjoining areas. Zone 2 contains some 11, 600 ET (30,160 EP), generally comprising Urban and Rural residential development. This system is predominantly fed by the Broadacres reservoir site and continued growth will require additional capacity in bulk water at this site.

The Reticulation area of Tannum Waters (Zone 2C) is covered by the adoption of the Tannum Waters Master Plan. As such, all reticulation works in Tannum Waters is subject to direct developer construction. These mains are indicated on MAP 20 - , as *"INT MP"* mains.

4.2.1 2A – 200NB Looping Main (Dahl Road Stage 1)

This 200NB main is required to connect off the existing 450NB main on Tannum Sands Road, and runs along Dahl Rd. This will provide a development potential of approximately 300ET to occur in Zone 2A

This is specifically the land between Tannum Sands High School and Pacific Ranch, Pacific Rise and the Boyne Smelter Land to the West of Coronation Drive.

4.2.2 2B – 200NB Looping main (Dahl Rd Stage 2)

This is the completion of works required to provide a loop between Tannum Sands Road and Coronation Drive. As a loop main, this work is required after approximately 300 ET have been added in the vicinity of 'Dahl Rd'.
Completion of the looped system allows further development in these areas and maintains pressure/fireflow capability.
In conjunction with appropriate Bulk Water Installations, the total development potential provided by this loop main (2A and 2B) is 1,110 ET.

4.2.3 2C – 300NB Trunk Main Coronation Drive to Tannum Central

This main is required to improve the capacity of the internal portion of Tannum Sands, specifically infill / higher density development, in the region of Hampton Drive, Ocean Street and Pacific Avenue.
This main is required after 'infill' of 15 ET is achieved.

4.2.4 2D – 200NB Trunk Main Tannum Central

This main is required to improve the capacity of the internal portion of Tannum Sands, specifically infill / higher density development, in the region of Hampton Drive, Ocean Street and Pacific Avenue.
This main is required after 'infill' of 5 ET is achieved.

4.2.5 2E – 450NB Trunk Main Broadacres Reservoir to Tannum Sands Road

This 450NB main is part of the 2nd stage (2E and 2F) of installation of the trunk main between Broadacres Reservoir and Tannum Sands.
This asset is required after the additional development of 300 ET in Zone 2. The installation provides the capability for the full development of Zone 2A.

4.2.6 2F – 450NB Trunk Main Pacific Ranch to Broadacres Access

This 450NB main is part of the 2nd stage (2E and 2F) of installation of the trunk main between Broadacres Reservoir and Tannum Sands.
This asset is required after the additional development of 300 ET in Zone 2. The installation provides the capability for the full development of Zone 2A.

4.2.7 2G – 600NB Trunk Main Broadacres Reservoir to Tannum Sands Road

Upon reaching 1,750 ET in Zone 2B, the capacity of the 450NB main from Broadacres is insufficient. A 600NB main is required to be installed, in addition to the 450NB main to create the required capacity.

This main is required to enable to ultimate development of Zone 2.

This main is required to parallel the 450NB main (2E), and nominally replace the existing 300NB main.

4.2.8 2H – 375NB Trunk Main Broadacres to Tannum Waters

Once the population of the Tannum Waters area reaches 495 ET, additional main capacity to the area is required. This capacity is provided by the installation of the 375NB reticulated main from the Broadacres reservoir as a 2nd looping main to this development.

4.2.9 2I – 200NB Main Applin Place to Tannum Waters

Once the population of the Tannum Waters area reaches 380 ET, additional main capacity to the area is required. This capacity is provided by the installation of this 200NB reticulated main from Tannum Sands Road. This main forms the 1st major network loop within Tannum Waters.

4.2.10 2J – 200NB Main in 'Turich' Development

This main is required after 300ET are developed within Zone 2B, as this is the capacity limit of main Int14 and Int15. The development of this main also provides for the commencement of development along Tannum Sands Road.

4.2.11 2K – 200NB Main in 'Turich' Development

This main is required after 300ET are developed within Zone 2B, as this is the capacity limit of main Int14 and Int15. This main provides for development of the North East corner of the Turich Developmental Area.

4.2.12 2L – 600NB Trunk Main to 'Turich' Development

This main is required for the ultimate development of the subzone 2B.

This main is required after 300ET are developed within Zone 2B, as this is the capacity limit of main Int14. A large diameter main is triggered early, in order to minimise upgrades to assets which are located in confined areas.

4.2.13 2M – 450NB Trunk Main within 'Turich' Development

This main forms an integral part of the ultimate development of subzone 2B.

This main is required after 300ET are developed within Zone 2B, as this is the capacity limit of main Int14. This main starts the formation of a looping main, and joins between Int14, and 2L.
A large diameter main is triggered early, in order to minimise upgrades to assets which are located in confined areas.

4.2.14 2N – 450NB Trunk Main within 'Turich' Development

This main is required after 1,200ET are developed within Zone 2B. This main is required to provide service to properties in the vicinity of the local hill.

4.2.15 2O – 300NB Trunk Main within 'Turich' Development

This main is required after 1,750ET are developed within Zone 2B.

This main is required to assist in the provision of service to properties in the vicinity of the local hill (central area of the Developmental Area).

4.2.16 2O1 – 200NB Trunk Main within 'Turich' Development

This main is required after 2,230ET are developed within Zone 2B.

This main assists in the provision of water reticulation to the western 'point' of the 'Turich' developmental area, and joins to main 2X.

4.2.17 2P – 300NB Trunk Main within 'Turich' Development

This main is required after 1,750ET are developed within Zone 2B.

This main is required to assist in the provision of service to properties in the vicinity of the local hill (central area of the Developmental Area).

4.2.18 2P1 – 200NB Trunk Main within 'Turich' Development

This main is required after 2,230ET are developed within Zone 2B.

This main assists in the provision of water reticulation to the western 'point' of the 'Turich' developmental area, and joins to main 2X.

4.2.19 2Q – 300NB Trunk Main within 'Turich' Development

This main is required after 1,750ET are developed within Zone 2B.

This main is required to assist in the provision of service to properties in the vicinity of the local hill (central area of the Developmental Area).

4.2.20 2R – 300NB Trunk Main within 'Turich' Development

This main is required after 1,750ET are developed within Zone 2B.

This main is required to assist in the provision of service to properties in the vicinity of the local hill (central area of the Developmental Area).

4.2.21 2S – 300NB Trunk Main within 'Turich' Development

This main forms an integral part of the ultimate development of subzone 2B.

This main is required after 1,200ET are developed within Zone 2B. This main completes the formation of a looping main, and joins between 2L and 2M.
A large diameter main is triggered early, in order to minimise upgrades to assets which are located in confined areas.

4.2.22 2T – 200NB Trunk Main within 'Turich' Development

This main is required after 1,200ET are developed within Zone 2B.

The development of this main provides for the commencement of development in the South East corner of the Turich Developmental Area, along Tannum Sands Road.

4.2.23 2U – 200NB Trunk Main within 'Turich' Development

This main is required after 2,230ET are developed within Zone 2B.

The development of this main provides for the commencement of development along the Southern boundary of the Turich Developmental Area.

4.2.24 2V – 200NB Trunk Main within 'Turich' Development

This main is required after 2,230ET are developed within Zone 2B.

The development of this main provides for the commencement of development along the Southern boundary of the Turich Developmental Area.

4.2.25 2W – 200NB Trunk Main within 'Turich' Development

This main is required after 1,750ET are developed within Zone 2B.

The development of this main provides for the commencement of development along the Southern boundary of the Turich Developmental Area.

4.2.26 2X – 200NB Trunk Main within 'Turich' Development

This main forms an integral part of the ultimate development of subzone 2B.

This main is nominally required after 4,230ET are developed within Zone 2B. This main provides water reticulation to the western 'point' of the 'Turich' developmental area, and joins to main 2Z.

4.2.27 2Y – 200NB Trunk Main within 'Turich' Development

This main is required after 4,230ET are developed within Zone 2B.

This main provides water reticulation to the western 'point' of the 'Turich' developmental area.

4.2.28 2Z – 200NB Trunk Main within 'Turich' Development

This main is required after 4,230ET are developed within Zone 2B.

This main provides water reticulation to the western 'point' of the 'Turich' developmental area.

4.3 ZONE 3

Zone 3 is designated as Benaraby and the immediate surrounding area. Zone 3 ultimately contains some 1,705 ET (4,430 EP), generally comprising Rural residential development

Benaraby is currently fed from a high level (Golegumma) reservoir. The capacity of this system is generally limited due to the rising main flowrate of 15 l/s, and has reached its capacity.

Any further development requires a 300NB reticulated trunk main to Benaraby from Wurdong reservoir.

4.3.1 3A – Parallel 150NB main – Ronald Cres

The existing main located in Ronald Crescent is unable to supply the required Level of Service (15l/s fire flow, with 12m residual head) to residents in Irma Court and Ronald Crescent. This is due to the relatively small diameter and the length of 'un-looped' main.

To rectify this problem, a parallel main (150NB) on the adjacent side of the road reserve is required to be installed for the full length of the Crescent, connecting to the end of the Ronald Crescent Main and the Leferink Road main.

4.3.2 3B – 200NB Looping main – Harbottle Rd to Bridge

The current capacity of Zone 3C, is limited by bulk water infrastructure and distribution infrastructure. To resolve the distribution limits, a 'looping' main is required to be installed between Bruce Highway / Harbottle Road intersection and Boyne River Bridge. The installation of this looping main, in conjunction with various Bulk Water upgrades, provides for a growth in Zone 3C of 42ET.

4.3.3 3C – 200NB Main Upgrade – O'Connor Road

The current capacity of Zone 3C, is limited by bulk water infrastructure and distribution infrastructure. A constriction of water supply exists in the existing infrastructure. The increase in diameter of this 100NB & 150NB main to 200NB, will provide an immediate increase to Zone 3C of 10 ET, and also provided a basis for further capacity increases with other distribution works (Mains 3B).

4.3.4 3D – 200NB Trunk Main – Leferink Road

Zone 3B is currently completely undeveloped. In order to develop, a suitably sized supply main is required. This trunk main will ultimately loop into the trunk main located on Awoonga Dam Road.
To provide tor the needs of development, a 200NB main is required along Leferink Road.

4.3.5 3E – 200NB Trunk Main – Leferink Road to Awoonga Dam Road

The current capacity of the southern part of Zone 3F is limited by the lack of infrastructure. In order to develop, a suitably sized supply main is required, and will loop between the trunk main located on Awoonga Dam Road (Main 3F) and Leferink Road (Main 3D).
To provide tor the needs of development, a 200NB main is required.

4.3.6 3F – 200NB Trunk Main – Awoonga Dam Road

The current capacity of the southern part of Zone 3F is limited by the lack of infrastructure. In order to develop, a suitably sized supply main is required, to connect to the existing Awoonga Dam Road main.
To provide tor the needs of development, a 200NB main is required.

4.4 ZONE 4

Zone 4 is designated Wurdong Heights and the immediate surrounding area. Zone 4 ultimately contains some 810 ET (2106 EP), and generally comprises rural residential land use.

This zone contains one pressure zone with a Service Level of RL 45. The existing Wurdong res, as well as a new reservoir shall feed the zone.

4.4.1 4A – 200NB Trunk Main Zone 4B

Following the installation of the Bulk Water Stage BW2 infrastructure, Zone 4B can be appropriately serviced. Some parts of this subzone can be serviced from the associated Bulk Water infrastructure, however, more than half the subzone requires this main in order to properly service the area.

This main is to run to the northern part of the subzone, parallel to the GAWB water main. It will provide for the growth of this area to the ultimate level of 380 ET.

4.4.2 4B – 200NB Trunk Main Zone 4B

This main is required to service the North-Western portion of subzone 4B, and takes service across the railway line. This main cannot be installed until Main 4A is commissioned.

4.4.3 4C – 300NB Trunk Main Zone 4B

With the increased growth of Wurdong Heights, the delivery main to the existing area is required to be upsized. The upsizing of this main will enable an additional 135 ET to be developed in subzone 4C.

4.4.4 4D – 150NB Trunk Main Zone 4C

The existing 80NB main are required to be upsized to 150NB to provide for both the future development of Zone 4C and to provide compliant levels of service to the Yalkarra Cres / Kanangra Road area.

These mains are required to be upsized before any further development in Zone 4C can occur. This is due to the 'ribbon' type development which exists.

4.4.5 4E – 150NB Trunk Main Zone 4C

The existing 80NB main are required to be upsized to 150NB to provide for both the future development of Zone 4C and to provide compliant levels of service to the Yalkarra Cres / Kanangra Road area.

These mains are required to be upsized before any further development in Zone 4C can occur. This is due to the 'ribbon' type development which exists.

4.4.6 4F – 150NB Trunk Main Zone 4C

The existing 80NB main are required to be upsized to 150NB to provide for both the future development of Zone 4C and to provide compliant levels of service to the Yalkarra Cres / Kanangra Road area.

These mains are required to be upsized before any further development in Zone 4C can occur. This is due to the 'ribbon' type development which exists.

4.4.7 4G – 150NB Trunk Main Zone 4C

The existing 80NB main are required to be upsized to 150NB to provide for both the future development of Zone 4C and to provide compliant levels of service to the Yalkarra Cres / Kanangra Road area.

These mains are required to be upsized before any further development in Zone 4C can occur. This is due to the 'ribbon' type development which exists.

4.4.8 4H – 150NB Trunk Main Zone 4C

The existing 80NB main are required to be upsized to 150NB to provide for both the future development of Zone 4C and to provide compliant levels of service to the Yalkarra Cres / Kanangra Road area.

These mains are required to be upsized before any further development in Zone 4C can occur. This is due to the 'ribbon' type development which exists.

5 DEVELOPMENT PROGRESS

The purpose of this strategic plan is to provide detailed information on the progressive development of the T / B / B / W Water Service Scheme and to alert Council and potential Developers to the extent and likely timing of major infrastructure provision and upgrades based on their subdivisional loadings.

This plan has undertaken a very limited assessment of local subdivisional infrastructure such as internal water mains, valving upgrades and interconnecting mains, in order to identify likely infrastructure needs for individual subdivisions. Detailed assessment of these items is not practical at this juncture, as development layouts and inter-linkage of networks are not available.

5.1 SEQUENTIAL DEVELOPMENT

This Plan has been developed and assessed by assuming sequential development, radiating out from the major supply locations (normally Reservoirs) and current developed areas of each system.

Most sequential developments within the DWSA will only require a simple assessment of internal mains and possible connection to other areas, to confirm compliance with the Strategic Plan.

More detailed assessments will be necessary with non-sequential or “leap frog” development within the DWSA which may require some ‘temporary’ external works, bring forward costs or headworks offsetting infrastructure (infrastructure included in the Capital Infrastructure Schedule) to connect to the existing system and meet service requirements.

5.2 INFILL DEVELOPMENT

This plan has provided for limited infill development. The level of infill development is indicated on MAP 22 - Ultimate New Development Potential.

It has been assumed that the currently developed areas will continue to develop as low – medium density developments, with limited medium developments only occurring in close proximity to waterway foreshores. Any higher level development than provided for, will require a dedicated analysis to be undertaken.

All infill development will require a revision of the model, to ensure that service levels across the network are maintained.

5.3 DEVELOPMENT OUTSIDE THE DWSA

The impacts of any development outside the DWSA are completely unknown and depending on the location and size of such developments may require extensive re-modelling to determine its impact on other Zones and the bulk water system. Any development outside the DWSA will require a review of the TBBW Strategic Plan including its impacts on the Capital Funding Plan, Capital Infrastructure Plan and Headworks Policies. As a consequence all proposed developments outside the DWSA will require a specific case by case detailed assessment of the hydraulic capacities and needs of the network.

Whilst the Strategic Plan is not intended to exclude development outside the DWSA, its primary purpose is to define a finite area to enable future augmentations to be modelled and to provide a process for assessing the extent and likely timing of major infrastructure provision and upgrades within the DWSA. Therefore given the resources and costs associated with preparing this plan, all costs associated with assessing development applications outside the DWSA should be passed on to the applicants.

Applicants need to be made aware of the potential lead times and costs associated with development requests outside the DWSA.

5.4 ASSESSMENT OF DEVELOPMENTS

Any development which is proposed inside the DWSA or requesting an extension to the DWSA, is required to be assessed within the model to ensure continuity of service levels to both the existing and new customers.

The assessment of proposals will be undertaken as :
Inside the DWSA:

- part of the Reconfiguration of Land (ROL) application, or
- Material Change of Use application which results in higher density than 6 EP per allotment.

Outside the DWSA:

- at the Material Change of Use (MCU) application for developments outside the DWSA.

Each development will be assessed by Councils Infrastructure Planning Section and will assess the proposal on the basis of the ‘staging plan’ provided as part of the ROL. The assessment will include detailed assessments of numerous service options, in consideration of the Capital Infrastructure plan, including the Pre-requisite Capital Works Plan.

In all cases of developments within the DWSA, any costs associated with this assessment work would be included in the standard assessment fees.

The Standard assessment fee will cover 1 assessment of the proposal. Any required ‘re-modelling’ of developments as a result of developer changes

(layout or staging plan) or developer disagreement with the outputs from previous assessment, will be required to be fully funded by the developer.

6 CAPITAL INFRASTRUCTURE PLAN

The Boyne Island, Tannum Sands, Benaraby and Wurdong Water Supply areas have been modelled on the progressive development of the DWSA from its current loading of 4,000 ET to a maximum loading of 20,150 ET (52,390 EP).

The Capital Infrastructure Plan divides the DWSA into zones to assist in identifying the level of infrastructure required in each area. It also provides a mechanism for developing separate headworks zones outside the DWSA.

The Capital Infrastructure Plan only includes infrastructure required to service the DWSA as a whole and does not list localized infrastructure such as internal sub-divisional mains, connecting mains that service individual developments or interconnecting loop mains between subdivisions.

The plan also requires any main 150NB and smaller (i.e. reticulation) to be fully funded by the developer. Some larger mains have also been included as fully developer funded portions as they are part of a "Master Planned Community" or part of 'internal looping mains'.

Full details of each component and supplementary explanations are included below. The Capital Infrastructure Plan is summarized in Table B-1 Capital Infrastructure Plan - Bulk Water and Table B-2 Capital Infrastructure Plan - Distribution Network.
Maps 5 - 21, show the location of each component listed in the Capital Infrastructure Plan.

6.1 DEVELOPMENTAL AREAS

This Plan has adopted two Developmental Areas. These areas are referred to as "Heidelberg's" development, and "Turich's" Development. These area have been indicated on MAP 19 - (Heidelberg) and MAP 20 - (Turich).

These two areas have been separately identified, as they:

- provide for a large portion of future development,
- currently 'remote' from the existing developments, and
- required infrastructure does not extend any existing area.

Within the Capital Funding Plan, the assets which are included in these areas have been calculated as being funded by these areas alone.

Only the mains identified as part of the plan are eligible for contribution by Council, is applicable.

6.2 EXCLUDED MAINS

A number of long term mains have been excluded from the Capital Infrastructure Plan and the Capital Funding Plan. These mains primarily consist of interconnecting mains and looping mains, and are considered to be entirely the developer's responsibility. Many of these mains are 'large' diameter; however, they are excluded mains as they are required purely to provide appropriate service levels at ultimate development.

MAP 18 - provides limited details on excluded mains. However as the final size and location of these mains will be dependent on subdivision layout, only limited modelling has be carried out. As a consequence each subdivision will require hydraulic assessment prior to subdivisional approval being granted.

All inter-connecting mains between subdivisions with separate tenure, will also be required to be installed. Since the provision of these mains is necessary for the benefit of the whole community, allowances have been included in the Capital Funding Plan for Council to fund the upsizing of interconnecting mains, if necessary.

6.3 PRE-REQUISITE CAPITAL WORKS

Works identified as being Pre-requisite works, are listed in the Table B-4 Pre-Requisite Infrastructure.

The pre-requisite works table is intended as a detailed guide of zone related infrastructure requirements particularly in relation to staged and "leap frog" style development.

The Bulk Water requirements have been assessed for each sub-zone as separate entities, as the actual development locations are impossible to predict. Therefore, this list is the minimum requirements, and depending upon previous developments, the actual level of pre-requisite works, may be substantially higher.

The list covers Bulk Water Requirements, Distribution Mains, and Excluded mains required for each subzone. As such, it may include non-eligible headworks offsetting infrastructure (infrastructure not listed in the Capital Infrastructure Plan) such as internal water mains, valving upgrades and interim external works required to connect "leap frog" developments to the existing reticulation system.

6.4 OVERSIZING CONTRIBUTIONS

For the purposes of the funding arrangements, total expected cost of works are utilised.

Oversizing contributions on works provided by developers will only be considered for mains which are over 150NB.

Mains which are not eligible for oversizing contributions (Council Contribution) to the total cost are:

- 150NB and smaller
- Larger mains which are solely required to ensure individual developments met the required level of service.

