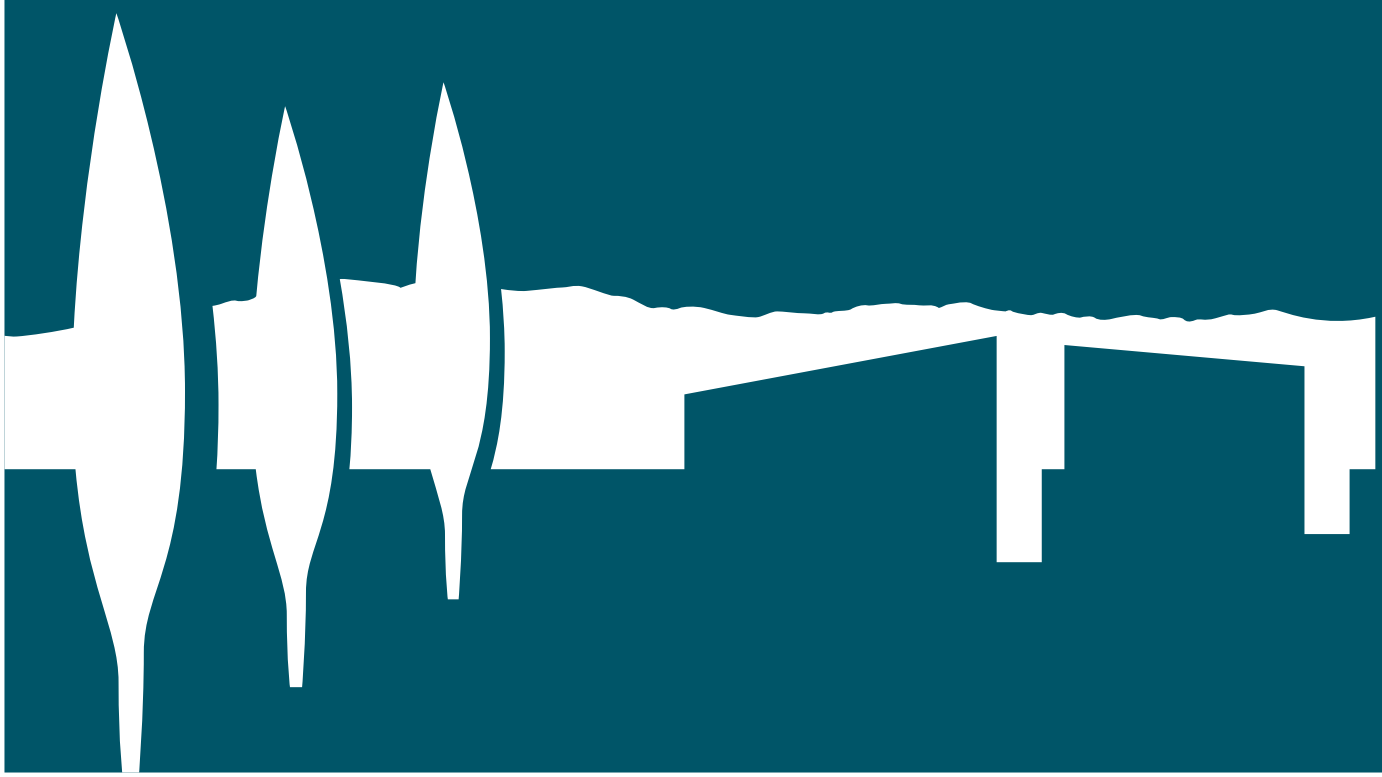
9.0

Infrastructure



9.1 Introduction

The aim of this section is to illustrate how appropriate infrastructure networks are to be developed to service Rolleston with key utility services, such as water supply, wastewater, stormwater, power and telecommunications.

9.1.1 INFRASTRUCTURE AIMS

A successful infrastructure network provides an efficient and reliable service to the community, whilst being part of the urban fabric of the town and, where possible, realises opportunities to provide additional amenity value.

With this overall intention, the aims of the Rolleston Structure Plan in relation to infrastructure are to:

- Provide an equal and appropriate level of service to all areas of the town
- Incorporate the "Five waters" design philosophy for sustainability and Structure Plan development principles into infrastructure planning from the start
- Ensure future networks meet the expectations of the future population of Rolleston
- Manage infrastructure networks in such a way as to mitigate environmental impacts and enhance aesthetics and ecological value
- Integrate infrastructure into the urban fabric of the town, particularly into the green networks, to maximise amenity and efficiency opportunities
- Pursue opportunities for low impact design solutions particularly associated with stormwater and its reuse
- Ensure demand management techniques and technology are incorporated at the design stage for all new developments and subdivisions

9.2 Water Supply

Water supply for Rolleston is sourced from five deep groundwater wells as shown on Figure 9.1. Water quality is high and treatment is not provided. Households are connected to an on-demand supply, all properties are metered and billed on a volumetric basis with an element of fixed charge.

