Assessment of Environmental Effects - Lincoln

Stormwater Discharges and Ancillary Activities

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Prepared for

Selwyn District Council

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Executive Summary

Lincoln is located approximately 20km southwest of the Christchurch City Centre. This Assessment of Environmental Effects (AEE) is the supporting document to an application by Selwyn District Council for:

- A global stormwater discharge permit under Rule WQL8 for all existing as well as all future stormwater discharges within the Lincoln Integrated Stormwater Management (ISMP) area – also referred to as Global consent area.
- Resource consents for ancillary activities to implement an Integrated Stormwater Management Plan.

This document should also be read in conjunction with the Integrated Stormwater Management Plan (ISMP) - Appendix 1. The ISMP has been prepared in order to meet Condition1 of Rule WQL8 of the NRRP and contains the information required in Section 4.7.3.2 of the NRRP.

A conceptual stormwater management system has been designed which aims to, where possible, treat stormwater runoff in centralised systems to achieve high levels of treatment as well as improved amenity values and ecological habitats. Ngai Tahu cultural values have been integrated into the proposed system.

Where ground conditions are suitable, discharge of stormwater to ground is proposed. The remaining stormwater runoff will be discharged into existing land drainage systems, the L2 River system (managed by Selwyn District Council) as well as Smarts Drain within the Halswell River system (managed by the Canterbury Regional Council).

Activities related to the implementation of the ISMP are associated with groundwater interception during excavation work, including the creation of wetlands and a springs waterway, damming and diverting of surface water, stream enhancement and the construction of stormwater outfall structures.

AEE - Conclusions

It is considered that the stormwater discharges and related activities are consistent with the relevant policy framework of the statutory plan developed under the Resource Management Act 1991. This is based on an assessment of potential and actual environmental effects of the proposed activities and mitigation measures. A summary of this assessment is as follows:

Water Quantity

No more than minor changes will occur:

- To the extent of downstream flooding within the Halswell and L2 River catchments during long duration events - typically greater than 7.5 hours,
- To the recharge of springs within the global consent area,
- For critical duration peak flow events within the future urban areas, up to the 50 year average recurrence interval (ARI) event, and
- At and adjacent to centralised infiltration systems (below the invert of basins) where localised and short-term groundwater mounding could be expected.

Water Quality

No more than minor changes will occur:

- To overall quality in shallow unconfined groundwater,
- To water temperatures in the upper L2 River as a result of stormwater wetland discharge
- On sediment metal concentrations in receiving waterways.

There will be no change or a reduction in:

- Nutrient concentrations at the point of discharge as compared to current discharge levels,
- Bacterial loads as compared to current discharges,
- Erosion levels within the global consent area and downstream. Any existing erosion within the Global consent will be stabilised as required.

There are expected to be minor increases in:

- The effects of contaminants on surface water, and

- Sediment concentration in receiving waterways

Other Effects

- Minor risk of accidental discharges and spillages entering the waterways via the stormwater system,
- Protection of Ngai Tahu values especially relating to spring flows where possible. Improvement of mahinga kai habitat, and
- Additional opportunities for community involvement, education and recreation in wetland area.

As a result of the proposed ISMP work, the applicant considers that there will be an improvement:

- In amenity of waterways,
- Stream habitat of the L1 Creek and L2 River including re-creation of plant and animal habitats following construction of stormwater wetlands and modifying the L1 weir, and
- There will be opportunities for multipurpose use of local detention and treatment areas, conveyance swales, wetlands and riparian areas.

Urban Growth

Based on the 2006 Census of population and dwellings, the 'usually resident' population of Lincoln was 2,727 people living in 867 occupied dwellings. This was a population increase of about 27% from the last Census in 2001. This trend is expected to continue over the next 40 years reaching a population of just under 12,000 by the year 2041. Development patterns and population growth are to be guided by Plan Change 1 to the Regional Policy Statement which is being implemented via Selwyn District Council's proposed District Plan Change 7. In addition the Lincoln Structure Plan process, started in 2007 identified the need for global stormwater management to support township growth.

Most of the Lincoln Global consent is located within the L2 River catchment. The remaining area drains into the Halswell River catchment. Both rivers drain into Lake Ellesmere (Te Waihora). The modelled area makes up about 0.5% of the total Lake Ellesmere (Te Waihora) catchment of 276,000 ha. The global consent area is 750ha.

Within the global consent area there are three types of waterways:

1. spring-fed plains streams,
2. land drains, some with spring water inflows and
3. the lower reaches of the Paparua water race.

Recent events, particularly the September 2010 and February 2011 earthquakes, may result in changed settlement patterns and development rates and also in reviews of the UDS and related statutory plans.

Integrated Stormwater Management Plan (ISMP) – Global Consent Area

The ISMP and stormwater management strategy aim to deliver the following broad objectives:

- Ensure regulatory compliance,
- Provide for ongoing monitoring and adaptive management,
- Protect and where possible enhance health and water quality of streams, rivers and Lake Ellesmere (Te Waihora),
- Not increase downstream peak flows and downstream flooding effects above current levels while allowing for new development,
- Provide strategic linkages with other networks (in particular movement and ecology) – refer Lincoln Structure Plan,
- Manage stormwater on a township wide basis in a coordinated and planned manner with specific guidance from SDC, applying their seven principles of sustainability,
- Meet the Selwyn District Plan growth requirements, and
- Manage the effects of urban growth in a sustainable way considering the RMA and LGA four well-beings.

Further details are provided in the ISMP document.

1.0 Introduction

1.1 Overview

This March 2011 Integrated Stormwater Management Plan (ISMP) (refer Appendix A) and Assessment of Environmental Effects has been prepared for Selwyn District Council (SDC) as part of the Lincoln Structure Plan and Integrated Catchment Management Plan project. The new documents have been revised and updated and supersede the ISMP and AEE provided to ECan with consent applications in June 2009. More information on stormwater management systems and layout has now been included. A summary of changes made to the June 2009 version is provided in Appendix I.

The intention of the Lincoln Structure Plan has been to produce an integrated, holistic, overarching set of planning documents that will enable Lincoln to grow in a sustainable manner. Once consents are granted, individual development proposals and SDC works within the Global consent are expected to be considered by SDC under the District Plan and the ISMP. The ISMP is also expected to provide the Canterbury Regional Council (Environment Canterbury or ECan) with a framework for considering any resource consent applications that may be made to ECan by individual developers or SDC.

The AEE assesses the effects of stormwater management on the natural characteristics in the Lincoln Global consent and outlines how stormwater in the Global consent will be managed in the future. The ISMP includes management concepts for existing developments as well as future developments.

Various regulations and ECan and SDC statutory plans apply to current and future developments and infrastructure within the Global consent:

- The Lincoln Structure Plan outlined the urban design vision and expected staging for the future development of Lincoln Township.
- The Subdivision Design Guide and Engineering Code of Practice have been adopted.
- Lincoln Outline Development Plans have been notified as part of District Plan Change 7.

The ISMP has been prepared in accordance with ECan's Natural Resources Regional Plan (NRRP) Section 4.7.3.2 Chapter 4 Water Quality. The Assessment of Effects on the Environment (AEE) has been prepared in accordance with the RMA 4th Schedule.

The ISMP is intended to provide for discharges that comply with ECan's requirements while giving SDC flexibility to decide and enforce how those requirements will be met. The intention is to meet ECan's surface water quality and quantity requirements at the ISMP boundaries and ECan's groundwater requirements within and at those boundaries.

1.2 Previous Versions of Applications

This AEE document supersedes previous documents submitted to support resource consent application. CRC092812. The first AEE was submitted in January 2009 and then updated in June 2009. These applications were made under the then current status of the Proposed Natural Resources Regional Plan (2009 status). In response to this application ECan requested additional information under RMA Section 92.

Since June 2009 the preliminary layout of stormwater systems in Lincoln has been amended and more details are now available. Additional investigations regarding cultural impacts, stormwater flows and aquatic ecology have been conducted.

In February 2010 proposed Plan Change 7 to the Selwyn District Plan was notified. This plan is intended to provide for residential growth of Lincoln and Rolleston townships and to introduce new subdivision and medium density provision.

In October 2010 ECan notified decisions on the proposed NRRP which is now subject to point of law challenge only.

Considering the implications of the above changes since the last update in June 2009 the AEE has been revised and this document now incorporates the following:

- the most current development and stormwater systems planning for the Global consent (May 2011)

- NRRP decisions notified in October 2010
- Proposed Plan Change 7 of the Selwyn District Plan, including associated outline development plans (ODPs)
- Additional investigations (cultural impacts, stormwater flows, aquatic ecology)
- Information requested by ECan under Section 92.
- Purpose of Document

This Assessment of Environmental Effects is the supporting document to an application by Selwyn District Council for resource consents from Environment Canterbury for :

- a global stormwater discharge consent for all existing as well as all future stormwater discharges within the Lincoln Integrated Stormwater Management (ISMP) area.
- resource consents for ancillary activities to implement the ISMP.

This application has been prepared in accordance with the ISMP document which is added in Appendix A. The ISMP has been prepared in order to meet Condition1 of Rule WQL8 of the NRRP and contains the information required in Section 4.7.3.2 of the NRRP:

Discharge of stormwater onto or into land or into a river, lake or artificial watercourse - stormwater management plan. Rule WQL8 is discussed below and is presented in full in Appendix F of this document.

The expectation is that existing stormwater discharge consents within the Lincoln Global consent will be surrendered and that future development within the Global consent will not require additional discharge consents. Performance reviews will be undertaken by SDC before taking on consent obligations from others once satisfifed. SDC expects to become the sole consent holder and take on the responsibility to comply with consent conditions and to maintain all stormwater systems.

1.3 Terminology

Previous reports and consultation documents of the Lincoln Structure Plan and Integrated Catchment Management Plan referred to the ISMP document as the *Integrated Catchment Management Plan (ICMP)*. The name was changed to *Integrated Stormwater Management Plan (ISMP)* for the following reasons:

- ICMP's have traditionally dealt with "3 Waters" (water supply and wastewater and stormwater treatment and disposal) on a catchment wide basis.
- SDC has a 5 Waters Strategy and an integrated 5 Waters Asset Management Plan covering potable water supplies, stock water, land drainage and community stormwater and community wastewater schemes. This ISMP deals with stormwater.
- This ISMP was prepared under the Proposed Natural Resources Regional Plan which will be using the terminology *Integrated Stormwater Management Plan*. To be consistent this terminology was adopted.

1.4 Planning Overview

The Integrated Stormwater Management Plan and Assessment of Environmental Effects was begun as part of a combined Lincoln Structure Plan and Integrated Catchment (Stormwater) Management Plan project. The purpose of this project was to realise an urban design vision for the future development of Lincoln Township using an integrated approach to achieving sustainable management of the natural and physical resources in this area.

The Lincoln Structure Plan has been influenced by the following statutory and non-statutory documents:

- Greater Christchurch Urban Development Strategy (2007)
- Canterbury Regional Policy Statement Variation 1
- Lincoln Structure Plan (2008)
- Proposed District Plan Change 7

Alternative land use patterns and development types were considered thoroughly in the structure planning process and subsequent discussions and decision loops (Reference: Structure Plan and Structure Plan Options Report). The structure plan design approach included overlays of the following networks:

- BLUE NETWORK (Catchments, natural water courses, land drainage and stock water races, the three urban waters, water management, low impact measures, aquifers, etc.).
- SOCIAL NETWORK (Community infrastructure, affordability, equity, urban health, safety, housing preference, etc.).
- GREEN NETWORK (Natural features, landform, ecological areas, urban parks, environmental connectivity, etc.).
- MOVEMENT NETWORK (Public transport, traffic management, strategic routes, freight, industrial, cycle, pedestrian, etc.).
- EMPLOYMENT ACITIVTY CENTRES (New economy, industrial and other large employers, town centres strategy, the special role of retail, etc.).
- CONSOLIDATION AND GROWTH (Determining the balance between internal consolidation and growth, residential needs, housing preference etc.).

The stormwater planning process was an integral part in this planning process and a Draft Integrated Stormwater Management Plan was prepared alongside the Structure Plan. The complex processes are visualised in

Figure 1. During the planning phase numerous options and their combinations were considered and the concept selected that satisfied most requirements.

The Lincoln Structure Plan was intended as a framework to guide development and has been used as a basis for:

- Changes to the District Plan;
- Developing an infrastructure programme;
- SDC's 2009-19 Long Term Council Community Plan
- Assessing development proposals

Prior to preparing this AEE, AECOM reviewed technical data and documents, consulted Environment Canterbury (ECan) scientists over various aspects of stormwater management in Lincoln Township and undertook site visits and initial catchment runoff modelling. A range of options for stormwater management in Lincoln was prepared and evaluated. Initial public and stakeholder consultation was carried out. Public consultation was undertaken on the options for stormwater management as well as for structure planning (Section 5.0).

Specific further consultation was undertaken with Ngai Tahu via Mahaanui Kurataiao (MKT) from August 2010 to April 2011. SDC's proposed stormwater layout, particularly in the eastern areas was then substantially modified to allow separation of existing groundwater inflows and springs from stormwater. The MKT cultural impact assessment is included as Appendix D.

Ongoing discussions have also been held with land developers to assist in planning flexible, practical solutions.

The Integrated Stormwater Management Plan also draws on information from the following Lincoln Stormwater Management documents:

- *Status Report: Background Version* (March 2007)
- *Lincoln ICMP Stormwater Management Options Report* (June 2007)
- *Lincoln ICMP Stormwater Management Options Report – Addendum* (Jan 2008)

The Status Report covered both the Structure Planning and Stormwater Management Planning aspects. Surface water quantity and quality, topography, groundwater levels and climate change were considered as well as a description and review of the current stormwater management systems (Maunsell and Planit, 2007). The Stormwater Management Options Report identified, evaluated and recommended stormwater management options for Lincoln (Maunsell, 2007). Those options have since been extended by ongoing research and by discussions with SDC, developers and other parties.

This AEE and appended ISMP supersede all previous Lincoln AEE and ISMP documents that SDC has submitted to ECan in this matter. It also includes all further information requested by ECan under RMA Section 92. It has been updated to incorporate recent notified decisions on relevant chapters of the proposed NRRP.

Since the first application in January 2009, SDC and AECOM staff have had a number of meetings with ECan staff. ECan has provided AECOM with copies of recent RMA S92 further information requests to other parties for

similar consent applications to these Lincoln applications, and copies of relevant Christchurch City Council consent information.

AECOM have reviewed recent information on low impact (water sensitive) urban design. Alternatives including conceptual stormwater systems layouts have been reviewed. SDC have progressed their subdivision design guidelines and Lincoln outline development plan criteria and have had discussions with developers on stormwater development contributions. SDC have also recently completed a Selwyn specific hydrological study on rainfalls and climate change. The resulting design rainfall depths are included in the Code of Engineering Practice (July 2010). Revision and updating is not included in the process diagram

Figure 1 below.

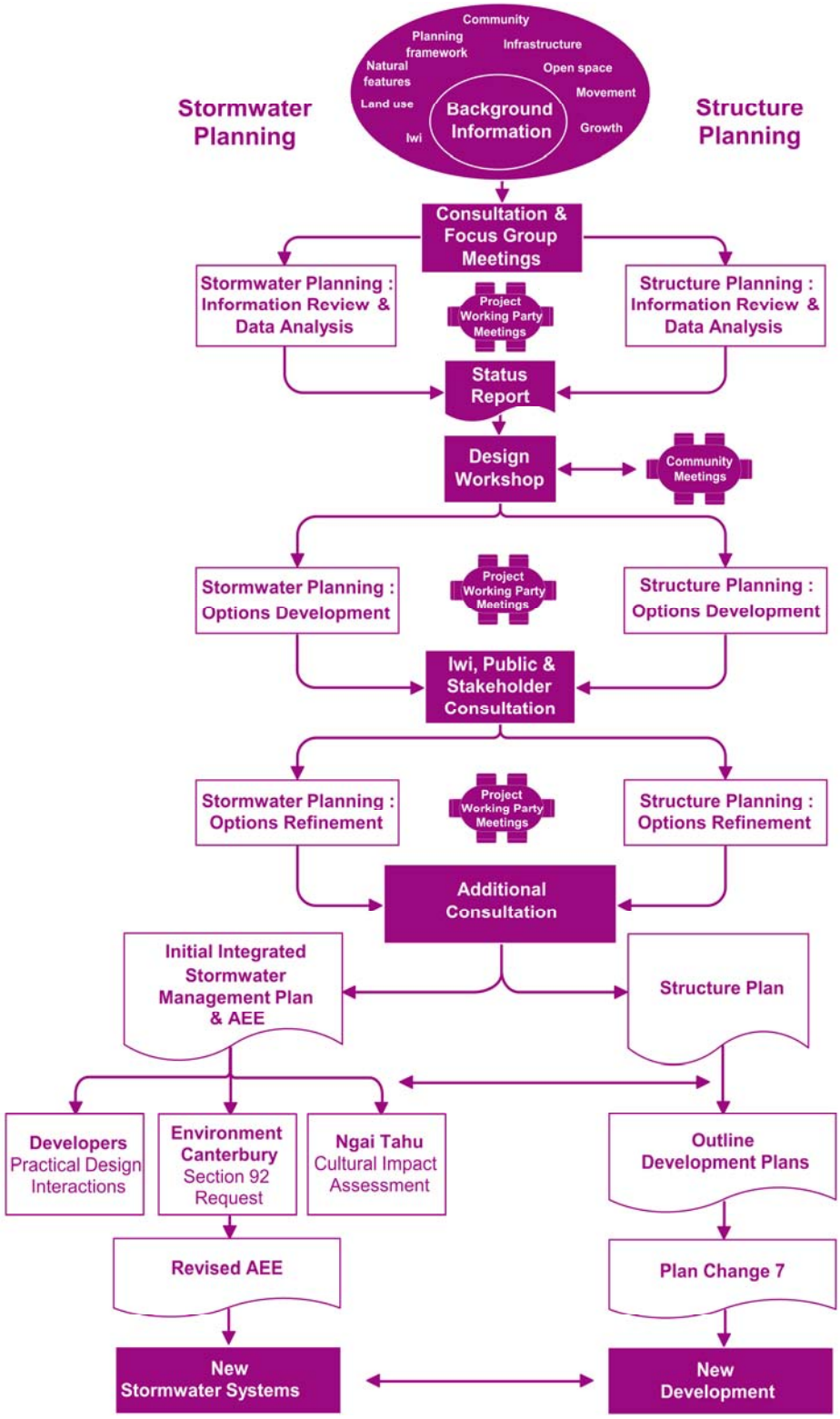

Figure 1 Stormwater Planning Process

1.5 Summary of Resource Consents Required

1.5.1 Discharge Consent from Environment Canterbury

SDC has applied for consent to discharge of stormwater from the Lincoln area to surface water and into ground under the proposed NRRP Variations 1 to 14 as released on 23 October 2010. The application and compliance with the rules in Chapter 4 of in the proposed NRRP is assessed in detail in Section 6.2 of this document. Discharges will occur during construction and long over the operational life.

The ISMP (Appendix A) has been prepared in accordance with Condition 1 of Rule WQL8 and Section 4.7.3.2 of the NRRP.

The key issues for the global discharge consent are:

a) the management of surface water effects on the L1 Creek, the L2 River, the Halswell River and Lake Ellesmere (Te Waihora). The focus lies on the management of effects on the receiving waters within the global consent area.
b) Recognising and providing for the concerns of tangata whenua relating to groundwater, particularly springs, and their separation from stormwater contamination.

1.5.2 Other Consents from Environment Canterbury

To implement the ISMP the following additional / ancillary consents under the proposed NRRP are required from Environment Canterbury:

a) Diversion of groundwater
b) Excavation over aquifers
c) Dam and Divert Surface Water (including structures, earthworks and vegetation clearance)
d) Discharge from spring waterway
e) Discharge of ground water (land drainage water)

Duration of Consents

A consent duration of 35 years is sought under Section 123(d) of the RMA. The 35 year duration is to provide certainty for SDC and the community for the major investments that will be required, in wetland land purchase, physical works, operations and maintenance and protection of numerous residential and business structures.

The proposal includes ongoing monitoring and adaptive management e.g. to take account of current climate change prediction uncertainties. The consent review process would allow any necessary future improvements to be required and included.

RMA Section 125 Lapse Dates

Section 125 of the RMA states that a resource consent lapses on the date specified in the consent or, if no date is specified, 5 years after the date of commencement of the consent.

As the proposed discharge consent will cover existing discharges, then that will be effectively activated as soon as the consent is granted.

For some of the ancillary works, which will be covered by land use consents, not all aspects of the works may be commenced within 5 years.

The consent application relates to the full extent of potential urban development in Lincoln as set out in Proposed Plan Change 1 (Change 1) to the Canterbury Regional Policy Statement (CRPS) and proposed Plan Change 7 to the District Plan (PC7). The development is expected to be carried out in two stages over the next 31 years and beyond. It is requested that consideration of an extended lapse date be given to the land use consents.

1.5.3 Consents from Selwyn District Council

Land use consents are expected to be required from Selwyn District Council. These will be applied for in a separate application process, and a request may be made to hear all consents together. Specific details regarding the scale of proposed earthworks (i.e. extent of cut and fill) are yet to be confirmed.

1.6 Report Structure

The main body of this document contains the AEE which is supported by appendices containing additional technical information. The AEE document outline is as follows:

- Description of Lincoln Global consent and current stormwater management (Section 2)
- Description of proposed activities (Section 3)
- Description of the Receiving Environment (Section 4)
- Consultation (Section 5)
- Consent requirements (Section 6)
- Assessment of actual and potential effects for stormwater discharges (Section 7)
- Assessment of actual and potential effects for ancillary activities (Section 8)
- Consideration of alternative mitigation options (Section 9)
- Planning framework (Section 10)
- The Resource Management Act 1991 (Section 11)
- Proposed consent conditions (Section 12)
- Conclusions (Section 13)
- References (Section 14)

2.0 Global Consent (ISMP) Area and Current Stormwater Management

2.1 The Lincoln Global Consent Area

2.1.1 Introduction

Lincoln is located approximately 20km southwest of Christchurch City Centre. The total modelled area of about 1,500 ha extends up to 3.5km around the existing Lincoln township.

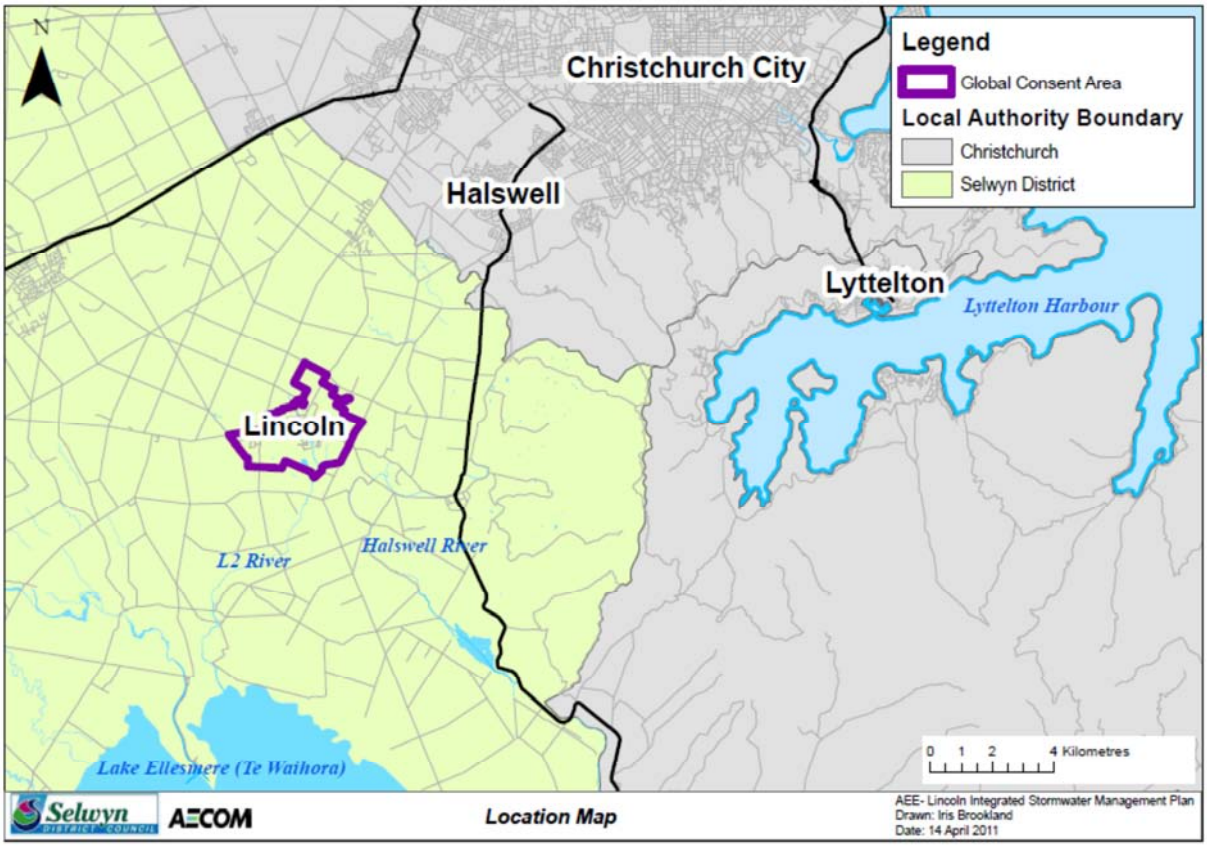

Figure 2 Location Map

The area for the Structure Plan and ISMP for Lincoln was chosen for its potential to provide for managed growth of Lincoln based on the Greater Christchurch Urban Development Strategy (UDS). The UDS is a growth management strategy (to 2041) that promotes a settlement pattern for residential, commercial, business and rural residential growth. The UDS population predictions and associated development densities for Lincoln were included as requirements in ECan's proposed Plan Change 1 (PC1) to the Regional Policy Statement.

The Lower Plains Flood Area associated with the Halswell River to the east (as identified in the Proposed District Plan) was also taken into account. This area is not recommended for future urban development and the south eastern ISMP boundary has been set accordingly. The Lincoln global consent area is shown marked in purple in Figure 3 below.

About 225 ha of the modelled area are currently developed; another 475 ha are expected to be subject to urban development in the future. The balance of 800 ha will remain in rural land use.

Outline Development Plans have been written forming District Plan Change 7. The extent of the Outline Development Plans in Lincoln is marked as hatched areas Figure 13.

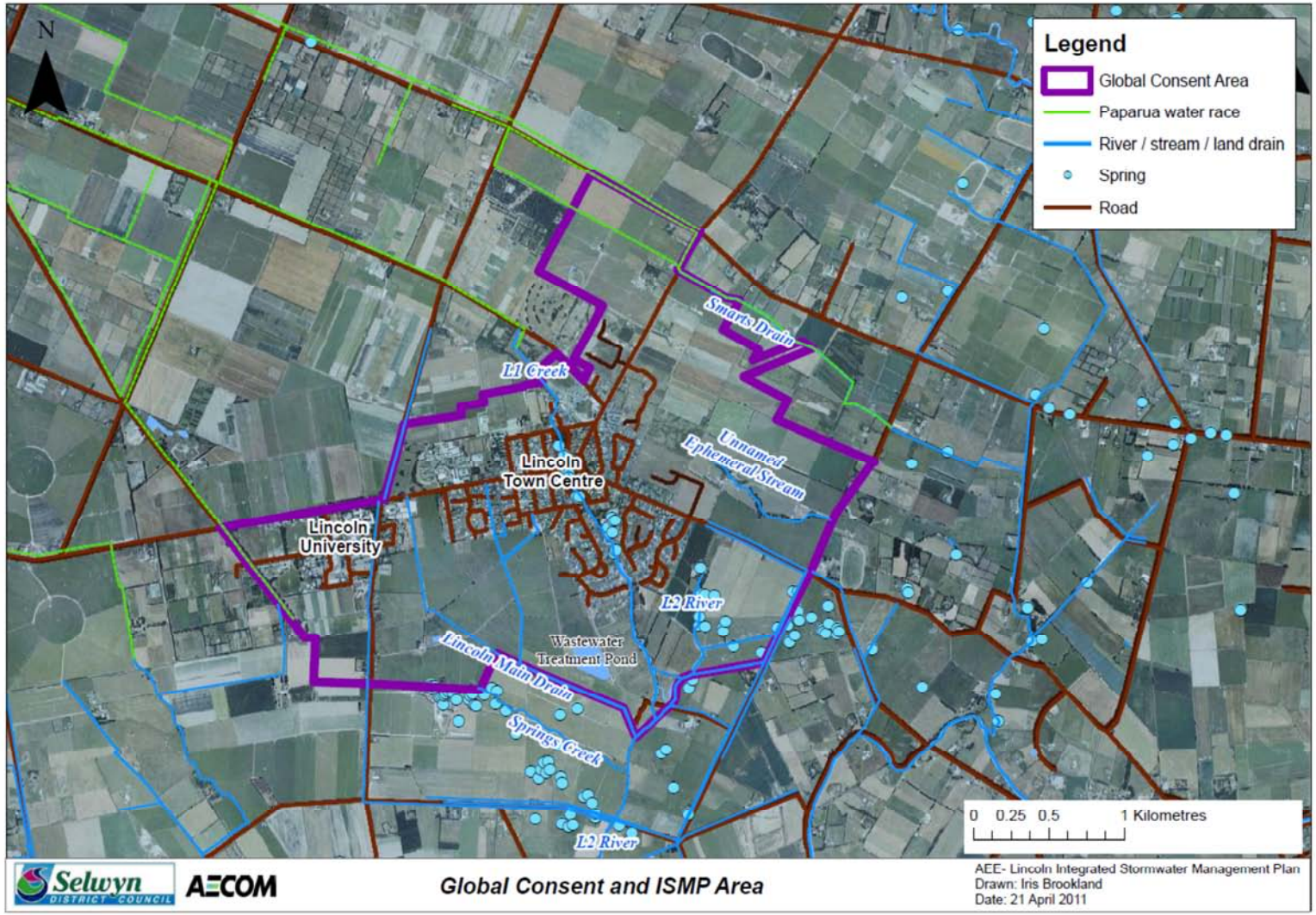

Figure 3 Lincoln Global Consent Area

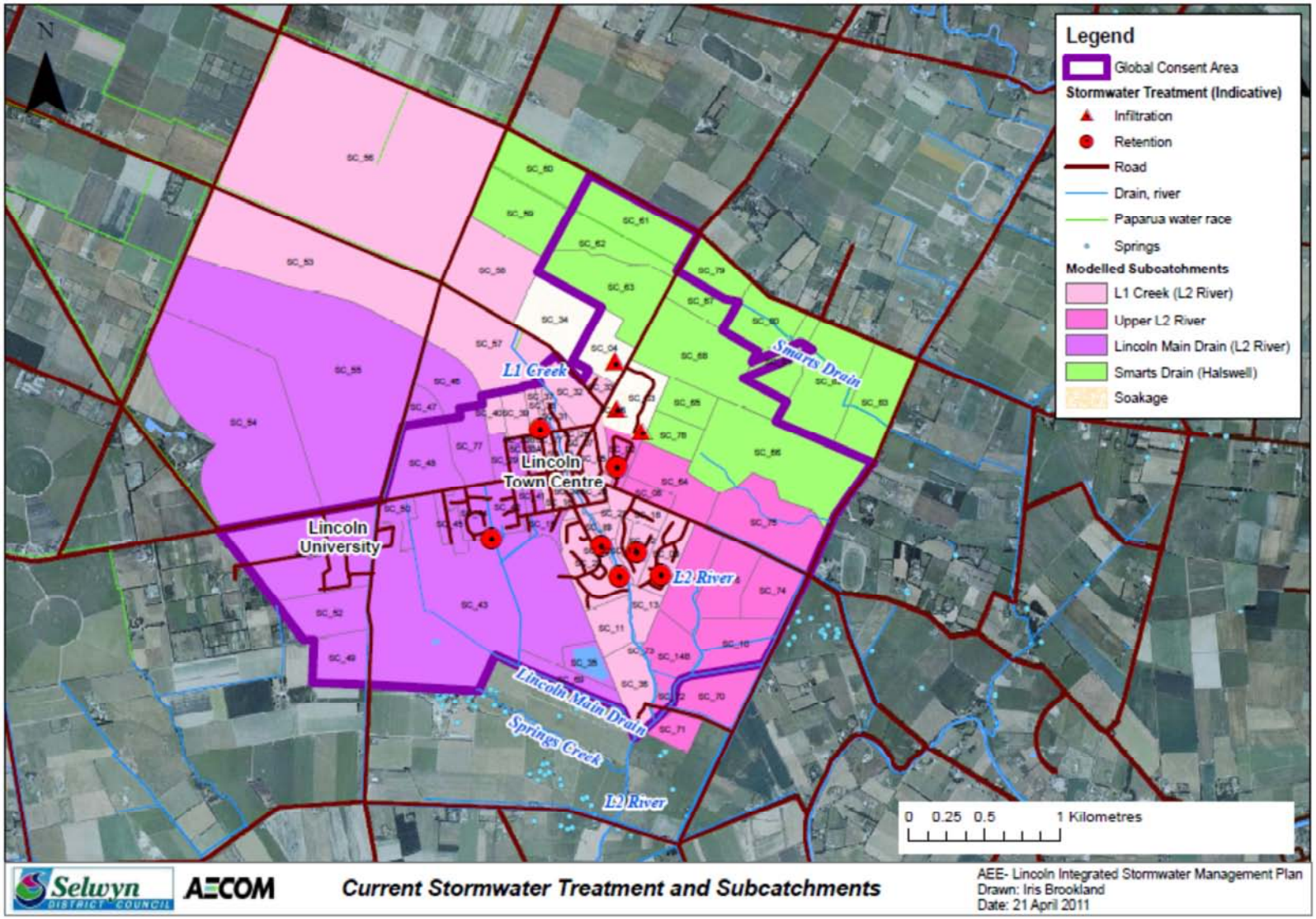

Figure 4 Current Stormwater Treatment and Subcatchments

2.1.2 Modelling Area Description and Catchments

Most of the Lincoln modelling area is located within the L2 River catchment (indicated purple and pink in Figure 4) with the remaining area draining into the Halswell River catchment (indicated green in Figure 4). Both rivers drain into Lake Ellesmere (Te Waihora). The Lincoln modelled area makes up about 0.5% of the total Lake Ellesmere (Te Waihora) catchment of 276,000 ha (Source: Lake Ellesmere Trust).