The list of pump stations, storages and associated works (Table B-1 Capital Infrastructure Plan - Bulk Water and Table B-2 Capital Infrastructure Plan - Distribution Network), is to be used as the 'standard' to which a development is required to construct. Any works constructed smaller than, or in a substantially different location to the listed infrastructure for the sole purpose of 'Staging" a development, will not be eligible for any Council contribution.

6.5 STRUCTURE OF PLAN

This Capital Infrastructure Plan has been developed by costing each asset item and identifying the stage (Bulk Water) or Zone (Distribution Mains) the asset is required.

6.5.1 Bulk Costs

As the works identified have not had any detail design undertaken, the Bulk Water costings have been calculated by the adoption of a series of unit rates, with the inclusion of the current understanding of issues facing each items, eg rock/clearing, land purchase and location, utility provision (power)

As Council purchases Bulk Treated Water from GAWB at nominated locations, and some of the identified upgrades are required prior to these locations, the value of these types of works have been identified at zero cost. This follows the premise that these works are the responsibility of GAWB, and the cost of such is built into GAWB's financial model for water charges.

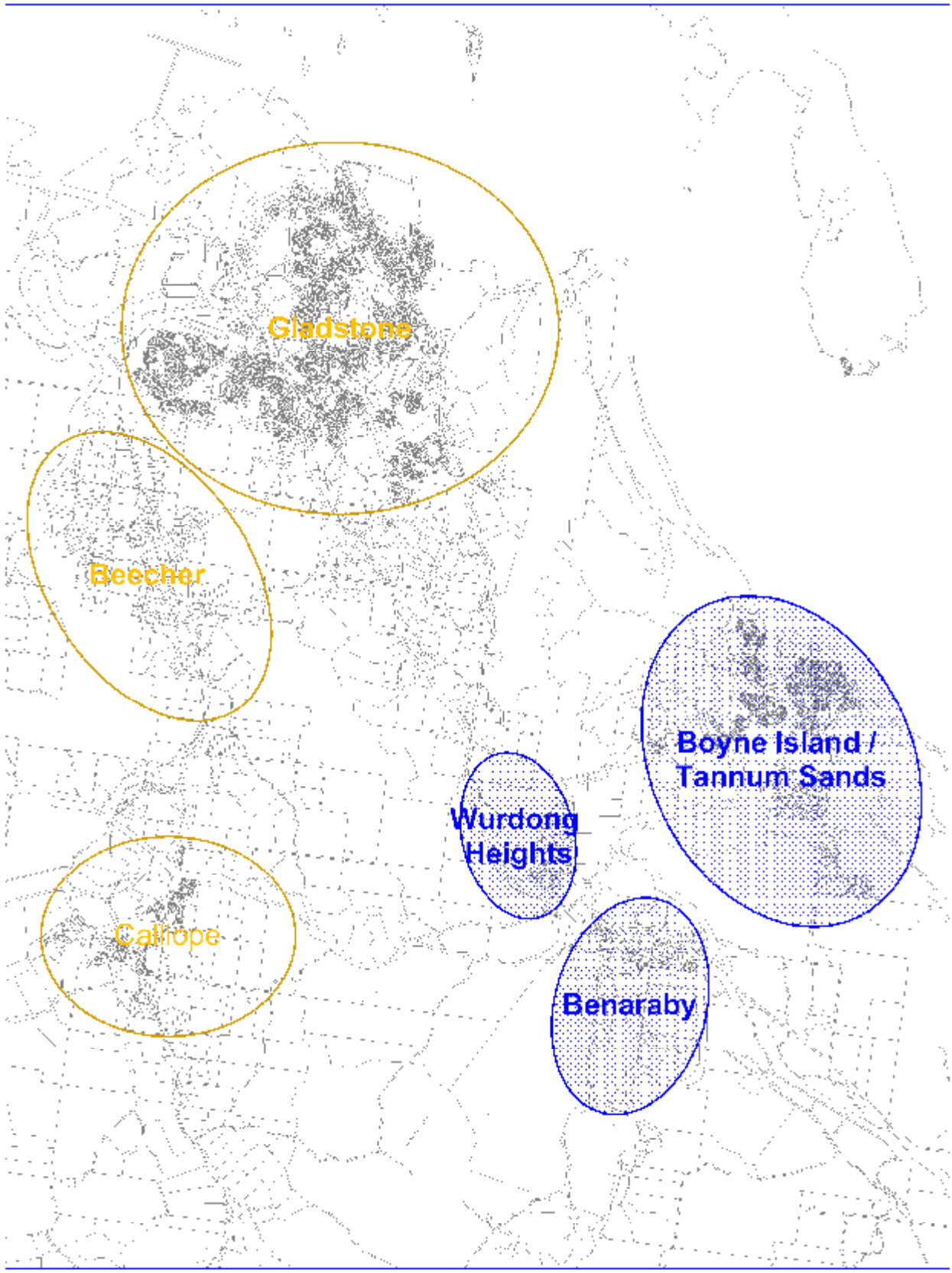
6.5.2 Distribution Costs

The cost of distribution mains has been calculated on the basis of unit rates with the inclusion of expected additional costs. These additional costs are expected to include rock / clearing, obtaining access beneath third party assets (Queensland Rail, Main Roads), etc.

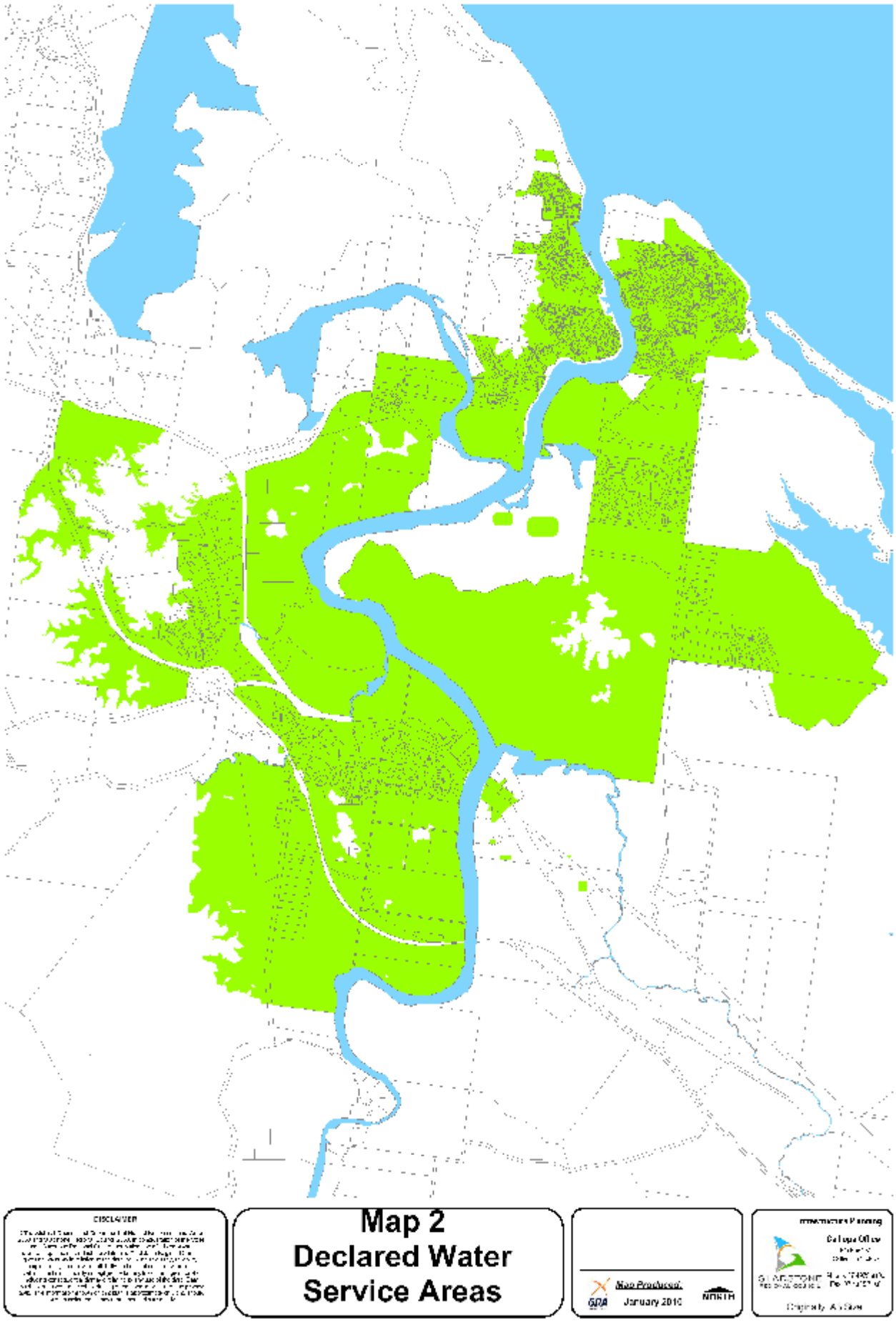
Appendices

A MAPS

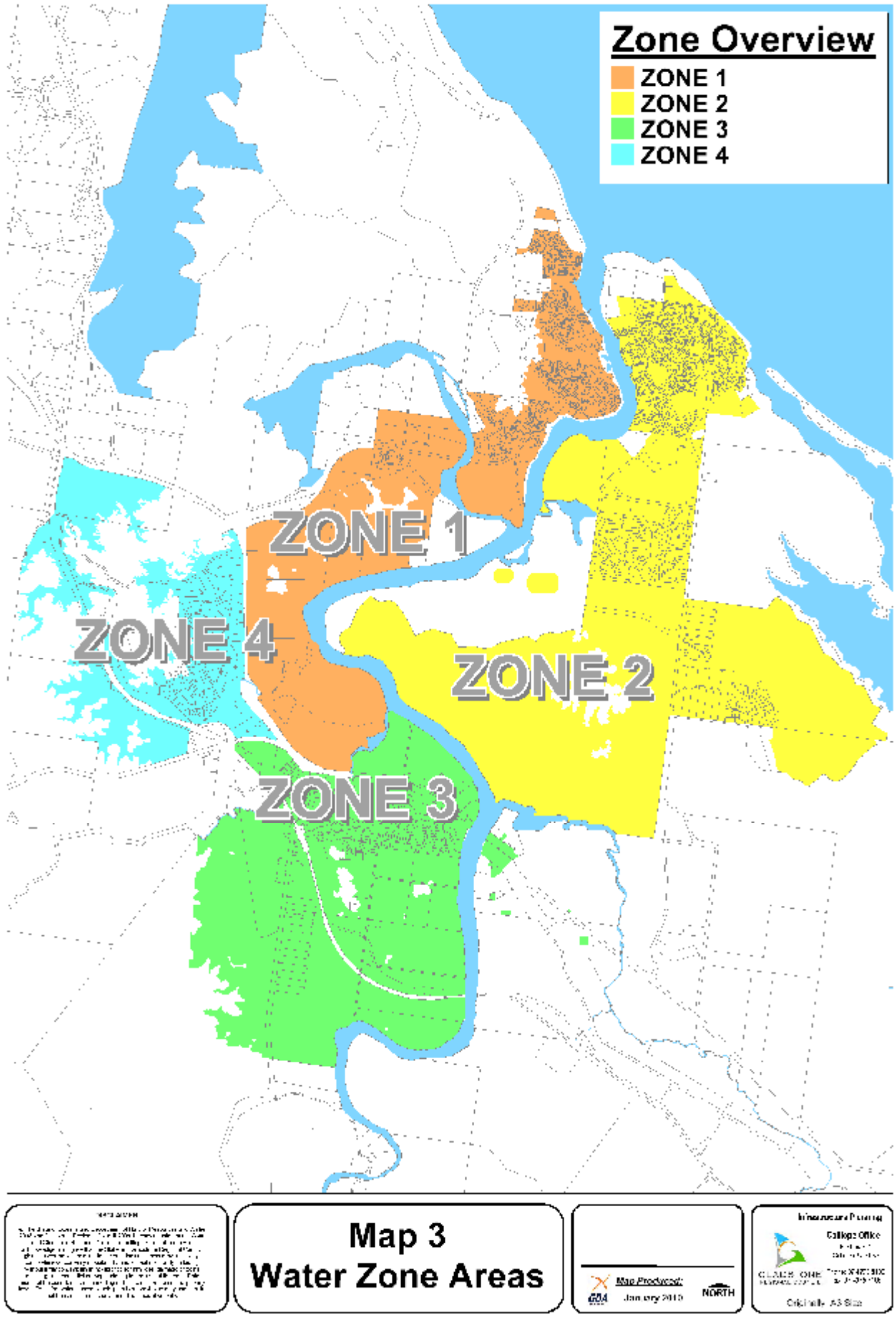
MAP 1 - Tannum Boyne Benaraby Wurdong Strategy Area



