

ADVANCED STORMWATER PLANNING FOR RAPID GROWTH

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ABSTRACT

Lincoln Township (population of 2,700), a rural community within Selwyn District has been identified as an area of significant growth in the Greater Christchurch Urban Development Strategy, with population predicted to increase to 10,000 by 2041.

The Selwyn District Council (SDC) wants to ensure that the growth is sympathetic to the town's existing character, is sustainable and the unique soil conditions, critical to ongoing agriculture enterprises, are protected. To achieve this objective the Council took the original approach of commissioning a Structure Plan and an Integrated Stormwater Management Plan, in parallel and in collaboration.

The Structure Plan, developed with the SDC Planning Team, addressed the issues of growth targets, integrating existing developments and an overall urban design vision. The Integrated Stormwater Plan, developed with the SDC Strategic Asset Management Team, focused on treatment and management, catchment attributes and delivery of a global stormwater discharge consent.

The two work streams functioned independently during the data collection and options development phases but with intermediate alignment workshops to create healthy tension and promote a consistent vision. Combined stakeholder public consultation reinforced the message of integration to the community.

Integrated stormwater management solutions included centralised stormwater treatment, improvement to riparian conditions and provision for climate-change.

KEYWORDS

Rapid growth, integrated planning, urban infrastructure existing character, resource efficiency

1 INTRODUCTION

Selwyn District Council (SDC) is facing very demanding urban growth targets. They also have to ensure long term sustainability of the district's natural, social and cultural resources and infrastructure. New and existing developments are being considered within the context of the wider rural hinterland. An overall urban design vision and infrastructure requirements were developed in parallel for Lincoln. These were articulated, also in parallel, through a Structure Plan and an Integrated Stormwater Management Plan (ISMP). Council's Wastewater Strategy is also a key component. SDC has applied for global resource consents for a system including soakage to ground in the northern part of Lincoln and linked stormwater wetlands in the south. They are now managing developer activity while maintaining the vision. To help with this, the concepts and criteria from the Structure Plan and ISMP, along with other development requirements, are being brought together at local area level in a set of outline development plan criteria to be included in the District Plan.

2 LINCOLN OVERVIEW

2.1 BEGINNINGS

Lincoln (the name means "lake colony") was first indicated on maps around 1850 as being sited on the shore of Te Waihora (Lake Ellesmere). The settlement was actually established in its present location in 1863. Lincoln University began as an agricultural college in 1878. The surrounding low lying swampy land was drained for

agricultural use. Water and soil resources have been and will remain vitally important in the development of the town.

2.2 CHARACTER

Over its almost 150 year history, Lincoln has developed a unique sophisticated village character. This reflects both the university with its strong natural resources base and other science hub activities, and the agricultural servicing functions supporting the fertile rural hinterland. Lincoln has become increasingly attractive as a dormitory suburb of Christchurch, because it is within 25 km of the city but is in a rural setting. The challenge facing Council and the community is to maintain the village character and achieve a long term sustainable community and infrastructure during major and rapid growth.

2.2.1 URBAN DEVELOPMENT STRATEGY

From the 1990's on it became increasingly clear that rapid urban development in Canterbury would require management at regional and local levels. The regional council (Environment Canterbury or ECan), local authorities and Transit New Zealand released the Greater Christchurch Urban Development Strategy (UDS) in 2007. The UDS identified Lincoln as one of the growth areas in the Selwyn District.

Providing appropriate infrastructure on time is a key influence in achieving the intended planning outcomes for the UDS growth townships within the Selwyn District, not only for Lincoln, but also for Rolleston, Prebbleton and other townships. Infrastructure networks serve communities over very long periods of time, so there are long term financial obligations to operate, maintain and renew assets. The ways in which assets are provided can contribute to sustainable development objectives. This includes asset types (in this case a combination of onsite and area soakage, swales and end of catchment wetlands) and asset provision (combined assets rather than small scattered individual pocket facilities).

2.2.2 GROWTH TARGETS

Following release of the UDS, ECan proposed household numerical growth targets for specific localities in their Regional Policy Statement. Figure 1 below shows growth rates in Lincoln accelerating from an almost static period in the late 1990's at around 2,000 people to the predicted almost 6 times larger by 2041. Providing for that growth while maintaining and enhancing the town's character and environment has been the key driver for Selwyn District Council's joint commissioning and subsequent adoption of a Structure Plan together with an Integrated Catchment Management Plan.

