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Christchurch City Council

Report on Belfast Area Plan: Infrastructure Analysis and Costing

Area Revision

November 2007



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1. Introduction

1.1 Overview of Project

The Council is engaged in a major planning effort in anticipation of significant future residential and industrial growth in the Belfast area of the City. In January 2006 GHD undertook a desktop study of the proposed development area that incorporates land from the Applefields area and the eastern side of Belfast from the Styx River to Channeys. The study estimated the costs that would accrue to the Council of water supply, wastewater, stormwater and transport infrastructure required for the potential development in the area.

In July 2007 this work was revised to include new areas of residential development in the south west of Belfast, to incorporate revised residential and industrial zonings and densities in the balance of the area, and to account for changes to the proposed transport upgrades.

1.1.1 Brief

The brief for this project requires determining the cost of infrastructure required to support the potential development of the land lying within the boundary of the Belfast Area Plan investigation, specifically for those elements owned and operated by the Council, namely Water Supply, Wastewater, Transport, Surface Water and Community Facilities.

The transport facilities required to service development in the area have been mapped out by the Council, requiring a quantifying and costing exercise to obtain the result for this brief. Water supply, wastewater and land drainage infrastructure required design consideration before the costs could be determined. Water supply and wastewater costs for the areas additional to the original report (Hussey South and Hussey Central) were estimated on a per lot basis using data from the original report.

Costs provided in this report exclude the internal subdivisional costs that are typically met 100% by the individual developer. The expenditure presented is that which will feature in the council's budgets for land acquisition, roading and other transport development, water supply and wastewater pump station and main extensions and construction of surface water detention and treatment facilities. Current Council processes are that these costs are incurred by the Council through inclusion in its Long Term Council Community Plan (LTCCP) and recovered through development contributions.

Major changes from the 2006 brief and report include:

- » The addition of land to the South West, either side of Hussey road
- » Rezoning of industrial land from Business 5 and 6 (B5 and B6) zoning to Business 4 (B4)
- » Rezoning of residential areas from Living 1 and 2 (L1 and L2) zoning to Living General (LG)

1.1.2 Zone Area Definitions

The study area boundary, and existing or proposed development zones are detailed in Figure 1, and in a fold out sheet inside the back cover.



Figure 1 Belfast Infrastructure Proposed Development Zone Area Overview



The following Christchurch City planning zones are relevant to the Belfast Study Area.

Business 2 (B2)	District Centre core business zone - core business and retail activity within an area
Business 4 (B4)	Suburban Industrial - light industry, including warehousing, retail and service industries
Business 5 (B5)	General Industrial -wide range of light and heavy industry, processing, warehousing
Business 6 (B6)	Rural Industrial - predominantly dry industry, constrained by the lack of water supply and sewage disposal.
Living General (LG)	General suburban
Living 1 (L1)	Outer suburban
Living 2 (L2)	Inner suburban

1.1.3 Anticipated Timing and Nature of Growth

A City Council report prepared by Matt Bonis (Infrastructure note, Matt Bonis, 6 April 05) envisages residential development within the Belfast Area Plan Study area commencing in 2013 following construction of either the Northern Bypass or the Western Bypass. The only exceptions are the portion of the Applefields area that may get underway around 2007-2009 and the area south of Radcliff Road planned for 2009-2011. The Applefields area, however, is currently part of an ongoing s293 process that is before the Environment Court and development of this area will be dependent on this decision. Our understanding at the present time is that Transit are preparing for an investigation contract for the Northern Arterial Route, through to the end of 2008, but there is no construction date agreed as yet.

With timely completion of one of the bypasses, residential development is anticipated to continue through to 2018, the area providing for 13,100 additional people (assuming 15 lots per ha and an occupancy of 2.6 people per lot). This growth is seen as starting with the Applefields block and then moving from the Styx River north on the east side of Main North Road. It is anticipated that development of the Hussey area will occur after the residential development on the east side is completed.

A large area of land has been recommended for industrial (B4) development, running north from the PPCS area and eventually becoming contiguous with the industrial zoning already in place in the Chaney's area. Sequencing this industrial growth has not yet been determined but its commencement, with the exception of the already zoned Chaney's block, will also wait for the completion of one of the bypasses.

Following the simple infrastructure principle that development should move out progressively from existing networks rather than leap frog into isolated areas that require expensive linkage back to the network, the development progression assumed for the Area Plan Study is set out below. Areas referred to are defined in Drawing 51-20588-C120 Appendix A, and in Figure 1.

Residential

1. Applefields
2. Styx North
3. Radcliffe North
4. PPCS South
5. PPCS Residential
6. Hussey Central
7. Hussey South

Industrial

- a. PPCS Industrial
- b. PPCS North
- c. Belfast North
- d. Factory North
- e. Main North Industrial
- f. Chaneys
- g. Supa Centa Extension

Current and Proposed Zoning

The Chaneys area is currently zoned B6 Rural Industrial. Although partially developed, the area has no Council owned water, wastewater or stormwater services. Further development could occur at any time with or without Council provided services.

The PPCS Industrial and PPCS North area along with an adjacent section of the Belfast North area are currently zoned B5 and already contain substantial industrial development. In line with the agreed scope (Letter to Matt Bonis, 7 June 2007) the costs for the supply of infrastructure have been developed assuming these existing industrial areas along with the proposed new industrial areas are all to be zoned B4. The only exception to this is the Supa Centa area, which is zoned B2.



1.2 Infrastructure Overview

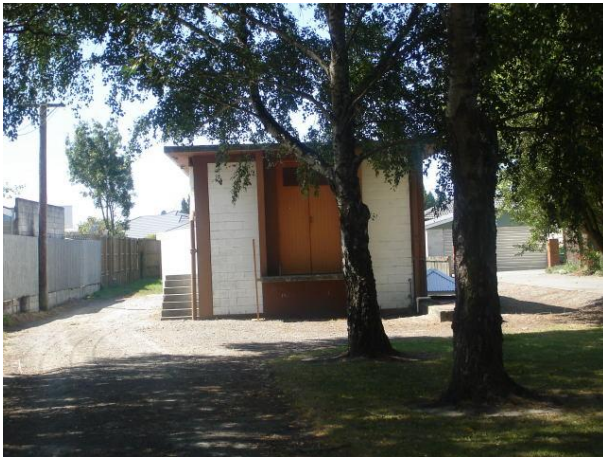
1.2.1 Water Supply

Current Servicing Arrangements

The Belfast area is currently serviced by two pump stations, the original Belfast station located at Darroch Street, which has two wells giving a total capacity 364 m³/hour, and a two well pump station at Thompsons Road with a total capacity of 461 m³/hour. There is a Ø300mm(diameter) main connecting the Belfast area to the South, over the Styx Bridge. This often has water flowing into Belfast particularly at low demand times when both of the above pump stations are switched off. There is also a Ø 200 mm main running from Clearwater Resort into the area through the Groyne reserve.

There is a significant network of trunk-mains and mains servicing the built up areas as far north as Dickies Road. This has grown piecemeal over time and does not have a logical structure as far as pipe sizes go, with some bottlenecks, one being the Ø150 mm main connecting the Ø300 mm mains on Richard Seddon Drive and Thompsons Road, the other being the Ø150 mm between Darroch Street and Factory Road. In practice these have not caused any known problems to date with sufficient pressure and flow being able to reach all reticulated parts of the mains system.

There is no existing water supply to any of the rural or proposed industrial areas, with no mains at all in the northern area of Channeys. Many private bores are currently in use to fill these gaps.



Darroch Street Water Pump Station

Schematics of Servicing

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones. A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C100 to C113, which show pipe locations and designations.

Constraints

The proposed pipe network sizes are determined in many cases by fire fighting capacity requirements, particularly in the industrial areas where a minimum main size of Ø200 mm is specified by the Christchurch City Council Infrastructure Design Standard, (Draft July 2007).

Wherever possible the location of new mains has been confined to existing and proposed roadways.

Design Assumptions

The following densities have been used when calculating peak water requirements for both pipe work and head works.

Table 1 Densities for Particular Zones

Zone	Lots / ha
LG	15
L1	11.5
L2	23
B2	10
B4	5.3
B5	2.7
B6	1.5

Investigation of the average pump station size in the North West of Christchurch showed a pump station design peak capacity of around 540 m³/hour, and this has been used as the basis for setting the size, and so determining the number of new pump stations required.

New mains have been assumed to be uPVC PN12 rated pipe.

Minimum main sizing for fire fighting purposes has been set at Ø200 mm for industrial areas and Ø100 mm for residential areas taken from SNZ PAS 4509:2003 NZFS Fire Fighting Water Supplies Code of Practice. Other than this, new mains have been sized to be well within recommended head losses to ensure good flow balance across the network and conservative costs.

Hydrants are assumed to meet SNZ PAS 4509:2003 NZFS Fire Fighting Water Supplies Code of Practice with a spacing of 90 m to 135 m

Information Sources

The following information sources were consulted to establish a possible design and budget costs for the water supply infrastructure required:

- » Christchurch City Council Infrastructure Design Standards, Draft July 2007
- » SNZ PAS 4509:2003 NZFS Fire Fighting Water Supplies Code of Practice
- » Christchurch City Council Staff



» South West Christchurch Area Study

Limitations on Scope

No specific hydrological or other assessment has been made in locating the new pump stations and wells. They have been positioned with appropriate sized mains to serve the new subdivisions in the proposed sequence of development as well as compliment the existing mains network.

Sub main costs for mains within the development areas have not been included in this study as they are assumed to be supplied by the individual developer for each area.

An allowance for fire hydrants and valves has been included in the mains costs.

Pump station head works costs are based on updated figures used in the South West Christchurch study, and data from the Council. Three wells per pump station have been allowed for to ensure well draw down is limited.

Significant Sequencing Issues

The Applefields area can be supplied by a single new pump station and is reasonably independent in water supply from the rest of the proposed developments. The remaining proposed developments are interdependent and so have had infrastructure costs grouped with the area that will require their installation first, with the result that pump stations are generally located towards the south of the areas they will eventually serve.

For cost effective installation the laying of new mains will need to be co-ordinated with the construction or upgrading of the new roads to allow these services to be installed within the road reserve.

1.2.2 Wastewater Reticulation



Tyrone Street Wastewater Pump Station

Current Servicing Arrangements

The existing sewer system serving Belfast terminates in a Ø 450/525 mm gravity main that runs from Lagan Street through to the Tyrone Street pump station. Two pumping stations, one located outside the study area in Redwood the other in Northwood, feed into the Main North Rd main together with a series of gravity laterals from properties in the established area. The North Western areas (Darroch Street)

supply wastewater to a Ø300 mm sewer main, which follows Factory Road and connects into the Ø525 mm main at Tyrone Street. The system terminates at the Tyrone Street pumping station from where it is pumped to the Bromley ponds.

This pumping system was initially sized using a population base of 13,000 people in the Belfast area. However our calculations indicate that the combination of the existing and new residential areas within the Area Plan study area excluding Hussey South, where the wastewater is not directed to Tyrone Street pumpstation, could accommodate a population of 16,950 people. Furthermore, the capacity of the Tyrone Street Station will be further exceeded when the Industrial areas of PPCS to Chaney's are developed.

The population base of 13,000 people would contribute an expected flow rate of 165 l/s. The theoretical flow rate for the fully developed scheme would be 370l/s, which assumes development of the industrial land including Chaney's. To accommodate this additional capacity the Tyrone Street pump station and the associated rising main to Bromley will need further upgrading or an alternative system installed. GHD has only costed the proposed system up to the Tyrone Street station and has not considered requirements for additional storage, pumping capacity or rising mains beyond that point.

Assuming that the Applefields block is developed first followed by a south to north development from the Styx river we estimate the capacity of the Tyrone Street-Bromley rising main will be reached when residential development encompasses the PPCS South block.

Schematics of New Servicing

Drawings showing the schematic layout and sizing of the sewer mains and the location of proposed pump stations are included in Appendix B. The final location of these facilities will depend on actual development progression and layout but it is believed that sufficient accuracy has been gained to enable budget costs to be determined.

Constraints

Design of the new sewer system has been based on the sequential order of development as detailed in Section 1.1.3 above. The existing Main North Road sewer system has constraints on capacity and it has therefore been decided to direct as much wastewater from the industrial areas as possible directly to the Tyrone street pump station or into the Ø525 mm diameter pipe leading to the station. It is proposed to connect the residential areas into the Main North Road system at Lagan St. This increases the flow rate, loading the pipe work to approximately 85% capacity. With the development phased from the south towards the pump station, much of the infrastructure for the southern regions requires installation of the preceding systems to support it. This is reflected in the high costings for the Styx North development.

Due to the flat topography of the Belfast area and the central location of the Tyrone Pumping station the proposed designs have had to employ minimum falls and this had dictated larger pipe diameters in some instances.

Design Assumptions

The capacity of the existing wastewater-piping network has been calculated using a waste flow rate of 220 litres/person/day. The population in the area was determined using the actual number of lots multiplied by the average household population (2.6 people/household).



The expected wastewater flows from the areas to be developed were based on the following flows (Table 2) as stated in the CCC Draft Design Standard.

Table 2 Sewer Flows Based on Zoning

Zone	Density	Average Sewer Flow (ASF)	Maximum Flow (MF)
LG	15 lots / hectare	0.103 l/s/ha	0.515 l/s/ha
L1	35 people/hectare	0.09 l/s/ha	0.45 l/s/ha
L2	70 people/hectare	0.18 l/s/ha	0.9 l/s/ha
B2	259 people/hectare	0.25 l/s/ha	1.25 l/s/ha
B4		0.095 l/s/ha	0.0.475 l/s/ha
B6		0.045 l/s/ha	0.225 l/s/ha

Limitations on Scope

The wastewater system designed typically comprises of a single sewer main supplying each development area. The Main North Industrial area will require the installation of additional mains to cover the large surface areas. The pipe work has generally been detailed in areas that had a positive fall for the sewer. However some of the flatter areas will require further consideration for end of line flushing to ensure the system is self-cleaning. This degree of detail has not been addressed in this report.

Significant Sequencing Issues

Issues with sequencing occur at the extremes of the development area. Due to potential capacity limitations on the existing Main North Road sewer main additional flow was limited to the residential area requirements only. The nearest suitable location for connection was at Lagan street. For the Styx North development this required installing gravity mains, pump stations and pressure mains that would be required by future development well before being initially required. To facilitate the installation of this pipe work where it is proceeding ahead of the establishment of road reserves it will necessary to secure the route with easements, by land purchase or the use of existing easements.

The northern industrial region around Chaney's has extensive areas already zoned for industrial development. These areas are not serviced with water supply, wastewater, or surface water infrastructure but there is already significant activity occurring and the balance could be developed at any time. This study assumes that the Council intends to see this existing zoning serviced and provides estimates of the cost of that servicing. For wastewater this would require a relay of pump stations and pipe work to be installed.

The proposed development scenario for the new industrial zoning is from the Tyrone Street Pump station radiating outwards. To cater for future upstream wastewater flow rates large pumps would initially need to be installed that would be capable of pumping all the waste from the Industrial areas. These pumps could initially be downsized until capacity requirements demanded the installation of larger pumps or rising mains from the proposed relay stations could be run right back to the Tyrone street pump station from individual pump stations.

1.2.3 Surface Water Management



Redwood on-road Stormwater Treatment

Current Servicing Arrangements: Overview

Three river systems provide an opportunity for the discharge of surface water from developed areas within the Belfast Area Plan region – the Styx River, Kaputone Stream and Waimakariri River. The existing drainage system utilises all three waterways.

At the south end of the study area, the Northwood development drains south and is discharged into the Styx River at two points upstream of the State Highway crossing after passing through detention basins.

The undeveloped land to the east of Main North Road, lying between the Styx River and Thompsons Road also drains south to the Styx River and is served by two drains, Curtis's and McFaddens.

Much of the older developed area of Belfast is drained by Wilson's drain, a partially piped system running along Main North Road, crossing open country at the north end of the town and passing under the motorway to discharge into the South Branch of the Waimakariri.

To the east a number of drains have their outfall in the Kaputone Stream. Further north, in the Chaney's area, drainage is either back into the Wilson's swamp system that finds its way to the Waimakariri via twin flap gated culverts under the motorway or flows north to the railway culvert that gives access to Kaianga Drain.

These existing drainage systems are described in the discussions for each drainage catchment in Section 2.

GHD's brief did not include an examination of water quality issues arising from existing development. The work is limited to consideration of surface water management facilities that could be required for new development. Existing development flows are allowed for through the assumption that sufficient detention is provided for new development that flows from such areas are limited to pre-existing flows, at least at the 50 year return period level.

Schematics of New Servicing and Design Assumptions

The brief seeks an assessment of the cost of these facilities and we have carried out calculations for each of the identified catchments sufficient to locate, size and cost the treatment and detention structures



required.

It has been assumed that treatment will be achieved through both sedimentation and soil filtration where the filtrate is collected in a subsoil drainage system, recognising that without site testing and noting the high groundwater levels and variable soil conditions it is not possible to recommend solutions that involve soakage to ground.

First flush volumes have been assessed using a 25 mm rainfall and deducted from the 50-year design storm volume to determine the volume of additional detention required.

To calculate the detention required in addition to the first flush volume we have first calculated the maximum discharge that would occur for a 50-year event in the current undeveloped state. Using the assumption that discharges from the catchment when fully developed should not exceed this undeveloped value, we have calculated the storage volume necessary to ensure that this discharge is not exceeded for any 50-year event. For all catchments the first flush volume and the balance detention volume is defined and used as the basis for costing. To ensure that developed flows do not exceed those currently occurring for storms of lower return periods than 50 years, it has been assumed that the outfalls from the '50 year' ponds are designed to restrict flows for lesser storms to no more than the pre-existing volumes.

Wherever possible the treatment/detention system is located adjacent to a waterway to enable the facilities to be an expansion of the esplanade reserve and to provide an obvious secondary flow path.

Treatment and detention facilities have been located, sized and costed to serve catchment areas chosen, suit the fall of the land and to recognise other constraints such as motorway and rail locations, and the ability to access waterways.

These catchments are shown in drawing C201, Appendix C. Catchment definition does not always match the areas assigned for the Area Plan Study (see 1.1.3 above) and allocation of costs to each study area has taken account of this lack of correlation and is explained in the sections following.

As stated, the primary drainage philosophy applied to all catchments was to ensure that discharged rates from development for events up to a 50-year return do not exceed current discharge rates. This ensures that any development does not cause adverse effects over and above those already experienced by the waterway of concern.

The key design assumptions applied to all catchments were:

- » Capture of the first 25 mm of catchment rainfall for first flush treatment.
- » Capture and detention of the design 50 year storm.
- » First flush ponds will be designed to drain within a 48 hour period.
- » Detention will drain within 7 days.
- » Ability to acquire the land required both rural and developed.

For costing purposes we have assumed a satisfactory standard of water quality improvement will be achieved through first flush sedimentation and filtration through the base of the first flush pond with filtrate collected in a subsurface drainage system and transferred to the detention basin. We have not attempted to cost wet pond or wetland solutions.



Northwood first flush pond

Cost Assumptions

The basic design applied for detention and treatment basins is described above. Deviations from this design that were needed for particular systems are discussed in their respective sections later within the report.

Assumptions common to all proposed systems are:

- » The costs are present day costs (August 2007) and no allowance has been made for potential construction cost fluctuations over time.
- » The majority of construction costs were taken from Rawlinsons *Construction Cost Handbook 2006* and checked against contract rates held by CCC and GHD construction cost databases.
- » While the configuration and operation of each detention/treatment facility will depend on the detailed design, allowance has been made for the structures that will typically be required.
- » A significant portion of surface water treatment and detention costs lies in land acquisition, which introduces considerable uncertainty into the costs reported. The Council's Property Officer has advised the following current land values:

– Rural land around Belfast	\$15/m ²
– Rural land to the west of Main North Road	\$17.50/m ²
– Industrial Land adjacent to PPCS	\$200/m ²
– Industrial land in the Chaney's area	\$80/m ²
– Residential land	\$475/m ²

For the estimates contained in the report we have had to assess what the Council might have to pay to obtain land for the detention and treatment basins. The amount paid will clearly depend on timing of the purchase as the land moves from rural status to "likely to be zoned for development" to actually zoned. For this report we have assumed a value of \$50/m² for land currently zoned rural.

- » Based on desktop analysis of Council supplied aerial photos, there are no identified impediments, such as buildings, to the formation of storm water detention areas in those indicative areas identified on drawing C201 (refer Appendix C)



Information Sources

A variety of information sources were used for this section of the study. This included specialist opinion, both in-house and external, as well as a variety of relevant reports and papers.

Site visits, aerial photographs and CAD drainage plans were among the tools used to formulate the proposed conceptual designs.

Sources included:

- » Christchurch City Council (2003). **Waterways, Wetlands and Drainage Guide – Part B: Design.**
- » V. Wong, Greenspace Unit (2003). **Background Research on Utility Waterways in Belfast.**
- » Davis Ogilvie (2004). **Engineering Assessment Report for Stormwater Disposal.**
- » Rawlinsons (2006). **Rawlinsons New Zealand Construction Handbook.**

Sequencing Issues

Costings provided for surface water management facilities do not include the stormwater collection and transport infrastructure that will be provided by individual developers. However the detention/treatment facilities costed will need to be in place ahead of, or as part of development, and where they serve a number of developable properties the Council will need to find the means of acquiring the land and ensuring construction of the works. Historically, the Council has used cost share schemes to ensure such major works can be progressed by the council with cost recovery effected through development contributions as the development occurs. Today this can be achieved through the Council's Development Contribution Policy.

Costs for landscaping and planting are included for each detention area.

1.2.4 Transport



Main North Road (A2)

Current Servicing Arrangements

The current road network within the study area consists essentially of the central State Highway arterial, Main North Road (SH1 / SH74), which the State Highway 1 bypass of the city joins midway, by way of

Johns Road. Main North Road has had the last remaining two-lane section recently upgraded, providing a four-lane arterial through the length of the study area. This not only serves the local area but carries the bulk of all northern traffic in and out of Christchurch.

Development so far has been spread along the length of Main North Road with significant recent expansion in the Northwoods area south of Johns Road and west of Main North Road. The current road network provides only limited access to the areas planned for future development and is already heavily loaded by the increase in traffic from recent development both within and outside the study area.

Cycle facilities within the study area are limited to short sections of cycle lanes at main intersections with no dedicated off road cycle paths. Many roads within the study area are very narrow offering inadequate shoulder area for cyclists. There is no overall system of pedestrian footpaths linking public green spaces apart from what has been incorporated in the Northwoods development.

Public transport is currently provided by bus services that follow Main North Road to Factory Road and a service into Northwoods from the City.

Planned Servicing Arrangements

A plan to improve the above transport situation in the study area is covered in the "Draft Belfast Area Plan Transport Assessment: May 2004" and accompanying schematics. The plan's key road network framework is based on the recommendations and Council resolutions following the Northern Rooding Options Scoping Study 2002. The planned system creates an improved network of arterial roads, cycleways and footpaths but is dependent on the Northern Arterial being built in the medium term, and to a lesser degree, the Western Belfast Bypass being built in the longer term. These arterials are required to remove the SH74 and SH1 through traffic from Main North and Johns Roads. No commitment has been made by Transit to carry out either of these works at this stage, within the 2006/2007 Ten Year Forecast to 2015/2016.

Works have been broken down into short, medium and long term works in the "Draft Belfast Area Plan" but for the sake of apportioning costs to specific areas we have grouped these works by sub-division area following the assumed expansion order outlined in Section 1.1.3.

Constraints

For the purposes of this report the changes in transport infrastructure have been assumed to follow that generally outlined in the "Draft Belfast Area Plan" and as defined through discussions with CCC in July 2007. No extra design work has been carried out. The plan generally only covers roads of "collector" status and above, it being assumed that the provision of minor local roads within sub-division areas, other than those stated, will be undertaken and funded by the developer. The costs of all roads and intersections considered have been apportioned between developers and the Council using what information has been available. LTNZ subsidies have also been noted in the cost breakdowns, where these are assumed to be applicable.

Design and Costing Assumptions

This report is generally limited to covering only those transportation costs with an element to be paid by CCC. It is assumed that generally the developer will pay directly for any new roading or upgrades required for their respective development, with Council only paying for additional costs to bring a road up to Arterial status if required..

It is assumed an LTNZ subsidy will be available for Council roading projects that are justifiable through



travel time and safety requirements. This subsidy has been assumed to be 53% on advice from CCC and would include cycleways used for commuting but not where the dominant use is recreation.

Unit rates for roads and footpaths have been derived from previous works and include a component for relocating services, storm water drains, kerb and channel, footpaths, lighting and some landscaping. Allowance has also been made for establishment and professional services.