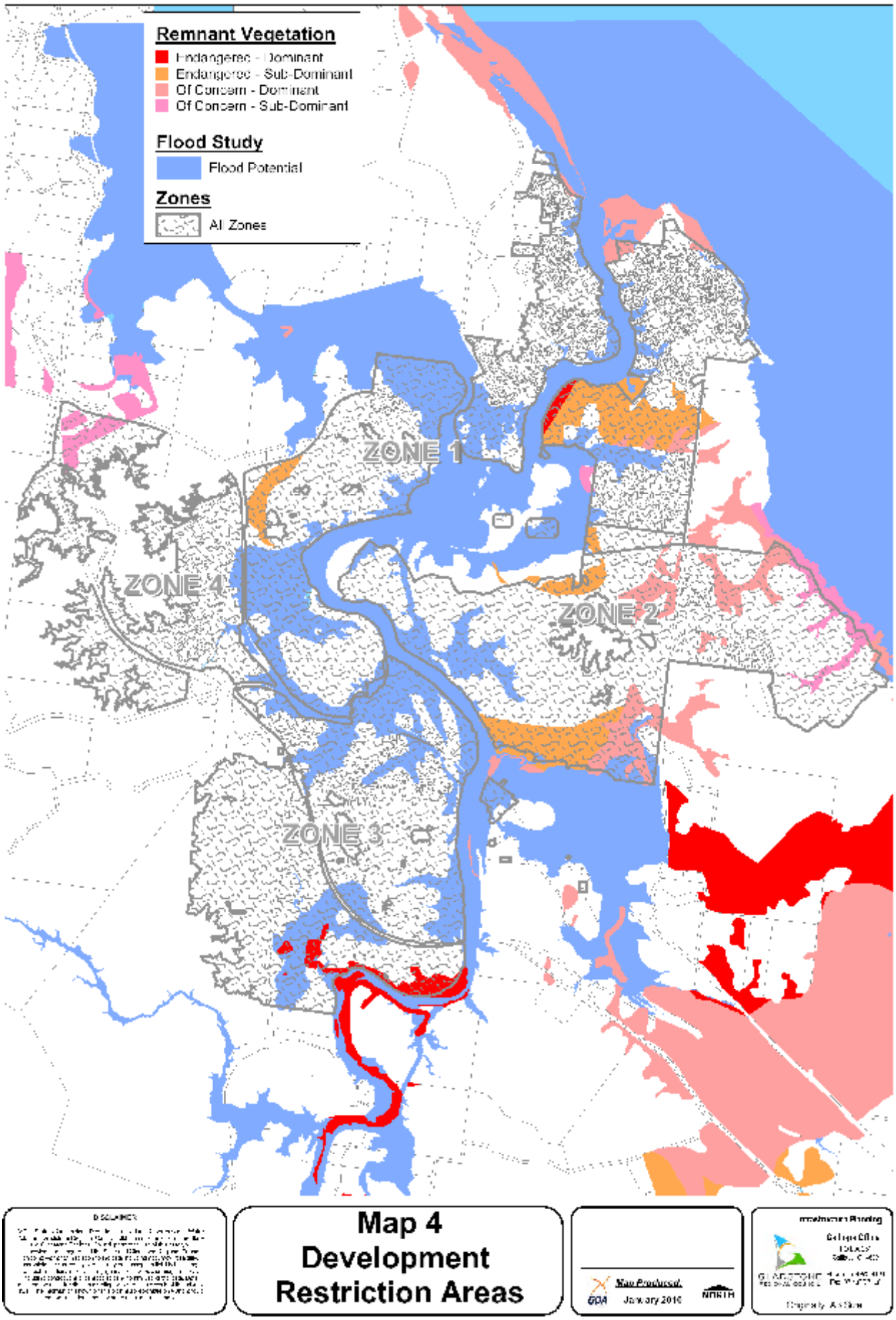
MAP 2 - Declared Water Service Area



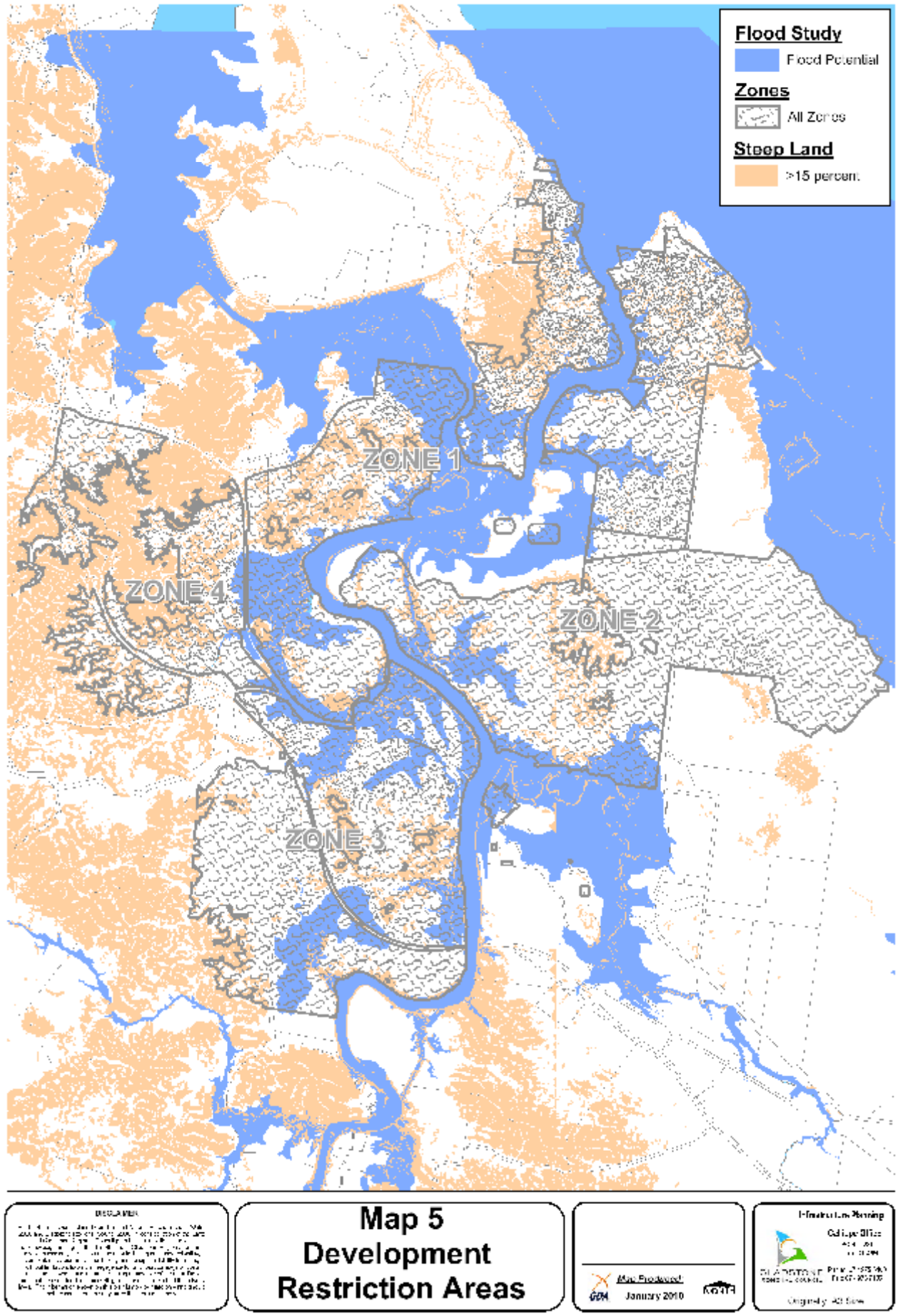
MAP 3 - Water Zone Areas



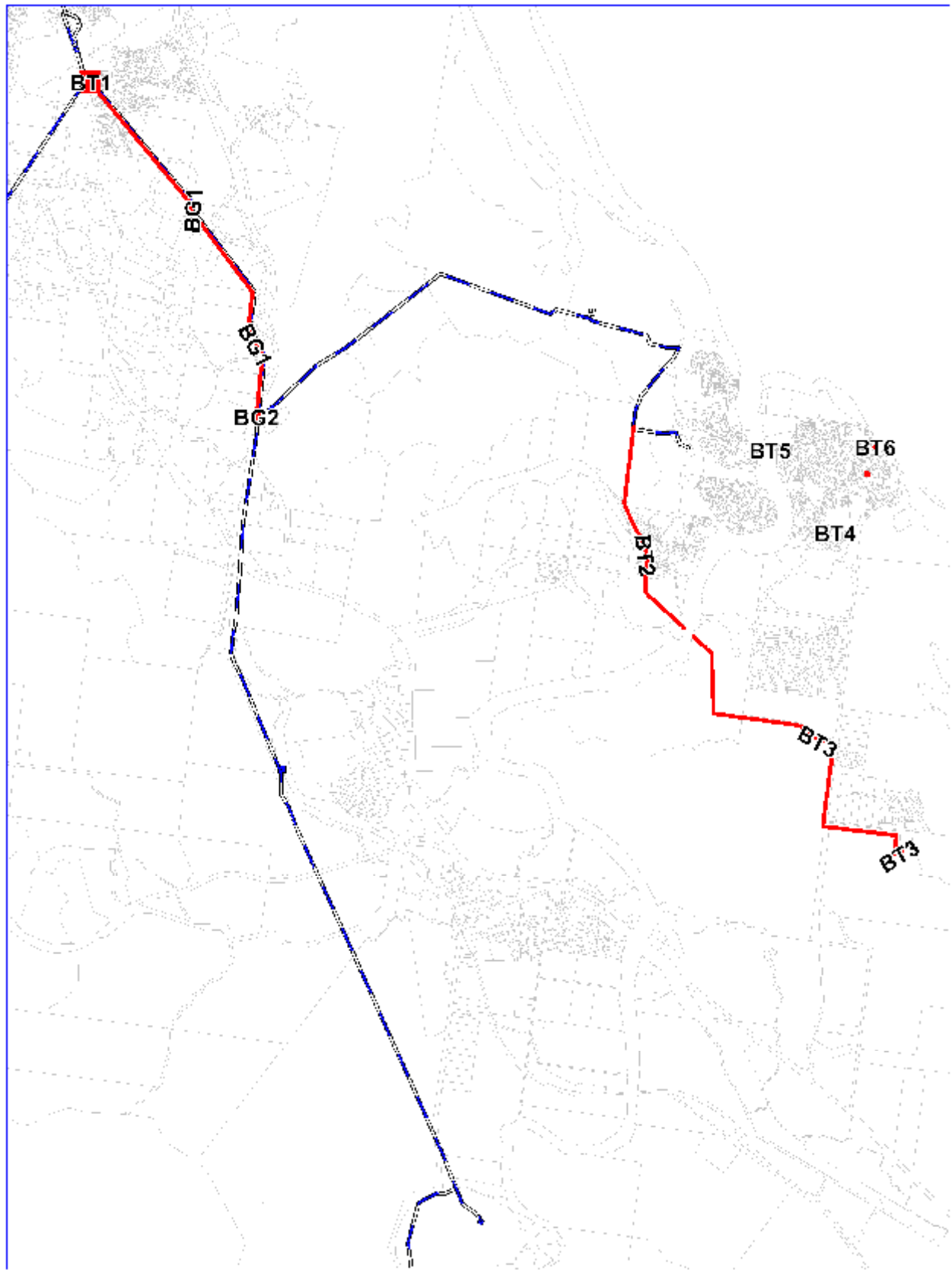
MAP 4 - Development Restriction Areas



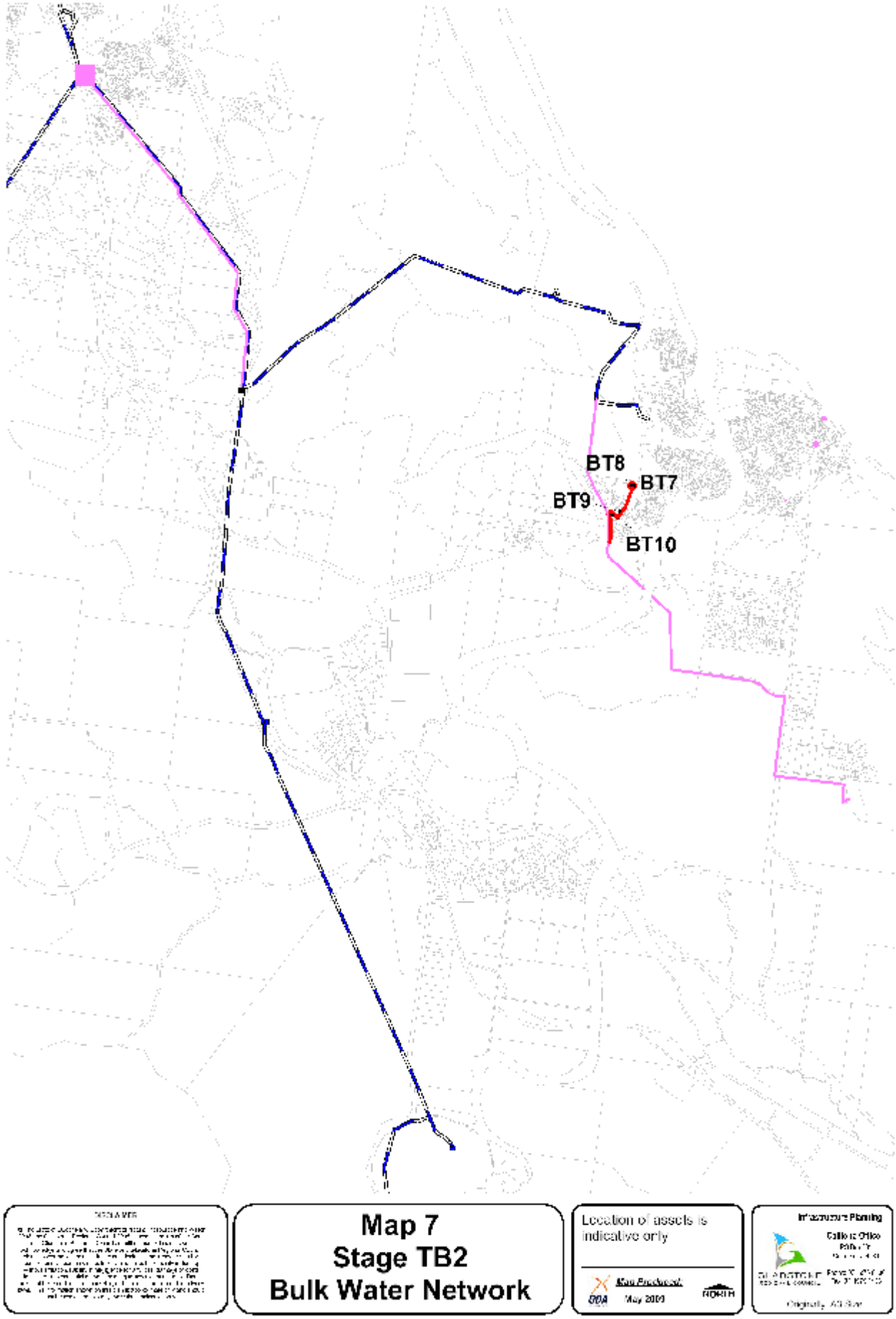
MAP 5 - Development Restriction Areas



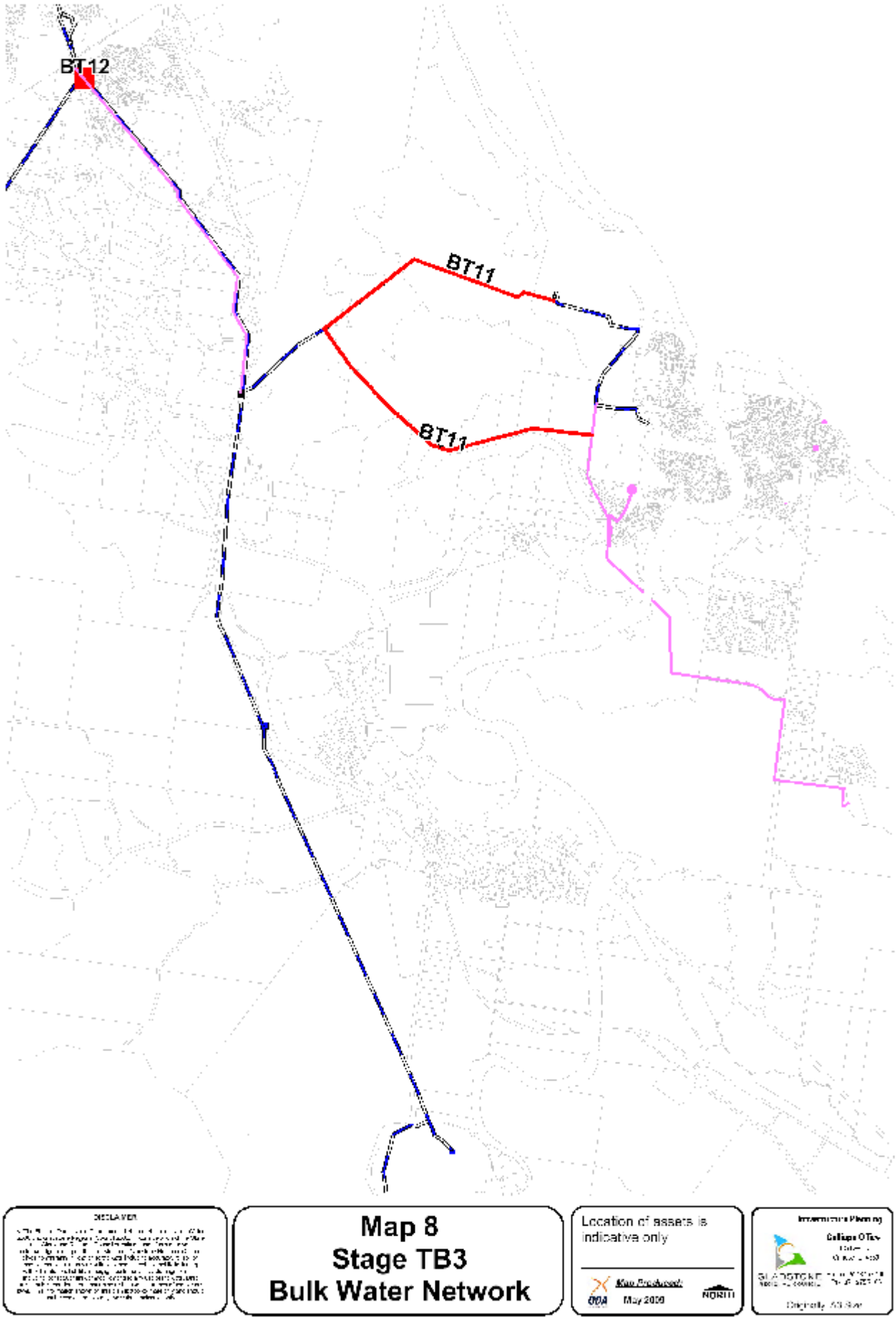
MAP 6 - Stage TB1 Bulk Water



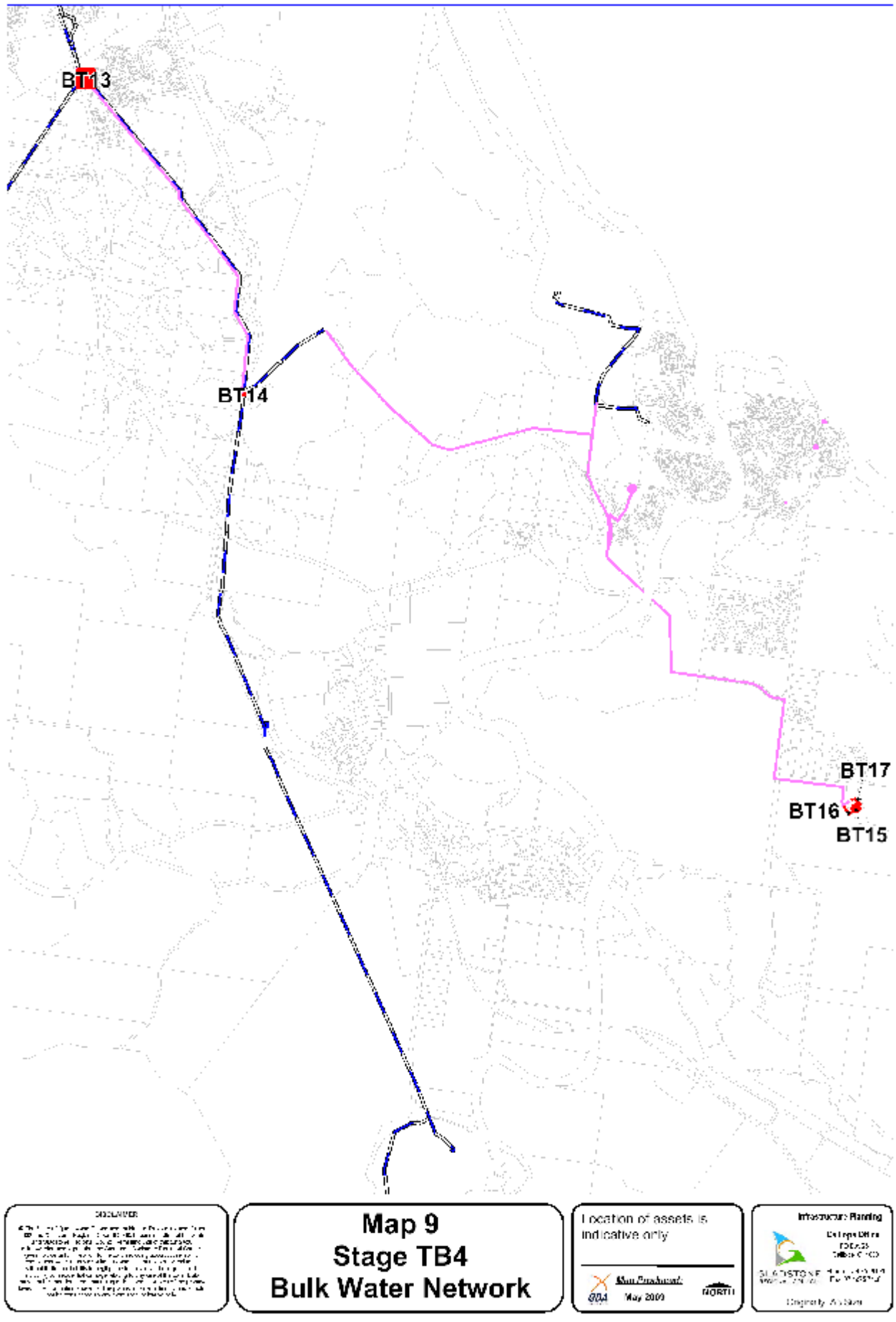
MAP 7 - Stage TB2 Bulk Water



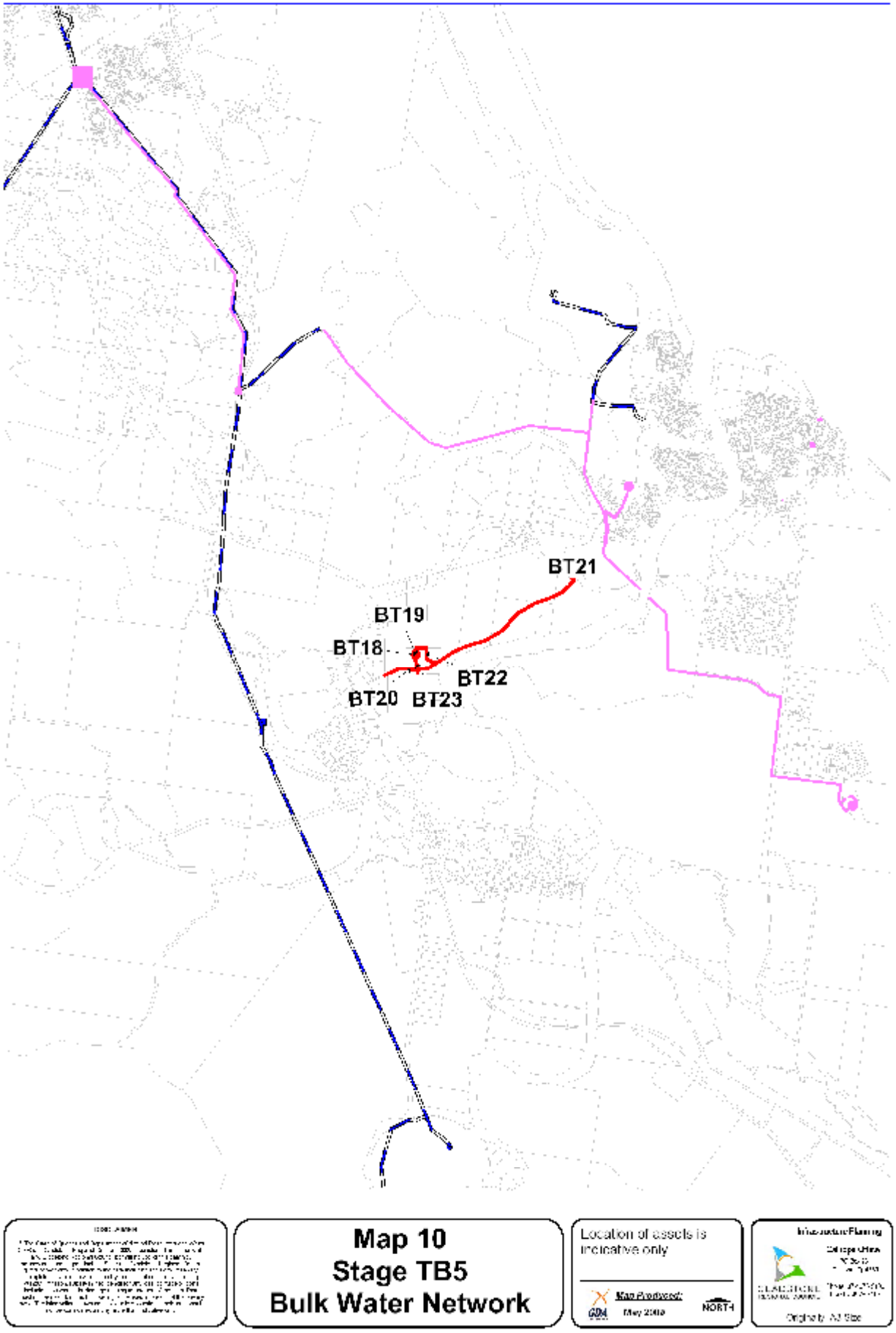
MAP 8 - Stage TB3 Bulk Water



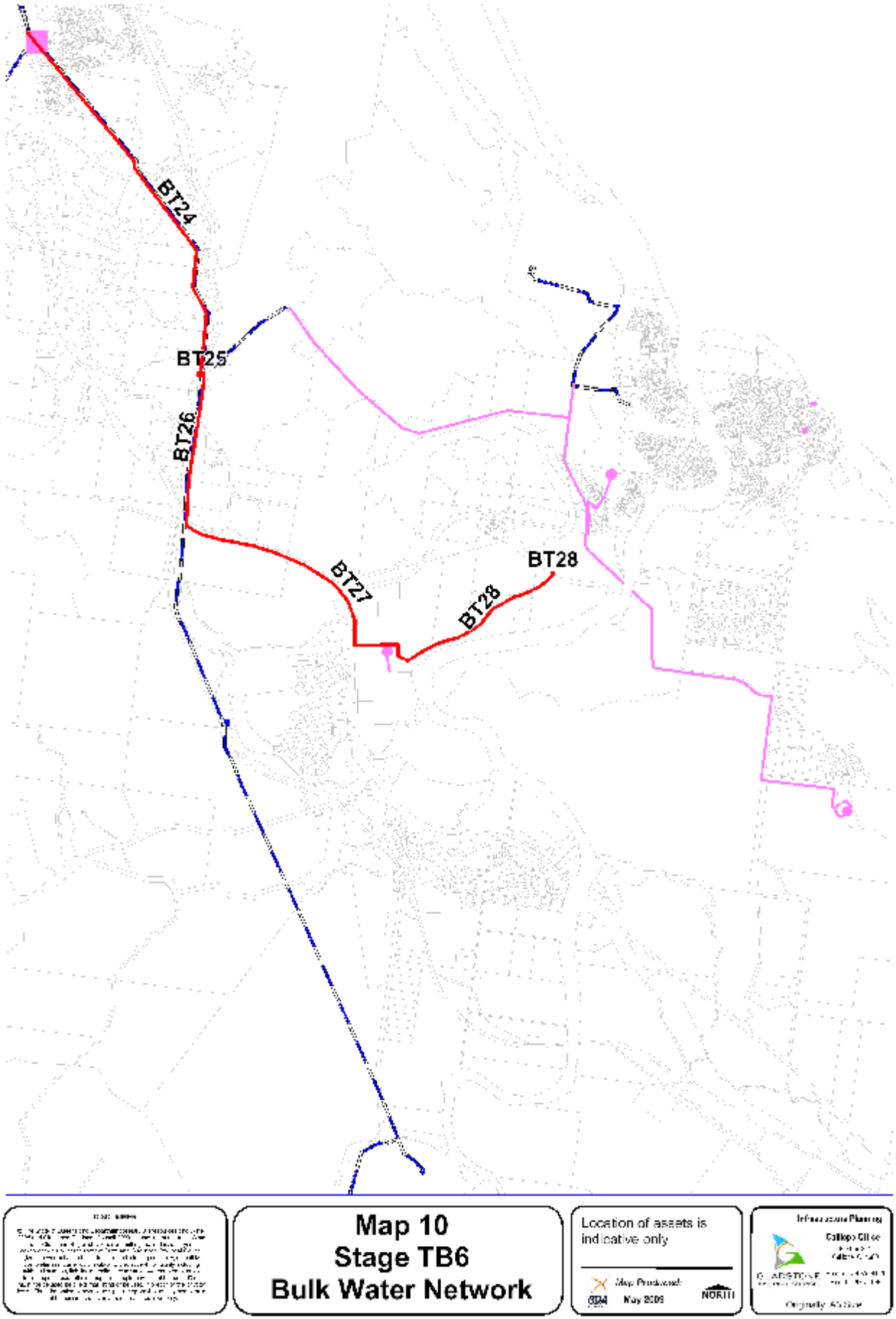
MAP 9 - Stage TB4 Bulk Water



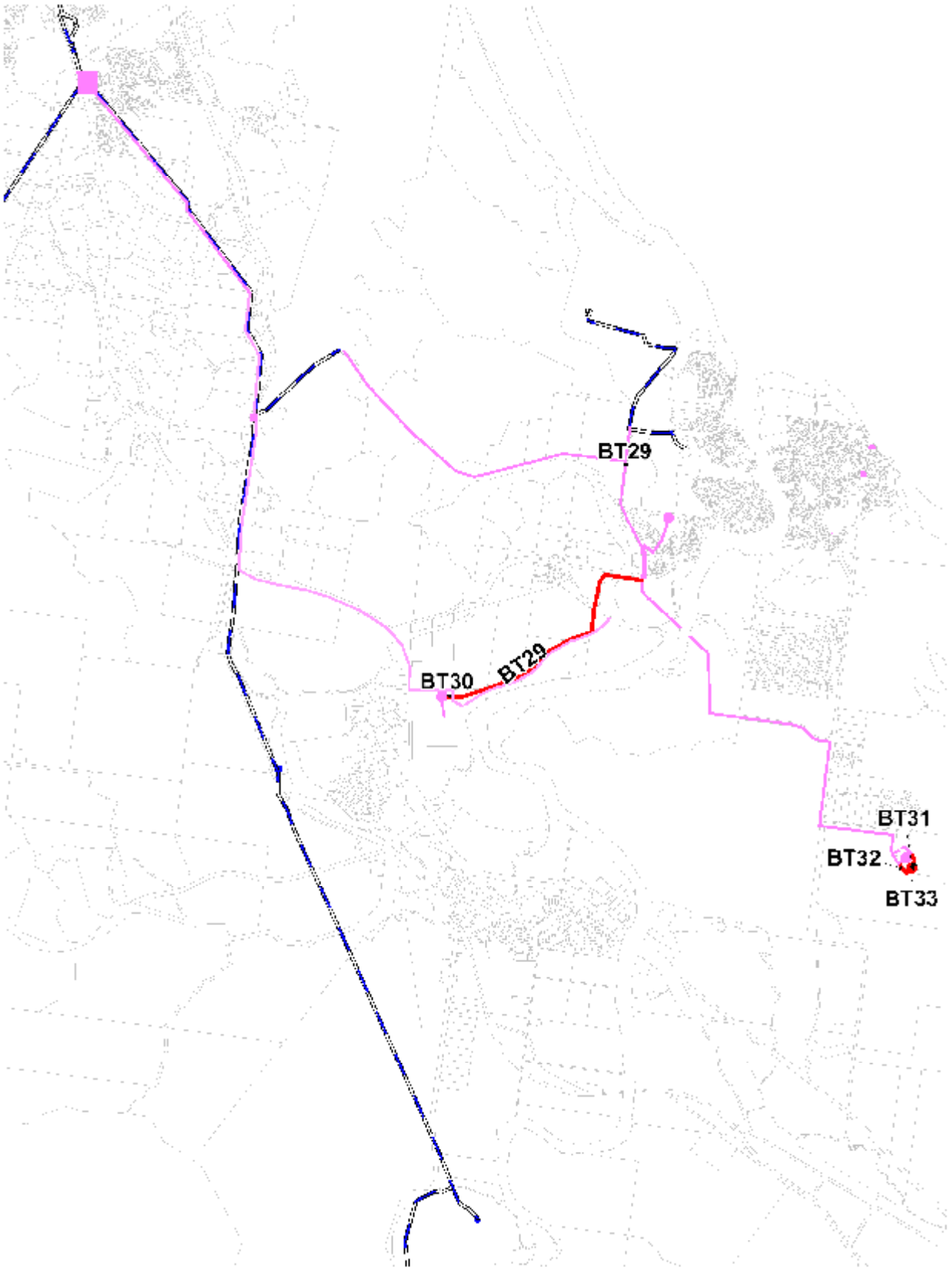
MAP 10 - Stage TB5 Bulk Water



MAP 11 - Stage TB6 Bulk Water



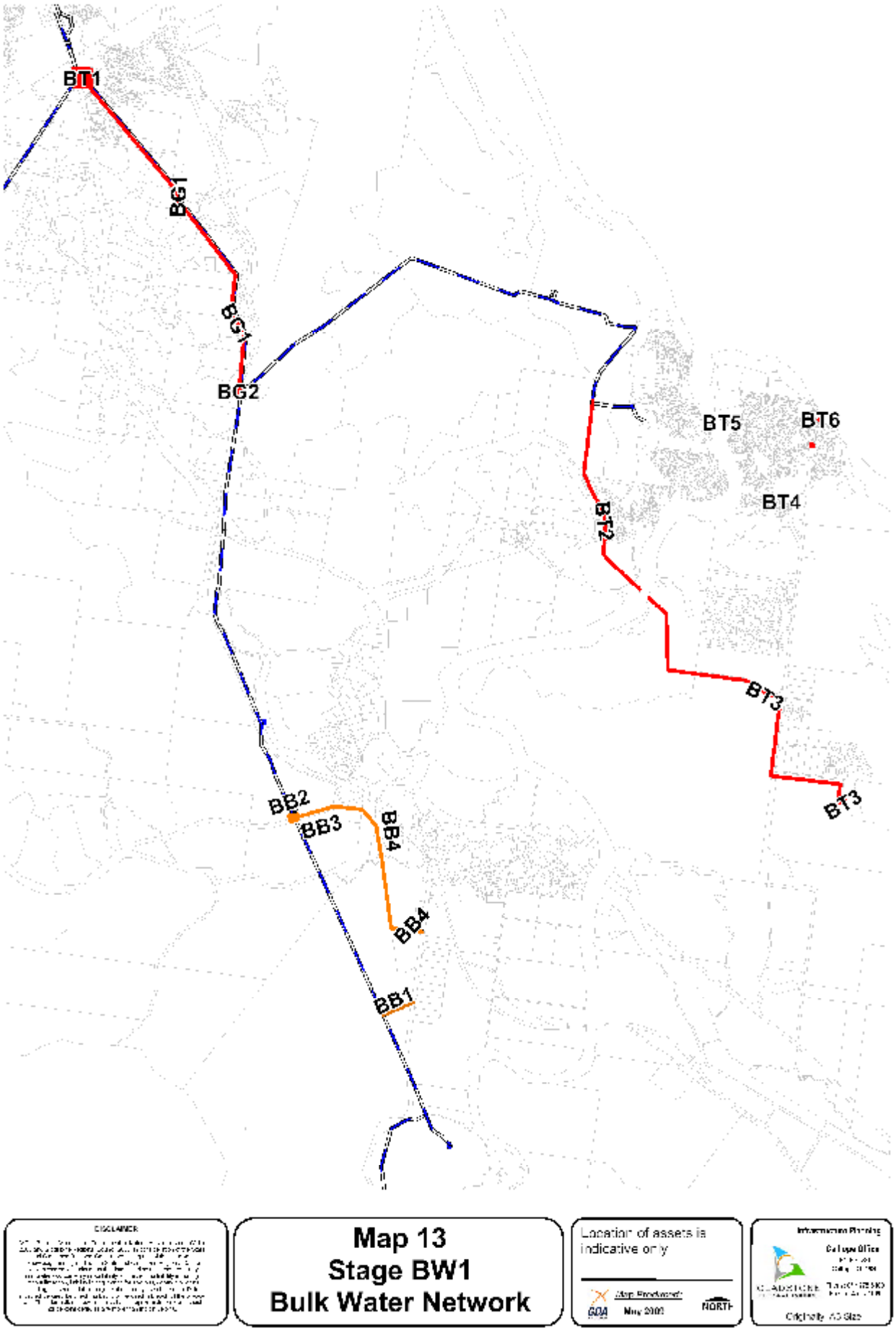
MAP 12 - Stage TB7 Bulk Water



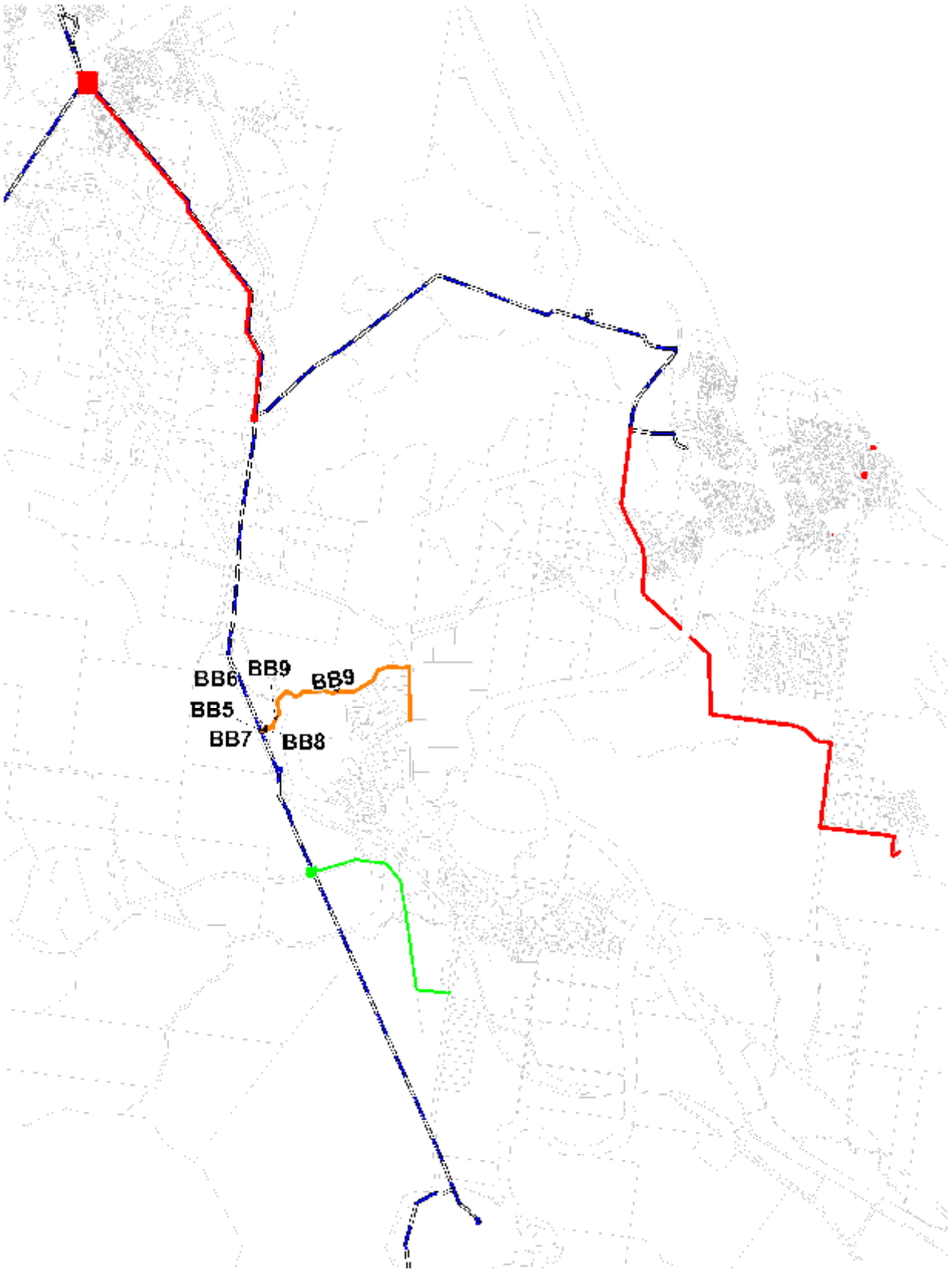
Map 12
Stage TB7
Bulk Water Network

Location of assets is indicative only

MAP 13 - Stage BW1 Bulk Water



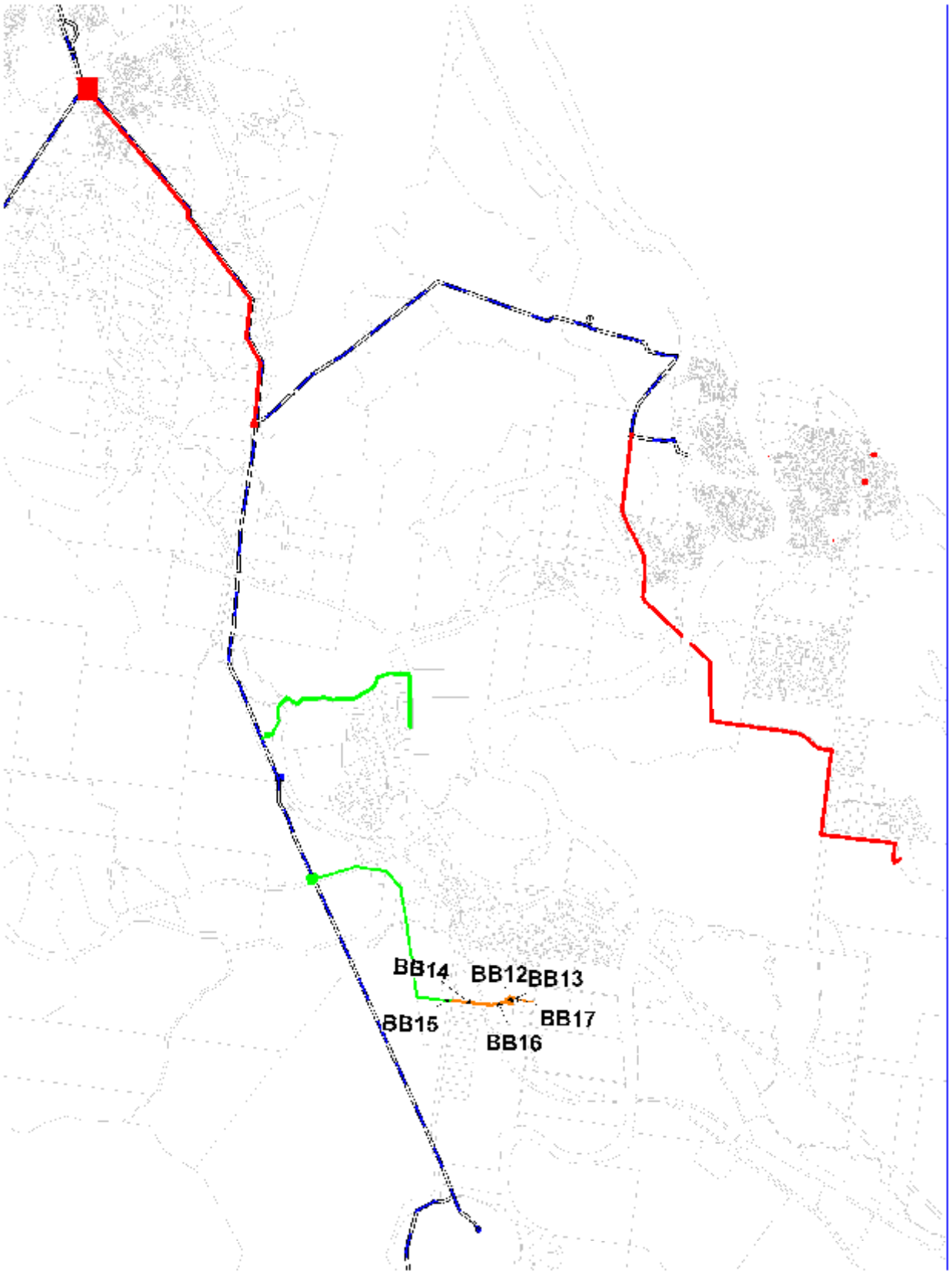
MAP 14 - Stage BW2 Bulk Water



Map 14
Stage BW2
Bulk Water Network

Location of assets is indicative only

MAP 15 - Stage BW3 Bulk Water



DISCLAIMER

Map 15
Stage BW3
Bulk Water Network

Location of assets is indicative only

Non Proposed

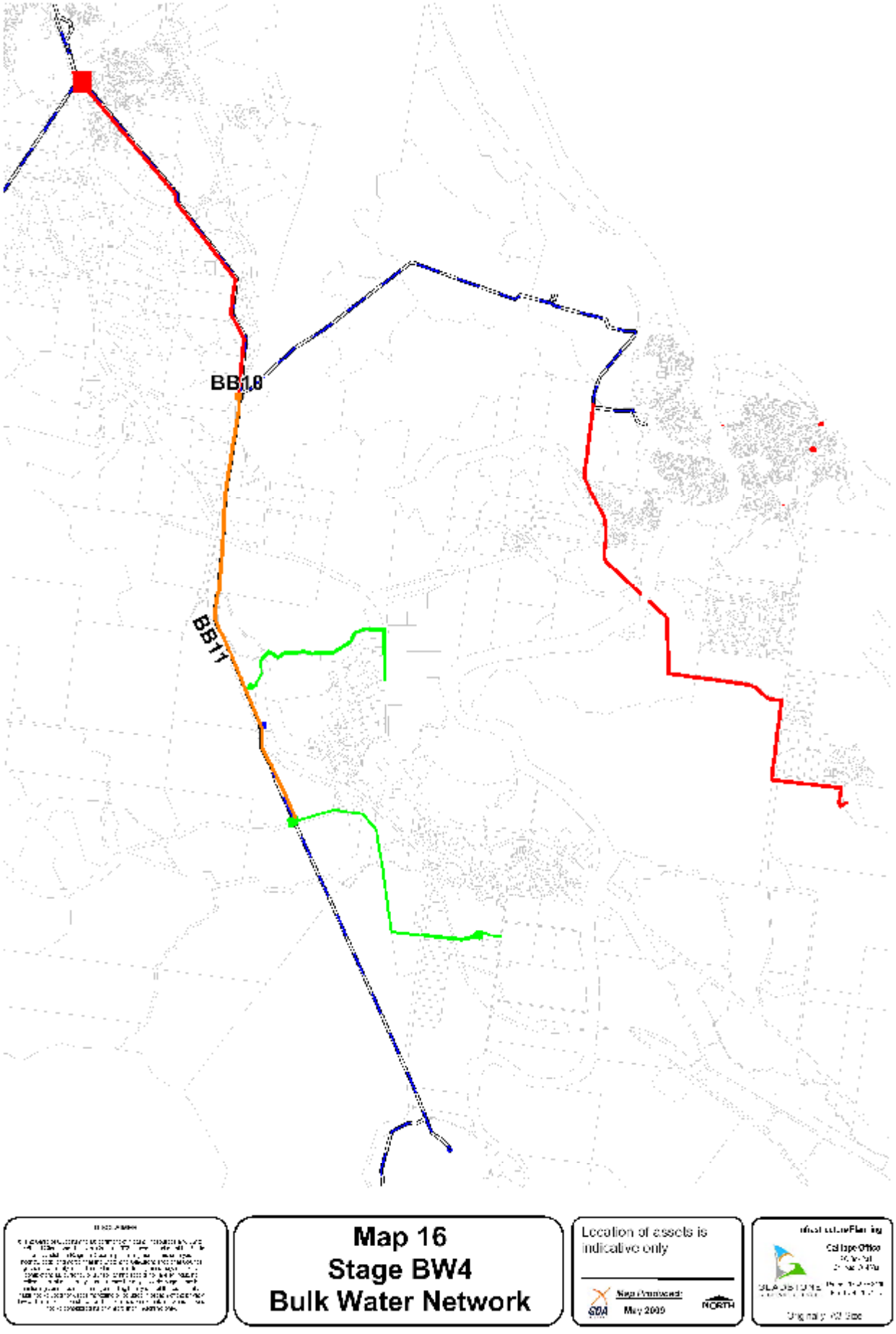
May 2009

NORTH

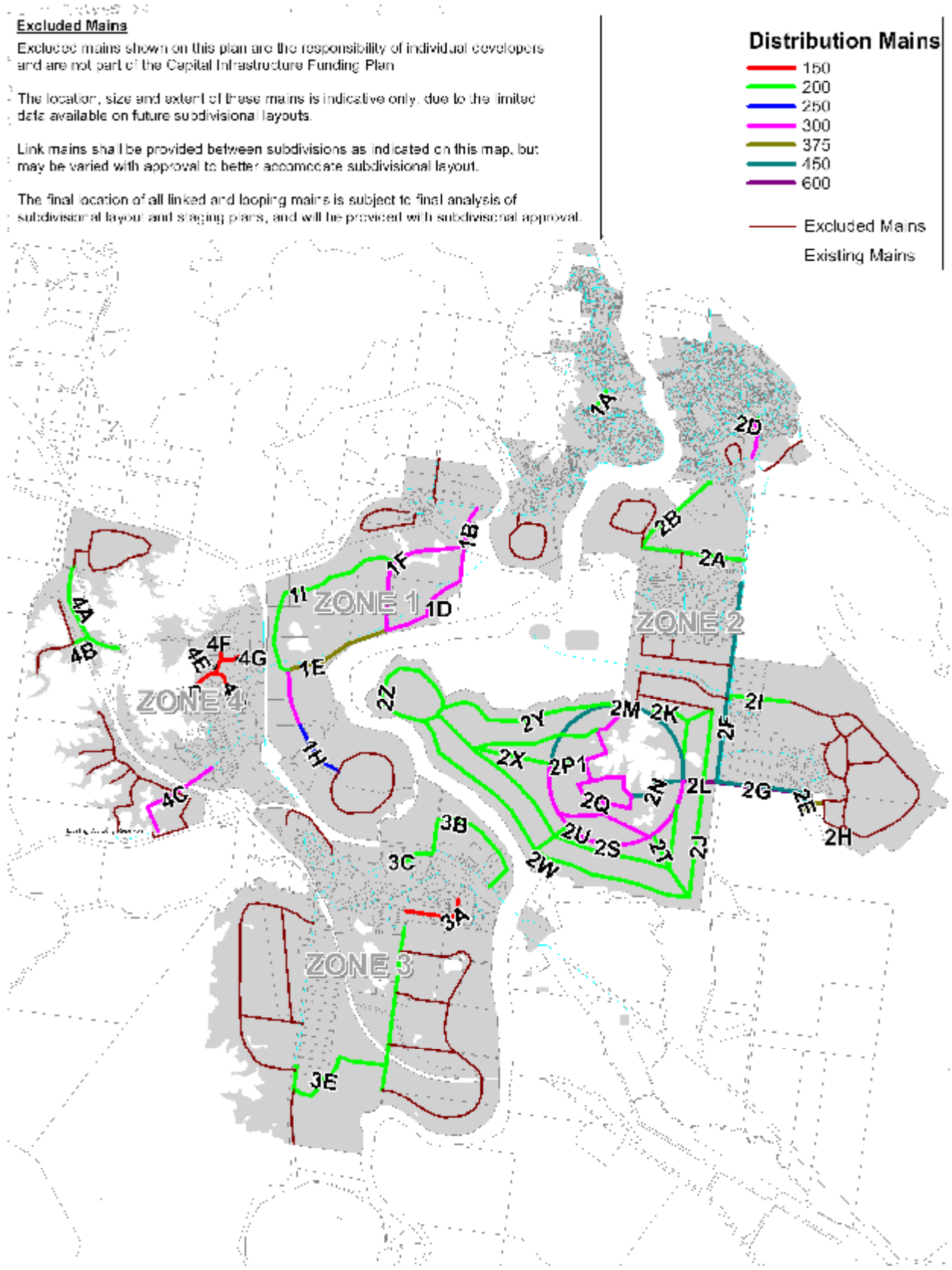
Infrastructure Planning

Original - A3 Size

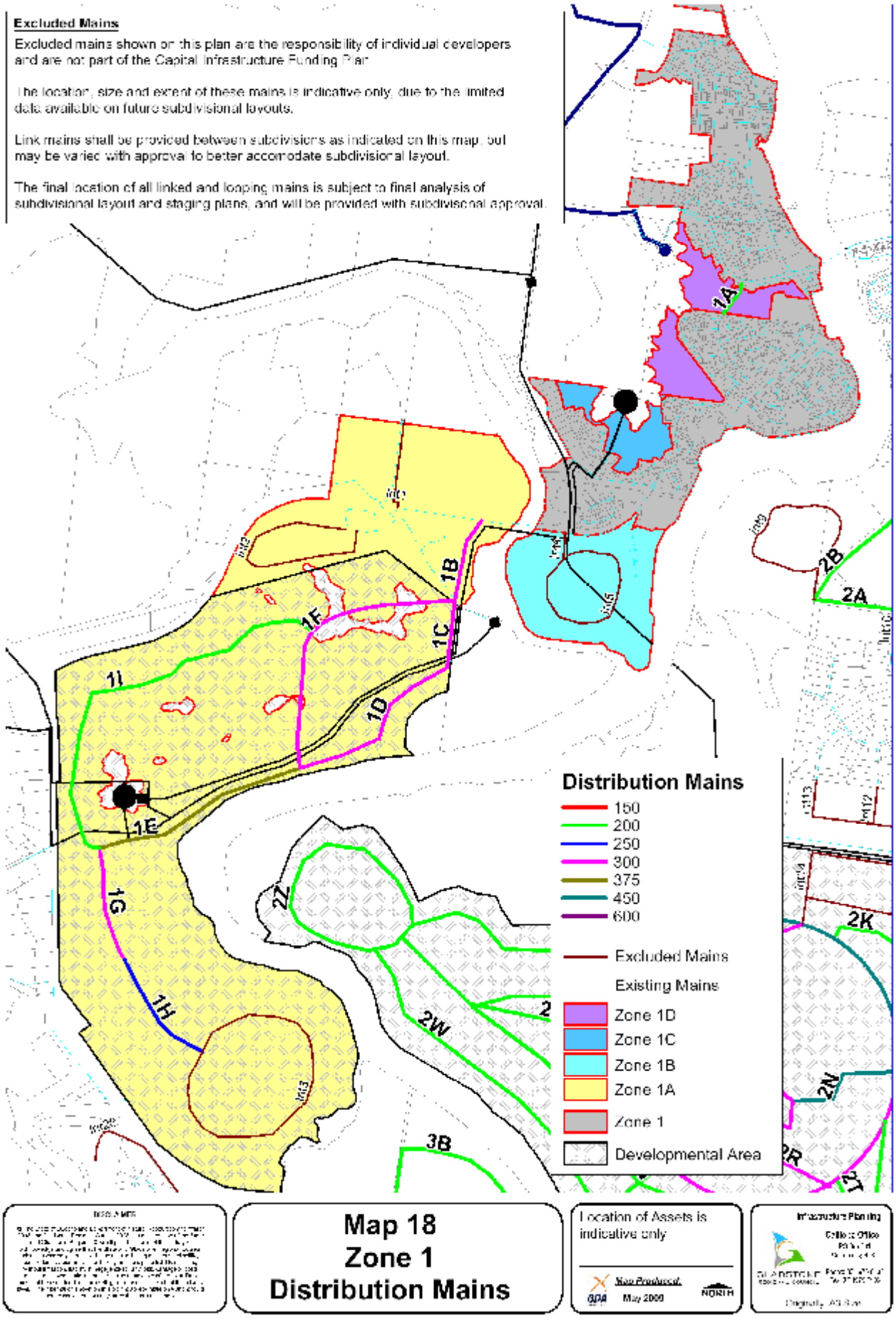
MAP 16 - Stage BW4 Bulk Water



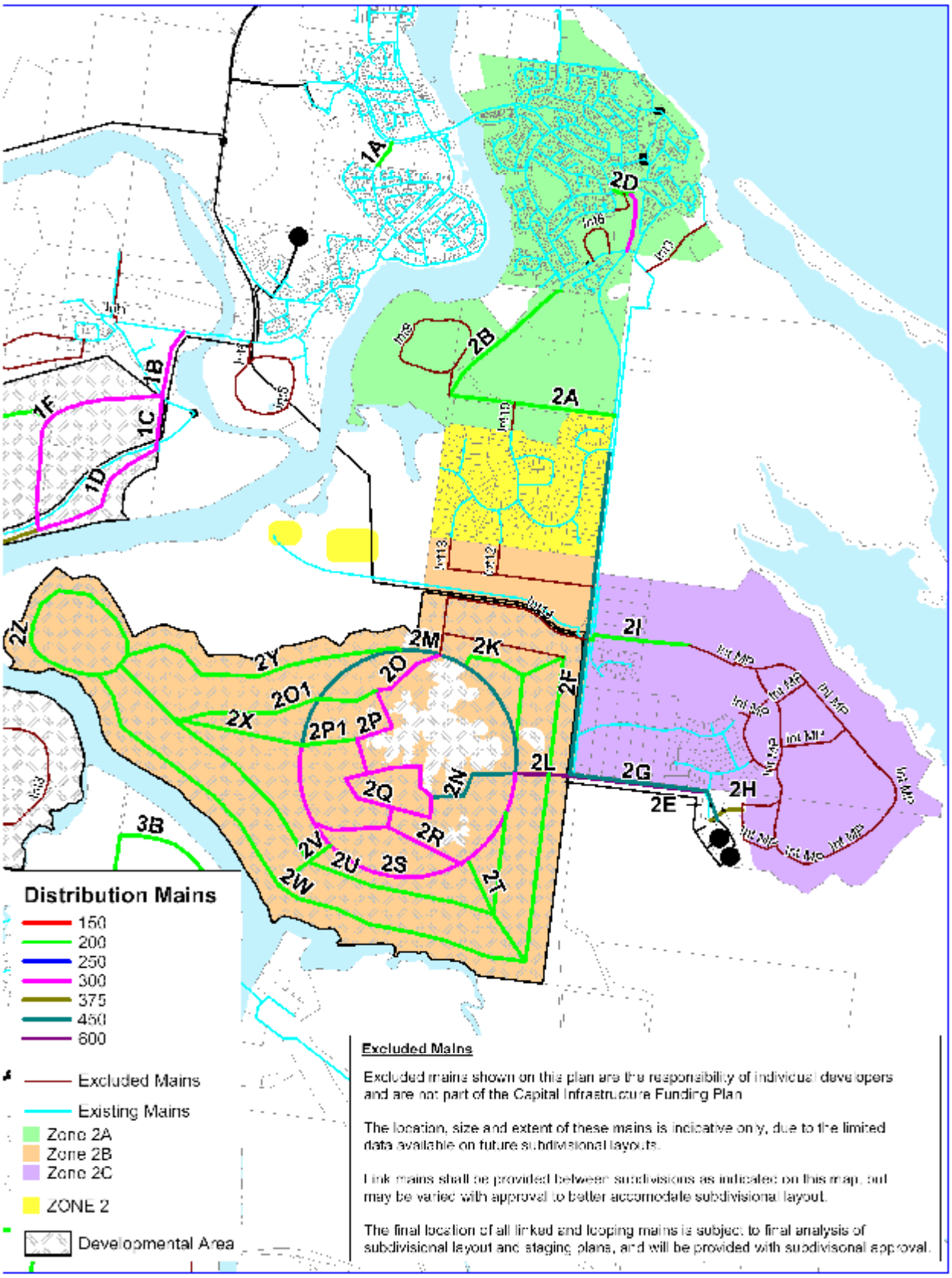
MAP 17 - All Zones Distribution Mains



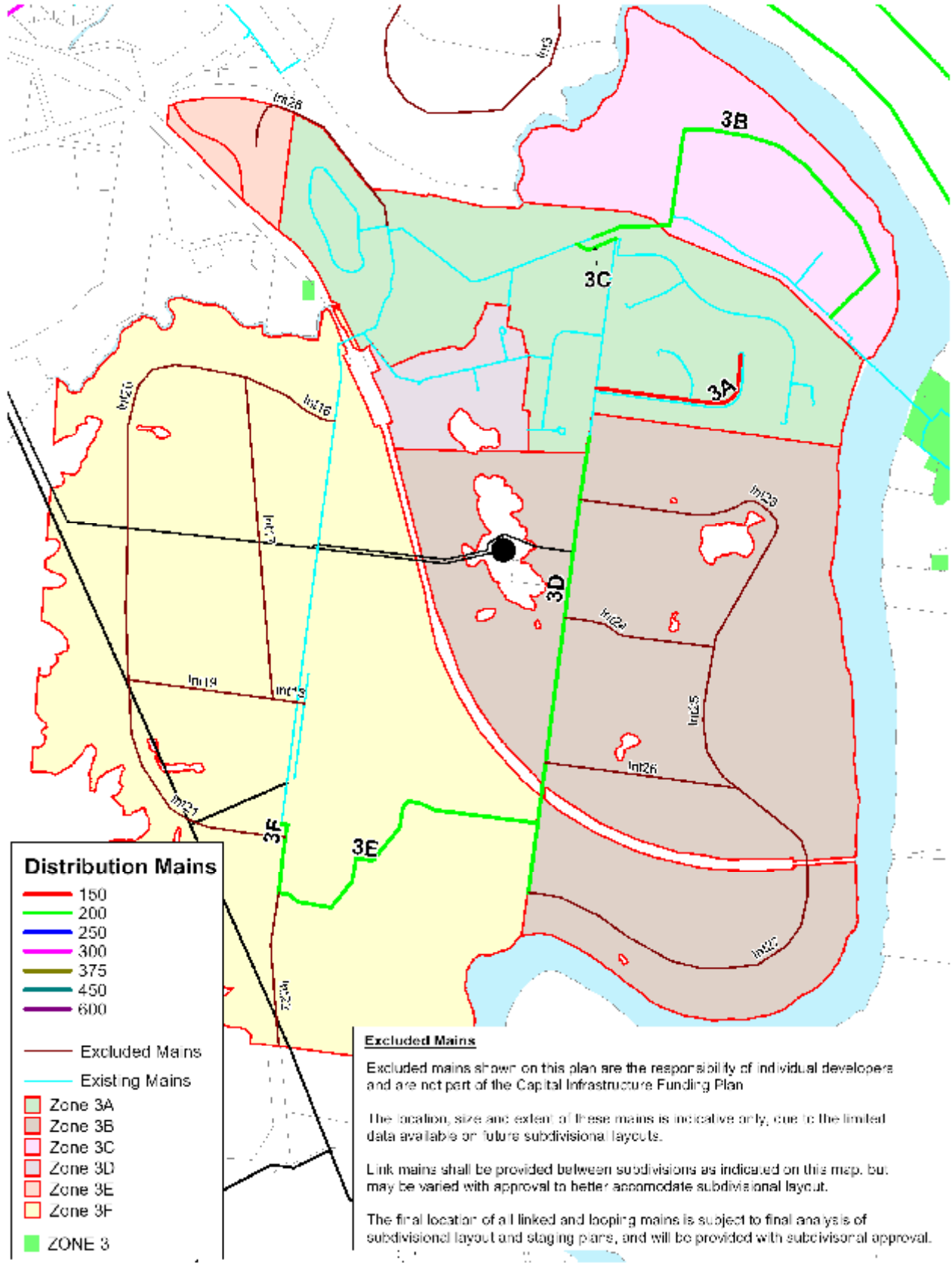
MAP 18 - Zone 1 Distribution Mains



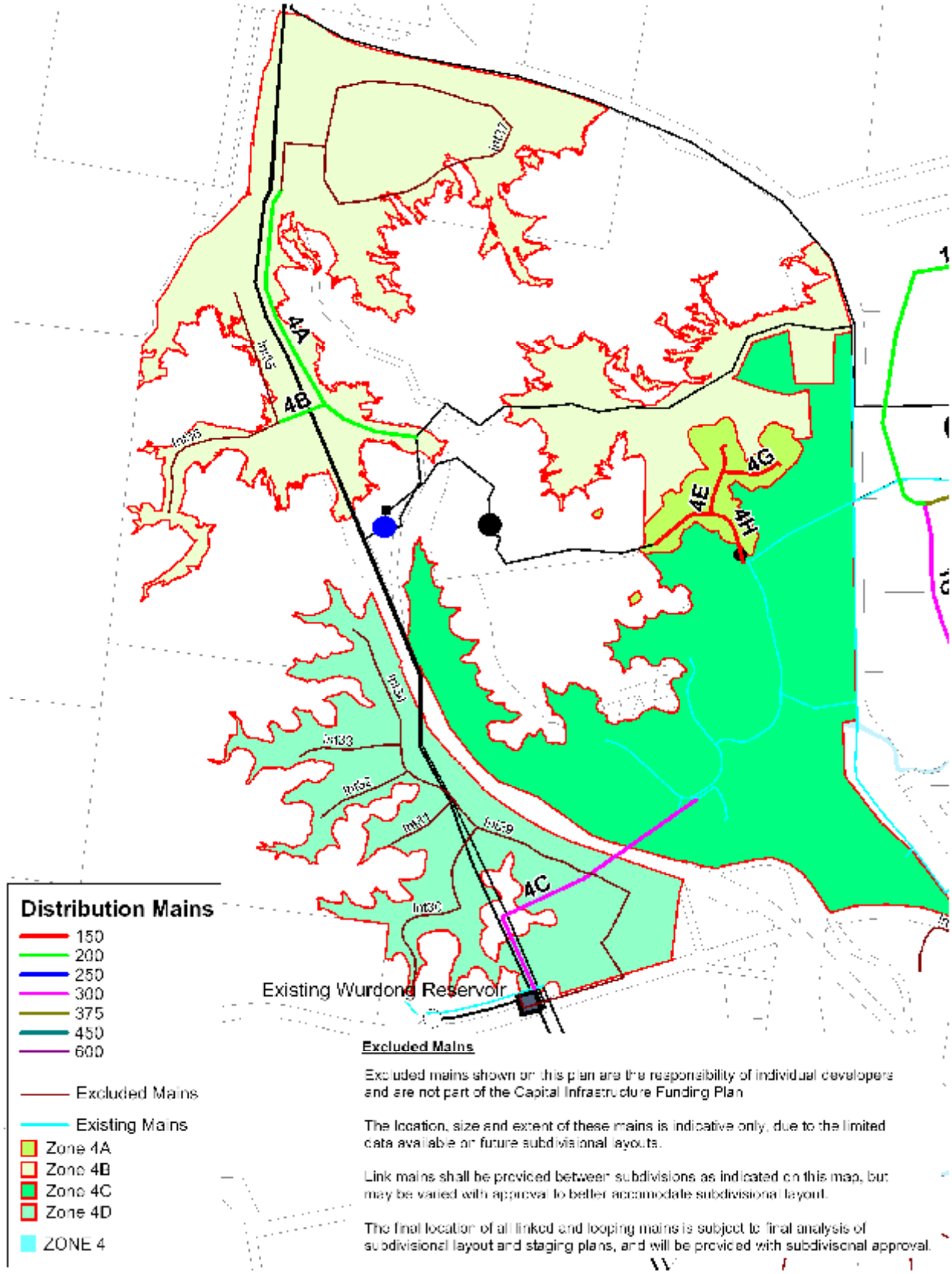
MAP 19 - Zone 2 Distribution Mains



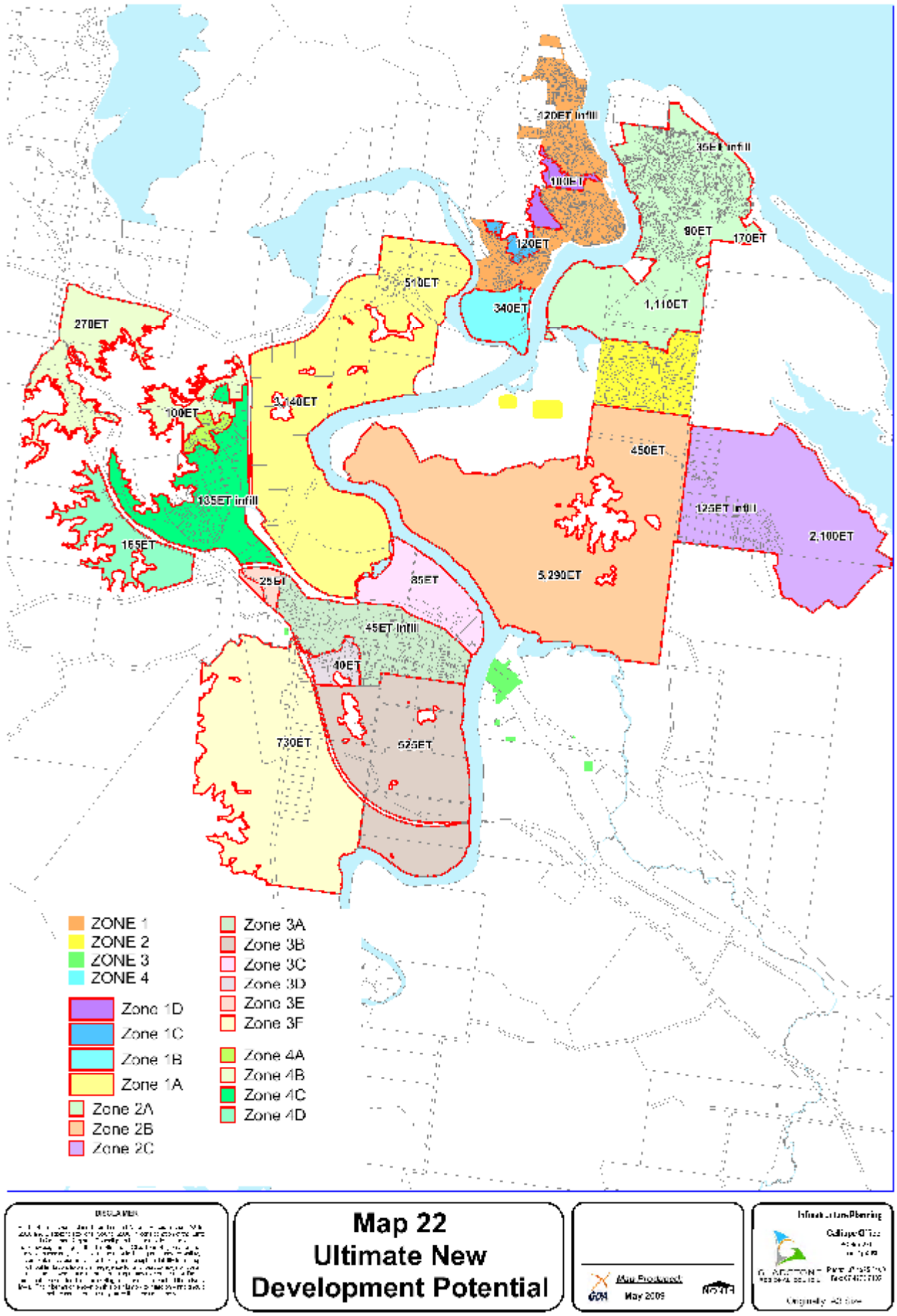
MAP 20 - Zone 3 Distribution Mains



MAP 21 - Zone 4 Distribution Mains



MAP 22 - Ultimate New Development Potential



B TABLES

Table B-1 Capital Infrastructure Plan - Bulk Water

	Description	Qty		Cost	Initial ET	Asset Trigger Point	Lots to Trigger Dev	Year	Comment
	TANNUM / BOYNE BULK WATER								
	Stg TB1 - 5,225 ET								
[BG1]	• Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works		item	**$0**	4,000	4,000	**0**	2007	300mm Main has had operational pressure derated This is need to be able to utilise the Glen Eden Boosters
[BG2]	• Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works		item	**$0**	4,000	4,000	**0**	2009	Booster provides too much pressure for 300NB main
[BT1]	• Re-commission Glen Eden Booster Pumps. GAWB Works.		item	**$0**	4,000	4,000	**0**	2009	Require increased flow
[BT2]	• 375NB rising main from GAWB Main to BITS Club.	3,180	m	**$2,222,000**	4,000	4,000	**0**	2009	Replace existing Broadacres feed with dedicated rising main.
[BT3]	• 450NB rising main from BITS Club to Broadacres Reservoir.	5,640	m	**$4,800,000**	4,000	4,000	**0**	2009	Replace existing Broadacres feed with dedicated rising main.
[BT4]	• Remove Coronation Drive pump station.		item	**$40,000**	4,000	4,000	**0**	2009	Replace existing Broadacres feed with dedicated rising main.
[BT5]	• Remove NRV's.		item	**$30,000**	4,000	4,000	**0**	2009	Boyne & Tannum operating as one network
[BT6]	• Remove zone separation in Tannum Sands.		item	**$6,000**	4,000	4,000	**0**	2009	Boyne & Tannum operating as one network
	Stg TB2 - 5,825 ET								**This is only influenced by Boyne Island Area Development**
[BT7]	• Acquisition of reservoir site on Lilly Hills.		item	**$225,000**	1,773	1,850	**77**	2010	Required to provide supply to South West Boyne Developments
[BT8]	• New 3ML Lilly Hills Reservoir.	3	ML	**$1,410,000**	1,773	1,850	**77**	2010	Required to provide supply to South West Boyne Developments
[BT9]	• 300NB Rising Main from Handley Drive to Lilly Hills Reservoir.	740	m	**$407,000**	1,773	1,850	**77**	2010	Connection of Reservoir via Rising Main
[BT10]	• 300NB Retic. Main from Lilly Hills Reservoir to 300NB main on Boyne Island Road.	1,120	m	**$615,000**	1,773	1,850	**77**	2010	Conenction of Reservoir to Network
	Stg TB3 - 6,925 ET								
[BT11]	• Upgrading and re-aligning the 375NB main passing adjacent the red mud dam. GAWB Works	4,860	m	**$0**	4,000	5,825	**1,825**	2020	Realingment required due to QAL works within RMD area. Upsizing to 450NB needed for increased demand.
[BT12]	• Upgrade Glen Eden booster pumps from 175 l/s to 200 l/s. GAWB works.	138	KW	**$0**	4,000	5,825	**1,825**	2020	Required due to increased demand.