The current township zonings as defined in the Proposed District Plan for business and living zones are shown in Figure 13. The present urban area is characterised by predominately low residential density, a small commercial centre, a range of community facilities (e.g. golf course, churches, cemeteries, schools, hospital) and education and research activities associated with Lincoln University and the Crown Research Institutes. The remainder of the Lincoln modelling area, as shown in light and dark green in Figure 13, is zoned rural. The rural area contains a mix of activities, including those associated with intensive and extensive farming, research and education, community facilities, closed landfills and the sewage plant and pond.

2.1.3 Population

Based on the 2006 Census of population and dwellings, the 'usually resident' population of Lincoln was 2,727 people living in 867 occupied dwellings. This was a population increase of about 27% from the last Census in 2001. This trend is expected to continue over the next 40 years (Figure 5) reaching a population of just under 12,000 by the year 2041.

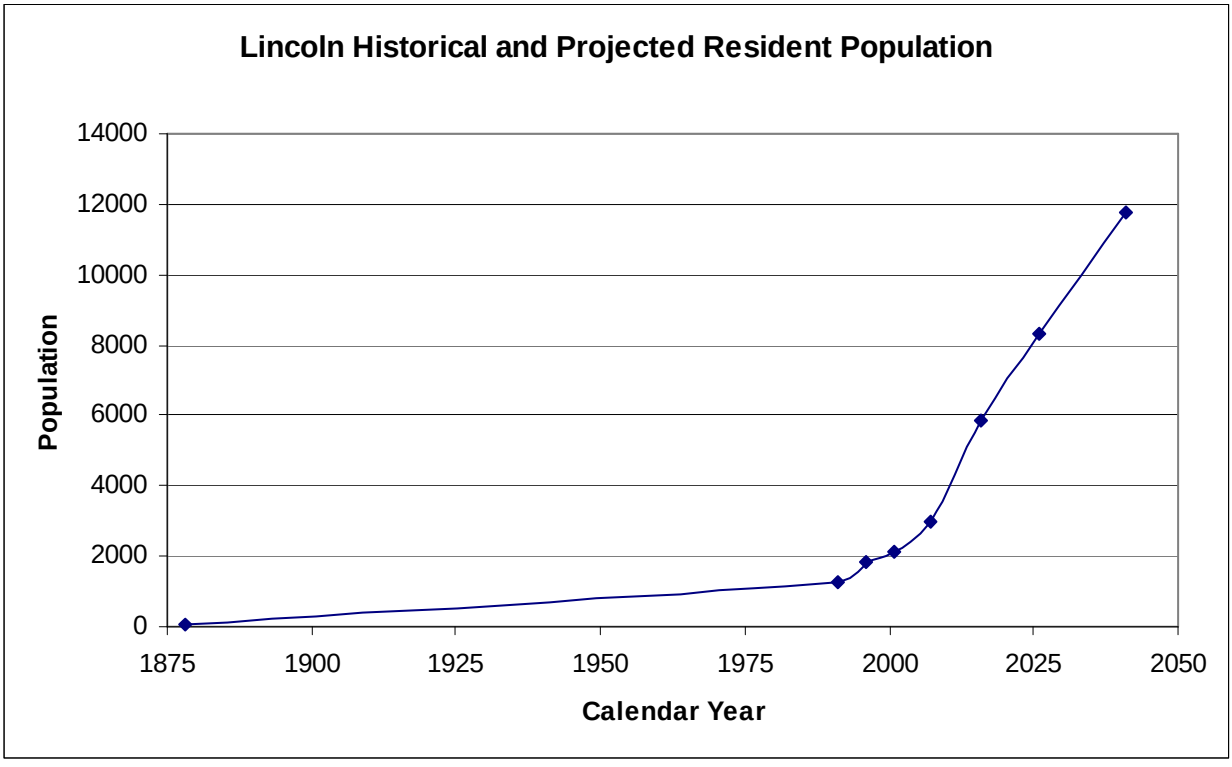

Figure 5 Lincoln Historical and Projected Resident Population

The February 2011 Christchurch earthquake may result in accelerated growth in Lincoln.

2.1.4 Industries with Schedule 9 Activities

Schedule 9 of the NRRP lists a number of activities or industries likely to produce contaminated stormwater either in an incident or by inappropriate handling or storage practices.

ECan has provided a confidential listing from their HAIL (hazardous activities and industries list) database. Selwyn District Council also maintaintains a list of potentially contaminated sites, which has been checked in

relation to the Global consent area. Sites with potential contamination are therefore already well documented for attention e.g. at subdivision consent time as required by Council's District Plan.

2.1.5 Existing Stormwater Management Systems

Much of Lincoln Township is currently served by a conventional "pit and pipe" stormwater drainage system, with discharge from buildings and impervious areas to kerbs and channels into a grated pit, and then via pipes to waterways and streams.

Untreated stormwater from individual properties and roadways is collected in a kerb and channel system and delivered via a partial pipe network to several discharge outlets into the L1 Creek and the L2 River land drainage systems. These discharges existed before the Resource Management Act 1991 (RMA) was introduced and no discharge consents are held.

Since 2004, subdivision stormwater has typically been collected in kerbs and channels and then piped to treatment and retention areas, before being discharged either to ground or into waterways. Existing resource consents for the discharge of stormwater are summarised in Appendix H. Currently 15 stormwater discharge consents from Environment Canterbury are held in the Lincoln global consent area.

Five consents were granted for the discharge of stormwater to ground, all of them located in the northern part of Lincoln Township. Discharge to ground is generally via infiltration basins designed for events of 50 year ARI of any duration. There are four consented discharges into the L1 Creek, and one into upper L2 River, four into Lincoln Main Drain and an unnamed drain and one into Smarts drain. The level of treatment varies:

- Oil interceptor and silt traps for the University car parking area and flow limitation
- Combination of first flush pond and secondary pond
- Swales and silt traps
- Swales and retention basin
- Swales and communal wet ponds and wetlands

The design capacities vary from a 5 year ARI to a 50 year ARI. Most systems are designed to ensure a 75% sediment removal.

Following the issuing of consents related to this ISMP, SDC will seek the surrender of all existing consents under their name. The monitoring and management of the existing consented discharges will then fall to SDC.

2.1.6 Water Quality

There are inconsistencies in existing stormwater flow attenuation and treatment levels in the Lincoln Global consent area with recent consented discharges providing a higher degree of mitigation.

There have been problems with existing stormwater treatment systems in the south of Lincoln. This is due to high ground water levels, with wetland treatment / retention basins being the only option in some areas.

Sediment sampling carried out as part of the ecological assessment (Appendix D) showed low accumulation of metals commonly found in an urban environment.

2.1.7 Water Quantity

Flooding has not been a major issue for current urban developments within the Lincoln Global consent area. Occasional flooding from the L2 River has been reported on farmland near the southern boundary of the Lincoln Global consent area.

The L2 Drainage Committee reports that Drain 28 south of Gerald Street in Lincoln Township has flowed to capacity during intense rainfall events. This can be attributed to the limiting factors of very shallow grades, high groundwater table, high water holding capacity of peat soils, and access difficulties for drain cleaning and maintenance. SDC are planning to pipe this drain.

During a site visit on 20 December 2006 minor ponding on roads was observed at two locations: Boundary Road corner Birchs Road (Figure 6) and in the subdivision of Lincolndale on Perthshire Crescent. After discussion with SDC it was concluded that both incidents were caused by blocked sumps, pipes or other stormwater devices rather than insufficient design capacity. The rainfall event was estimated to be in the range of a 6 hour 20% AEP. This indicates the need for pro-active maintenance cleaning including where possible before forecasted major storms.

Figure 6 Ponding on Boundary Road corner Birchs Road

2.1.8 Current Design Requirements

For the design of new stormwater treatment and retention systems the following current design requirements have to be met:

Selwyn District Council Documents

New stormwater drainage systems require approval from Selwyn District Council. These are assessed in line with ECan stormwater consent conditions and physical constraints. The Selwyn District Council Engineering Code of Practice Part 5: Stormwater and Land Drainage (SDC, 2010) applies.

It contains design provisions on minimum freeboard, minimum pipe sizes and sizing of the stormwater drainage system. Sizing requirements are as follows:

Primary piped system:	10 year ARI storm
Overall system:	50 year ARI storm
Bridge structures:	100 year ARI storm

The Engineering Code of Practice (July 2010) also includes the recently reviewed provisions on design rainfall depths, including climate change factors.

Standard NZS 4404:2010

New Zealand Standard 4404:2010 Land Development and Subdivision Infrastructure includes provisions for stormwater drainage aspects including design and construction. The standard was updated in 2010 and now requires the consideration of climate change and emphasises managing stormwater ‘before it gets into the pipe’ by the use of vegetated swales, natural or artificial waterways, ponds and wetlands.

The following criteria for design storms have to be met:

Primary protection (pipe or waterway network)

- 10 year ARI (equivalent to 10% AEP)
    - Rural and rural residential areas
    - Residential areas
    - Commercial and industrial areas
    - All areas with no secondary flow path

Secondary protection

- 100 year ARI (equivalent to 1% AEP)
    - (combination of primary protection system and designed secondary flow paths, controlled floodplains and setting of appropriate building levels)

3.0 Description of the Proposed Activities

3.1 Proposal Overview

In its broadest sense this global consent application provided for discharging water and contaminants to ground and water in accordance with the requirements of the Lincoln Integrated Stormwater Management Plan (ISMP). The discharges relate to all current and future stormwater from the Global consent area in accordance with the type and extent of development anticipated under Change 1 to the RPS and PC7 to the District Plan. This includes stormwater generated during construction work of subdivision development as well as from stormwater infrastructure.

This application includes all discharges within the Lincoln Global consent area that existed on the 1 November 2010.

The required attenuation volumes of stormwater treatment devices have been modelled (refer Table 1 and Appendix C). The indicative locations of proposed flow paths and attenuation devices are shown on Figure 8. Detailed design will be undertaken following issue of consents.

The activities will be carried out in development areas within the Lincoln global consent area. The development areas included in this application are marked as ODP areas or District Plan Zones Business and Residential on Figure 13.

The approximate location of discharge points and additional activities is shown in Figure 7 and the coordinates are tabled in Appendix E. More detailed design is required before the locations can be confirmed.

Stormwater discharges related to activities or industries likely to produce contaminated stormwater listed in NRRP Schedule WQL9 are not covered by this ISMP and the global discharge consent. They will require separate stormwater discharge consents from the Canterbury Regional Council and are not part of this application.

Proposed consent conditions for all consents applied for can be found in Section 12.0. The conditions provide for design and construction of mitigation measures, review of the ISMP, monitoring and reporting.

SDC intends to accept the existing stormwater discharge consents from subdivisions as part of this consent, if and when they meet SDC requirements and the holder agrees to surrender the consent.

The application also includes resource consents sought for the implementation of the ISMP. This will involve the construction of stormwater systems, outfall structures, the diversion and damming of the ephemeral stream, riparian works and the diversion of groundwater that may enter the stormwater systems. Groundwater will be intercepted, diverted and discharged into the upper L2 River via a separate spring waterway.

A flexible lapsing period is sought to enable the ISMP to be implemented over an extended phasing period, as required by Change 1 and PC7. This consideration relates mainly to the ancillary consents.

Proposed Plan Change 7 to the District Plan seeks to rezone land identified in Proposed Plan Change 1 to the Regional Policy Statement and the Lincoln and Rolleston Structure Plans to provide for the future growth of the District in accordance the Greater Christchurch Urban Development Strategy. Refer section 3.4 for more detail.

3.2 Summary of Proposed Activities

The global stormwater discharge resource consent application is for:

1. The continuation of discharge of untreated stormwater runoff from existing residential and business zones (including roads) into surface water (L1 Creek, LII and Lincoln Main Drain) as marked in hashed orange in Figure 9.
2. The approximate current location of known discharge points is indicated in light purple on Figure 7. There might be other locations not identified on the map.
3. The continuation of discharge of untreated stormwater runoff from existing development at Lincoln University.
4. The discharge of treated stormwater from new development areas (including roads) to surface water (L2 River) as marked in pink and mid green in Figure 9. The indicative locations of discharge points are marked in dark purple on Figure 7.
5. The discharge of treated stormwater from new development areas to ground (where possible). Potential areas are marked in grey in Figure 9. The indicative location of discharge points to ground are marked in yellow on Figure 7.
6. The discharge of treated stormwater runoff from the existing mixed residential and community facility development of ODP 6 into the L1 Creek as Figure 9. The indicative locations of discharge points are marked in dark purple on Figure 7.
7. The temporary discharge of treated stormwater runoff from individual developments into the L1 Creek and L2 River and Smarts Drain via land drains until centralised treatment systems are provided by the SDC. (This applies to all new development areas in Figure 9.) The discharge systems will discharge into land drains either before entering the L2 River system or into Smarts Drain at the same discharge points as shown on Figure 7.
8. The discharge of untreated stormwater into the ephemeral stream to the west of Ellesmere road and north of Edward Street. The indicative discharge points are marked in dark purple on Figure 7.
9. The discharge of overland flow from the Global consent area into the L1 Creek, L2 River, Lincoln Main Drain and the unnamed ephemeral stream at various locations.
10. The continuation of discharges from road runoff in rural undeveloped areas within the Global consent area.
11. The discharge of land drainage water from subsoil piping or dewatering
12. The stopping of discharge of existing overflows from the Paparua Water Race system.

More detail regarding the proposal for discharge of water and contaminants can be found in Section 3.4.

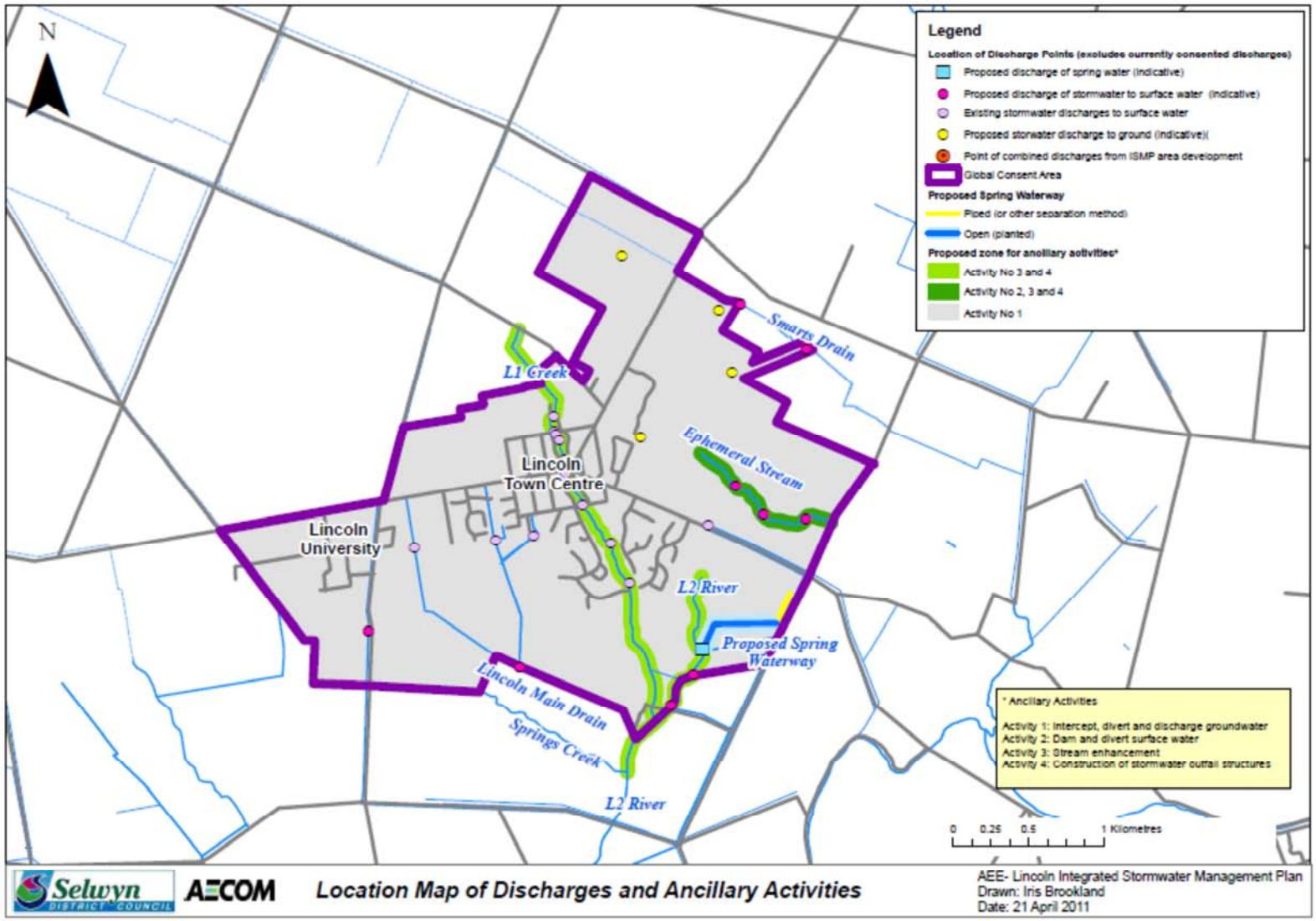

Figure 7 Indicative Location of Proposed Discharges and Ancillary Activities

3.3 Stormwater Management Strategy

During the combined Structure Planning and Stormwater Management Planning Process and the development of the ODP areas (Figure 13) the following Overarching Stormwater Management Objectives were adopted:

3.3.1 Revised Stormwater Management Objectives

- Ensure regulatory compliance.
- Ongoing monitoring and adaptive management
- Protect and where possible enhance health and water quality of streams, rivers and Lake Ellesmere (Te Waihora).
- Not increase downstream peak flows and downstream flooding effects above current levels while allowing for new development
- Provide strategic linkages with other networks (in particular movement and ecology).
- Manage stormwater on a township wide basis in a coordinated and planned manner with specific guidance from SDC, applying their seven principles of sustainability.
- Meet the Selwyn District Plan growth requirements.
- Manage the effects of urban growth in a sustainable way considering the RMA and LGA four well-beings.

For new residential areas further guidance is given in the Subdivision Design Guide (SDC, 2009). It encourages the recharge of groundwater through infiltration and to take advantage of stormwater management requirements to add value to a subdivision.

3.3.2 Stormwater Management Principles for the Global Consent Area

To achieve the above goals the following stormwater management principles have been developed considering the varying natural catchment characteristics within the Lincoln global consent area.

Climate change:

Conveyance and storage systems are to be designed to allow for an increase in rainfall intensities of up to 16% as a result of climate change.

Level of service:

- Conveyance and storage systems are to be designed to allow for 16% increase in rainfall intensities as a result of climate change.
- Peak flow attenuation for events of up to 50 year ARI (average recurrence interval) for storms durations up to the critical duration.
- All new primary systems will have the capacity to convey the 10 year ARI (10% AEP) event including allowance for climate change (16% increase in rainfall intensities).
- Extreme event (secondary) flows will be in defined overland flow paths (generally along swales or roads) and in waterways. Specific overland secondary flow paths are to be provided to convey flows in excess of 10 year ARI (10% AEP) away from buildings and private property.
- Protection against flooding of building platforms to less than or equal to a 50 year ARI (2% AEP) is to be provided, including a minimum freeboard of 0.4m for habitable building floors, 0.3m for commercial and industrial buildings and 0.25m for habitable building platforms.
- Sediment removal efficiency of temporary treatment systems shall be at least 75% for construction sites.

The required level of service is in accordance with the Selwyn District Council Engineering Code of Practice (SDC, 2010).

Preference of Treatment Methods

The following are some of the main methods expected to be used in centralised treatment systems:

- Combination of vegetated swales and ground soakage (residential areas only)
- Combination of vegetated swales with constructed wetlands
- Combination of vegetated swales with extended wet ponds
- Combination of vegetated swales with extended dry ponds

The choice of method is based on the natural characteristics of the sites and the receiving waterways.

If by the time of construction no centralised system is available, temporary individual systems will be built that meet the levels of service (refer above) and achieve treatment efficiencies that are comparable to the preferred methods listed above (for treatment efficiencies refer to the current version of Christchurch City Council's Waterways and Land Drainage Guide -WWDG). SDC will require these temporary systems to be managed to comply with the global discharge consent.

For individual properties, proprietary devices may be allowed before discharging into the SDC stormwater network.

3.3.3 Proposed Mitigation Measures

Figure 9 below shows the proposed stormwater management concept for the global consent area. It includes all developments whether existing (currently consented and unconsented) or proposed.

Basin and wetland size estimates have been based on modelled peak flow mitigation (Stormwater Modelling Report, AECOM 2011) for increased rainfall intensities as a result of climate change. The stormwater flow attenuation and treatment systems (ponds and wetlands) have generally been located at the downstream end of sub-catchments. The locations of these treatment systems may vary in the final design, e.g. parts of them may be located within residential developments as an urban design feature. In this case the amended systems will be required to achieve the same performance at the ISMP boundary as the systems proposed in this plan.

Key factors that will be considered in specific engineering design before adoption by Council include: simplicity of construction and operation; long term sustainable performance; community amenity; ecological benefits including continuity; protection of cultural values and operating, maintenance and monitoring costs.

The concept is explained in more detail below. Drainage areas and their attenuation systems are shown in Figure 9. Required attenuation volumes to achieve the levels of service have been modelled and are summarised in Table 1 and shown in Figure 9.

Table 1 Indicative Required Attenuation Volumes (Source: Modelling Report, Appendix C)

Location / Description of Development	Approximate Drainage Area (ha)	Proposed stormwater system	Indicative Storage Volume (m^3)	Comment
LLD (Dairy) Block and upstream subcatchments	497	Distributed wetland / wet pond system	90,000	Distributed system, represented as one basin in model.
Commercial / Industrial Block	12.5	Dry pond	5,500	Includes adjacent road reserves
Halswell Soakage	102	Infiltration Basin	Not specified, subject to design	
Halswell 2	8.8	Dry pond	2,400	
Halswell 3	36.2	Dry Pond	6,500	
Ephemeral 1	15.1	Dry Pond	7,500	
Ephemeral 2	26	Dry Pond	15,000	
Wetland	106	Wetland / pond System	60,000	Dry basins Ephemeral 1 and Ephemeral 2 are discharging through the Wetland.
Hobbs and Zeestraten Block	34	Wet pond	8,900	Outlet restricted by two 375mm pipes. (Reference plan: Drawing No. C.15750, Davie Lovell Smith, 2010)
Community and Recreation Centre	3.64	Dry pond	350	Volume estimated from site plan (Powell Fenwick, 2009), overflow weir added in model.
Extension Liffey Fields	27.9	Infiltration Basin	Not specified, subject to design.	Dry basin at Liffey Fields extended to accommodate additional subcatchments

Please also refer to the Modelling report (Appendix C) for further details.

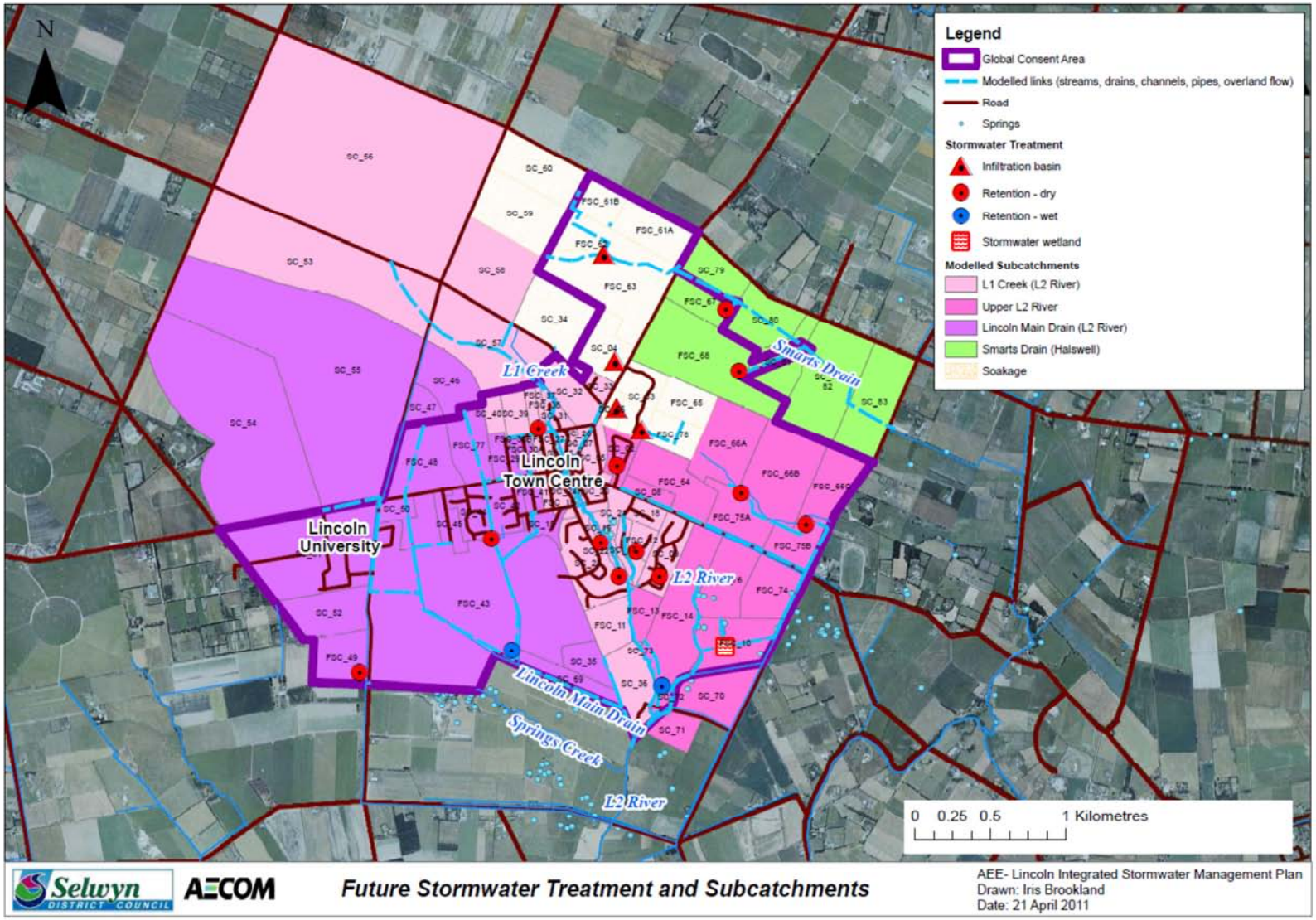

Figure 8 **Current Stormwater Treatment and Subcatchments**

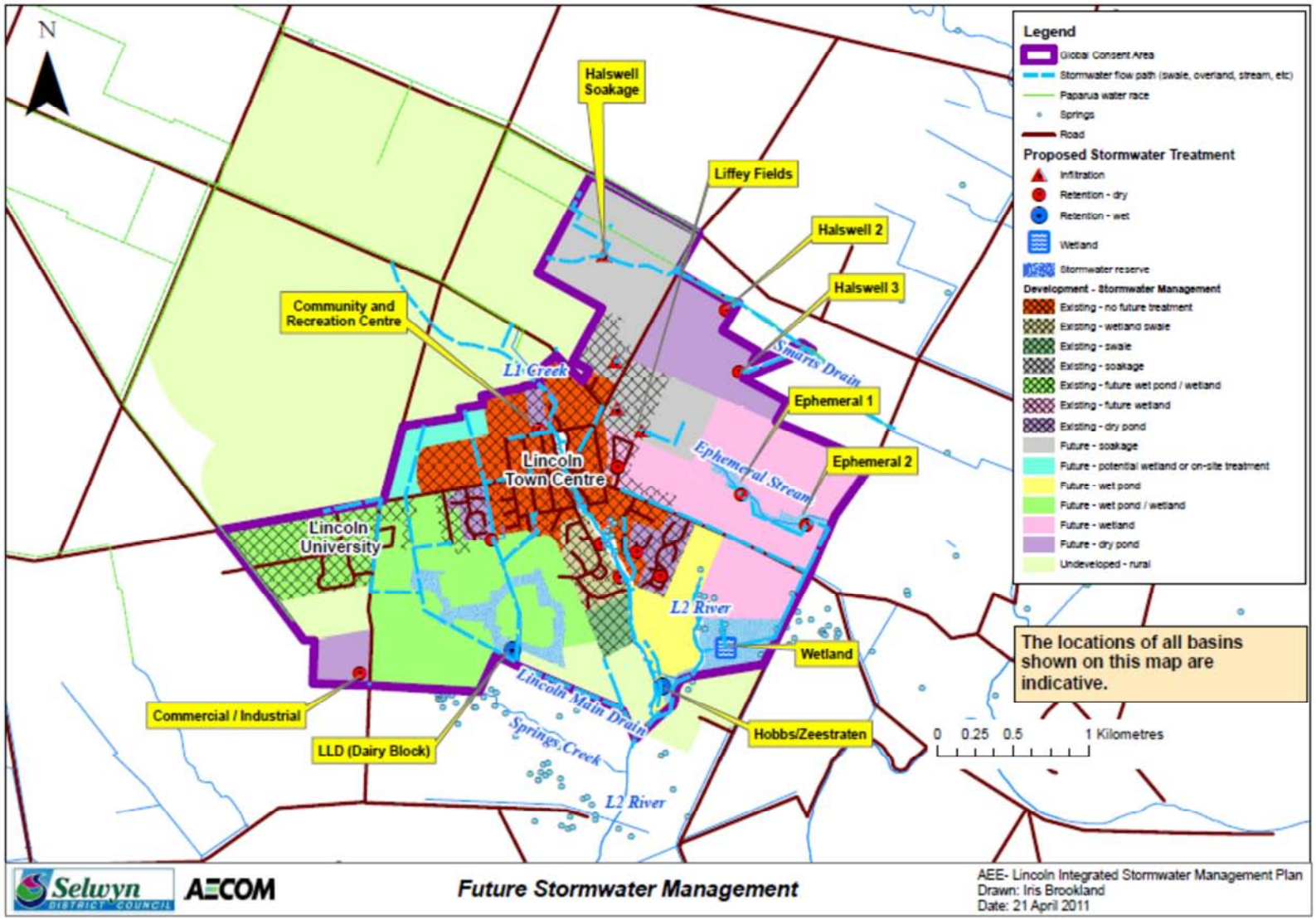

Figure 9 Future Stormwater Management

3.4 Proposal

This section of the report discusses in more detail the proposal for discharge of water and contaminants summaries in Section 3.2.

3.4.1 Construction Phase

General

A major mitigating factor is that the area is generally flat and the erosion and stability risks associated with earthworks in hill country do not exist. Erosion and temporary sediment control is aimed at avoiding or mitigating the washout of silt exposed during construction works into the stormwater system or waterways. This is usually achieved by minimising the mobilisation of silt and by capturing and removing the suspended sediment from stormwater runoff.

In the past the Auckland Regional Council publication TP90 was widely used for guidance in the Canterbury Region. However, as geology, soils and rainfall intensities are substantially different in the Auckland and Canterbury Regions, the Canterbury Regional Council (ECan) has recently developed their own guidance material, the Erosion and Sediment Control Guidelines 2007. These guidelines were adapted by assessing existing erosion and sediment control guidelines and combining this with local input from councils, consultants, contractors and ECan staff.

All activities will be required to be managed in accordance with ECan's Erosion and Sediment Control Guidelines (ECan, 2007). The application of these guidelines will ensure good erosion and sediment practices during the construction phases to avoid the loss of good top soil, blockages of the stormwater network and treatment systems and the pollution of receiving waters. The proposed construction process is to work upstream from the discharge points, minimising exposed areas, providing ponding areas to trap sediment and establishing vegetation as soon as possible. The general aim is that the central stormwater treatment systems such as the wetland will be operational before construction of the upstream catchment can begin. Sediment removal devices will be designed to achieve the minimum standard of 75% removal of TSS.

An erosion and sediment control plan that meets the requirements of ECan's Sediment and Erosion Control Guidelines (ECan, 2007) will be required to be submitted to SDC for approval with every subdivision and/or building consent application.

The guidelines identify four fundamental principles for cost-effective erosion and sediment control to be considered throughout a project's planning, design and construction phases. The principles are:

- Control run-on water
- Separate 'clean' water from 'dirty" water
- Protect the land surface from erosion
- Prevent sediment from leaving the site

The success of the measures will be regularly monitored and the processes adjusted where required.

Appendix J contains the selection process and summary of options from the ECan guidelines. Table 2 below indicates the expected activities and corresponding suites of potential mitigation measures drawn from the guidelines.

Stormwater System Construction

Construction activities will be required to be managed in accordance with ECan's sediment control guidelines.

The proposed construction process is to work upstream from the discharge points, providing ponding areas to trap sediment, minimising exposed areas, and establishing mulch and/or vegetation cover to bare areas as soon as possible.

Table 2 below provides a summary of potential mitigation measures taken from ECan's sediment control guidelines the references (e.g. 6.1.1) are from the guideline and provided in appendix J.

Table 2 Activities and Sediment Control Measures

Guideline measure	Application
6.1.1 watering for dust control	All earthworks areas where dust generation is an issue
6.2.1 grassing	All earthworks areas where wind/water erosion is possible
6.3.1 perimeter diversion	Where upstream catchments are likely to discharge significant quantities of water onto the earthworks site. Due to the flat topography this measure may have limited use.
6.3.5 soft armour channel lining – geotextiles	Where constructed channels don't have any other form of scour protection and design velocities are greater than 1.5m/s
6.3.5 soft armour channel lining – grass	Where constructed channels don't have any other form of scour protection and design velocities are less than 1.5m/s
7.1.3 sediment fence	Where the catchment length does not exceed 100m and where a grass buffer strip is not practicable.
7.1.3 grass buffer strip	Where the catchment length is short (5 - 10m) and a minimum of 5m of vegetation can be provided.
7.1.4 site exit points	Where construction machinery enter public sealed roads
7.2.1 sediment retention ponds	For larger earthworks sites. Flocculation may be used to improve discharge quality.
7.2.4 soakage systems	To dispose of 'run on' water in areas where permeable soils exist.
7.2.5 sediment curtains	Used where working in waterways or water body could result in the release of sediment.
8.0 stream diversions	Over pumping, temporary culverts or construction of a temporary channel could be used to minimise the effects of in-channel works.