New and upgraded roads are assumed to be surfaced with chip seal while cycle ways and off road pedestrian walkways are assumed asphalt.

Existing local roads in Northwoods that are being upgraded to collector status are assumed to be left as they are except for the removal of landscaped narrows and some remarking.

Due to the four lane Main North Road actually being down rated in the long term to minor arterial status it is assumed no major capital works would be undertaken and costing has been limited to remarking and adjustments to kerb, berms and parking to allow for full length cycle ways.

For the purposes of this report the Northern Arterial is assumed to be a four lane major arterial while the Western Bypass is assumed to be a two lane major arterial. The estimates for both of these routes are based on current available cost information but must be viewed as indicative only at this stage.

While a designation already exists for the proposed 4-lane Northern Arterial, with a nominal width of 40m, it is assumed more land will be required to allow for design to modern roading standards (e.g. AusRoads) and so a legal road width of 60 m has been allowed for in costing the Northern Arterial. Similarly, an allowance has been made for a 30 m wide legal road when costing the 2-lane Western Bypass on council advice.

It has been assumed that all pedestrian crossings of the main trunk railway line will be controlled with signals. A considerable saving in the order of up to \$110 000 per crossing can be gained if these are left uncontrolled.

Bus stops are assumed to be spaced at 400m centres along bus routes. Outbound bus stops are assumed to be achieved with road marking and signage while inbound bus stops are considered to be a covered bus stop.

Information Sources

The following information sources were consulted to establish budget costs for the required road works and other transport infrastructure:

- » Northern Roding Options Scoping Study (NROSS) Final Report 2002
- » Recent costs from the SH74 four-laning around Styx Bridge
- » Construction costs from previous road works carried out by City Solutions
- » South West Christchurch Area Plan Study
- » GHD in-house sources

Limitations on Scope

This report has only considered the costs associated with upgrading the roads and transport infrastructure within the study area boundaries. Even where roads extended beyond the boundary, allowance has only been made for that part of the road within the study area. The only exception to this

is the Western Bypass where the section (M6) running from Dickies Road to the bottom end of Applefields has been included, as shown in Appendix D, Figure D1.

No road design work has been carried out apart from that necessary to define carriageway widths and the number and size of structures such as intersections and bridges.

Public transport costs have been limited to covered bus stops, for pick-up points only and a lump sum of \$500 000 for development of a “bus interchange” stop where the various bus routes meet. No costs have been included for the future possibility of light rail transport being offered along the main trunk line.

Significant Sequencing Issues

The Applefields subdivision and related roads are a stand-alone area, which could be developed with reasonable independence from other areas in the study. Any development in this area is likely to depend on the Northern Arterial or Western Bypass being implemented first and is subject to an S293 process currently in the Environment Court. The extension of Northwoods Boulevard and road improvements within Northwoods have been grouped with the Applefields area as this is likely to be an appropriate time for these works to be carried out.

The rest of the new development has been assumed to progress from the Styx North area northwards. Transport costs have therefore been grouped with the first sub-area in the development sequence that requires them, as such some areas have limited transport costs associated with them as most of the infrastructure they require will have already been installed as a requirement of an earlier development.

Off Road Cycleways and Footpaths

A network of off road cycleways and footpaths has been proposed by the Council to link greenspace areas and provide efficient off road travel routes (refer Figure D4, Appendix D). The development costs of these pathways have been grouped with the first sub-area in the development sequence requiring them and have been included in the transport cost table for that area.

It has been assumed that the Council are likely to pay for paths following the Main Trunk railway line while Transit will pick up costs for paths running along the new Northern Arterial route.



2. Infrastructure Costs by Sub Area

2.1 General Matters

2.1.1 Sub Area Description and Areas-Maps

The Belfast Area Plan work has established sub-areas for study purposes, which define proposed zonings and assist with sequencing the development. These have been used as the basis for preparing costings and are shown on drawing C120, Appendix A.

With the exception of the commercially zoned Supa Centa (B2), instructions for this updated study were to treat all of the new and existing industrial land as B4. This includes the Chaney's area, which is currently zoned as B6 and the PPCS areas, which are currently B5.

2.1.2 Industrial Zones and Associated Lot Development

As with residential development, which is assumed to progress from South to North, the industrially zoned land development is also assumed to commence around Belfast Road and progress northwards. A critical consideration in determining how this development could progress is the future of the PPCS operations and the accessibility of their land holdings.

Similar to the constraint on residential development it is assumed that any new industrial zoning will not be able to be developed until one of the bypasses is constructed.

2.1.3 Engineering, Contingency, Inflation allowances

Costs estimates from the costing exercise carried out in June 2006 have been inflation adjusted to August 2007. An allowance of 15% has been made for engineering fees, and a further 15% as contingency.

Land costs are market rates as estimated at August 2007 on advice from the Council's Property Officer.

2.2 Applefields

2.2.1 General

The Applefields/Devondale area is some 107 ha bounded by Main North Road, Johns Road and the Waimakariri Stopbank. This area is planned to contain 96 ha of residential land, with the new LG zoning, the remaining 11 ha would be designated as green space.

The area has a number of existing life-style block properties along the northern boundary that are serviced by bore water but have a gravity sewer main to the south of the properties. There is also residential development along the Main North Road boundary.

There is currently a Section 293 action before the Environment Court regarding the Applefields area. The actual timing and extent of development that takes place in this area will be dependent on this decision. Being a relatively independent area, in infrastructure terms, the timing of development in the Applefields area will have reduced impact on other areas, however for the purposes of this report Applefields is assumed to be one of the first areas developed.

2.2.2 Water Supply

Description of Infrastructure Required

Applefields will be served by a Ø375 mm main running along the new road through the middle of the subdivision. This will link up with the Ø200 mm main at the Northern Boulevard end and connect through to the Ø375 mm main at the opposite end, which comes from the Darroch Street pump station. This forms a ring main covering the western side of the study area.

A new Applefields pump station will be installed at the western end of the subdivision supplying the Ø375 mm main.

Ø200 mm and Ø150 mm branch mains will connect across to the existing main running along Main North Road and Johns Road to create a network.

Allowance in the head works costs have been made to increase pump capacity for the Darroch Street pump station such that it can use the full capacity of the recently installed second well.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Assumptions

It is assumed the new mains will be installed at the same time as the new roads are put in and that the two crossings of Johns Road will be undertaken at the same time as the relevant intersections are upgraded.

The new Applefields pump station is to be installed before significant flow is drawn from the new pipe work.



Costs

The following table summarises the water supply costs for the Applefields area.

Table 3 Applefields Water Supply Costs

Type	Designation	Cost
Mains	W19	\$1,021,700
	W20	\$51,000
	W21	\$104,100
	W22	\$199,700
	W23	\$7,100
Pump Stations	Applefields	\$1,682,600
	Darroch St (upgrade)	\$90,400
Engineering Fees (15%)		\$473,500
Contingency (15%)		\$544,500
Total		\$4,174,600

2.2.3 Wastewater

Description of Infrastructure Required

Drawing C103 and C105 shows the conceptual wastewater infrastructure (reticulation and pump station) for the Applefields area. The flat topography of the area does not allow for a single gravity main to service the whole area and requires two collection points to be established. The area has low-lying areas at either end of the site creating natural collection locations that can be serviced by gravity pipework.

Wastewater from the west of the site is transported through gravity mains into the west collection manhole. From this collection point, sewage will be pumped to a collection manhole via a 1140m long rising main which would follow the proposed collector road through Applefields. From the Eastern manhole it is proposed to gravity fall the sewer through to Darroch Street connecting into the Main Road, Ø450 mm sewer. This connection will necessitate either directional drilling or excavation across Main North Road. As mentioned, the site has an existing gravity sewer located on the northwestern boundary, which may be able to be incorporated into a new scheme depending on available downstream capacity and the depth of the sewer in relation to the probable development layout.

It should be noted that when Hussey Central is developed the wastewater from this area will be pumped through the Applefields reticulation and the cost of this capacity is included in the cost estimates shown in Table 4.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Costs

Cost details for wastewater infrastructure for the Applefields development are included in the table below.

Table 4 Applefields Wastewater Costs

Type	Section	Cost
Gravity mains	G33	\$ 370,100
	G34	\$ 312,600
	G35	\$ 302,200
	G36	\$ 300,700
Rising mains	P15	\$ 570,000
Pump Stations	PS15	\$ 180,000
Collection Manhole	CM2	\$ 5,000
Engineering Fees (15%)		\$ 306,100
Contingency (15%)		\$ 352,000
TOTAL		\$ 2,698,700

2.2.4 Surface Water

Description of Existing Infrastructure

Applefields is predominantly rural. Wilsons drain runs along its Southern and Eastern boundary along Johns Road and Main North Road, providing an outfall for the residential development along Main North Road.

Description of Infrastructure Required

The area as a whole has no obvious drainage paths, suggesting that the area maybe suited to soakage solutions. A Davis Ogilvie (2004) report proposes a soakage solution consisting of two soakage basins for the Applefields area. Should soakage not be feasible, then detention and an outfall to the Waimakariri River would be required.

The proposed solution for the Applefields area consists of two catchments (C1 and C2) draining to a treatment / detention basin for each catchment, C1 and C2 sized to retain the 50-year storm. The required size for these basins has been estimated at 8798 m² and 8120 m² respectively, assuming a 1m deep detention area. Allowance has been made to construct an outfall for each facility draining to the South Branch of the Waimakariri. The configuration of the facility will allow detention and disposal



through soakage of the first flush volumes, 3192 m³ and 3732 m³ respectively with diversion of greater flows to detention and soakage or disposal through an outfall to the Waimakariri River.

The catchment areas and proposed treatment/detention location for these catchments can be seen in drawing C201 Appendix C.

Costs

The table below details the estimated construction costs for the storm water management systems for Catchments 1 and 2.

Table 5 Applefields Surface Water Construction Costs (Catchments 1 and 2)

Catchment	Infrastructure	Pond size (m ²)	Cost	
C1	42.6 ha	First Flush Pond	3192	\$470,700
		Detention Pond	8798	\$241,300
		Other		\$52,100
C2	49.8 ha	First Flush Pond	3732	\$506,300
		Detention Pond	8120	\$226,700
		Other		\$52,100
Engineering (15%)				\$232,400
Contingency (15%)				\$267,200
Land				\$1,788,100
Total				\$3,836,900

2.2.5 Transportation

Description of Infrastructure Required

New roading for the proposed Applefields area will require the continuation of Northwood's Boulevard (C3) through to Johns Road (A3), as shown in Appendix D, Figure D1, necessitating the acquisition of a Housing NZ Corporation property (Estimated at \$398,600) and the construction of a signalled intersection on Johns Road. A new collector road (C5) will run from this intersection up through the new subdivision where it forks to join Main North Road in two places opposite Richill Rd (C6) and Belfast Road (C7). Acquisition of four properties will be required to allow these roads to cut through the existing row of properties situated along the west side of Main North Road.

Two new local roads (L2 & L3) will make connections across from the new collector to Johns Road. There will also be a new local road (L4) from the end of Darroch Street to the collector and allowance has been made for a new local road (L1) to provide access to the Groynes. A new local road (L9) will be present from the new collector (C5) north to near the boundary of the Applefields development.

These and any other additional local roads giving access to individual sections are assumed to be the responsibility of the developer. Possible exception are local roads L1 and L4 which are likely to be a CCC cost.

The exact number of intersections onto Johns Road giving access to the Applefields area is still not decided and the arrangement used for this study is only one option.

A new off road pedestrian footpath will follow the west boundary of the study area from Dickies Road down to the Groynes reserve running along the top of the existing stock bank.



Johns Road (A3)

Drawings

Figure D1 – Figure D3 in Appendix D show the proposed ultimate road layout along with the designations used in this report for roads and intersections. Figure D4 shows the anticipated off road cycle and pedestrian facilities and designations used while Figure D5 shows the proposed bus routes.

Assumptions

It is assumed the Applefields development would be one of the earlier developments and Johns Road would remain two lane with only the addition of signal controlled intersections at the cross roads formed by Johns Road (A3), Northwood's Boulevard (C3) and the new collector (C5), and where both L2 and L3 meet Johns Road (A3). The signalised intersection of Johns Road (A3) and Main North Road (A2) will have to be upgraded.

Land required for the new roads is assumed to be rural land at a rate of \$17.50 / m². The four residential properties are assumed to cost \$375,000 each (as at August 2007). Council will need to re-designate and purchase this land before this roading plan will be possible.

Costs

The tables below detail the transportation costs for the Applefields area. Engineering (15%) and contingency (15%) have been included. Table 6 contains the transport total costs, including intersection costs. The direct Developer costs shown in the table are exclusive of and additional to any development contribution charges. Table 7 itemises the costs for each intersection.



Table 6 Applefields Transportation Cost

Road/Path	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
L1	\$899,300	\$0	\$899,300	\$0	\$0
L2 (I16, I14)	\$1,277,700	\$1,277,700	\$0	\$0	\$0
L3 (I15, I17)	\$1,711,700	\$1,711,700	\$0	\$0	\$0
L4 (I12)	\$781,900	\$7,500	\$774,400	\$0	\$0
L8	\$0	\$0	\$0	\$0	\$0
L9 (I27)	\$787,600	\$787,600	\$0	\$0	\$0
C3	\$848,100	\$0	\$398,600	\$449,500	\$0
C4	\$14,900	\$0	\$7,000	\$7,900	\$0
C5 (I13, I18)	\$5,521,600	\$4,733,600	\$788,000	\$0	\$0
C6 (I4)	\$3,668,400	\$3,668,400	\$0	\$0	\$0
C7 (I5)	\$3,204,300	\$3,204,300	\$0	\$0	\$0
A2 (I6)	\$329,300	\$132,300	\$92,600	\$104,400	\$0
P6	\$633,400	\$316,700	\$316,700	\$0	\$0
Total	\$19,678,200	\$15,839,800	\$3,276,600	\$561,800	\$0

Table 7 Intersection Costs

Intersection	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
I4	\$264,500	\$264,500	\$0	\$0	\$0
I5	\$788,000	\$788,000	\$0	\$0	\$0
I6	\$264,600	\$132,300	\$0	\$0	\$132,300
I12	\$7,500	\$7,500	\$0	\$0	\$0
I13	\$7,500	\$7,500	\$0	\$0	\$0
I14	\$7,500	\$7,500	\$0	\$0	\$0
I15	\$7,500	\$7,500	\$0	\$0	\$0
I16	\$788,000	\$788,000	\$0	\$0	\$0
I17	\$788,000	\$788,000	\$0	\$0	\$0
I18	\$0	\$0	\$0	\$0	\$0
I27	\$7,500	\$7,500	\$0	\$0	\$0
Total	\$2,930,600	\$2,798,300	\$0	\$0	\$132,300

2.3 Styx North

2.3.1 General

The Styx North area is some 31 ha, bounded by the Styx River to the south, Main North Road to the West and Radcliffe Road to the East. This area is proposed to be fully residential with 28 ha of land to be the new LG zoning and the remainder as green space. **Water Supply**

Description of Infrastructure Required

The Ø300 mm main from Thompsons Rd pump station will be continued out to Blakes Road then down to join with a new Ø200 mm main travelling along Radcliffe Road. This will provide trunk-main service to both the Styx North, Radcliffe North and Supa Centa expansion.

A new pump station, "Radcliffe North", will be installed near the end of Blakes Road connecting into the Ø300 mm main. This will provide water for this area as well as the proposed future developments to the north.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Assumptions

An additional cost of \$30,000 has been allowed for tunnelling under the railway line, or lifting track to lay the new Ø200 main across the main trunk line.

Costs

The following table summarises the water supply costs for the Styx North area.

Table 8 Styx North Water Supply Costs

Type	Designation	Cost
Mains	W1	\$197,000
	W3	\$217,900
	W2	\$61,700
Pump Stations	Radcliffe North	\$1,682,600
Engineering Fees (15%)		\$323,900
Contingency (15%)		\$372,500
Total		\$2,855,600



2.3.3 Wastewater

Description of Infrastructure Required

This area has natural fall to the South of the site and the location of the main collection sewer has been placed to reflect this. The main gravity sewer (Ø150 mm) falls from either end of the site and collects at a common pumping station (PS1). As noted above the high costs attributed to this development are due to the requirements of having to send the waste directly to the Lagan street end of the Main North road sewer end. This involves the installation of much of the infrastructure for succeeding developments, which accounts for approximately 60 percent of the cost. The total wastewater flow for the Styx North area is 14.5 litres/second.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Costs

Wastewater cost details for the Styx North development are included in the table below.

Table 9 Styx North Wastewater Costs

Type	Section	Cost
Gravity mains	G1	\$ 379,300
	G2	\$ 277,200
	G3	\$ 68,900
	G4	\$ 309,300
	G7	\$ 493,500
Rising mains	P1	\$ 101,300
	P2	\$ 97,500
	P4	\$ 545,000
Pump Stations	PS1	\$ 80,000
	PS2	\$ 102,000
	PS4	\$ 141,000
	PS10	\$ 64,000
Collection Manhole	CM1	\$ 5,000
Engineering Fees (15%)		\$ 399,600
Contingency (15%)		\$ 459,500
TOTAL		\$ 3,523,100

2.3.4 Surface Water

Description of Existing Infrastructure

The Styx North zone is primarily rural farmland. There are two drains flowing into the Styx River – the Curtis and McFaddens drains.

Curtis drain runs along Radcliff road between Main North Road and the railway line; the drain then turns south and follows the West side of the railway, discharging in to the Styx River.

McFaddens drain is located East of Curtis, again following Radcliff Road, turning south and transporting the surface water runoff into the Styx.

There are several private stormwater culverts along Radcliffe road, which are likely to be undersized to cope with increased runoff from development in the area and will require upgrading. The cost of this upgrade has not been included in the estimations.

Description of Infrastructure Required

The proposed management system for this area consists of two catchments (C3 and C4). The catchment areas and proposed treatment/detention location for these catchments can be seen in



drawing C201 Appendix C.

Catchment C3 captures runoff from Styx North, Radcliff North, and the Supa Centa zones. Runoff will be transported down Curtis Drain along the length of the railway line to a first flush and detention pond system at the edge of the Styx River.

Catchment C4 works on the same principal as C3. However, C4 services a much larger area encompassing the remainder of the “Styx North” zone whilst also servicing, the “Radcliff North” zone and a small section of “PPCS South” zone.

Costs

Table 10 below details the estimated construction costs for the storm water management systems for catchments C3 and C4.

Table 10 Styx North Surface Water Costs

Catchment	Infrastructure	Pond size (m ²)	Cost
C3 32.1 ha	First Flush Pond	2730	\$213,200
	Detention Pond	5663	\$173,600
	Other		\$68,100
C4 26 ha	First Flush Pond	1948	\$161,400
	Detention Pond	3767	\$135,600
	Other		\$52,100
Engineering (15%)			\$120,600
Contingency (15%)			\$138,700
Land			\$1,058,100
Total			\$2,121,400

2.3.5 Transportation

Description of Infrastructure Required

Radcliffe Road (A4) will need to be widened and upgraded to an Urban Minor Arterial. This will require the acquisition of additional land along one side of the of the existing road, varying from 3 m to 5 m in width. The intersection of Radcliffe Road with Main North Road (A1) would not require upgrading.

The continued expansion of the Supa Centa will require the installation of a roundabout on Radcliffe Road at the intersection with the entrance to the Supa Centa and proposed entrance to the Supa Centa Extension development to the South of Radcliffe Road.

With the opening up of the Styx North subdivision the first part of the proposed pedestrian footpath network would also be added (P5). It has been assumed that this footpath will follow the north bank of the Styx River, cross the existing railway with a controlled level pedestrian crossing and will cross Main North Road at the controlled intersection with Styx Mill Road.

Drawings

Figure D1 – Figure D3 in Appendix D show the proposed ultimate road layout along with the designations used in this report for roads and intersections. Figure D4 shows the anticipated off road cycle and pedestrian facilities and designations used while Figure D5 shows the proposed bus routes.

Assumptions

- » It is assumed the current controlled railway crossing on Radcliffe road will need to be widened to allow for the proposed minor arterial status. A lump sum of \$80,000 has been allowed for this.
- » Land required for the upgraded road is assumed to be rural land at a rate of \$15 / m² and this is assumed, in the main, to be supplied by developers.
- » All local roads within the new subdivision are assumed to be supplied by the developer and have not been costed here.
- » It is assumed the new footpath runs along the north side of the Styx River, which avoids the need for a crossing.

Costs

The tables below detail the transportation costs for the Styx North area. Engineering (15%) and contingency (15%) have been included. Table 11 contains the transport total costs, including intersection costs. The direct Developer costs shown in the table are exclusive of and additional to any development contribution charges. Table 12 itemises the costs for each intersection

Table 11 Styx North Transportation Costs

Road/Path	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
A4 (I26)	\$3,031,300	\$2,118,300	\$429,100	\$483,900	\$0
P5	\$600,800	\$600,800	\$0	\$0	\$0
Total	\$3,632,100	\$2,719,100	\$429,100	\$483,900	\$0

Table 12 Styx North Intersection Costs

Intersection	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
I26	\$264,500	\$264,500	\$0	\$0	\$0
Total	\$264,500	\$264,500	\$0	\$0	\$0



2.4 Supa Centa Extension

2.4.1 General

The Supa Centa Extension increases the existing commercial area using land south of Radcliffe Road, between the railway and Main North Road. Two options have been considered,

1. A 2 ha block immediately below Radcliffe Road and
2. An 8 ha block using all the land available.

The site would be zoned B2 and construction on the site would be phased to start towards the end of the Styx North development, subsequent to a population increase meaning that much of the infrastructure will be in place prior to its construction.

2.4.2 Water Supply

No additional water infrastructure is required for the Supa Centa development, which will be served by the new Ø200 mm main installed previously for the Styx North development. The option of further expanding the Supa Centa to occupy all the land available to the west of the railway would also be catered for.

2.4.3 Wastewater

The site falls slightly from Main North Road to the railway and we have allowed for the installation of a sewer main along the rear of the section only. The sewer falls from South to North to ensure there is sufficient fall to remove waste from the front of the site. The total wastewater flow for the area is 3 litres/second.

Expanding the Supa Centa would increase the wastewater flows from the Supa Centa to approximately 10 l/s. This is within the capacity of the proposed infrastructure and no additional infrastructure is required.

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588 -C120 shows an overview of the study area and proposed development zones.

Costs for the Supa Centa have been included in the development costs for Styx North.

2.4.4 Surface Water

The Supa Centre is encompassed within surface water catchment area C3. For a description of the proposed treatment system for this catchment, refer to the previous section (Styx North). The option of increasing the Supa Centa development to use all the available land on the west side of the railway has also been costed. An increase in the Supa Centa development will increase the amount of impervious land in the area, requiring a larger detention basin to capture runoff. However, as the Supa Centa is only a small part of the catchment (C3), the additional costs are relatively small, as shown in Table 13.

Table 13 Supa Centa Expansion Options – Surface Water Construction Costs (C3)

Catchment	Infrastructure	Pond size (m ²)		Cost	
		Catchment 3 Option 1, Supa Centa 2 ha	Catchment 3, Option 2, Supa Centa 8ha		
C3 32.1 ha	First Flush Pond	2,730	3694	\$213,200	\$277,000
	Detention Pond	5,663	6636	\$173,600	\$194,600
	Other			\$68,100	\$68,100
	Engineering (15%)			\$68,200	\$81,000
	Contingency (15%)			\$78,500	\$93,100
	Land			\$629,400	\$774,700
	Total				\$1,231,000

2.4.5 Transportation

Description of Infrastructure Required

Two local roads are planned for the Supa Centa, one in the existing development from Radcliffe Road through to Thompsons Street and the other in the proposed Supa Centa development on the southern side of Radcliffe Road, between Radcliffe Road and Main North Road. This will also include signals at Main North Road and a roundabout at Radcliffe Road. All transport costs associated with the development of the Supa Centa are to be covered by the developer. This would include any slip lanes and the required upgrades to the intersections on Main North Road and Radcliffe Road that service the Supa Centa and proposed Extension (e.g. intersections I7 & I8)

All other transport requirements for the Supa Centa expansion are met by the infrastructure upgrades carried out for the Styx North development.



2.5 Radcliffe North

2.5.1 General

Radcliffe North is a 19 ha area bounded by Thompsons, Radcliffe, and Blakes roads, and the railway line. The area is assumed to be all zoned as General Living, with approximately 2 ha retained as green space. The proposed development will progress after the Styx North development.

2.5.2 Water Supply

No additional water infrastructure is required for Radcliffe North which will be served by the new Ø300 mm and Ø200 mm mains installed previously for the Styx North development.

2.5.3 Wastewater

The infrastructure required for the Radcliffe area will be installed as part of the Styx North development, see above. Total peak wastewater flow for the area is 9 litres/second.