	Stg TB4 - 8,950 ET								
[BT13]	• Decommission Glen Eden Booster. GAWB works		item	**$0**	4,000	6,925	**2,925**	2027	Relocation of Pumping Facilities, for improved hydraulics
[BT14]	• New Toolooa Booster Pump Station. GAWB works.	260	KW	**$0**	4,000	6,925	**2,925**	2027	Required to provide improved flow rates due to demand.
[BT15]	• Additional 15 ML Reservoir at Broadacres.	15	ML	**$3,800,000**	4,000	6,925	**2,925**	2027	Added alongside existing 6ML reservoir
[BT16]	• Extend 450NB rising main to new reservoir.	240	m	**$224,000**	4,000	6,925	**2,925**	2027	Connection of new reservoir to existing network
[BT17]	• 600NB retic. main linking 15ML & 6 ML Broadacres reservoirs.	200	m	**$265,000**	4,000	6,925	**2,925**	2027	Connection of new reservoir to existing network

	Description	Qty		Cost	Initial ET	Asset Trigger Point	Lots to Trigger Dev	Year	Comment
	TANNUM / BOYNE BULK WATER								
	Stg TB5 - 9,330 ET								**This is only influenced by Boyne Island Area, specifically 'Heidelberg' Development.**
[BT18]	• Acquire 'Heidelberg' Reservoir site land.		item	**$450,000**	1,773	2,230	**457**	2017	
[BT19]	• New 10ML "Heidelberg" Reservoir.	10	ML	**$3,000,000**	1,773	2,230	**457**	2017	Required to provide service to 'Heidelberg' development area.
[BT20]	• Recommission 200NB rising main South Trees Inlet to Gladstone-Benaraby Road.	2,480	m	**$75,000**	1,773	2,230	**457**	2017	Temporary fill line for reservoir
[BT21]	• Construct Temporary Pump Station at BITS.	44	KW	**$507,000**	1,773	2,230	**457**	2017	Required to ocercome elevation issues.
[BT22]	• New 200NB rising main Reservoir to [BT20].	500	m	**$165,000**	1,773	2,230	**457**	2017	Temporary fill line for reservoir
[BT23]	• New 450NB reticulation trunk main Reservoir to general retic.	220	m	**$176,000**	1,773	2,230	**457**	2017	Connection of Reservoir to network
	Stg TB6 - 12,080 ET								
[BT24]	• Upgrade South Gladstone to Toolooa main (300) to a 600NB main. GAWB Works	5,820	m	**$0**	4,000	9,330	**5,330**	2038	Rejoin both suction mains - requirement for suction head
[BT25]	• Additional pump set - Toolooa Pump Station to 'Heidelberg' Reservoir. GAWB Works		item	**$0**	4,000	9,330	**5,330**	2038	Required to provide frequired flow rate to Reservoir
[BT26]	• Install 600NB tee at Hughs Road for 'Heidelberg' Feed. GAWB Works		item	**$0**	4,000	9,330	**5,330**	2038	Connections between pumps and reservoir
[BT27]	• New 600NB rising main Toolooa Bends to 'Heidelberg' Reservoir	5,900	m	**$8,920,000**	4,000	9,330	**5,330**	2038	Connections between pumps and reservoir
[BT28]	• Decommission rising main [BT20] and 'BITS' pump station [BT21].		item	**$30,000**	4,000	9,330	**5,330**	2038	Removal of redundant assests.
	Stg TB7 - 17,630 ET								
[BT29]	• New 600NB rising main 'Heidelberg' to 450NB Broadacres rising main.	3,680	m	**$5,902,000**	4,000	12,080	**8,080**	2049	Makes Heildeberg main reservoir feeding broadacres and Lilly Hills Res
[BT30]	• New Pump Station 'Heidelberg' reservoir to Broadacres and Lilly Hills reservoirs.	254	KW	**$1,509,000**	4,000	12,080	**8,080**	2049	Required to ensure flow rates are achieved to other reservoirs.
[BT31]	• Additional 15ML reservoir at Broadacres site.	15	ML	**$3,800,000**	4,000	12,080	**8,080**	2049	Added alongside existing 6ML reservoir
[BT32]	• Extend 450NB rising main to new Reservoir. [BT30]	220	m	**$222,000**	4,000	12,080	**8,080**	2049	Connection of new reservoir to existing network
[BT33]	• Extend 600NB reticulation main to link all 3 Broadacres Reservoirs .	160	m	**$237,000**	4,000	12,080	**8,080**	2049	Connection of new reservoir to existing network

	Description	Qty		Cost	Initial ET	Asset Trigger Point	Lots to Trigger Dev	Year	Comment
	BENARABY / WURDONG BULK WATER								
	Stg BW1 - 945 ET								
[BB1]	• Decommission GAWB main - Golegumma line to Awoonga Dam Road. GAWB Works	500	m	**$0**	480	480	**0**	2009	Provides a reticulated flow of 33 l/s to Benaraby Wurdong
[BB2]	• New tee at Wurdong Reservoir takeoff and alterations for new 300NB reticulation main.	1	item	**$15,000**	480	480	**0**	2009	Removal of redundant assets.
[BB3]	• Alter Benaraby Booster - South Gladstone to Wurdong Reservoir.	60	m	**$30,000**	480	480	**0**	2009	Improve filling and transient charactreristics