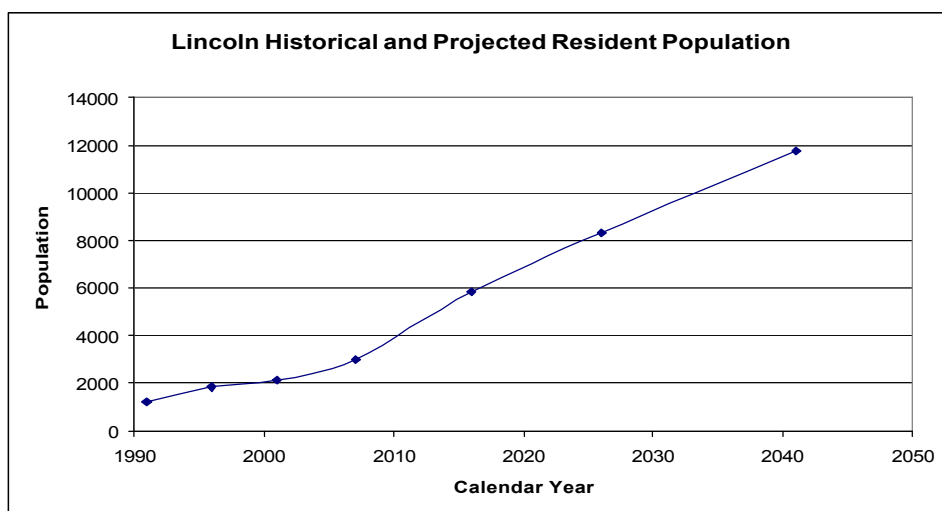


Figure 1

2.2.3 FUTURE EFFECTS

The present global economic uncertainty has temporarily slowed the rate of growth, although a number of major developers are continuing with their resource and subdivision consenting processes at present. Pent up demand is expected to further accelerate the projected rate of development in the medium term to achieve the 2009 Stormwater Conference

longer term population shown in Figure 1 above. Having strong forward plans in place to manage that development will become even more important in future.

2.3 LAND RESOURCES

The soils in the Lincoln area are classed as versatile and have high water holding capacity. They are therefore very valuable for agricultural use. SDC want to minimise urban sprawl onto those soils.

2.4 WATER RESOURCES

2.4.1 WATER QUANTITY

Figure 2 below shows surface water courses that have been included in stormwater planning for Lincoln. In addition to natural streams, man made land drainage channels and stock water race channels also have to be included in planning so their interactions and continuity are maintained. Stock water races discharge to land and natural water courses. Land drainage channels receive groundwater and surface runoff from urban as well as rural land. They are typically 1.5 to 2m deep in the ICMP area, so they can provide ground water drainage to the adjacent farmland.

The figure also shows the widespread incidence of springs around the streams and in the southern and eastern areas. The lowest of those locations have been reserved for stormwater treatment wetlands. The high groundwater levels will ensure water is available even during droughts to maintain the constructed stormwater wetlands that are planned for those areas. The high groundwater levels and flat surface grades will however make transfer of water from the catchments into the wetlands more difficult and construction will be more difficult and costly.

The area beyond the south eastern ICMP margin is low lying, with the surface at the margin about 5 metres above sea level. The gradients from there to the catchment outlet into the shallow coastal lagoon Te Waihora (Lake Ellesmere) are very flat. The lagoon level is generally above sea level. Widespread flooding can occur, as shown in Figure 2. Climate change is expected to increase sea level, and hence water levels in Te Waihora and back up the catchment. This has been recognised in locating the ISMP and Structure Plan south eastern boundaries.

