

The background of the lower half of the cover is an aerial photograph of a rural landscape. It shows a mix of dry, brownish vegetation, green fields, and some small buildings or structures. A road or path runs diagonally across the middle of the image. The overall tone is earthy and natural.

Mount Larcom Water Supply Strategic Infrastructure Plan

Prepared October 2009

Mt Larcom Water Supply Strategic Infrastructure Plan

Amendment Table

AMENDMENT DESCRIPTION	VERSION	DATE
Adopted	1	20 October 2009

Executive Summary

The Mount Larcom Water Supply Infrastructure Strategic Plan has been prepared to enable Council and the Development industry to understand the required water infrastructure for development to occur in Mount Larcom, whilst still enabling Council to ensure that Standards of Service are maintained to the residents.

The plan assesses two different scenarios, the first being the current level of development and the second being any future development. The first scenario considers the existing network under the Small Community Category, as per the DNRM Planning Guidelines for Water Supply and Sewerage, whilst the second scenario considers the system under the General Urban Category.

The difference between these two categories is the level of fire flow required. For the Small Community Category 7.5L/s for 2hrs is required for residential and 15L/s for 2hrs for commercial, compared to 15L/s for 2 hrs for residential and 30L/s for 4hrs for commercial for the General Urban Category.

The plan covers the infrastructure required for:

- The existing system to meet all Standards of Services under the Small Community Category.
- The system to be upgraded from Small Community Category to General Urban Category in order to allow future development.

The existing system has enough capacity (after required augmentations) to supply the current level of development (160ET). The cost of the required augmentations is \$178,700. This infrastructure is also necessary for any future development.

For any new development to occur the existing system is required to be upgraded from the Small Community Category to the General Urban Category and additional bulk water infrastructure is required. The cost of this infrastructure is approximately \$3,151,500 and will be funded by any developer/s.

The infrastructure identified to allow future development to occur is only the minimum requirement; therefore the size of this infrastructure will be reassessed as part of the development application process.

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1 Introduction

Mount Larcom is currently a small rural community that has historically seen very small growth. The majority of proposed developments have not been supported by the State Government due to the close proximity of the Gladstone State Development Area (GSDA). As there is very little development occurring, it is not practical or financially sound to upgrade the system past the level that is required by the existing township. It is therefore important that Council implements strategic planning for the area to rectify the current fire fighting capacity issues as well as the impact that future development will have on the water supply system.

The computer software package H2OMap Water, produced by MWHSoft, has been utilised to simulate the water supply network. The use of the software provides a high level of analysis of both the existing network and possible augmentations.

The report is based on two scenarios. The first is the current level of development, and the second is the future development. This is due to Council adopting different categories of water supply for the existing developed area, to that for future development.

2 Objectives of the Plan

The primary objectives of the Strategic Infrastructure Plan are to:

- Identify the Defined Water Supply Area for the Mount Larcom Township.
- Identify the Fire Flow category for the:
 - o Existing Network – no development
 - o Future Network – with development
- Identify the Capital Infrastructure required for the existing network in order to rectify the current fire flow issues.
- Identify the minimum Capital Infrastructure required to upgrade the system from Small Community Category to General Urban Category in order for development to occur.
- Outline the minimum costs associated with the required infrastructure.

3 Assumptions

Various assumptions were made in order to develop this infrastructure plan.

- Population density = 2.6 EP per ET
- Current Number of Equivalent Tenements = 160ET
- Average Daily Flow (AD) = 450L/EP/day (427kL/ET/yr used in the model)
- Mean Day Max Month (MDDM) = 675 L/EP/day
- Max Day (MD) = 900 L/EP/day
- Residential Development Density = 10 ET per hectare
- Max Rural Residential Development Density = 1.7 ET per hectare
- Modelling is based on Maximum Day with Maximum Hour at 18:00hrs
- Commercial Areas include
 - o Mount Larcom State School
 - o Service Station
 - o Council Depot
 - o Showgrounds
 - o Bowling Club
 - o Hotel

The operating standards that have been used to assess the capacity of the water supply system are:

- Minimum operational pressure (in the main) = 25m
- Maximum operational pressure (in the main) = 80m
- Residual pressure during a fire at the hydrant = 12m
- Residual pressure during a fire not at hydrant = 6m
- Min. size of a water main (residential) = 100mm dia
- Min. size of water main (commercial/industrial) = 150mm dia
- Trunk Main size (no connections) = > 250mm
- Maximum headloss in rising and suction mains = 15m/km
- Velocity in Rising & Suction Mains = 0.5m/s to 1.8m/s
- Required performance shown in Table 3-1.