[BB4]	• New 300NB trunk retic. main Wurdong Res Offtake to Awoonga Dam Road.	3,400	m	**$1,778,000**	480	480	**0**	2009	Improved flow to Benaraby Distribution system.
	Stg BW2 - 1,122 ET								**This is only influenced by Wurdong Heights Development.**
[BB5]	• Install 300NB metered tee for 'Low Level' Reservoir Feed. GAWB Works		item	**$0**	480	945	**465**	2030	supply connection for new reservoir
[BB6]	• Acquire land for 1.1ML low Level Reservoir.		item	**$150,000**	480	945	**465**	2030	Required to provide supply to Northern Wurdong Developments & service level to high level areas
[BB7]	• New 1.1ML low level Reservoir.	1.1	ML	**$820,000**	480	945	**465**	2030	Required to provide supply to Northern Wurdong Developments & service level to high level areas
[BB8]	• New 200NB main, from tee to 'Low Level' Reservoir.	40	m	**$20,000**	480	945	**465**	2030	supply connection for new reservoir
[BB9]	• Connection of Reservoir to Township Reticulation.	3,340	m	**$1,201,000**	480	945	**465**	2030	connection of reservoir to network
	Stg BW3 - 1,250 ET								**This is only influenced by Benaraby Development.**
[BB12]	• Acquire land for 6ML Benaraby Reservoir.		item	**$225,000**	480	1,122	**642**	2014	Required to provide demand of Southern Benaraby
[BB13]	• New 6ML Benaraby Reservoir.	6	ML	**$2,171,000**	480	1,122	**642**	2014	Required to provide demand of Southern Benaraby
[BB14]	• Extend 300NB Rising Main - Awoonga Dam Road to new Reservoir.	820	m	**$377,000**	480	1,122	**642**	2014	Connection of fill main to reservoir
[BB15]	• Decommission 300NB connection into 200NB Awoonga Dam Road main.		item	**$19,000**	480	1,122	**642**	2014	Required to ensure Benaraby Res feeds benaraby area, and rising main is dedicated.
[BB16]	• New 300NB retic. main - Benaraby Reservoir to 200NB main Awoonga Dam Road	920	m	**$423,000**	480	1,122	**642**	2014	Connection of Reservoir to network
[BB17]	• New 300NB retic. main - Benaraby Reservoir to Leferink Road	340	m	**$157,000**	480	1,122	**642**	2014	Connection of Reservoir to network
	Stg BW4 - 2,515 ET								
[BB10]	• New PS at Toolooa Bends, GAWB works.	135	KW	**$0**	480	1,250	**770**	2028	required to supply increased demand
[BB11]	• Upgrade feed main to Benaraby Booster. GAWB Works.	6,640	m	**$0**	480	1,250	**770**	2028	required to supply increased demand

Table B-2 Capital Infrastructure Plan - Distribution Network

	Description	Qty		Total Cost	Initial ET	Asset Trigger Point	Lots to Trigger Dev	Year	Comment
Zone 1 - Boyne Island (Max 6,035 ET)									
[1A]	• 200NB Curtis Ave link main.	240	m	**$120,000**	1773	1773	**0**	2008	Restores fireflows for southern areas of Boyne
[1B]	• 300NB main from Boyne Road to Pioneer Dr via Dennis Park.	560	m	**$277,000**	1773	2028	**255**	2014	Required when development commences
[1C]	• 300NB extension of main toward Cemetrery boundary.	560	m	**$312,000**	1773	2283	**510**	2017	Preliminary Capital Infrastructure
[1D]	• 300NB Heidelberg Distribution main.	1,100	m	**$554,000**	1773	2333	**560**	2018	Preliminary Capital Infrastructure
[1E]	• 375NB Heidelberg Distribution main.	1,420	m	**$986,000**	1773	2503	**730**	2020	Preliminary Capital Infrastructure
[1F]	• 300NB Heidelberg Distribution main.	1,860	m	**$895,000**	1773	2853	**1080**	2025	Preliminary Capital Infrastructure
[1G]	• 300NB Heidelberg Distribution main.	760	m	**$401,000**	1773	3973	**2200**	2037	Preliminary Capital Infrastructure
[1H]	• 250NB Heidelberg Distribution main.	800	m	**$375,000**	1773	4228	**2455**	2040	Preliminary Capital Infrastructure
[1I]	• 200NB Heidelberg Distribution main.	2,660	m	**$839,000**	1773	3323	**1550**	2030	Preliminary Capital Infrastructure
Zone 2 - Tannum Sands (Max 11,600 ET)									
[2A]	• 200NB main from Tannum Rd 450NB main along Dahl Rd.	1,340	m	**$392,000**	2225	2495	**270**	2011	Required on commencement of development in Zone 2A
[2B]	• 200NB main extension on Coronation Drive to Dahl Rd.	1,250	m	**$366,000**	2225	2795	**570**	2014	Allows continued development with respect to operational pressures
[2C]	• 300NB main linkage Tannum Rd b/w Coronation Dr and Hampton Dr.	490	m	**$220,000**	2225	2645	**420**	2013	
[2D]	• 200NB main linkage Hampton Dr b/w Pacific Ave and Cremorne Dr.	230	m	**$68,000**	2225	2565	**340**	2012	
[2E]	• 450NB main linkage from Broadacres Res. to Tannum Road	1,360	m	**$1,223,000**	2225	2450	**225**	2010	Complete 450NB retic link, 300NB can continue to operate