To meet increasing demand in Rolleston, new wells connecting to the confined aquifer will be required. These will be subject to obtaining resource consent.

Water demand in Rolleston is high, particularly in summer. Competition for water resources across the Canterbury Plains is high, the needs of various users need to be balanced to ensure continuity of service. To meet the Structure Plan principles of a 'drought ready' Rolleston and ensure adequate resources for future generations demand management measures in Rolleston and across the District are required. Council has developed a water demand management strategy that alongside water loss reduction programmes and consumption studies will help to manage demand. The demand management strategy establishes a target to reduce demand in Rolleston to 85 litres/person/hr.

Recent resource consents gained for Rolleston have required Council to take all reasonable steps to avoid leakage from pipes and structures. The demand reduction targets will be carried forward into future consents. It is expected that all future consents will require such targets as the demand for water increases across the Region, and as climate change brings uncertainty in relation to supply.

Effective demand management will reduce consumption, therefore delaying infrastructure investment and conserving supplies. It is expected that increasingly stringent resource consent conditions will be applied in the future for new consents, therefore demand management measures should be implemented across Rolleston for new and existing development.

Domestic and commercial water metering with volumetric charging is applied to all properties within Rolleston. There is scope to further manage demand by optimising volumetric charging mechanisms should this be required in the future.

The Structure Plan proposes a significant increase in open space and planting as part of the overall design. In order to mitigate the impacts of these plantings on water demand, these areas should be planted with drought resistant species. During the driest periods some irrigation will be required and alternatives such as use of stormwater and water re-use can be considered to limit the impact of potable water resources. Opportunities such as water re-use for irrigation of parks and reserves will be used to manage peak water consumption as part of a wider water demand management strategy, subject to cost benefit analysis.

As development occurs, opportunities for increasing network interconnectedness will be sought to further improve the management of peak demands and increase resilience of the network. Developers will be responsible for reticulation within their developments, and for providing reticulation linkages to adjoining developments as required by Council.

Being able to distribute water from a number of wells across the town will ensure continuity of supply and maintain system turn over. Some pipelines may require capacity upgrades in time and this will be determined through hydraulic modelling of the system. Growth related upgrades and network expansions will be funded through development contributions.

A Public Health Risk Management Plan (PHRMP) is being developed for Rolleston to identify and schedule any necessary works to ensure the water supply is compliant with the Health Drinking Water Amendment Act before the statutory deadline for a medium drinking-water supply of 1 July 2013. The PHRMP and associated improvement plan will give regard to the projected increases in the population of Rolleston.