2.5.4 Surface Water

Surface water treatment for Radcliff North is treated by two water treatment systems. The majority of Radcliff North falls within catchment C4 whilst the remainder is covered by catchment C3. A description of each of these can be found in Section 2.3 (Styx North).

2.5.5 Transportation

Description of Infrastructure Required

Blakes Road (C9) will need to be upgraded and widened to urban collector status in order to give full access to the new Radcliffe North area. This road will also need additional land taken to meet the road reserve width requirements. In places a strip of 5m of rural land will be required and this is assumed to be supplied by developers.

In order to form a ring road and provide another access point to both Main North Road and Marshlands Road it is assumed Belfast Road (C14) will be upgraded to Urban Collector status at this time, requiring an additional 5m width land to be aquired for approximately two thirds of its length. To ensure this will be possible Council need to consider acquisition through purchase or designation.

Drawings

Figure D1 – Figure D3 in Appendix D show the proposed ultimate road layout along with the designations used in this report for roads and intersections. Figure D4 shows the anticipated off road cycle and pedestrian facilities and designations used while Figure D5 shows the proposed bus routes.

Assumptions

- » It has been assumed the current culverts on Blakes Road and Belfast Road are suitable to carry the upgraded road widths.
- » It is assumed the current controlled railway crossing on Belfast Road is wide enough for the roads proposed minor arterial status.

- » Land required for the new roads is assumed to be rural land at a rate of \$15 / m².
- » All local roads within the new subdivision are assumed to be supplied by the developer and have not been costed here.

Costs

The tables below detail the transportation costs for the Radcliffe North area. Engineering (15%) and contingency (15%) have been included. Table 14 contains the transport total costs, including intersection costs. The direct Developer costs shown in the table are exclusive of and additional to any development contribution charges. Table 15 itemises the costs for each intersection

Table 14 Radcliffe North Transportation Costs

Road/Path	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
C9 (I9)	\$3,348,300	\$0	\$1,573,700	\$1,774,600	\$0
C14 (I10)	\$3,468,200	\$2,174,800	\$607,900	\$685,500	\$0
Total	\$6,816,500	\$2,174,800	\$2,181,600	\$2,460,100	\$0

Table 15 Radcliffe North Intersection Costs

Intersection	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
I9	\$0	\$0	\$0	\$0	\$0
I10	\$7,500	\$7,500	\$0	\$0	\$0
Total	\$7,500	\$7,500	\$0	\$0	\$0



2.6 PPCS South

2.6.1 General

The PPCS south site is a 15 ha area which is bounded by Thompsons and Blakes Roads, the railway and the proposed extension to Sheldon Park. Proposed zoning is LG. To the North of the PPCS site there appear to be effluent ponds and a solid waste area. Redevelopment costs associated with any contamination clean up of these areas has not been allowed for in our analysis.

2.6.2 Water Supply

Description of Infrastructure Required

A new Ø300 main will run up Blakes Road from the intersection of Thompsons Road up to Belfast Road providing a trunk-main for the PPCS South area as well as the PPCS Residential area and PPCS Industrial area.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers C101 to C113, which show pipe locations and designations. Drawing C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing C120 shows an overview of the study area and proposed development zones.

Assumptions

It is assumed installation of the new mains will coincide with upgrading works on the roads.

Costs

The following table summarises the water supply costs for the PPCS South area.

Table 16 PPCS South Water Supply Cost

Type	Designation	Cost
Mains	W4	\$ 307,700
	W5	\$ 34,800
Engineering Fees (15%)		\$ 51,400
Contingency (15%)		\$ 59,100
Total		\$ 453,000

2.6.3 Wastewater

PPCS South site is diagonally bisected by the Kaputone stream and this has necessitated the installation of sewer mains running along Thompsons Road and a section along Blakes Road. Both of these sewer mains follow the natural fall of the site towards the South Eastern corner. The sewer along Blakes Road will need to pass under the Kaputone stream and be collected at a pump station (PS3) located in the South East corner. Total peak wastewater flow for the area is 7 litres/second.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Cost

Cost details for the PPCS South development are included in the table below.

Table 17 PPCS South Wastewater Cost

Type	Section		
Gravity mains	G5	\$	212,300
	G6	\$	134,700
Rising mains	P3	\$	90,000
Pump Stations	PS3	\$	66,000
Engineering Fees (15%)		\$	75,400
Contingency (15%)		\$	86,800
TOTAL		\$	665,100

2.6.4 Surface Water

Description of Existing Infrastructure

The zone, PPCS South is currently primarily rural land though a significant proportion has been developed as part of the PPCS factory. This area is encompassed by catchment area C5.

The area drains directly into the Kaputone stream. One road drain exists, Blakes Road drain which follows Blakes road, entering the Kaputone immediately east of the intersection of Blakes Road and Belfast Road.

Description of Infrastructure Required

The proposed system for this catchment consists of a two pond - first flush and detention system, located within the esplanade reserve adjoining the Kaputone Stream and also contiguous with the proposed motorway corridor. The treatment/detention facility can be positioned to ensure the outfall is above



Kaputone stream 50 year flood level, and shaped to reflect the elongated nature of the reserve. Normal outflows would be sized to ensure the Kaputone is not receiving flows greater than those currently occurring but a spillway structure would allow flows to the Kaputone in the event the detention facility was overwhelmed.

Just upstream of this facility there is an opportunity to allow an overflow from the Kaputone to discharge to the Styx River utilising the Motorway Road Reserve. This would only operate at times of very high flow in the Kaputone, but would be a way of limiting downstream flood flows in the Kaputone and ensuring satisfactory operation of the detention/treatment facilities proposed along the stream.

Costs

Table 18 below details the estimated construction costs for the storm water management systems for catchment C5.

Table 18 PPCS South Surface Water Construction Costs (C5)

Catchment	Infrastructure	Pond size (m ²)	Cost	
C5	54.4 ha	First Flush Pond	2,816	\$218,800
		Detention Pond	12,519	\$321,700
		Other		\$52,100
Engineering (15%)			\$88,900	
Contingency (15%)			\$102,200	
Land			\$1,150,100	
Total			\$1,933,800	

Transportation



Belfast Road A5

Description of Infrastructure Required

Transport requirements for PPCS South are met by the infrastructure upgrades provided in the previous section. The only addition specifically grouped with this development is the pedestrian walkway linking the new footpath in the Styx North sub-division with Main North Road by following the Kaputone stream (P4). A controlled, at grade, crossing of the Main Trunk Railway Line has been assumed for this footpath.

Drawings

Figure D1 – Figure D3 in Appendix D show the proposed ultimate road layout along with the designations used in this report for roads and intersections. Figure D4 shows the anticipated off road cycle and pedestrian facilities and designations used while Figure D5 shows the proposed bus routes.

Assumptions

It is assumed the new footpath runs along the south side of the Kaputone Stream to avoid the need for a crossing.

Costs

The table below details the transportation costs for the PPCS South area. Engineering (15%) and contingency (15%) have been included. The direct Developer costs shown in the table are exclusive of and additional to any development contribution charges

Table 19 PPCS South Total Transportation Costs

Road/Path	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
P4	\$428,400	\$214,200	\$214,200	\$0	\$0
Total	\$428,400	\$214,200	\$214,200	\$0	\$0



2.7 PPCS Residential

2.7.1 General

The PPCS Residential development is an area of 25 ha that is bounded by the Kaputone stream and Blakes Road. The development comprises 22.5 ha of the proposed new LG zoning and 2.5 ha of greenspace. It is proposed that a short section of the stream be re-directed to along the side of the new motorway to remove two crossings. This will need to be confirmed at the design stage as to whether such an option is ecologically appropriate. It has been assumed that the costs associated with this will be a charge against motorway construction

2.7.2 Water Supply

Description of Infrastructure Required

Most of this area is served by the Ø300 main installed down Blakes Road however a Ø375 mm main running from the Blakes Road intersection east down Belfast Road to the study boundary will serve the north end.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Assumptions

No mains have been assumed to run down the Northern Arterial route and so PPCS Residential is assumed to be served by mains on the north, south and west sides only.

Costs

The following table summarises the water supply costs for the PPCS Residential area.

Table 20 PPCS Residential Water Supply Cost

Type	Designation	Cost
Mains	W10	\$ 75,600
Engineering Fees (15%)		\$ 11,300
Contingency (15%)		\$ 13,000
Total		\$ 99,900

2.7.3 Wastewater

The PPCS residential site has a natural fall towards the Kaputone Stream from the Western side of the site. This fall is only of the order of 1.5m across the site's 350m width. The proposed sewer system consists of a single gravity main running South to North that feeds a pumping station (PS4) to the North

of the site. This gravity sewer also accommodates all down stream waste from the Radcliffe and Styx North areas.

Total peak wastewater flow for the area is 12 litres/second.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Cost

The costs for the installation for the PPCS Residential development have been included in the Styx North installation.

2.7.4 Surface Water

The PPCS Residential zone is encompassed with the catchment area C5. For a description of the proposed treatment facility, please refer to Section 2.6.4.

2.7.5 Transportation

Description of Infrastructure Required

Transport requirements for PPCS Residential are again met by the infrastructure upgrades provided for Radcliffe North. Again a new off road pedestrian walkway is provided joining the previous two walkways just north of Radcliffe Road and running north following the deviated Kaputone Stream downstream to Belfast Road (P3).

Drawings

Figure D1 – Figure D3 in Appendix D show the proposed ultimate road layout along with the designations used in this report for roads and intersections. Figure D4 shows the anticipated off road cycle and pedestrian facilities and designations used while Figure D5 shows the proposed bus routes.

Assumptions

It is assumed the new footpath will run along the east side of the Kaputone Stream to avoid the need for a crossing. Crossings from the new subdivision on the west side will be required to give access to this new walkway but have not been allowed for at this time.

Costs

The table below details the transportation costs for the PPCS Residential area. Engineering (15%) and contingency (15%) have been included. The direct Developer costs shown in the table are exclusive of and additional to any development contribution charges.



Table 21 PPCS Residential Transportation Costs

Road/Path	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
P3	\$308,400	\$308,400	\$0	\$0	\$0
Total	\$308,400	\$308,400	\$0	\$0	\$0

2.8 PPCS Industrial

2.8.1 General

The PPCS Industrial Site is land that is currently occupied by the PPCS plant. The site is 19 ha and the proposed zoning is B4 Industrial. It has been assumed that any demolition and rehabilitation costs will be borne by the developer once the plant closes. The area is bounded by the Railway to the West, Belfast Rd to the North, Blakes Rd to the East and an extension to the Sheldon Park reserve.

2.8.2 Water Supply

Description of Infrastructure Required

With the addition of the PPCS Industrial area, the extra capacity of the new Radcliffe North pump station will have been exceeded requiring a new pump station “Blakes Road” to be installed just north of the Belfast intersection. This will connect into the Ø300 mm main on Blakes Road

A new Ø200 mm main will run from the Blakes Road intersection back down Belfast Road connecting into the existing Ø200 mm main that currently terminates at the railway. This will effectively form another ring main with two pump stations on it covering the southeast section of the study area.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Assumptions

An additional cost of \$30,000 has been allowed for boring or lifting track to lay the new Ø200 mm main across the main trunk line.

Costs

The following table summarises the water supply costs for the PPCS Industrial area.

Table 22 PPCS Industrial Water Supply Cost

Type	Designation	Cost
Mains	W6	\$ 122,200
Pump Stations	Blakes Rd	\$ 1,682,600
Engineering Fees (15%)		\$ 270,700
Contingency (15%)		\$ 311,300
Total		\$ 2,386,800



2.8.3 Wastewater

The PPCS Industrial wastewater system consists of a single Ø225 mm gravity main along the Western side of the railway and connecting to another gravity main falling Eastwards along the Belfast Road reserve. This terminates at Pump Station PS5 where the wastewater is pumped back to the Tyrone Street pump station. This area is proposed to be zoned B4 and in accordance with the code of practice the minimum pipework internal diameter of 225 mm.

Total peak wastewater flow for the area is 8 litres/second.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Cost

Cost details for the PPCS Industrial development are included in the table below.

Table 23 PPCS Industrial Wastewater Costs

Type	Section		
Gravity mains	G8	\$	198,400
	G10	\$	184,400
Rising mains	P5	\$	675,600
Pump Stations	PS5	\$	108,000
Engineering Fees (15%)		\$	175,000
Contingency (15%)		\$	201,200
TOTAL		\$	1,542,600

2.8.4 Surface Water

Description of Existing Infrastructure

This catchment encompasses the existing PPCS industrial development and contains two existing drains, Blakes Road and Belfast Road each of which discharge to the Kaputone just east of the Blakes Road/Belfast Road intersection. However, the fall of the land for this catchment suggests that detention and discharge to the Kaputone is better situated at the north end of the catchment.

Description of Infrastructure Required

PPCS North falls within catchment C6. Drawing C201, Appendix C illustrates the total catchment area of C6 and the proposed location of the treatment/detention facility.

The proposed surface water management system for this catchment consists of draining the catchment to the north, for which a new culvert would be required under Belfast Road.

The proposed system for this catchment consists of a two pond, first flush and detention system, located within the esplanade reserve adjoining the Kaputone Stream. The Council will be able to require an esplanade reserve adjoining the Kaputone, at time of subdivision, for those sections of the Kaputone Stream which have an average width greater than 3m. The treatment detention facility can be positioned to ensure its outfall is above Kaputone stream 50 year flood level, and shaped to reflect the elongated nature of the reserve. Normal outflows would be sized to ensure the Kaputone is not receiving flows greater than those currently occurring but a spillway structure would allow flows to the Kaputone in the event the detention facility was overwhelmed.

Land costs for the industrial area immediately adjacent to the PPCS site have been estimated at \$200/m². This makes land acquisition required for the option of onsite detention and storage of stormwater a major cost. Cost estimates have included an allowance for an additional 10% land area around the perimeter of the ponds. The total cost of acquiring land in this catchment is close to \$4.2 million. This catchment may be better served by on site stormwater treatment systems with a smaller footprint, such as sand filters.

Costs

The table below details the estimated construction costs for the storm water management systems for catchment C6.

Table 24 PPCS Industrial Surface Water Construction Costs (C6)

Catchment	Infrastructure	Pond size (m ²)	Cost	
C6	28.7 ha	First Flush Pond	6,454	\$459,700
		Detention Pond	12,546	\$322,300
		Other		\$73,700
	Engineering (15%)			\$128,400
	Contingency (15%)			\$147,600
	Land			\$4,180,100
Total				\$5,311,800

2.8.5 Transportation

Description of Infrastructure Required

Transport requirements for this development would be met by upgrades carried out for the previous developments outlined in the sections above.



2.9 PPCS North

2.9.1 General

The PPCS North development is an area of 22 ha that is bounded by the Kaputone River, the Railway and Belfast Rd. PPCS currently have their factory processing plant in this area on land currently zoned B5. The proposed zoning for all of the PPCS North area is B4 Industrial. It is assumed all costs for any demolition and rehabilitation of the B5 land required to meet the new zoning would be met by the developer.

2.9.2 Water Supply

Description of Infrastructure Required

With the development of the PPCS North area the Ø300 mm main in Blakes Road will be continued along the new road to the end of Richill Road and then north along the new local road parallel to the railway to connect into the existing Ø200 mm main running along the new loop road through Belfast North and Factory North.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Assumptions

It is assumed the new pipe work will be installed at the same time as the new roads are constructed.

Costs

The following table summarises the costs for the water supply for the PPCS North area.

Table 25 PPCS North Water Supply Cost

Type	Designation	Cost
Mains	W7	\$ 255,400
	W8	\$ 10,800
Engineering Fees (15%)		\$ 39,900
Contingency (15%)		\$ 45,900
Total		\$ 352,000

2.9.3 Wastewater

The PPCS North development includes the construction of a new collector from the end of Richill Street connecting to Blakes Rd. This road follows a 7.5m contour line giving good fall from the higher areas

through the West and centre of the site. The proposed (Ø225 mm) main follows the road reserve falling towards Belfast Road and terminating at Pump Station PS5. The rising main for this pump station could follow the collector road reserve connecting to the rising main from the Belfast North development and feeding the Tyrone Street pumping station. This would be a sequencing issue as PS5 is installed as part of the PPCS Industrial development. This site is proposed to be zoned B4 and in accordance with the code of practice all pipework installed is a minimum of 225 mm diameter.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Cost

Cost details for the PPCS North development are included in the table below.

Table 26 PPCS North Wastewater Cost Summary

Type	Section	Cost
Gravity mains	G11	\$ 303,400
Engineering Fees (15%)		\$ 45,500
Contingency (15%)		\$ 52,300
TOTAL		\$ 401,300

2.9.4 Surface Water

PPCS North falls within the catchment zone C6, please refer Section 2.8.4.

2.9.5 Transportation

Description of Infrastructure Required

With the development of this area a new urban collector road (C12) from the end of the upgraded Blakes Road (C9) through to Main North Road (A2) is required via Richill Road (C8). The existing Richill Road will have its status upgraded to collector and will have a new railway crossing connecting it to the existing portion of Richill Road. At the same time the railway crossing on Factory Road will need to be closed and removed to meet with Ontrack requirements for no increases in the number of level railway crossings on the Main Trunk Line (MTL). This arrangement will need to be confirmed with Ontrack at the initial design stages.

If it is not possible to relocate the railway crossing as planned then the new collector (C12) would follow the line of the Kaputone stream and the proposed local road (L5) and join on to Factory Road to use the existing crossing there. In this case Factory Road would be upgraded instead of Richill Road.

The new urban collector (C12) will meet the upgraded Blakes Road (C9), requiring the intersection with Belfast Road to be upgraded to a roundabout. A new local road will be built (L5) running parallel with the



railway connecting Factory Road with C12 and the new crossing.

Drawings

Figure D1 – Figure D3 in Appendix D show the proposed ultimate road layout along with the designations used in this report for roads and intersections. Figure D4 shows the anticipated off road cycle and pedestrian facilities and designations used while Figure D5 shows the proposed bus routes.

Assumptions

Putting in the new road (C12) relies on the existing PPCS industrial plant closing or being able to give up the required land at a reasonable cost.

It is assumed the extra railway sidings running across the end of Richill Road will be lifted up so that the new railway crossing only need deal with two sets of tracks.

The new local road (L5) is assumed to run along railway land on which the standard rural rate of \$15/m² has been used to calculate the purchase value.



Guthries Road A5

Costs

The table below details the transportation costs for the PPCS North area. Engineering (15%) and contingency (15%) have been included. The direct Developer costs shown in the table are exclusive of and additional to any development contribution charges.

Table 27 PPCS North Transportation Cost

Road/Path	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
L5	\$577,600	\$0	\$271,500	\$306,100	\$0
C8	\$29,800	\$0	\$14,000	\$15,800	\$0
C12	\$4,227,500	\$4,227,500	\$0	\$0	\$0
Total	\$4,834,900	\$4,227,500	\$285,500	\$321,900	\$0

2.10 Belfast North

2.10.1 General

The 53 Ha Belfast North site is bounded by the Kaputone Stream to the West and the new arterial motorway to the East. The topography falls to the North of the site.

2.10.2 Water Supply

Description of Infrastructure Required

A new Ø300 main running from the Blakes Road main up the new local road through the centre of the Belfast North area will connect onto a new Ø200 mm main follows the new loop road and services the north of Belfast North as well as the proposed Factory North area.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Assumptions

It is assumed the Northern Arterial will be in place by this stage and so the new local road parallel to Guthrie's Road (L7) will be available to accommodate water mains.

It is assumed the new pipe work will be installed at the same time as the new roads are constructed.

Costs

The following table summarises the water supply costs for the Belfast North area.

Table 28 Belfast North Water Supply Cost

Type	Designation	Cost
Mains	W11	\$ 228,200
	W9	\$ 278,200
Engineering Fees (15%)		\$ 76,000
Contingency (15%)		\$ 87,400
Total		\$ 669,800



2.10.3 Wastewater

The Belfast North development comprises of two wastewater systems. The southern section comprises of a gravity main (G13) falling south along the new local road reserve connecting into a further gravity (G12) main falling westward along Belfast Rd to the PPCS Industrial Pump Station (PS5). The Northern section includes gravity mains along the road reserves for Factory Rd, the new local link road and the local loop road. These all terminate at pump station PS6. The rising main from PS6 runs directly to the Tyrone Street Pump Station.

Total peak wastewater flow for the area is 23 litres/second.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Cost

Cost details for the Belfast North development are included in the table below.

Table 29 Belfast North Wastewater Costs

Type	Section	Costs
Gravity mains	G9	\$ 116,700
	G12	\$ 134,200
	G13	\$ 315,100
	G15	\$ 318,000
	G14	\$ 116,700
	G16	\$ 478,500
Rising mains	P6	\$ 195,000
Pump Stations	PS6	\$ 74,000
Collection Manhole	CM3	\$ 5,000
Engineering Fees (15%)		\$ 263,000
Contingency (15%)		\$ 302,400
TOTAL		\$ 2,318,700

2.10.4 Surface Water

Description of Existing Infrastructure

Belfast North is primarily rural land. Surface water drains directly into the Kaputone for the majority of the catchment. An existing open channel drains the east side of Guthries Road, commencing west of Guthries Road at a location 100 m South of Factory Road. The drain crosses Guthries road in a 600 mm culvert and travels east via an open channel into the Kaputone.

Description of Infrastructure Required

The Belfast North zone has variable topography and has been split into four catchments; C7, C8, C9, and C10. These catchments can be viewed in Appendix C Drawing C201.

All catchments work by the same principal of providing first flush ponding and detention for the design 50 year storm. The location of all treatment/detention facilities are adjacent to the Kaputone, with the exception of C10 that drains to the Guthries culvert (described earlier). It is expected that the capacity of this culvert will need to be increased to enable greater flow discharges. Widening of the drain that transports this water to the Kaputone may be required but no allowance has been made for this in costing.

Consideration needs to be given to the possible effects of the cemetery on the proposed ponds. The Pattle Delamore Partners Ltd (PDP) report on potentially contaminated sites in the Belfast area suggests that there would be potential impacts to land down gradient of the cemetery, which is towards the east and outside of the Belfast study area.

Costs

The table below details the estimated construction costs for the storm water management systems for each catchment.



Table 30 Belfast North Surface Water Construction Costs (C7 to C10)

Catchment	Infrastructure	Pond size (m ²)	Cost
C7 7.2 ha	First Flush Pond	1,630	\$140,300
	Detention Pond	2,884	\$115,300
	Other		\$52,100
C8 6.8 ha	First Flush Pond	1,540	\$134,300
	Detention Pond	2,841	\$114,400
	Other		\$52,100
C9 10.4 ha	First Flush Pond	2,351	\$188,100
	Detention Pond	3,113	\$120,600
	Other		\$52,100
C10 25.0 ha	First Flush Pond	5,626	\$404,900
	Detention Pond	19,534	\$496,600
	Other		\$73,700
Engineering (15%)			\$291,700
Contingency (15%)			\$335,400
Land			\$2,963,900
Total			\$5,535,500

2.10.5 Transportation

Description of Infrastructure Required

By this stage in the development the proposed Northern Arterial (M1 – M4) will be in place, or will soon be constructed, so a new local road (L7) will be required running parallel to Guthries Road. Another new local road (L6) forming a loop north of Factory road will give access to the rest of the Belfast North area as well as the Factory North area.

If the new collector and railway crossing (C12) can not be built or is delayed running through the PPCS site these new roads along with the existing Factory Road railway crossing can provide an alternate connection through from Blakes Road (C9) to Main North Road (A2).

The pedestrian walkway (P2 & P1) along the east side of Kaputone stream would be continued from Belfast road all the way to Marshlands Road. This would cross Factory road and the new loop road (L6) and pass under the Northern Arterial along with the Kaputone Stream.

With the completion of these two roads the new Belfast East bus route can be used although if there is enough demand a shortened version could be started once C12 is in place or even earlier along Belfast Road (A5)

With the introduction of the Belfast East bus service now terminating at the same point as the new Belfast West service a bus interchange is required in the vicinity of the corner of Richill Road and Main North Road. This could be located along the east side of Main North Road just north of Richill Road using a strip of acquired B1 land. This stop would service all south bound Main North Road bus routes and the Belfast East and West routes which would make a left hand circuit around the block. North bound Main North Road routes would have a stop on the west side of the road with passengers crossing the road at the Richill Street controlled intersection.

Drawings

Figure D1 – Figure D3 in Appendix D show the proposed ultimate road layout along with the designations used in this report for roads and intersections. Figure D4 shows the anticipated off road cycle and pedestrian facilities and designations used while Figure D5 shows the proposed bus routes.

Assumptions

- » The new L7 road is needed as it is assumed the Northern Arterial will cut off and run along part of Guthries Road.
- » It is assumed the new pedestrian footpath will fit under the bridge that will carry the Northern Arterial over Kaputone Stream.