[2F]	• 450NB main extension Tannum Sands Road from Res. access to Silverton Dr.	2,600	m	**$1,847,000**	2225	2450	**225**	2010	
[2G]	• 600NB main along Broadacres Access Rd.	1,090	m	**$1,090,000**	2225	4665	**2440**	2033	Note requires 300NB in parallel to work for full development
[2H]	• 375NB main feed to Tannum Waters from Res.	300	m	**$196,000**	2225	2915	**690**	2016	Allows continued development of Tannum Waters (Zone 2C)
[2I]	• 200NB main link to Tannum Waters from Applin Pl.	840	m	**$246,000**	2225	2500	**275**	2011	
[2J]	• 200NB Turich Distribution Main.	3,510	m	**$1,027,000**	2225	2530	**305**	2011	
[2K]	• 200NB Turich Distribution Main.	1,480	m	**$664,000**	2225	5315	**3090**	2038	
[2L]	• 600NB Turich Distribution Main.	450	m	**$450,000**	2225	5115	**2890**	2037	
[2M]	• 450NB Turich Distribution Main.	2,740	m	**$1,946,000**	2225	5615	**3390**	2041	
[2N]	• 450NB Turich Distribution Main.	790	m	**$355,000**	2225	5915	**3690**	2043	
[2O]	• 300NB Turich Distribution Main.	620	m	**$279,000**	2226	5965	**3739**	2043	

	Description	Qty		Total Cost	Initial ET	Asset Trigger Point	Lots to Trigger Dev	Year	Comment
	Zone 2 - Tannum Sands (Max 11,600 ET)								
[2O1]	• 200NB Turich Distribution Main.	1,670	m	**$489,000**	2225	7775	**5550**	2054	
[2P]	• 300NB Turich Distribution Main.	630	m	**$283,000**	2227	6025	**3798**	2044	
[2P1]	• 200NB Turich Distribution Main.	450	m	**$132,000**	2225	7275	**5050**	2051	
[2Q]	• 300NB Turich Distribution Main.	2,150	m	**$965,000**	2228	6165	**3937**	2044	
[2R]	• 300NB Turich Distribution Main.	1,440	m	**$646,000**	2229	6265	**4036**	2045	
[2S]	• 300NB Turich Distribution Main.	2,890	m	**$1,297,000**	2230	6465	**4235**	2046	
[2T]	• 200NB Turich Distribution Main.	960	m	**$281,000**	2225	6715	**4490**	2048	
[2U]	• 200NB Turich Distribution Main.	3,950	m	**$1,156,000**	2226	6805	**4579**	2049	
[2V]	• 200NB Turich Distribution Main.	540	m	**$158,000**	2225	6975	**4750**	2050	
[2W]	• 200NB Turich Distribution Main.	4,380	m	**$1,282,000**	2225	7275	**5050**	2051	
[2X]	• 200NB Turich Distribution Main.	1,680	m	**$754,000**	2225	8375	**6150**	2056	
[2Y]	• 200NB Turich Distribution Main.	2,330	m	**$682,000**	2226	8275	**6049**	2055	
[2Z]	• 200NB Turich Distribution Main.	2,290	m	**$670,000**	2227	9075	**6848**	2057	
	Zone 3 - Benaraby (Max 1,705 ET)								
[3A]	• 150NB main from existing Leferink Rd along full length of Ronald Crs.	860	m	**$224,000**	348	350	**2**	2008	Fixes fireflow issues, due to dead end mains
[3B]	• 200NB loop main Harbottle Rd to Boyne River Bridge.	2,320	m	**$679,000**	348	428	**80**	2009	
[3C]	• 200NB upgrade of existing O'Connor Road main.	200	m	**$59,000**	348	388	**40**	2008	
[3D]	• 200NB main joining existing and [BB15] along Leferink Rd.	2,140	m	**$626,000**	348	690	**342**	2016	
[3E]	• 200NB main Leferink to Awoonga via "Owbridge" property.	1,540	m	**$451,000**	348	880	**532**	2025	
[3F]	• 200NB main from Awoonga Dam Rd existing main to main [3E].	360	m	**$106,000**	348	880	**532**	2025	
	Zone 4 - Wurdong (Max 810 ET)								
[4A]	• 300NB main from [BB7] to Northern section.	1,420	m	**$637,000**	130	303	**173**	2030	Allows further ROL of lower Wurdong Areas
[4B]	• 200NB main from [4L1] to Western section (under railway).	220	m	**$65,000**	130	328	**198**	2032	
[4C]	• 300NB main from Benaraby booster to current connection in Helen Cres.	1,320	m	**$593,000**	130	147	**17**	2009	Allows further ROL of lower existing Wurdong Areas
[4D]	• 150NB Yalkarra Crs upgrade.	300	m	**$78,000**	130	137	**7**	2008	Increases operational pressure and fireflows
[4E]	• 150NB Kanangra Rd upgrade.	200	m	**$52,000**	130	137	**7**	2008	Increases operational pressure and fireflows
[4F]	• 150NB Kanangra Rd upgrade.	140	m	**$37,000**	130	137	**7**	2008	Increases operational pressure and fireflows
[4G]	• 150NB Illoura Rd upgrade	260	m	**$68,000**	130	137	**7**	2008	Increases operational pressure and fireflows
[4H]	• 150NB Yalkarra Crs upgrade.	280	m	**$73,000**	130	137	**7**	2008	Increases operational pressure and fireflows

	Description	Qty		Total Cost	Initial ET	Asset Trigger Point	Lots to Trigger Dev	Year	Comment
	General								
G1	Oversizing of Minor mains 150NB to 200NB	4	item	$400,000					
G2	Installation of Minor mains 150NB	4	item	$520,000					