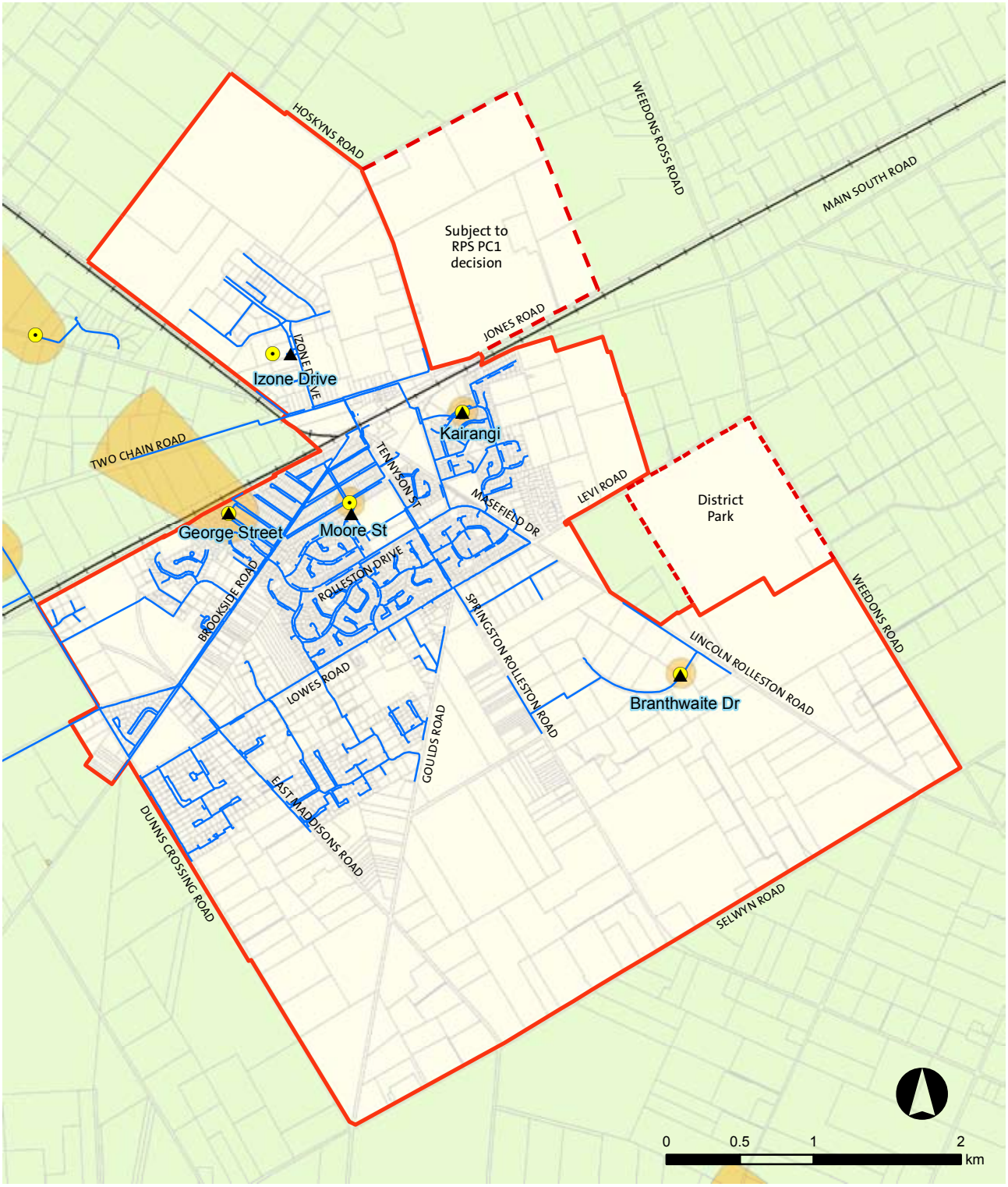


Figure 9.1: Existing Water Supply for Rolleston

Study area
Rural land
Railway
Water Pump Station
Water Main
Community Well
Community Well Protection Zone

9.3 Wastewater

Wastewater from Rolleston is treated at 'The Pines' activated sludge plant located west of Rolleston on Burnham School Road. Effluent is collected through a reticulated network and pumped directly to the treatment plant where treated effluent is discharged to ground by spray irrigation.

The Pines treatment plant is located on an 84 ha site and expansion of the plant is planned in three stages, to cater for growth in Rolleston and redirection of wastewater from Lincoln, Springston and Prebbleton. The first phase of expansion is planned for completion in 2009/10 which includes the installation of the new Southern Rolleston Pumping Station. Until this first phase of expansion is operational, further development in Rolleston is restricted.

Izone has an independent reticulation and pumping station for transferring wastewater flows to The Pines. Further development of the network in Izone is the developer's responsibility.

The layout of the reticulation is set out in a master plan for the Eastern Selwyn district .

A large proportion of wastewater in Rolleston will in future be conveyed by gravity mains to the new Southern Rolleston pumping station, located at the intersection of Springston-Rolleston and Selwyn Roads. Gravity mains running east/west will collect wastewater from new subdivisions and convey it via a trunk main which will run from Lowes Road along Springston-Rolleston Road to the Southern Pump Station. From there it will be pumped via a pressurised rising main along Selwyn and Dunns Crossing Roads to the treatment plant.

To enable development of the greenfield areas in Rolleston, sequencing of wastewater network extensions will complement residential staging as can be seen in Figure 9.2. The areas known as SR3 and SR4 fronting Levi Road are the first areas identified for development, to 2016. These areas, if they develop before the new infrastructure is constructed, will as an interim measure be served using the existing sewer network, and will utilise all remaining system and treatment capacity.

The installation of the trunk main along Springston-Rolleston Road, connecting to the Southern Rolleston pumping station, is essential to enable reticulation servicing all other growth pocket areas connecting into it to be installed in conjunction with sequenced subdivisional development. It will also enable permanent service connections to be provided to SR3 and SR4.

The areas known as SR6 is also part of the first stage of development and will be linked to the primary trunk main via new west to east mains, likely to be laid along Dynes Road and the new CRETS collector road. Because SR6 is some distance from Springston-Rolleston Road, the Council will need to provide or fund reticulation from that road to the boundary of each development area. The mains route following the CRETS road will depend on the final location of the new road, and may require a designation in existing zoned land to the west of Springston-Rolleston Road.