3.4.2 New Residential Development

On-property Systems

Any on-property systems will be provided within the property at the owner's expense and will be subject to specific approval by SDC. They are not expected to be adopted by SDC but to remain in private ownership. On-property systems may include on-site soakage systems.

To reduce the required treatment and conveyance capacities as well as downstream peak flows, on-site soakage from roof and hard standing areas for up to 10% AEP will be considered on a case by case basis where soil and sub-soil conditions are suitable:

For on-site disposal of stormwater for lower AEPs the selection of most appropriate on-site treatment methods shall be made with reference to *On-Site Stormwater Management Guideline* (NZWERF, 2004) and CCC's Waterways, Wetlands and Drainage Guide (2003 or later current version).

Key issues for on-property systems approval include:

- Effectiveness under design conditions (10% and 2% AEP)
- Long term reliability
- Ability for SDC to monitor and enforce performance and maintenance at the landowner's expense

On property detention or flow attenuation using surface or subsurface tanks is not proposed as a general measure, because of expected difficulties in managing many small individual systems on private properties.

No restrictions on unpainted galvanised roof materials are proposed. These materials are not commonly used. Sediment sampling has shown low levels of metals. The effects of a small number of unpainted roofs on future stormwater quality in the Lincoln global consent area is expected to be less than minor.

Systems at Street Level

Systems at street level will include:

- Kerb and channel systems
- Piped systems including submerged outlet sumps
- Vegetated swales with piped underdrainage

Key issues for approval include:

- Effectiveness under design conditions (10%, 2% AEP)
- Long term reliability
- Effects on community amenity
- Long term sustainable performance and operating costs
- Ability for SDC to monitor performance

Conveyance Systems

Conveyance systems to transfer discharge from street level systems to and from specific attenuation and treatment practices may include vegetated swales and channels, pipes or a combination of them.

Swales will attenuate flow as well as provide treatment before the water enters any local or centralised pond or wetland system. Swales are to be designed according to the current version of the NZ Transport Agency Stormwater Treatment Standard or approved equivalent. Side slopes shall be no steeper than 1:4 for vegetated swales and 1:2 for planted swales. The design rainfall intensity shall be no less than 10 mm/hr and the residence time at least 9 minutes. Where swales are not suitable, alternative devices may be considered provided it can be demonstrated that they will provide the same level of service for conveyance and treatment.

Indicative conveyance network locations have been shown as stormwater flow paths in (Figure 9). These locations are to be confirmed during design. Networks will need to be sized to provide capacity for upstream existing developed areas and for new developments to be connected in.

Lots should generally fall towards roadways so that the roads may be used as secondary flow paths. Where this is not possible flow paths shall be kept on public land such as access ways, parks, and reserves.

Flow Attenuation and Treatment Systems

Preferred Soakage:

Where sites are located above an unconfined to semi-confined aquifer, disposal to ground is the preferred treatment method. Areas to be considered for potential soakage are ODP Area 4 and parts of ODP Area 3 as marked on Figure 9.

Stormwater disposal locations are to be located and distributed so that groundwater mounding is minimised (see Appendix K). Site specific investigations will highlight any groundwater mounding potential. Over sizing the basin or constructing multiple basins can help minimise the effects of groundwater mounding if identified as a problem. Where onsite soils do not allow for sufficient drainage, centralised common/shared infiltration stormwater infiltration basins may be used to achieve sufficient groundwater discharge capacity.

Development design will include site assessments to characterise the physical properties of soil and subsoil, including an investigation of the infiltration capacity and long term infiltration rates.

Regular monitoring and sampling of the soil of infiltration systems will be carried out at representative locations. If contaminated beyond consented levels, the soil will be replaced.

Centralised Attenuation and Treatment Systems in Ponds and Wetlands

SDC is seeking a sustainable balance between providing for flow attenuation, treatment, ecological habitats and amenity vs. land requirements and ongoing operating, maintenance and renewal costs, i.e. appropriate asset management practices.

Where soakage is not possible flow attenuation and treatment will generally be in swales and channels and centralised pond and wetland systems as indicated in Figure 9.

The hierarchy preferred treatment methods is set out above. These systems will provide for discharge into the L2 River upstream of the L1 Creek confluence. The system serving ODP Area 1 and the northern part of the 'Dairy Block' will discharge into the L2 River via the existing Lincoln Main Drain. Parts of ODP Area 3 will discharge into Smarts Drain which is part of the Halswell River Catchment.

The approximate required attenuation volumes (as described in the Modelling Report, Appendix C) are shown in Table 1. They will be refined once preliminary design has been completed.

Developments in this area are expected to be connected to these centralised systems which will be constructed by SDC or developers in conjunction with SDC.

Pond and wetland systems will be designed according to the *Waterways, Wetlands and Drainage Guide* (CCC, 2003 or updated versions of this document) and *Stormwater Treatment Standard for State Highway Infrastructure* (NZTA, 2010 or current later version) and ARC TP 10. For water quality treatment, systems shall be sized for first flush treatment of 20 mm rainfall depth and slow release of water for further treatment. To provide for sufficient treatment, the average hydraulic residence time shall be at least 24 hours.

Staging and Temporary Treatment:

Stormwater systems or parts of them will be constructed in advance of development occurring. Staged systems will be designed to minimise disturbance to ecosystems that will establish in the first stage.

Should at the time of development a centralised system not be available, the developer may design and construct a temporary treatment system for the construction and immediate post – construction phases to treat discharges from this development. The treatment standard of the selected system will need to be equivalent or better to that of the proposed centralised solution for that sites catchment.

Sufficient detention will be required to ensure that after development occurs individual and overall areas will be not exceed pre-development peak runoff (refer level of service). To manage the potential cumulative temporary effects of several developments the SDC may allocate an acceptable maximum peak discharge to each development. Once a centralised system becomes operational the stormwater from all developments (including those with temporary stormwater treatment) within its catchment will be diverted into that system for treatment and any temporary treatment system can be decommissioned. Costs associated with diversion, permanent conveyance, treatment and discharge systems and decommissioning of temporary facilities will be recovered from the developers of those areas.

3.4.3 New Commercial / Industrial Developments

Stormwater from industrial, commercial and business sites (excluding those undertaking WQL9 activities, which are expected to have individual consents and are not covered by this AEE and ISMP) will generally be managed in accordance with best practice. Risks will be assessed for Council's systems and the environment. The requirements of Council's District Plan, Lincoln ODP criteria, stormwater bylaw and trade waste bylaw, ECan onsite guidelines and any consent conditions attached to those sites and to the ISMP will be considered. Council will then assign requirements to specific land parcels and businesses.

Some treatment processes in pond and wetland systems depend on the biological health of the system as well as providing amenity and ecological values. It is important to protect these processes from heavily contaminated stormwater containing toxic or hazardous substances. A first flush pond has been proposed at the outlet of ODP Area 5 in addition to on-site stormwater management practices as detailed below. This would help to retain any stormwater contaminated by spillage from entering the network and mitigate the risk of damage to the downstream treatment system, and eventually to the receiving environment.

For hard standing and car parking areas, traditional stormwater on-site controls (oil/water separators and sumps with submerged outlets) will be required. Roof water would be discharged directly into the stormwater system.

Should a spill occur and hazardous substances enter the stormwater system SDC will require that they are notified immediately.

3.4.4 New Mixed Development - ODP Area 6

The development of this area (residential and community facilities) will include its own stormwater treatment system discharging into the L1 Creek upstream of the North Belt road bridge. The following stormwater management system is proposed:

a) Road, community centre and car parking hardstand areas – capturing rainwater and directing it through swales in the car park for treatment and then into a detention basin prior to entering the Council reticulated stormwater system.

b) Residential Subdivision – stormwater treatment in swales

3.4.5 Existing Development without Stormwater Attenuation or Treatment

The older areas of Lincoln (marked light and dark orange on Figure 9) have a kerb and channel and piped stormwater conveyance network which discharges without treatment, other than street sumps, into the L1 Creek or Lincoln Main Drain.

The ecological assessment (Boffa Miskell 2010) has shown no significant urban sediment contamination in the receiving area. It is proposed to retain the existing system discharging into the L1 Creek. At this stage retrofitting of stormwater treatment devices is not proposed. Retrofitting of stormwater devices might be considered by the SDC when the ISMP is being reviewed in the future.

The runoff currently discharging into Lincoln Main Drain (area marked light orange Figure 9) will be diverted into the stormwater management system of the Dairy Block (ODP 1) for detention only.

Existing premises undertaking Schedule WQL9 activities will be notified within 1 year of the ISMP consents being granted of the requirement to gain individual ECan consents, which may include Certificates of Compliance, for any discharges.

Intensification

Development densities in the central older part of town are likely to increase as some existing larger properties are subdivided. For the water quantity assessment and mitigation design it was assumed that 30% of the central older part of town would be subdivided. The assumption was based on the presence of sections sizes larger than 1,000m^2. No additional stormwater treatment is proposed for residential infill subdivision. The sediment sampling carried out for the ecological report showed low level of metals resulting from the current township areas. Retrofitting effective treatment would require land to be taken. Should long-term monitoring show a declining quality of water and sediment quality in the receiving environment retrofitting of stormwater treatment devices would be considered.

For commercial / industrial developments within existing developments site specific water quality treatment will be required.

3.4.6 Existing Developments with Treatment

The consented treatment systems and the discharge points from the following developments will be retained and maintained by the SDC. The Council will also seek to surrender the discharge consents and incorporate them into the global discharge consent for the Integrated Stormwater Management Area. This will simplify the administration, operation and maintenance of all stormwater systems. A list of all current existing discharge consents is provided in Appendix H. The areas are marked on Figure 9.

3.4.7 University Campus – Existing

The Lincoln University Campus has not been specifically included in a centralised stormwater management system and no submissions for such coverage were received during the consultation process on the draft ISMP. Lincoln University is therefore expected to manage its stormwater on-site. Runoff from the site will flow through the stormwater management system of the LLD Block (Dairy Block) (ODP Area 1 and above area south of Edward Street). Although the LLD system is not designed to treat and attenuate the flows some water quality benefits may be realised. It is not anticipated that extensive further development of the University site will happen in the near future. If this does occur within the life of the global consent, flow attenuation, quality treatment and spill risk management will be required to be assessed at that time by the University.

3.4.8 Lincoln Main Drain (Open Drain 28)

The L2 Drainage Committee reports that this drain often reaches capacity and is difficult to maintain due to obstructed access. Neighbouring properties on both sides are fenced and there is not enough space for access for machinery needed for drain clearance. This drain is scheduled to be piped underground and a secondary flow path provided for events of less probable AEP's.

3.4.9 Climate Change Adaptation Measures – Existing Developments

Selwyn District Council will develop a separate district wide strategy of how to deal with existing stormwater networks in the light of climate change predictions. A possibility is to increase capacity when programmed road and pipe renewals are undertaken.

3.4.10 Riparian Management

The following recommendations for riparian areas have been made in the ecological surface water assessment (Appendix B):

- Ephemeral L1 Creek and Springs (between Boundary Road and Lincoln High School): dense harakeke and raupo.
- Upper L1 Creek and Liffey Reserve: trimming of the exotic species canopy cover (to allow more light in and to reduce the effects of autumn leaf fall on water quality), understorey enhancement with species such as harakeke and *Coprosma*.
- Upper L2 River: fencing of undeveloped banks, management of rank grasses to a harakeke, toitoi, Carex condition. A progression through to native forest elements is possible.

The assessment noted that a width of 5m is sufficient in many cases to provide all the benefits of riparian vegetation cover.

New esplanade reserves have been provided for along the upper reaches of the L2 River in ODP Area 2 and along the true left bank of the lower L1 Creek in ODP Area 2 (refer Appendix K). Developers will be required to carry out improvement of existing riparian planting at their own cost in accordance with landscape plans approved by Council. SDC will use the Ecological Assessment (Boffa Miskell, 2010), the CCC Waterways, Wetlands and Drainage Guidelines and the Cultural Impact Assessment for Lincoln ISMP (MKT, 2010) for guidance. SDC will provide lists of approved plants for these areas and also for street plantings.

3.4.11 Creation of Spring Waterway

To address Ngai Tahu concerns over the mixing of stormwater flows with uncontaminated spring flows, a new spring waterway will be created adjacent to the eastern wetland system (Figure 11). Water from springs along the western side of Ellesmere Road will be collected and piped to the spring waterway north of the eastern wetland system. A roadside swale above the pipe will carry stormwater flows to a wetland. The spring water will pass through a waterway with riparian zones to the north of the wetland and discharge into the upper L2 River. The separation of potentially contaminated stormwater flows from spring water will protect the mauri of the spring water. The riparian zones will provide mahinga kai. The indicative discharge point of the spring waterway into the upper L2 River is marked on Figure 7. This is at the same location as the present drain discharge.

3.4.12 Spill Response Capabilities

SDC will ensure that contractors are available and have the capability to respond to spillages of harmful substances accidently entering the stormwater system.

3.4.1 Road Runoff

Runoff from the major roading network will be collected in sumps and transported in pipes and roadside swales and channels. Common local soakage areas will be established where feasible.

3.4.2 Street and Sump Cleaning Programme

Council will ensure that street cleaning and sump clearing practices in the global consent area are appropriate to maintain intake capacities and contaminant removal performance.

3.5 Ancillary Activities

To implement the ISMP the following additional / ancillary activities will need to be carried out, for which consents are also sought and described below.

Bulk earthworks will be required to implement Activities 1 to 4 below. The duration of the earthworks, on any particular site, is expected to be between two weeks (stream enhancement works) and 6 months (bulk earthworks for wetland construction).

The volume of earthworks is expected to be in the range of $10m^3$ (stream enhancement works) and $80,000m^3$ (wetland construction).

Activity 1: Intercept, Divert and Discharge Groundwater: Excavation work to construct stormwater systems may intercept with the groundwater table. Diversion of groundwater that may enter the proposed stormwater collection, conveyance systems, treatment systems and spring waterway, for discharge to L1 Creek, L2 River and Smarts Drain. This may occur over the entire global consent area (Figure 7). In some of the lower lying development areas subsoil drainage may be required in the roads to protect the road foundations.

Any assessment of the diverted flow rates and their effects on upgradient and downgradient water levels can be approximate only until the final systems layout is developed. Even then there will be uncertainties, e.g. seasonal groundwater level variations including the expected effects of long term climate change, and the effects of any external activities including possible wide area irrigation.

In ODP areas and downstream of stormwater discharge points the proposed stormwater systems will replace existing land drainage systems. Existing groundwater diversion flows from the global consent area via those land drainage systems will be replaced by flows within the stormwater systems.

A new waterway (Figure 11) will be created to collect existing groundwater and spring flows and direct (discharge) them into the L2 River upstream of the discharge from the stormwater wetland system (marked blue Figure 7). The springs flow will not be as far as practicable mixed with stormwater runoff. The waterway is proposed to have a riparian zone. The flow rate is expected to be as now, in the order of 50-100 L/s (depending on seasonal groundwater levels).

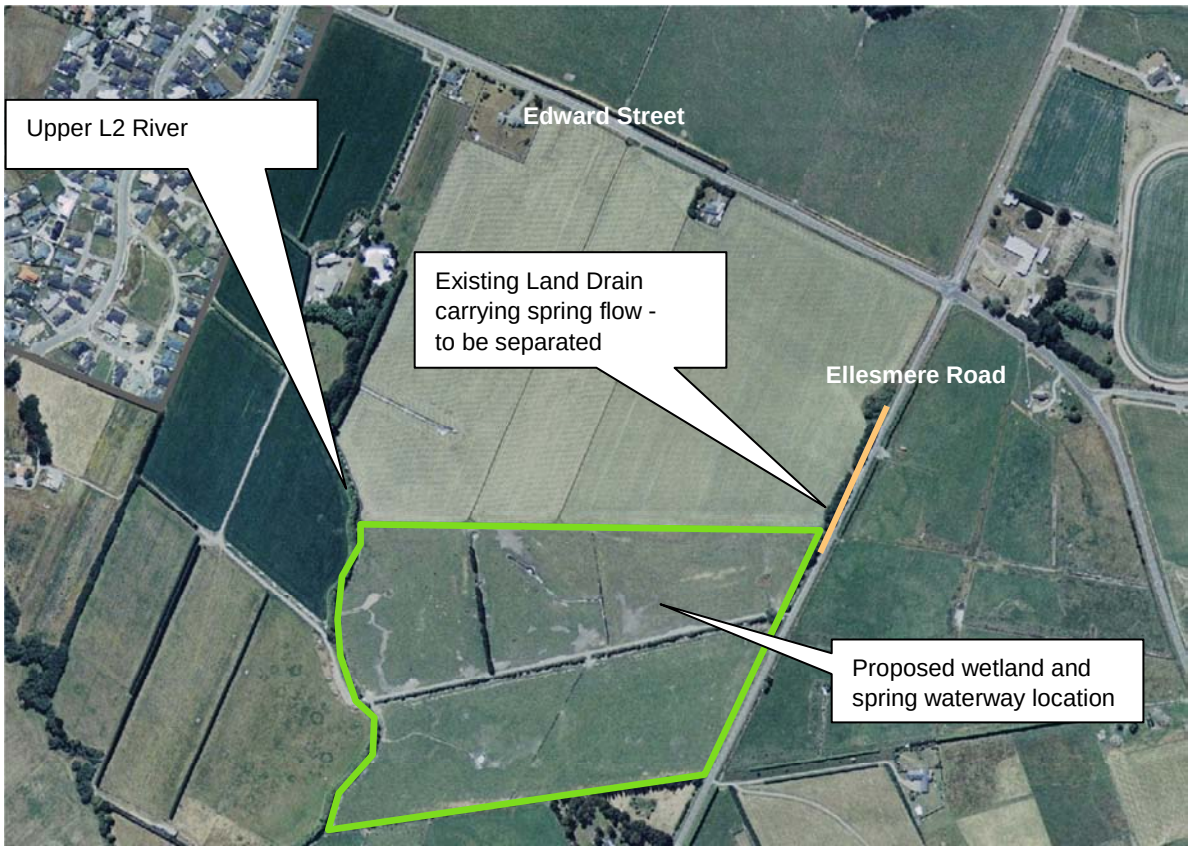

Figure 10 Proposed Block of Land for Wetland Location

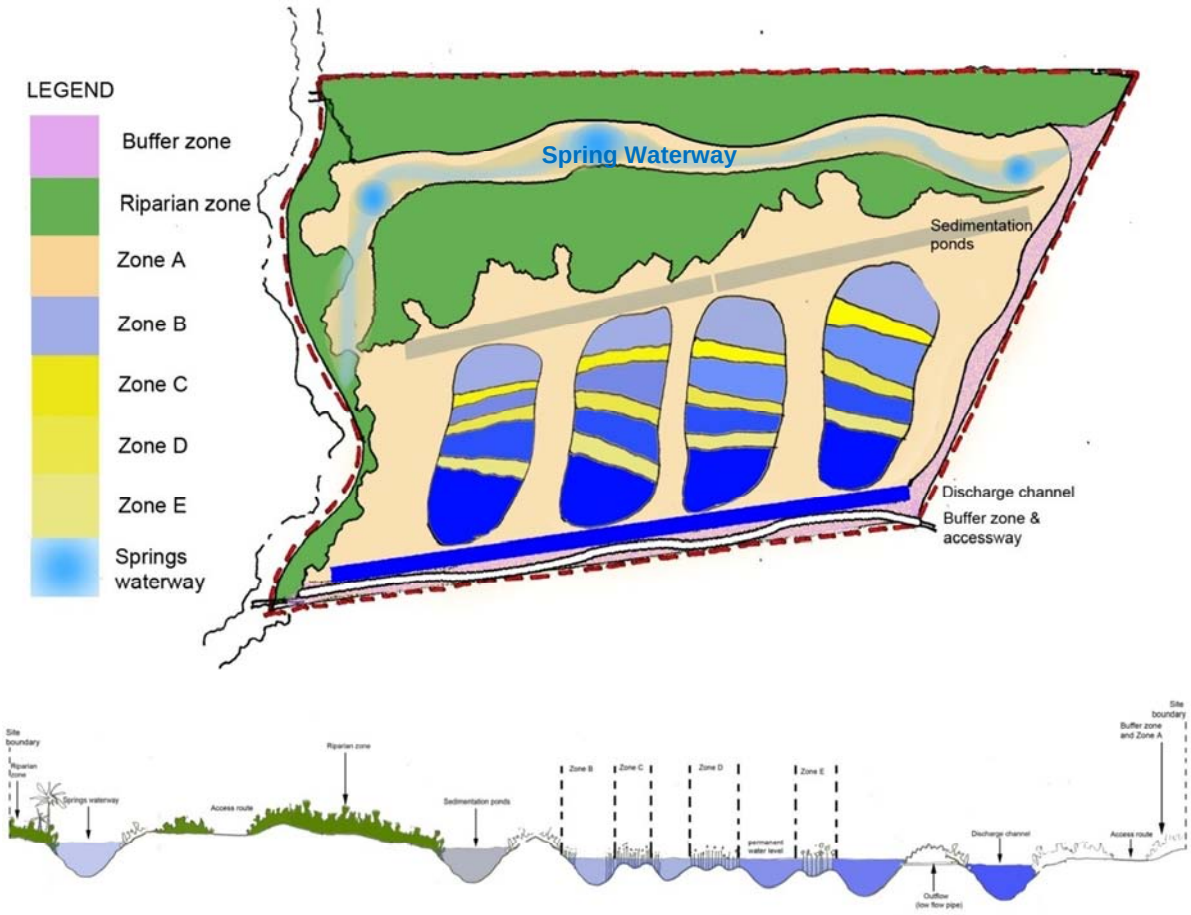

Figure 11 Possible Conceptual Layout of Stormwater Wetland System and Springs Waterway

Activity 2: Dam and Divert Surface Water. The ephemeral stream located within the land north of Edward Street and west of Ellesmere Road is classified as a lowland river in the Natural Resources Regional Plan (NRRP). Sometime in the past the stream crossed under Ellesmere Road north of Edward Street at or about 2470295E and 5729231N (ECan GIS coordinates NZMG) into the Halswell River catchment. A review of SDC's records has however suggested that a diversion south via the roadside of Ellesmere Road into the L2 River catchment has been occurring for around 30 years. This application seeks to authorise the existing diversion.

ODP 3 provides for land adjoining the stream to become a stormwater reserve and stormwater to be conveyed within the modified stream. Additional stormwater attenuation volume is required. This is intendedto be achieved within the stream, e.g. by building two consecutive online retention ponds with flow controlled outlet structures and stabilised overflow weirs.

Activity 3: Stream Enhancement

a) Unnamed ephemeral stream in ODP Area 3

As part of the development the riparian zone and stream bed and banks will be restored to provide enhanced ecological and amenity values for the surrounding residential development. The work includes the re-contouring of bed and banks and vegetating of banks and surrounding stormwater reserve land. Shallow excavation and the erection of earth bunds will be required to create the online retention areas as described in Activity 2. The discharge will be via a flow controlled outlet structure and a stabilised overflow weir.

Structures will be built to allow stormwater to enter the stream and also to discharge stormwater from this stream for conveyance in swales to the wetland system. The erection of culverts and weirs may be required.

b) L1 Creek and L2 River

The work will include the re-contouring of beds and banks, weed removal from banks and riparian margins and plantings. The activity is expected to be location specific but could be carried out in areas marked light green and dark green on Figure 7. The specific locations will be determined in response to reserve improvements, programmed works opportunities, developers works proposals and any other opportunities as they arise. The work will be carried out considering the recommendations made in the ecological assessment of these streams (Appendix B):

- Ephemeral L1 Creek and Springs (between Boundary Road and Lincoln High School): dense harakeke and raupo.
- Upper L1 Creek and Liffey Reserve: canopy cover trimming (more light and reduction in autumn leave fall), riparian enhancement with species such as harakeke and *Coprosma spp.*
- Upper L2 River: fencing of undeveloped banks, management of rank grasses to a harakeke, toitoi, Carex condition. A progression through to native forest elements is possible.

As noted earlier, a width of 5m will be sufficient in many cases and will provide all benefits of a riparian vegetation cover.

New esplanade reserves have been provided for along the upper reaches of the L2 River in ODP Area 2 and along the true left bank of the lower L1 Creek in ODP Area 2 (refer Appendix K). The Ecological Assessment (Boffa Miskell, 2010), the CCC Waterways, Wetlands and Drainage Guidelines (2003 or later) and the Cultural Impact Assessment for Lincoln ISMP (MKT, 2010) will be used for guidance.

Activity 4: Construction of stormwater outfall structures

New outfall structures will be built to discharge stormwater from the wetland system and L2 River. New outfall structures might also be required to discharge overland flow into the L1 Creek and L2 River. These outfall structures may simply be open channels.

Existing outfall structures may need to be replaced or repaired to ensure protection of the banks from scouring.

The existing weir below the L1 pond (at former Lincoln Country Club) may be upgraded to enhance water quality and amenity values. No other structures are expected to be affected.

All structures and erosion protection associated with the proposal will be carried out in accordance with the current version of the CCC Waterways, Wetlands and Drainage Guide (CCC, 2003) and SDC's Engineering Code (SDC, 2010)

In the unnamed ephemeral stream north of Edward Street structures will be built to allow stormwater to enter the stream, to attenuate the water in online ponds and discharge it for conveyance to the wetland system. The erection of weirs and earth bunds and restricted outfall structures may be required.

Structures will also be required to direct stormwater flows into Smarts Drain.

Work is expected to be required on the existing L1 "Ellesemere Country Club" pond, which may consist of outlet upgrades for fish passage.

3.6 Land Use –Plan Change 7

Proposed Plan Change 7 to the District Plan seeks to rezone land identified in Proposed Plan Change 1 to the Regional Policy Statement and the Lincoln and Rolleston Structure Plans to provide for the future growth of the District in accordance the Greater Christchurch Urban Development Strategy.

This Plan Change includes:

- New District-wide and Township specific provisions within the subdivision section to implement the Subdivision Design Guide, along with provisions relating to medium density housing (to implement the Medium Density Design Guide) to support the consolidation of townships while achieving good urban design outcomes.
- Rezoning land in Lincoln to a new "Living Z" or "Living Z Deferred" zone for residential development and 11 hectares of land in Lincoln to a possible "Business 2 Deferred" zone for industrial development.

- The requirement to develop an Outline Development Plan (ODP) before development can occur and identifying ODP criteria that will need to be addressed within the ODP to support the implementation of the key aspects of the Structure Plan.
- Staging requirements to meet Phase 1 (2007-2020) and Phase 2 (2021-2041) of Regional Policy Plan Change 1.

Plan Change 7 has been publicly notified and the period for submissions and further submissions has now closed. A hearing are planned to commence in May 2011.

The maximum development proposed in Plan Change 7 and existing District Plan zones is shown in Figure 12.

The global consent area will predominantly contain residential and educational land uses. Individual industrial, commercial and business activities are expected to be small scale service providers rather than major manufacturing or warehousing facilities. Their operation is not expected to include the storage and use of substantial quantities of materials that might have significant environmental effects. Existing activities servicing the rural hinterland are expected to stay at or near current levels.

An additional 3,105 households are expected to be accommodated within a total ODP area of about 363 ha (Table 3). The development is expected to occur in two stages of 1,750 households by the year 2020 and another 1,355 by the year 2041 (Table 4).

An area of 11 ha (ODP 5) has been set aside for business purposes only and has been zoned as Business 2 (Deferred) in Plan Change 7. The deferment will be lifted once an ODP has been formulated for this area.

Table 3 Household Accommodation

Area	Gross Area (ha)	Net Area (ha)	Minimum Density over Net Area (households/ha)	Number of Households
ODP 1	68	49.5	10	495
ODP 2	78	54	10	540
ODP 3	155	148	10	1,480
ODP 4	61	57	10	570
ODP 5 (business only)	11	10	0	0
ODP 6	0.75	0.75	30	20
			Total	**3,105**
Northern half of 'LLD/Dairy' Block'	60		Existing Zoning	371
			Total	**3,476**

Table 4 Development Phases within ODP Areas

Area	Number of Households		
	Phase 1 (2007 – 2020)	Phase 2 (2021 – 2041)	Total
ODP 1	-	495	495
ODP 2	440	100	540
ODP 3	1,140	340	1,480
ODP 4	150	420	570
ODP 5 (business only)	-	-	-
ODP 6	20	-	20
Total	**1,750**	**1,355**	**3,105**

The ODPs have been developed to meet the following criteria:

- Efficient and effective transport connections
- Integrated management and lifecycle assessment of water systems within and through ODP areas and the existing township
- Provision of a range of residential densities and lot sizes

- Integrated open spaces
- Protection and enhancement of natural, ecological, landscape, cultural and historical heritage features.

The layout of the proposed Outline Development Plans (ODPs) contained within PC7, together with the existing roading network is shown in Figure 12 below.

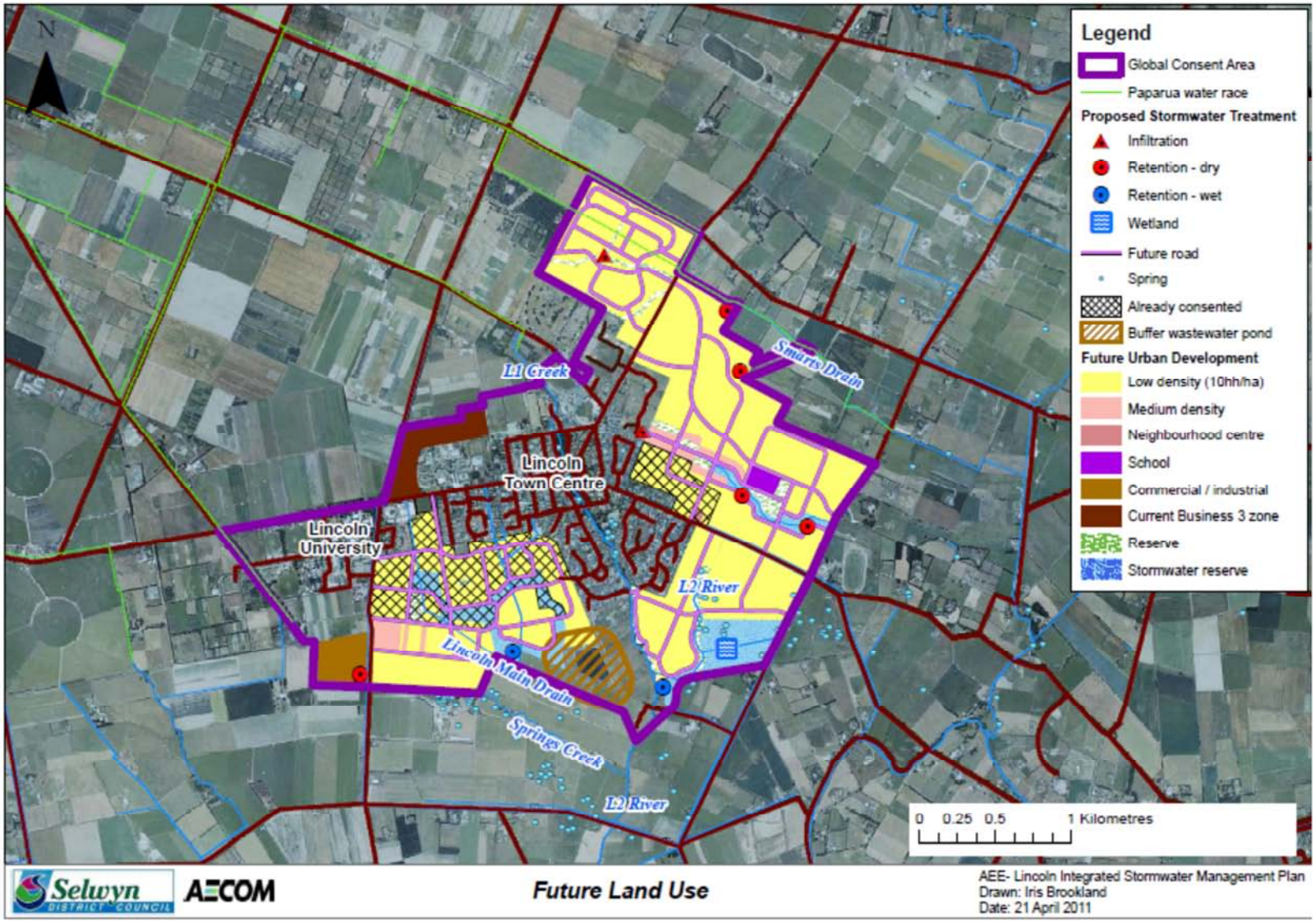

Figure 12 Future Land Use

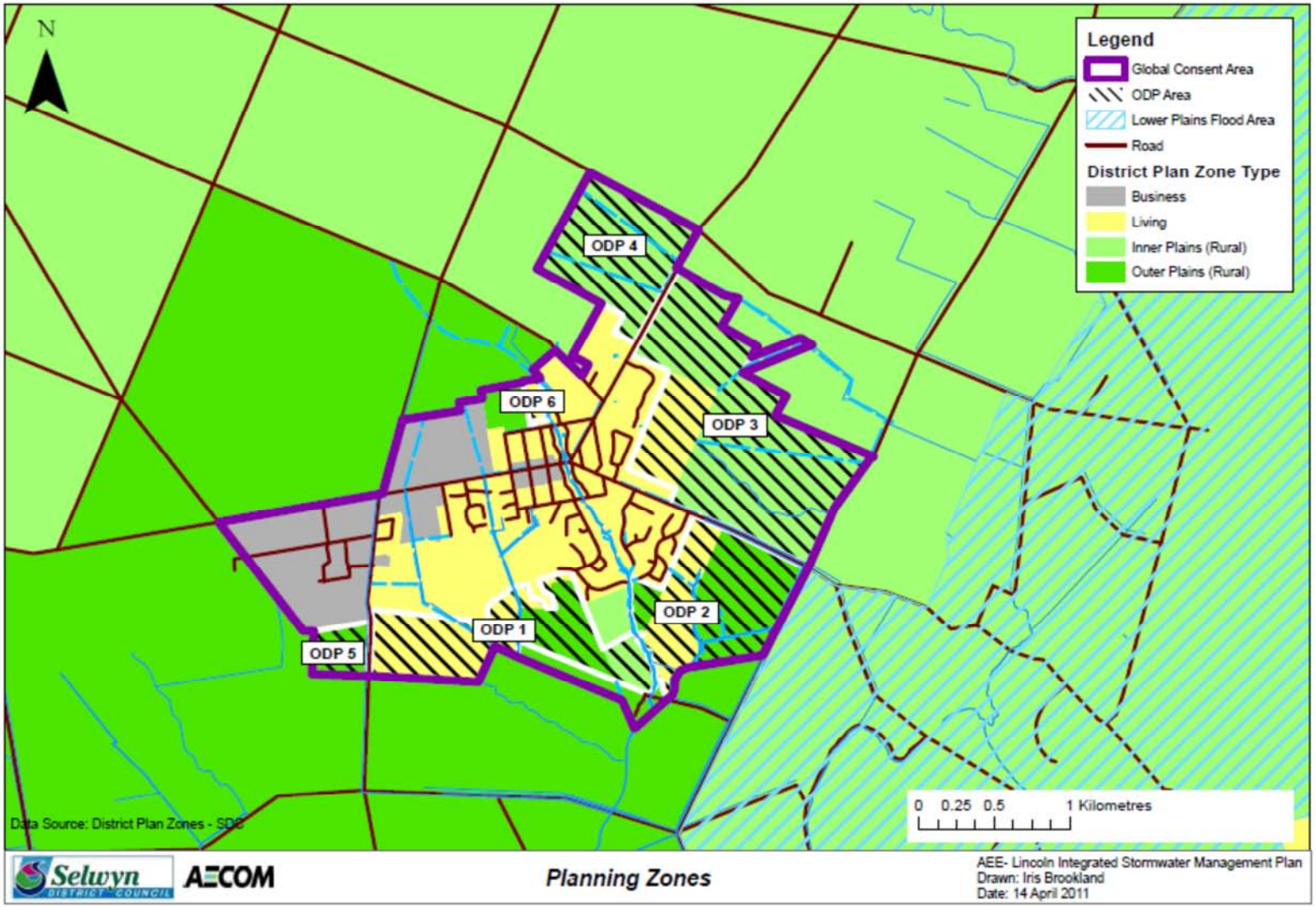

Figure 13 Planning Zones

4.0 Description of the Receiving Environment

4.1 Introduction

This section describes the natural properties of the Lincoln global consent area which are relevant to stormwater management considerations. Key issues and values have been identified.