Table B-3 Capital Funding Plan

	Description	Works in Zone	Population in Zones 1	1(H)	2	2(T)	3	4	Funds Cost	Income	Fund Balance
	Water Fund Reserve (assumed)										
2007			**1773**	**0**	**2227**	**0**	**348**	**132**			**$2,000,000**
[BG1]	• Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works	TB							$ -		
2008			**1773**	**0**	**2227**	**0**	**348**	**132**	**$711,000**	**$0**	**$1,289,000**
[1A]	• 200NB Curtis Ave link main.	1							$ 120,000		
[3A]	• 150NB main from existing Leferink Rd along full length of Ronald Crs.	3							$ 224,000		
[3C]	• 200NB upgrade of existing O'Connor Road main.	3							$ 59,000		
[4D]	• 150NB Yalkarra Crs upgrade.	4							$ 78,000		
[4E]	• 150NB Kanangra Rd upgrade.	4							$ 52,000		
[4F]	• 150NB Kanangra Rd upgrade.	4							$ 37,000		
[4G]	• 150NB Illoura Rd upgrade	4							$ 68,000		
[4H]	• 150NB Yalkarra Crs upgrade.	4							$ 73,000		
2009			**1788**	**0**	**2312**	**0**	**412**	**139**	**$10,193,000**	**$783,349**	**-$8,120,651**
[3B]	• 200NB loop main Harbottle Rd to Boyne River Bridge.	3							$ 679,000		
[4C]	• 300NB main from Benaraby booster to current connection in Helen Cres.	4							$ 593,000		
[BB1]	• Decommission GAWB main - Golegumma line to Awoonga Dam Road. GAWB Works	BW							$ -		
[BB2]	• New tee at Wurdong Reservoir takeoff and alterations for new 300NB reticulation main.	BW							$ 15,000		
[BB3]	• Alter Benaraby Booster - South Gladstone to Wurdong Reservoir.	BW							$ 30,000		
[BB4]	• New 300NB trunk retic. main Golegumma Main to Awoonga Dam Road.	BW							$ 1,778,000		
[BG2]	• Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works	TB							$ -		
[BT1]	• Re-commission Glen Eden Booster Pumps. GAWB Works.	TB							$ -		
[BT2]	• 375NB rising main from GAWB Main to BITS Club.	TB							$ 2,222,000		
[BT3]	• 450NB rising main from BITS Club to Broadacres Reservoir.	TB							$ 4,800,000		
[BT4]	• Remove Coronation Drive pump station.	TB							$ 40,000		
[BT5]	• Remove NRV's.	TB							$ 30,000		
[BT6]	• Remove zone separation in Tannum Sands.	TB							$ 6,000		
2010			**1815**	**0**	**2390**	**0**	**474**	**149**	**$5,727,000**	**$809,772**	**-$13,037,879**
[2E]	• 450NB main linkage from Broadacres Res. to Tannum Road	2							$ 1,223,000		
[2F]	• 450NB main extension Tannum Sands Road from Res. access to Silverton Dr.	2							$ 1,847,000		
[BT7]	• Acquisition of reservoir site on Lilly Hills.	TB							$ 225,000		
[BT8]	• New 3ML Lilly Hills Reservoir.	TB							$ 1,410,000		
[BT9]	• 300NB Rising Main from Handley Drive to Lilly Hills Reservoir.	TB							$ 407,000		
[BT10]	• 300NB Retic. Main from Lilly Hills Reservoir to 300NB main on Boyne Island Road.	TB							$ 615,000		
2011			**1839**	**12**	**2474**	**0**	**528**	**159**	**$1,665,000**	**$829,414**	**-$13,873,465**
[2A]	• 200NB main from Tannum Rd 450NB main along Dahl Rd.	2							$ 392,000		
[2I]	• 200NB main link to Tannum Waters from Applin Pl.	2							$ 246,000		
[2J]	• 200NB Turich Distribution Main.	2(T)							$ 1,027,000		
2012			**1865**	**32**	**2558**	**0**	**571**	**169**	**$68,000**	**$811,308**	**-$13,130,157**
[2D]	• 200NB main linkage Hampton Dr b/w Pacific Ave and Cremorne Dr.	2							$ 68,000		
2013			**1907**	**52**	**2636**	**0**	**604**	**177**	**$220,000**	**$783,158**	**-$12,566,999**
[2C]	• 300NB main linkage Tannum Rd b/w Coronation Dr and Hampton Dr.	2							$ 220,000		
2014			**1953**	**72**	**2720**	**0**	**631**	**184**	**$4,015,000**	**$783,027**	**-$15,798,972**
[1B]	• 300NB main from Boyne Road to Pioneer Dr via Dennis Park.	1							$ 277,000		
[2B]	• 200NB main extension on Coronation Drive to Dahl Rd.	2							$ 366,000		
[BB12]	• Acquire land for 6ML Benaraby Reservoir.	BW							$ 225,000		
[BB13]	• New 6ML Benaraby Reservoir.	BW							$ 2,171,000		
[BB14]	• Extend 300NB Rising Main - Awoonga Dam Road to new Reservoir.	BW							$ 377,000		
[BB15]	• Decommission 300NB connection into 200NB Awoonga Dam Road main.	BW							$ 19,000		
[BB16]	• New 300NB retic. main - Benaraby Reservoir to 200NB main Awoonga Dam Road	BW							$ 423,000		
[BB17]	• New 300NB retic. main - Benaraby Reservoir to Leferink Road	BW							$ 157,000		
2016			**2038**	**122**	**2888**	**0**	**671**	**196**	**$822,000**	**$1,493,100**	**-$15,127,872**
[2H]	• 375NB main feed to Tannum Waters from Res.	2							$ 196,000		
[3D]	• 200NB main joining existing and [BB15] along Leferink Rd.	3							$ 626,000		
2017			**2080**	**147**	**2972**	**0**	**691**	**202**	**$4,685,000**	**$744,605**	**-$19,068,267**
[1C]	• 300NB extension of main toward Cemetrery boundary.	1(H)							$ 312,000		
[BT18]	• Acquire 'Heidelberg' Reservoir site land.	TB							$ 450,000		
[BT19]	• New 10ML "Heidelberg" Reservoir.	TB							$ 3,000,000		
[BT20]	• Recommission 200NB rising main South Trees Inlet to Gladstone-Benaraby Road.	TB							$ 75,000		
[BT21]	• Construct Temporary Pump Station at BITS.	TB							$ 507,000		
[BT22]	• New 200NB rising main Reservoir to [BT20].	TB							$ 165,000		
[BT23]	• New 450NB reticulation trunk main Reservoir to general retic.	TB							$ 176,000		
2018			**2118**	**177**	**3058**	**0**	**710**	**209**	**$554,000**	**$758,989**	**-$18,863,278**
[1D]	• 300NB Heidelberg Distribution main.	1(H)							$ 554,000		

	Description	Works in Zone	Population in Zones 1	1(H)	2	2(T)	3	4	Funds Cost	Income	Fund Balance
	Water Fund Reserve										-$18,863,278
2020			2179	257	3235	0	750	223	$986,000	$1,576,790	-$18,272,488
[BT11]	• Upgrading and re-aligning the 375NB main passing adjacent the red mud dam. GAWB Works	TB							$ -		
[BT12]	• Upgrade Glen Eden booster pumps from 175 l/s to 200 l/s. GAWB works.	TB							$ -		
[1E]	• 375NB Heidelberg Distribution main.	1(H)							$ 986,000		
2025			2352	467	3716	0	861	260	$1,452,000	$4,287,391	-$15,437,097
[1F]	• 300NB Heidelberg Distribution main.	1(H)							$ 895,000		
[3E]	• 200NB main Leferink to Awoonga via "Owbridge" property.	3							$ 451,000		
[3F]	• 200NB main from Awoonga Dam Rd existing main to main [3E].	3							$ 106,000		
2027			2419	567	3926	0	910	276	$4,289,000	$1,876,744	-$17,849,353
[BT13]	• Decommission Glen Eden Booster. GAWB works	TB							$ -		
[BT14]	• New Toolooa Booster Pump Station. GAWB works.	TB							$ -		
[BT15]	• Additional 15 ML Reservoir at Broadacres.	TB							$ 3,800,000		
[BT16]	• Extend 450NB rising main to new reservoir.	TB							$ 224,000		
[BT17]	• 600NB retic. main linking 15ML & 6 ML Broadacres reservoirs.	TB							$ 265,000		
2028			2440	632	4014	20	935	284	$0	$995,755	-$16,853,598
[BB10]	• New PS at Toolooa Bends, GAWB works.	BW							$ -		
[BB11]	• Upgrade feed main to Benaraby Booster. GAWB Works.	BW							$ -		
2030			2486	762	4191	65	985	302	$3,667,000	$2,049,040	-$18,471,558
[BB5]	• Install 300NB metered tee for 'Low Level' Reservoir Feed. GAWB Works	BW							$ -		
[BB6]	• Acquire land for 1.1ML low Level Reservoir.	BW							$ 150,000		
[BB7]	• New 1.1ML low level Reservoir.	BW							$ 820,000		
[BB8]	• New 200NB main, from tee to 'Low Level' Reservoir.	BW							$ 20,000		
[BB9]	• Connection of Reservoir to Township Reticulation.	BW							$ 1,201,000		
[4A]	• 300NB main from [BB7] to Northern section.	4							$ 637,000		
[1I]	• 200NB Heidelberg Distribution main.	1(H)							$ 839,000		
2032			2537	892	4365	120	1038	320	$65,000	$2,125,518	-$16,411,040
[4B]	• 200NB main from [4L1] to Western section (under railway).	4							$ 65,000		
2033			2564	957	4451	150	1065	329	$1,090,000	$1,080,502	-$16,420,538
[2G]	• 600NB main along Broadacres Access Rd.	2(T)							$ 1,090,000		
2037			2643	1257	4782	295	1174	366	$851,000	$4,473,979	-$12,797,559
[1G]	• 300NB Heidelberg Distribution main.	1(H)							$ 401,000		
[2L]	• 600NB Turich Distribution Main.	2(T)							$ 450,000		
2038			2662	1337	4867	335	1203	376	$9,614,000	$1,179,704	-$21,231,855
[2K]	• 200NB Turich Distribution Main.	2(T)							$ 664,000		
[BT24]	• Upgrade South Gladstone to Toolooa main (300) to a 600NB main. GAWB Works	TB							$ -		
[BT25]	• Additional pump set - Toolooa Pump Station to 'Heidelberg' Reservoir. GAWB Works	TB							$ -		
[BT26]	• Install 600NB tee at Hughs Road for 'Heidelberg' Feed. GAWB Works	TB							$ -		
[BT27]	• New 600NB rising main Toolooa Bends to 'Heidelberg' Reservoir	TB							$ 8,920,000		
[BT28]	• Decommission rising main [BT20] and 'BITS' pump station [BT21].	TB							$ 30,000		
2040			2698	1507	5037	425	1263	396	$375,000	$2,458,170	-$19,148,685
[1H]	• 250NB Heidelberg Distribution main.	1(H)							$ 375,000		
2041			2715	1597	5122	475	1293	407	$1,946,000	$1,278,955	-$19,815,730
[2M]	• 450NB Turich Distribution Main.	2(T)							$ 1,946,000		
2043			2752	1782	5287	590	1356	429	$634,000	$2,666,593	-$17,783,137
[2N]	• 450NB Turich Distribution Main.	2(T)							$ 355,000		
[2O]	• 300NB Turich Distribution Main.	2(T)							$ 279,000		
2044			2772	1877	5362	660	1389	441	$1,248,000	$1,400,273	-$17,630,864
[2P]	• 300NB Turich Distribution Main.	2(T)							$ 283,000		
[2Q]	• 300NB Turich Distribution Main.	2(T)							$ 965,000		
2045			2790	1977	5431	740	1423	453	$646,000	$1,448,514	-$16,828,350
[2R]	• 300NB Turich Distribution Main.	2(T)							$ 646,000		
2046			2811	2077	5493	830	1458	465	$1,297,000	$1,490,640	-$16,634,710
[2S]	• 300NB Turich Distribution Main.	2(T)							$ 1,297,000		
2048			2852	2287	5589	1050	1531	490	$281,000	$3,143,053	-$13,772,657
[2T]	• 200NB Turich Distribution Main.	2(T)							$ 281,000		
2049			2872	2397	5623	1180	1569	503	$12,826,000	$1,652,413	-$24,946,244
[2U]	• 200NB Turich Distribution Main.	2(T)							$ 1,156,000		
[BT29]	• New 600NB rising main 'Heidelberg' to 450NB Broadacres rising main.	TB							$ 5,902,000		
[BT30]	• New Pump Station 'Heidelberg' reservoir to Broadacres and Lilly Hills reservoirs.	TB							$ 1,509,000		
[BT31]	• Additional 15ML reservoir at Broadacres site.	TB							$ 3,800,000		
[BT32]	• Extend 450NB rising main to new Reservoir. [BT30]	TB							$ 222,000		
[BT33]	• Extend 600NB reticulation main to link all 3 Broadacres Reservoirs .	TB							$ 237,000		
2050			2890	2512	5652	1320	1607	517	$158,000	$1,705,033	-$23,399,211
[2V]	• 200NB Turich Distribution Main.	2(T)							$ 158,000		
2051			2895	2643	5675	1470	1646	531	$1,414,000	$1,758,169	-$23,055,042
[2P1]	• 200NB Turich Distribution Main.	2(T)							$ 132,000		
[2W]	• 200NB Turich Distribution Main.	2(T)							$ 1,282,000		
2054			2895	3073	5710	1980	1705	640	$489,000	$5,639,689	-$17,904,353
[2O1]	• 200NB Turich Distribution Main.	2(T)							$ 489,000		

	Description	Works in Zone	Population in Zones 1	1(H)	2	2(T)	3	4	Funds Cost	Income	Fund Balance
	Water Fund Reserve										-$17,904,353
2055			**2895**	**3140**	**5764**	**2200**	**1705**	**699**	**$682,000**	**$2,002,170**	**-$16,584,183**
[2Y]	• 200NB Turich Distribution Main.	2(T)							$ 682,000		
2056			**2895**	**3140**	**5834**	**2480**	**1705**	**759**	**$754,000**	**$2,093,040**	**-$15,245,143**
[2X]	• 200NB Turich Distribution Main.	2(T)							$ 754,000		
2057			**2895**	**3140**	**5893**	**2790**	**1705**	**810**	**$1,590,000**	**$2,152,835**	**-$14,682,308**
[2Z]	• 200NB Turich Distribution Main.	2(T)							$ 670,000		
G1	Oversizing of Minor mains 150NB to 200NB								$ 400,000		
G2	Installation of Minor mains 150NB								$ 520,000		
2064			**2895**	**3140**	**6060**	**5540**	**1705**	**810**		**$14,999,130**	**$316,822**
	TOTALS								**$75,014,000**	**$73,330,822**	

Table B-4 Pre-Requisite Infrastructure

Area		Total Loading (Lots)	Prerequisite Details
Zone 1A	(1)	37-130 (without Lilly Hills Res)	• Stage TB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BT1] Re-commission Glen Eden Booster Pumps. GAWB Works. [BT2] 375NB rising main from GAWB Main to BITS Club. [BT3] 450NB rising main from BITS Club to Broadacres Reservoir. [BT4] Remove Coronation Drive pump station. [BT5] Remove NRV's. [BT6] Remove zone separation in Tannum Sands.
			• Distribution Mains [1A] 200NB Curtis Ave link main. [1B] 300NB main from Boyne Road to Pioneer Dr via Dennis Park.
			• Excluded Works - Developer Funded [Int1] 300NB connection at Tuckers Rd from Boyne Island Rd 300NB main. [Int2] 150NB looping connection fromDennis St.
	(2)	130-1,200 Note 150 at RL 35 - 40, remainder at <RL 35	• Prerequisites 1A(1)
			• Stage TB2 Bulk Water [BT7] Acquisition of reservoir site on Lilly Hills. [BT8] New 3ML Lilly Hills Reservoir. [BT9] 300NB Rising Main from Handley Drive to Lilly Hills Reservoir. [BT10] 300NB Retic. Main from Lilly Hills Reservoir to 300NB main on Boyne Island Road.
			• Stage TB3 Bulk Water [BT11] Upgrading and re-aligning the 375NB main passing adjacent the red mud dam. GAWB Works [BT12] Upgrade Glen Eden booster pumps from 175 l/s to 200 l/s. GAWB works.
			• Distribution Mains [1C] 300NB extension of main toward Cemetrery boundary. [1D] 300NB Heidelberg Distribution main. [1F] 300NB Heidelberg Distribution main.
	(3)	1,200 - 1,580	• Prerequisites 1A(2)
			• Stage TB4 Bulk Water [BT13] Decommission Glen Eden Booster. GAWB works [BT14] New Toolooa Booster Pump Station. GAWB works.
			• Stage TB5 Bulk Water [BT18] Acquire 'Heidelberg' Reservoir site land. [BT19] New 10ML "Heidelberg" Reservoir. [BT20] Recommission 200NB rising main South Trees Inlet to Gladstone-Benaraby Road. [BT21] Construct Temporary Pump Station at BITS. [BT22] New 200NB rising main Reservoir to [BT20]. [BT23] New 450NB reticulation trunk main Reservoir to general retic.
			• Distribution Mains [1E] 375NB Heidelberg Distribution main. [1I] 200NB Heidelberg Distribution main.
	(4)	1,580 - 3,610	• Prerequisites 1A(3)
			• Stage TB6 Bulk Water [BT24] Upgrade South Gladstone to Toolooa main (300) to a 600NB main. GAWB Works [BT25] Additional pump set - Toolooa Pump Station to 'Heidelberg' Reservoir. GAWB Works [BT26] Install 600NB tee at Hughs Road for 'Heidelberg' Feed. GAWB Works [BT27] Install 600NB tee at Hughs Road for 'Heidelberg' Feed. GAWB Works [BT28] Decommission rising main [BT20] and 'BITS' pump station [BT21].
			• Distribution Mains [1G] 300NB Heidelberg Distribution main. [1H] 250NB Heidelberg Distribution main.
			• Excluded Works - Developer Funded [Int3] 150NB looping connection from [1H] 250NB main.

Area		Total Loading (Lots)	Prerequisite Details
Zone 1B	(1)	0 - 100 (without Lilly Hills Res)	• Stage TB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BT1] Re-commission Glen Eden Booster Pumps. GAWB Works. [BT2] 375NB rising main from GAWB Main to BITS Club. [BT3] 450NB rising main from BITS Club to Broadacres Reservoir. [BT4] Remove Coronation Drive pump station. [BT5] Remove NRV's. [BT6] Remove zone separation in Tannum Sands. • Distribution Mains [1A] 200NB Curtis Ave link main. • Excluded Works - Developer Funded [Int4] 200NB connection from Boyne Island Rd 300NB main. [Int5] 150NB looping connection from [Int4].
	(2)	0 - 350	• Prerequisites 1B(1) • Stage TB2 Bulk Water [BT7] Acquisition of reservoir site on Lilly Hills. [BT8] New 3ML Lilly Hills Reservoir. [BT9] 300NB Rising Main from Handley Drive to Lilly Hills Reservoir. [BT10] 300NB Retic. Main from Lilly Hills Reservoir to 300NB main on Boyne Island Road.
Zone 1C	(1)	0 - 30	• Stage TB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BT1] Re-commission Glen Eden Booster Pumps. GAWB Works. [BT2] 375NB rising main from GAWB Main to BITS Club. [BT3] 450NB rising main from BITS Club to Broadacres Reservoir. [BT4] Remove Coronation Drive pump station. [BT5] Remove NRV's. [BT6] Remove zone separation in Tannum Sands. • Distribution Mains [1A] 200NB Curtis Ave link main.
	(2)	30 - 60	• Prerequisites 1C(1) • Stage TB2 Bulk Water [BT7] Acquisition of reservoir site on Lilly Hills. [BT8] New 3ML Lilly Hills Reservoir. [BT9] 300NB Rising Main from Handley Drive to Lilly Hills Reservoir. [BT10] 300NB Retic. Main from Lilly Hills Reservoir to 300NB main on Boyne Island Road.
Zone 1D	(1)	0 - 100	• Stage TB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BT1] Re-commission Glen Eden Booster Pumps. GAWB Works. [BT2] 375NB rising main from GAWB Main to BITS Club. [BT3] 450NB rising main from BITS Club to Broadacres Reservoir. [BT4] Remove Coronation Drive pump station. [BT5] Remove NRV's. [BT6] Remove zone separation in Tannum Sands. • Distribution Mains [1A] 200NB Curtis Ave link main.