The sequencing of major wastewater infrastructure within the MUL, along with indicative responsibility for construction, is illustrated in Table 9.1 overleaf.

Table 9.1: Sequencing of Major Wastewater Infrastructure

Asset Description	Areas Serviced	Time Period	Construction By
South Rolleston Pumping Station (SRPS)	All new development in MUL, plus other SDC townships	Immediate - Short term	SDC
Rising main from SRPS to The Pines	All new development in MUL, plus other SDC townships	Immediate - Short term	SDC
Springston-Rolleston Rd trunk main from Lowes Rd to SRPS	All new development in MUL, some direct, some via other mains	Short term	SDC
Levi Rd, Lincoln-Rolleston Rd to Helpet	SR3, SR4 plus intensification	Short term	Part SDC, part subdivision
Helpet to Springston-Rolleston Rd (if capacity issues arise)	SR3, SR4 plus intensification	Short term	SDC
Dynes Rd to & inc part of Goulds Rd	SR6, plus intensification	Short term	Part SDC, part subdivision
Goulds Rd to new CRETS road	SR6 plus intensification	Short term	SDC
CRETS road, Springston-Rolleston Rd to Goulds Rd	SR6	Short term	Part SDC, part subdivision
CRETS road, Goulds Rd to Dunns Crossing Rd	SR5 (part), SR9 (part)	Medium term (2017-2026)	Subdivision
East Maddisons Rd (N), inc to Dunns Crossing Rd	SR5 (part)	Medium term (2017-2026)	Part SDC (EM Rd), part subdivision
East Maddisons Rd (S)	SR9 (part), SR10 (part)	Medium term (2017-2026)	SDC and/or subdivision
Selwyn Rd (W) to SRPS	SR9 (part), SR10 (part), SR11 (part)	Medium term (2017-2026)	Part SDC, part subdivision
Selwyn Rd (E) to SRPS	SR12 (part), SR13 (part)	Long term (beyond 2041)	SDC and/or subdivision
Internal main to SR12	SR12 (part)	Long term (beyond 2041)	Subdivision
Internal main & connection to Lincoln Rolleston Rd	SR13 (part), SR15	Long term (beyond 2041)	Subdivision
Connecting main, Springston-Rolleston Rd to Branthwaite Drive	SR8, SR7 (part)	Long term (beyond 2041)	Subdivision
CRETS road, Springston-Rolleston Rd to Lincoln-Rolleston Rd	SR12 (part), SR13 (part), SR14	Long term (beyond 2041)	Subdivision
Lincoln-Rolleston Rd, CRETS road to Levi Rd	SR8 (part), SR14	Long term (beyond 2041)	SDC and/or subdivision
Additional trunk reticulation to be confirmed – may be internal or follow Weedons Rd, Selwyn Rd	SR14 (part), SR15 (part)	Long term (beyond 2041)	SDC and/or subdivision

Note that the 2008 Wastewater Master Plan did not allow for SR14 or SR15, so decisions will need to be made about which of the above mains will be used to service these areas, or whether to install additional mains.