4.2 Description of Surface Water System

4.2.1 Introduction

There are four major surface water system types within or downstream of the Lincoln global consent area:

1) Spring fed tributaries and L2 River
2) Land drainage system draining into the Halswell River and the L2 River
3) Paparua Water Race system
4) Halswell River

All drains, rivers and streams in the Lincoln global consent area are located within the Lake Ellesmere catchment.

4.2.2 Springfed Tributaries and L2 River

The L1 Creek (Liffey Stream), the upper L2 River and Springs Creek are all spring-fed and tributaries of the L2 River system.

L1 Creek

Physically the L1 Creek originates in a gully north of Boundary Road and west of Springs Road. The gully, which only contains flow during significant rainfall events, crosses the Paparua Water Race (this particular reach is piped) and Boundary Road in a southward direction and Springs Road in an eastward direction through culverts. Just to the north of Lincoln Township the L1 Creek receives excess water from the Paparua Water Race. Flow then increases by the output of several springs downstream of the North Belt within the Liffey Reserve. The L1 Creek flows through the Liffey Reserve within the Lincoln urban area and receives several treated and untreated stormwater discharges before it joins with Lincoln Main Drain and the upper reach of the L2 River approximately 1km south of Lincoln Township.

L2 River

The L2 River forms part of the Selwyn District Land Drainage System. It is a spring fed lowland river and after a total length of about 11 km flows into Lake Ellesmere. Its full length has been characterised and influenced by agricultural land use and farming practices as well as drainage requirements. Those agricultural practices can result in a lack of shading and riparian planting. 46% of the lower reaches river banks were unfenced in 2004 (Environment Canterbury, 2004). To improve the drainage efficiency the L2 River has been straightened and channelised in its lower reaches and is subject to regular channel cleaning practices.

Springs Creek

The creek is a straightened, uniform morphology, drain with formed banks and little to no riparian cover. It discharges into the L2 River about 0.4km downstream of the L1 Creek confluence.

Key Issues

- Land use practices causing limited riparian buffer, bank erosion, stock effluent, extensive exotic organic input and raised nutrient levels.
- Loss of wetlands and mahinga kai species
- Downstream flooding in long duration rainfall events.

Values

- Historic Ngai Tahu value for mahinga kai and source of Te Waihora (taonga), waipuna (springs) of particular significance, but understood to have had only limited fishing due to difficult access when it was a swamp.
- Springs and spring ecology
- The Liffey Reserve is highly valued by the Lincoln community.
- URS (2006) states that an Angling Survey carried out by NIWA in 2003 identified the L2 River as the second most popular fishing river in the Ellesmere / Selwyn catchment. It is considered to be good habitat for trout (Fish and Game evidence and ECan low flow technical notes water user groups).

4.2.3 Land Drainage Systems

Historically the Lincoln global consent area used to be a swamp. Today the area is intersected by a system of open land drains. The main system is approximately 2 metres deep on average. Some designated drains are ECan's management responsibility (in the Halswell Drainage District) and other classified drains are SDC's management responsibility (in the L2 Drainage District). All other smaller drains in the area are the responsibility of the adjoining landowners (Waugh Consultants, 2005). Their location is not exactly known.

The primary purpose of land drains is to remove subsurface water to enable the land to be used for agricultural and horticultural purposes. Some drains south of Edward Street also receive input from spring flows and discharge into the L2 River system. The function of the land drainage systems is therefore land drainage rather than flood control. The underlying principle is that low-lying areas must take the natural flow of water from higher lying areas (Waugh 2005).

ECan's Living Streams Project noted that stock access to drains has the potential to influence the water quality of the L2 River (ECan, 2004).

To maintain drainage capacity and protect the area from flooding, regular drain management practices are carried out by the L2 Drainage Committee and ECan using contractors with proven skills. Maintenance work includes the following:

- weed cutting
- drain cleaning
- weed spraying
- removing blockages
- maintaining flood gates and culverts

(ECan, 2004 and Waugh Consultants, 2005)

Figure 14 Land Drain at Collins Road

Key Issues

- high water table
- regular maintenance required
- historic swamp
- potential effects from increased irrigation in Central Plains area

Values

- Lowering water table to make land usable for agriculture and urban development

4.2.4 Paparua Water Race

The north western part of the Lincoln modelling area is serviced by a network of channels (Figure 15, Figure 3) that form part of the lower reaches of the Paparua Stock Water Race which is fed from the Waimakariri River. The water race system is administered by Selwyn District Council and Christchurch City Council and has been in operation for about 120 years. The system covers an area of approximately 43,000 ha with diverse land uses and soil types. The total length of the races is approximately 470 km (Agriculture New Zealand et al. 1997). The Paparua Water Race now has some environmental and historical values associated with it (pers. communication Keri Harrison, SDC, 2007). As the land drainage system in the Central Plains area was established to support a change to agricultural land use a widespread loss of natural wetlands occurred. Some of the wetland species, however, colonised the water race network and remain there now (Colin Meurck, Landcare, pers. communication, 2010).

Excess water from the Paparua water race system discharges within the Lincoln global consent area into land drains within the L2 and Halswell River catchments, the L1 Creek and into ground.

Water races as defined in Section 5 of the Local Government Act 2002 are generally used for farming purposes. Currently water race reaches do not receive point source discharges of stormwater, but they do collect overland runoff from adjacent pasture or fields and hence contribute to storm flows and contaminant loads at their end points.

The water race system within the Lincoln global consent area is used for stock water and the main reaches are maintained and cleaned by Selwyn District Council while local races are maintained by land owners. Landowners pay a rated charge based on land size and unit rate.

Key Issues

- Poor water quality
- Potential to transfer pests such as didymo from Waimakariri intake to L2 River and Halswell River catchments
- Importing of rural stormwater flows into Lincoln global consent area

Values

- Historic value, established about 120 years ago
- Ecological values, habitat for fish
- Preservation of lowland wetland species

Figure 15 Paparua Water Race at Tancreds Road

It is Councils intention to stop this water race, disconnecting it from the Lincoln and Halswell drainage networks.

4.2.5 Unnamed Ephemeral Stream

An unnamed ephemeral stream west of Ellesmere Road north of the Edward Street intersection (Figure 3) is located within the global consent area. The channel passes through a working farm. The stream is classified in the proposed NRRP as a *spring-fed plains* stream but currently groundwater levels are such that there is no spring flow. During dry periods stock is fenced in the stream bed causing sediment disturbance and faecal and nutrient contamination.

4.2.6 Halswell River

The Halswell River is a tributary of Lake Ellesmere and its catchment extents from Hornby in the north to Lake Ellesmere in the south. It has a total area of about 19,000ha. The river is fed from the western slopes of the Port Hills near Christchurch. A major contributor to the flow is Knights Stream which itself has a number of tributaries with spring sourced flows. The baseflow of the Halswell River is estimated to be about 330 L/s) below the Knights Stream confluence (Golder Associates, 2007). At Ryans Road (near Smarts Drain discharge) the base 7 day mean annual low flow is about 515 L/s (NIWA, 2001).

The Halswell River catchment was originally a swamp and the river has a large flood plain. The catchment is served by an extensive land drainage network which requires a rigorous maintenance scheme due to its flat gradient. Today the river channel has a relatively uniform profile. Land use in the catchment includes intensive agriculture and housing.

The September 2010 earthquake resulted in significant reduction of drainage capacity of the waterway by blocked drains and raised riverbeds. Ecan is in the process of restoring the drainage capacity over the coming years.

Key Issues

- Currently reduced capacity of Halswell River drainage system due to earthquake damage.
- Land use practices causing limited riparian buffer, bank erosion, stock effluent, extensive exotic organic input and raised nutrient levels.
- Loss of wetlands
- Downstream flooding in long duration rainfall events.

Values

- Valued by local community
- Use by anglers and for recreation

4.2.7 Te Waihora / Lake Ellesmere

Lake Ellesmere has an area of about 20,000 ha and an average depth of 1.4m. It is a brackish and shallow coastal lagoon with highly eutrophic water. The catchment covers an area of about 276,000 ha reaching from the foothills of the Southern Alps to the Rakaia River and Banks Peninsula. The Central Canterbury Plains make up about 75% of the catchment area. Two thirds of the lake's freshwater comes from springs. Over 40 streams and rivers discharge into the lake.

Historically the Lake Ellesmere had higher water levels and would extend from Kaitorete Spit to Tai Tapu (Source: Waihora Ellesmere Trust).

Today a Water Conservation Order regulates the artificial opening levels of the lake to the sea. The lake is artificially opened if the water level exceeds 1.05 m above sea level between August and the end of March, and 1.13 m above sea level during any period between April and the end of July. The Order also regulates the right to dam or to drain land.

Key Issues

- High nutrient and sediment concentration
- Human use of catchment including land drainage, intensive farming, clearing of wetlands

Values

- High biodiversity values
- 1990 National Water Conservation Order – outstanding wildlife habitat
- Significant for local runanga for spiritual and food gathering reasons
- Valued by local community
- Use by anglers and for recreation

4.3 Surface Water and Sediment Quality

4.3.1 Spring-fed Tributaries and L2 River

Water Quality

There are limited historical data and factual information available as to the water quality and stream health of the L1 Creek and L2 River headwaters within the Lincoln global consent area which could give an indication of the actual effects of the existing urban land use and stormwater discharges.

The median values of limited historic water quality data monitored between 1987 and 1993 by ECan in the lower L1 Creek are summarised in Table 5 together with values from spot samples carried out in 2004 - 2011.

Table 5 Water Chemistry in L1 Creek

	Dissolved Oxygen (Saturation)	Faecal coliforms	Suspended Solids	Temperature	pH	Turbitidy	Ammonia N	Nitrate + Nitrite Nitrogen	Total Nitrogen	Dissolved Reactive Phosphorus	Total Phosphorus	Conductivity
	g/m^3 (%)	n/ 100ml	g/m^3	Deg C		NTU	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3	uS/cm
Upper L1 Creek (north of Gerald Street) 11.10.2004 source not confirmed	8.2 (77)	n/a	n/a	12.3	n/a	n/a	0.022	4.7	4.8	0.007	0.012	n/a
Upper L1 Creek (north of Gerald Street) Boffa Miskell 03/2010	6.0	n/a	n/a	12.4	6.3	0-1	n/a	n/a	n/a	n/a	n/a	0.261
Lower L1 Creek Historic Median (ECan)	8.7 (79)	300	7.5	12.5	7	2	0.099	6.3	6.9	0.024	0.38	n/a
Lower L1 Creek (downstream of weir) Boffa Miskell 03/2010	7.0	n/a	n/a	11.5	6.9	9-12	n/a	n/a	n/a	n/a	n/a	0.271

There is a high community interest in the L1 Creek within Lincoln township. Lincoln Enviro Trust has carried out community water sampling activities and was assisted by the Waterwatch Programme which is based at Lincoln University. Although these samples have not been collected by scientific professionals they have been added to this description (Table 6 below) as they show some valuable information of typical characteristics of the water quality in the L1 Creek.

Table 6 Water Chemistry in upper L1 Creek sampled by Waterwatch Programme and Lincoln Enviro Trust

Date	Dissolved Oxygen	Oxygen Saturation	Faecal coliforms	Conductivity	Temperature	pH	Turbitidy	Nitrate Nitrogen	Phosphate
	g/m^3	%	n/100ml	uS/cm	Deg C		NTU	g/m^3	g/m^3
7/8/2007	9.4	87	284	187	11.7	6.8	5	2.1	0.18
9/10/2007	8.2	78	not tested	148	12	7	17	1	0.52
22/4/2008	8.6	78	1400	100	10.6	7.2	12	1	0.09
13/11/2008	7.9	77	1400	230	14.5	7	2	2	0.37
4/4/2009	8.47	77.5	not tested	303	14.8	6.8	not tested	7	0.04
6/9/2009	9.3	83	not tested	191	13	7.2	not tested	2.9	0.34
3/5/2010	7.36	69.9	3281	303	12.8	6.8	7.9	4.9	0.15
Median	**8.5**	**78**	**1400**	**191**	**12.8**	**7**	**7.9**	**2.1**	**0.18**

Water quality sampling in the L2 Headwaters was carried out in 2007 and 2010 as part of ecological studies by Talyor and Chapman (2007) and Boffa Miskell (2010, Appendix B).

Table 7 Water Chemistry in L2 River Headwaters

	Dissolved Oxygen	Faecal coliforms	Suspended Solids	Temperature	pH	Turbitidy	Ammonia N	Nitrate + Nitrite Nitrogen	Total Nitrogen	Dissolved Reactive Phosphorus	Total Phosphorus	Conductivity
	g/m^3	cfu/ 100ml	g/m^3	Deg C		NTU	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3	uS/cm
Upstream of L2 confluence 17.5.2007	8.38	350	n/a	13	7.1	n/a	0.03	4.16	4.19	n/a	n/a	n/a
Upstream of L2 confluence 03/2010	4.0	n/a	n/a	14.1	6.7	26	n/a	n/a	n/a	n/a	n/a	0.275

Table 8 Water Chemistry in L2 River downstream of L1 Creek Confluence

	Dissolved Oxygen (Saturation)	Faecal coliforms	Suspended Solids	Temperature	pH	Turbitidy	Ammonia N	Nitrate + Nitrite Nitrogen	Total Nitrogen	Dissolved Reactive Phosphorus	Total Phosphorus	Conductivity
	g/m^3 (%)	cfu/ 100ml	g/m^3	Deg C		NTU	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3	uS/cm
18.01.2011	n/a	n/a	<3	n/a	n/a	n/a	n/a	5.5	5.7	n/a	0.018	n/a

The results show a dissolved oxygen concentration in the L1 Creek and L2 River with a median just below the 80% saturation prescribed in the RMA 1991 Schedule 3: water quality classes.

The total nitrogen concentration in the L1 Creek and L2 River is moderate and above the long term concentrations of 3.3 g/m^3 N measured downstream in the L2 River at Pannetts Road. In contrast the total phosphorus concentration in the L1 Creek is well below the long term downstream value of 0.044 g/m^3 (refer Appendix G).

It should be noted that these were one off samples. The L1 Creek sampling site is subject to urban land use upstream while the L2 River sampling site is solely influenced by agricultural and horticultural land use practices. Both streams are characterised by the presence of springs. Higher nitrogen levels and lower phosphorus level could indicate that, as suggested by ECan, the source of the nitrogen is from groundwater inflow rather than from surface runoff.

The ecology report prepared for SDC by Boffa Miskell Ltd in October 2010 (Appendix B) reports on the state of aquatic ecology in the spring fed streams within the Lincoln global consent area. Regarding water quality the report makes the following comments:

'The spot water measures suggest periodic oxygen stress, pH stress and the potential for high turbidity periods. Caution must always be taken however, when inferring trends and conditions from a one off spot measure.'

'The L1 and L2 generally have "typical" poor quality lowland Canterbury aquatic habitat, with relatively good water quality as a product of the multitude of springs as the water sources. This is despite the land use practices that have not caused a riparian buffer to be maintained, bank erosion, stock effluent, extensive exotic organic input and raised nutrient levels (particularly Phosphate).'

Additional water quality sampling has been carried out in the L2 by Selwyn District Council and Golders which included testing of dissolved metal concentrations and total suspended solids. Table 13 below shows the

dissolved metal concentrations for the commonly found urban metals of lead, copper and zinc and also records TSS.

Table 9 Metal and TSS levels in L2 River (50m downstream of L1/L2 confluence)

	Total suspended solids	Dissolved Copper	Dissolved Lead	Dissolved zinc
	g/m^3	g/m^3	g/m^3	g/m^3
18 Jan 2011 (high flow) (SDC)	<3	<0.0005	<0.0001	<0.0010
17 Feb 2011 (low flow) (SDC)	<3	<0.0005	<0.0001	<0.0014
Max value from 5 readings between 7 - 16 March 2011 (low flow) (SDC)	5	<0.0005	<0.0001	0.0016
8 June 2007 (high flow) (Golder)	3	<0.0005	-	0.002
15 Feb 2008 (high flow) (Golder)	18	0.0014	<0.0001	0.0027
24 July 2008 (high flow) (Golder)	67	0.0024	0.00012	0.0091
Water Quality standard for 95% protection level	na	0.0014	0.0034	0.008

The results in Table 9 show low dissolved metal concentration in the L2 River in both low and high flow conditions. The metal levels are below the 95% protection level (spring fed plains rivers PNRRP WQL4 Table WQL17) in all but one high flow sample where copper and zinc levels were elevated.

Sediment Quality

The same October 2010 Boffa Miskell Report (Appendix B) also investigated sediment quality and concluded the following:

'The sediment samples in relation to ANZECC 2000 sediment quality guidelines, do not trigger any of the ISQG – Low value triggers, suggesting a low current accumulation of common urban related metals.'

'However, all values of nitrogen products are currently very low in the sediments, while the total phosphorus is relatively high 230-540 mg/kg dwt and highest in the lowest river sites.'

Key Issues

- Elevated nutrient concentrations in water
- Elevated phosphorus concentration in sediment
- Periodic oxygen stress

Values

- Good water quality as a result of spring water contribution
- No elevated metal concentrations in sediment despite prolonged untreated urban stormwater discharges

4.3.2 L2 River Downstream - Water Quality

The following quote was taken from an earlier Lincoln ISMP Stage 1 Report (URS 2006a) and refers to monitoring in the L2 River at Pannetts Road Bridge which is approximately 10km downstream of Lincoln Township:

... 'Environment Canterbury have a long term monitoring site on the LII, and take occasional samples from the LI. The Living Streams programme report summarises water quality monitoring at Pannetts Rd. Suspended solids concentrations over the 10 year period fluctuated between approximately 0.9 and 10 mg/l, however several 'spikes' of higher values have occurred, mainly between 1994 and 1997. Nutrients (nitrogen and phosphorus) were constantly above guideline levels, with all forms of nitrogen being above guideline values. Nutrients such as these are commonly associated with rural land uses, and stock access to waterways (phosphorus in particular is transported with soil). The Living Streams assessment determined that 42% of the lower LII riverbank was unfenced. The Living Streams programme also attributed a loss in invertebrate populations, and general habitat to channel modification and drain cleaning via mechanical methods.'

There seems to be a consensus on the compromised water quality of the L2 River downstream. ECan has identified groundwater inflows (springs) and agriculture as nitrogen sources within Lake Ellesmere Tributaries. Urban development has been shown to have very minor effects on metal concentrations in sediment.

4.3.3 Water Races – Water Quality

Water quality in water races, while primarily derived from the race system river sources, can be adversely affected by runoff from agricultural land which finds its way into the system through overland flow. Contamination also occurs directly by stock access to the water races.

Limited race water quality data are available. In 1997 the water race reach discharging into the headwaters of the L1 Creek was sampled on three occasions between October and December. Analysis was carried out and is summarised in Table 10 below.

Table 10 Water Quality - Paparua Water Race (L1 Creek Headwaters)

	Dissolved Oxygen (Saturation)	Faecal coliforms	Suspended Solids	Temperature	pH	Turbitidy	Ammonia N	Nitrate + Nitrite Nitrogen	Total Nitrogen	Dissolved Reactive Phosphorus	Total Phosphorus	Conductivity
	g/m^3 (%)	cfu/ 100ml	g/m^3	Deg C		NTU	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3	uS/cm
30 Oct 97	n/a	>2000	n/a	n/a	n/a	34	0.046	n/a	0.6	0.006	0.086	n/a
06 Nov 97	n/a	320	n/a	n/a	n/a	6.5	0.026	n/a	0.43	0.012	0.037	n/a
11 Dec 97	n/a	660	n/a	n/a	n/a	3.6	0.035	n/a	1.7	0.019	0.037	n/a

Water quality data in the Paparua Water Race show similar dissolved reactive phosphorus concentrations to the L1 Creek. The water race has slightly lower concentrations of total phosphorus.

Ammonia nitrogen concentrations are at similar levels, but total nitrogen concentrations are lower in the water race. This could indicate the contribution of nutrients in groundwater inflows to the L1 Creek.

There is the possibility of uncontrolled discharges of contaminant loads including animal faecal matter, from the water race into the headwaters of the L1 Creek and hence in the L1 Creek flows through Lincoln Township and on to the L2 River.

4.3.4 Smarts Drain – Water Quality

No recent water quality information is available. Records from sampling in 1986 are presented in Table 11 below. The water quality in this drain is expected to be generally similar to that in the Paparua Water Race, as this feeds into the drain. Adjacent agricultural activities are likely to influence the water quality. Elevated concentrations of nutrients (nitrogen and phosphorus), bacteria and suspended solids are likely.

Table 11 Water Quality in Smarts Drain

	Dissolved Oxygen (Saturation)	Faecal coliforms	Total Suspended Solids	Temperature	pH	Turbitidy	Ammonia N	Nitrite and Nitrate Nitrogen	Total Nitrogen	Dissolved Reactive Phosphorus	Total Phosphorus	Conductivity
	g/m^3 (%)	cfu/ 100ml	g/m^3	Deg C		NTU	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3	uS/cm
1 Oct 86	10.4 (93)	-	86	10.1	7.3	-	0.329	-	-	0.077	-	-
3 Sep 86	8.5 (71)	-	15	7.5	-	-	-	2.6	-	0.06	-	-
5 Aug 86	12.2 (94.2)	-	37	4.4	-	-	-	0.235	-	0.175	-	-

4.3.5 Lincoln Main Drain – Water Quality

Water quality in Lincoln Main Drain was investigated by Golder Associates in June 2007 at three sites at base flow conditions (Table 12). The water quality was characterised by cool temperatures, near neutral pH, slightly depressed oxygen saturation and a low concentration of suspended solids. Total phosphorus and dissolved metal concentrations were moderate, some sites in excess of guideline values. Total nitrogen concentrations were elevated at all sites.

Table 12 Base Flow Water Quality Data Lincoln Main Drain

	Dissolved Oxygen (Saturation)	Faecal coliforms	Total Suspended Solids	Temperature	pH	Turbitidy	Ammonia N	Nitrite and Nitrate Nitrogen	Total Nitrogen	Dissolved Reactive Phosphorus	Total Phosphorus	Conductivity
	g/m^3 (%)	cfu/ 100ml	g/m^3	Deg C		NTU	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3	uS/cm
8 June 2007 (Golder Associates, 2008)	7-8.3 (58-69)	-	<3-8	7.5-11.3	6.4-6.8	-	0.01 - 0.08	-	1.2-9.4	0.004 - 0.139	0.04 - 0.3	20.9 - 28.6

Table 13 High Flow Metal and TSS levels in Lincoln Main Drain (upstream of L2)

	Total suspended solids	Dissolved Copper	Dissolved Lead	Dissolved zinc
	g/m^3	g/m^3	g/m^3	g/m^3
15 Feb 2008 (Golder)	29	0.0031	0.0003	0.011
24 July 2008 (Golder)	120	0.0034	0.0002	0.026
4 Sept 2008 (Golder)	26	0.0016	0.0001	0.015
Water Quality standard for 95% protection level	*na*	*0.0014*	*0.0034*	*0.008*

Lincoln Main Drain currently receives stormwater discharges from Lincoln University and some residential areas in Lincoln township. Sampling during high flow conditions showed an increased concentration of suspended solids. Golder Associates (2008) noted a general increase in stormwater derived contaminants such as suspended solids and metals while nutrients typically associated with rural activities showed no clear trend. On two occasions sampling was taken in the downstream L2 River and Lincoln Main Drain during the same storm event and the effect of mixing and dilution can be seen. Although copper and zinc levels were above the 95% toxicant protection level in the Lincoln Main Drain samples, due to mixing the levels measured downstream in the L2 River were greatly reduced.

4.3.6 Lake Ellesmere and Tributaries

Despite its high values and its significance as a wildlife habitat, Lake Ellesmere experiences persisting problems with high nutrient concentrations and elevated biomass. It is categorised as being in a hypertrophic state. Lakes of this category are highly fertile (supersaturated in phosphorus and nitrogen) have low visibility and low dissolved oxygen levels. Their use for recreation purposes is compromised and they are also limited as habitat for desirable aquatic species (Source: www.bop.govt.nz).

Figure 16 below shows the nutrient mass load transport into Lake Ellesmere from nine tributaries including the L2 River and the Halswell River. The blue bars show the 2005/2006 data and the red bars the long-term data. It can be seen that the Halswell River, Doyleston Drain, Harts Creek and the L2 River are the main nutrient contributors for total phosphorus and total nitrogen.

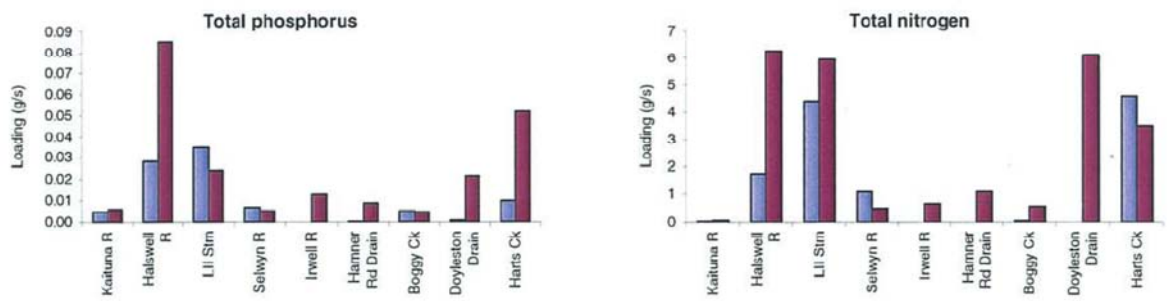

Figure 16 Median Mass Loading of Nutrients from Nine Lake Ellesmere Tributaries

Limited flow and water quality data suggest that during dry weather conditions the spring flow in the global consent area contributes about 9 % of the total nitrogen load reaching Lake Ellesmere from its tributaries. As noted above, this nitrogen is expected to have entered the aquifer up-gradient of the Lincoln global consent area

as a result of farming practices. The change in land use in the global consent area from farming to mainly residential is expected to slightly reduce nitrogen loads.

4.4 Aquatic Ecology

4.4.1 Spring-Fed Streams in Global Consent Area

The Aquatic Ecology Study undertaken by Boffa Miskell (Appendix B) establishes a baseline on current aquatic stream quality in all spring fed streams within the global consent area. The focus was on investigating sites that would receive future stormwater discharges and not the upper catchment springs. The investigation included the collection of water quality data, habitat and aquatic fauna data at seven sites in L1 Creek, L2 River and Springs Creek.

The investigations found that at all sites the aquatic habitat is disturbed and degraded. The fauna are representative of a polluted and stressed system. The existing fauna is found to be very tolerant of a wide range of water and habitat conditions.

Sediment samples show that there is no significant accumulation of metals. This indicates that current treated and untreated stormwater discharges do not have a significant effect on sediment contaminant levels.

Fish have not been surveyed, but brown trout, eel and two species of bully are the only expected resident fish species within the global consent area.

Key Issues

- Excess of soft substrate
- Nutrient inputs (nitrogen and phosphorus)
- Riparian modifications (including exotic and deciduous tree cover)
- Bank erosion
- Stock effluent

Key Values

Historically the L1 Creek and L2 River have been of high importance to iwi for mahinga kai. This was partly because these streams used to be part of a large swamp. It is believed that fishing was limited due to poor access.

4.4.2 Land Drainage Systems

Land drains are generally defined as part of the district stormwater conveyance and disposal network and not as waterways of any amenity or ecological value. They require regular maintenance to remove weed growth and sediments to ensure their flow capacity is maintained. ECan's Living Streams Project noted that stock access to water in drains has the potential to influence the drain water quality and hence the water quality of the L2 River.

A study of drains in the south of Lincoln Township undertaken by Boffa Miskell (2001) presented the following findings:

- *The drains are generally of low habitat value.*
- *The drains are predominantly straight with little heterogeneity in structure or form.*
- *The drains are grazed to the edge.*
- *The drains often have an evident silt layer on vegetation and debris.*
- *Banks are often unstable.*
- *In smaller slower flowing drains the water surface is completely covered in species such as the native Azolla filiculoides.*
- *Introduced watercress (Rorippa microphylla) occurs in the slightly more open drains.*

- *Very occasional riparian Carex secta and Juncus spp. are present.*
- *In the larger drains with a more consistent water supply upland bully, eel and even trout may occur but the present habitat values for these species are low.*

Key Issues

- Low habitat value
- Lack of fencing / stock access
- Unstable banks
- Silt layer
- Regular maintenance required

Key Values

- Draining land to make it usable for agricultural and urban land use

4.5 Surface Water Quantity

4.5.1 Low Flows and Base Flows

L2 River Catchment

Base flows in streams and drains in the global consent area mainly originate from the output of numerous springs. In the headwaters of the L2 River excess flow from the Paparua water race usually contributes to the base flow, although this flow may be stopped at times by upstream activities. Table 14 shows **estimated** base flows of streams within the global consent area.

Table 14 Estimated Base Flows in Global Consent Area

Stream / River	Location	Flow Rate	Data Source
L1 Creek	Upper Liffey Reserve	100L/s	Estimate only
L2 River	Headwater	120 L/s	AEL, 2007
L2 River	Moir's Property (just upstream of L1 Creek confluence)	220 L/s	AEL, 2007
Lincoln Main Drain	L2 River confluence (below proposed wetland	140 L/s	Kerr, 2010
Springs Creek	L2 River confluence	200 L/s	Estimate
L2 River (12km downstream)	Pannetts Road	2,000 L/s	ECan

At Moir's property the estimated 7 day mean annual low flow (7DMALF) is about 200L/s (ECan, 2007b).

Regular flow monitoring for the L2 River catchment is undertaken by ECan at Pannetts Road. This is also the regular water quality monitoring site. The site is located approximately 12 km downstream of Lincoln Township. The monthly flow record started in September 1993 and is ongoing. The flow has varied between 0.83 m^3/s to 3.5 m^3/s with a median value of 2 m^3/s. The highest flows were generally recorded in the winter months from July to September and the lowest during summer. The 7DMALF is 1824 L/s (ECan 2007b).

Some other drains have also inflows of spring water and therefore have a base flow. Those flows have not been quantified.

Halswell River Catchment

Parts of the Lincoln global consent area drain into drains and creeks discharging into the Halswell River system which then drains into Lake Ellesmere. This discharge occurs near the monitoring site at Ryans Bridge on the Lincoln Old Tai Tapu Road. The 7DMALF of the Halswell at this site is estimated to be about 515 L/s (ECan 2007b).

Paparua Water Race

Excess water from stock water races discharges either into open drains in the Halswell River catchment or the L2 River catchment and contributes to river flows. At some locations water race excess water discharges into ground.

As part of the Paparua Water Race System Review (Agriculture New Zealand et al. 1997) flow measurements of strategic points of water race sections were carried out on 19 and 20 November 1996 of an intake of 655 L/s from the Waimakariri at Halketts Road a flow of 8 L/s was measured in the water race at Birchs Road (300 m south of Tancreds Road) and 7 L/s near the rubbish collection area (University). No flow measurement was taken at Boundary Road at the golf course. It was believed that these data represent the base flow of the system with no major irrigation occurring these days. It was estimated that about 20 L/s excess water is discharged into the land drainage system around Lincoln in dry weather conditions.

Water race flows must continue to be provided for in development proposals. Outline development plan criteria for Lincoln will require allowance to be made for those flows. It is possible that these races may be closed in future. Consultation has yet to occur on that.

Key Issues

- Groundwater springs are the main source for flows within the global consent area during base flow conditions.

4.5.2 Flooding

Aerial photographs obtained from ECan show widespread flooding in the L2 River and Halswell River catchments during a long duration rainfall event in August 1986. From 21 August to 24 August 1986 the NIWA rain gauge at Lincoln Broadfield recorded a total rainfall of 80mm.The event was estimated to have a 2 to 5 year return period for a storm of 24 to 72 hour duration. GIS data obtained from ECan (Figure 17) show the extent of the flooding for flood events in the years 1977, 1986 and 1992.