Costs

The table below details the transportation costs for the Belfast North area. Engineering (15%) and contingency (15%) have been included. The direct Developer costs shown in the table are exclusive of and additional to any development contribution charges.

Table 31 Belfast North Transportation Costs

Road/Path	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
L6	\$2,773,400	\$2,773,400	\$0	\$0	\$0
L7	\$1,983,200	\$1,983,200	\$0	\$0	\$0
P1	\$111,500	\$0	\$111,500	\$0	\$0
P2	\$390,600	\$390,600	\$0	\$0	\$0
Bus Exchange	\$661,300	\$0	\$661,300	\$0	\$0
Total	\$5,920,000	\$5,147,200	\$772,800	\$0	\$0



2.11 Factory North

2.11.1 General

The Factory North development is an area bounded by the railway line, the Kaputone Stream and the new Northern Arterial Motorway to the West. The area is 19 Ha and is proposed to have a B4 zoning.

2.11.2 Water Supply

Description of Infrastructure Required

No additional trunk-mains have been allowed for in addition to the above for the Factory North subdivision.

2.11.3 Wastewater



Tyrone Street Wastewater Pipe Main

The proposed Factory North wastewater pipework follows the road reserve of the new loop road in the South and bisects the area to the North. The area is proposed to be zoned B4 and the minimum diameter of the pipework, in accordance with the code of practice is 225 mm.

Waste water is pumped (PS8) from the area via a rising main to the Main North Industrial Pumping station (PS9). It may be better from an operational point of view to pump directly to the Tyrone Street Station and reduce the pumping capacity of the Main North Industrial pump station. The rising main could follow the loop road and connect into the Belfast North system.

Total peak wastewater flow for the area is 8 litres/second.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113.

Costs

Wastewater cost details for the Factory North development are included in the table below.

Table 32 Factory North Wastewater Cost

Type	Section	Costs
Gravity mains	G17	\$ 408,500
Rising mains	P8	\$ 203,300
	P9	\$ 270,000
Pump Stations	PS8	\$ 68,000
	PS9	\$ 130,000
Engineering Fees (15%)		\$ 162,000
Contingency (15%)		\$ 186,300
TOTAL		\$ 1,427,900

2.11.4 Surface Water

Factory North is encompassed within Catchment C12, as shown in drawing C201, Appendix C. Catchment C12 also encompasses the Main North area. Two zoning options (B4 or LG) for development have been considered for the Main North area. The associated costs for the Factory North area and these options are discussed in Section 2.12.

2.11.5 Transportation

Description of Infrastructure Required

The Factory North area will be serviced by the new L6 loop road described in the previous section.

With development now occurring along most of the length of the railway the proposed shared cycle and pedestrian path (PC1) will be required. This is assumed to run the full length of the study area following the main trunk line along its east side.

Drawings

Figure D1 – Figure D3 in Appendix D show the proposed ultimate road layout along with the designations used in this report for roads and intersections. Figure D4 shows the anticipated off road cycle and pedestrian facilities and designations used while Figure D5 shows the proposed bus routes.

Assumptions

- » The new shared path is assumed to be located on railway land and so no land purchase has been allowed for.
- » It is assumed a safety fence will be provided between the path and the railway along its length.



- » Sufficient room under the Northern Arterial rail over-bridge to accommodate the new shared-use path Will be required and this additional expense has been allowed for as part of a lump sum in the Northern Arterial costings (Refer Section 2.16)
- » Road crossings at Radcliffe Road, Belfast Road, Richill Road and Factory Road (if still in use) will be uncontrolled.

Costs

The table below details the transportation costs for the Factory North area. Engineering (15%) and contingency (15%) have been included.

Table 33 Factory North Transportation Cost

Road/Path	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
PC1	\$2,341,000	\$0	\$1,100,300	\$1,240,700	\$0
Total	\$2,341,000	\$0	\$1,100,300	\$1,240,700	\$0

2.12 Main North – Industrial / Residential

2.12.1 General

The Main North development area is bounded by Main North Rd, the railway, and the existing Belfast Township. The area is approximately 53 ha and topographically quite flat with a slight fall west towards Main North Road. Two development options have been costed for this area:

Option 1 Industrial zoning, B4

Option 2 Residential zoning, proposed new LG zoning

2.12.2 Water Supply

Description of Infrastructure Required

The water supply infrastructure required to service the area is essentially the same for both the residential and industrial zonings proposed.

To service this area and allow for expansion north into Chaney's a new Ø200 mm main will run from the existing Factory Road main north up Tyrone Street through the Main North Industrial area to join another Ø200 mm main to be installed along Main North Road.

Towards the northern end of this a new pump station "Chaney's" will be installed along with a short section of Ø375 mm main serving the north end of the area and in readiness for expansion into the Chaney's area.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Assumptions

It is assumed the new main running through the middle of the Main North Industrial area would follow a local road for the area.

It is assumed the new pipe work along Main North Road will be installed at the same time as this road is upgraded.

Costs

Cost details for the water supply for the development of the Main North area as either industrial or residential zoning are shown in the table below.



Table 34 Main North Water Supply Cost

Type	Designation	Cost
Mains	W12	\$ 135,900
	W13	\$ 379,100
	W14	\$ 107,300
Pump Stations	Chaneys	\$ 1,682,600
Engineering Fees (15%)		\$ 345,700
Contingency (15%)		\$ 397,600
Total		\$ 3,048,200

2.12.3 Wastewater

The flatness of the area does not provide an obvious location for the installation of the wastewater pipework. The proposed system allows for the installation of pipework along the road reserve of Main North Road that feeds into a gravity main falling South towards the Tyrone Street pumping station. Due to the distance and the flat topography this pipework terminates at a lift pumping station (PS9) that feeds directly to Tyrone Street pumping station. Another gravity main falling northwards, has been located to the west of the railway line. This terminates at a pumping station (PS 11) with a lift pump to feed back into the Main North Road system.

Total peak wastewater flow for the area is 23 litres/second based on the area being B4 zoning and is 25 litres/second based on LG zoning. The required infrastructure for the area is the same for both types of zoning.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Cost

Cost details for the wastewater infrastructure required for the Main North development area are shown in the table below.

Table 35 Main North Wastewater Cost - Industrial

Type	Section		
Gravity mains	G22	\$	1,342,000
	G23	\$	579,900
	G21	\$	817,000
Rising Mains	P11	\$	31,000
Pump Stations	PS11	\$	122,000
Engineering Fees (15%)		\$	433,800
Contingency (15%)		\$	498,800
TOTAL		\$	3,824,500

2.12.4 Surface Water



Twin culverted Outlet West of Motorway

Description of Existing Infrastructure

The Factory North and Main North zones are currently rural farmland. The only major existing drainage system is Wilson's drain that travels through the Main North Industrial zone, across the Main North Road and North West to the South Branch of the Waimakariri River.

Description of Infrastructure Required

Catchment C12 drains to the northern corner of the site. The detention/treatment pond for this catchment is located on the north side of the Main North Road. Installation of two culverts will be required in order to transport the water through the Main North zone and onwards to the detention area, the first is required under the railway line and the second crosses the Main North Road. The existing



drainage, Wilson's drain will also be used as a drainage path to this retention pond. While costing has assumed a single large retention and treatment facility located in land proposed to become Reserve, detailed design could see retention distributed in in-line storage and smaller ponding areas to reduce the size of the main facility. This detention basin discharges through the existing twin culvert outfall that runs beneath the motorway and discharges to the South Branch.

Stormwater treatment and detention requirements were initially calculated based on the area being zoned as industrial. For residential zoning, the pond sizes required are much less as the amount of impervious area is less and the times of concentration are greater.

Costs

The table below illustrates the expected costs for the required infrastructure for industrial and residential development of this catchment respectively. Note, this catchment and associated infrastructure services includes the Factory North and Main North zones.

Table 36 Main North Surface Water Construction Costs

Catchment	Infrastructure	Option 1 - INDUSTRIAL		Option 2 - RESIDENTIAL	
		Pond size (m ²)	Cost	Pond size (m ²)	Cost
C12 71.1 ha	First Flush Pond	15,986	\$1,090,800	7,993	\$561,600
	Detention Pond	49,451	\$1,104,700	20,363	\$485,600
	Other		\$207,000		\$207,000
	Engineering (15%)		\$360,400		\$188,100
	Contingency (15%)		\$414,400		\$216,300
	Land		\$4,907,800		\$2,126,700
	Total		\$8,085,100		\$3,785,300

2.12.5 Transportation

Description of Infrastructure Required

It has been assumed that the Northern Arterial (NA) will be in place by the time the Main North area is developed. To reduce costs and minimise intersections on the the NA, it is proposed to re-route Main North Road so that it can run under the NA using the same underpass that the MTL railway will use.

The realignment of Main North Road (A6) would be constructed as a Minor Arterial. It would branch off a new roundabout installed at the northern end of Main North Road (A2), head eastward to where it will pass under the Northern Arterial next to the railway line continuing North East to intersect with Marshlands Road (A8) at the upgraded and signalised intersection (I1). Local roads off this would give access to the development on either side.

The transport infrastructure costs required for the area whether it is zoned as industrial or residential are essentially the same.

Drawings

Figure D1 – Figure D3 in Appendix D show the proposed ultimate road layout along with the designations used in this report for roads and intersections. Figure D4 shows the anticipated off road cycle and pedestrian facilities and designations used while Figure D5 shows the proposed bus routes.

Assumptions

- » For the roading upgrades in this area to be relevant the Northern Arterial is assumed to have been constructed.
- » Tyrone Street (L10) is to be extended to meet Main North Road (A6) and another local road is to be constructed North from Main North Road (A6) for an approximate length of 100m.

Costs

The tables below detail the transportation costs for the Main North area. Engineering (15%) and contingency (15%) have been included. Table 37 contains the transport total costs, including intersection costs. The direct Developer costs shown in the table are exclusive of and additional to any development contribution charges. Table 38 itemises the costs for each intersection

Table 37 Main North Transportation Costs

Road/Path	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
L10	\$1,004,600	\$1,004,600	\$0	\$0	\$0
L11	\$323,700	\$323,700	\$0	\$0	\$0
A6 (I3)	\$3,615,500	\$0	\$1,699,300	\$1,916,200	\$0
Total	\$4,943,800	\$1,328,300	\$1,699,300	\$1,916,200	\$0



Table 38 Main North Intersection Costs

Intersection	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
I3	\$1,970,000	\$0	\$0	\$0	\$1,970,000
Total	\$1,970,000	\$0	\$0	\$0	\$1,970,000

2.13 Hussey South

2.13.1 General

The area defined as Hussey South is in the south west of the Belfast study area and consists of approximately 32 ha of predominantly rural land to the south of Hussey Road and the north of Styx Mill Road. The area is an additional area to the original report.

2.13.2 Water Supply

Description of Infrastructure Required

There is no existing water supply infrastructure in the area. A new Hussey Pump Station will be installed at the northwest end of the Hussey South subdivision supplying a Ø375 mm main running along Hussey Road. This will also supply Hussey Central.

The Hussey South water supply was costed on a per lot basis based on the updated per lot costs from the areas in the original report.

Drawings

A detailed view of the area is shown in drawing numbers 51-20588-C101 to C113. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Assumptions

The new Hussey Pump Station will be built before significant flow is drawn from the new pipe work.

Costs

The table below shows a summary of the water supply costs for the Hussey South area.

Table 39 Hussey South Water Supply Costs

Cost per lot	\$	2,889 / lot
Water Supply Infrastructure Costs	\$	944,000
Engineering Fees (15%)	\$	141,600
Contingency (15%)	\$	162,800
Total	\$	1,248,400

2.13.3 Wastewater

Description of Infrastructure Required

The Hussey South wastewater system was costed on a per lot basis based on the updated per lot costs from the areas in the original report.

The wastewater will be directed into the existing system south of the study area. Any required upgrades



in the existing system are not covered in this study.

Drawings

A detailed view of the area is shown in drawing numbers 51-20588-C101 to C113. Drawing C103 and C105 shows the Hussey North area. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Costs

Table 40 Hussey South Wastewater Costs

Cost per Lot	\$	2,600
Wastewater Infrastructure Costs	\$	844,200
Engineering Fees (15%)	\$	126,600
Contingency (15%)	\$	145,600
Total	\$	1,116,400

2.13.4 Surface Water

Description of Existing Infrastructure

The Hussey South area is predominantly flat rural farmland with the adjacent Styx River flood plain as a dominant feature. There are existing waterways that drain the stormwater treatment ponds from the subdivision on Gardiners Road. A culvert under Husseys Road drains to the Styx River, and ponds to the east of the catchment, which form part of the Styx Mill Conservation Reserve.

Description of Infrastructure Required

The proposed management system for this area consists of two catchments (C16 and C17). The catchment areas and proposed treatment/detention location for these catchments can be seen in Drawing 51-20588-C201 in Appendix C.

Catchment 16 captures runoff from an area situated along the north of Styx Mill Road. Runoff will collect at a treatment facility located at the edge of the Styx River in the east of the catchment.

Catchment 17 will capture and treat runoff from developments within the small area in Styx River basin prior to its discharge into the Styx River.

The proposed two-pond stormwater treatment system consists of a first flush pond and a detention pond. The detention ponds will be located to ensure that the outfall is above the 50 year flood flows of the Styx River and sized to ensure that the receiving environment does not receive flows greater than those currently occurring.

Costs

The table below details the estimated construction costs for the storm water management systems for catchments C16 and C17.

Table 41 Hussey South Surface Water Construction Costs (C16 and C17)

Catchment	Infrastructure	Pond size (m²)	Cost	
C16	29 ha	First Flush Pond	2,175	\$176,400
		Detention Pond	5,768	\$181,400
		Other		\$52,100
C17	10 ha	First Flush Pond	750	\$82,100
		Detention Pond	1,826	\$91,100
		Other		\$52,100
Engineering (15%)				\$95,300
Contingency (15%)				\$109,600
Land				\$788,900
Total				\$1,629,000

2.13.5 Transportation

Description of Infrastructure Required

Transportation requirements for Hussey South are met by the existing infrastructure. All local roads within the subdivision area assumed to be supplied by the developer and have not been costed here.

Drawings

Figure D1 – Figure D3 in Appendix D show the proposed ultimate road layout along with the designations used in this report for roads and intersections. Figure D4 shows the anticipated off road cycle and pedestrian facilities and designations used while Figure D5 shows the proposed bus routes.

Assumptions

It is assumed that Styx Mill Road and Gardiners Road will not require any form of upgrade to service the Hussey South Area.



2.14 Hussey Central

2.14.1 General

The area defined as Hussey Central is an area of approximately 76 ha, which is bound by Hussey Road to the south and Johns Road to the north. The area is proposed to be zoned Living General (LG), with an allowance made for green space.

2.14.2 Water Supply

Description of Infrastructure Required

The Hussey Central water supply was costed on a per lot basis based on the updated per lot costs of the areas in the original report.

A new Hussey Pump Station will be installed at the southwest end of the subdivision supplying a Ø375 main running along Hussey Road.

Drawings

A detailed view of the area is shown in drawing numbers 51-20580-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Assumptions

The new Hussey Pump Station will be built before significant flow is drawn from the new pipe work.

Costs

Table 42 Hussey Central Water Supply Costs

	Costs	
Cost per lot	\$	2,870 / lot
Water Infrastructure Costs	\$	2,227,300
Engineering Fees (15%)	\$	334,100
Contingency (15%)	\$	384,200
Total	\$	2,945,600

2.14.3 Wastewater

Description of Infrastructure Required

The Hussey Central wastewater system was costed on a per lot basis based on the updated costs of the areas in the original report.

Drawing C112 and C113 shows the Hussey Central area. The wastewater from the subdivision will be collected at a manhole on Hussey Road and subsequently pumped through the Applefields/Devondale development and eventually to the Tyrone Street Pump Station.

The Ø525 Tyrone St and Richill Street Sewer Mains will be upgraded to Ø600 mm to cope with the additional flow from the Hussey Central Development. This upgrade is being driven by a capacity requirement that is 105% of current pipe capacity. Detailed design may show this upgrade is not necessary.

Drawings

A detailed view of the area is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Costs

The following table summarises the wastewater costs for the Hussey Central area.

Table 43 Hussey Central Wastewater Costs

	Costs	
Cost Per Lot (Infrastructure)	\$	2,600.00/lot
Hussey Central WW Infrastructure	\$	2,903,500
Richill and Tyrone St Upgrades	\$	940,500
Engineering Fees (15%)	\$	576,600
Contingency (15%)	\$	663,100
TOTAL	\$	5,083,800

2.14.4 Surface Water

Description of Existing Infrastructure

The Hussey Central area is primarily rural farmland. The area is relatively flat and naturally drains to both the Styx River and the Kaputone Stream. The existing infrastructure is limited to a culvert under Hussey Road, which drains to the Styx River.

Description of Infrastructure Required

The proposed surface water management system for the area consists of two catchments (C18 and C19), and a small area C20. These are shown in drawing C201 (Appendix C).

Catchment C18 captures runoff from the western part of the area where it will be detained before being released into the Styx Mill receiving environment at a flow less than that which is already occurring as the result of a 50 year flood. The proposed ponds will be located to ensure that the outfall is above the 50 year flood flows of the Styx River.



Catchment C19 captures stormwater from the eastern part of the area. A first flush treatment and detention pond system is proposed for the south of the catchment, prior to discharge into the Styx River.

Consideration of the potential for lead contamination from an old Gun Club in the area needs to be made prior to development in the area.

Note: A plan change has been lodged with the Council relating to those land blocks containing the proposed detention area C19. This may well lead to an altered detention design, for this sub-catchment, in the final detention network through the area plan.

Costs

The table below details the estimated construction costs for the storm water management systems for catchments C18, and C19.

Table 44 Hussey Central Surface Water Construction Costs

Catchment	Infrastructure	Pond size (m ²)	Cost
C18 29.4 ha	First Flush Pond	2,202	\$178,200
	Detention Pond	5,528	\$175,900
	Other		\$84,300
C19 37.6 ha	First Flush Pond	2,935	\$226,700
	Detention Pond	6,758	\$197,300
	Other		\$52,100
Engineering (15%)			\$137,200
Contingency (15%)			\$157,800
Land			\$1,306,700
Total			\$2,516,200

2.14.5 Transportation

Description of Infrastructure Required

It is proposed that Northwood Boulevard would link with Hussey Road (C2), which is to be upgraded to collector status, and then intersect with a new urban minor arterial (A5), which runs North-South between Johns Road (M7) and Hussey Road (C2). The section of Hussey Road west of this intersection (C13) is also to be upgraded to collector status. The new urban minor arterial (A5) is to join the existing Johns Road (M7) at a new large roundabout.

Some minor works involving the removal of landscaped narrows are required on the Northwood's Boulevard to Hussey Road link (c2) in order to raise this to collector status.

Once these roading changes have been made it will be possible to introduce the proposed Belfast West bus route.

Drawings

Figure D1 – Figure D3 in Appendix D show the proposed ultimate road layout along with the designations used in this report for roads and intersections. Figure D4 shows the anticipated off road cycle and pedestrian facilities and designations used while Figure D5 shows the proposed bus routes.

Assumptions

- » It is assumed that Gardiner's Road will not require any form of upgrade to service the Hussey Central Area.
- » All local roads within the subdivision are assumed to be supplied by the developer and have not been costed here.

Costs

The tables below detail the transportation costs for the Hussey Central area. Engineering (15%) and contingency (15%) have been included. Table 45 contains the transport total costs, including intersection costs. The direct Developer costs shown in the table are exclusive of and additional to any development contribution charges. Table 46 itemises the costs for each intersection

Table 45 Hussey Central Transportation Costs

Road/Path	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
C2 (I21)	\$55,400	\$55,400	\$0	\$0	\$0
C13	\$2,171,500	\$2,171,500	\$0	\$0	\$0
A5	\$2,097,500	\$1,678,000	\$197,200	\$222,300	\$0
Total	\$4,324,400	\$3,904,900	\$197,200	\$222,300	\$0

Table 46 Hussey Central Intersection Costs

Intersection	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
I21	\$7,500	\$7,500	\$0	\$0	\$0
Total	\$7,500	\$7,500	\$0	\$0	\$0



2.15 Chaney's

2.15.1 General

The Chaney's development is an area of 103 ha that is already zoned B6 dry industry. The area is bounded by the motorway to the west and Marshland Rd to the east extending through to the Waimakariri River. In 2003 it was reported to Council that 60 ha of this land was vacant with existing development being supplied by private bore water and the wastewater disposed to soakage via septic tanks.

2.15.2 Water Supply

Description of Infrastructure Required

The Chaney's area is assumed to be re-zoned as B4, implying development that is predominantly dry industry. A new Ø375 mm main running from the junction with Marshlands Road will continue up Main North Road to join a cross main on Empire Road and so provide service to this area.

This cross main lends itself to connection to the Kainga main if integration with this system is required in the future.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Assumptions

- » Connection into the Kainga water supply system is not being proposed.
- » It is assumed the new pipe work along Main North Road will be installed at the same time as this road is upgraded.

Costs

The table below details the Water Supply costs Chaney's area.

Table 47 Chaney's Water Supply Cost

Type	Designation	Cost
Mains	W16	\$ 836,700
	W18	\$ 101,700
Engineering Fees (15%)		\$ 140,700
Contingency (15%)		\$ 161,900
Total		\$ 1,241,000

2.15.3 Wastewater

The area falls from South to North towards the Waimakariri River and with the Tyrone Street Pump station being the only suitable location for wastewater removal to the Bromley treatment plant the waste needs to be pumped back uphill through a series of relay pump stations.

Total peak wastewater flow for the area is 45 litres/second which is collected in Ø225 mm gravity pipes sized in accordance with the code of practice.

The Chaney's development is split into three areas. Each area is to be serviced by a pump station supplied by gravity mains. The pump stations relay the information back to a collection manhole (CM3) at the northern corner of Otukaikino. The waste then falls by gravity pipe to Pump Station #9 where it is then sent to the Tyrone Street Pump Station.

Drawings

A detailed view of the water supply and sewerage infrastructure is shown in drawing numbers 51-20588-C101 to C113, which show pipe locations and designations. Drawing 51-20588-C100 acts as a key to the above drawings showing how they fit together to cover the area.

Drawing 51-20588-C120 shows an overview of the study area and proposed development zones.

Cost

Cost details for the Chaney's development are included in the table below.



Table 48 Chaney's Wastewater Cost

Type	Section	Costs	
Gravity mains	G26	\$	245,100
	G27	\$	245,100
	G28	\$	283,000
	G29	\$	298,800
	G31	\$	163,400
	G32	\$	315,100
Rising mains	P12	\$	297,500
	P13	\$	341,300
	P14	\$	40,600
Pump Stations	PS12	\$	162,000
	PS13	\$	122,000
	PS14	\$	62,000
Collection Manhole	CM4	\$	5,000
Engineering Fees (15%)		\$	387,100
Contingency (15%)		\$	445,200
TOTAL		\$	3,413,200

2.15.4 Surface Water



Railway culvert adjacent to Marshlands Road

Description of Existing Infrastructure

The Chaney's area is already zoned for industrial development B6, but is not yet serviced by municipal water, wastewater, or stormwater services. It has been divided into two catchment areas, C14 and C15, each shown on drawing C201, Appendix C.

Both catchments are primarily rural land with some established commercial/industrial activity.

The area to the west of Main North Road is served by a series of open drains that discharge into the Wilson's swamp system, and then under the motorway to the South Branch of the Waimakariri. The Rural land lying between the Railway and Main North Road in C14 has no clear drainage pattern but can be made to drain across the road into the same drainage system.

C15 is a large industrial catchment with some development but still mainly rural, contained on its eastern boundary by the Railway. Drainage of the area is to the Kaianga Drain, accessed from C15 via a bridged crossing under the Railway. This appears to be the logical collection point for surface water in the catchment.

Description of Infrastructure Required

The proposed infrastructure for this zone consists of two treatment/detention facilities.

For catchment C14, the proposed system consists of draining this area North West via a culvert through the Main North Road to a ponding area that feeds into the existing open drain system to the Waimakariri. While zoned for industrial development, the area proposed for detention is bounded by the proposed new bypass and Main North Road and would be better reserved as open space for surface water management purposes.

The proposed system for catchment C15 consists of draining all water North East following the existing fall to a treatment/detention ponding area adjacent to the railway track. This pond will discharge into Kaianga Drain which eventually outfalls into the Styx River.



Railway Bridge over Chaney's area Drainage

Costs

The table below illustrates the expected costs for the required infrastructure for catchments C14 and C15 (Chaney's zone). Land costs were assumed at \$80/m².