Table 3-1: Modelling Scenarios – Water Supply

Scenario	Required Performance Criteria	Comment
• 3 days at Mean Day Maximum Month (MDMM)	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)
• 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
• Fireflow	12m residual pressure minimum at hydrant	Refer to Section 5.7

(DNRM, 2005, Ch 6 Pg 7)

4 Defined Water Supply Area

The Defined Water Supply Area (DWSA), shown in Map 1 – Mount Larcom Defined Water Service Area, encompasses all parcels of land (or portions of) that currently have a water connection or is vacant land zoned village (as per the Calliope Shire Planning Scheme 2007).

All residential (zoned village except for those commercial premises) parcels of land have been allocated one residential water connection (equivalent to 1 ET). All other parcels have been allocated an equivalent tenement value depending on their use. It has been assumed that there will be no infill in the area except for the dwelling development of those vacant lots which have been allocated 1 ET.

5 Demand

The demand on the water supply system in Mount Larcom has been calculated in terms of equivalent tenements (ET). Equivalent Persons (EP) is only used for comparative reasons. There are currently 160 ET that can connect to the existing water supply system.

The average day (AD) consumption was determined to be 450L/EP/day. This was calculated using Council's water billing data for Mount Larcom, Gladstone Area Water Board Bulk Water Bills (at East End Reservoir) and data from the Mag Flow meter installed in early 2007. Figure 5-1 is a graph comparing the data used over a period of 8 years. There is a noticeable drop in consumption from 2002 when water restrictions were imposed.