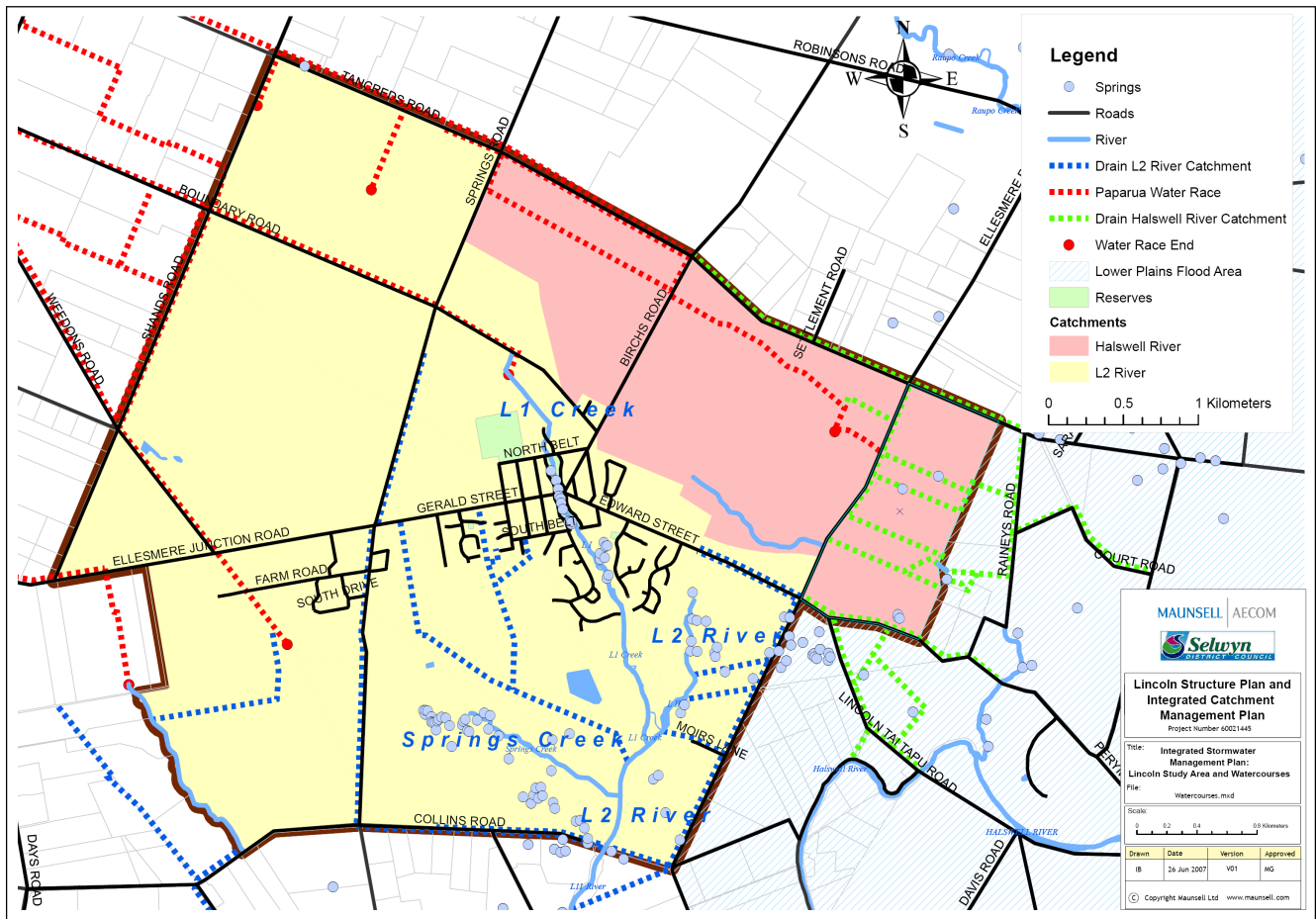


Figure 2 Water Resources and Issues

2.4.2 WATER QUALITY

The quality of surface water that originates outside the town is dominated by runoff from pastoral (animal) farming activities. The planned development is expected to improve that water quality by displacing fairly intensive animal grazing with residential use.

Groundwater quality in the unconfined aquifer areas is variable, reflecting surface land uses. Quality in the deeper confined layers is high.

2.5 5 WATERS INFRASTRUCTURE

SDC's integrated infrastructure planning and operations include the "5 Waters". These are:

1. Potable water supplies
2. Animal water supplies (via stock water races)
3. Agricultural land drainage (via deep drainage channels)
4. Urban stormwater systems
5. Urban wastewater systems

In this district there are close linkages between the 5 Waters and SDC has developed an integrated strategy for managing them.

2.6 IRRIGATION

Agricultural irrigation currently occurs in the area around Lincoln as well as in the wider Canterbury Plains. This irrigation is subject to ECan consents and control.

Groundwater levels in Lincoln are close to the surface in the northern part of the town and at the surface in the southern areas. Future wide area irrigation higher on the Canterbury Plains may increase these levels. The Central Plains scheme has been forecast to raise Lincoln groundwater levels by up to five metres. The potential effects from this raising have been noted by SDC and others in submissions to ECan on the Central Plains consent applications but are not currently being considered as part of stormwater planning. If groundwater is affected, level control actions are expected to be required from the irrigators.

2.7 SUSTAINABILITY

SDC and ECan are required by legislation to consider the “4 wellbeings” (environmental, cultural, social and economic) in their decision making. SDC has also decided that in order to move towards sustainability, it should act according to the seven sustainability principles in table 1 below that it has developed for its 5 Waters planning and activities.