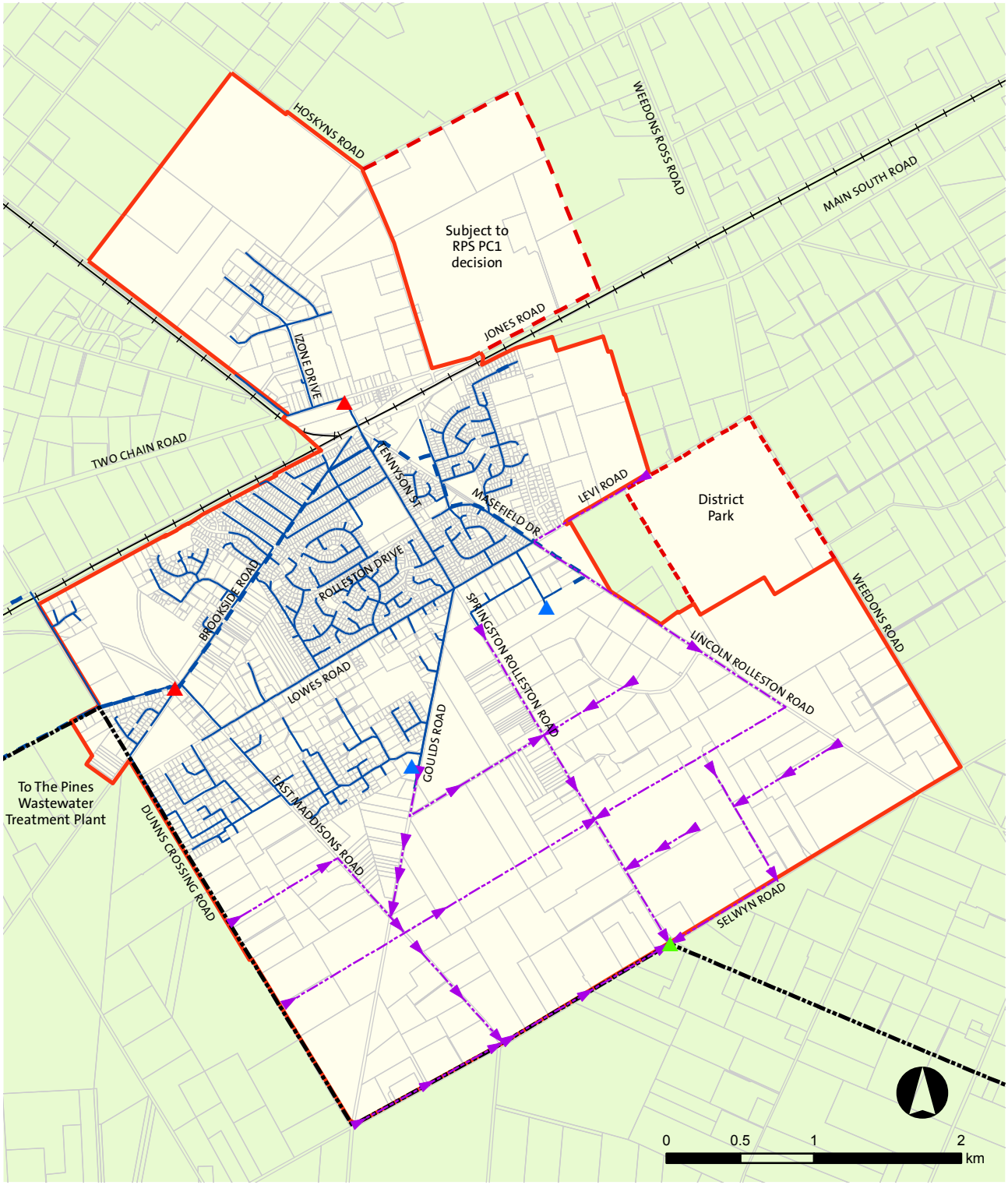


Figure 9.2: Wastewater Masterplan for Rolleston

- Study area
- Rural land
- Railway
- Abandoned Sewage Pump Station
- Existing Sewage Pump Station
- New Sewage Pump Station
- Proposed Public Main
- Proposed Rising Main
- Existing Main
- Rising Main

The location of the proposed wastewater mains are indicative and show approximate location for illustrative purposes only.

The capital costs of wastewater network development undertaken by Council will be recovered via development contributions. This includes the Southern Rolleston pumping station, rising mains to The Pines, the trunk main along Springston-Rolleston Road, and any connecting mains to development boundaries that are needed to service growth pockets (such as to SR3, SR4, Dynes Road and the CRETS road routes, and others tabulated above). Infrastructure that serves both Rolleston and surrounding towns, such as Lincoln and Springston, will be funded via development contributions from all benefiting settlements. This includes the pumping station and rising mains to The Pines.

In addition to the capital works planned, Council are developing a long term plan to manage wastewater flows and losses in the network as part of the 5 waters demand management policy. The policy seeks to manage demand based on changes to the network/systems and consumer behaviour. This strategy will delay future investment and ensure sustainable use of resources.

9.4 Stormwater Treatment, Use and Soakage

9.4.1 STORMWATER MANAGEMENT

Stormwater runoff in Rolleston is currently disposed of to ground via the free draining soils underlying the township. There are no surface watercourses within the town for stormwater to discharge into, and the few piped stormwater systems in the township are short and end in local discharge soakage points.

Each residential subdivision in Rolleston has its own stormwater treatment and disposal system with individual discharge consents granted by Environment Canterbury. This makes compliance with resource consent conditions a challenge for the Council adding additional costs for operation, monitoring and consents administration.

The Council will manage future development of the stormwater system in Rolleston by establishing principles for stormwater management and providing guidance and standards for developers. This is intended to avoid the proliferation of different management methods, some of which are considered inappropriate in an urban setting.

Stormwater will continue to be managed at a local, rather than "township" level, and there are no plans to develop integrated catchment management plans or seek global discharge consents. Developers within each ODP area will establish the amount of land required for stormwater treatment, flow paths and any retention ponds using the principles and standards established by Council, and obtain the necessary consents. It is expected that some efficiencies will be able to be obtained by considering cross boundary solutions with respect to adjoining subdivisions and developments in each ODP area. Plan Change 7 will be influential in determining how stormwater will be managed within Rolleston to mitigate any adverse effects to surface and underground waters.