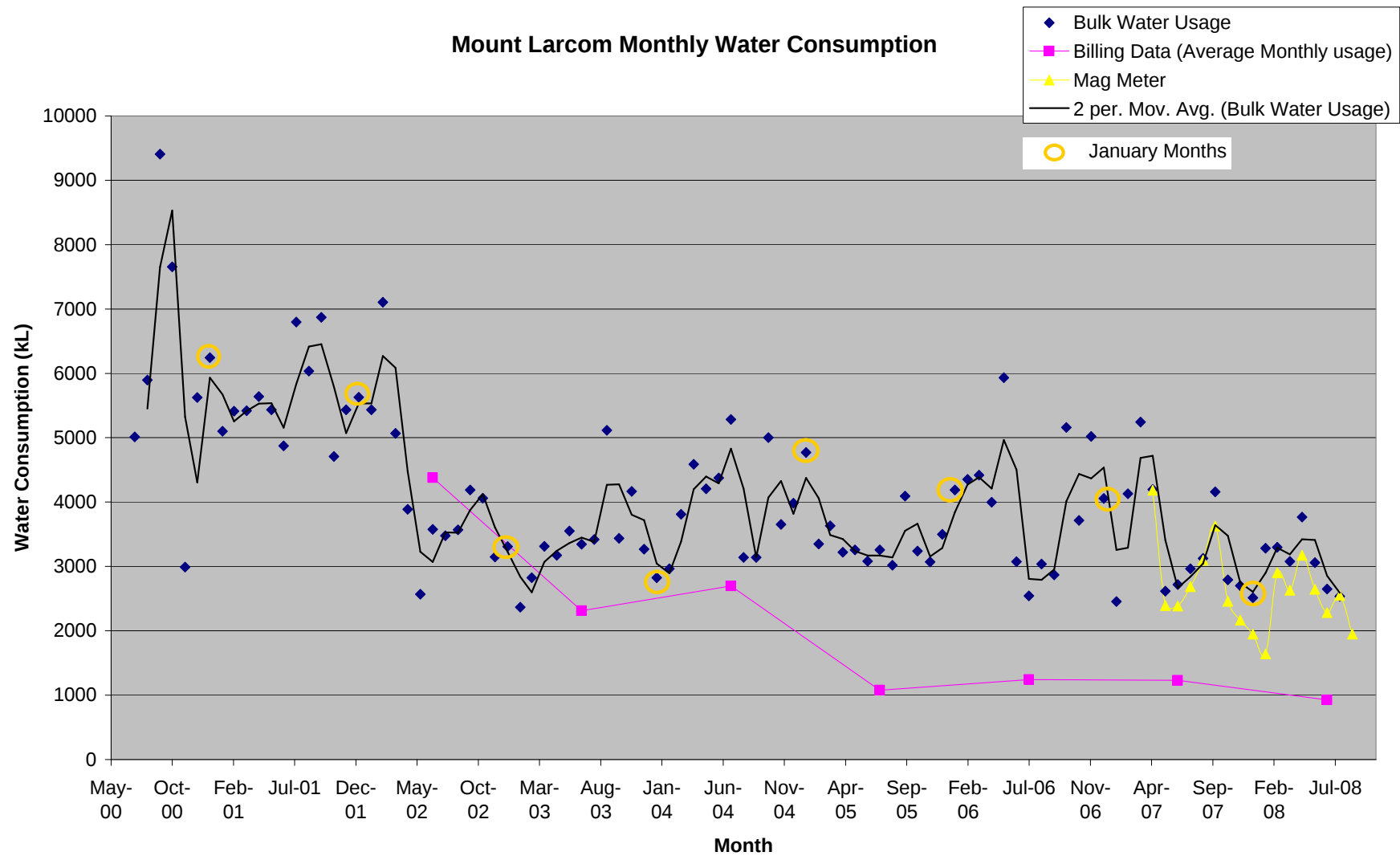


Figure 5-1: Mount Larcom Monthly Water Consumption Comparison of Data

6 Fire Fighting Categories

The Mount Larcom Water Supply System can be considered under two Categories as per the DNRM Planning Guidelines for Water Supply and Sewerage. The two categories are:

- Small Community Category (< 500 EP),
Fire Flow required:
 - o 7.5L/s for 2hrs (Residential)
 - o 15L/s for 2 hrs (Commercial)
- General Urban Category (> 500 EP),
Fire Flow required:
 - o 15L/s for 2hrs (Residential)
 - o 30L/s for 4 hrs (Commercial)

It is Council's position that the Mount Larcom Water Supply System be considered under the *Small Community Category* until there is more than 160 ET (416EP) serviced by the system. 160 ET is the current level of development including any vacant lots zoned village in the planning scheme. Once this limit is reached, the System is to be considered under the *General Urban Category*.

Therefore, any future development (small or large scale developments) will trigger the system to be upgraded to meet the standards associated with the General Urban Category. The minimum upgrades required to achieve this category are outlined in Section 8 Future Development, and do not include any allowance of the infrastructure required solely for the proposed development.

7 Scenario 1 - Current Development Levels

The current capacity of the water supply system has been determined based on 160ET operating under the Small Community Category. All components of the system have been checked including reservoirs, pump station, rising mains and the reticulation system.

7.1 Capacity of the Existing Network

The capacity of the existing system has been identified in order to determine the infrastructure required for the existing system to meet the Service Standards associated with the Small Community Category.

7.1.1 Reservoirs

Gladstone Area Water Board (GAWB) currently supplies treated water to the East End Reservoir (GAWB owned). The council is then responsible to deliver the water to the township via the suction main, pump station, rising main and Mount Larcom Reservoirs. The East End reservoir has been considered to have ample capacity to supply the expected future demand of Mount Larcom; therefore the capacity of this reservoir has not been analysed.

The Mount Larcom Reservoirs are sized based on the capacity required to service 3 minimum days when there is no inflow into the reservoir plus emergency storage. From historical flow records it has been established that a minimum day is 0.6 of an Average Day. The emergency storage is required for fire fighting purposes where it has to supply 15L/s for 2 hrs (0.108ML). The current reservoirs have a total capacity of 0.446ML (diameter of 13.01m).

Therefore the Mount Larcom Reservoirs can service only 160 ET when considered in the Small Community Category. This means that there is no spare capacity in the Mount Larcom Reservoirs; however they do not need upgrading for the existing demand.

7.1.2 Rising Main, Suction Main & Pump Station

The suction main links the East End Reservoir to Willmont Pump Station and the rising main connects Willmont Pump Station to the Mount Larcom Reservoirs. Currently, the rising and suction mains are 100mm in diameter and the duty point of the Willmot Pumps is 8.33L/s, 91.2m head utilising an 11kW motor.