Principle 1: Make decisions based on the four aspects of well-being

Principle 2: Observe the Precautionary Principle to provide contingency and enable adaptability of our community

Principle 3: Seek “intra-generational” and “inter-generational” equity

Principle 4: Internalise environmental and social costs

Principle 5: Foster community welfare

Principle 6: Act to halt the decline of our indigenous biodiversity and maintain and restore remaining ecosystems

Principle 7: Consider, and promote the sustainability of our neighbouring communities and work with governing bodies for sustainable outcomes

The 7 principles have been built into SDC’s overarching 5 Waters Strategy. Their stormwater systems objectives, including those for Lincoln, fit within that overall strategy.

SDC are currently developing a numerical method for ranking the sustainability of proposals against the 7 principles. Management of activities at individual development level is discussed below.

Climate change and other possible environmental changes are being allowed for in design requirements and by setting aside additional land to allow for future upgrading if required.

3 INTERACTIONS AND PROCESSES

The Structure Plan, developed with the SDC Planning Team, addressed the issues of growth targets, integrating the existing town with new developments and an overall urban design vision. The Integrated Stormwater Plan, developed with the SDC Strategic Asset Management Team, focused on treatment and management, catchment attributes and delivery of a global stormwater discharge consent.

The two work streams functioned independently during the data collection and options development phases but with intermediate alignment workshops to create healthy tension and promote a consistent vision. Combined stakeholder public consultation reinforced the message of integration to the community. These multidisciplinary design core workshops provided all parties with an ongoing overview, an appreciation of the multiple networks and well defined integration points.

Five interacting networks were considered:

- Blue - water supply, wastewater, stormwater
- Green – ecological linkages
- Movement – transport including motor vehicles, cycling and walking
- Reserves and open spaces
- Social

Figure Integration with the stormwater management network includes riparian planting, linked wetland areas, linkages between open spaces, ecological corridors and public accessibility. Cycling and walking routes have been included in riparian areas.

The potential for conflicts between ecological provisions and public and residential uses was considered in setting land area requirements. Areas have been allowed for grassed buffer strips e.g. to avoid birds wandering from wetlands onto public areas or residential properties or causing night noise nuisance.

4 STORMWATER PLANNING PROCESS

Figure 3 below shows the processes, including connections to and from other strategies and plans that were used to develop the ISMP and consent applications. The process included:

- Information gathering and analysis
- Options development
- Feedback with the Structure Plan team and public
- Options refinement
- ISMP development
- AEE and consent applications