Table 49 Chaney's Surface Water Construction Costs

Catchment	Infrastructure	Pond size (m ²)	Cost
C14 26.2 ha	First Flush Pond	5,895	\$417,000
	Detention Pond	12,702	\$325,700
	Other		\$84,300
C15 74.5 ha	First Flush Pond	16,770	\$1,118,600
	Detention Pond	44,944	\$971,600
	Other		\$52,100
Engineering (15%)			\$445,400
Contingency (15%)			\$512,200
Land			\$6,860,200
Total			\$10,787,100

2.15.5 Transportation



Dickies Road

Description of Infrastructure Required

The Chaney's industrial area has Main North Road running through its lower corner, up the west side and then across to the old river road bridge separating the north west corner as well. This road (A7) is to be upgraded to Urban Main Road – Limited Access status.

At this time Spencerville Road (C10) will be upgraded to Urban Collector status while Dickies Road (C11) will be upgraded to Rural Collector status with footpath. Dickies Road (C11) will require the construction of a two-lane bridge over the Western Arterial (M5)

With the development of the Chaney's area the top portion of Marshlands Road (A8) and following part of Main North Road (A7) would be upgraded to Minor Arterial status providing another route for traffic into the north of Christchurch from the Chaney's area.

While local roads within the Chaney's development have been assumed to be supplied by the developer, the Council has two proposals for how these will integrate with the existing roads and upgraded Marshlands and Main North Roads. Option 1 has been used for costing and is shown in Figure D3 in Appendix D, while Option 2 is shown in Figure D6. Costs for both will be similar for Council as most of the costs of intersection upgrades required would be carried by the developers of the Chaney's area being served.

Drawings

Figure D1 – Figure D3 in Appendix D show the proposed ultimate road layout along with the designations used in this report for roads and intersections. Figure D4 shows the anticipated off road cycle and pedestrian facilities and designations used while Figure D5 shows the proposed bus routes.



Assumptions

- » It is assumed that the bridge at the river crossing on Dickies Road is of sufficient width for the roadway required.
- » For the roading upgrades in this area to be relevant, the Northern Arterial is assumed to have been constructed.

Costs

The tables below detail the transportation costs for the Chaney's area. Engineering (15%) and contingency (15%) have been included. Table 50 contains the transport total costs, including intersection costs. The direct Developer costs shown in the table are exclusive of and additional to any development contribution charges. Table 51 itemises the costs for each intersection

Table 50 Chaney's Transportation Costs

Road/Path	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
C10	\$470,200	\$0	\$221,000	\$249,200	\$0
C11	\$396,200	\$0	\$186,200	\$210,000	\$0
A7 (I1, I25, I22, I23, I24)	\$4,881,700	\$22,500	\$2,283,800	\$2,575,400	\$0
A8	\$1,973,900	\$0	\$927,700	\$1,046,200	\$0
Total	\$7,722,000	\$22,500	\$3,618,700	\$4,080,800	\$0

Table 51 Chaney's Intersection Costs

Intersection	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
I1	\$0	\$0	\$0	\$0	\$0
I22	\$7,500	\$7,500	\$0	\$0	\$0
I23	\$7,500	\$7,500	\$0	\$0	\$0
I24	\$7,500	\$7,500	\$0	\$0	\$0
I25	\$0	\$0	\$0	\$0	\$0
Total	\$22,500	\$22,500	\$0	\$0	\$0

2.16 Northern Arterial

The Northern Arterial (NA) is designed to carry all SH74 traffic directly from the motorway down the east side of Belfast and then on down into central Christchurch. In the 2001 NROSS study this was proposed as a 2 lane arterial route but for the purposes of this study has been assumed to be a four lane major arterial.

For the purposes of sequencing in this report it has been assumed that the Northern Arterial would be built early on in the development of Belfast with the Western Bypass being built at a later date. Upgrading Johns Road to four lanes would be done in the interim. However, if the Western Bypass were built earlier, then the Northern Bypass would most likely be delayed with the staging of transport improvements in the eastern side of Belfast needing reconsideration with respect to the assumptions in this report.

A designation for the NA already exists along the proposed route but will need to be widened to 60 m in width to allow for a four lane Major Arterial.

As stated earlier, no date has been confirmed for development of the NA in current Transit plans and in order to secure Transit funding, downstream traffic improvements around Cranford Street will need to have been completed by the Christchurch City Council.

2.16.1 Transportation

Description of Infrastructure Required

The Northern Arterial (M1-M4) is proposed to branch off the existing motorway where the current flyover is connecting to Main North Road. It will pass over the re-routed Main North Road (A6) and the main trunk railway line by way of a flyover. An on ramp from Main North Road will provide north-bound traffic from Belfast access to the NA. This is only one of several proposals Council have considered and has been used in this study as it minimises structures and intersections on the NA.

The NA then follows the Transit designation sweeping down over Guthries Road where it then passes over Belfast Road and is assumed to intersect with Radcliffe Road using an interchange. Depending on the design and extent of this interchange considerably more land may be required for construction than is currently designated or allowed for in this study's costing. Transit will make the final decision as to whether an interchange is made with Radcliffe Road, and indications are that this will not be considered unless the full Supa Centa expansions go ahead.

To relieve traffic pressure until the construction of the Western Belfast Bypass, Johns Road (A3) will be upgraded to an Urban four lane arterial. This will require the upgrading of several controlled intersections along its length. The actual number of intersections providing access into the subdivisions is still under consideration as mentioned in the Applefields Section.

A new shared cycleway and pedestrian footpath (PC2) may run down the east side of the Northern Arterial crossing the path following the Kaputone stream (P2). A branch (P7) passing under the Northern Arterial with the Styx River will connect the new path with the footpath (P5) in the Styx North development.

Drawings

Figure D1 – Figure D3 in Appendix D show the proposed ultimate road layout along with the designations



used in this report for roads and intersections. Figure D4 shows the anticipated off road cycle and pedestrian facilities and designations used while Figure D5 shows the proposed bus routes.

Assumptions

- » At the time of writing design of the Northern Arterial and Western Bypass is only at a conceptual level and so estimates included are only of an indicative nature.
- » A designation already exists for the route of the Northern Arterial and it is understood some of this land has already been bought by the Council or by Transit, however the cost estimates in this report assumes all the land required for the new road has yet to be bought.
- » The Kaputone Stream crosses the Northern Arterial corridor at two places in the PPCS Residential area at points separated by about 700 metres and an option has been considered that avoids the two culvert crossings by diverting the stream along the west side of the corridor. Rough calculations indicate that neither of these options has a clear cost advantage. \$500,000 has been included to cover whichever option is chosen.
- » The new shared cycleway is assumed to be located on the Northern Arterial land and so no allowance has been made for land purchase.

Costs

The tables below detail the transportation costs for the Northern Arterial. Engineering (15%) and contingency (15%) have been included. Table 52 contains the transport total costs, including intersection costs. The direct Developer costs shown in the table are exclusive of and additional to any development contribution charges. Table 53 itemises the costs for each intersection.

If the interchange between the NA and Radcliffe Road is not undertaken then the costs of (I11) in Table 53 would be deducted from (M1) in Table 52, resulting in a **revised cost of \$10,465,800 for (M1)**.

Table 52 Northern Arterial Transportation Costs

Road/Path	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
M1 (I11)	\$15,094,600	\$0	\$0	\$0	\$15,094,600
M2	\$17,279,800	\$0	\$0	\$0	\$17,279,800
M3	\$41,193,500	\$0	\$0	\$0	\$41,193,500
M4 (I2)	\$9,622,000	\$0	\$0	\$0	\$9,622,000
A3	\$6,062,000	\$0	\$0	\$0	\$6,062,000
PC2	\$1,777,600	\$0	\$417,700	\$471,100	\$888,800
P7	\$42,000	\$0	\$21,000	\$0	\$21,000
Kaputone Deviation	\$661,300	\$0	\$0	\$0	\$661,300
Culvert Upgrades *	\$5,000,000	\$0	\$5,000,000	\$0	\$0
Total	\$96,732,700	\$0	\$5,877,400	\$942,100	\$89,913,200

* To allow the footpaths P7 and P2 to pass under the NA beside the Styx River and Kaputone Stream respectively these culverts will need to be upgraded in size. This extra cost will need to be borne by Council due to the recreational nature of these paths and is shown by the "culvert upgrades" cost line.

Table 53 Northern Arterial Intersection Costs

Intersection	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
I2	\$7,500	\$0	\$0	\$0	\$7,500
I11	\$4,628,800	\$0	\$0	\$0	\$4,628,800
Total	\$4,636,300	\$0	\$0	\$0	\$4,636,300



2.17 Western Belfast Bypass

The Western Belfast Bypass was proposed initially in the NROSS 2001 report, as a two lane arterial continuing the motorway down the western side of Belfast and connecting to the existing west Christchurch bypass. The bypass would carry all SH1 traffic destined for southern or western suburbs or heading south of Christchurch.

For the purposes of sequencing in this report it has been assumed that the Northern Arterial would be built early on in the development of Belfast with the Western Bypass being built at a later date.

To relieve traffic pressure to the western ring road before the bypass is built, Johns Road (A3) would be widened to four lanes at an earlier date.

2.17.1 Transportation

Description of Infrastructure Required

The Western Belfast Bypass (M5-M7) will extend the current motorway past the top of Main North Road (A2) down the west side of Belfast, initially passing under Dickies Road (C11) by way of a new over-bridge on Dickies Road. It then travels down the outside of the current stopbank before joining Johns Road (A3) by the Groynes reserve in a signalised intersection. Council / Transit have already purchased sufficient land from Rosebank to enable this intersection with Johns Road to go ahead.

Drawings

Figure D1 – Figure D3 in Appendix D show the proposed ultimate road layout along with the designations used in this report for roads and intersections. Figure D4 shows the anticipated off road cycle and pedestrian facilities and designations used while Figure D5 shows the proposed bus routes.

Assumptions

- » For the purposes of the study the Western Belfast Bypass has been cost as a two lane arterial with provision for future widening.
- » There will be no north-bound traffic entry onto the motorway directly from the end of Main North Road (A2). This traffic will have to travel along (A6) then enter the north-bound motorway via M4
- » No additional costs have been allowed for raising the M6 part of the bypass in order to form a new stop bank.

Costs

The tables below detail the transportation costs for the Western Belfast Bypass. Engineering (15%) and contingency (15%) have been included. Table 54 contains the transport total costs, including intersection costs. The direct Developer costs shown in the table are exclusive of and additional to any development contribution charges. Table 55 itemises the costs for each intersection.

Table 54 Western Belfast Bypass Transportation Costs

Road/Path	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
M5	\$17,273,500	\$0	\$0	\$0	\$17,273,500
M6 (I19)	\$19,442,100	\$0	\$0	\$0	\$19,442,100
M7 (I20)	\$6,682,800	\$0	\$0	\$0	\$6,682,800
Total	\$43,398,400	\$0	\$0	\$0	\$43,398,400

Table 55 Western Belfast Bypass Intersection Costs

Intersection	Total Cost	Direct Developer Cost	CCC Cost	LTNZ Cost	TNZ Cost
I19	\$1,576,000	\$0	\$0	\$0	\$1,576,000
I20	\$1,970,000	\$0	\$0	\$0	\$1,970,000
Total	\$3,546,000	\$0	\$0	\$0	\$3,546,000



3. Infrastructure Cost Summary

Table 56 below summarises the costs set out in the body of this report. Because of uncertainty surrounding the by-pass construction dates no attempt is made to assign a timetable to the development but this is easily done once a date for construction of either the Northern or Western Bypass is assumed.

All calculations supporting the estimates are contained in linked spreadsheets allowing rapid updating should any of the assumptions be changed.

Table 56 Infrastructure Cost Summary - CCC

Sub Area	Water Supply	Wastewater	Stormwater	Transport CCC	Total CCC
Applefields	\$4,174,600	\$2,698,700	\$3,836,900	\$3,276,600	\$12,440,600
Styx North	\$2,855,600	\$3,523,100	\$2,121,400	\$429,100	\$7,929,100
Supa Centa	\$0	\$0	\$0	\$0	\$0
Radcliffe North	\$0	\$0	\$0	\$2,181,600	\$2,181,600
PPCS South	\$453,000	\$665,100	\$1,933,800	\$214,200	\$2,304,900
PPCS Residential	\$99,900	\$0	\$0	\$0	\$99,900
PPCS Industrial	\$2,386,800	\$1,542,600	\$5,311,800	\$0	\$8,925,600
PPCS North	\$352,000	\$401,300	\$0	\$285,500	\$1,038,800
Belfast North	\$669,800	\$2,318,700	\$5,535,500	\$772,800	\$6,621,300
Factory North	\$0	\$1,427,900	\$0	\$1,100,300	\$2,599,700
Main North - Industrial	\$3,048,200	\$3,824,500	\$8,085,100	\$1,699,300	\$12,437,900
Hussey Central	\$2,945,600	\$5,083,800	\$2,516,200	\$197,200	\$9,180,500
Hussey South	\$1,248,400	\$1,116,400	\$1,629,000	\$0	\$3,746,800
Chaney's	\$1,241,000	\$3,325,900	\$10,787,100	\$3,618,700	\$13,726,000
Northern Arterial	\$0	\$0	\$0	\$5,877,400	\$5,877,400
Western Bypass	\$0	\$0	\$0	\$0	\$0
Total	\$19,474,900	\$25,928,000	\$41,756,800	\$19,652,700	\$89,110,100

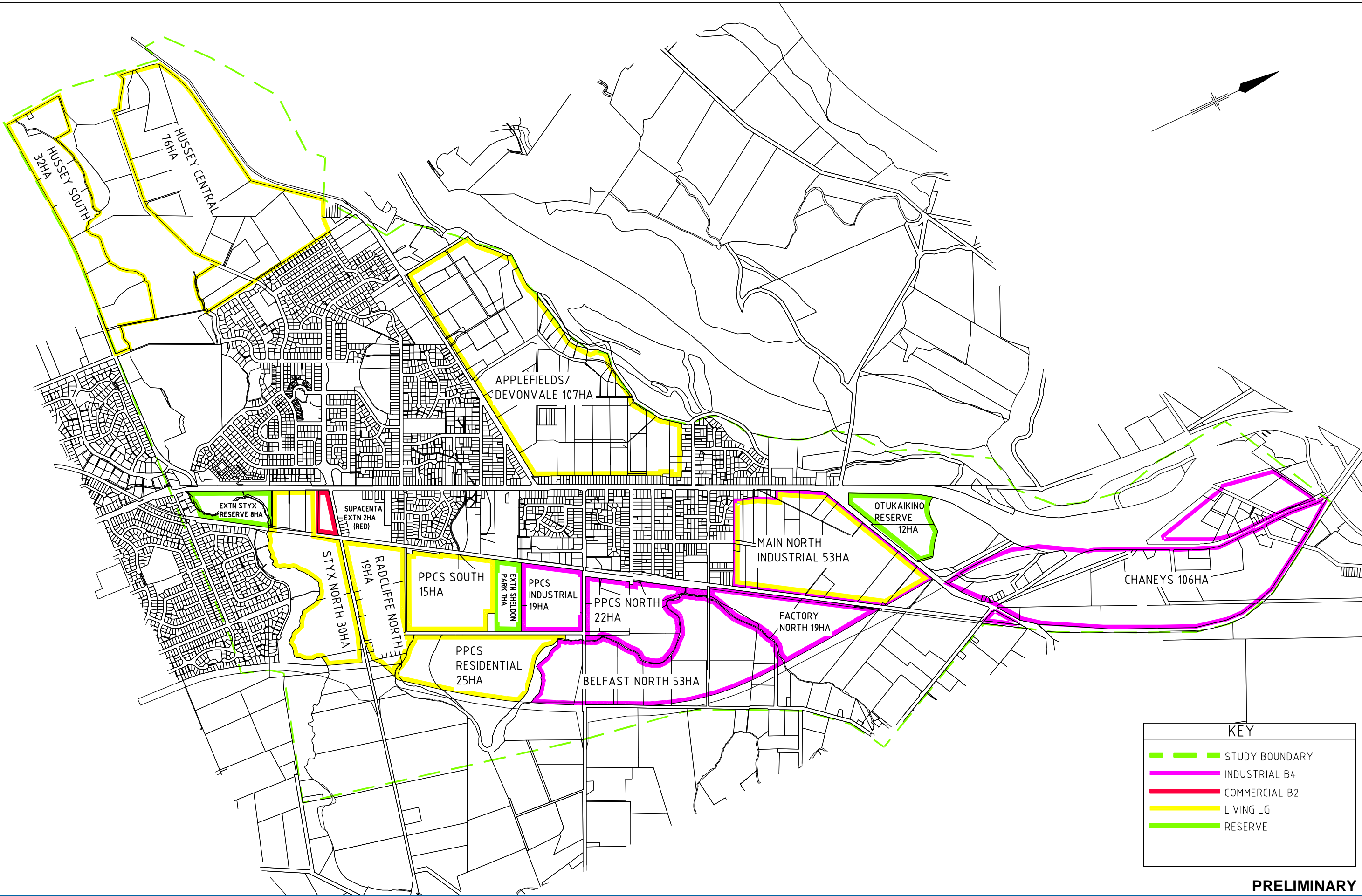
Note: "Transport CCC" are Council transport costs after LTNZ subsidy has been removed and exclusive of Developer and Transit costs.



Appendix A
Overview Drawings

Overview Drawings:

C120 – Zone Area Overview



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	INDUSTRIAL B4
	COMMERCIAL B2
	LIVING LG
	RESERVE

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Appendix B

Water and Wastewater Drawings

C100 – Water Supply and Wastewater Overview

C101 – Northwood Subdivision

C102 – Styx Reserve, Supa Centa and Styx North

C103 – Applefields

C104 – Radcliffe North, PPCS South, PPCS Residential,
PPCS Industrial and Sheldon Park

C105 – Applefields

C106 – PPCS North, Belfast North

C107 – Northwest Belfast

C108 – Main North Area

C109 – Chaney's

C110 – Chaney's North

C111 – Hussey North

C112 – Hussey South and Hussey Central

C113 – Hussey South and Hussey Central

51-20588-C112

51-20588-C111

51-20588-C113

51-20588-C113

51-20588-C103

51-20588-C105

51-20588-C107

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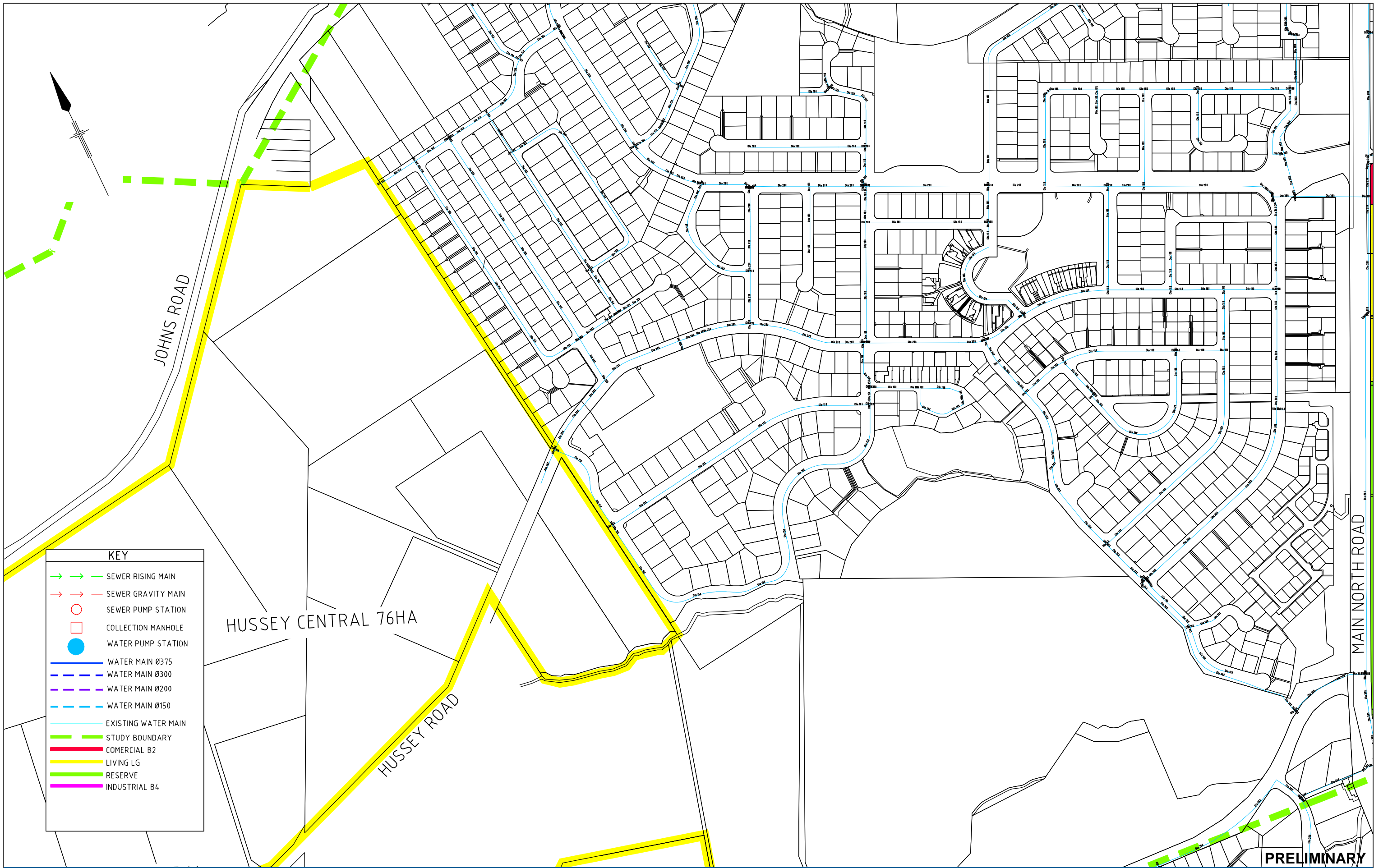
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Drawing No:	51-20588-C100
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HUSSEY CENTRAL 76HA

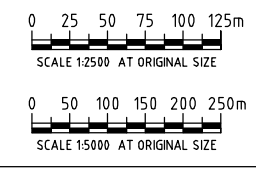
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JOHNS ROAD