The Council's 5 Waters Strategy seeks to identify opportunities and work towards integrated stormwater planning outcomes, assisted by appropriate design standards. There is an opportunity to adopt low impact urban design methods as Rolleston develops. Low impact urban design measures include the minimization of

earthworks and land form change, creating natural areas to manage stormwater quantity and quality whilst adding amenity and the use of water sensitive urban design (WSUD).

WSUD promotes the integration of stormwater, water supply and sewerage within a development precinct . WSUD approaches encourage:

- Detaining rather than rapidly conveying stormwater through an area
- Treating stormwater runoff using 'at surface' methods (such as bio-retention swales, constructed wetlands, green networks etc) integrated into the landscape design
- Capturing and using rainwater and stormwater as alternative water sources to conserve potable water
- Using vegetation to filter water
- Water efficient landscaping
- Promoting water-related environmental, recreational and cultural values
- Harvesting local water for various uses including irrigation
- Maintaining natural hydrological areas such as wet or soakage areas
- Reusing water
- Localised wastewater treatment systems
- Maximising solar energy

Use of these techniques will reduce demand on aquifer supplies and help to move Rolleston towards its desired status as a 'drought ready' town.

9.4.2 'AT-SURFACE' APPROACH TO STORMWATER MANAGEMENT

An 'at surface' approach to stormwater management in Rolleston is considered appropriate. This technique resolves some of the issues faced with traditional treatment methods when used at flat sites and can reduce infrastructure costs. The following diagram (figure 9.3) is indicative only, it illustrates how stormwater runoff from roads and buildings can be captured at surface and using a combination of small pipes and conveyance trenches be held and used within the road corridor to support vegetation and planting.

Localised treatment and infiltration sites can also be used before stormwater enters a pipe network or is discharged to groundwater. Planting can be used to filter and treat stormwater (such as in rain gardens, bio-retention ponds and vegetated swales). The plantings are easily integrated into the green network of the urban fabric. Stormwater can be retained at a local level, reducing the need to irrigate landscaped areas. As Rolleston has a dry climate and free draining soils, further measures can be used to further slow infiltration of any stormwater collected during long summer droughts and assist reuse for irrigation.

Street and subdivision design should accommodate and integrate at surface stormwater collection, transport, treatment, end use and ultimate disposal.

Figure 9.3: Capturing street runoff 'at-surface'

9.5 Paparua Water Race Network

The Paparua Water Race network flows from the Waimakariri River in the north, to the south and through Rolleston. The network dates back to 1884 and is still used for stock water purposes outside of the town boundary. Water races add to the rural character of Rolleston and will be enhanced and redirected where appropriate to create a feature. The races are generally narrow and feature on prominent roads such as Tennyson Street, Springston, Rolleston Road and Goulds Road.

Water races are the only open waterways within the Rolleston Structure Plan area. Although these races are not natural waterways they possess many of the same characteristics as streams, attracting birds, fish and supporting a range of plants. Intensive maintenance can limit the attractiveness and ecological value of the races, however the Structure Plan provides opportunities to increase their amenity and ecological value. Landscaping with suitable planting can create attractive green walkways and access corridors linking to public amenities and increasing opportunities for public access within and connecting to Rolleston.

The water race network also provides a visual corridor along which views of the Port Hills and the Southern Alps can be appreciated.

Access to the water's edge and resting places provide additional recreational opportunities. Direct recreational contact with race water such as swimming, should not however be encouraged at present. Water quality samples from water races show high concentrations of coliform bacteria and other contaminants on occasions. Summer is a particular concern for contamination and for possible public access and contact recreation if races are enhanced. ECan's waterways enhancement programme recognises this contamination and seeks to reduce it. As part of its 5 Waters sustainability programme, Council could consider working with ECan to facilitate edging of water races with riparian vegetation to provide natural filtration, discourage direct recreational use and improve the ecological value of the races. Fencing of rural races to prevent direct access of large stock with accessible drinking bays will also reduce bacterial load and improve water quality.

9.6 Energy

9.6.1 POWER

Power is supplied by Orion to Rolleston through overhead lines, drawn from Transpower's Springston substation (GXP, or Grid Exit Point), typically via high voltage 66kV, 33kV and 11kV lines. Within the Rolleston MUL a number of currently rural roads have 11kV voltage overhead reticulation as well as 400V local supply lines, namely Dunns Crossing, Selwyn, Weedons, Brookside, Dynes (part), Goulds, Springston-Rolleston, and Lincoln-Rolleston Roads. East Maddisons Road has a 33kV line. Orion is also planning to install a 66kV line on Weedons Road in the near future.