L2 River Catchment

The lower reaches of the L2 River, including the area adjacent to the eastern boundary of the Lincoln global consent area, are located within the Lower Plains Flood Area or the Lake Ellesmere Flood Area (Figure 17). These areas were identified by Environment Canterbury for District Planning purposes and were significantly affected by flooding during long duration rainfall events in the past. The boundaries were determined using historical photographs. The flood return period is estimated to be approximately 20 years. The degree of flooding within these areas can vary due to local topography. Flooding is also possible in areas outside this zone (pers. communication Richard Holmes, ECan, 2007).

The critical duration for the entire L2 Catchment at the mouth of the L2 River (Te Waihora) is 7.5 hours (calculated by Kerr 2009 and accepted by ECan). Maximum flows from the ISMP modelling area modelled just downstream of the confluence of Lincoln Main Drain and the L2 River also occur at events of 6 hour duration (Appendix C).

Flooding in the L2 River catchment can be worsened by extensive submerged weed growth in the river channel which was found to cause water level rises from 23 to 97 cm in reaches between the Lincoln oxidation pond and the mouth (Ward, J. et al., 1997). This indicates the importance of regular weed clearing and maintenance programmes and access. It also indicates the importance of designing conveyance, attenuation and treatment systems to avoid backwater effects on upstream land uses.

A researcher at the University of Canterbury recently completed a study analysing the impact of sea level rise on Lake Ellesmere and the L2 River (Samad, 2007). Samad has concluded that there will be no significant flooding effects within the Lincoln modelling area as result of the increased water levels in Lake Ellesmere.

Halswell River Catchment

No particular investigations have been undertaken or data obtained regarding flow monitoring and flooding issues in the Halswell River Catchment. From consultation with ECan it is understood that there are existing significant flooding problems within the catchment. (Tony Oliver, pers. communication). The Lower Plains Flood Zone, which is the Halswell River flood plain identified by Environment Canterbury, is adjacent to the boundary of the Lincoln global consent area and has been flooded in the past as shown on Figure 17 which shows the extent of historical flooding.

Cleaning silt deposited during the Septbember 2010 earthquake is being carried out to restore the capacity.

Paparua Water Race

Some overland runoff from roads and undeveloped agricultural land can enter water races and therefore increase the flow during rainfall events. Although they are formally not classed as drains, storm inflows are not excluded from them so in effect they are part of the overall drainage system. Waterraces will be stopped prior to the current

Lincoln and Halswell connection points and discharged to ground or headworks flows reduced to meet end of line (rural) needs.

Key Issues

- Widespread downstream flooding during long duration events in the catchments of Halswell River and L2 River.
- Minor effects on downstream global consent area flood volumes.

4.5.3 Stormwater Modelling

Stormwater modelling has been carried for the current development and for the planned future development. The report on this is provided in Appendix C.

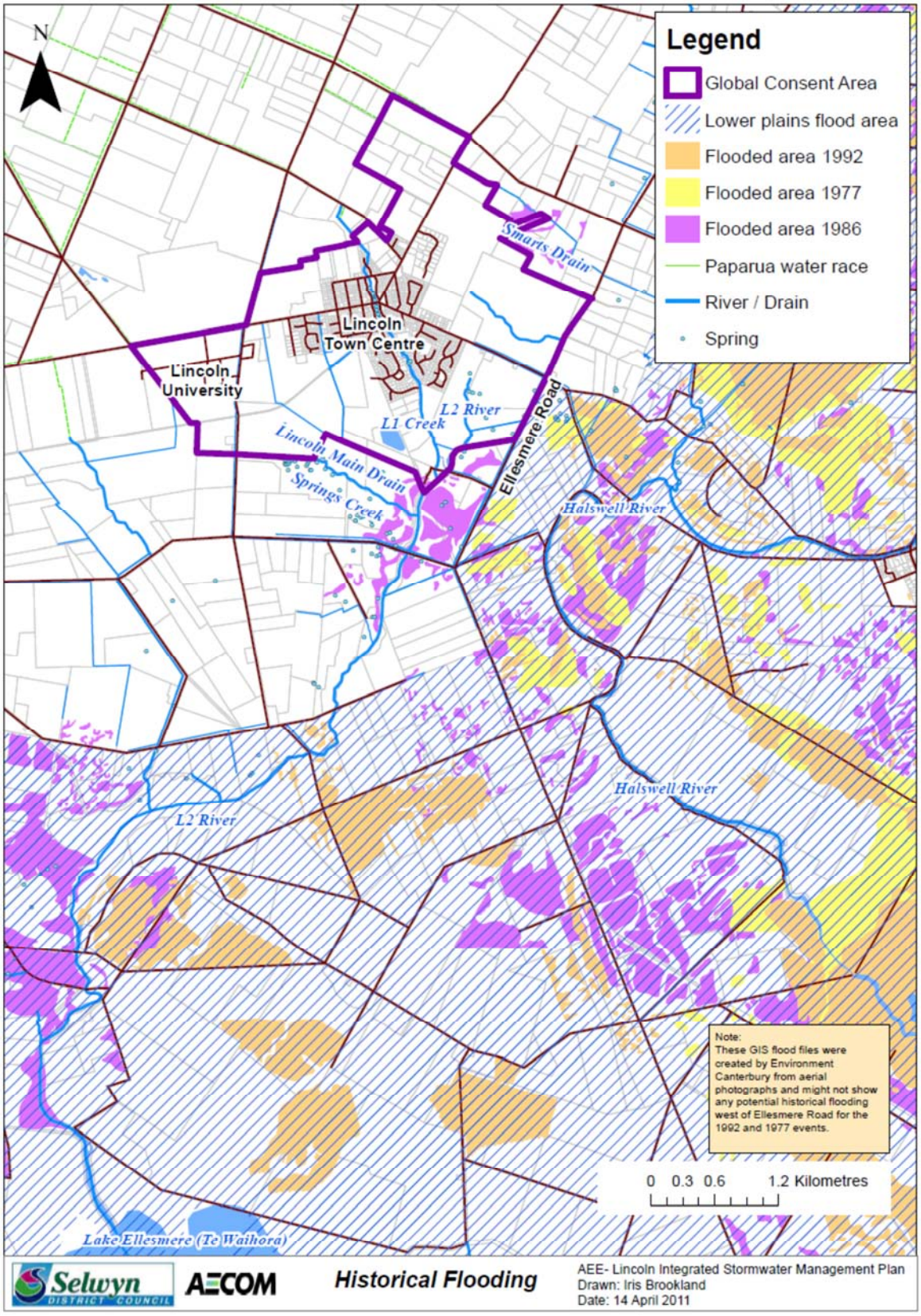

Figure 17 Historical Flooding

4.6 Soil Drainage Properties

There is a considerable variation in soil type and structure across the Lincoln modelling area. To the south, the land is typically lower, and the soils are heavier and poorly drained. Further to the north and west, the land rises and the soils become lighter in structure and more free-draining. These characteristics, which significantly affect stormwater infiltration capacity, are illustrated in Figure 18. These data have been obtained from the Lower Plains and Downs Soil database.

Various soil samples taken in the north eastern part of Lincoln global consent area show significant clay contents in soils that appear as moderately or imperfectly draining on Figure 18. This suggests an overall low drainage capacity over the modelling area to be developed and highlights the need for individual site investigations to determine the feasibility of stormwater disposal to ground.

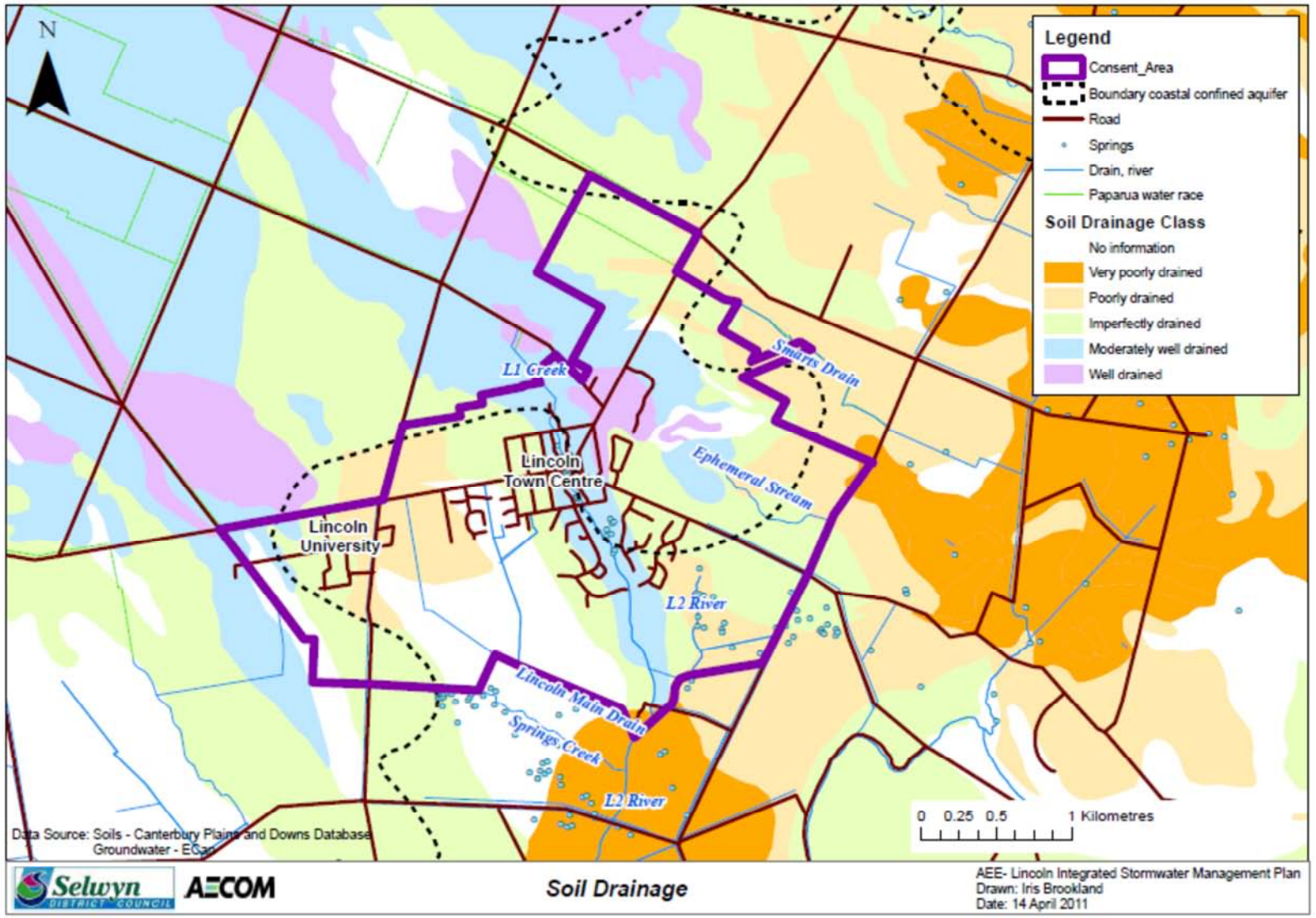

Figure 18 Soil Drainage

4.7 Groundwater and Topography

Land in the Lincoln modelling area generally slopes from the northwest towards the southeast. Surface levels are approximately 25m above mean sea level in the northwest corner, sloping down to just over 4m at the south-eastern corner, as indicated on Figure 19. The horizontal distance from the northwest to southeast corners is approximately 6,000m. The approximately 21m fall over this distance equates to an overall average surface grade of approximately 0.35% or 1 in 285.

Groundwater in the modelling area generally flows southeast towards Lake Ellesmere. Shallow bore high water level information indicates that shallow groundwater levels can rise to ground level in the south east corner. This indicates a peak level overall average groundwater gradient of approximately 0.3% or 1 in 300. The approximate overall gradient in the southern areas, as indicated in Figure 19 below, is expected to be approximately 0.2% (1 in 500) or flatter.

There is strong anecdotal evidence from locals, developers and the L2 Drainage Committee that the area in the southeast of the Lincoln modellling area is very wet and not suitable for development or dairy farming due to low ground levels and a high water table. The limited factual data available, summarised below, supports that conclusion:

- There are many springs found in this area
- Ground surface levels (digital elevation model) and piezometric contour levels are similar. The difference is between 2m and 0.5 m. However, piezometric contour data are only indicative. The purpose of piezometric contours is to identify ground water flow direction within an aquifer.
- At well M36/0509, which is a shallow well (4m depth) located at Lincoln University, limited monitored groundwater levels generally vary between 0.5m and 3m below ground level and average at 2.1m.
- There have been problems with retention basins south of Gerald and Edward Street in Lincoln with groundwater inflows due to high water tables.

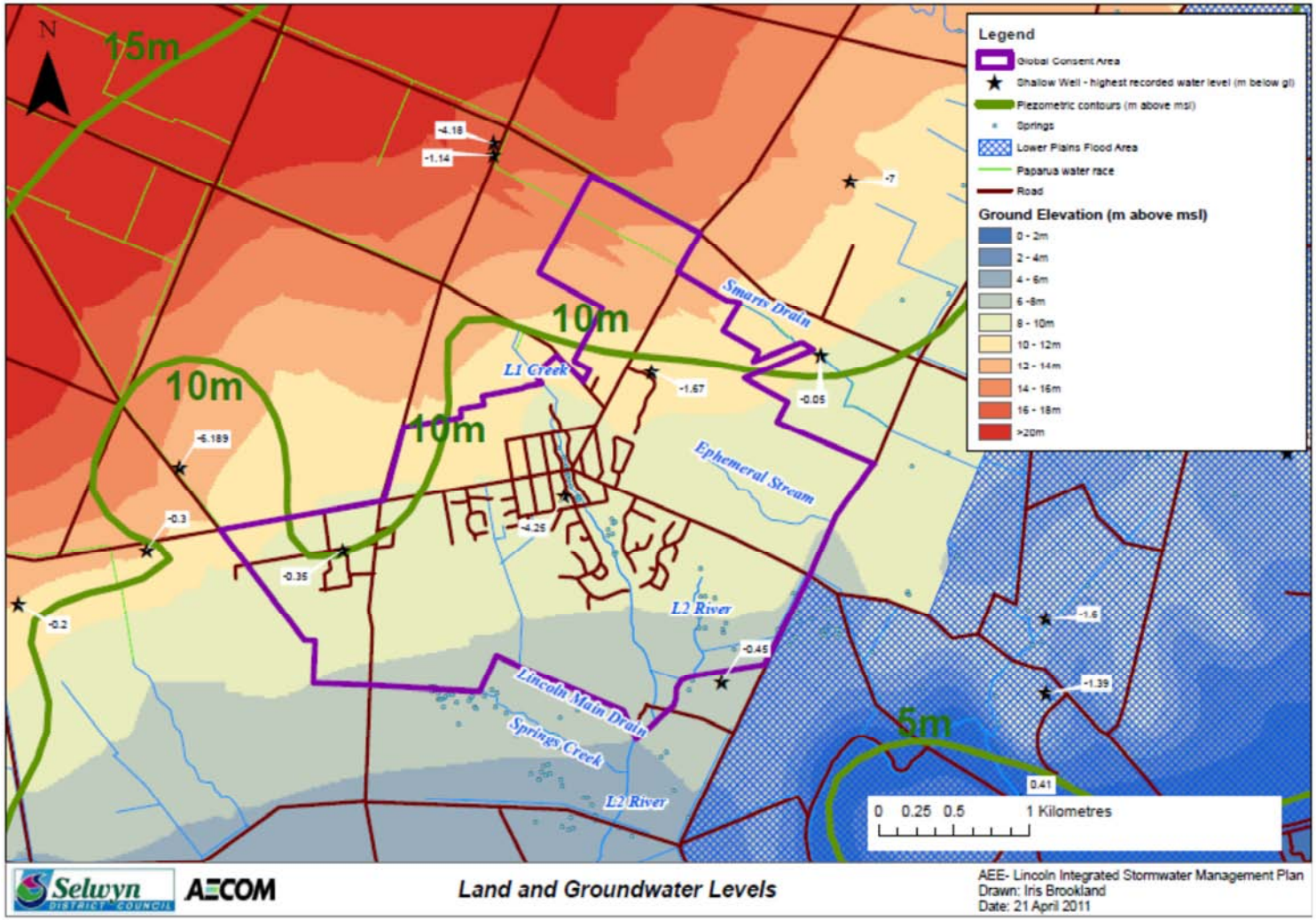

Figure 19 Topography and Water Table

Groundwater Regional Context (Quote from URS, 2006a)

The aquifers underlying the central plains are bordered in the north by the Waimakariri River and in the south by the Rakaia River. The glacial outwash deposits of these rivers have formed the central plains, with the Waimakariri River deposits accounting for approximately two-thirds of the central plains area and extend as far south as the Selwyn River (Brown, 2000). The upper to mid areas of the plains are characterised by the presence of unconfined to semi-confined aquifers. The aquifers coalesce towards the coast into the confined aquifers of the Christchurch artesian system that underlies the central plains coastal sector from the Waimakariri River to Taumutu north of the Rakaia River mouth (Brown, 2001). The migration of the Waimakariri River to the south of Banks Peninsula occurred numerous times during the past, with the mouth of the river located south of the Peninsula frequently during interglacial periods (Brown, 2002). The Waimakariri, Selwyn, and Rakaia rivers all connect to the artesian aquifer system south of Banks Peninsula. Groundwater levels do vary, with the depth to water generally being greater further away from the Waimakariri River. Groundwater contours show a general trend of flow east to southeast, from Halkett and the Waimakariri River towards Christchurch and Lake Ellesmere (Brown, 2000). The dominant groundwater inflows come from seepage losses from the Waimakariri River. The highest density of bores is located near State Highway One, where development of rural lifestyle blocks is occurring. Water use includes public water supply, domestic and stock water, as well as for irrigation. Groundwater in the central plains area is considered to be highly allocated by the Regional Council, with the Selwyn – Waimakariri groundwater zone classified by Environment Canterbury as over allocated.

Local Context (Quote from URS, 2006a)

The aquifers underlying Lincoln are characterised as leaky confined aquifers, with the top of the first confined aquifer occurring between one and ten metres below ground level, depending on the surface confining layer boundary. While the depth of the confined aquifers are not as well defined in this area as they are around Christchurch, hydrogeological cross-sections do indicate the presence of the Riccarton, Linwood, Burwood and Wainoni Gravels extending inland from the lake. However, the aquifers in this zone become less defined and continuous further inland from the Lake Ellesmere.

The aquifers in the Lincoln area are predominantly artesian, with artesian pressures increasing with depth. Groundwater levels in the first aquifer approach ground surface generally towards the east and south of the township and coincide with the surface confining layer. There are numerous springs in the zone (Earl, 1997), and are sourced from the upper most aquifer, the Riccarton Formation. They occur generally at the boundary of the confined-unconfined zone, where water is forced upwards, or they may reach the surface through a vent in the uppermost confining layer, the Christchurch/Springston Formation. This is evident in the L1 River that flows through the eastern end of the township, where numerous springs discharge groundwater into the stream. The drains and streams in this zone are fed by gravity springs at the boundary of the confined and unconfined zones, and artesian springs from the upper confined aquifer. Inputs to the groundwater system in this area come from throughflow from the Waimakariri River with rainfall contributing to the shallow aquifer further with distance from the river (Steward, Trompetter and van der Raaij, 2002). The west of Lincoln groundwater inputs have been classified as being predominately rainfall or Selwyn River recharge. Groundwater outputs are into spring-fed streams and groundwater abstractions, and throughflow into the aquifer system around Lake Ellesmere. While there is a layer of confining sediment present in and around Lincoln, the extent of this layer is variable. The first aquifer (Riccarton Gravels) may be unconfined, i.e. the water table is below the limit of the surface aquitard where it exists. A situation of high seasonal summer abstractions, and low recharge rates (as in the 1997/98 and 1998/99), mean that the aquifer fluctuates from confined to unconfined as water levels drop.

Springs

There are numerous mainly permanent springs found in the Lincoln global consent area (refer Figure 19). They form the main water source of the L1 Creek, the L2 River and Springs Creek. Most springs are classified as artesian while the type of a number of springs in the south west of the global consent area is undetermined. The springs in the Global consent area are most likely to be sourced from the shallowest aquifer the Riccarton Formation (Earl, 1998). They generally occur at the boundary of the confined and unconfined zone where the confining layer is thin or more permeable.

<u>Key Issues</u>

- General trend in inland Canterbury Plains of declining ground water levels and stream depletion. The number of springs declined over the last 50 to 100 years.
- Springs have been dug out and piped out of paddocks, knowledge lost over the years.
- Likelihood of increased flows and groundwater levels if Central Plains Water project goes ahead resulting in increased groundwater recharge upgradient of Lincoln.

Values

- Main permanent source of streams within the global consent area
- High associated cultural values for Ngai Tahu (see Section 4.9)

4.8 Water Use

Surface Water Takes

There are seven current consented surface water takes within the Lincoln modelling area (Figure 20). Two consents allow water to be taken from the L1 Creek for the purpose of cropping, two consents allow water to be taken from the Springs Creek and Lincoln Main Drain for the purpose of dairying and the other three water takes have no specified use.

Groundwater Use

The community water supply wells including the Community Drinking Water Supply Protection Zones as identified in the NRRP are shown in Figure 21. Lincoln is well served by groundwater artesian bores, located at Gerald Street – West Belt, Kildare Terrace, and a small bore at Millstream Drive. These bores are classed as secure and no treatment is required. The urban area is fully reticulated. Further community supply bores may be required for future growth and to provide a more secure networked system. Residents in rural areas rely on individual wells for domestic and agricultural supply as shown in Figure 21.

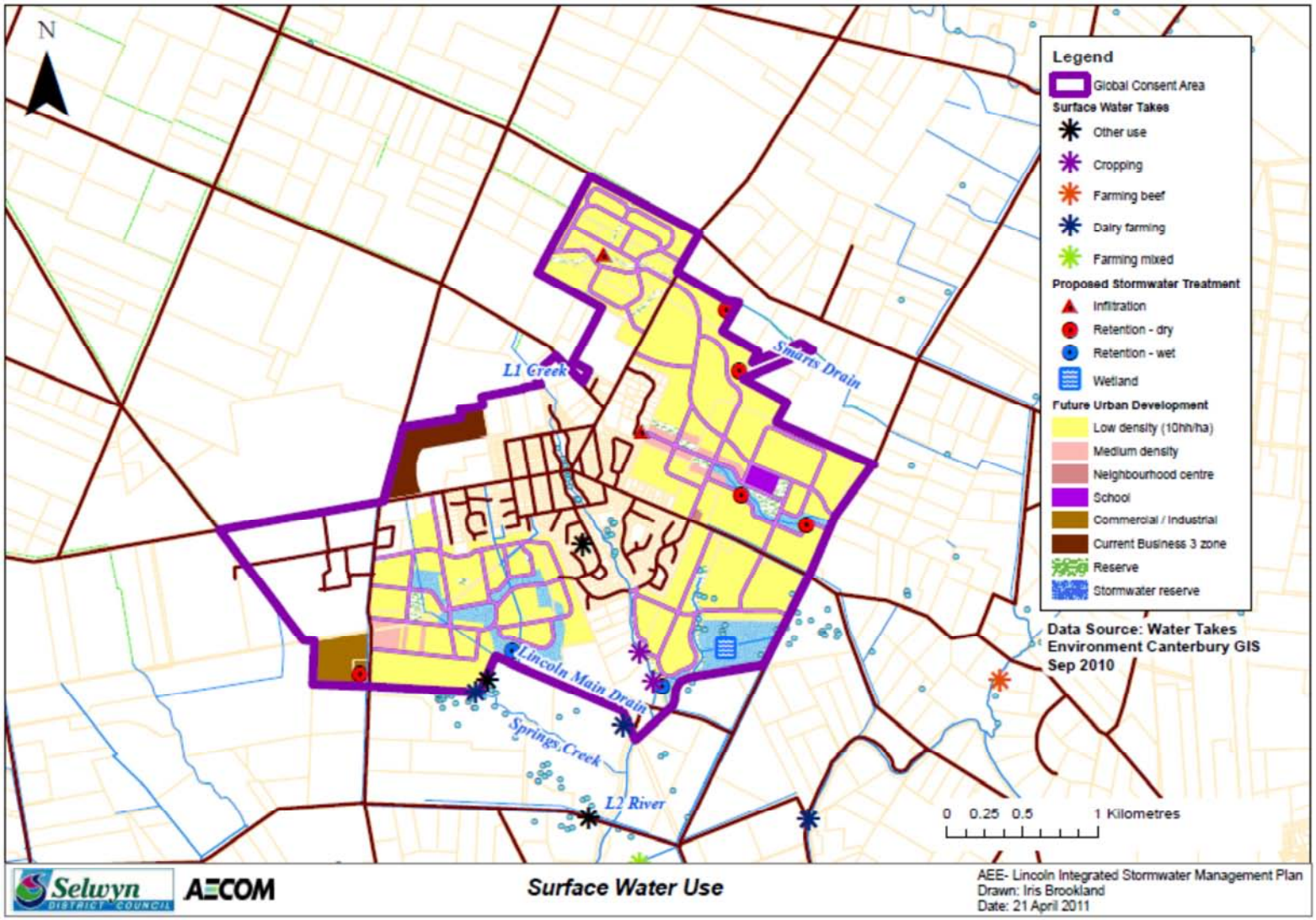

Figure 20 Surface Water Takes

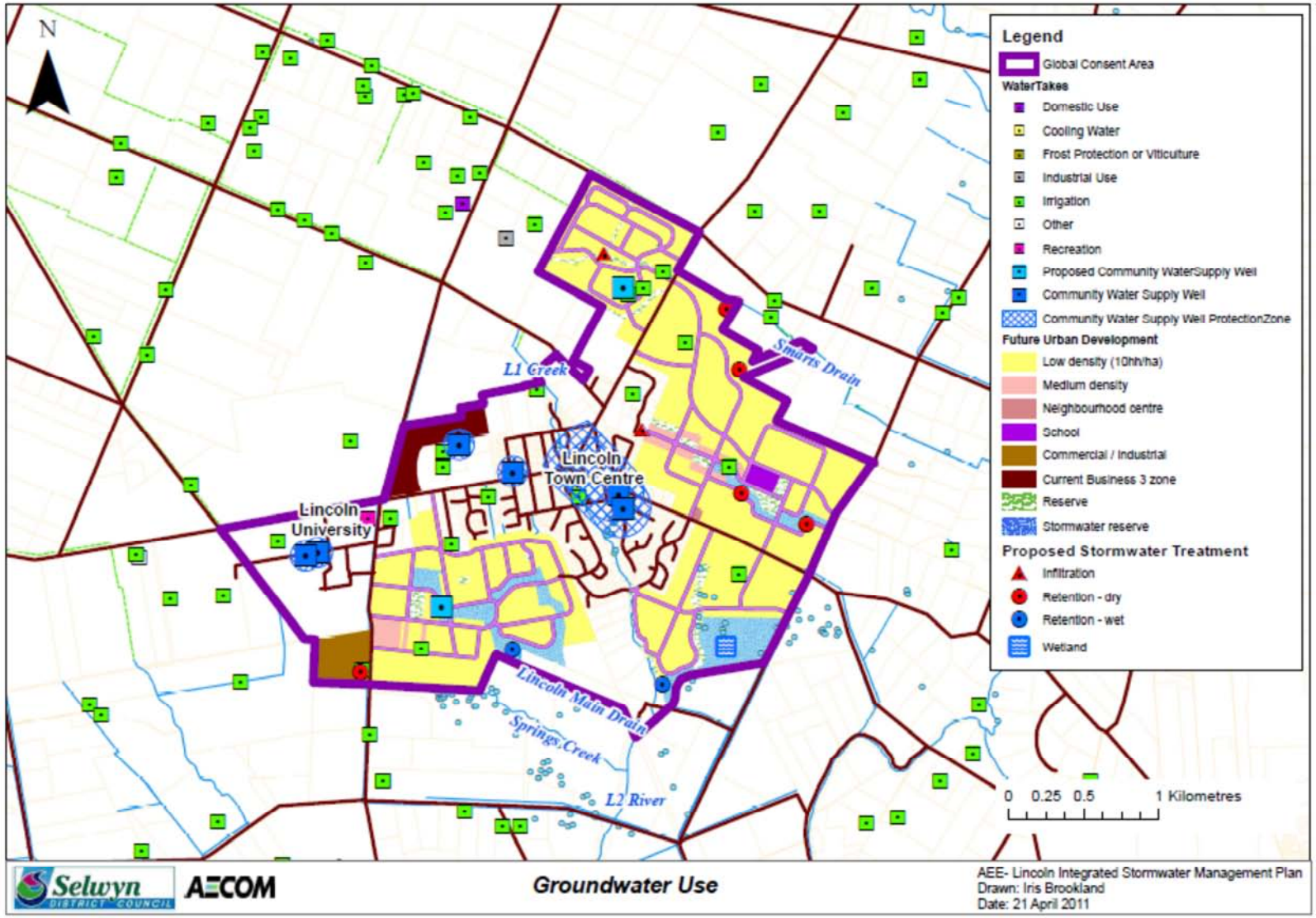

Figure 21 Groundwater Use

4.9 Cultural Values

In Ngai Tahu culture water plays a central role. Through the availability of mahinga kai and the ability to exercise kaitiakitanga over their resources, ancestral connections to the springs and rivers are maintained.

Te Taumutu Runanga are the Kaitiaki Runanga of all waterways in the global consent area.

Historically the waterways in the Lincoln global consent area were of significance for mahinga kai including traditional kainga and habitation sites. The damage, decline and loss of mahinga kai in the global consent area has been and continues to be a serious concern to Ngai Tahu. The waterways are also significant as tributaries and source waters of Te Waihora, which is a taonga of great significance for Ngai Tahu.

Waipuna (springs) are of particular significance to Ngai Tahu as they source the L1 Creek and the L2 River which in turn feed Te Waihora. For Ngai Tahu the mauri or life-giving and life-supporting capacity of the springs, wetlands, ground and surface waters of the L1 Creek and L2 River as well as Te Waihora is of vital importance.

Within the global consent area, protection of the integrity of waipuna from stormwater and best practice treatment of stormwater before discharge to natural waterways are key mechanisms that have been agreed between Ngai Tahu and SDC. Development of riparian management requirements is also under way.

5.0 Consultation

5.1 Introduction

Consultation has been ongoing over the entire stormwater management plan and structure planning process. This section describes the most recent consultation activities on specific stormwater management matters as well as initial stormwater management related consultation carried out in conjunction with the Lincoln Structure Plan.

5.2 Combined Consultation

5.2.1 Initial Consultation

Advertising Consultation

The first phase of the consultation process involved the preparation and publication of a public notice in the 'Council Call' section of the Central Canterbury News (CCN) within three consecutive editions, commencing on 16 January 07. The purpose of this notice was to raise public awareness of the commencement of the Integrated Stormwater Management Plan and Structure Plan process. The notice also provided an outline of the consultation strategy that was to be undertaken and encouraged participation of all interested persons.

Early Consultation with Te Taumutu Rūnunga

A meeting was held with Maani Stirling of Te Taumutu Rūnunga on 9 February 07 to discuss how the rūnunga should be consulted in terms of the Structure Plan and Integrated Stormwater Management Plan process. Prior to the meeting a report was prepared by Andrew Mactier (Policy Planner, Selwyn District Council) to provide an overview of the baseline information on Te Taumutu Rūnunga values and principles.

At the meeting the purpose of the study and Integrated Stormwater Management Plan were explained to Mr Stirling. He indicated that the main issues for the Rūnunga would be around water quality and its effects on the waterways and Te Waihora (Lake Ellesmere).

Township Committee Consultation

Specific consultation was undertaken with specific groups, including the Lincoln Township Committee and the community-based Lincoln Envirotown Trust.

Focus Group Consultation

Consultation with key stakeholders was seen as a means of obtaining information and initial thoughts and ideas on the development of a Structure Plan and Integrated Stormwater Management Plan. A list of key stakeholders was drawn up in early January and broken down into the following focus groups:

Group 1 Environment Canterbury, Department of Conservation, Lincoln Envirotown Trust, L2 Drainage Committee, Waihora Ellesmere Trust;

Group 2 Developers and landowners known to want to develop their land, including Lincoln University, SDC Corporate Manager;

Group 3 Crown Research Institutes, Lincoln University, Lincoln University Students Association;

Group 4 Lincoln Business Association, SDC Economic Development Officer, Federated Farmers;

Group 5 Lincoln Community Committee, Lincoln High School, Lincoln Primary School, Lincoln Domain Management Committee, Lincoln and Districts Community Care Association, Ministry of Education, SDC Lincoln Library.

The meetings with the five focus groups were held on the 13th and 15th of February 2007. All focus group members were invited to attend a presentation on the last day of the Design Workshops held on 2, 3 and 4 April 2007.

In addition to questions relating to structure planning aspects a number of questions with regard to stormwater were asked. The feedback from the focus groups was excellent. It was brought together in one document and presented in the Status Report (Maunsell and PLANIT, 2007). The broad matters raised regarding the ISMP process are identified below.

Flooding and ponding

There was a clear indication that the area in the southern section of the Lincoln global consent contains a number of springs and is prone to ponding as a result of the high water table and prevailing soil types.

Land ownership and use

A number of different land uses exist in the rural component of the Lincoln Global consent area, including educational and research activities, intensive and extensive farming activities, community facilities, recreational activities and waste disposal.

Landfills and contaminated land

There is a closed SDC landfill located on Weedons Road. Some areas of potentially contaminated land were identified and a separate report was prepared to address the implications of any contamination identified.

Sewage disposal

Options were available to increase the capacity of sewage discharge from Lincoln Township, including an agreement between SDC and CCC and the upgrade of the existing Rolleston treatment plant and disposal area Pines.[1]

Urban design

Most of the focus groups considered that low impact urban design features, including stormwater management measures should be incorporated into the Structure Plan.

All groups considered that linkages throughout the expanded Lincoln area were needed.

Liffey Domain

The Liffey (L1) Creek was identified as having important ecological and recreational values to the community, as well as providing a sense of identity (i.e. village character). Water quality within the L1 Creek was therefore of concern.

Watercourses

Other watercourses, including stock water races, were identified as both a constraint to development and as an opportunity to enhance the aesthetic quality of subdivisions.

Landowner and Other Interested Party Consultation

A number of other potentially interested parties including landowners, utility operators and community groups were identified and a letter was sent out on 21 February 07 seeking comments from these parties by 16 March 07. The responses were collated and presented in the Status Report (Maunsell and Planit, 2007) and integrated into the Integrated Stormwater Management Plan and Structure Plan process.