When the pumps are operating, the mains and pump station have the following characteristics:

- Pump Station operates at 6.95L/s and 99.94m of head gain from approximately 6:30am to 8:30pm (16hrs).
- Velocity and Headloss/1000 in rising main = 0.95m/s, 18.78m/km
- Velocity and Headloss/1000 in suction main = 0.81m/s, 12.86m/km
- Pressure in the suction main near the pumps = 5.64m (when pumps are running)

The pumps are not operating excessive hours under maximum day scenario; however running them for more than 16hrs allows for no contingencies. The rising and suction mains are operating satisfactorily for the existing system however there is no spare capacity in these mains for increased flow. This is because of the higher than allowable headloss in the rising main and the suction main is below the low pressure safety margin in close proximity to the pump. Therefore the pumps, rising and suction mains do not need upgrading for the existing system under the Small Community Category.

7.1.3 Reticulation Mains

The network was modelled under maximum day conditions for a period of 3 days where the maximum hour is 18:00hrs. The system was simulated under normal flow and fire flow conditions.

The maximum head loss in the system was only 1.3 m/km which is located in the main the runs along Raglan Street.

The minimum pressure is at 14 Balfour Street (top of the hill) with a pressure of 23.70m at maximum hour. The greatest pressure is at the Mount Larcom State School with a pressure of 52.89m.

The system was also checked for any fire flow issues under the Small Community Category. A fire flow of 7.5L/s was applied to all nodes in the township area except for those nodes near the commercial premises which a 15L/s flow was applied.

The modelling has been completed so that a fire is modelled at each node separately and the most critical node (either the fire node or another node in the system) for each fire is recorded. The most critical node was identified from the nodes located only in the township itself. The Customer Service level indicates that the fire node requires 12m of residual pressure and 6m of residual pressure in the rest of the system. All modelling has been performed under worse case scenario situations.

When the simulation was run it was evident that the system was able to meet the residential fire flow (7.5L/s) demand, however it was not able to meet some of the commercial flows (15L/s). Therefore the issues are around some of the commercial areas, which are near the extremities of the system. These issues are enhanced by the fact that there is very little looping of mains in the system (especially at the extremities).

In order to provide the appropriate level of service, it is clear that some capital works is needed to be undertaken. This works is generally categorised as the installation of looping mains and upgrading 'bottle neck' mains to a larger diameter.

7.2 Infrastructure Required

Several options were simulated in order to determine the most cost effective and practical solution. In particular, looping mains and upgrading of 'bottle necks' were part of the majority of options.

The infrastructure has been sized to meet the normal operational standards as well as the Small Community Category fire flow standards. It has been

determined that the following infrastructure is required to satisfy the current level of development (160ET).

- 1A – 150mm new link main on Bismark St
- 1B – 150mm new link main from Bowling Club to Showgrounds
- 1C – Upgrade main under railway line to 200mm

Details of this required Infrastructure is provided in Map 2 – Current Demand Infrastructure Requirements. This infrastructure solves all fire flow issues in the existing system and slightly improves the operational pressure in front of 14 Balfour St. (identified critical point).

7.2.1 1A – 150mm new link main on Bismark St

This 150mm main is required to create a loop in part of the network on the western side of Mount Larcom. It allows the system to achieve adequate fire flows at the Mount Larcom State School.

7.2.2 1B – 150mm new link main between bowling club and showgrounds

This main creates a loop in the network between the Bowling Club and the Showgrounds. This work creates suitable levels of capacity at the showgrounds and Bowling club.

7.2.3 1C – Upgrade main under railway line to 200mm

The existing main under the railway line is a major ‘bottle’ neck in the network. The existing 100mm NB main needs to be upgraded to a 200mm main in order to satisfy the nominated standards. This upsized main increases capacity in the western side of the network. This work is a prerequisite for 1B.

7.3 Infrastructure Costs

The infrastructure costs are based on the preliminary design. Full detailed cost will be needed after the detailed design has been completed. The cost to install the required capital infrastructure for the existing network is outlined in Table 7-1.

Table 7-1: Cost of Capital Infrastructure Required for Current Level of Development

Item		Amount	Unit	Cost
1A	150mm new link main on Bismark St	270	m	\$ 77,300
1B	150mm new link main from Bowling Club to Showgrounds	160	m	\$ 45,800
1C	Upgrade main under railway line to 200mm	172	m	\$ 55,600
Total Cost				\$ 178,700

Therefore the total cost of the infrastructure required to solve the fire flow issues in the existing system under the Small Community Category is \$178,000.