Area		Total Loading (Lots)	Prerequisite Details
Zone 2	(1)	Current	No additional development is provided.
Zone 2A - Northern (Infill)	(1)	0 - 5 (additional)	• Stage TB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BT1] Re-commission Glen Eden Booster Pumps. GAWB Works. [BT2] 375NB rising main from GAWB Main to BITS Club. [BT3] 450NB rising main from BITS Club to Broadacres Reservoir. [BT4] Remove Coronation Drive pump station. [BT5] Remove NRV's. [BT6] Remove zone separation in Tannum Sands.
	(2)	5 - 15 (additional)	• Prerequisites 2AN(1) • Distribution Mains [2D] 200NB main linkage Hampton Dr b/w Pacific Ave and Cremorne Dr.
	(3)	15 - 35 (Additional)	• Prerequisites 2AN(2) • Distribution Mains [2C] 300NB main linkage Tannum Rd b/w Coronation Dr and Hampton Dr.
Zone 2A	(1)	1,928 - 2,228	• Stage TB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BT1] Re-commission Glen Eden Booster Pumps. GAWB Works. [BT2] 375NB rising main from GAWB Main to BITS Club. [BT3] 450NB rising main from BITS Club to Broadacres Reservoir. [BT4] Remove Coronation Drive pump station. [BT5] Remove NRV's. [BT6] Remove zone separation in Tannum Sands. • Distribution Mains [2A] 200NB main from Tannum Rd 450NB main along Dahl Rd. • Excluded Works - Developer Funded [Int6] 150NB loop on Coronation Dr. [Int7] 150NB loop off Pryde St. [Int8] 150NB connection from Tannum Caravan Park to Old Tannum Res. [Int9] 150NB connection from main [2A], to *'BSL Land'* . [Int10] 150NB connection from Silverton Dr 150NB main to [2A]. Depending on where development occurs
	(2)	2,228 - 2,678	• Prerequisites 2A(1) • Distribution Mains [2B] 200NB main extension on Coronation Drive to Dahl Rd. [2E] 450NB main linkage from Broadacres Res. to Tannum Road [2F] 450NB main extension Tannum Sands Road from Res. access to Silverton Dr.
	(3)	2,678 - 3,335	• Prerequisites 2A(2) • Stage TB3 Bulk Water [BT11] Upgrading and re-aligning the 375NB main passing adjacent the red mud dam. GAWB Works [BT12] Upgrade Glen Eden booster pumps from 175 l/s to 200 l/s. GAWB works.

Area		Total Loading (Lots)	Prerequisite Details
Zone 2B	(1)	0 - 300	• Stage TB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BT1] Re-commission Glen Eden Booster Pumps. GAWB Works. [BT2] 375NB rising main from GAWB Main to BITS Club. [BT3] 450NB rising main from BITS Club to Broadacres Reservoir. [BT4] Remove Coronation Drive pump station. [BT5] Remove NRV's. [BT6] Remove zone separation in Tannum Sands. • Excluded Works - Developer Funded [Int11] 200NB connection from Tannum Sands Rd 300NB main. [Int12] 150NB connection from Diamond Crs 100NB main to [Int10]. [Int13] 150NB connection from Cobalt Crs 100NB main to [Int10]. [Int14] 200NB connection from Tannum Sands Rd 300NB main.
	(2)	300 - 1,200	• Prerequisites 2B(1) • Distribution Mains [2E] 450NB main linkage from Broadacres Res. to Tannum Road [2J] 200NB Turich Distribution Main. [2K] 200NB Turich Distribution Main. [2L] 600NB Turich Distribution Main. [2M] 450NB Turich Distribution Main. • Excluded Works - Developer Funded [Int15] 200NB connection from [2J] to [Int14]
	(3)	1,200 - 1,750	• Prerequisites 2B(2) • Stage TB3 Bulk Water [BT11] Upgrading and re-aligning the 375NB main passing adjacent the red mud dam. GAWB Works [BT12] Upgrade Glen Eden booster pumps from 175 l/s to 200 l/s. GAWB works. • Distribution Mains [2N] 450NB Turich Distribution Main. [2S] 300NB Turich Distribution Main. [2T] 200NB Turich Distribution Main.
	(4)	1,750 - 2,230	• Prerequisites 2B(3) • Distribution Mains [2G] 600NB main along Broadacres Access Rd. [2O] 300NB Turich Distribution Main. [2P] 300NB Turich Distribution Main. [2Q] 300NB Turich Distribution Main. [2R] 300NB Turich Distribution Main. [2W] 200NB Turich Distribution Main.
	(5)	2,230 - 4,230	• Prerequisites 2B(4) • Stage TB4 Bulk Water [BT13] Decommission Glen Eden Booster. GAWB works [BT14] New Toolooa Booster Pump Station. GAWB works. [BT15] Additional 15 ML Reservoir at Broadacres. [BT16] Extend 450NB rising main to new reservoir. [BT17] 600NB retic. main linking 15ML & 6 ML Broadacres reservoirs. • Distribution Mains [2O1] 200NB Turich Distribution Main. [2P1] 200NB Turich Distribution Main. [2U] 200NB Turich Distribution Main. [2V] 200NB Turich Distribution Main.

Area		Total Loading (Lots)	Prerequisite Details
Zone 2B	(6)	4,230 - 5,750	• Prerequisites 2B(5) • Stage TB5 Bulk Water [BT18] Acquire 'Heidelberg' Reservoir site land. [BT19] New 10ML "Heidelberg" Reservoir. • Stage TB6 Bulk Water [BT24] Upgrade South Gladstone to Toolooa main (300) to a 600NB main. GAWB Works [BT25] Additional pump set - Toolooa Pump Station to 'Heidelberg' Reservoir. GAWB Works [BT26] Additional pump set - Toolooa Pump Station to 'Heidelberg' Reservoir. GAWB Works [BT27] Install 600NB tee at Hughs Road for 'Heidelberg' Feed. GAWB Works [BT28] Decommission rising main [BT20] and 'BITS' pump station [BT21]. • Stage TB7 Bulk Water [BT29] New 600NB rising main 'Heidelberg' to 450NB Broadacres rising main. [BT30] New Pump Station 'Heidelberg' reservoir to Broadacres and Lilly Hills reservoirs. [BT31] Additional 15ML reservoir at Broadacres site. [BT32] Extend 450NB rising main to new Reservoir. [BT30] [BT33] Extend 600NB reticulation main to link all 3 Broadacres Reservoirs . • Distribution Mains [2X] 200NB Turich Distribution Main. [2Y] 200NB Turich Distribution Main. [2Z] 200NB Turich Distribution Main.
Zone 2C	(1)	Current (80) - 380	• Stage TB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BT1] Re-commission Glen Eden Booster Pumps. GAWB Works. [BT2] 375NB rising main from GAWB Main to BITS Club. [BT3] 450NB rising main from BITS Club to Broadacres Reservoir. [BT4] Remove Coronation Drive pump station. [BT5] Remove NRV's. [BT6] Remove zone separation in Tannum Sands. • Excluded Works - Developer Funded Stage 1 Tannum Waters must connect to existing network. [IntMP] 150NB connection to Spinnaker Drive 150NB main. [IntMP] 150NB connection to Broadacres Drive 150NB main. Stage 2 of Tannum Waters must connect to existing network. [IntMP] 250NB connection to Plimsoll Court 200NB main. [IntMP] 150NB connection to Keel St 150NB main via pathway. [IntMP] Various internal mains as required with development.
	(2)	380 - 495	• Prerequisites 2C(1) [2E] 450NB main linkage from Broadacres Res. to Tannum Road [2F] 450NB main extension Tannum Sands Road from Res. access to Silverton Dr. [2I] 200NB main link to Tannum Waters from Applin Pl. • Excluded Works - Developer Funded [IntMP] Various internal mains as required with development.
	(3)	495 - 1,200	• Prerequisites 2C(2) [2H] 375NB main feed to Tannum Waters from Res. • Excluded Works - Developer Funded [IntMP] Various internal mains as required with development.
	(4)	1,200 - 2,300	• Prerequisites 2C(3) • Stage TB3 Bulk Water [BT11] Upgrading and re-aligning the 375NB main passing adjacent the red mud dam. GAWB Works [BT12] Upgrade Glen Eden booster pumps from 175 l/s to 200 l/s. GAWB works.

Area		Total Loading (Lots)	Prerequisite Details
Zone 3A	(1)	Current (215)	Zone is fully commited
	(2)	215 - 275	• Stage BB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BB1] Decommission GAWB main - Golegumma line to Awoonga Dam Road. GAWB Works [BB2] New tee at Wurdong Reservoir takeoff and alterations for new 300NB reticulation main. [BB3] Alter Benaraby Booster - South Gladstone to Wurdong Reservoir. [BB4] New 300NB trunk retic. main Wurdong Res Offtake to Awoonga Dam Road.
			• Distribution Mains [3A] 150NB main from existing Leferink Rd along full length of Ronald Crs. [3C] 200NB upgrade of existing O'Connor Road main.
Zone 3B	(1)	Current (0)	No development can occur until Stage BW3 is complete, as fireflows are not achieved
	(2)	0 - 175	• Stage BB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BB1] Decommission GAWB main - Golegumma line to Awoonga Dam Road. GAWB Works [BB2] New tee at Wurdong Reservoir takeoff and alterations for new 300NB reticulation main. [BB3] Alter Benaraby Booster - South Gladstone to Wurdong Reservoir. [BB4] New 300NB trunk retic. main Wurdong Res Offtake to Awoonga Dam Road.
			• Stage BB3 Bulk Water [BB12] Acquire land for 6ML Benaraby Reservoir. [BB13] New 6ML Benaraby Reservoir. [BB14] Extend 300NB Rising Main - Awoonga Dam Road to new Reservoir. [BB15] Decommission 300NB connection into 200NB Awoonga Dam Road main. [BB16] New 300NB retic. main - Benaraby Reservoir to 200NB main Awoonga Dam Road [BB17] New 300NB retic. main - Benaraby Reservoir to Leferink Road
			• Stage BB4 Bulk Water [BB10] New PS at Toolooa Bends, GAWB works. [BB11] Upgrade feed main to Benaraby Booster. GAWB Works.
			• Distribution Mains [3D] 200NB main joining existing and [BB15] along Leferink Rd.
			• Excluded Works - Developer Funded [Int23] 200NB connection off [3D] [Int24] 200NB connection off [3D] to [Int23] [Int25] 200NB connection off [Int23] to [Int26]
	(3)	175 - 450	• Prerequisites 3B(2)
			• Excluded Works - Developer Funded [Int26] 200NB connection off [3D] to [Int25] [Int27] 200NB connection off [3D] to [Int26]
Zone 3C	(1)	Current (58)	No development can occur until Stage BW1 is complete, as fireflows are not achieved
	(2)	58 - 68	• Stage BB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BB1] Decommission GAWB main - Golegumma line to Awoonga Dam Road. GAWB Works [BB2] New tee at Wurdong Reservoir takeoff and alterations for new 300NB reticulation main. [BB3] Alter Benaraby Booster - South Gladstone to Wurdong Reservoir. [BB4] New 300NB trunk retic. main Wurdong Res Offtake to Awoonga Dam Road.
			• Distribution Mains [3C] 200NB upgrade of existing O'Connor Road main.

Area		Total Loading (Lots)	Prerequisite Details
Zone 3C	(3)	68 - 80	• Prerequisites 3C(2) • Distribution Mains [3B] 200NB loop main Harbottle Rd to Boyne River Bridge.
	(4)	80 - 100	• Prerequisites 3C(3) • Stage BB3 Bulk Water [BB12] Acquire land for 6ML Benaraby Reservoir. [BB13] New 6ML Benaraby Reservoir. [BB14] Extend 300NB Rising Main - Awoonga Dam Road to new Reservoir. [BB15] Decommission 300NB connection into 200NB Awoonga Dam Road main. [BB16] New 300NB retic. main - Benaraby Reservoir to 200NB main Awoonga Dam Road [BB17] New 300NB retic. main - Benaraby Reservoir to Leferink Road • Stage BB4 Bulk Water [BB10] New PS at Toolooa Bends, GAWB works. [BB11] Upgrade feed main to Benaraby Booster. GAWB Works.
Zone 3D	(1)	Full	Zone is fully commited with current River Downs applications
Zone 3E	(1)	Current (0)	No development can occur until Reservoir as fireflows are not achieved
	(2)	0 - 25	• Stage BB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BB1] Decommission GAWB main - Golegumma line to Awoonga Dam Road. GAWB Works [BB2] New tee at Wurdong Reservoir takeoff and alterations for new 300NB reticulation main. [BB3] Alter Benaraby Booster - South Gladstone to Wurdong Reservoir. [BB4] New 300NB trunk retic. main Wurdong Res Offtake to Awoonga Dam Road. • Stage BB3 Bulk Water [BB12] Acquire land for 6ML Benaraby Reservoir. [BB13] New 6ML Benaraby Reservoir. [BB14] Extend 300NB Rising Main - Awoonga Dam Road to new Reservoir. [BB15] Decommission 300NB connection into 200NB Awoonga Dam Road main. [BB16] New 300NB retic. main - Benaraby Reservoir to 200NB main Awoonga Dam Road • Stage BB4 Bulk Water [BB10] New PS at Toolooa Bends, GAWB works. [BB11] Upgrade feed main to Benaraby Booster. GAWB Works. • Excluded Works - Developer Funded [Int28] 150NB connection off existing network
Zone 3F	(1)	32 - 310 west of Awoonga Dam Rd and infill of exisitng lots	• Stage BB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BB1] Decommission GAWB main - Golegumma line to Awoonga Dam Road. GAWB Works [BB2] New tee at Wurdong Reservoir takeoff and alterations for new 300NB reticulation main. [BB3] Alter Benaraby Booster - South Gladstone to Wurdong Reservoir. [BB4] New 300NB trunk retic. main Wurdong Res Offtake to Awoonga Dam Road. • Excluded Works - Developer Funded [Int16] 200NB connection off existing 200NB Main [Int17] 200NB connection between [Int16] and [Int18] [Int18] 200NB connection off existing 200NB Main [Int19] 200NB connection between [Int18] and [Int20] [Int20] 200NB connection between [Int16] and [Int19]

Area		Total Loading (Lots)	Prerequisite Details
Zone 3F	(2)	310 - 365 (or East of Awoonga Dam Road)	• Prerequisites 4A(1) • Stage BB3 Bulk Water [BB12] Acquire land for 6ML Benaraby Reservoir. [BB13] New 6ML Benaraby Reservoir. [BB14] Extend 300NB Rising Main - Awoonga Dam Road to new Reservoir. [BB15] Decommission 300NB connection into 200NB Awoonga Dam Road main. [BB16] New 300NB retic. main - Benaraby Reservoir to 200NB main Awoonga Dam Road [BB17] New 300NB retic. main - Benaraby Reservoir to Leferink Road • Stage BB4 Bulk Water [BB10] New PS at Toolooa Bends, GAWB works. [BB11] Upgrade feed main to Benaraby Booster. GAWB Works. • Distribution Mains [3D] 200NB main joining existing and [BB15] along Leferink Rd. [3E] 200NB main Leferink to Awoonga via "Owbridge" property. [3F] 200NB main from Awoonga Dam Rd existing main to main [3E].
	(3)	365 - 800	• Prerequisites 4A(2) • Excluded Works - Developer Funded [Int21] 200NB connection off existing 200NB Main to [Int20]
Zone4A	(1)	Full (25)	Zone 4A is fully commited due to the pressure and fireflow limitations in this zone resulting from high elevation.
Zone 4B	(1)	0 - 150	• Stage BB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BB1] Decommission GAWB main - Golegumma line to Awoonga Dam Road. GAWB Works [BB2] New tee at Wurdong Reservoir takeoff and alterations for new 300NB reticulation main. [BB3] Alter Benaraby Booster - South Gladstone to Wurdong Reservoir. [BB4] New 300NB trunk retic. main Wurdong Res Offtake to Awoonga Dam Road. • Stage BB2 Bulk Water [BB5] Install 300NB metered tee for 'Low Level' Reservoir Feed. GAWB Works [BB6] Acquire land for 1.1ML low Level Reservoir. [BB7] New 1.1ML low level Reservoir. [BB8] New 200NB main, from tee to 'Low Level' Reservoir. [BB9] Connection of Reservoir to Township Reticulation. • Distribution Mains [4A] 300NB main from [BB7] to Northern section. [4B] 200NB main from [4L1] to Western section (under railway). • Excluded Works - Developer Funded [Int38] 200NB connection off 300NB retic, [Int39] 200NB connection off 300NB retic, [Int40] 200NB connection off 300NB retic,
	(2)	150 - 380	• Prerequisites 4B(1) • Stage BB4 Bulk Water [BB10] New PS at Toolooa Bends, GAWB works. [BB11] Upgrade feed main to Benaraby Booster. GAWB Works.
Zone 4C	(1)	Current (105)	• Stage BB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BB3] Alter Benaraby Booster - South Gladstone to Wurdong Reservoir.
	(2)	105 - 120	• Prerequisites 4C(1) • Distribution Mains [4D] 150NB Yalkarra Crs upgrade. [4E] 150NB Kanangra Rd upgrade. [4F] 150NB Kanangra Rd upgrade. [4G] 150NB Illoura Rd upgrade [4H] 150NB Yalkarra Crs upgrade. [4C] 300NB main from Benaraby booster to current connection in Helen Cres.

Area		Total Loading (Lots)	Prerequisite Details
Zone 4C	(3)	120 - 165	• Prerequisites 4C(2) • Stage BB2 Bulk Water [BB5] Install 300NB metered tee for 'Low Level' Reservoir Feed. GAWB Works [BB6] Acquire land for 1.1ML low Level Reservoir. [BB7] New 1.1ML low level Reservoir. [BB8] New 200NB main, from tee to 'Low Level' Reservoir. [BB9] Connection of Reservoir to Township Reticulation.
	(4)	165 - 240	• Prerequisites 4C(3) • Stage BB4 Bulk Water [BB10] New PS at Toolooa Bends, GAWB works. [BB11] Upgrade feed main to Benaraby Booster. GAWB Works.
Zone 4D	(1)	0 - Full (approx. 165)	• Stage BB1 Bulk Water [BG1] Isolate the GAWB 300NB main from 450/375/600 main. GAWB Works [BG2] Utilize the 450/375/600 main with Glen Eden Booster. GAWB Works [BB1] Decommission GAWB main - Golegumma line to Awoonga Dam Road. GAWB Works [BB2] New tee at Wurdong Reservoir takeoff and alterations for new 300NB reticulation main. [BB3] Alter Benaraby Booster - South Gladstone to Wurdong Reservoir. • Distribution Mains [4C] 300NB main from Benaraby booster to current connection in Helen Cres. • Excluded Works - Developer Funded [Int29] 200NB connection off 300NB retic, [Int30] 150NB connection off [Int29] [Int31] 150NB connection off [Int29] [Int32] 150NB connection off [Int29] [Int33] 150NB connection off [Int29] [Int34] 150NB connection off [Int29]

C KEY TERMS AND CONCEPTS

Bulk Water Assets
For the purpose of this plan, these assets comprise:

- Pumps
- Storages (Reservoirs)
- Rising Mains to Reservoirs, and
- Reticulation mains between new storages and existing systems.

Current Capacity
Capacity of system based on actual current connections and approved development applications

Development
Any actual or anticipated lot, work or use resulting from 'development' as defined in the Integrated Planning Act 1997 which creates a demand for infrastructure.

Developmental Area
This is an area of future development potential, which does not have any existing servicing infrastructure throughout it. In order to become fully developed, it requires a substantial length of large diameter mains for servicing.

DWSA
This is the Declared Water Service Area. This area identifies where residential development, subject to necessary infrastructure being installed, can occur without the need for any revision to this plan.

Equivalent Person (EP)
Basic unit or units used for determining the change in demand for water or sewerage services as a result of a proposed development. This unit is based on a comparison with the usage of a service by an average occupant of an average residential dwelling.

Equivalent Tenement (ET)
Basic unit used to determine the flow demand for water connections. The unit is based on a standard family, comprised of 2.6 EP.
This is occasionally referred to as Equivalent Demand Unit (EDU).

Excluded Mains
These are mains which are excluded from the Capital Infrastructure Plan. These mains are generally larger than 150NB, but are only required for the future development of individual parcels, and as such are not of benefit to the greater community.

Ultimate Capacity
Current Capacity plus future anticipated development.

Oversizing Payment
A payment which is equivalent to the difference in the installation cost of the council required main and a 200NB main, or a larger main if specifically required for the proposed development. The payment figure will be determined by Council at regular periods.

Infill Development
Redevelopment of existing lots which have a current hydraulic demand (real or theoretical) on the network, and results in an increased loading upon the network.

Infrastructure Contribution
A charge applied to development through the conditions of the development permit for the provision of trunk infrastructure that services, or is planned to service, the development.

Inter Connecting Mains,
These are mains which are required for the development, but will also service a future development. These mains will be required to be extended to the boundary of the development in a location which is easily connected, and provides appropriate potential to develop further properties.

Interim External Works
These are works which are external to the development, however, due to a number of issues including 'leap frog development' will only be temporary in nature. That is, they will be decommissioned when relevant further development occurs.

Internal Water Mains,
These are mains which are utilised only by the development in question, and may include trunk infrastructure.

"Leap Frog" Development
This is development which does not form a continuous development pattern to the collection point.

Level of Service
This is the performance criteria of the water supply to the residents. This comprises the guaranteed level of water supply, in terms of pressure and flow rate, and includes allowances for fire fighting purposes.

Planning Assumptions
Those statements within the planning scheme that outline the basis for planning, design and funding the networks of infrastructure that are required to serve development undertaken in the community.

Sequential Development
This is development which occurs in a format which 'radiates' out from the central supply point (nominally the Reservoir), in a continuous development pattern.

Trunk Infrastructure

Infrastructure which is part of:

the Water Treatment Facilities,
the Pumping Station Facilities (including Rising Mains),
the Water Storages, and
mains which are greater than 200NB.