As urbanisation occurs, it is reasonable to assume that the public would expect many of these lines to be undergrounded. This is a costly undertaking, and depending on the configuration of high voltage and 400V lines in a road corridor the capital cost would be several hundred dollars per metre. This would total several million dollars over the whole MUL area. It is unlikely that Orion would undertake this undergrounding at its cost, so the costs would need to be met by developers. It is also unlikely that Council would wish to contribute such a magnitude of cost.

Expansion of the network will also be required to service the expected growth in Rolleston. This will involve the provision of new underground reticulation in new urban streets, in addition to new substations and other necessary infrastructure. Reticulation is typically provided by Orion as part of the land development process, with network strengthening (such as new substations) also being an Orion cost – which is ultimately passed on to consumers.

There are no high voltage Transpower lines within the Rolleston MUL.

9.6.2 GAS

Some parts of Rolleston have gas reticulation provided by Rockgas. Rockgas has plans to extend this network to provide supplies for residential and commercial purposes within the town.

9.6.3 ALTERNATIVE ENERGY SOURCES

The Structure Plan provides an opportunity to consider and optimise the use of alternative forms of energy production, within or near the town such as solar, wind or bio fuel digesters. Biodiesel manufacturing is currently undertaken at Izone. Electricity and gas are at present the most practical, readily available and commercial energy sources, however alternatives will need to be sought over time. There are also opportunities to ensure that all practical demand management steps are taken as part of the new development to reduce the long term carbon foot print of Rolleston.

9.7 Telecommunications

Provision of a reliable and high speed telecommunications service in Rolleston is important for both residential and commercial customers. To encourage businesses and residents to locate in Rolleston, high levels of service are required, particularly relating to broadband internet connections. It is expected that additional telecommunications infrastructure will be required to meet the needs of the growing population.

New infrastructure within subdivisions is typically provided by telecommunications providers as part of land development, with network improvements or strengthening also being funded by that sector. In future more providers are also likely to provide infrastructure, such as Vodafone mobile telephony and potentially other communications technology.

On existing rural roads, as described above, telecommunications cables are typically located on the Orion above-ground system. If this is undergrounded there is also a component of telecommunications cost to be met.

9.8 Gravel Extraction

Active gravel extraction is not currently undertaken in Rolleston. The gravel pit that occupies the south-east corner of the MUL is active, however supplies have been depleted. This site has potential for re-use as a recreational facility such as an off-road cycle area, which will provide amenity value and improve the area aesthetically.

A gravel extraction facility to serve the Rolleston/ Selwyn area will be required. Due to the high cost of transportation, gravel needs to have localised sources, which will reduce the environmental impacts. A gravel management strategy was created for the District that identified two areas in Rolleston as potential sites in addition to other areas further from the town.

9.9 Infrastructure Summary

Table 9.2: Key Issues, Constraints & Design Outcomes

Item		Key Issues and Constraints	Design Outcome
Infrastructure	Water	High water demand putting a strain on aquifer resources	Use of demand management techniques, water metering and water re-use to reduce the effects of increased demand on the aquifer
	Wastewater	Increasing demand for sustainable wastewater treatment for Eastern Selwyn District	Expansion of The Pines wastewater treatment plant to cater for growth in Rolleston and surrounding towns
		Required expansion of the wastewater network	Implementation of eastern Selwyn Sewerage Scheme which includes collection, treatment and disposal upgrades
	Stormwater	Stormwater disposed of to ground with no integrated management	Use of 'at surface' stormwater management techniques, using natural vegetation to treat stormwater and retention to enable re-use
		Free draining soil types require high levels of irrigation with impacts on landscaping opportunities	Use of stormwater retention and water re-use to limit irrigation requirements using aquifer water. Landscape design using selected tree/plant species which are drought tolerant but achieve amenity requirements (e.g. greening of streets, provision of shade & seasonal colour, attract birds etc)
	Water Races	Operational water races flowing through the town with periodically poor water quality	Landscaping and if appropriate diversion of water races to retain rural character of Rolleston Fencing of upstream water races with drinking bays to improve water quality
		A lack of natural surface watercourses limits opportunities for enhancement and creation of water based recreation facilities/ amenity values	Use of water races to create waterway features and enhance green linkages

9.10 Implementation

9.10.1 ACTION PLAN

The likely land requirements, approximate timelines and cost implications have been assessed. The rate of development of infrastructure is related to both the rate of population growth and subdivisional activity, and therefore subject to change. Some actions may need to be undertaken ahead of development occurring in order to provide appropriate connections.