8 Scenario 2 - Future Development

It has been determined that the existing system will be able to support the current development of 160 ET (with the identified augmentation works).

The existing system is to be classified in the Small Community Category. However, any further development in Mount Larcom will require the system to be upgraded to meet the standards of the higher fire fighting category, General Urban Category (DNRM Planning Guidelines for Water Supply & Sewerage).

Any and all works associated with augmenting the network to meet the level of service standards associated with the General Urban Category will be at any developer/s cost. The minimum infrastructure that will have to be provided is outlined in this section.

8.1 Ultimate Development

The ultimate development level of Mount Larcom has not been specified in this document because development in the area has historically been unsteady and slow. It is also considered that only large scale developments would proceed, due to the high cost of the initial works required.

There has also been much opposition in the past from the State Government for Mount Larcom to develop further; therefore it is unrealistic to complete a fully detailed long term strategic infrastructure plan.

8.2 *Minimum Infrastructure Required*

The minimum infrastructure required incorporates components of both the bulk water system and the reticulation system. The infrastructure identified in this section is the minimum requirement in order to upgrade the system from the Small Community Category to the General Urban Category and the minimum additional bulk water infrastructure required to allow development to occur.

The cost of this infrastructure will be funded by any developer/s because the higher fire flow standard (General Urban Category) is only triggered by additional development. The infrastructure in this section is not required for the existing system and level of demand.

It should be highlighted that the size of the minimum required infrastructure is the absolute minimum and has been based on the General Urban Category being just triggered (i.e. existing level of demand plus one).

8.2.1 Reservoirs

The current reservoirs can only supply 6 ET due to the emergency fire storage required for the General Urban Category (30L/s for 4 hours, 0.432ML) being four times greater than that required for the Small Community Category.

As the current reservoirs are under capacity for the General Urban Category extra storage is required. The total reservoir size needed for the existing level of development in Mount Larcom is 0.8ML.

There is no spare area at the existing reservoir site to install an additional reservoir therefore it is necessary to acquire a new reservoir site. The new site would have a higher elevation than the existing site due to the elevation of the surrounding land that could possibly be serviced in the future.

A higher elevated site would create two zones in the township, a high level zone and a low level zone. It has been assumed that the new reservoir will replace the existing reservoirs because the low level zone could only service 6ET which is the capacity of the existing reservoirs under the General Urban Category.

Therefore a new 0.8ML reservoir is required on a new and higher elevated site. This involves purchasing a new reservoir site, purchasing land for new rising mains and access, cost of supplying power to the site and a new 0.8ML reservoir.

A possible reservoir site is shown in Map 4 – Future Demand Bulk Water Infrastructure Requirements, and has been used as a basis for the cost estimate. However, the final location and size of this reservoir will be determined as part of the development application process.

8.2.2 Rising Main, Suction Main & Pump Station

The existing rising main, suction main and pump station is at full capacity however it does not have to be upgraded for the existing level of development under the Small Community Category. However due to the new reservoir site being required, a new 150mm NB rising main and 100mm NB suction main is required. These mains are the minimum size required. It has also been identified that the existing pump set is sufficient for the new bulk water system under the current level of development.

Nominally the pump set, switchboard and electronics will need replacing as part of any new development however this cost has not been included in the cost estimate as the size is dependant on the scale of development/s.

The new suction main will operate in parallel to the existing 100mm NB suction main with a short section of 150mm NB main feeding into the pump station. The new rising main will replace the existing 100mm NB rising main. Both mains will be installed on the same alignment as the existing mains.

The ultimate arrangement and size of the new mains and pump set will be reassessed as part of the development application process.

8.2.3 Reticulation Mains

The existing reticulation system can not provide adequate fire flows for the General Urban Category. In the majority of Commercial type areas there is negative residual pressure during fire flow simulations therefore there is a greater chance of water quality issues as dirt and rubbish may be sucked into the mains.

Several options were simulated in order to determine the most desirable. Looping mains and upgrading of 'bottle necks' had to be rectified as well as other upgrades of trunk mains. The infrastructure required is listed below and shown in Map 3 – Future Demand Infrastructure Requirements.