Since the initial options were consulted on, landowners and developers have continued with more detailed site-specific investigations and development planning. Additional stormwater options have been proposed, which have been incorporated.

5.2.2 Structure Plan Design Workshop

The workshop was held between 2 and 4 April 07 with participants comprising the Project Working Party, Selwyn District Council staff, ECan staff and appointed consultant specialists. A public meeting was held on the night of 2 April to inform the public about the project background, design process and seek their views for the future of Lincoln.

The workshop commenced with a briefing on relevant planning aspects (networks) such as transport, green spaces, social, commercial, water, infrastructure etc. During the following two days the participants overlaid and

[1] The Selwyn District Wastewater Strategy was developed including for the sewage treatment pond in Lincoln to be decommissioned and sewage to be pumped from the pond site to centralised treatment in Rolleston. Consents have been sought for the Rolleston works and land uses. The ISMP and Plan Change 7 ODP show an ongoing buffer area around the Lincoln pond site to provide for possible effects from the ongoing pumping activities.

conceptualised information on the above networks to formulate an overall integrated Draft Structure Plan for Lincoln which also included a stormwater management concept.

The workshop closed with a presentation of the outcomes to the full Selwyn District Council followed by a presentation to invited key stakeholder (focus) groups as identified in Section 5.2.1.

5.2.3 Public Consultation

Following the Design Workshop, Structure Plan and Stormwater Management Option Reports were prepared. SDC sought feedback on the reports and invited comments between 18 June and 9 July 2007. A summary pamphlet and response form were sent to all parties involved in the Focus Group Meetings and those who were known as interested parties.

An information display was erected within the Lincoln Library during the consultation period, which showed the key elements of the Issues and Options Reports. SDC and consultants staff were available to answer questions over three two hour periods during this time. The reports, summary pamphlets and response forms were also available from the Information Display and on the SDC's website. A public notice was sent to SDC's community notice 'Council Call' informing the community about consultation options.

During the consultation period 35 written submissions were received expressing a mixture of concerns and relating to the Structure Plan and Integrated Stormwater Management Plan. The main concerns raised regarding the Integrated Stormwater Management Plan are listed below in no particular order:

- the location of wetlands and effects on land owners (and developers),
- staging of developments,
- a lack of options for stormwater treatment during the construction process,
- option selection for eastern system: preferred option scored only one point more than second most favoured option,
- uncertainty about details of drain enhancement,
- uncertainty about responsibility to fund and build trunk conveyance system and wetland system,
- wish to see action plans and financial commitments by SDC, concerns that the establishment of wetland systems might delay developments,
- more investigations needed: ecology, hydrology, topography, etc.

A combined workshop amongst the project team was held on 16 August 2007 to resolve the received submissions. A summary of these responses and the decisions made on the various points raised with respect to the LSP and ISMP are available as a supplementary report to the Lincoln Structure Plan.

5.2.4 Additional Meetings

A number of key stakeholders were invited to meet with members of the project team in order to discuss the Stormwater Management Issues and Options reports directly. This included Ngai Tahu Property Ltd, the Ministry of Education, Lincoln University, Landcare Research, Crop & Food Research, AgResearch and the Lincoln Township Committee. Meetings were subsequently held with Ngai Tahu Property Ltd, Lincoln University, Landcare Research and Crop & Food Research.

5.3 Recent Consultation – Stormwater Management

5.3.1 Te Waihora Trust and Taumutu Runanga

As the SDC Plan Change 7 process developed it became clear that Taumutu Runanga and Te Waihora Trust had ongoing concerns, particularly about the protection of spring waters from mixing with contaminated water. SDC commissioned Mahaanui Kurataio Ltd to provide a cultural assessment (Appendix D). SDC and AECOM staff participated in a number of off-site and on-site hui. The presently proposed layout including the springs waterway beside the southeast wetland was one result of these discussions. Developing agreed riparian management is another.

Council staff have also meet specifically with MKT in April 2011 to work through concerns they had regarding the cultural impact and works that would mitigate such impacts. Is was agreed that spring and stormwater separation would occur where reasonable, particularly in the wetland treatment area adjacent to Ellesmere Road. Further

discussion on cultural health assessment and planting had not been completed at the time of this applications submission.

5.3.2 Developers and Others

Additional discussions have also taken place between SDC and land owners, developers and their representatives. Soils, contours, groundwater levels, soakage capability, development proposals, alternatives to the Structure Plan layout, staging sequences and option costs and development contributions have been discussed.

6.0 Consent Requirements

6.1 Resource Management Act 1991

The purpose of the Resource Management Act 1991 (RMA) is to promote the sustainable management of natural and physical resources (Section 5(1)). The administration of functions under the Act is largely delegated to local authorities. Section 30(1) (c) of the RMA empowers a regional council to, amongst other things, control the maintenance and enhancement of the quality of water in water bodies and coastal water. Environment Canterbury (ECan) is therefore responsible for regulating stormwater discharges within the Canterbury region.

Section 15 of the RMA, Discharges of Contaminants into the Environment, states:

(1) No person may discharge any—

(a) Contaminant or water into water; or

(b) Contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water; or

…

unless the discharge is expressly allowed by a national environmental standard or other regulations, a rule in a regional plan as well as a rule in a proposed regional plan for the same region (if there is one), or a resource consent.…

ECan has publicly notified its decisions on submissions to the Proposed Natural Resources Regional Plan (NRRP). The provisions of the NRRP must be considered for the global stormwater discharge application for Lincoln.

Section 107 of the RMA restricts the granting of discharge permits as follows:

(1) Except as provided in subsection (2), a consent authority shall not grant a discharge permit or a coastal permit to do something that would otherwise contravene section 15 or section 15A allowing—

(a) The discharge of a contaminant or water into water; or

(b) A discharge of a contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water

if, after reasonable mixing, the contaminant or water discharged (either by itself or in combination with the same, similar, or other contaminants or water), is likely to give rise to all or any of the following effects in the receiving waters:

(c) The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials:

(d) Any conspicuous change in the colour or visual clarity:

(e) Any emission of objectionable odour:

(f) The rendering of fresh water unsuitable for consumption by farm animals:

(g) Any significant adverse effects on aquatic life.

…

The proposed activities will comply with S107. The environmental effects listed in S107 (1) (c) to (g) above are not expected to occur as a result of the proposed activities.

Section 7 of the RMA requires Local and Regional Authorities to consider the effects of climate change. Currently available information and predictions of climate change in New Zealand and Canterbury have been considered when preparing this ISMP. Additional capacity will be included in stormwater conveyance networks to provide for increased rainfall intensities. Regular climate change reviews have been programmed.

6.2 Rules Analysis

Decisions on Variations 1, 2, 4 and 14 to the Proposed Natural Resources Regional Plan (PNRRP) were publicly notified on the 23rd October 2010. Six appeals were originally lodged with the High Court, with the appeal by the Waimakariri District Council having since been withdrawn. Of the remaining appeals, the Meridian Energy Ltd appeal is of some relevance to the proposed development. Meridian Energy Ltd has appealed a number of provisions in Chapter 4, Water Quality and Chapter 5 Water Quantity, particularly regarding WQN1 and WQN25. Whilst the PNRRP as a whole is not yet operative, any rules that have not been appealed to the High Court can be considered to be effectively operative under section 86f of the RMA. it is considered that full weight may be given to those rules not identified in the appeal identified above.

6.2.1 Stormwater Discharges

Transitional Regional Plan (TRP)

The Transitional Regional Plan contains a number of General Authorisations (GA), bylaws and regulations that determine the status of activities under this plan and are deemed to be regional rules under the RMA.

The TRP authorises discharges of stormwater into surface water from small developments (less than 30 lots) as a permitted activity. An amendment was proposed in November 2007 to also allow discharge to ground from small developments as a permitted activity until the proposed NRRP becomes operative. The TRP states that where discharges do not meet the conditions of the General Authorisation they are considered to be discretionary activities. As WQL8 of the PNRRP has not been appealed to the High Court it is considered to be effectively operative and the provisions of the TRP are not relevant to this stormwater discharge application.

When considering this application for other ancilliary activites more weight should be given to the proposed NRRP rather than the TRP. The NRRP has also been prepared under the RMA and has more consideration of environmental effects of activities. The TRP was prepared prior to the RMA.

Proposed Natural Resources Regional Plan (NRRP) – incorporating Oct 2010 decisions

Relevant provisions of the NRRP and planning maps are provided in Appendix F of this document.

NRRP chapters deal with water quality (Ch. 4), water quantity (Ch. 5), beds and margins of lakes and rivers (Ch. 6), wetlands (Ch. 7) and soil conservation (Ch. 8).

Relevant Sections of the proposed NRRP Chapter 4 have been appended to this report (Appendix F). The ISMP has been prepared under Rule WQL8 of the NRRP and fulfils the requirements of Section 4.7.3.2 of thereof.

For the purpose of the Lincoln ISMP, ECan staff have advised the study team to consider the NRRP under the annotated rules and to update the applications accordingly. While some changes have occurred, these have not significantly changed the application.

The assessment is made under Rule WQL8 as the discharges occur from a stormwater management area, as follows:

Rule WQL8 - Discharge of stormwater onto or into land or into a river, lake or artificial watercourse - stormwater management plan

Rule WQL8 (Appendix F) applies to discharges of stormwater onto or into land or into a river, lake or artificial watercourse from a stormwater management area. As required by Rule WQL8 a stormwater management plan (ISMP, Appendix A) has been prepared.

Condition 1 requires the preparation of Stormwater Management Plan meeting the requirements as set out in Section 4.7.3.2 of the NRRP. The Lincoln Integrated Stormwater Management Plan has been prepared in accordance with this section and therefore Condition 1 is complied with.

Condition 2 requires the discharges to rivers and lakes outside the mixing zone to meet the water quality standards set out in Schedule WQL1. It assumes that the receiving environment meets the relevant water quality standard prior to the discharge. For the Global consent area the standards of spring-fed plains rivers applies. This rule does not apply for discharges into or onto land.

Water quality data are limited for rivers in the global consent area. However, it appears that at times the existing elevated nutrient concentrations and E.Coli numbers do not meet the water quality standard. It is also possible that other parameters such as temperature and visual clarity could be temporarily exceeded by the discharges. Therefore it has to be assumed that Condition 2 is not complied with.

Condition 3 a) requires the suspended sediment concentration of the discharge to a spring-fed river (such as L1 Creek and L2 River) not to exceed 50 g/m^3 and to an artificial watercourse not to exceed 100g/m^3. Condition 3 b) also requires that the flow in the receiving water body will not increase the flow during a 20% AEP event by more than 5%.

It is expected that Condition 3a) cannot be complied with at all times. This includes existing discharges into the L1 Creek which is a spring-fed river.

All stormwater attenuation systems will be designed to comply with Condition 3b) at locations downstream from the global consent area. There might be some localised increases in flows within the area as some stormwater conveyance will occur in artificial watercourses that are currently land drains.

Therefore Condition 3 is not complied with.

Condition 4 requires discharges to be outside the Christchurch Groundwater Protection Sub-Zones 1A, 1B, 1C or 1D. The Lincoln global consent area is not located within the identified zones. Condition 4 is complied with.

Condition 5 requires the discharges not to be within 500m upstream from an intake for a community drinking water supply listed in Schedule WQL2 or within a community drinking water supply protection zone for a well listed in Schedule WQL2.

There is no intake for a community drinking water supply in the river and the discharges onto or into land will not be located within the community drinking water supply protection zones. Condition 5 is complied with.

Condition 6 requires an application to be completed and accepted by Environment Canterbury for all discharges existing on the 1 November 2010 within five years of this rule becoming operative. This application includes all discharges within the Lincoln global consent area that existed on the 1 November 2010. Condition 6 is complied with.

NRRP Planning Status

Overall the proposed discharges from the Lincoln global consent area would be a non-complying activity under Rule WQL8 due to non-compliance with Condition 2.

6.2.2 ISMP Information Requirements – Section 4.7.3.2

This section of the NRRP identifies specifies information to be included in the preparation of stormwater management plans under Rule WQL8.

The stormwater management plan shall include information on:

- Land use
- Capacity of stormwater network systems
- Site assessments for stormwater disposal onto or into land
- Possible mitigation measures to avoid, remedy or mitigate adverse effects, their effectiveness and the reasons for selecting the proposed measures
- Programme of works
- Monitoring programme

6.2.3 Ancillary Activities

Activity 1: Groundwater Interception, Diversion and Discharge

NRRP

Rule WQL36 Excavation of land in the Coastal Confined Gravel Aquifer System, or over an unconfined or semi-confined aquifer.

WQL36 Condition 1a – non compliance

The excavation is expected to occur within 50 metres of the bed of permanently or intermittently flowing rivers. The land subject to excavation is located on both sites of the boundary between the Coastal Confined Aquifer System and a semi confined aquifer.

Conditions 1b, 1c, 1d and 1e are complied with. There is no natural wetland within the global consent area and the excavation will not occur within a Community Drinking Water Supply Protection Zone for a well listed in Schedule WQL2 or in any Christchurch Groundwater Protection Zone.

Rule WQN21 Diverting of water via land drainage

WQN21 Condition 1 – compliance

The diversion will not adversely affect any existing wetlands, but will provide the constructed stormwater wetland systems with base flow and maintain plant health in dry weather.

The creation of a spring water way also does not affect any existing wetland. A riparian margin will be created that has high ecological, cultural and amenity values.

WQN21 Condition 2 – compliance

By the time of construction the land for the conveyance system and storage systems will owned by SDC or developers.

Rule WQL1 Discharge of water or a contaminant into a river, lake or artificial watercourse, or onto land which may result in water or a contaminant entering a river, lake, or artificial watercourse.

WQL1 Condition 1 – non-compliance

Groundwater discharge via the present land drain of approximately 100L/s contributes significantly to the base flow of the L2 River of about 220 L/s upstream of the L1 Creek confluence. The creation of a spring waterway will replace the present land drain and discharge a similar amount of spring water into the upper L2 River at a location marked on Figure 7. Technically Rule WQL1 is not complied with. However, the discharge is effectively existing and beneficial for the health of the upper L2 River system.

WQL1 Condition 2 –non-compliance

The expected discharge rate is as now, approximately 100l/s.

WQL1 Condition 3 –compliance

The spring waterway discharge will be of similar quality as the existing discharge from the land drain and low on suspended sediments and dissolved organic carbon.

WQL1 Condition 4 –compliance

As the spring waterway on Ellesmere Road will be separated from the stormwater flows it is not expected to contain any hazardous substances, hazardous waste or added radioactive isotopes.

WQL1 Condition 5 –non-compliance

The discharge from the land drain is existing, but the discharge from the Spring Waterway will increase the flow in the upper L2 River by more than 10 percent during a 1 in 5 year ARI flood event. As stated above the discharge is part of the L2 River base flow and not expected to include stormwater runoff. It does not alleviate flooding of a dwelling or land or cause significant erosion.

WQL1 Condition 6 –compliance

The discharge is uncontaminated spring water. Therefore it is expected to comply with the water quality requirements set out in this condition.

WQL1 Condition 7 –compliance

There is no community drinking water supply listed in Schedule WQL2 in the L2 River.

WQL1 Condition 8 –compliance

The discharge is existing and is not transferred from another catchment.

Several conditions of Rule WQL1 are not complied with and therefore Rule WQL48 *Discharge of water or a contaminant into a river, lake or an artificial water course* applies. The following is the assessment of the discharge under Rule WQL48:

WQL48 Condition 1 –non-compliance

The discharge contributes about 50% of the L2 River base flow, but is expected to be low in suspended solids concentration.

WQL48 Condition 2 –non-compliance

The shallow groundwater has an elevated concentration of nutrients that does not comply with the water quality standard for spring-fed plains rivers. However, the receiving L2 River and the spring water discharge is from the same groundwater source and therefore expected to be of similar quality.

WQL48 Condition 3 –compliance

There is no community drinking water supply listed in Schedule WQL2 and no significant spawning reach for salmon listed in Schedule WQN14.

NRRP Planning Status

Non-complying activity under Rule WQL36.

Permitted activity under Rule WQN21.

Non-complying activity under Rule WQL1 and WQL48.

Activity 2: Damming and Diversion of Unnamed Ephemeral Lowland Stream

NRRP Rule WQN25 – Damming of water in the bed of a surface water body:

Condition 1 – compliance. The catchment area is less than 100ha.

Condition 2 – compliance. The water body does not have high naturalness and is not listed in Table WQN16, or WQN17 of Schedule WQN5 and is not listed in Schedule WQN6

Condition 3 – non compliance. The dammed volume will exceed 5,000 m^3. The upstream pond is expected to have a volume of approximately 7,500m^3 (Ephemeral 1) and the downstream pond 15,000m^3 (Ephemeral 2). There is no minimum flow set for this river.

Condition 4 – compliance. The activity will not flood land or property owned or occupied by another person. It will occur within a stormwater reserve.

Condition 5 – compliance. There are no water takes from this river.

Condition 6 – non-compliance. The activity is a discretionary activity under Rule BLR4.

Condition 7 – compliance. This river is not a known fish habitat.

Condition 8 – compliance. This river is not backed up by the tide.

Rule BLR4 Erection or placement, and use of structures

Condition 1: compliance. The river is not listed in Schedule WQN5 or Schedule BLR6.

Condition 2: assumed non-compliance. The structures have not been designed yet and therefore it is possible that this condition will not be complied with as some culverts could be longer than 7.5 metres.

Condition 3: assumed non-compliance. The structures have not been designed yet and therefore it is possible that this condition will not be complied with as some bridges could be longer than 10 metres.

Condition 4 – compliance. The catchment area is less than 100ha.

Condition 5 – non-compliance. The dammed volume will exceed 5,000 m^3. The upstream pond is expected to have a volume of approximately 7,500 m^3 (Ephemeral 1) and the downstream pond 15,000m^3 (Ephemeral 2).

Condition 6 – compliance. No jetty or whitebait stand will be erected.

Condition 7 – compliance. No plant specified identified in Schedule BLR1 will be planted or introduced.

Condition 8 – compliance. No crack willow will be planted

Condition 9 – compliance. The structures will be designed and carried out in a way that equipment, materials or debris obstruct or alter the passage of water in a manner described in points (a) to (d) of this rule.

Condition 10 – compliance. The activity will be carried out during dry periods where there is not water in the river bed.

Condition 11 – compliance. There is no vegetation used for flood control or bank stabilisation within the global consent area.

Condition 12 – compliance. Access to lawfully established structures will not be restricted

Condition 13 – compliance. The river is not known as a fish habitat and is not listed in Schedule WQN14.

Condition 14 – compliance. The navigation of the bed or water body will not be altered as a result of this activity.

Condition 15 – compliance. The structure will be kept in sound condition and clear of accumulated debris.

Condition 16 – compliance. Any deposited substance will be uncontaminated inert material. It will not be deposited into surface water or below the water table.

Condition 17 – compliance. The colour and material used for visible riprap, fill, retaining walls or anchored tree protection will be of colour and material that blends in with the surrounding natural environment.

Condition 18 – compliance. No vehicles or machinery will be refuelled within the river bed.

Condition 19 – compliance. The river is not backed up by tide.

Condition 20 – compliance. When the activity is completed any reject, surplus or unused material stored in the bed will be spread out, any excavated areas will be left with battered slopes not exceeding 3:1 slope and all equipment and temporary structures will be removed from the bed.

NRRP Planning Status:

Discretionary activity under Rules WQN25 and BLR4.

Activity 3: Enhancement of Stream Beds and Margins within the Global Consent Area

NRRP Rule WQL29 Vegetation clearance within a riparian zone or adjacent to a wetland

Condition 1 – non-compliance. The total area of vegetation clearance is expected to exceed the limits specified in Table WQL29. In some areas an area of riparian planting of 5m width will be provided. This will cover an area of 50% of the riparian buffer zone.

Condition 2 – compliance. All practicable measures will be taken to avoid debris generated by the vegetation clearance being deposited in a way that contradicts this condition.

Condition 3 – compliance. The global consent area is located at an elevation of less than 900m.

Condition 4 – compliance. Trees or any parts of trees will be felled and removed in a way that complies with this condition.

Condition 5 – compliance. The bare ground will be covered according to this condition.

Condition 6 – compliance. The rivers are not listed in Schedule WQN14 or Schedule WQN17.

Condition 7 – compliance. Vegetation clearing by burning, if any, will be carried out in accordance with this condition.

Condition 8 – non-compliance. The earthworks will not meet the requirements for a permitted activity under Rule WQL30. There is no flood control vegetation within the global consent area.

NRRP Rule WQL30 Earthworks or cultivation within a riparian zone or adjacent to a wetland boundary

Condition 1 – non-compliance. The extent of earthworks is expected to exceed the maximum area or volume specified in this condition. For the wetland and spring waterway a rough order estimate of 2100m3 is proposed based on 5m wide excavation of average 1m deep. For the ephemeral attenuation areas a rough order estimate of 22500m3 of earthworks cut to fill is proposed. Further minor earthworks will occur during bank stabilisation and riparian planting works.

Condition 2 – compliance. All practicable measures will be taken to avoid depositing soils into the bed of a river or in a position where it is likely to enter a river

Condition 3 –compliance. Any discharge of sediments in a river will not exceed the limits set out in this condition.

Condition 4 –compliance. All excavations, batters, side-castings or other soil disturbance or deposition will be managed in a way that complies with this rule.

Condition 5 – compliance. Stormwater run-off controls, water table cut-offs sediment traps and culverts will be installed and maintained on tracks and roads to minimise erosion of the land surface and surface run-off.

Condition 6 – compliance. Any trenches excavated for infrastructure will be backfilled within 10 days of being excavated.

Condition 7 – compliance. The rivers within the global consent area are not listed in Schedule WQN14 or WQN17.

Condition 8 – compliance. The earthworks will not destabilise, damage or disturb any lawfully established flood control structure.

NRRP Rule BLR5 Excavation, drilling, tunnelling, depositing, reclamation, drainage or disturbance in, on, under or over the bed

Condition 1 – compliance. There is no lake listed in Table WQN18 or Schedule WQN5 within the global consent area.

Condition 2 – non-compliance. The activity will occur within surface water.

Condition 3 – compliance. No rocks greater than 500mm will be disturbed or removed.

Condition 4 –compliance. No substance other than bed material will be deposited on the bed.

Condition 5 –compliance. There will be not reclamation of the bed.

Condition 6 – non-compliance. The rivers within the global consent area are not listed in Schedule BLR2 or BLR3. The excavated volume could exceed $20m^3$ per week or $50m^3$ per 12 consecutive months. For the ephemeral attenuation areas a rough order estimate of 22500m3 of earthworks cut to fill is proposed. Further minor earthworks will occur during bank stabilisation and riparian planting works. This volume of material could be moved within a time period of three months.

Condition 7 –compliance. Excavated material from the bed will be removed within ten days of excavation.

Condition 8 –compliance. ECan customer services will be notified if there will be more than $50m^3$ excavated within any 4 weeks.

Condition 9 –non-compliance. Parts of the work will be carried out within 50m from a structure listed under this condition.

Condition 10 –compliance. The passage of water will not be obstructed or altered in a manner that contravenes with this condition.

Condition 11 –compliance. There is no vegetation used for flood control or bank stabilisation within the global consent area.

Condition 12 – compliance. No plant species identified in Schedule BLR1 will be planted or introduced.

Condition 13 – compliance. The navigation of the bed or water body will not be obstruct or altered in a way that has potential to cause injury to any person.

Condition 14 – compliance. No refuelling of machinery of vehicles will occur in the bed.

Condition 15 – compliance. After completion of the work all reject and surplus material will be removed from the bed, stripped areas battered with slopes not exceeding 3:1 slope and flow channels reinstated. All equipment and temporary structures will be removed from the bed.

NRRP Rule BLR6 Planting and Disturbance of Vegetation

Condition 1 – compliance. The activity will not be carried out within the bed of any high naturalness water bodies listed in Schedule WQN5 or Schedule BLR6.

Condition 2 – compliance. No plants identified in Schedule BLR1 will be planted or introduced.

Condition 3 – compliance. No crack willows will be planted.

Condition 4 – compliance. The activity will not obstruct fish passage and the river is not a significant salmon spawning site listed in Schedule WQN14.

Condition 5 – compliance. The activity will not increase by more than minor the risk or potential of flooding or increase the erosion of the river bed or drain the bed.

Condition 6 – compliance. The access to lawfully established structures will be maintained.

Condition 7 – compliance. No vegetation used for flood control or bank stabilisation will be disturbed, removed, damaged or destroyed.

Condition 8 – compliance. The sediment control plan will ensure that colour and clarity changes comply with this condition.

Condition 9 – compliance. No plantation forest will be planted.

Condition 10 – compliance. No disturbed or cut vegetation will be deposited in, on, over or under the bed of a river or left in a position where it could enter surface water.

Condition 11 – compliance. No refuelling of machinery of vehicles will occur in the bed.

NRRP Planning Status:

- Restricted discretionary activity under Rule WQL29 (vegetation clearance)
- Restricted discretionary activity under Rule WQL30 (earthworks)
- Restricted discretionary activity under Rule BLR5 (structures)
- Permitted activity under Rule BLR6 (vegetation).

Activity 4: Construction of Outfall Structures

NRRP Rule BLR4 Erection or placement, and use of structures

Condition 1: compliance. The river is not listed in Schedule WQN5 or Schedule BLR6.

Condition 2: compliance. This condition only applies to culvert crossings.

Condition 3: compliance. This condition only applies to bridges.

Condition 4 – compliance. The catchment area is less than 100ha.

Condition 5 – non-compliance. The dammed volume will exceed 5,000 m^3. The upstream pond is expected to have a volume of approximately 7500m^3 and the downstream pond 15,000m^3.

Condition 6 – compliance. No jetty or whitebait stand will be erected.

Condition 7 – compliance. No plant specified identified in Schedule BLR1 will be planted or introduced.

Condition 8 – compliance. No crack willow will be planted

Condition 9 – compliance. The structures will be designed and carried out in a way that equipment, materials or debris obstruct or alter the passage of water in a manner described in points (a) to (d) of this rule.

Condition 10 – compliance. The activity will be carried out during dry periods where there is not water in the river bed.

Condition 11 – compliance. There is no vegetation used for flood control or bank stabilisation within the global consent area.

Condition 12 – compliance. Access to lawfully established structures will not be restricted

Condition 13 – compliance. The rivers are not known as fish habitat and are not listed in Schedule WQN14.

Condition 14 – compliance. The navigation of the beds or water bodies will not be altered as a result of this activity.

Condition 15 – compliance. The structure will be kept in sound condition and clear of accumulated debris.

Condition 16 – compliance. Any deposited substance will be uncontaminated inert material. It will not be deposited into surface water or below the water table.

Condition 17 – compliance. The colour and material used for visible riprap, fill, retaining walls or anchored tree protection will be of colour and material that blends in with the surrounding natural environment.

Condition 18 – compliance. No vehicles or machinery will be refuelled within the river bed.

Condition 19 – compliance. The river is not backed up by tide.

Condition 20 – compliance. When the activity is completed any reject, surplus or unused material stored in the bed will be spread out, any excavated areas will be left with battered slopes not exceeding 3:1 slope and all equipment and temporary structures will be removed from the bed.

NRRP Planning Status:

Discretionary activity under Rule BLR4.

6.2.4 Summary – Rule Assessment

Table 15 Planning summary – ancillary activities

Activity	NRRP Rule	NRRP - Activity Status
Activity 1: Groundwater interception, diversion and discharge	WQL36 WQN21 WQL1 and WQL48	Non-complying Permitted Non-complying
Activity 2: Dam and divert surface water	WQN25 BLR4	Discretionary Discretionary
Activity 3: Stream enhancement	WQL29 WQN30 BLR5 BLR6	Restricted discretionary Restricted discretionary Restricted discretionary Permitted
Activity 4: Construction of outfall structures	BLR4	Discretionary

7.0 Assessment of Actual and Potential Effects – Stormwater Discharges

7.1 Introduction

The ISMP has been designed to be "flexible" meaning that catchment information collection (monitoring) will be ongoing, and regular ISMP reviews will ensure that new information is considered and mitigation measures are adopted when required. As the development and implementation of the ISMP is designed to occur in stages, there will be opportunities to amend the plan, activities and design in the future. There are some limits on the catchment information that is currently available for the assessment of the effects on the environment. Parts of the assessment are therefore descriptive rather than numerically or spatially definitive. Annual monitoring reports are proposed that will comment on new findings and improve the knowledge.

7.2 Actual and Potential Effects During Construction and Development – all Activities

There is the potential that sediment may be released temporarily during construction of infill development (intensification), new developments (ODP areas), stormwater systems (basins, main pipelines, swales, channels, ponds and wetland), stormwater outfall structures in streams and rivers and during stream enhancement and maintenance work. Mitigation measures for land developments are described in Section 3.4 and include the requirement for Sediment and Erosion Control Plans (applying ECan's Erosion and Sediment Control Guidelines) as well as the requirement to treat runoff in stormwater treatment systems (75% removal efficiency or higher). The required construction sequence will ensure that downstream treatment systems or temporary systems are built before land development begins. Mitigation measures for the ancillary activities (damming and diversion of surface water, stream enhancement and construction of stormwater outfall structures) are detailed in Section 8.2.

Infill developments (intensification):

The infill developments are expected to be small scale (lot by lot). They may occur in more recent developments where an existing stormwater treatment system is available, but they are also expected to occur in the older town centre where the stormwater runoff will enter the L1 Creek without further treatment through the existing stormwater conveyance system.

Sediment control plans outlining the on-site measures will minimise the amount of sediment entering the stormwater system. The general topography in the Lincoln global consent area is flat. These factors suggest that the risk of significant amounts of sediments entering the streams and rivers in the global consent area is minor.

New developments

The preparation and implementation of an Erosion and Sediment Control Plan will be required to a level of detail commensurate with the size and complexity of the development. Additionally it is expected that the centralised stormwater treatment systems will be operational to provide additional treatment of construction discahrges should they occur. If centralised systems are not available, temporary local systems may be installed. The topography of development areas is flat.

The L1 Creek and the upper L2 River headwaters will be protected from any stormwater discharges generated by new development activities. A slight increase in sediment concentrations in stormwater discharges is expected during the construction period, but this will decline over time as vegetation cover is re-established.

Stormwater system construction

The construction of stormwater systems will also be managed in accordance with ECan's sediment control guidelines. The construction will start at discharge points and progress upstream providing ponding areas for sediment trapping and minimising exposed areas and establish vegetation cover to bare areas as soon as possible. As for the new development there will be no discharges into L1 Creek or the upper L2 River.

Soil erosion and sediment contributing to receiving waters during the construction phase has the potential to significantly exceed the erosion and sediment effects of the post-construction period. Sediment loads from development stages are expected to decrease as the stages are completed and revegetation is under way. Although mitigation measures as detailed in Section 3.4 will be applied, some temporary increases in sediment loads in the receiving streams and rivers may occur.

Sediment will however enter the river where other land use practices and regular weed clearing and sediment removal activities also cause suspension of sediments. In Lincoln Main Drain, Smarts Drain, L1 Creek downstream of weir and L2 River downstream of the stormwater discharge points the minimised sediment input from the activities will be only one of many contributing factors to increased sediment concentrations and habitat degradation. The other contributing factors are:

- Bank erosion
- Land use
- Farm animal access
- Drain cleaning practices

Most sediment input accumulated from the proposed activities will be removed as part of the ongoing drain cleaning practices.

The habitat of the L1 Creek and L2 River within the global consent area has been described as follows:

Generally, all of the metrics at all of the sites indicate that the aquatic habitat is disturbed and degraded and that the fauna are representative of a polluted and stressed system. The fauna area very tolerant of a wide range of water and habitat conditions. The habitat suffers from an excess of soft substrates, nitrogen nutrient inputs, phosphate inputs, and riparian modifications (including deciduous tree cover), but does not have any substantive metal contamination issues. (Excerpt from Boffa Miskell, 2010 Section 4)

No activities within the Springs Creek catchment will be carried out under the ISMP, therefore no effects on Springs Creek are expected. The spring-fed headwaters of the L1 Creek and L2 River will be protected from additional stormwater discharges (other than those resulting from infill development) and therefore the effects are expected to be less than minor.

The effects of sediment discharges during construction phase are considered to have minor effects on the health of the ecosystem and the quality of the aquatic habitat in the receiving environment as the fauna has been found to be very tolerant. Sedimentation contamination due to maintenance and construction practices is a short term effect which generally only involves naturally existing soils with no other contaminants. It is expected that in the long term the habitat, ecosystems and amenity of the L1 Creek and L2 River will be improved by stream enhancement activities.

7.3 Effects of Stormwater Discharges

7.3.1 Contaminants in Stormwater

Stormwater contaminants can be divided into the following groups:

a) Suspended solids
b) Metals
c) Nutrients
d) Hydrocarbons
e) Harmful micro-organisms
f) Debris and litter

Suspended Solids

Suspended solids are generated from exposed earth surfaces and contain fine sediments, which are held in suspension during stormwater flows and then settle out with decreasing flow velocities. The release of sediment into stormwater is highest during the construction phase of a development.

Lincoln is expected to experience sustained growth and development over the entire time frame of this ISMP. Suspended sediment will require management measures during construction phases. The overall flat grades will make this relatively easy compared to hill areas.

Metals

Zinc, copper and lead are the most common metal pollutants found in urban aquatic environments. Vehicle emissions and vehicle component wear are the main contributors of these metals. Zinc is also relatively common as it is used as an anti-corrosion agent. However the use of unsealed zinc products has reduced over the years

as its effects are understood and mitigated against. The removal of lead use in petrol and pipes has reduced the levels of lead from urban runoff.

Nutrients

Nutrients, typically phosphorus and nitrogen, can enter stormwater from roading material, soil and dust, decaying plant matter and litter, fertiliser applications and animal manure. Nutrient levels are generally lower from an urban catchment than from an intensively farmed rural area.

In the Lincoln global consent area significant areas will be converted from agricultural land use to urban land use and a reduction in surface runoff nutrient concentrations and loads is expected. No significant change in groundwater nutrients resulting from development is expected however. Up-gradient farming practices are expected to continue to dominate nutrient levels. Management of rural land use activities is outside the scope of the ISMP and consent applications and is expected to be part of the Canterbury Water Management Strategy activities.