Table 9.3: Infrastructure - Implementation Issues & Costs

Layer Component	Action	Land Requirements	Time Frame	Cost Implications
Water Supply	Implementation of demand management strategy to manage current and future demand	Nil	Short to medium term	Various initiatives signalled in LTCCP
	Loss Reduction Leakage management	Nil	Ongoing	Signalled in LTCCP
	Obtain resource consents and construct new wells	Possible – for headworks sites	Short term	LTCCP provision in place
	Hydraulic modelling to confirm reticulation needs	NA	Short term	Planning actions
	New reticulation	None identified	All periods	Expect to be almost entirely met through development
Wastewater	Implementation of Eastern Selwyn Sewerage Scheme, which includes upgrades to "The Pines', new SRPS, rising mains, detailed planning and network extensions in each ODP area.	Mostly achievable on existing roads and within new subdivisions. Some designations possible	All periods	Bulk funding of ESSS provided in LTCCP ($84m over 13 years) Further SDC funding likely beyond that time Recovery through development contributions
	Cost benefit analysis of water reuse options	Likely achievable within existing network corridors	Short term	To be determined during further investigations
Stormwater	Confirm principles and standards for stormwater management within subdivisions in Rolleston	NA	Immediate	Planning actions
	Encourage the application of low impact and water sensitive urban design (LIUD & WSUD) principles by developers	Provided by developers	Ongoing	Assess ongoing operating costs to SDC as part of the consent approval process

Layer Component	Action	Land Requirements	Time Frame	Cost Implications
	Include "at source" and 'at surface' techniques in subdivision design guidelines and engineering code of practice	Provided by developers	Immediate	Planning actions
	Encourage developers to coordinate stormwater management within ODP (or parts thereof) areas	Developer's responsibility	All periods	Capital costs met by developers
Water Races	Water race enhancements. Include guidance for water race enhancement in sub-division guidelines	Yes – if redirection proposed	All periods	To be scoped
Power	Develop SDC policy for undergrounding	NA	Short term	Could be significant if SDC contributes
Telecommunications	Promote new technology	NA	Ongoing	Telecommunications providers
Gas	Liaise with Rockgas re proposals for new services	NA	Short term	None identified
Gravel Extraction	Seek suitable location for extraction facility in Rolleston/Selwyn area. Beautification of depleted gravel pit on corner of Selwyn and Weedons Roads considering recreational uses	Yes – for new sites	Short term	To be scoped
Energy	Carbon and energy management strategy (energy efficiency, renewable energy generation, greenhouse gas emissions and sequestration)	Green space, public space, buildings	Medium term	To be scoped

9.10.2 INFRASTRUCTURE - DEVELOPMENT PRINCIPLES CHECKLIST

Well Designed Rolleston

Provision of a well designed infrastructure network will ensure that appropriate services are available for future generations. Asset management principles will be applied to ensure that the long term costs of provision of infrastructure are shared equitably over time. This will also take into account the projected needs of the future population whilst managing demand to conserve natural resources for future generations.

Above ground infrastructure assets will be integrated into the urban fabric of Rolleston in line with the urban design principles. In particular, protection and enhancement of the water race network will strengthen amenity values along movement routes and within proposed green corridors, creating a shared landscape and ecological asset for the community.

A Sustainable Town

Infrastructure will be provided by Council in line with the design philosophy for sustainability outlined in section 2.3.1. In particular infrastructure will be provided in a manner that will help Rolleston be self sufficient and drought ready. An important aspect of future infrastructure provision is demand management. While new infrastructure can be provided to meet the needs of the growing population it is important to ensure that natural resources are used in the most efficient manner and wastage is minimised.

Further investigation of new methods and technologies such as water reuse "at source" and 'at surface' stormwater design techniques is desirable. These methods amongst others will identify means of applying low impact urban design to Rolleston's natural water cycle.

The use of building and neighbourhood guidelines, will help to ensure the most suitable infrastructure is provided through future works. Energy efficiency and on-site energy generation opportunities will contribute to self sufficiency and a carbon neutral town.

Realistic and Achievable Rolleston

Significant SDC investment in the wastewater network in particular is a feature of this plan, even though much of the infrastructure will be provided as part of subdivision development. The 2008 wastewater master plan includes indicative sizing and costs for the new network, and these will be reviewed and more detailed planning and design work undertaken in advance of final decisions needing to be made on individual components.

Construction of an innovative and successful 'at-surface' stormwater management pilot scheme will be considered in order to demonstrate the benefits and feasibility compared to traditional, ad-hoc stormwater disposal methods used in Rolleston. Obtaining community participation in the design process, construction and maintenance of the water race enhancements will be a key to its future success.