- Infrastructure as detailed in Section 7.2
- 2A – 150mm link Main up Bottle Tree Terrace
- 2B – 150mm link main from Bismark St to School

- 2C – 150mm main from Balfour St to Link Main in Bismark St
- 2D – 150mm main on King George St – from Davis St to Bismark St
- 2E – 150mm main from railway to Bowls Club
- 2F – 200mm main on Raglan St from Balfour St to Railway

The listed reticulation mains solve all the remaining issues except for at the Council Depot. It was concluded that this is a low risk area therefore the risk of not supplying fire flows is very minimal.

8.2.3.1 2A – 150mm Link main up Bottle Tree Terrace

The 150mm link main up Bottle Tree Terrace is required to create a loop from the main on Davis Street to Bismark St. This provides more capacity for fire fighting purposes on the west side of the network as it connects up some of the dead end mains.

8.2.3.2 2B – 150mm link main from Bismark St to School

This main is needed to provide the commercial fire flows to the school and the service station.

8.2.3.3 2C – 150mm main from Balfour St to Link Main in Bismark St

The main from Balfour St to the Bismark St link main (1A) has to be upgraded to 150mm. This then creates a trunk main through the western side of the network.

8.2.3.4 2D – 150mm main on King George St – from Davis St to Bismark St

There is a fire flow issue at the southern end of King George St. This issue is solved by upgrading this main to 150mm.

8.2.3.5 2E – 150mm main from railway to Bowls Club

Currently this main is 80mm poly which limits the flow dramatically. Therefore this main needs to be upgraded to 150mm. This creates more capacity for the eastern side of the network.

8.2.3.6 2F – 200mm main on Raglan St from Balfour St to Railway

The main on Raglan St from Balfour St to the main under the Railway needs to be upgraded to 200mm in order to achieve the fire flows on the eastern side of the network.

8.2.4 Infrastructure Costs

The infrastructure costs are based on the preliminary design. Full detailed cost will be needed after the detailed design has been completed. The cost of the minimum infrastructure, reticulation and bulk water, required to upgrade the existing system from the Small Community Category to General Urban category is outlined in Table 8-1. The identified size of this infrastructure is considered to be the minimum and it will be reviewed as part of the development application process.

It should be noted that the augmentation works required for the existing system, as outlined in Section 7.2, is a pre-requisite for the infrastructure identified in Table 8-1.

Table 8-1: Cost to Upgrade the Existing System from Small Community Category to General Urban Category

Item		Amount	Unit	Cost
Reticulated System				
2A	New 150mm link Main up Bottle Tree Terrace	355	m	\$ 101,600
2B	New 150mm link main from Bismark St to School	245	m	\$ 70,100
2C	Upgrade main from Balfour St to Link Main in Bismark St to 150mm	250	m	\$ 71,500
2D	New 150mm main on King George St – from Davis St to Bismark St	100	m	\$ 28,600
2E	Upgrade main from Railway to Bowls Club to 150mm	160	m	\$ 45,800
2F	Upgrade main on Raglan St from Balfour St to Railway to 200mm	325	m	\$ 105,000
Sub Total				\$ 422,600
Bulk Water System				
RES1	New 0.8ML Reservoir on higher site	-	-	\$1,076,200
RM1	New 150mm Rising Main	3475	m	\$ 993,900
SM1	New 100mm Suction Main	2635	m	\$ 574,500
SM2	New 150mm Main joining parallel suction mains to PS (including alterations to the PS)	-	-	\$ 10,000
RET1	200mm Bulk Reticulation Main (from Reservoir to Bruce Highway Road Reserve)	230	m	\$ 74,300
Sub Total				\$2,728,900
Total Cost				\$3,151,500

Therefore the minimum cost to develop any parcel of land at Mount Larcom is \$3,151,500. This includes the cost required to upgrade the existing system to General Urban Category plus the minimum anticipated cost of the bulk water upgrades.