Hydrocarbons

Urban runoff can contain relatively high concentrations of PAH (polycyclic aromatic hydrocarbons), which are highly toxic to animals and are known human carcinogens. Sourced mainly from atmospheric particles from fires and exhausts, abraded bitumen and sump oil, most PAH's are insoluble in water and adhere to the particulate components of runoff. Stormwater treatment to remove sediment is therefore a practical tool to limit implications for sediment feeders living in the receiving waters.

Spills and accidental discharges of hydrocarbons are a potential concern, mostly in industrial areas.

The character of Lincoln is expected to be maintained as that of a rural town with only limited commercial / industrial activity. ODP Area 5 in the southwest of the Structure Plan overall area has been shown for industrial/commercial development including farm machinery servicing etc (Figure 12).

Industrial / commercial areas will require sound stormwater management practices including individual site spill prevention and recovery methods, training and equipment; individual site sediment and oil trapping, diversion of stock truck washings to sewer; and a final treatment stage. A dry pond retention basin is proposed before the exit point from this area to the Springs Road roadside drain system.

Harmful Micro-Organisms

Harmful micro-organisms (pathogens) are found in runoff from agricultural land used for grazing and in outflows from areas with a large population of waterfowl including watercourses and stormwater practices such as wet ponds and wetlands.

Through the conversion of agricultural land into residential land use a reduction of pathogen loads in the runoff can be expected. Waterfowl populations in stormwater ponds and wetlands may need control if pathogen concentrations reach unacceptable levels.

Water race flows can contain high concentrations of pathogens, particularly in summer and where stock upstream have direct access to the races.

Other lower level sources of pathogens to stormwater may include sewage overflows and leaking sewers. SDC has an active programme of sewer overflow avoidance and is developing a proactive infiltration/exfiltration programme, so sewage contamination will not be a significant issue for Lincoln stormwater.

In rural areas including the Lincoln global consent area farming practices can contribute to degradation and contamination of water ways by:

- incorrect fertiliser application (nutrients)
- irrigation runoff entering waterways (nutrients and faecal bacteria)
- inadequate dairy shed design (faecal contamination, nutrients)
- stock access and crossings (sediment, faecal contamination, nutrients)
- cultivation of soils allowing runoff or wind to transport soils into waterways (sediments).

Debris and Litter

Urban litter includes paper, discarded food, plastics, metals and containers of all shapes and sizes. Litter is visually offensive and may also contain other contaminants. The proposed stormwater practices will remove litter before stormwater is discharged to surface water.

Runoff Contaminant Concentrations

The concentration of contaminants in stormwater can vary significantly during a storm event and also depending on land use within the catchment. Table 16 shows a summary of discharge concentrations from mainly New Zealand data. Contaminant event mean concentrations in stormwater runoff have been assumed and are printed in bold in the bottom row. Some of the data were measured during short duration rainfall events. The mean concentration would be lower for longer rainfall events as most contaminants are transported during the first flush period (first 15 to 25mm). Concentrations within in the lower half of the range have therefore been assumed as a general average. Storms with ARI's of up to 50 years will be attenuated and treated. Due to the large basin sizes required for flow attenuation, a high level of dilution is expected for longer duration storms.

Pollutant Removal Efficiencies

Expected pollutant removal efficiencies can also vary significantly and depend on the treatment system volume or surface areas relative to catchment runoff. Generally inflows with higher pollutant concentrations will achieve a higher degree of removal (as shown e.g. in CCC's WWDG). A range for removal efficiencies for different systems has been summarised in Table 17. For comparison some Auckland data (ARC, 2003) have also been provided. The assumed average removal efficiency for the global consent area is printed in bold in the grey shaded cells.

Predicted Discharge Contaminant Concentrations

Treatment in the global consent area will be carried out in treatment trains where possible, meaning runoff will be treated in at least two systems. Vegetated swales are generally expected to convey and treat the water before a soakage system, dry pond, wet pond or wetland. Runoff from some areas north of the Ephemeral Stream will be conveyed in swales and treated in dry ponds. The currently untreated stormwater from the older part of the village will not be conveyed in swales and no retrofit of treatment systems is proposed. These discharges are expected have event mean concentrations similar to those assumed in the bottom row of Table 16.

Based on the above information in . Table 16 and Table 17 expected mean discharge concentrations have been calculated for each treatment system type combined with the conveyance in swales. The expected mean discharge concentrations for each pollutant are shown in the green rows in Table 18.

Table 16 Assumed Stormwater Runoff Quality

Site Description	Source	Comment	Total Suspended Sediment	BOD	Total Nitrogen	Total Phosphorus	Copper	Lead	Zinc
			g/m^3	g/m^3	g/m^3	g/m^3	mg/m^3	mg/m^3	mg/m^3
Urban	Williamson (1993)	50 percentile	170	-	2.5	0.42	40	110	260
Urban	Williamson (1993)	10 percentile	50	-	1.3	0.2	15	60	90
Riccarton Main Drain (residential)	Main (1994)		62	-	1.0	0.25	-	-	400
SH 17, Dairy Flat	Moores et al. (2010)	Mean concentration, short duration events, about 6,400 vehicles per day	-	-	-	-	38-152		207-910
Wigram Detention Basin (mixed)	Main (1994)		101	-	-	-	14	33	412
Clyde Carpark, Canterbury University	Wicke, et al. (2009)*	EMC, 6 events, max rainfall depth 13.2mm	21	-	-	-	11	4	58
Subcatchment: Eastern Bays, AKL	AWT and Meritec (2002)**	EMC, Auckland Eastern Bays / Tamaki*	55-180	8-38	-	-	26-50	-	160-280
US summary of EMCs	CWP 2004 cited in Shaver et al. (2007)***	Incorporates all US climate zones and land use types	78	14	2.4	0.32	14	68	162
Assumed EMCs for Global Consent area	Storms with AEPs of up to 50 years will be attenuated and treated. Levels of metals in the studies mentioned relate to higher density urban environments than Lincoln presents. Concentrations in the lower to median range have been assumed.		**80**	**14**	**2.0**	**0.3**	**25**	**25**	**200**

* Wicke et al. (2009), Canterbury Universtiy. *Developing a Rainfall Contaminant Relationship Model for Christchurch Urban Catchments*. Presented at 2009 Stormwater Conference.

** AWT New Zealand and Meritec Ltd, 2002. Catchment Existing Status Report and Data Capture Recommendation Report. ICS Area 5: Eastern Bays / Tamaki. Integrated Catchment Study Stage 1A. Main Report.

*** Shaver et al. (2007). *Fundamentals of Urban Runoff Management.* Technical and Institutional Issues. Produced in cooperation with the U.S. Environmental Protection Agency.

Table 17 Expected Stormwater Pollutant Removal Efficiencies

Treatment Device	Source	Total Suspended Sediment	BOD	Total Nitrogen	Total Phosphorus	Copper	Lead	Zinc	Bacteria
		%	%	%	%	%	%	%	%
Vegetated swale (or alternative device)	CCC, 2003	20-60	20-40	20-40	20-40	20-60	20-60	20-60	20-40
	ARC, 2006 (Contaminant Load Model)	75	-	-	-	57	-	47	-
	Assumed for Global consent area	**50**	**30**	**30**	**30**	**50**	**40**	**40**	**30**
Soakage basin	CCC, 2003	60-100	20-60	40-80	40-80	40-100	40-100	40-100	60-100
	ARC, 2003	90	80	55-60	60-70	85-90	85-90	85-90	90
	Assumed for Global consent area	**80**	**60**	**60**	**60**	**80**	**80**	**80**	**80**
Ext. dry pond	CCC, 2003	40-80	20-40	20-40	40-60	20-60	20-60	20-60	0-40
	ARC, 2003	30-80	-	10-40	15-40	10-50	20-70	10-60	20-60
	Assumed for Global consent area	**60**	**30**	**30**	**40**	**35**	**40**	**40**	**30**
Ext. Wet pond	CCC, 2003	60-80	20-60	40-60	40-80	40-80	40-80	40-80	40-80
	ARC, 2003	50-90	-	30-60	30-80	20-80	30-90	30-90	20-80
	Assumed for Global consent area	**70**	**40**	**50**	**60**	**50**	**60**	**60**	**55**
Wetlands	CCC, 2003	60-80	20-40	20-60	40-80	40-80	40-80	40-80	60-100
	Various summarised in Boffa Miskell, 2010	-	-	40-50	50	-	70-85	40-60	80-97
	Assumed for Global consent area	**70**	**30**	**40**	**60**	**60**	**70**	**60**	**50**

Table 18 Predicted Average Stormwater Contaminant Concentration, Removal Efficiency and Discharge Quality

	Total Suspended Sediments	**BOD**	**Total Nitrogen**	**Total Phosphorus**	**Copper**	**Lead**	**Zinc**
Assumed runoff **contaminant concentration** prior to mitigation	80 g/m^3	14 g/m^3	2.0 g/m^3	0.3 g/m^3	25 mg/m^3	25 mg/m^3	200 mg/m^3
Assumed average removal efficiency - **Vegetated swale (or equivalent device)**	50%	30%	30%	30%	50%	40%	40%
Assumed average removal efficiency - **Soakage basin*)**	40% (80%)	30% (60%)	30% (60%)	30% (60%)	40% (80%)	40% (80%)	40% (80%)
Assumed average removal efficiency - **Extended dry pond*)**	30% (60%)	15% (30%)	15% (30%)	20% (40%)	17.5% (35%)	(20%) 40%	15% (30%)
Assumed average removal efficiency - **Extended wet pond*)**	35% (70%)	20% (40%)	25% (50%)	30% (60%)	25% (50%)	30% (60%)	27.5% (55%)
Assumed average removal efficiency - **Wetlands*)**	35% (70%)	15% (30%)	20% (40%)	30% (60%)	30% (60%)	30% (60%)	42.5% (85%)
Expected mean discharge concentration **swale (or alternative) + soakage basin**	24 g/m^3	6.9 g/m^3	1 g/m^3 **)	0.15 g/m^3	7.5 mg/m^3	9 mg/m^3	72 mg/m^3
Expected mean discharge concentration **swale (or equivalent device)+ extended dry pond**	28 g/m^3	8.3 g/m^3	1.2 g/m^3 **)	0.17 g/m^3	10.3 mg/m^3	12 mg/m^3	102 mg/m^3
Expected mean discharge concentration **swale (or equivalent device)+ extended wet pond**	26 g/m^3	7.8 g/m^3	1.1 g/m^3 **)	0.15 g/m^3	9.4 mg/m^3	10.5 mg/m^3	87 mg/m^3
Expected mean discharge concentration **swale (or equivalent device)+ wetland**	26 g/m^3	8.3 g/m^3	1.1 g/m^3 **)	0.15 g/m^3	8.8 mg/m^3	10.5 mg/m^3	69 mg/m^3

*) NB: Stormwater will be treated in treatment trains. These may include a selection of the following: vegetated swale and either soakage basins, extended dry ponds, extended wet ponds or wetlands. It has been assumed that the first element of the train (swale) will receive runoff containing average contaminant concentrations as shown as EMCs in Table 16 and will achieve removal efficiencies as shown in Table 17. The second element will receive pre-treated runoff containing reduced contaminant concentrations. It therefore is assumed that it will be more difficult to remove the remaining contaminants as the easily removable ones have been removed previously. To reflect this the removal rate of the second treatment device in the train has been reduced by 50%. The values in brackets are the average removal efficiencies as shown in Table 17.

**) Elevated nitrogen concentrations in groundwater entering the stormwater system may result in higher discharge concentrations nitrogen than stated in Table 18 above. Groundwater in the area can have concentrations of total nitrogen between 3 and 6 g/m^3.

For new commercial / industrial areas (possible ODP 5) a higher concentration of metals than from residential areas may be expected. As modern building and stormwater management practices will be used in this area it is expected that these higher concentrations will be appropriately managed initially on site through the use of oil and sediment interceptors where appropriate. In additionrunoff from this area would be treated in a dry pond and then conveyed through the Lincoln Land Development Site. This would increase the treatment efficiency significantly. As the area is relatively small compared to the rest of the catchment serviced by the wetland it is not expected that the discharge quality from this system would change significantly if ODP area 5 is developed.

During dry periods and smaller rainfall events the discharge from stormwater treatment systems could have a higher concentration of nutrients (especially nitrogen) than shown in Table 18. This is a function of the quantity and quality of shallow groundwater entering the stormwater system. Water quality sampling in spring-fed reaches of the L1 Creek and L2 River (refer Section 4.3.1) shows nutrient concentrations of 3 – 6 g/m^3 during dry weather periods. This is higher than would be expected in treated stormwater runoff that does not contain groundwater inflows.

Discharge Quantity

Stormwater modelling of 50 year ARI design storms was undertaken to assess the effects of stormwater peak flows and the effectiveness of proposed attenuation measures. Modelling was carried out at a strategic level (overland flow, swales and storages) rather than at a detailed level (individual pits and pipes). This reflects the uncertainties over detailed development design and the limited topographical data that is presently available. Detail can be added as development occurs. The model only provides flows and volumes and cannot be used to assess flood risk on individual properties.

Two scenarios were used for assessing peak flow rates and runoff volumes:

- A base case of current development plus allowance for mid – range climate change to 2090 (16% increase in rainfall intensities)
- Future development including mid-range climate change predictions

The model was used to locate and approximately size peak flow conveyance and flow mitigation systems. These are expected to be built in stages just before or as part of future development. The full modelling report can be viewed in Appendix C of this AEE.

The layout of the conceptual conveyance and storage systems differs substantially from the layouts shown in earlier versions of the AEE. This reflects progress with consenting of local development area stormwater systems, the Outline Development Plans produced for SDC's Plan Change 7, and ongoing discussions between SDC and tangata whenua, landowners and developers. Details of the systems are still subject to design following consenting.

The following Table 19 shows the modelled current development and the mitigated post future development stormwater peak flows for the Lincoln Global consent area for 50 year ARI design storm events of critical durations.

Table 19 Modelled Peak Flows in Streams and Rivers in Global consent area (50 year ARI)

			Q max (m3/s)		
Link	**Location**	**Storm Duration (hours)**	**Current Development**	**Future Development with Mitigation**	**Change Qmax (m^3/s)**
L1 Creek	Upstream of L2 confluence	6	7.7	7.3	-0.4
		7.5	7.5	7.1	-0.4
		10	7.3	6.9	-0.4
L2 River	Outlet ISMP modelling area	7.5	19.3	16.3	-3.0
		10	19.1	17.0	-2.1
		12	18.7	17.1	-1.6
Smarts Drain (Halswell River Catchment)	Halswell Outlet (combined Halswell 1 to 3)	10	2.2	3.2	-1.2
		60	3.7[2]	1.6	-2.1

7.3.2 Potential Effects without Mitigation

The points below describe the expected effects on the receiving environment from stormwater runoff from new developments if no mitigation measures were applied:

1) Downstream flooding - Increased stormwater peak flows and volumes in L2 River and Halswell River catchment would occur. This is due to a greater proportion of impervious surfaces. This would exacerbate downstream flooding issues in both catchments and may cause adverse effects on farming practices, individual existing discharge systems and buildings.
2) Urban contaminant loads - Increased loads of contaminants associated with urban activities such as suspended solids, hydrocarbons, heavy metals and litter would occur. This can cause long-term adverse effects on the habitat and health of fauna and eco systems in the receiving waterways.
3) Sedimentation - There would be increased sedimentation of streams during construction phases. Heavy loads of sediment can result in sediment build up in the base of the waterway, reducing the quality of the aquatic habitat and consequent health risks to the fauna and eco systems.
4) Erosion - Increased erosion of stream channels due to higher flow rates would occur. This can cause additional sediment to be dispersed along the waterway with effects on fauna as above. Erosion of channels can cause adverse effects on adjacent land.
5) Amenitiy - Amenity values would decrease along streams and land drains. Due to adverse effects on fauna, fishing and mahinga kai collection values will be reduced. Erosion of stream channels and adjacent banks would reduce the access ability along waterways.
6) Spills - There would be an increased risk of spills of substances harmful to the environment entering the stormwater system. Harmful substances can have a serious effect on fauna and ecosystems causing widespread damage. Risk to humans utilising the waterways is also possible.
7) Rural contaminants - Nutrient and bacterial loads could possibly decrease due to land use conversion from rural (application of fertilisers and animal waste) to urban uses. This could also reduce the growth rate of weed in the streams and benefit water quality in Lake Ellesmere.
8) Stock access - Continuedstock access to land drains and streams would resultin erosion and contamination with suspended solids and faecal bacteria. Suspended solids can cause adverse effects on the habitat of the fauna and ecosystems. Bacterial contamination could have adverse effects on stock drinking the water and any human recreational uses of the waterways.
9) Groundwater recharge – Due to the increase in impervious surfaces the level of groundwater recharge would decrease slightly.

[2] The greater 60 hour storm volume is currently expected to spill across Ellesmere Road

7.3.3 Mitigation Measures

The following Table 20 describes the proposed mitigation measures and their expected effects. It should be noted that a suite of mitigation measures has been proposed that are appropriate to Lincoln, state of the art, holistic and designed for the entire Lincoln global consent area considering possible cumulative effects. All these aspects are expected to result in higher discharge quality than previously achieved in the Lincoln global consent area.

Table 20 Summary of Proposed Mitigation Measures

Mitigation Measure	Description	Mitigated Effects (see 7.3.1 above)
Potential soakage area On site disposal of roof stormwater to ground On-site storage and infiltration to ground Infiltration trenches and basins	Roof stormwater will be directly to ground.	All
Detention basins (wet and dry)	• Preference of centralised systems • Indicative retention basins shown on Figure 12. • Provision of dry pond and wet pond local detention areas as required by topography. • increased amenity within developments (local community open space) • increased community “ownership” of their water resources	All but groundwater recharge
ODP Area 5, commercial / industrial First flush dry pond upstream of LLD system Hard standing areas – on-site controls Exclusion of sites with activities listed in Schedule WQL9	• Council will require best practicable, • Risk assessment for Council system • Direct discharge of roof water • Centralised dry pond as first flush treatment and spill protection • Discharge via Springs Road roadway swale into LLD system for further treatment and retention	All
Location of discharge points L1 and L2	• L1 and L2 discharge points will be located as far downstream as possible to ensure the protection of water quality, habitat and ecosystems in the upper reaches. • No discharge from development areas will occur into Springs Creek.	Urban contaminants, Sedimentation, Erosion, Amenity,
Centralised stormwater runoff treatment in wetland system with settling pond and provision of buffer zone	• Water quality treatment to high levels • Combination with other treatment systems including swales and detention ponds • Global consent area wide flood attenuation (management of peak flows of up to 12 hours and 2% AEP). • Re-introduction of very valuable under-represented habitat • Provision of mahinga kai	All except groundwater recharge

Mitigation Measure	Description	Mitigated Effects (see 7.3.1 above)
	Processes in Wetland • Physical filter where fine particles can adhere • Nutrient stripping from sediment and water • Development of epiphytic biofilms that can take up dissolved pollutants • Trapping of fine sediments that chemicals are adsorpted to • Transformation of pollutants into stable products Wetland Operation • Groundwater inflows into the wetlands would maintain dry weather levels and not elevate 'dead' storage levels in the wetland system because the weir outlets will keep them low. • Regular removal of vegetation • Bird control to manage bacterial contamination Elevated water temperature of discharged water could cause an increase in water temperature in the L2 River. Improved riparian conditions in the rivers would mitigate this and maintain the overall temperature downstream of the discharges. An outlet installed at lower water level will also ensure that colder water is discharged from the wetland system.	
Continuation of river and drain clearing	The current practice of clearing weed from the L2 River will need to be continued to ensure the drainage capacity is maintained. The weed cutting is carried out regularly by the L2 Drainage Committee and affects a 9 km stretch of the L2 River downstream of the former oxidation pond outfall (Ward and Robb, 1997). This is associated with a range of effects on the environment both positive and negative: • The drainage capacity is maintained. • The weed cutting might also include sediments that have passed the wetland treatment. This practice will prevent the accumulation of sediment containing stormwater contaminants downstream of the discharge points. • Eco-systems are disturbed regularly. • During the clearing process sediments are released for short periods. • Access for machinery has to be maintained and may limit the potential for riparian enhancements.	Sedimentation, Erosion and Amenity

Mitigation Measure	Description	Mitigated Effects (see 7.3.1 above)
	• At some places the channel is deepened with steep sides; some banks have collapsed (ECan, 2004). •	
Riparian enhancement	A healthy riparian margin along streams will provide habitats and improve ecological, recreational and landscape values. It may have beneficial impacts on the water quality as well. • Improved amenity and habitat values. • Mitigation of temperature increase as a result of wetland discharges • Filtration of contaminants • Erosion protection	Urban contaminants, Sedimentation, Erosion and Amenity
Climate change provisions	All stormwater systems will be sized to allow for a future increase in rainfall intensities of 16%.	Flooding, Erosion
Requirement of Erosion and Sediment Control Plan	Plan to meet ECan's Erosion and Sediment Control Guidelines. To be submitted with every subdivision.	Sedimentation, Erosion, Amenity and Spills
Stormwater management guided by ISMP (including review, monitoring provisions)	Integrated and consistent stormwater management within the Global consent area to ensure the ISMP objectives are achieved. The ISMP is a living document and knowledge of the catchment conditions increases over time. Required action will be identified early.	all
Efficient road and sump cleaning	The adequacy of current road sweeping and sump cleaning practices will be ensured. This will manage the levels of contaminants including sediments, heavy metals and litter entering the receiving water courses.	Urban contaminant loads, Sedimentation,

7.3.4 Actual and Potential Effects after Mitigation

Effects on Surface Water Quality

The current water quality, within the global consent area is generally good with some elevated nutrient levels. At times the level of dissolved oxygen saturation falls below the level required in the RMA standard.

Erosion and Sediment

In the L1 Creek and the upper L2 River any existing erosion issues will be addressed as they are identified and the riparian zone is improved. This is expected to offset any increased sediment input from intensification within the old Lincoln township area. The upper L2 River will be protected from any stormwater discharges.

Wetland and pond systems are very effective in removing suspended sediments. It is not expected that downstream erosion will increase significantly as the peak flows of the discharges from the proposed stormwater systems will be limited to current development levels. Other existing practices such weed clearing, stock access and the lack of riparian margins are expected to be the major contributing factors to any erosion and suspended sediment issues.

Within the global consent area the L1 and L2 waterway cross section areas are generous, the silty clay soils have some resistance to erosion and low storm flow velocities are generally predicted to continue. This means there is a low risk of erosion that could cause sediment transport and ecological damage. Runoff from short duration local

storm events discharging into low flows could cause localised effects. These will be avoided by the provision of storage basins with controlled engineered outflow systems.

The expected event mean concentration of total suspended sediments in discharges from stormwater treatment devices is expected to be less than 50 g/m^3 and therefore complies with Rule WQL8.

Contaminants

In the L1 Creek and L2 River there is an existing issue with elevated nutrient concentrations exceeding the NRRP water quality standard. These originate from spring water sources and also agricultural land use in rural parts of the global consent area.

As the global consent area will be developed with urban land use the input of nutrients from agricultural land use practices will decrease. Expected nutrient levels in the treated stormwater are low. A reduction in nutrient and bacterial loads in the L2 River (upstream and downstream of proposed discharge points) is likely. This would slightly reduce the nutrient load into Lake Ellesmere, even without treatment.

Total event mean concentration of nitrogen in treated stormwater is expected to be between 0.6 and 1.0 g/m^3 and is therefore less than required concentration of dissolved inorganic nitrogen in the water quality standard set out in WQL1. The expected event mean concentrations of the treated discharges are expected to be lower than those of the L2 River. It is expected that the proposed discharges will not cause an increase in nutrient loads into Lake Ellesmere.

A slight increase of certain contaminants commonly found in urban stormwater discharges such as hydrocarbons and metals is possible downstream of the proposed discharge points. Records of existing metal levels show that on the majority of occasions the levels are below the 95% protection level. Table WQL17 in Chapter 4 of the PNRRP includes a narrative standard for the 95% protection level, which states that adverse effects on aquatic organisms are less than minor at that level. The effect of slightly higher metal levels in the waterway during storm events should also be less than minor due to the short term nature of the increases.

It should be noted that the existing metal levels recorded are from stormwater sourced from existing untreated areas. Stormwater from future development in Lincoln will all be treated with primary and secondary systems therefore removing contaminants prior to discharge to the waterways. The levels of metals is expected to remain low and predominantly below the 95% protection level which has less than minor effects on aquatic ecology.

Water Temperature in L1 Creek and L2 River

During the relatively long residence time of water in the proposed shallow wetlands the water temperature may increase in summer. This could temporarily increase the water temperature in the L2 River by more than the 2 degrees required by the NRRP water quality standards (WQL1).

To limit the temperature increase, low flow discharge pipes will draw from deeper colder areas in the wetland system. The proposed improved riparian conditions in the L1 Creek and L2 River would also have the potential to reduce water temperature by increasing shading and thus further mitigating the increased temperature from the wetland discharges.

The Boffa Miskell Ecology Report included water temperature measurements at a number of sites. These show a wide range of existing temperatures from 11.5 to 14.3 degrees. This range is greater than the 2 degree limit in the water quality standard. In a short distance of under 200 metres a variance of 1.7 degrees exists. The existing fauna is described as being relatively stable and similar throughout the waterways studies which reflects the tolerance of the fauna to a wide variance in water temperature. Therefore the possibility of short term increases in temperatures of discharges from the wetland are expected to be tolerated by the existing fauna, with no apparent adverse effects.

Bacterial Contamination

Agricultural land use such as stock access and runoff from grazing areas as well as a high water fowl population are the current sources of bacterial contamination which at times is likely to exceed the NRRP water quality standard (WQL1). It is expected that the bacterial contamination levels will not increase within the global consent area as rural land use will be replaced by urban land use. However, the water fowl population in the wetland and pond areas will need to be managed. Bacterial contamination does not have any adverse effect on the health of aquatic fauna however may have subsequent impacts on the quality of mahinga kai and recreational water use.

The proposed urban development is highly unlikely to result in bacterial contamination levels causing adverse effects.

Accidental discharges and Spillages

Accidental discharges from industrial and residential activities or road accidents have the potential to reach the stormwater system.

The proposed commercial / industrial area (ODP Area 5) is expected have its own detention pond upstream of the pond / wetland system in ODP Area 1. Should a spillage occur, required on-site management practices will ensure a prompt response. Any spill material that does move from individual sites will be trapped in the dry pond. Pond floor soils will be replaced as required.

Existing industrial sites are also required to have a stormwater management plan including spill clean up procedures.

Residential spillages are rare but possible. For any spillage to cause adverse effects it needs to occur concurrent with a rainfall event which reduces the possibility. However if an event was to occur, the spill would be trapped in sumps and/or the swale and treatment device prior to discharging to a waterway. This allows the spill to be effectively caught and dealt with before causing any adverse effects on waterway eco systems.

Surface Water Takes

The current surface water takes are expected to cease with the change from rural to urban land use. The water take from Springs Creek are not expected to be affected by urban development.

Effects on Sediment Quality

The existing sediment quality within the global consent area is good and shows low metal contaminant concentrations although the L1 Creek receives a number of treated and untreated stormwater discharges.Therefore the continuation of existing stormwater discharges is expected to have a no more than minor effect on sediment quality. It is also expected that the new discharges treated to a high level will not add significant amounts of contaminants. Any new stormwater discharges into the L2 River are downstream of the spring-fed headwaters.

The effects on sediment in downstream areas are also expected to be less than minor as the sediment including any contaminants is removed from the riverbed on a regular basis.

Effects on Surface Water Quantity

Effects of development within the global consent area will be managed at a local level by detention storage and controlled release. Widespread flooding in long duration events of lower AEP's (greater average return intervals) occurs now in the L2 River and Halswell River catchments including Lincoln. This cannot be managed at the ISMP level and is expected to continue.

Risk of Localised Flooding

Localised flooding within the global consent area is expected to be reduced by the provision of overland flow paths, drain capacity upgrades and an integrated stormwater system maintenance programme.

L1 Creek / L2 River Flood Risk

The following conclusions are based on strategic modelling of 50 year ARI design storms (see Appendix C) and apply to discharges from the ISMP modelling area into the L2 River catchment.

- For storms of up to 50 year ARI and durations of up to 12 hours the post development peak flows will be less than the current development peak flows at the outlet of the ISMP modelling area (L2 River downstream of Lincoln Main Drain confluence). An allowance for climate change was included in both scenario calculations.
- The critical duration at the L2 River mouth at Te Waihora has been calculated to be 7.5 hours (Kerr 2009). Therefore for all events of longer than 7.5 hour duration, the peak flows generated in the global consent/modelled area will not coincide with peak flows further downstream. The peak flows in the L2 River

will already have discharged before long duration storm peak flows from the ISMP modelling area will reach the downstream reaches of the L2 River.

- For short duration storms up to 7.5 hours the peak flows in the upper reaches of the L2 River will be significantly reduced compared to the current development scenario.
- There will be minor increases in overall runoff volumes discharging from the global consent area into the L2 River system (refer Modelling Report, Appendix C) resulting from a proposed minor diversion from the Halswell catchment and from the increased impervious developed area. Resulting changes in flood levels are expected to be no more than minor.
- Velocities predicted in current and future development scenarios will remain at similar levels.

The overall conclusion is that the increase in runoff peak flows in the L2 River as a result of future urban development in Lincoln can be mitigated and the downstream effects are expected to be minor.

Smarts Drain / Halswell River Flood Risk

The following conclusions can be made for discharges from the global consent area into Smarts Drain and the Halswell River catchment:

- Short duration storms are expected to have no adverse downstream effects on the Halswell River catchment. The peak flows can be fully mitigated up to 50 year ARI events.
- Long duration storms are not expected to have adverse effects either. Modelling results show reduced flows compared to the current development scenario.

The overall conclusion is that any increase in potential runoff peak flows into the Halswell River catchment as a result of future urban development in Lincoln can be mitigated so downstream effects are avoided.

Effects on Ecological Values

Aquatic Ecology

The current ecological values of streams within the ISMP have been found to be generally poor with the ecological habitat being described as '*disturbed and degraded*' (Appendix B). This applies to all streams regardless of whether they currently receive stormwater discharges (L1 Creek) or not (Springs Creek).

The remaining fauna is very tolerant of a wide range of water and habitat conditions such as contamination, temperature, slight increase in velocities and frequencies of high flows.

Therefore as a result of the proposed stormwater discharges no negative effects on the quality of the existing aquatic ecosystems are predicted. The proposed additional activities and mitigation would have a positive effect on the ecosystems.

Riparian and Terrestrial Ecology

With the creation of large wetland areas with plant and animal life similar to the swamps that existed in pre European times a local plant and animal resource will be re-created. Water cress, raupo, harakeke and other plant resources that are now scarce in the L1 / L2 River system will be more abundant.

Pests

Bird numbers on wetland ponds and margins will be monitored and may need to be proactively managed to avoid increased nuisance.

The upgrading and re-planting of riparian margins would favour native species and be managed to suppress the growth of pest plants.

Effects on Cultural Values

Effects on Ngai Tahu Values

The overall ISMP proposal has been recognised to have the potential to enhance Ngai Tahu values because of its integrated approach, springs/stormwater separation and high level of stormwater treatment providing protection of the mauri of spring fed rivers and Te Waihora (Reference, Appendix D).

The following details the effects on values and explains the effectiveness of mitigation measures:

Waipuna / Springs:

- Existing springhead flows (e.g. at the L2 source) will be generally maintained
- The proposed stormwater discharges will occur downstream of spring heads
- Springs might be created during construction of wetlands and swales. Spring water will be needed to maintain base flows in the wetlands and keep the desired plant species alive.
- Separation of all spring flows from stormwater flows will not be feasible technically and financially. However, the creation of a spring waterway is proposed in the vicinity of the south eastern wetland to capture spring flow and direct it to the upper L2 River without mixing it with stormwater.

Mahinga Kai

Traditionally the global consent area was of value for mahinga kai. The construction of the wetland systems will provide in an addition to their stormwater treatment function, a good habitat for tuna (eels) and other food source species. A further increase in mahinga kai can be expected in the L1 Creek and L2 River as the habitat and water quality are improved.

Effects on Groundwater Quality

Due to existing ground conditions only the minority of runoff from new development areas will be treated in infiltration basins. The use of infiltration basins relies on the process of contaminants adsorbing onto the soil while passing towards the groundwater. The treatment efficiencies as shown in (Table 17) can therefore be achieved. As stated earlier the shallow groundwater in the Lincoln global consent area has currently elevated nutrient concentrations which can be attributed to agricultural land use practices upgradient. The ISMP does not propose to mitigate the effects of those upgradient sources.

Discharge to ground will occur outside the current and future community drinking water supply zones. The only other consented groundwater take for domestic purposes is up-gradient of the development areas and potential infiltration basins. Consented groundwater takes for other purposes (mainly irrigation) within the development areas are expected to cease as urban development progresses.

No industrial activities will occur in catchments with infiltration systems.

There will be minimal risk of groundwater contamination from the wetland system as it is located in an area of positive groundwater pressure (groundwater will come in rather than stormwater getting out, except for very brief periods during major storms until water ponded in the wetland empties out.).

Effects on Groundwater Quantity

Groundwater Levels

Stormwater disposal locations are to be located and distributed so that groundwater mounding is minimised (see Appendix K). Site specific investigations will highlight any groundwater mounding potential. Over sizing the basin or constructing multiple basins can help minimise the effects of groundwater mounding if identified as a problem. Where onsite soils do not allow for sufficient drainage, centralised common/shared infiltration stormwater infiltration basins may be used to achieve sufficient groundwater discharge capacity.

Where possible stormwater from roofs will be disposed on-site, thus spatially distributing some of the discharges to ground.

Groundwater levels will be locally drawn down at the proposed wetland areas flows go into and through the springs waterway and to ensure wetland flows and vegetation are maintained. This drawdown could be an advantage for the neighbouring urban development to the north.

Recharge of Springs

The use of infiltration basins will offset the increased impermeable areas caused by development and maintain the recharge of groundwater and therefore the spring flows.

The increase of other impermeable surfaces in the other areas is not expected to have a more than minor effect on spring flows for following reasons:

- Most of the development is located on the coastal confined aquifer which is recharged further to the northwest.