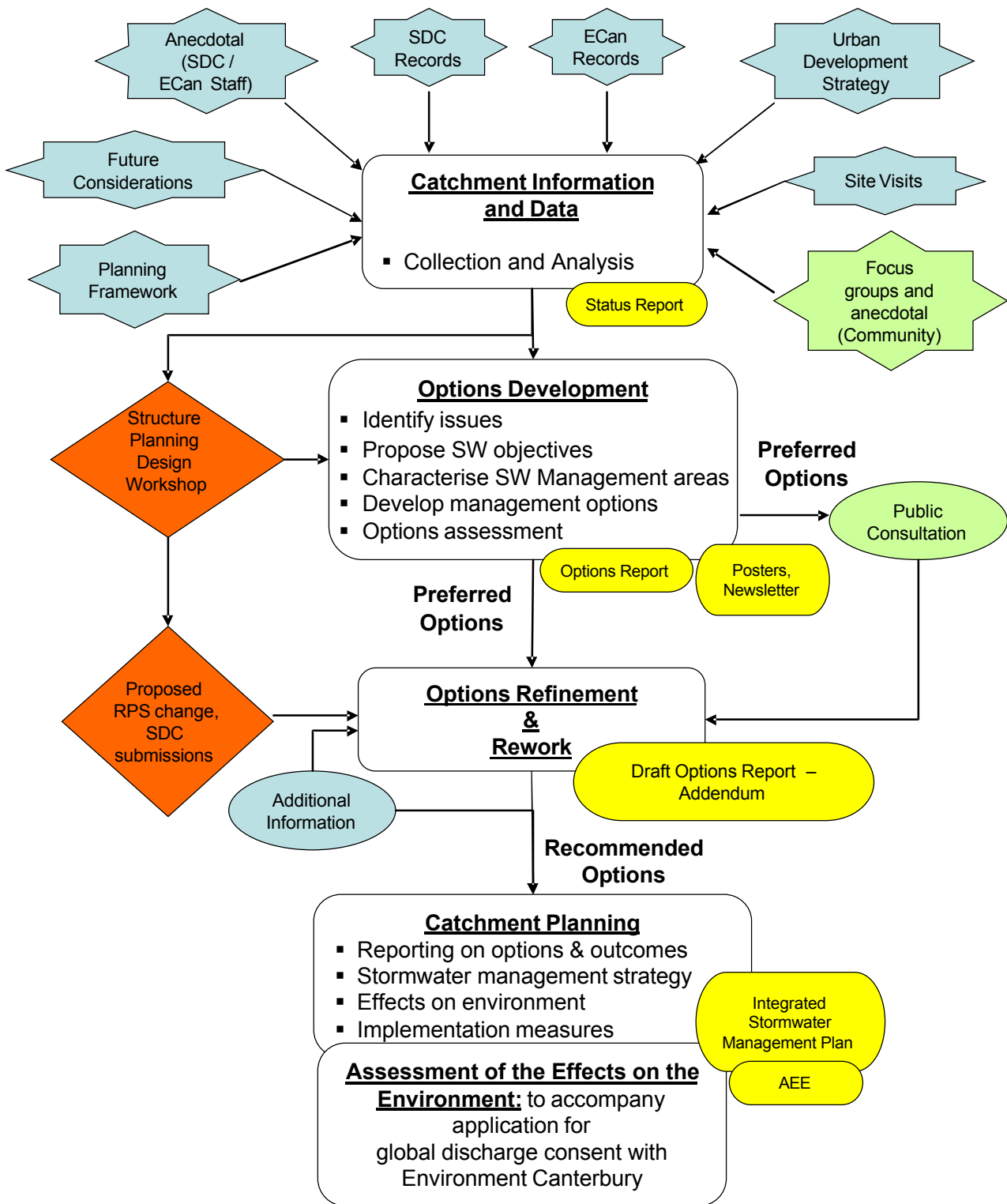


Figure 3

5 STRUCTURE PLAN

Figure 4 is a summary of the Structure Plan development process. It included:

- Assessing district plan and ECan regional plans
- Reviewing background information on land, infrastructure networks and urban design practice
- Consultation
- Defining key outcomes
- Drafting and reviewing the Structure Plan and ISMP
- Notifying and adopting the Structure Plan