9 Maps

Map 1 – Mount Larcom Defined Water Service Area

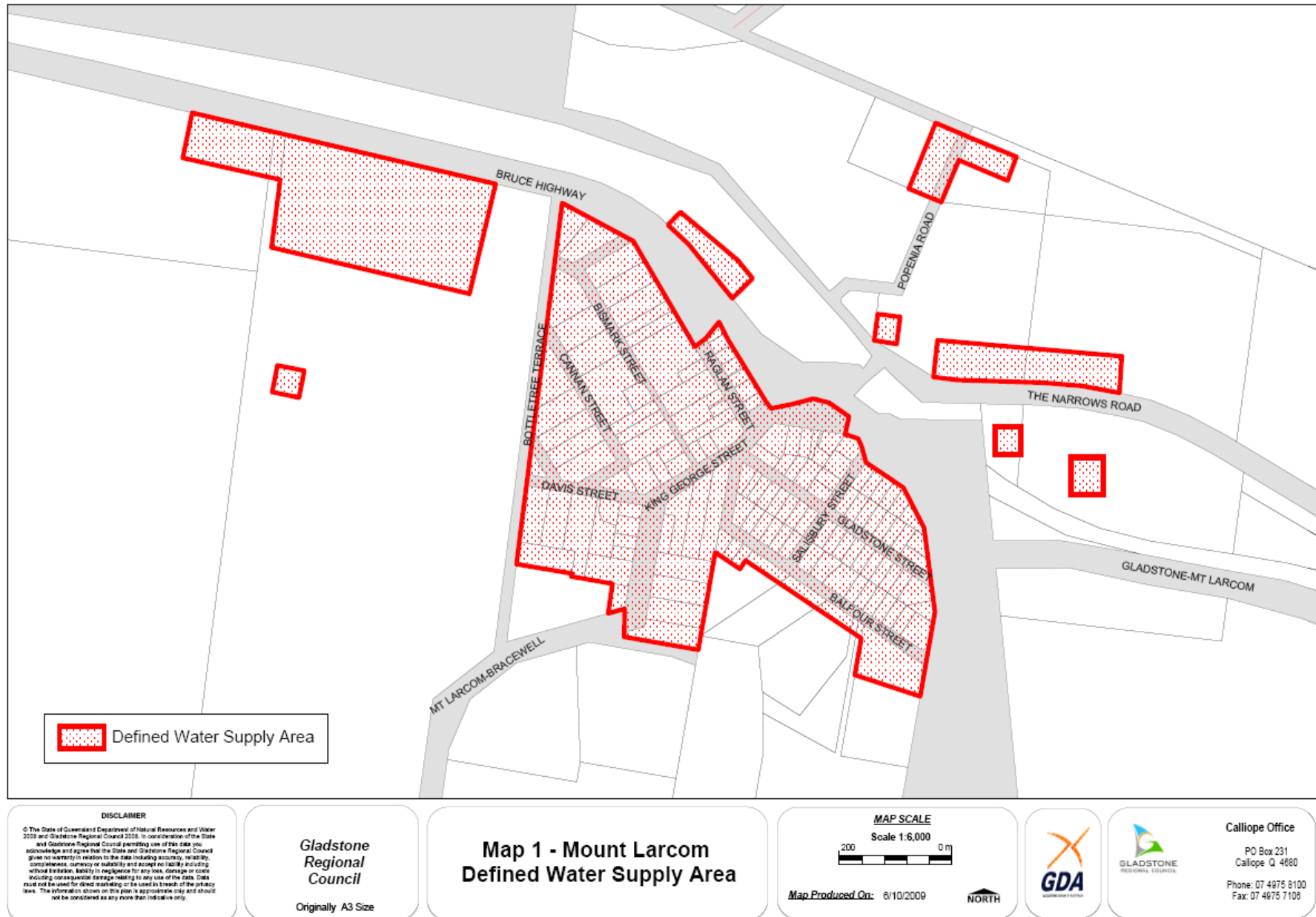
Map 2 – Current Demand Infrastructure Requirements

Map 3 – Future Demand Infrastructure Requirements – Reticulation System

Map 4 – Future Demand Infrastructure Requirements – Bulk Water System

Mt Larcom Water Supply Strategic Infrastructure Plan
Map 1 – Mount Larcom Defined Water Service Area

Mt Larcom Water Supply Strategic Infrastructure Plan



Mt Larcom Water Supply Strategic Infrastructure Plan
Map 2 – Current Demand Infrastructure Requirements

Mt Larcom Water Supply Strategic Infrastructure Plan



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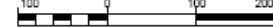
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Map 2 - Scenario 1: Current Demand Infrastructure Requirements