MAIN NORTH ROAD

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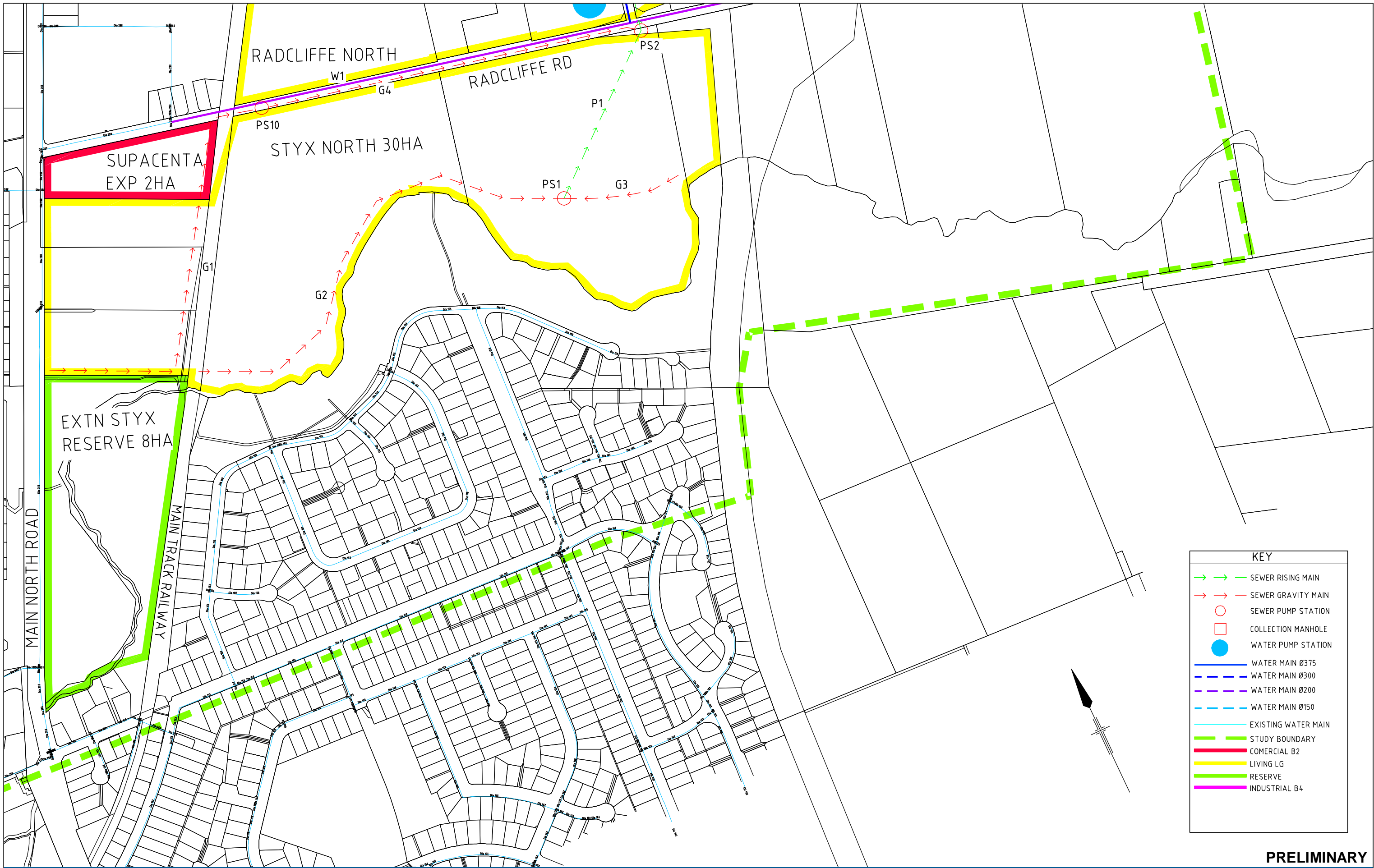
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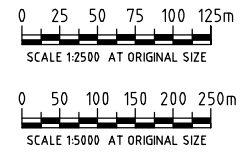
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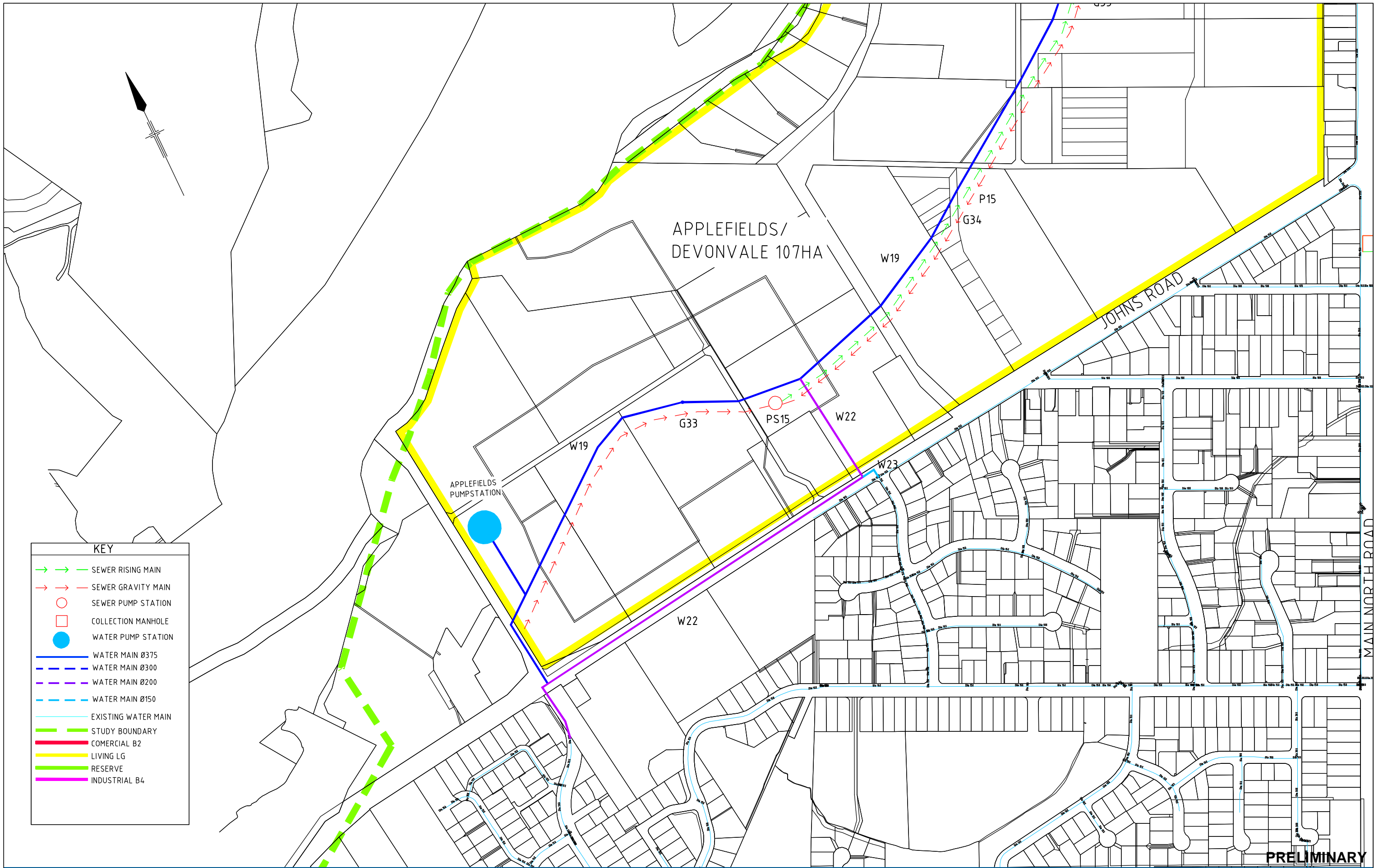
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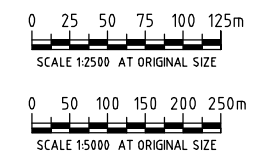
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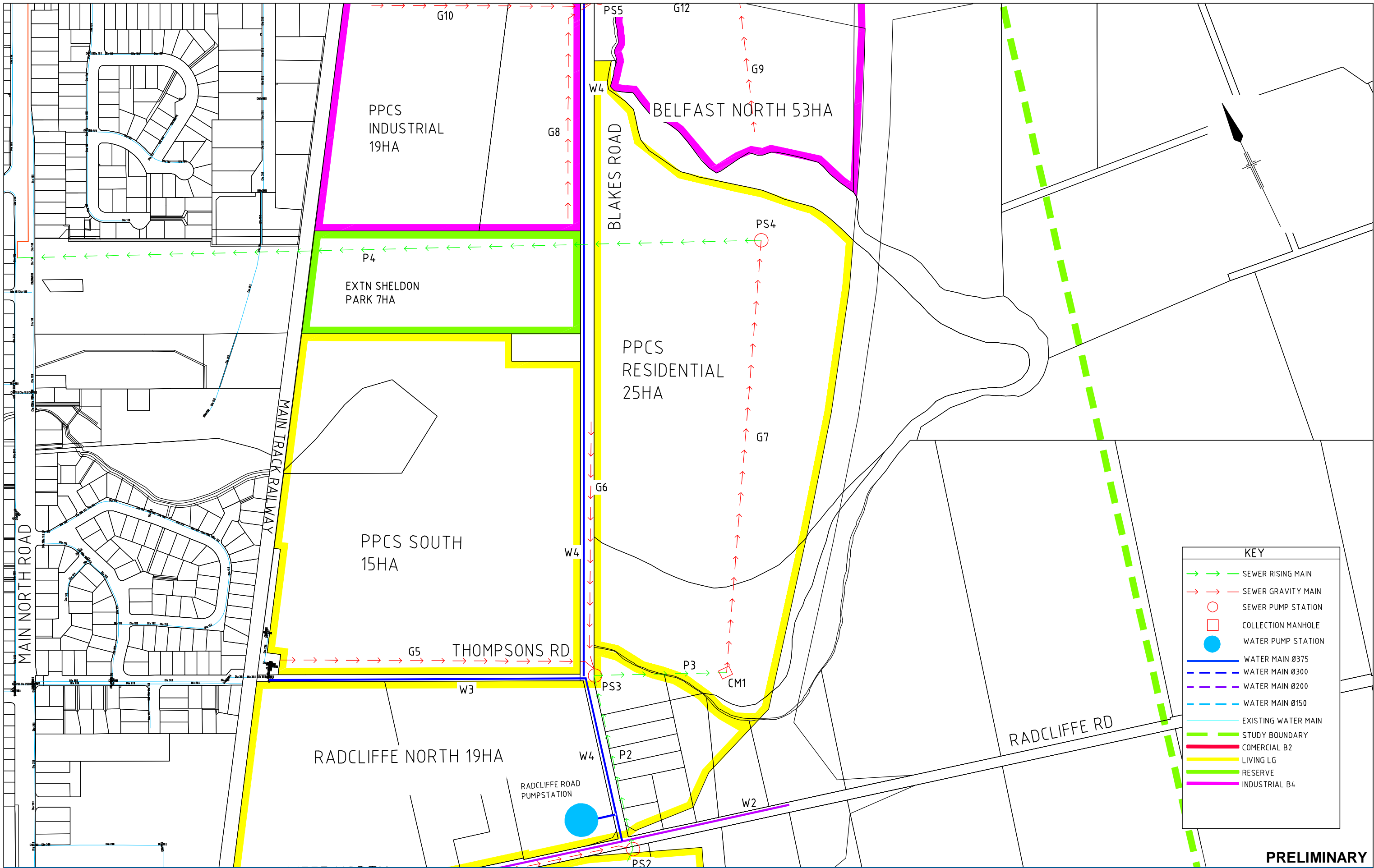
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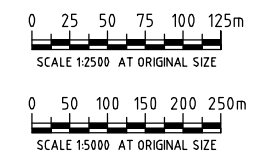
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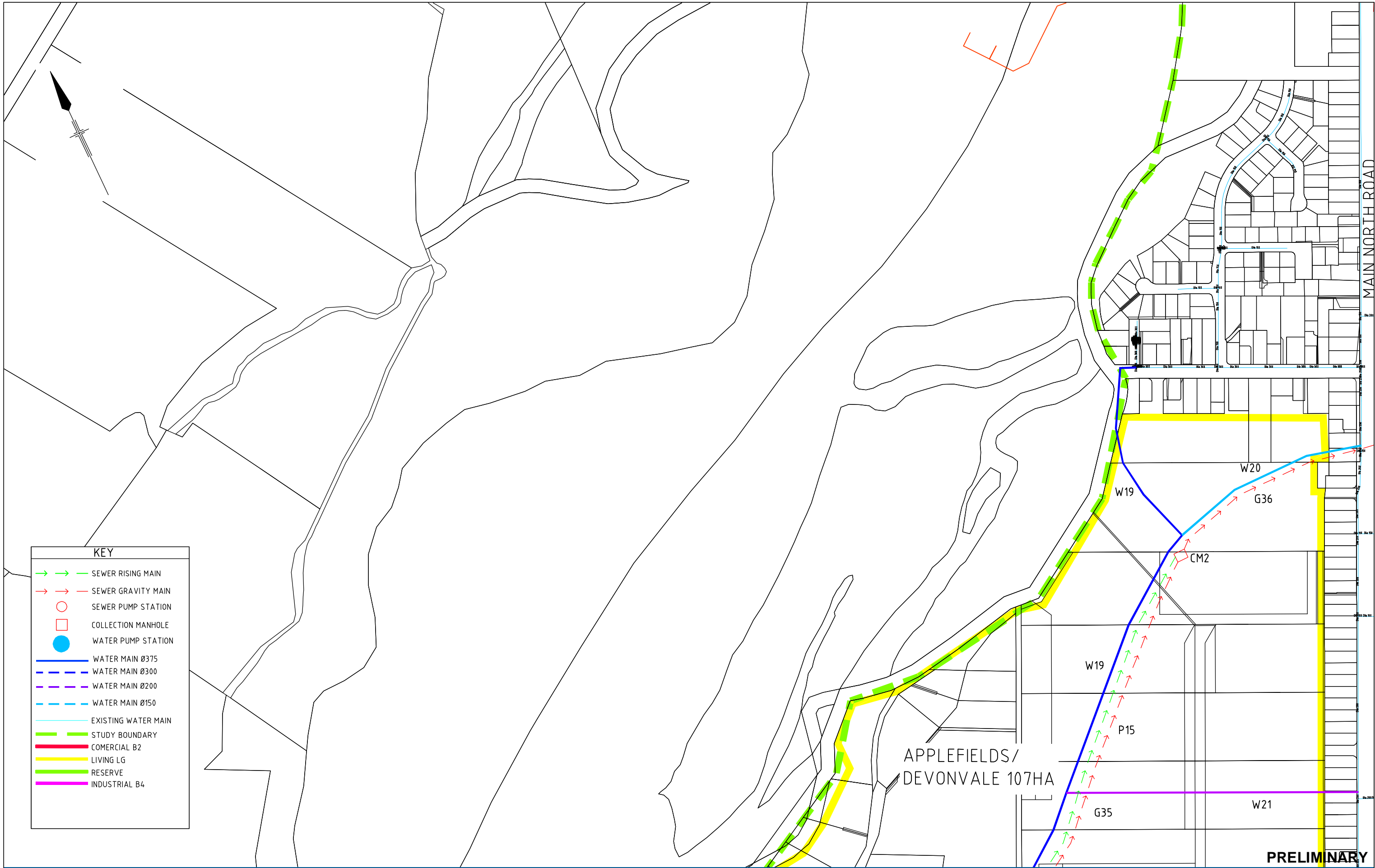


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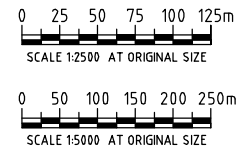
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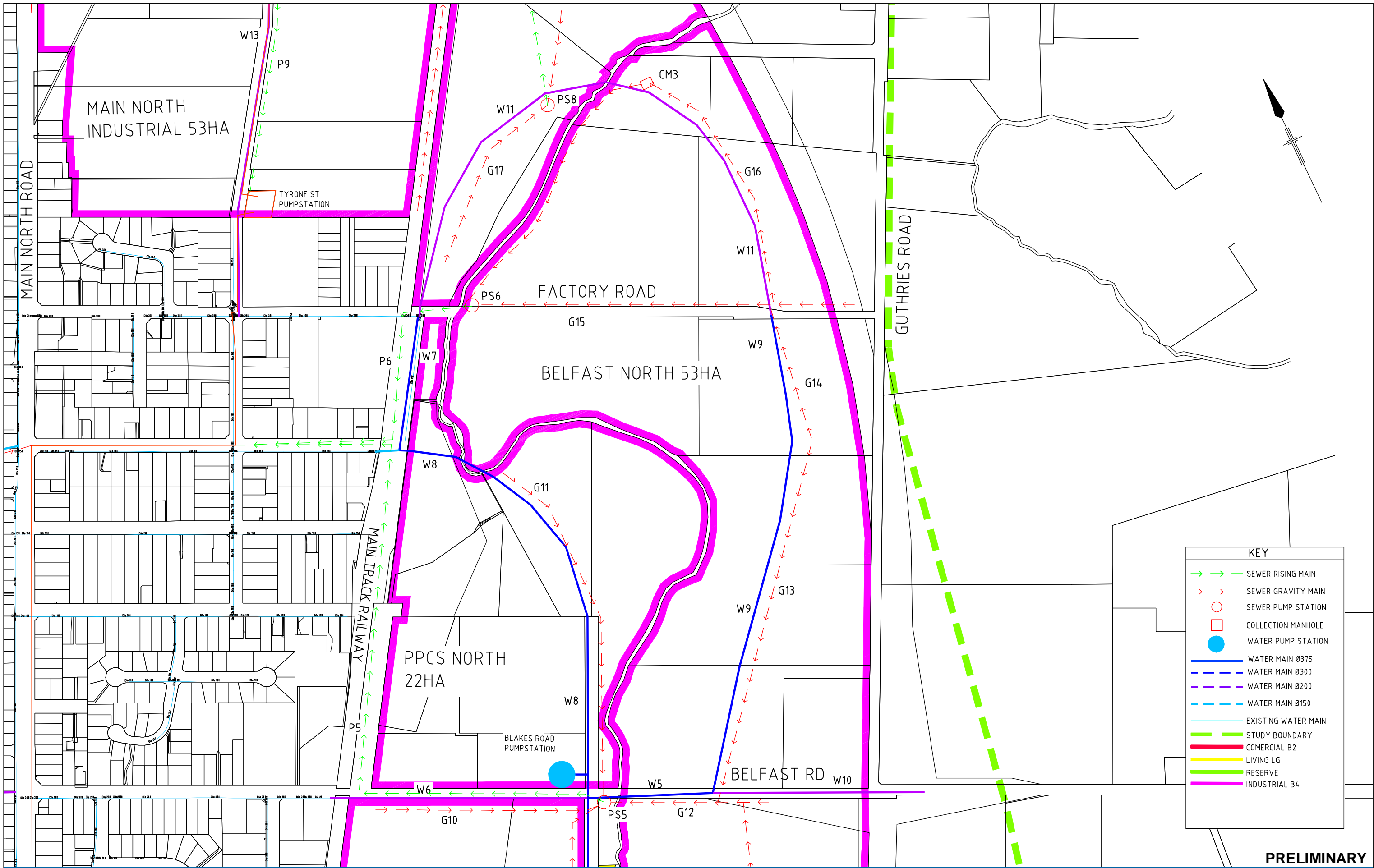


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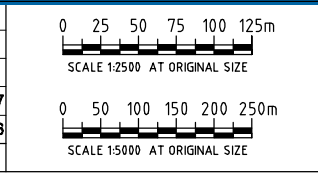
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	WATER PUMP STATION
	WATER MAIN Ø375
	WATER MAIN Ø300
	WATER MAIN Ø200
	WATER MAIN Ø150
	EXISTING WATER MAIN
	STUDY BOUNDARY
	COMERCIAL B2
	LIVING LG
	RESERVE
	INDUSTRIAL B4

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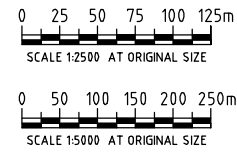
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Client	CHRISTCHURCH CITY COUNCIL
Project	BELFAST INFRASTRUCTURE DEVELOPMENT
Title	SEWER AND WATER SUPPLY PLAN PPCS NORTH, BELFAST NORTH
Original Size	A1
Drawing No:	51-20588-C106
Rev:	B



KEY	
	SEWER RISING MAIN
	SEWER GRAVITY MAIN
	SEWER PUMP STATION
	COLLECTION MANHOLE
	WATER PUMP STATION
	WATER MAIN Ø375
	WATER MAIN Ø300
	WATER MAIN Ø200
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	STUDY BOUNDARY
	COMERCIAL B2
	LIVING LG
	RESERVE
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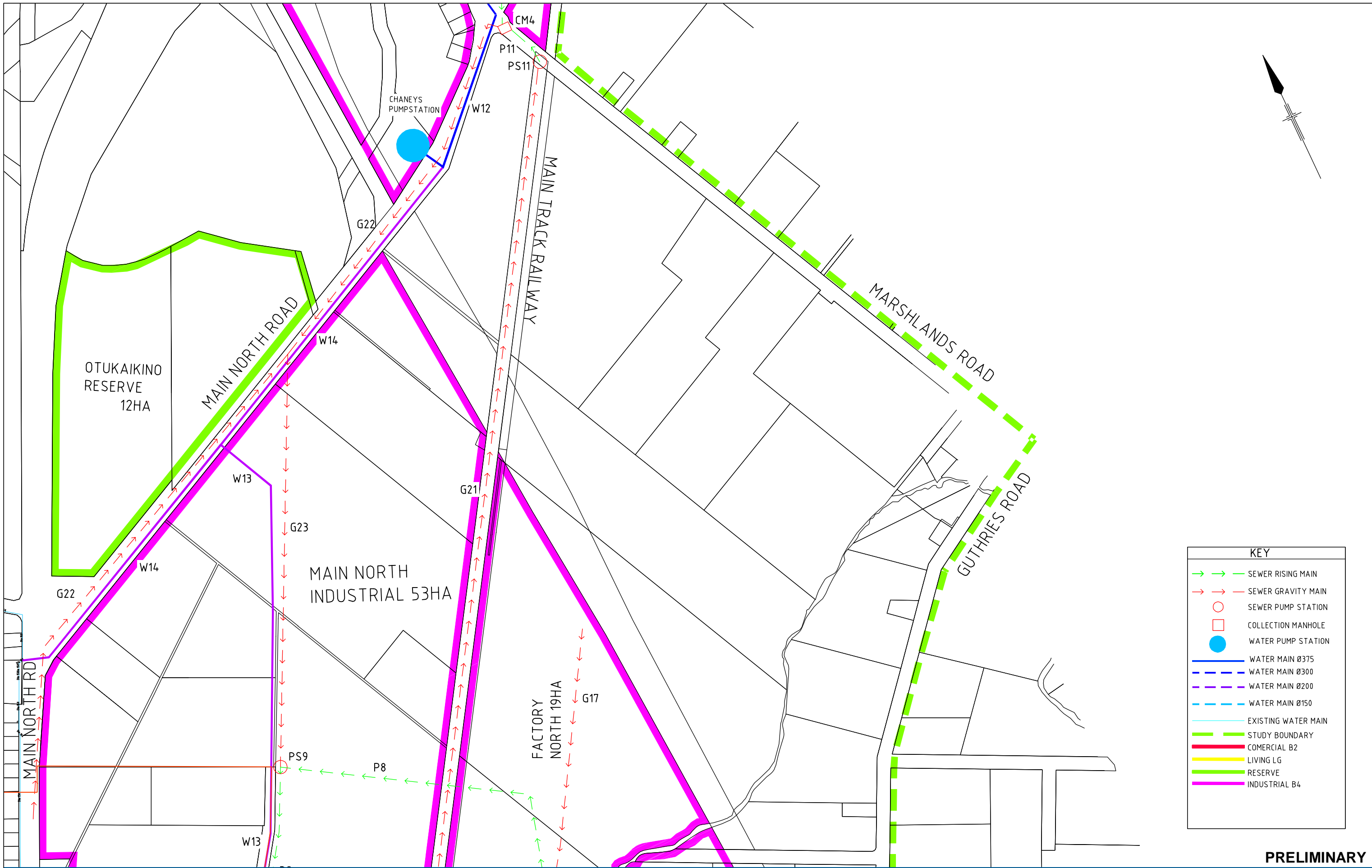
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Date			
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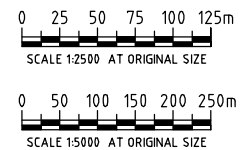
Client	CHRISTCHURCH CITY COUNCIL
Project	BELFAST INFRASTRUCTURE DEVELOPMENT
Title	SEWER AND WATER SUPPLY PLAN NORTHWEST BELFAST
Original Size	A1
Drawing No:	51-20588-C107
Rev:	B



KEY	
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	SEWER GRAVITY MAIN
	SEWER PUMP STATION
	COLLECTION MANHOLE
	WATER PUMP STATION
	WATER MAIN Ø375
	WATER MAIN Ø300
	WATER MAIN Ø200
	WATER MAIN Ø150
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	STUDY BOUNDARY
	COMMERCIAL B2
	LIVING LG
	RESERVE
	INDUSTRIAL B4