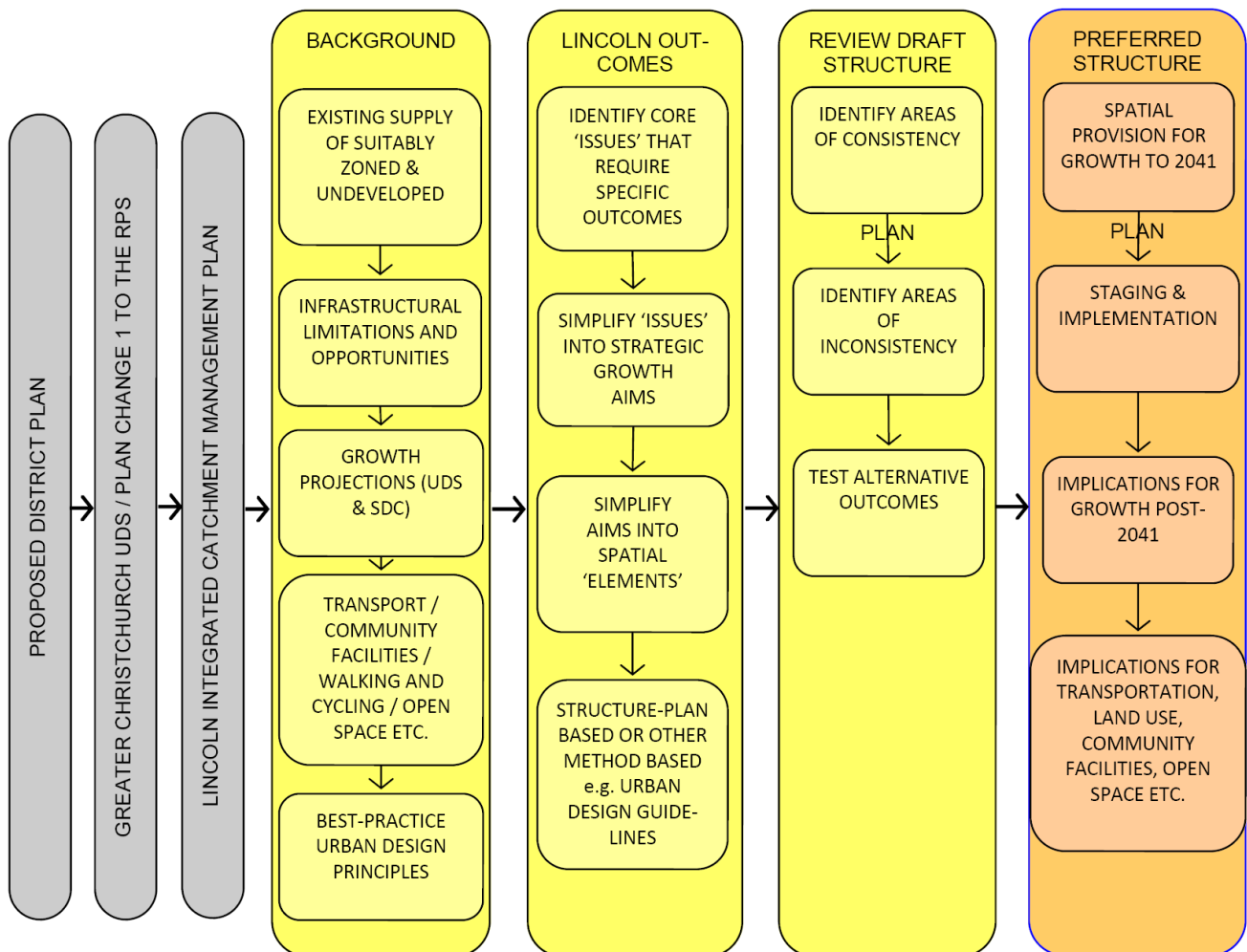


Figure 4 Structure Plan Development Process

6 ALIGNING THE TWO PLANS

The two work streams functioned independently during the data collection and options development phases but with intermediate alignment workshops to create healthy tension and promote a consistent vision. Combined stakeholder public consultation reinforced the message of integration to the community.

Figure 5 shows the final Structure Plan layout. Figure 6 shows the planned staging, to help ensure coordinated development at the planned densities occurs.