MAP SCALE

Scale 1:5,000



Map Produced On: 7/10/2009

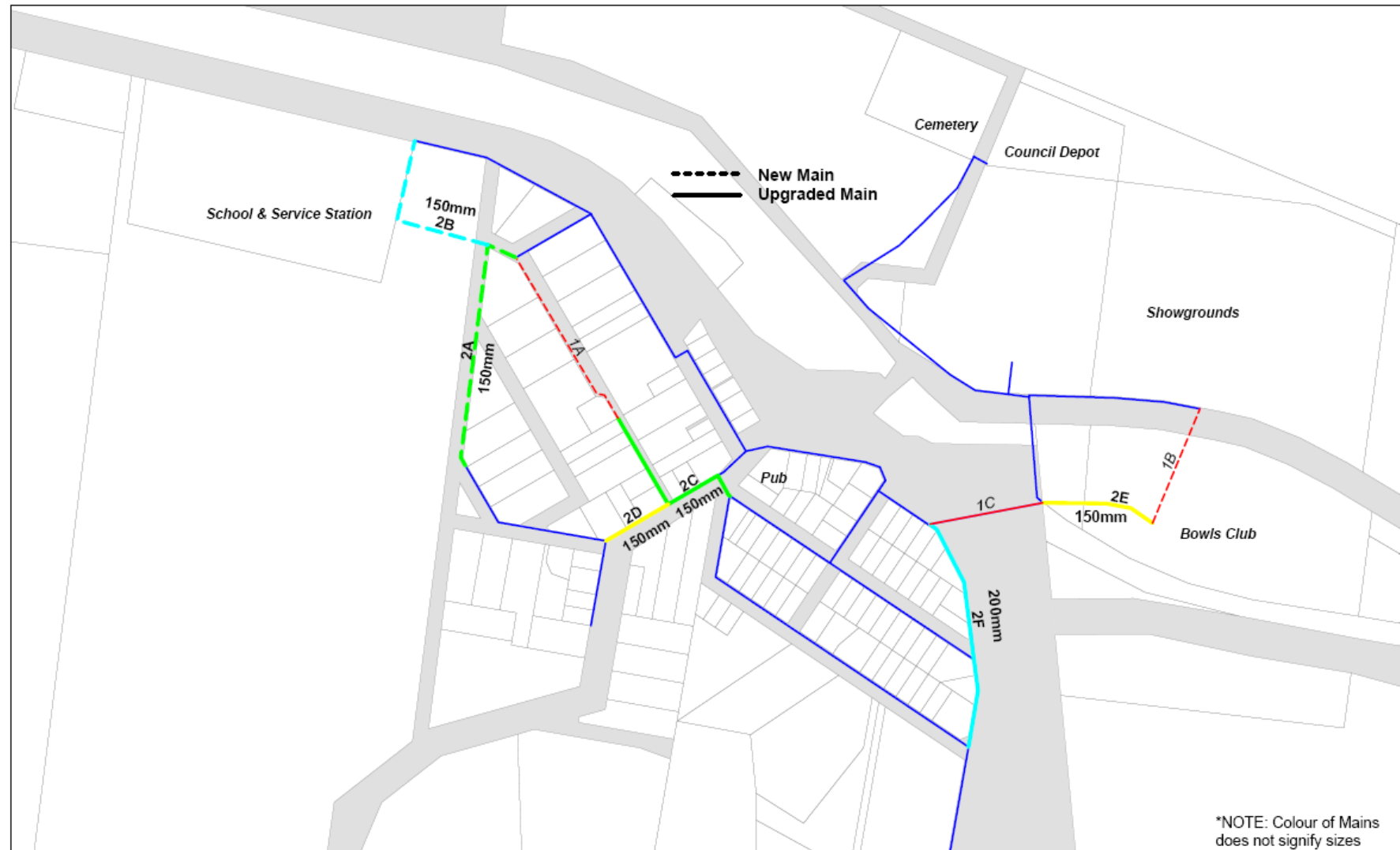


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Mt Larcom Water Supply Strategic Infrastructure Plan
Map 3 – Future Demand Infrastructure Requirements – Reticulation System

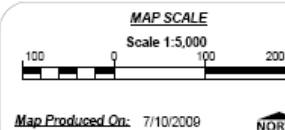


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**Map 3 - Scenario 2: Future Demand
Infrastructure Requirements -
Reticulation System**



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Map 4 – Future Demand Infrastructure Requirements – Bulk Water System