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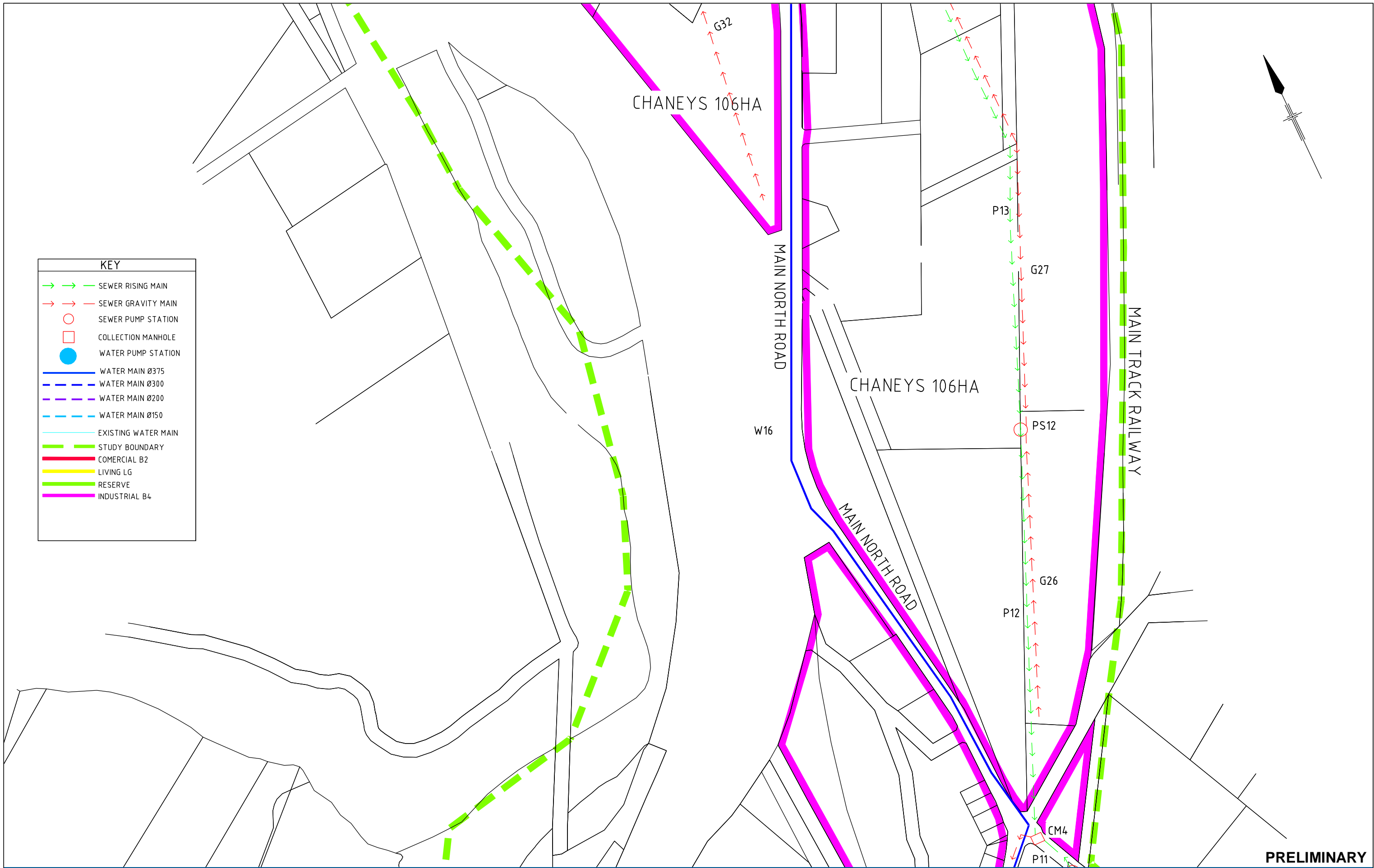
No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
B	PRELIMINARY ISSUE		ADC			22/08/07
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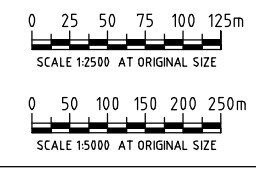
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Drafting Check		Design Check	
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Client	CHRISTCHURCH CITY COUNCIL
Project	BELFAST INFRASTRUCTURE DEVELOPMENT
Title	SEWER AND WATER SUPPLY PLAN MAIN NORTH AREA
Original Size	A1
Drawing No:	51-20588-C108
Rev:	B



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Approved
Date

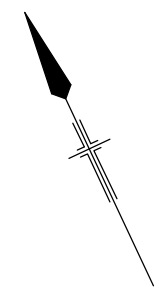
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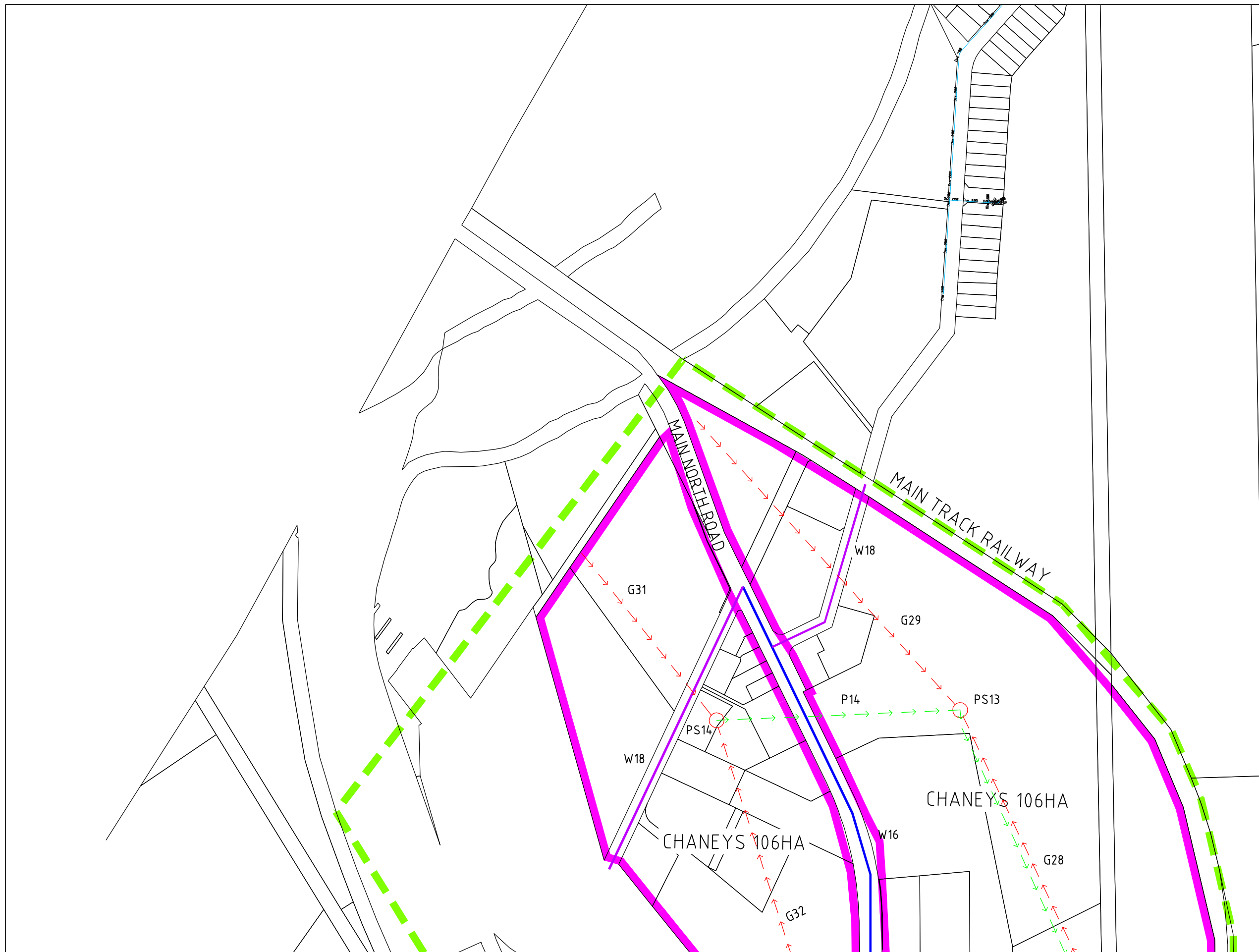
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Project	BELFAST INFRASTRUCTURE DEVELOPMENT
Title	SEWER AND WATER SUPPLY PLAN CHANEYS
Original Size	A1
Drawing No:	51-20588-C109
Rev:	B

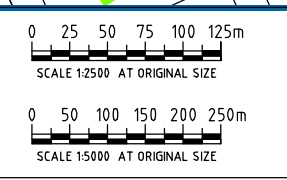


KEY	
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	SEWER GRAVITY MAIN
	SEWER PUMP STATION
	COLLECTION MANHOLE
	WATER PUMP STATION
	WATER MAIN Ø375
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	WATER MAIN Ø150
	EXISTING WATER MAIN
	STUDY BOUNDARY
	COMERCIAL B2
	LIVING LG
	RESERVE
	INDUSTRIAL B4



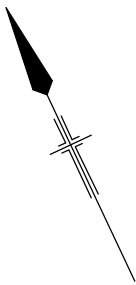
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B	PRELIMINARY ISSUE		ADC			22/08/07
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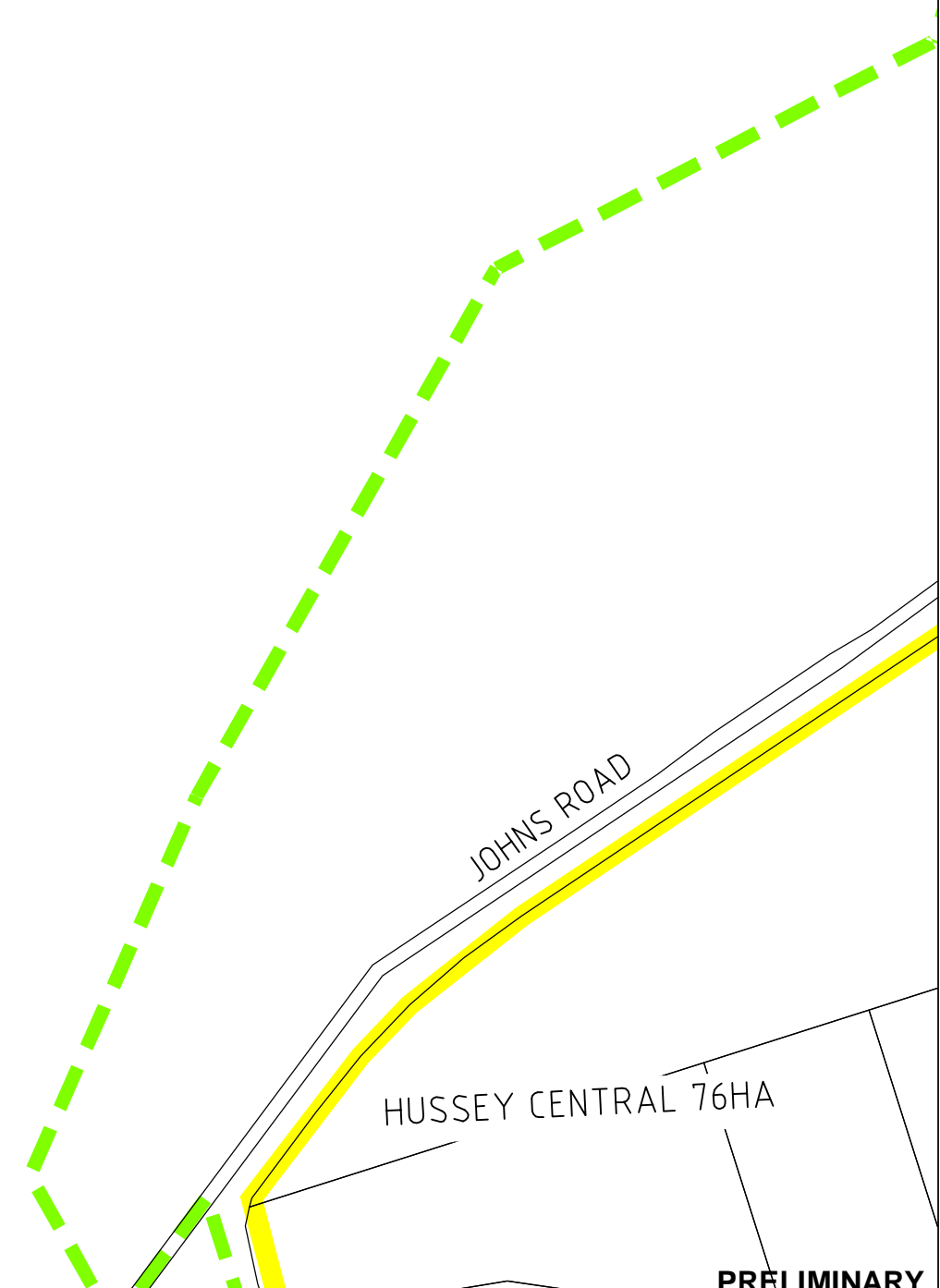


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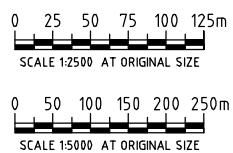
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Project	BELFAST INFRASTRUCTURE DEVELOPMENT
Title	SEWER AND WATER SUPPLY PLAN CHANEYS NORTH
Original Size	A1
Drawing No:	51-20588-C110
Rev:	B



KEY	
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	SEWER GRAVITY MAIN
	SEWER PUMP STATION
	COLLECTION MANHOLE
	WATER PUMP STATION
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	RESERVE
	INDUSTRIAL B4



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B	PRELIMINARY ISSUE		ADC			22/08/07
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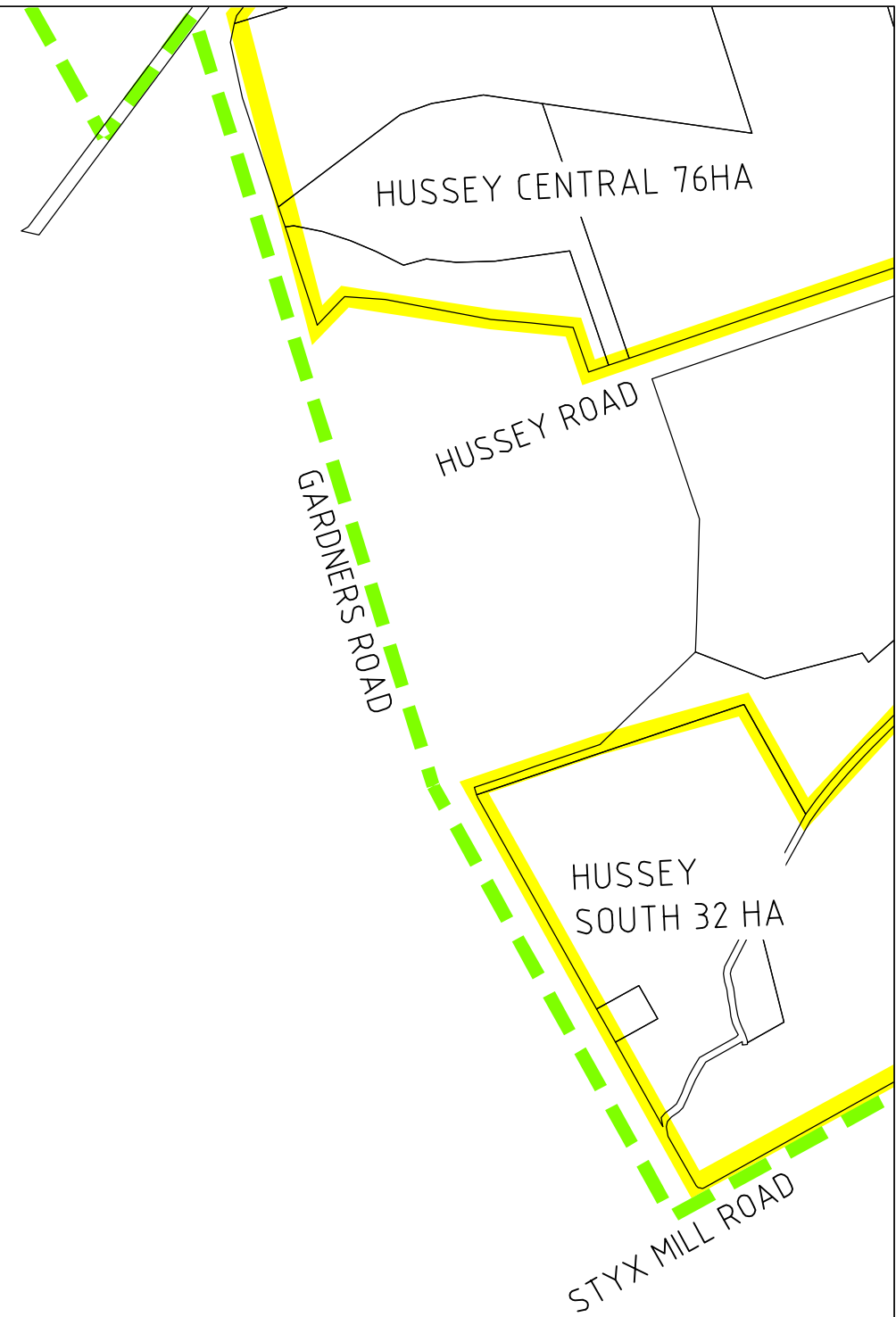
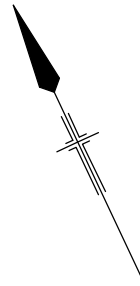


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Date			
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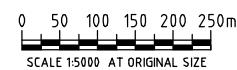
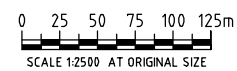
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Project	BELFAST INFRASTRUCTURE DEVELOPMENT
Title	SEWER AND WATER SUPPLY PLAN HUSSEY NORTH
Original Size	A1
Drawing No:	51-20588-C111
Rev:	B



KEY	
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	SEWER GRAVITY MAIN
	SEWER PUMP STATION
	COLLECTION MANHOLE
	WATER PUMP STATION
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	WATER MAIN Ø150
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	COMERCIAL B2
	LIVING LG
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Drafting Check		Design Check	
Approved			
Date			
Scale	1:2500(A1);1:5000(A3)	This Drawing must not be used for Construction unless signed as Approved	

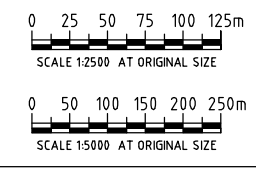
Client	CHRISTCHURCH CITY COUNCIL
Project	BELFAST INFRASTRUCTURE DEVELOPMENT
Title	SEWER AND WATER SUPPLY PLAN HUSSEY SOUTH AND HUSSEY CENTRAL
Original Size	A1
Drawing No:	51-20588-C112
Rev:	B



KEY	
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	SEWER GRAVITY MAIN
	SEWER PUMP STATION
	COLLECTION MANHOLE
	WATER PUMP STATION
	WATER MAIN Ø375
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	WATER MAIN Ø150
	EXISTING WATER MAIN
	STUDY BOUNDARY
	COMERCIAL B2
	LIVING LG
	RESERVE
	INDUSTRIAL B4

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Project	BELFAST INFRASTRUCTURE DEVELOPMENT
Title	SEWER AND WATER SUPPLY PLAN HUSSEY SOUTH AND HUSSEY CENTRAL
Original Size	A1
Drawing No:	51-20588-C113
Rev:	B

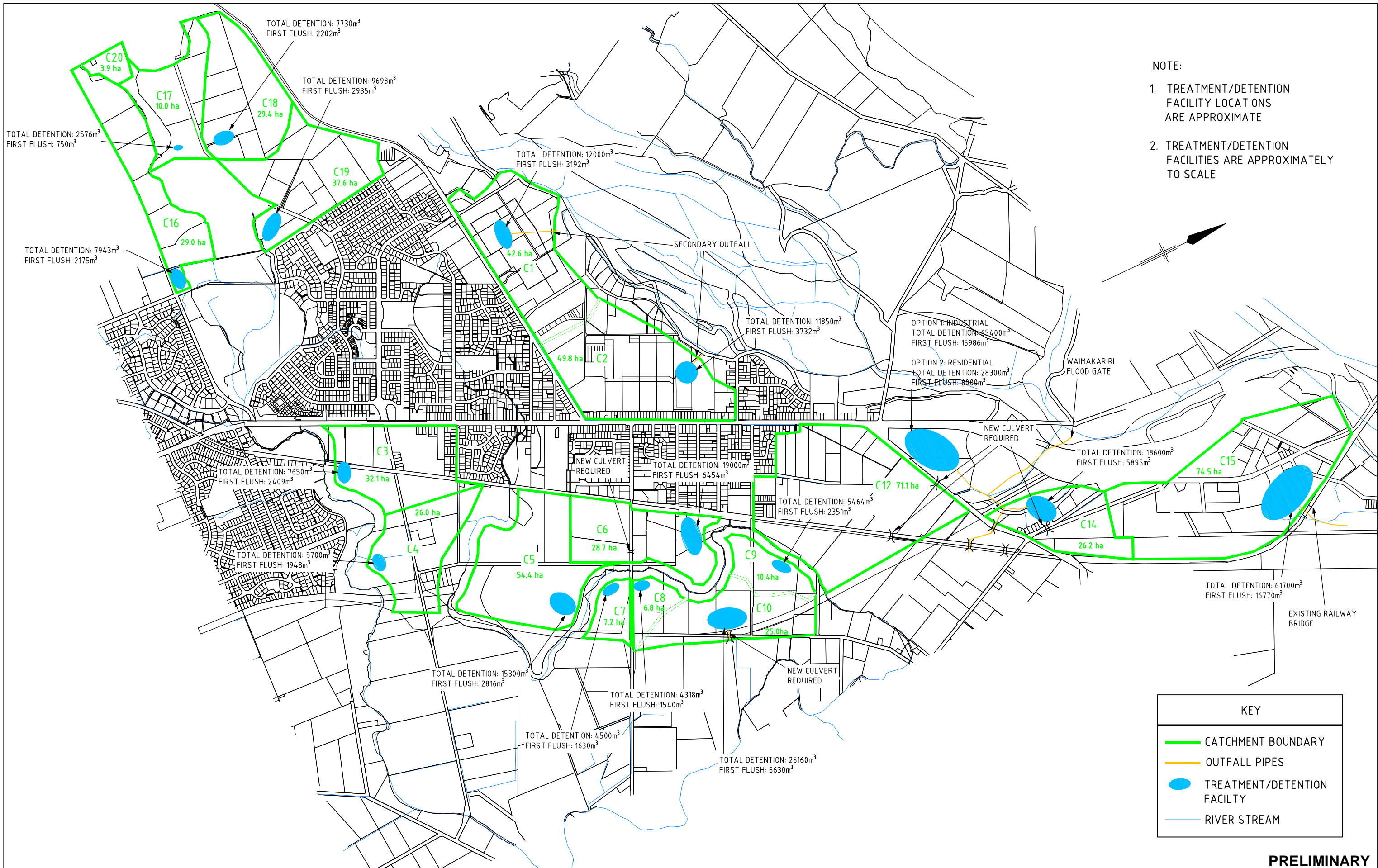


Appendix C

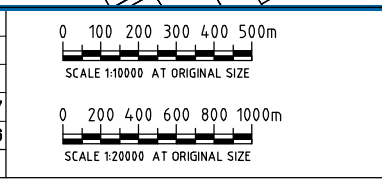
Stormwater Drawings

C201 – Stormwater Plan

C202 – Existing Stormwater Drainage Layout for
Marshlands Road/Main North Road Intersection



B PRELIMINARY ISSUE		ADC	22/08/07
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Client	CHRISTCHURCH CITY COUNCIL
Project	BELFAST INFRASTRUCTURE DEVELOPMENT
Title	SURFACE WATER MANAGEMENT PLAN
Original Size	A1
Drawing No:	51-20588-C201
Rev:	B



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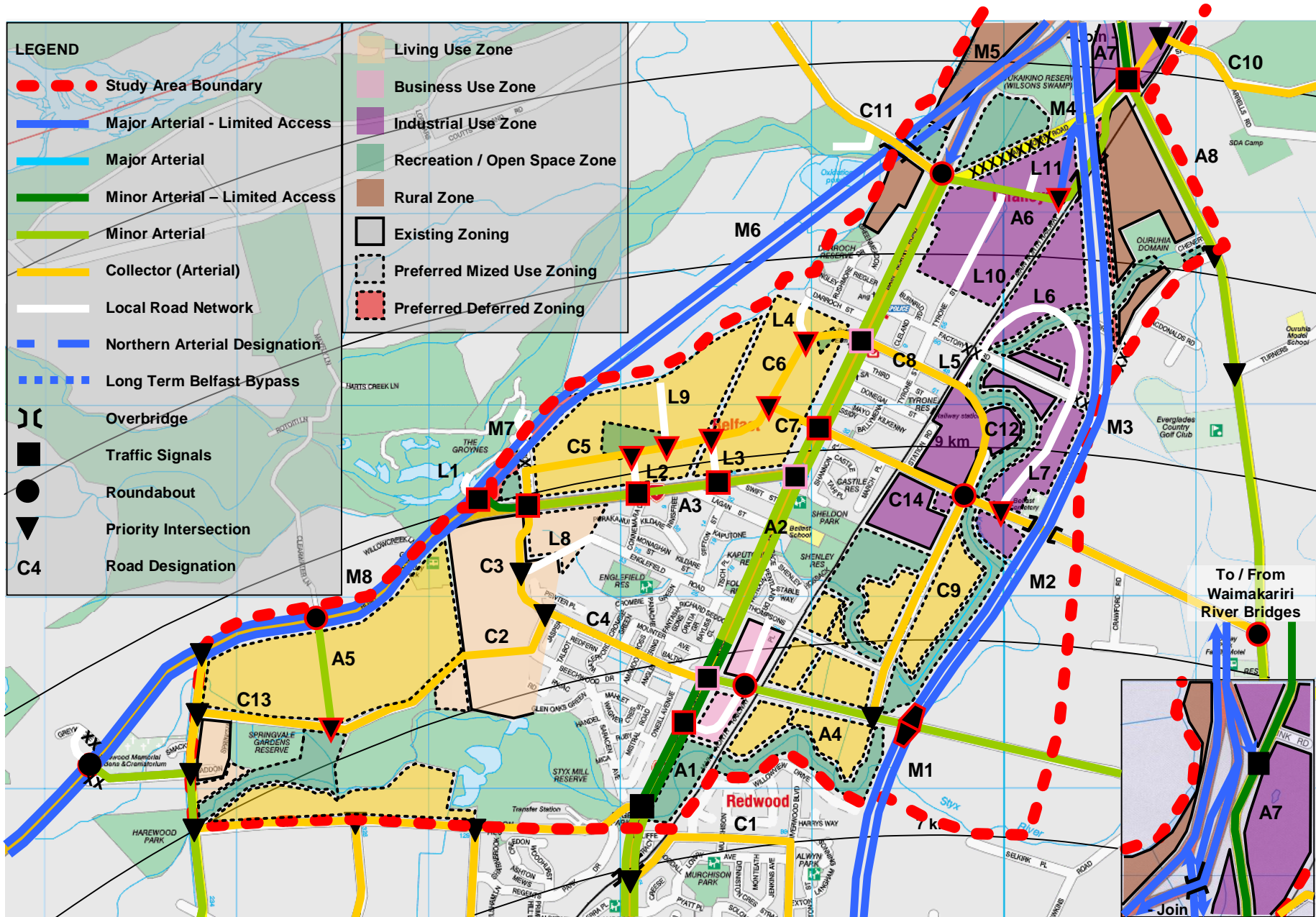
Client	CHRISTCHURCH CITY COUNCIL
Project	BELFAST INFRASTRUCTURE DEVELOPMENT
Title	EXISTING DRAINAGE LAYOUT - MARSHLANDS ROAD /MAIN NORTH ROAD INTERSECTION
Original Size	A1
Drawing No:	51-20588-C202
Rev:	B