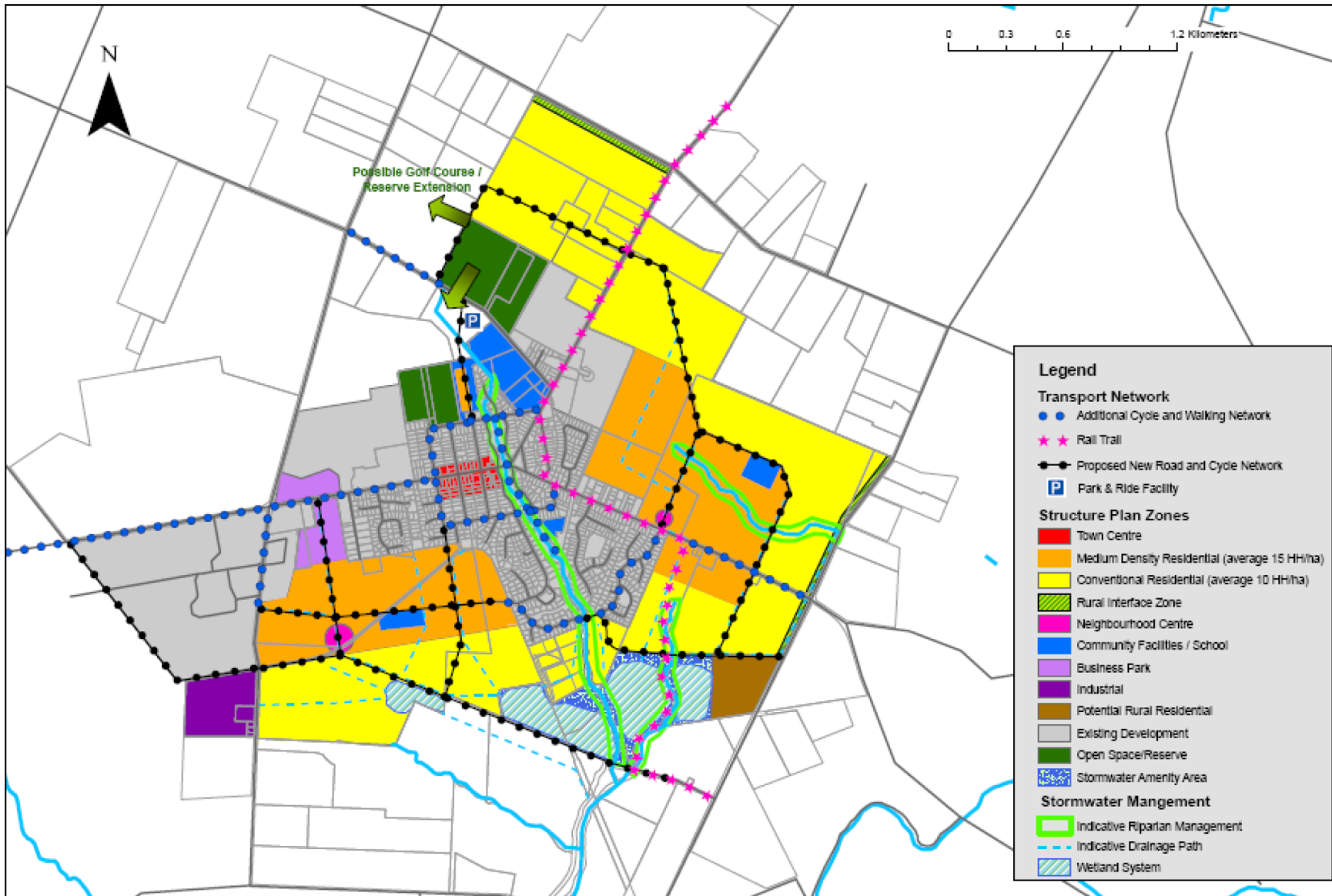


Figure 5 Structure Plan

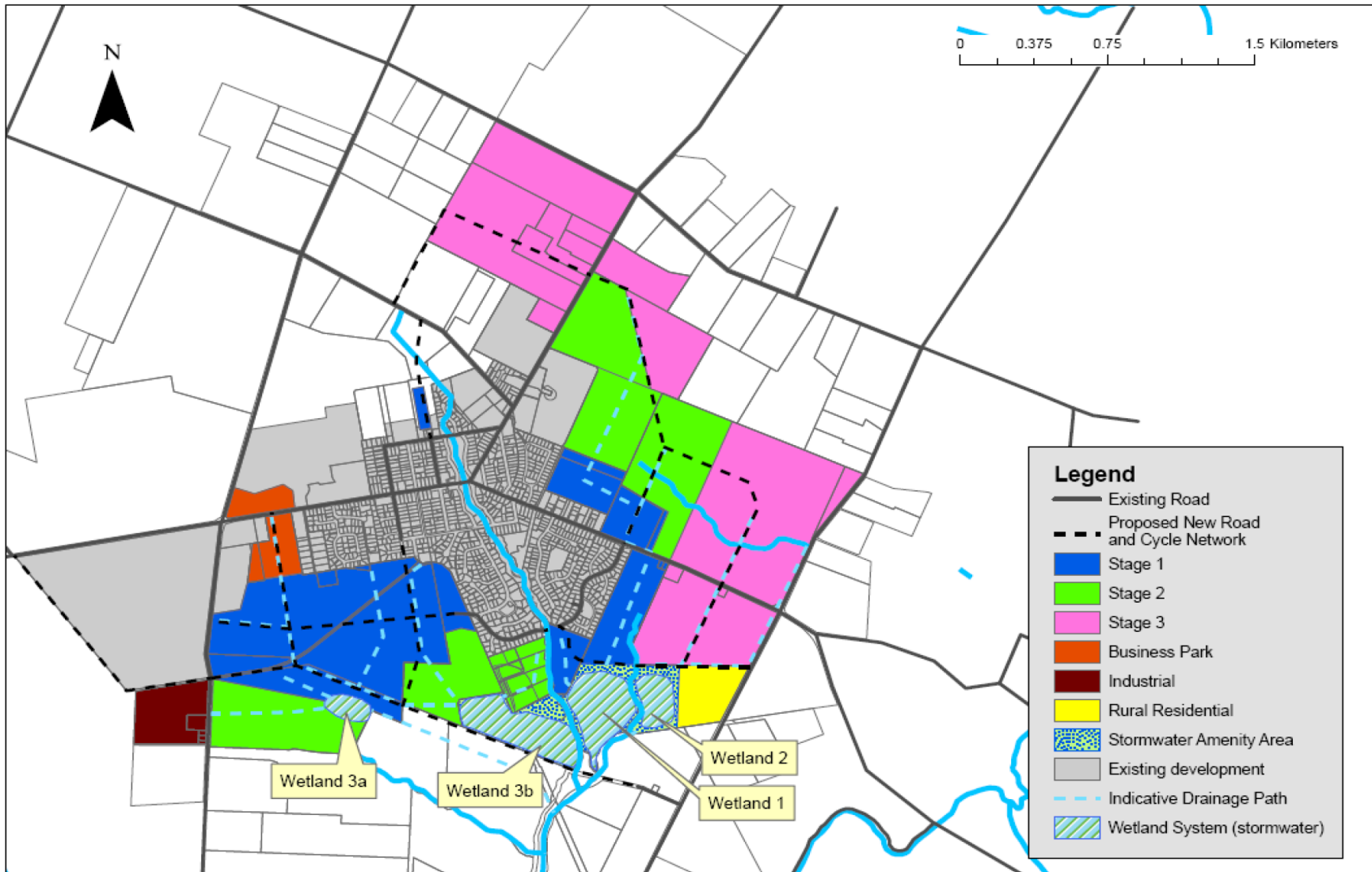


Figure 6 Structure Plan Staging

7 MANAGING DEVELOPMENT

7.1 DEVELOPMENT TO DATE

Private residential development activity has been accelerating in Lincoln from the year 2000 onwards. A number of individual stormwater resource consents have been issued. SDC consulted with developers early in the process of building the Lincoln Structure Plan and ISMP. Several private plan change applications have since been made to Council. Difficulties with this piecemeal approach have become evident compared to the planned centralised community systems. These include:

- Having many small systems substantially increases overall operations and maintenance costs
- Dry basins at neighbourhood level have lower treatment efficiency and lower aesthetic value
- Ecological quality and linkages are very difficult to achieve

SDC are now moving to use outline development plans as a tool to ensure that they can effectively manage developer expectations and maintain the overall vision and principles for Lincoln while allowing scope for individual developers' designs.

7.2 OUTLINE DEVELOPMENT PLANS

Coordinated provision of infrastructure is required to achieve the best future township form, long term cost optimisation, and to serve current and future communities. The Lincoln Structure Plan illustrates planned staged development, future zoning, community facilities and, at a high level, anticipated infrastructure network requirements. To ensure that infrastructure is developed in ways and at times that meet the above expectations, specific requirements are now being identified for five Outline Development Plan (ODP) areas in Lincoln. These will be mandated through the District Plan. In addition to these wider expectations, developers will be expected to comply with and/or meet the objectives of a number of other standards, codes of practice and guidelines. Compliance with SDC's ISMP global consent requirements will also be mandated.

The funding of infrastructure provision is being included in the criteria for each ODP area. The allocation of capital costs for new infrastructure will be assessed using the Council's Development Contributions Policy. Ongoing operations and maintenance costs and, ultimately, renewal costs also need to be considered when planning for infrastructure provision – whether the assets are created by developers or the Council.

The Lincoln Structure Plan and ISMP will require a significant investment in new waterways and wetlands and other “green and blue” assets. The funding provisions for each ODP area will consider issues including:

1. The level of ongoing operations and maintenance costs for new riparian strips, wetlands, buffer strips separating residential and rural land-uses, and other typically passive green spaces
2. The costs of providing excess capacity for other reasons, such as “future proofing” e.g. for climate change


8 CONCLUSIONS

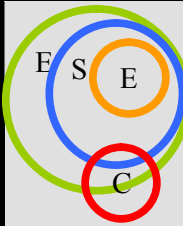
Rapid growth of a whole community provides major opportunities but also major risks. Integrated planning from an overall strategic level through to individual infrastructure networks and development areas is essential to realise the opportunities, achieve long term sustainable outcomes and manage the risks.

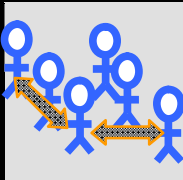
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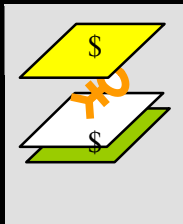
This paper was made possible by the Selwyn District Council, the contributions of the Lincoln community and many others.

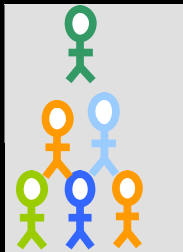
APPENDIX 1 SDC SUSTAINABILITY PRINCIPLES


	<p>Principle 1: Make decisions based on the four aspects of well-being</p> <p>Integrate environmental, economic, social and cultural considerations within Council decision making. Consider both the short-term and long-term effects of the decision.</p>
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	<p>Principle 2: Observe the Precautionary Principle to provide contingency and enable adaptability of our community</p> <p>Err on the side of caution in the face of scientific uncertainty and a risk of serious or irreversible environmental damage.</p>
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	<p>Principle 3: Seek “intra-generational” and “inter-generational” equity</p> <p>Improve quality of life and create opportunity for all of the current generation, without compromising the quality of life and opportunity of future generations.</p>
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	<p>Principle 4: Internalise environmental and social costs</p> <p>Develop and adopt a system that recognises the true costs and benefits of protecting and restoring environmental/ecological, human, social and cultural resources affected as a result of the services that Council provides.</p>
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	<p>Principle 5: Foster community welfare</p> <p>Support and encourage the region to prosper socially and culturally. Our assets are not just our built assets but our people, their skills and the connections between them.</p>
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	<p>Principle 6: Act to halt the decline of our indigenous biodiversity and maintain and restore remaining ecosystems</p>
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	Conserve, and sustainably use and manage, the district's biodiversity, recognising the various services that ecosystems provide to humans as well as the environment's intrinsic value.
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	Principle 7: Consider, and promote the sustainability of our neighbouring communities and work with governing bodies for sustainable outcomes
	Recognise that we are part of a whole globe system whether we can physically see the impacts of our actions or not.