Appendix D

Transport Drawings

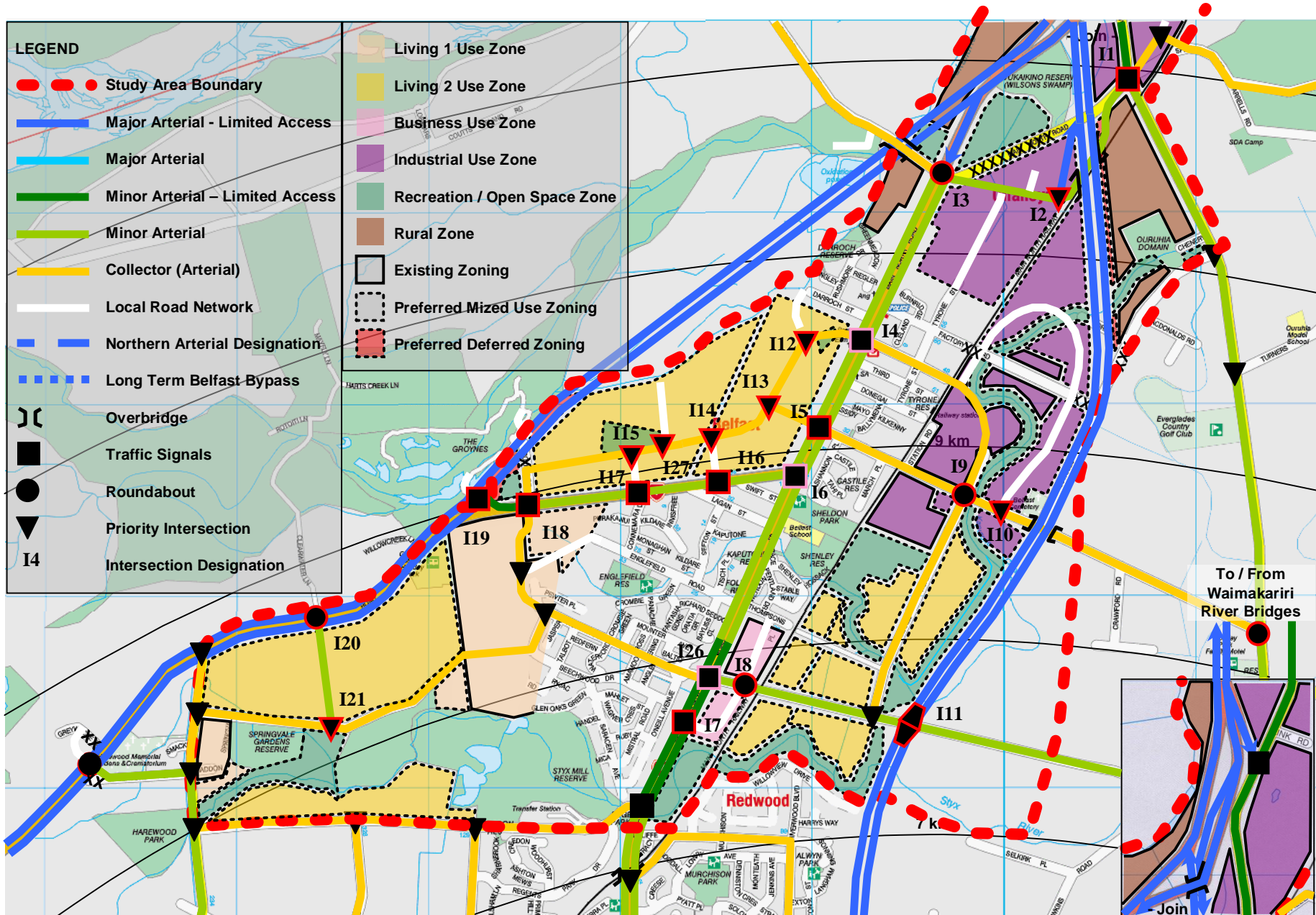
Figure D1	Ultimate Road Layout
Figure D2	Intersection Designation
Figure D3	Chaneys Transport - Road and Intersection Designations
Figure D4	Cycle and Pedestrian Facilities
Figure D5	Proposed bus routes
Figure D6	Chaneys Option 2



VERSION 200703 - NOTE: These figures must be read in conjunction with the attached report

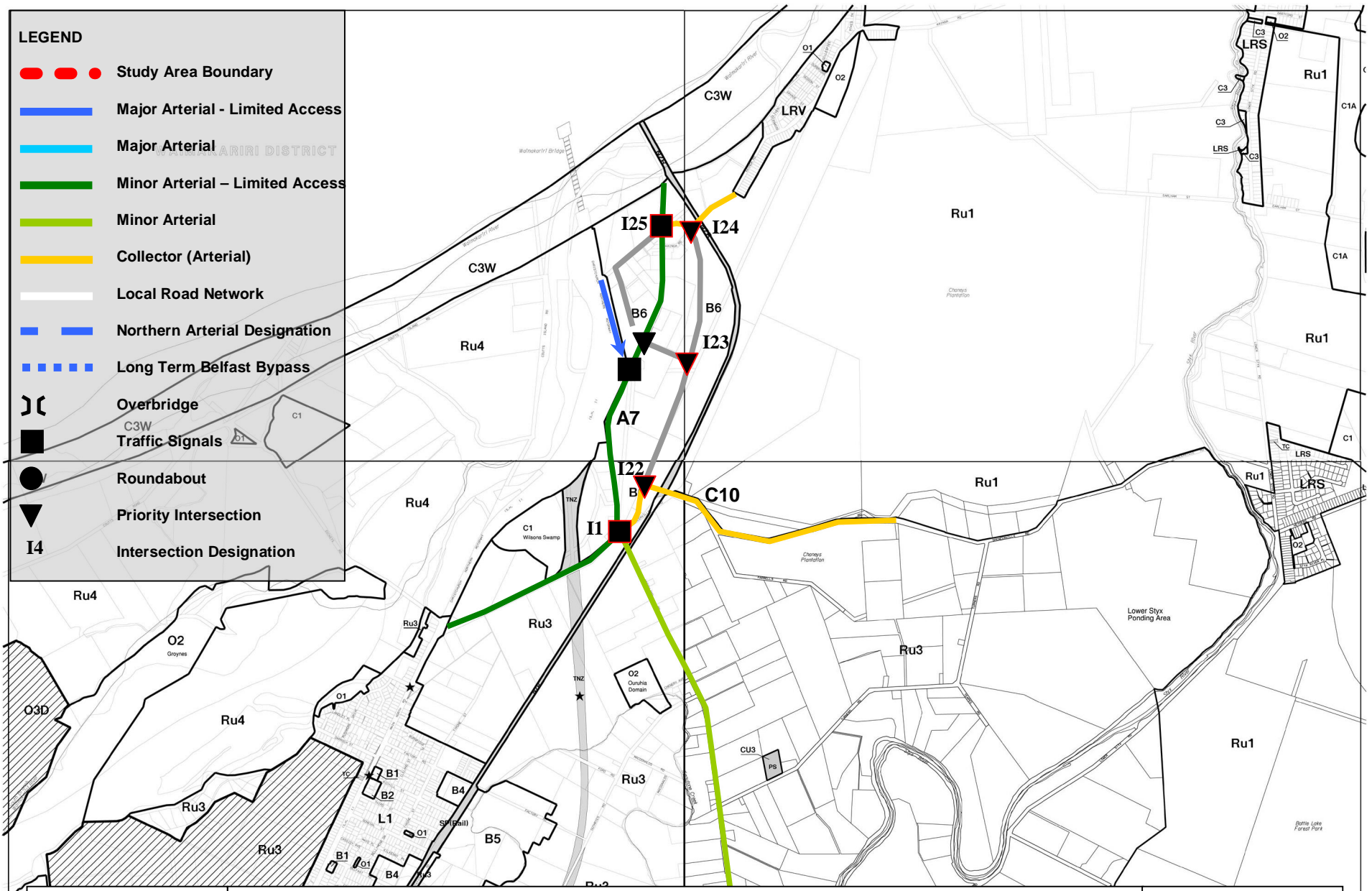
DRAFT BELFAST AREA PLAN - TRANSPORT ULTIMATE Roding LAYOUT – Road Designations

FIGURE D1
(From CCC Fig 8A)



**DRAFT BELFAST AREA PLAN - TRANSPORT
ULTIMATE ROADING LAYOUT – Intersection Designations**

**FIGURE D2
(From CCC Fig 8A)**



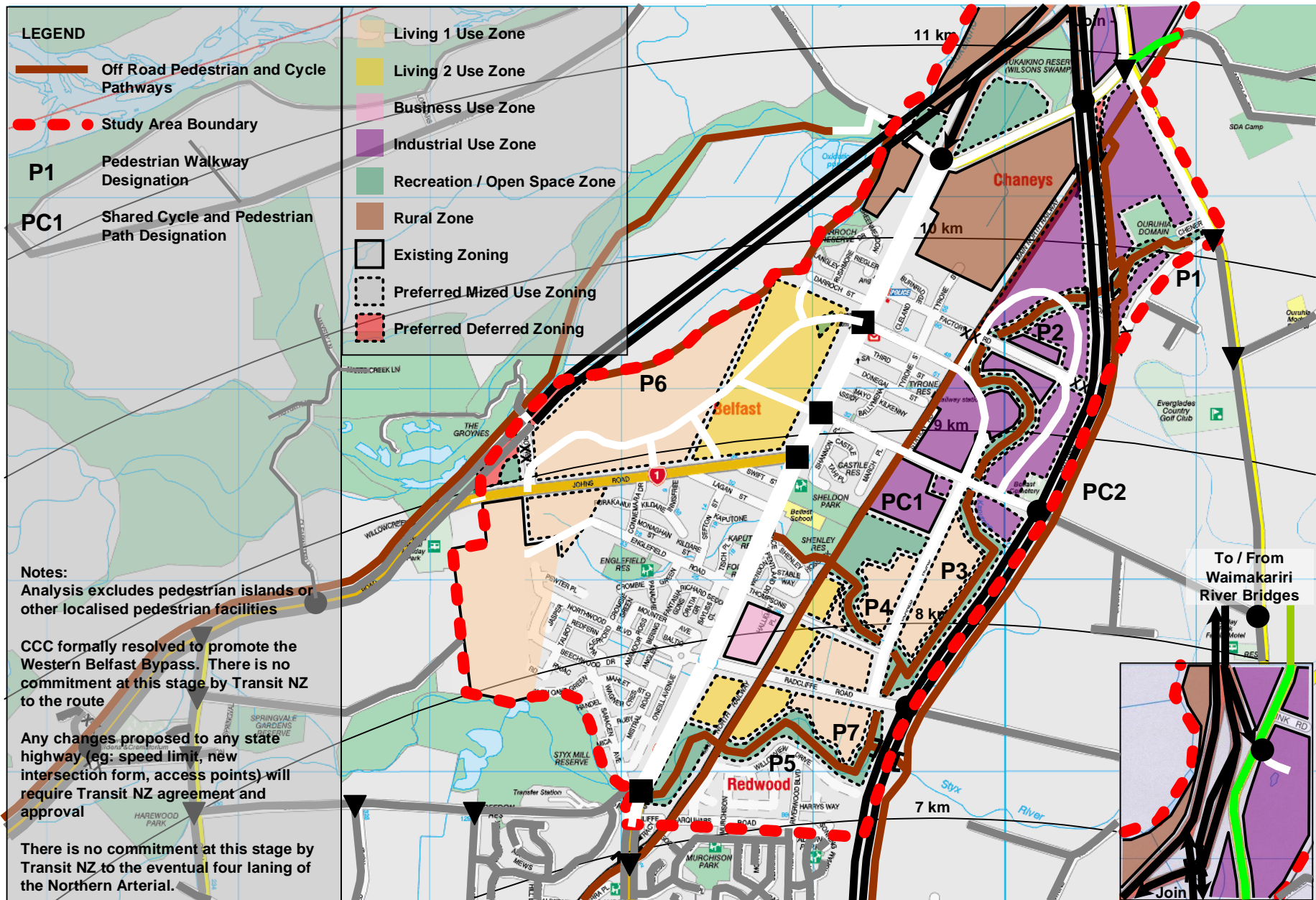
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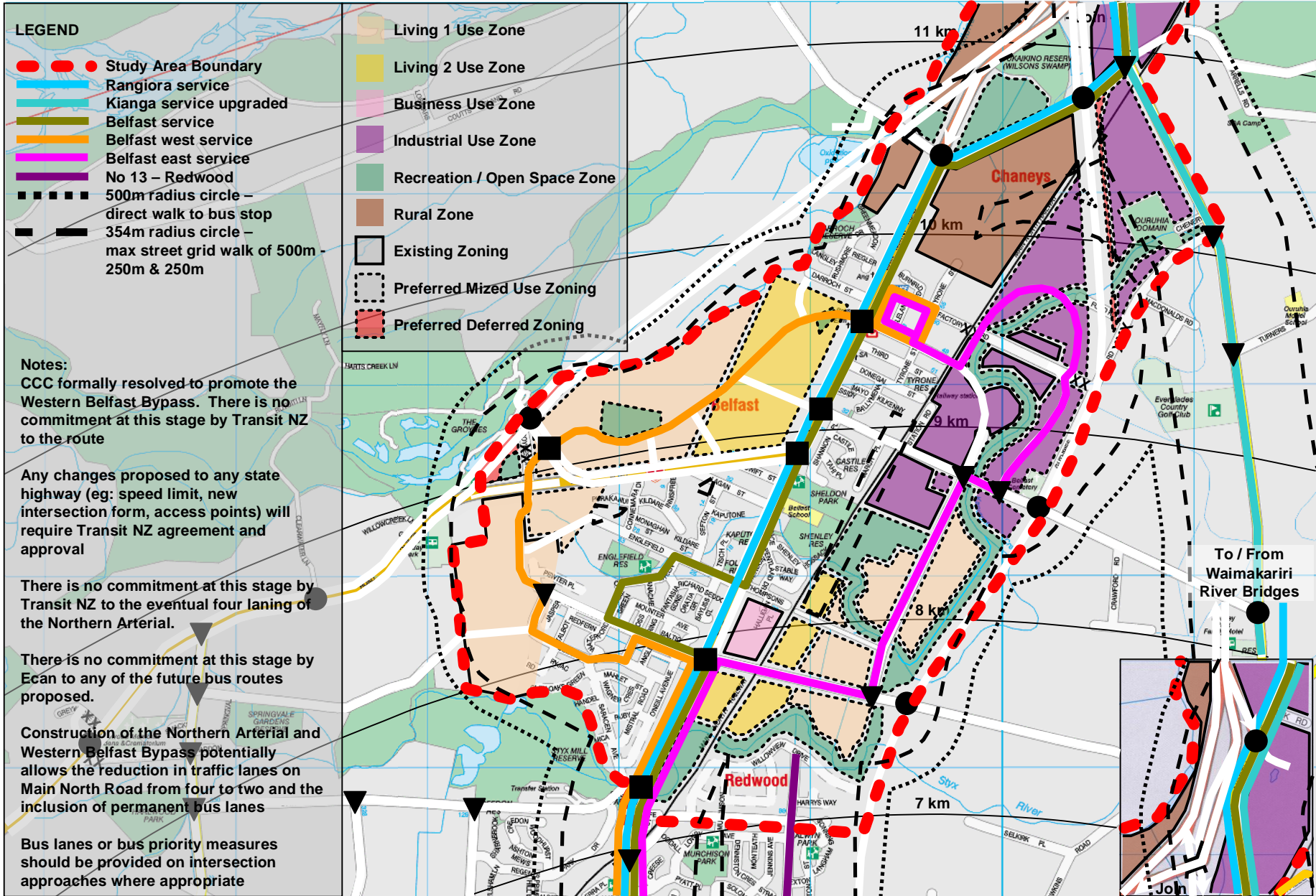
- ● ● Study Area Boundary
- ▬ Major Arterial - Limited Access
- ▬ Major Arterial
- ▬ Minor Arterial – Limited Access
- ▬ Minor Arterial
- ▬ Collector (Arterial)
- ▬ Local Road Network
- ▬ Northern Arterial Designation
- ▬ ▬ ▬ ▬ Long Term Belfast Bypass
- } Overbridge
- Traffic Signals
- Roundabout
- ▼ Priority Intersection
- I4 Intersection Designation



DRAFT BELFAST AREA PLAN - TRANSPORT
CHANEYS – Road and Intersection Designations

FIGURE D3
(From CCC Fig X)







Appendix E
Transport Cost Breakdown Tables

Table 57 Applefields Transport Cost Breakdown

Label	Property	Road Cost	Structures	Intersections	Total Cost
L1	\$102,700	\$796,500	\$0	\$0	\$899,300
L2	\$55,100	\$427,200	\$0	\$795,400	\$1,277,700
L3	\$104,700	\$811,600	\$0	\$795,400	\$1,711,700
L4	\$88,500	\$686,000	\$0	\$7,500	\$781,900
L8	\$0	\$0	\$0	\$0	\$0
L9	\$89,100	\$691,000	\$0	\$7,500	\$787,600
C3	\$495,900	\$337,200	\$14,900	\$0	\$848,100
C4	\$0	\$0	\$14,900	\$0	\$14,900
C5	\$695,000	\$3,971,500	\$59,700	\$795,400	\$5,521,600
C6	\$1,346,700	\$2,027,400	\$29,800	\$264,500	\$3,668,400
C7	\$1,177,700	\$1,238,700	\$0	\$788,000	\$3,204,300
A2	\$0	\$92,600	\$104,400	\$264,500	\$329,300
P6	\$87,700	\$545,600	\$0	\$0	\$633,400
Total	\$4,243,100	\$11,625,300	\$223,700	\$3,718,200	\$19,678,200

Table 58 Hussey Central Transport Cost Breakdown

Label	Property	Road Cost	Structures	Intersections	Total Cost
C2	\$0	\$33,100	\$14,900	\$7,500	\$55,400
C13	\$0	\$2,171,500	\$0	\$0	\$2,171,500
A5	\$242,000	\$1,855,500	\$0	\$0	\$2,097,500
Total	\$242,000	\$4,060,100	\$14,900	\$7,500	\$4,324,400



Table 59 Styx North Transportation Cost Breakdown

Label	Property	Road Cost	Structures	Intersections	Total Cost
A4	\$95,200	\$2,536,000	\$135,600	\$264,500	\$3,031,300
P5	\$58,100	\$361,600	\$181,100	\$0	\$600,800
Total	\$153,300	\$2,897,600	\$316,700	\$264,500	\$3,632,100

Table 60 Radcliffe North Transportation Cost Breakdown

Label	Property	Road Cost	Structures	Intersections	Total Cost
C9	\$23,200	\$2,334,700	\$44,700	\$945,600	\$3,348,300
C14	\$81,400	\$3,364,400	\$14,900	\$7,500	\$3,468,200
Total	\$104,600	\$5,699,100	\$59,600	\$953,100	\$6,816,500

Table 61 PPCS South Transportation Cost Breakdown

Label	Property	Road Cost	Structures	Intersections	Total Cost
P4	\$34,200	\$213,100	\$181,100	\$0	\$428,400
Total	\$34,200	\$213,100	\$181,100	\$0	\$428,400

Table 62 PPCS Residential Transportation Cost Breakdown

Label	Property	Road Cost	Structures	Intersections	Total Cost
P3	\$42,700	\$265,700	\$0	\$0	\$308,400
Total	\$42,700	\$265,700	\$0	\$0	\$308,400

Table 63 PPCS North Transportation Cost Breakdown

Label	Property	Road Cost	Structures	Intersections	Total Cost
L5	\$57,500	\$520,100	\$0	\$0	\$577,600
C8	\$0	\$0	\$29,800	\$0	\$29,800
C12	\$2,285,300	\$1,673,800	\$268,500	\$0	\$4,227,500

Label	Property	Road Cost	Structures	Intersections	Total Cost
Total	\$2,342,800	\$2,193,900	\$298,300	\$0	\$4,834,900

Table 64 Belfast North Transportation Cost Breakdown

Label	Property	Road Cost	Structures	Intersections	Total Cost
L6	\$260,500	\$2,357,000	\$155,900	\$0	\$2,773,400
L7	\$194,400	\$1,758,900	\$29,800	\$0	\$1,983,200
P1	\$15,400	\$96,100	\$0	\$0	\$111,500
P2	\$52,300	\$325,100	\$13,200	\$0	\$390,600
Bus Exchg	\$66,100	\$0	\$595,100	\$0	\$661,300
Total	\$588,700	\$4,537,100	\$794,000	\$0	\$5,920,000

Table 65 Factory North Transportation Cost Breakdown

Label	Property	Road Cost	Structures	Intersections	Total Cost
PC1	\$0	\$2,195,200	\$145,800	\$0	\$2,341,000
Total	\$0	\$2,195,200	\$145,800	\$0	\$2,341,000

Table 66 Main North Transportation Cost Breakdown

Label	Property	Road Cost	Structures	Intersections	Total Cost
L10	\$100,000	\$904,600	\$0	\$0	\$1,004,600
L11	\$32,200	\$291,500	\$0	\$0	\$323,700
A6	\$446,300	\$3,124,400	\$44,700	\$1,970,000	\$3,615,500
Total	\$578,500	\$4,320,500	\$44,700	\$1,970,000	\$4,943,800

Table 67 Chaney's Transportation Cost Breakdown

Label	Property	Road Cost	Structures	Intersections	Total Cost
C10	\$0	\$470,300	\$0	\$0	\$470,200
C11	\$0	\$396,200	\$0	\$0	\$396,200
A7	\$0	\$3,253,400	\$29,800	\$1,598,300	\$4,881,600



Label	Property	Road Cost	Structures	Intersections	Total Cost
A8	\$0	\$1,836,700	\$137,200	\$0	\$1,973,900
Total	\$0	\$5,956,600	\$167,000	\$1,598,300	\$7,721,900

Table 68 Northern Arterial Transportation Cost Breakdown

Label	Property	Road Cost	Structures	Intersections	Total Cost
M1	\$268,500	\$9,945,200	\$252,200	\$4,628,800	\$15,094,600
M2	\$484,000	\$16,134,500	\$661,300	\$0	\$17,279,800
M3	\$310,700	\$29,042,100	\$11,840,800	\$0	\$41,193,500
M4	\$0	\$9,614,600	\$0	\$7,500	\$9,622,000
A3	\$332,200	\$5,729,700	\$0	\$0	\$6,062,000
PC2	\$0	\$1,585,400	\$192,200	\$0	\$1,777,600
P7	\$5,800	\$36,100	\$0	\$0	\$41,900
Kaputone Deviation	\$0	\$0	\$661,300	\$0	\$661,300
Bridge Upgrades	\$0	\$0	\$5,000,000	\$0	\$5,000,000
Total	\$1,401,200	\$72,087,600	\$18,607,800	\$4,636,300	\$96,732,700

Table 69 Western Bypass Transportation Cost Breakdown

Label	Property	Road Cost	Structures	Intersections	Total Cost
M5	\$1,525,200	\$10,458,300	\$5,290,000	\$0	\$17,273,500
M6	\$2,273,900	\$15,592,300	\$0	\$1,576,000	\$19,442,100
M7	\$850,500	\$5,832,200	\$0	\$1,970,000	\$6,682,800
Total	\$4,649,600	\$31,882,800	\$5,290,000	\$3,546,000	\$43,398,400



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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
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