- The existing soils have a very low permeability. This means the difference in infiltration between undeveloped areas and impervious developed areas will be relatively small.
- In many areas the groundwater pressure is positive, so no recharge is possible.

It should be noted that future large scale irrigation activities over unconfined upgradient aquifers have the potential to significantly increase the groundwater water levels and spring flows in the Lincoln global consent area

Effects on Amenity Values

With the implementation of this ISMP the Lincoln community will enjoy improved amenity values along the margins of the waterways. Reaches will be accessible to the public that previously were within private agricultural land. A significant wetland area with native plant species will be created. The wetland will offer opportunities for community involvement including research, education and restoration groups. Dry pond areas will also provide amenity.

7.3.5 Summary of Effects

In summary the predicted effects of the stormwater discharges after development and including mitigation measures are

- No change in sediment concentrations in the receiving waterways and possibly an improvement with riparian works reducing areas susceptible to erosion
- No increase in erosion within the global consent area and downstream. Any existing erosion within the global consent area will be stabilised.
- Occasional temporary increases in water temperature in the upper L2 River from wetland discharges with no subsequent effect on eco systems which are highly tolerant to temperature change.
- No change or reduction in bacterial loads.
- No change or slight reduction in nutrient concentrations in waterways which has a positive effect by reducing weed growth
- No effects on groundwater and surface water takes as they will cease with change of land use
- No change to the already minor risk of accidental discharges and spillages entering the waterways from existing development. A positive effect in new developments due to spills being more easily remediated prior to entering waterways.
- Reduction in localised flooding.
- Full peak flow mitigation of storms of up to 50 year ARI.
- No more than minor effects on downstream flooding during long duration storm events.
- No more than minor effects on metals concentrations in sediments in receiving waterways.
- No adverse effects on aquatic fauna. Stream habitat improvements are expected.
- Re-creation of plant and animal resources in stormwater wetlands
- Protection of Ngai Tahu values especially relating to spring flows and separation of waters. Improvement of mahinga kai habitat.
- No more than minor changes to overall groundwater quality and quantity.
- Localised and short-term groundwater mounding possible in proximity to centralised infiltration systems.
- Slight decrease of groundwater levels in proximity to wetland area. This could be an advantage for neighbouring urban development.
- No more than minor effects on recharge of springs
- Additional opportunities for community involvement, education and recreation
- Increased amenity to be enjoyed by the community. There will be opportunities for multipurpose use of local detention and treatment areas, conveyance swales, wetlands and riparian areas.

8.0 Assessment of Actual and Potential Effects – Ancillary Activities

8.1 Introduction

This section assesses the effects on the environment of the ancillary activities which are necessary to implement the ISMP. Some of these activities are mitigation measures themselves, designed to mitigate the effects of the proposed stormwater discharges.

8.2 Actual and Potential Effects

8.2.1 Activity 1: Groundwater Interception, Diversion and Discharge

The proposed diverted flow will cause only minor and localised effects on the groundwater environment, which is dominated by the land drainage network with its drains of around 2m deep. These land drainage channels flow permanently.

The upper aquifer is typically under positive pressure as evident from the many springs in the lower global consent area. Because of the positive pressure and the proposed excavation depth, contamination of the groundwater with stormwater is unlikely.

The reticulated water supply network for Lincoln Township is sourced from artesian wells drilled into deeper aquifers. The pressure/yield of these wells will not be affected by the groundwater inflow into the stormwater system from the shallow aquifer.

Springs in the immediate vicinity of the ponds and wetlands might experience slightly reduced flows. This would be beneficial for agricultural and urban land use purposes. It would assist the existing land drainage systems to ensure that the land is dry enough for use.

As the ponds and wetlands will discharge into the L2 River and L1 Creek the base flow of these water courses will not be affected.

Existing shallow wells in the global consent area will become redundant. Down gradient wells are in some distance from the global consent boundary and are unlikely to be affected.

The discharge of the Spring Waterway into the upper L2 River (location shown on Figure 7) will replace the existing discharge from a land drain that at present flows permanently and is fed by several springs. This flow contributes to the base flow of the upper L2 River. Therefore no significant change in quality and quantity of the discharge is expected. There might be an improvement in water quality as the Spring Waterway will not receive any runoff from agricultural or urban land and will pass through riparian plantings. The outfall structure will be designed so that no erosion or scouring of the river bank occurs.

Mitigation Measures

- Recharge by the use of infiltration systems where possible.
- Separation of clean groundwater from stormwater in springs waterway adjacent to wetland.
- Excavation work will be carried out in accordance with the Erosion and Sediment Control Guidelines (ECan, 2007b) and measures as outlined in Section 3.4 will be taken.

8.2.2 Activity 2: Dam and Divert Surface Water – Ephemeral Stream

It is understood that the Halswell River Catchment has severe existing water quality and quantity issues (pers. communication with ECan officer, 2007). The ISMP proposal is to continue and formalise the present informal directing of the occasional runoff flows from the “ephemeral stream” into the L2 River catchment rather than the Halswell River catchment. Therefore no adverse effects on the Halswell River are expected. The stream only flows during moderate to heavy rain. The diverted water will consist mainly of surface runoff water rather than base flow and the quantity will be minor in comparison to other flows in the L2 River. Once the area is developed the stream channel will be replaced with swales (or open channels) and online retention basins. This will provide a high level of treatment and is expected to protect the water quality in the L2 River. The system will be designed to mitigate the peak flows of 50 year ARI rainfall events up to a duration of 12 hours. As the critical duration of the L2

River system is 7.5 hours the effects of the stream diversion are expected to be minor. The damming of water in on-line ponds is part of the stormwater attenuation and treatment system and is therefore expected to have positive effects on water quality and quantity.

Although the ephemeral stream is classed in the NRRP as a spring fed-plains river (NRRP Map A-066) the actual condition of this stream is of low amenity and ecological value with only intermittent water flow and stock fenced in the stream-bed during dry periods. Development in accordance with the ISMP (Activity 2) is expected to increase the amenity of this channel and its habitat value by the incorporation of the channel and the proposed ponds into a stormwater reserve. A reduction in nutrient concentrations can also be expected as stock will no longer have access to the channel.

Possible cultural effects from the existing and proposed ongoing diversion have been considered. The L2 River south of the L1 Creek confluence already contains mixed water from springs, land drainage and excess water from the Paparua Water Race which is sourced from the Waimakariri River. Diverting mainly runoff from the ephemeral stream is considered to have a minor effect on the already compromised system.

No springs are shown on the ECan GIS layer. Therefore it is not expected that spring flows would be mixed with stormwater flows.

Overall, the cultural effects of the proposed diversion are considered to be minor.

Mitigation measures

The channel of this stream has been included in outline development plan requirements for ODP Area 3 and improvements to its ecological and amenity values will be made. A stormwater reserve for the area has been included. Diverted flows will be incorporated in the overall management of stormwater in the global consent area to avoid adverse downstream effects in the L2 River catchment.

8.2.3 Activity 3: Stream Enhancement

Potential Effects

a) Unnamed ephemeral stream:

The current state of the unnamed ephemeral stream is poor in terms of its ecological and amenity values. As part of the development the riparian zone and stream bed and banks will be restored to provide enhanced ecological and amenity values for the surrounding residential development. Temporary sediment disturbance might occur. As the stream banks will be re-contoured they will be designed to avoid future erosion.

The flood carrying capacity of the river will be enhanced as the channel will be widened and additional storage volume will be introduced.

Earthworks are expected to be carried out during dry periods (summer) when the river runs dry and therefore sediments are unlikely to reach the L2 River catchment. Planting will follow earthworks as closely as possible to mitigate any initial erosion risk.

This activity will have positive effects such as improved amenity and ecological values. Adverse effects are expected to be no more than minor and of a temporary nature.

b) L1 Creek and L2 River

The riparian zone and stream bed and banks will be improved to provide enhanced ecological and amenity values for the surrounding residential development. The overall effects of this activity will be positive and the habitat and amenity values of these streams improved. The flood carrying capacity of the rivers will be maintained and no increase in water levels is expected.

Temporary sediment disturbance might occur. As the stream banks might be re-contoured at places they will be designed to avoid future erosion.

Earthworks are expected to be carried out during dry periods (summer) when the river runs low and therefore less sediment is likely to be released into the L2 River catchment. Planting will follow earthworks as closely as possible to mitigate any initial erosion risk.

Earthworks volumes are difficult to estimate, but it is conservative to assume that there will be technical non-compliance with NRRP earthworks volume limits. We understand that those limits were devised to limit the risks of erosion and sediment effects. The proposed erosion and sediment control measures described above will provide best practice protection, negating the need for earthworks volume limits.

Downstream of the Lincoln global consent area various other land use and drain cleaning practices also release sediments into the L2 River. These activities include agriculture, horticulture and channel cleaning with heavy machinery.

Mitigation measures (locations as shown in Figure 9):

1) The earthworks will be carried out during low flow conditions. This will minimise disturbed sediment discharging to water.
2) All practicable measures shall be taken to avoid debris generated by the vegetation clearance being deposited in the bed of a river or lake or on land in a position where it can enter the river.
3) Trees will be felled away from rivers and where possible tree trunks will not be dragged through or across the bed.
4) Bare ground will be replanted as soon as practical and no later than three months after vegetation clearance. At least 80% of the ground cover will be re-established within 24 months. Any further clearance at the site will not be undertaken until 80% of the groundcover is established.
5) All work will be carried out in accordance with ECan's Erosion and Sediment Control Guideline 2007.
6) All practicable steps will be taken to avoid soil being deposited into the bed of a river or placed at a position where it is likely to enter a river.
7) All excavations, batters, side-castings or other areas of soil disturbance or deposition resulting from the activity will be stabilised to prevent slumping, or and protected from soil erosion by revegetation or other methods as soon as practicable. These protection or stabilisation works will commence no later than within three months of the activity ceasing.
8) Stormwater run-off controls, water table cut-offs, sediment traps and culverts will be installed and maintained on tracks and roads to minimise erosion of the land surface and surface run-off.
9) Any trenches excavated for infrastructure shall be back-filled and compacted within 10 days of being excavated.
10) Excavated material (other than surplus or reject material) will be removed from the bed within 10 days of excavation.
11) The Customer Service Centre of Environment Canterbury will be notified before any excavation of more than 50 m^3 in any four weeks.
12) No machinery will be refuelled in the bed.
13) After completion reject, surplus or unused bed material stored in the bed will be spread out and stripped areas will be left with battered slopes not exceeding a 3:1 slope and any flow channels disturbed during the activity shall be reinstated. All equipment and temporary structures associated with the activity will be removed from the bed.

8.2.4 Activity 4: Construction of stormwater outfall structures

Effects on the Environment:

Indicative locations of proposed outfall structures are shown in Figure 7. The exact locations and design details will be determined as part of the stormwater system design. The outfall structures will be built to protect against erosion and scouring of the river banks and Smarts Drain. No ongoing erosion to the bed and banks is expected as a result of the construction of these outfall structures. The visual impact of the outfalls within esplanade reserves will be minimised.

Existing outfall structures will be replaced or repaired as required and weeds removed. The results of the replacement will be improved amenity and habitat values along the L1 Creek and L2 River and any current scouring of the riverbank will be reduced.

Temporary sediment disturbance might occur during construction and machinery will be required for excavation. The sediment discharges are expected to be comparable with those that occur from regular drain cleaning practices in the L1 Creek and L2 River carried out by the L2 drainage committee. The fauna in the receiving rivers have been found to be very tolerant of a wide range of water and habitat conditions. It is expected that a temporary increase sediment concentrations would have a less than minor impact on the aquatic ecology.

The mitigation measures below drawn from current best practice are intended to provide sufficient guidance to allow global and ancillary consents to be issued.

Mitigation measures:

1) Structures including outfalls will be designed and maintained to minimise erosion. They will be kept in sound condition for the purpose for which they are constructed and kept clear of accumulated debris. Inspections will be carried out as part of the monitoring programme.
2) Investigation and design will generally be in accordance with the current version of the *Waterways, Wetland and Drainage Guide* (CCC, 2003 or later).
3) Earthworks will be carried out during low flow conditions when rainfall events are rare. This will minimise the risk of sediment discharging to water.
4) All practicable steps will be taken to minimise the sediments that will enter the L1 Creek and upper L2 River. All work will be carried out in accordance with ECan's Erosion and Sediment Control Guideline 2007. An outline of proposed activities and related sediment control measures is provided in Section 3.4.
5) Any substance deposited in, on, under or over the bed associated with the activity, will be of inert materials, uncontaminated with any hazardous substance and will not be deposited into surface water or at or below the water table.
6) Any deposited substance in, on, under or over the bed associated with the activity, such as riprap, fill material, retaining walls or anchored tree protection, which remains visible once the activity is complete will be of colour and material type that blends with the surrounding natural environment.
7) No machinery or vehicles will be refuelled on river beds.
8) After completion reject, surplus or unused bed material stored in the bed will be spread out and stripped areas will be left with battered slopes not exceeding a 3:1 slope and any flow channels disturbed during the activity shall be reinstated. All equipment and temporary structures associated with the activity will be removed from the bed.

9.0 Consideration of Alternative Mitigation Options

9.1 Introduction

The stormwater planning process was an integral part in the land use planning process and the Draft Integrated Stormwater Management Plan was prepared alongside the Structure Plan. During the planning phase numerous options and their combinations were considered and the system selected that satisfied most requirements. This sections summarises the stormwater management mitigation matters and measures that were considered.

9.2 Stormwater Management Options

Consideration 1: Centralised Systems versus Individual Systems

In the past stormwater management systems in Lincoln have been constructed for individual developments. Experience shows that some of the systems have not performed at the desired level, the design does not add to the amenity values of the township and maintenance costs have been high. Also, cumulative effects were not considered when consents were applied for.

The *Lincoln ICMP Stormwater Management Options Report* (Maunsell, 2007) evaluated the potential environmental, social economic and cultural effects of the continuation of building individual stormwater systems on a case by case basis (business as usual) and centralised treatment systems. The business as usual option achieved the lowest rating. Possible issues of this approach were:

- Multiple land ownership in eastern Lincoln
- Staging, each system would have its own outfall and consenting process
- Higher maintenance and operational costs for multiple systems
- Site by site flow mitigation could increase downstream flood risk
- Risk of treatment devices only meeting the minimum treatment requirements
- Risk of stormwater retention areas being isolated within developments and not incorporated in the green space network.

Council decided to streamline stormwater management in Lincoln and take a holistic approach to achieve the most effective stormwater treatment as well as the best interaction with other ‘networks’. Except for possible individual on site soakage, stormwater will be treated in a number of centralised systems.

Consideration 2: Discharge Methods

The alternative discharge methods for the Lincoln global consent area are:

- Discharge to ground
- Discharge to water
- Discharge to ground and water

As the physical properties of the global consent area vary, discharge to ground and to water is proposed. Discharge to ground is the preferred method as has fewer potential adverse effects on flooding and hydrology than discharge to water. Where discharge to ground is not possible the stormwater will be discharged to water after treatment.

Consideration 3: Water Quality Mitigation Options

During the planning and pre-design process stormwater treatment in wetland systems (where no soakage is possible) was preferred over retention basins (dry or wet). This decision was based on advantages in stormwater treatment performance (CCC, 2003), amenity values, ecological and cultural values. The proposed eastern wetland system will give the opportunity to create a wetland area of considerable size that fulfils a number of functions.

A range of stormwater management options was investigated and evaluated considering the four well-beings in the *Lincoln ISMP Stormwater Management Options Report* (Maunsell, 2007). This report was then released for consultation with the public and stakeholders. After considering submissions, additional consultation with developers and more detailed investigations (aquatic ecology, cultural impacts and strategic stormwater modelling with preliminary sizing) the proposed stormwater management regime was developed.

The following amendment have been made since that time:

- Use of a wet pond for parts of ODP Area 2.
- The topography prevents some areas of ODP Area 3 from being conveyed into the wetland system. The runoff from these areas is now proposed to be treated in dry retention basins and discharged into Smarts Drain.
- The use of a dry retention basin for ODP Area 5 (proposed commercial / industrial)
- Resource consent has been obtained for the northern part of the LLD (Dairy) Block (north of ODP Area 1) featuring a distributed pond and wetland system within the development.
- Private rain gardens and water tanks are not favoured because of concerns over ongoing effectiveness and high maintenance costs.
- To protect and enhance the Ngai Tahu values of springs and streams within the global consent area a spring waterway has been proposed to separate spring flow from stormwater and create a habitat for mahinga kai species.

Consideration 4: Flood Mitigation Options

Both downstream catchments (Halswell River and L2 River) suffer from widespread flooding during long duration rainfall events. Therefore flood mitigation is non-negotiable.

The topography allows an area east of Lincoln (parts of ODP Area 3) to drain into either the Halswell River catchment or the L2 River catchment. As the widespread downstream flooding during long duration rainfall events is considered to be more severe than in the L2 River catchment it is proposed to direct runoff into the L2 River where feasible.

10.0 Planning Framework

10.1 Canterbury Regional Policy Statement (CRPS)

The Canterbury Regional Policy Statement provides an overview of the resource management issues of Canterbury. It sets out how natural and physical resources are to be managed in an integrated way with the aim of sustainable management.

Methods to implement the requirements of the RPS include the NRRP, resource consents, investigations, information etc.

The following summarises the issues identified in the RPS relevant to stormwater discharges and the relevant related policies.

Chapter 9 Water

Chapter 9 Water deals with the quantity and quality of ground and surface water and considers the effects of water allocation, land use and discharges of contaminants on water quality. The relevant objectives and policies are identified as follows:

Objective 3: Enable present and future generations to gain cultural, social, recreational, economic, health and other benefits from the water quality in Canterbury's water bodies and coastal waters, while:

(a) safeguarding the existing value of water bodies for efficiently providing sources of drinking water for people;

(b) safeguarding the life-supporting capacity of water, including its associated: aquatic ecosystems, significant habitats of indigenous fauna and areas of significant indigenous vegetation;

(c) …

Related Policies:

Policy 9: Management of point and non-point source discharge and setting of water quality conditions.

Policy 10(a): Recognition of water bodies with high natural character and recreational use or potential.

Policy 10(b): Identification of degraded water bodies. Lake Ellesmere, the water body the L2 catchment discharges to, and five other water bodies or water body types, were identified as having priority for upgrading of water quality.

Policy 13: where no water quality standard is specified for a contaminant, the discharge to be consented should not preclude existing reasonable uses of the water body.

As has been discussed in Section 7.0, the proposed integrated stormwater management system will cause only minor and localised effects on groundwater and surface water bodies. The implementation of a comprehensive stormwater treatment and disposal system will ensure that water quality conditions in the surrounding catchments are maintained. Opportunities for water quality enhancement also exist through the implementation of riparian management plans and effective stormwater treatment throughout the proposed network.

Policy 14: where a resource consent is for an activity which involves the mixing of water from different water bodies, information on the effects of the activity on the environment should include effects of the mixing on cultural values of Tangata Whenua.

The Cultural Impact Assessment (CIA) states that subject to a number of conditions, the proposal "has potential to enhance Ngai Tahu values, because the high level stormwater treatment and the integrated catchment wide approach can generally provide better protection of the mauri of the spring fed rivers and Te Waihora". Specific requirements, such as the creation of a new springs waterway, have also been built into the form and function of the stormwater network to safeguard the cultural values identified.

Overall, it is considered that the proposed activities are consistent with the water policy framework.

Chapter 10 Beds of Rivers and Lakes and their Margins

Chapter 10 addresses the effects of land use on the natural character, indigenous flora and fauna, health of aquatic ecosystems, Tangata Whenua, and amenity, cultural and recreation values. The relevant objective and policy are identified as follows:

Objective 1: With respect to land use and development within the beds and margins of lakes and rivers, protection and where appropriate, enhancement of:

(a) Natural character

(b) …

Policy 3: Retain, and promote the establishment of, riparian vegetation, particularly indigenous vegetation along the margins of rivers and lakes, to reduce the adverse effects of land use on water quality and to enhance conservation and amenity values.

The proposed activities will result in some earthworks and vegetation clearance within the esplanade reserves of the L1 and L2 River. While it is acknowledged that some minor soil erosion and increased sediment loading will occur during the construction phase, it is considered that the proposed integrated stormwater management and associated mitigation measures will result in the re-creation of plant and animal resources in riparian margins, improvement of amenity values, a reduction in contaminants entering waterways and a reduction in localised flooding.

On the basis of the above, it is considered that the proposal is consistent with the policy framework for Rivers and their margins.

Chapter 12 Settlement and the Built Environment

Chapter 12 Settlement and the Built Environment deals with urban development and the physical expansion of settlements and their significant effects on the sustainable management of natural and physical resources.

Objective 1: Enable urban development and the physical expansion of settlements and the use and provision of network utilities to occur while avoiding, remedying or mitigating adverse effects on the environment, including particular effects on:

(a) uses and values associated with water quality of water bodies.

(b) flow and level regimes of water bodies, including the flow regimes of spring-fed streams.

<u>Related Policies:</u>

Policy 2: Discouragement of use of land for urban development and the physical expansion of settlements and minimising adverse effects on network utilities under conditions such as:

- contamination of drinking water sources
- adverse effects on flows and level regimes of water bodies
- adverse effects on natural character meeting certain criteria
- adverse effects on ancestral land and water sites

The proposed ISMP has been designed to provide integrated management of stormwater discharge. A number of mitigation measures are proposed, including a riparian enhancement plan, improved conveyance systems and centralised attenuation and treatment systems. Therefore, it is considered that any adverse effects on water quality and flow and level regimes of water bodies resulting from the proposal will be adequately addressed through these mitigation measures.

On the basis of the above, it is considered that the proposal is consistent with the policy framework for Settlement and the Built Environment.

Proposed CRPS Change No. 1

Proposed Change No. 1 of the Regional Policy Statement Chapter 12A, Development of Greater Christchurch (Change 1) contains the current proposed policies for managing urban growth within Greater Christchurch, including the Lincoln global consent area, up to 2041. The change also contains specific provisions for projected household growth and development sequencing and definitions of 'net density'. Decisions of submissions were notified on 19 December 2009 and appeals to the Environment Court have since been lodged

To make the Lincoln Structure Plan and ISMP consistent with the proposed RPS change, the household numbers, development areas and staging were amended in the Draft Structure Plan. The revised Draft Structure Plan was the subject of further consultation with key stakeholders.

Following the notification of Change 1 to the RPS, SDC lodged a submission on it requesting a reallocation of households from rural residential to residential and clarifying that existing undeveloped but zoned land is included in the projected population figures. The final Structure Plan and ISMP was therefore based on the SDC submission, being the most up-to-date information at that time. The overall household figure for Lincoln of 3,900 has since been confirmed through decisions on Change 1.

Draft Canterbury Regional Policy Statement

The Canterbury Regional Policy Statement 2010 draft was released for informal 'public input' on September 2010 and is the first step in the development of a new policy statement for the region. The draft Regional Policy Statement is in the very early stages of development and therefore no weight has been placed on this document.

Conclusion

The Lincoln Structure Plan, Plan Change 7 and the associated Integrated Stormwater Management Plan have been designed to meet the RPS policies and growth targets.

10.2 The Proposed Natural Resources Regional Plan for Canterbury

The proposed NRRP contains the following objectives and policies which are relevant to the integrated management of surface water runoff for Lincoln:

Chapter 4 Water Quality

Objective WQL1: Water Quality Outcomes for Rivers and Lakes

The ISMP has been designed to meet the NRRP objective WQL1.1 Rivers (Appendix A). Objective WQL1.1 deals with the water quality of rivers. Where water quality outcomes are not met (as stated in Table WQL5) the water existing water and bed quality has to progressively be improved.

The proposed activities and the associated change in land use will improve water and bed quality in the L1 Creek and L2 River for some parameters such as nutrients and bacterial contamination. Mitigation measures for existing untreated stormwater discharges include the improvement of riparian vegetation which will have positive effects on the water temperature and possibly water quality as well as significant improvement of habitat and amenity values of these rivers.

We consider that the proposed activities together with the ISMP fully meet the Objective WQL1.

Objective WQL2: Water quality outcomes for groundwater and contaminated land

(2) In semi-confined, unconfined, and other confined aquifers where

(b) the water quality is affected by human activities, the groundwater quality shall meet the following values:

(ii) the water quality shall remain within the Guideline Value for any aesthetic determinand listed in the Drinking Water Standards

(iv) any other inorganic or organic determined of health significance or pesticide shall not be detected at a concentration greater than one tenth of the Maximum Acceptable Value for that determined

The ISMP is located between the Coastal Confined Aquifer System and a semi confined aquifer. Objective WQL2 seeks to ensure that water quality is maintained in areas where the aquifers are semi-confined or confined. Due to ground conditions within the global consent area only the minority of stormwater runoff from new development areas will be treated in infiltration basins. The purpose of infiltration basins is to absorb contaminants into the soil

before reaching groundwater resources, however it is recognised that some residual dissolved contaminants will reach the groundwater. Overall however, the implementation of the ISMP is not anticipated to noticeably affect groundwater quality, particularly as the shallow groundwater in the Lincoln global consent area already has elevated nutrient concentrations attributed to upgradient agricultural land use practices.

Relevant Policies

The NRRP Variation 1 contains the following policies which are relevant to the integrated management of surface water runoff for Lincoln and are detailed in Appendix A:

- Policy WQL1: Point source discharges that may enter surface water.
- Policy WQL2: Prevent the discharge of certain contaminants to surface water.
- Policy WQL5: Management of riparian zones
- Policy WQL 6: Point source discharges onto or into land which affect soil or groundwater quality.
- Policy WQL8: Prevent the entry of hazardous contaminants to groundwater.
- Policy WQL12: Avoid the potential for contamination of community drinking water sources.

The above policies were considered when preparing the ISMP.

Water Quality Schedules

Policy WQL1 and Rule WQL8 state that discharges must meet water quality standards set out in Schedule WQL1 to be a discretionary activity. If the standards cannot be met the activity will become non-complying.

Water quality classes have been assigned and contains water quality standards. In the global consent area the L1 Creek, the Ephemeral Stream and the L2 River are classed spring-fed plains rivers. Downstream the Halswell River is also classed spring-fed plains.

The area surrounding Lincoln Township has an extensive network of land drainage systems with some drains managed by ECan and others by the Selwyn District Council. The drains are generally not classified in the NRRP and therefore have no water quality standards associated with them. Water quality standards technically apply where the drains enter the L1 Creek or the L2 River.

Figure 22 depicts part of NRRP Map A-066 showing water bodies classified as lowland rivers as green lines.

The Water Quality Schedule 1, Water Quality Standards for the Class of spring-fed plains rivers is summarised in Table 21. Limited water quality data suggest that currently the water quality standards are not complied with. This is likely to apply to the parameters E.coli, dissolved inorganic nitrogen and dissolved reactive phosphorus

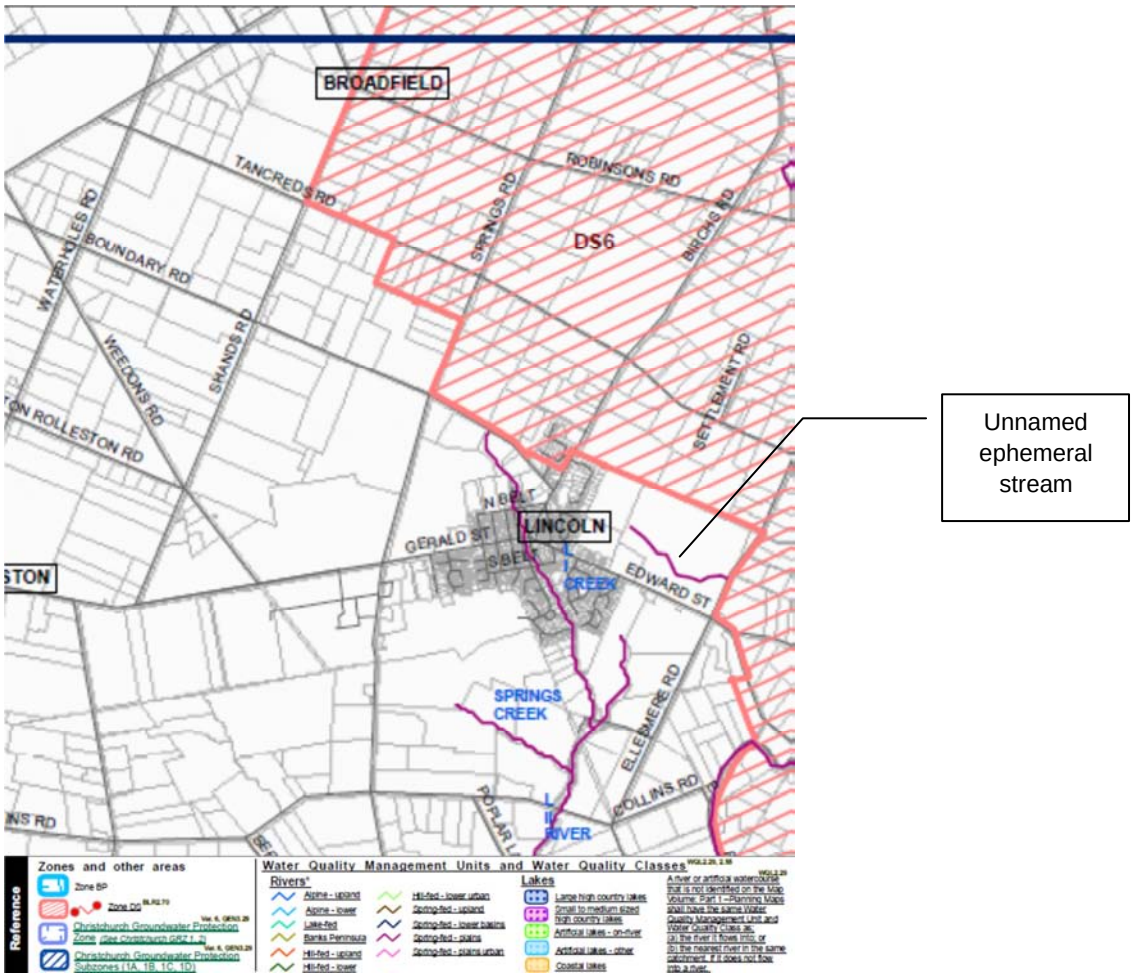

Figure 22 Water Quality Management Units and Water Quality Classes Rivers (Source: NRRP, Map A-066)

Table 21 Summary of Water Quality Standards – Spring-fed Plains Rivers

Parameter	Requirement
Dissolved organic carbon	< 2.0 mg/L change
Temperature	< = 2 deg C change
pH	6.5 to 8.5
Visual clarity	<= 35% change
Colour	<= 10 Munsell units change
Dissolved inorganic nitrogen	< 1.5 mg/L
Dissolved reactive phosphorus	< 0.016 mg/L
E.coli	< 550 E.coli per sample in 95% of samples
Toxicants	<= 95% for relevant level of protection

The Water Quality Standards for all water classes except for class Natural require that the concentration of any toxicant listed in Table WQL17 shall not exceed the concentration specified for the 95 percent level of protection for that toxicant.

Table WQL17 listing all toxicants and protection levels is shown in Appendix A. However, the main toxicants relevant to stormwater discharges are summarised in Table 22.

Table 22 Relevant WQL19 Toxicants

Chemical	99% Species Protection Level	95% Species Protection Level	90% Species Protection Level
Copper	1 µg/L	1.4 µg/L	1.8 µg/L
Lead	1 µg/L	3.4 µg/L	5.6 µg/L
Zinc	2.4 µg/L	8 µg/L	15 µg/L
Benzene	600 µg/L	950 µg/L	1300 µg/L
o-xylene	200 µg/L	350 µg/L	470 µg/L
p-xylene	140 µg/L	200 µg/L	250 µg/L
Naphthalene	2.5 µg/L	16 µg/L	37 µg/L

Schedule 2: Community Drinking Water Supply Protection Zones

Discharge to ground under Rule WQL7 within Community Drinking Water Supply Protection Zones is also a controlled activity within an ISMP area. The location of Community Drinking Water Supply Protection Zones has been considered within the ISMP process.

Table WQL20 in Schedule 2 lists all community drinking water supplies in Canterbury including their location, depth of bore and direction of groundwater flow. Community Drinking Water Supply Protection Zones within the study area are shown in Figure 21.

Table 23 below shows the community drinking water supply wells within the study area listed in Schedule 2 of the NRRP.

Table 23 Community Drinking Water Supplies in Study Area

Site Number	Commu-nities	Well Number	Grid Reference East	Grid Referenc e North	Depth of Bore (m)	Direction from which groundwater flows (true bearing)	Peak load population
64	Lincoln	M36/5377	2468164	5729564	37.0	304	5,000
175	Lincoln	M36/1862	2468866	5727383	34.3	315	5,000
		M36/1965	2468897	5729414	34.4	315	5,000
283	Lincoln University	M36/2857	2466870	5729024	86.0	345	5,000
284	Lincoln University	M36/1597	2466788	5729004	39.6	345	5,000
1576	Crop and Food	M36/1961	2467808	572942	37.6	279	500

No discharge to land will occur within the Community Drinking Water Supply Protection Zones of the above wells.

Additional wells may be required to provide for future demand. The proposed soakage discharge is very unlikely to affect possible future wells.

Schedule WQL 9: Use or Store of Hazardous Substances

Schedule 9 of the NRRP lists activities that are likely to produce contaminated stormwater (Appendix F). This Schedule is relevant in identifying existing potential sources of contaminants as well as for the consideration for future land uses. This ISMP requires a description and evaluation of selected measures for treatment, as well as volume and contaminant reduction including response to spills and leaks from a site where an activity listed in Schedule WQL9 occurs.

Chapter 6 Beds and Margins of Lakes and Rivers

Chapter 6 of the NRRP addresses land use within the beds and margins of lakes and rivers to maintain and enhance the natural form and behaviour of these systems. The relevant objectives and policies from this chapter are identified and assessed below:

Objective BLR1: Activities within the beds of lakes and rivers and land adjacent to the bed

Activities within the beds of lakes and rivers and/or land adjacent to the bed are able to be undertaken while:

(a) protecting flood carrying capacity;

(b) protecting the stability and integrity of structures and the banks of lakes and rivers;

(d) preserving natural character

(g) promoting the maintenance and enhancement of amenity values

Policy BLR1: Control land uses, including soil excavation and plant removal within 7.5metres of the bed of a river by ensuring that activities shall not restrict water flow, cause localised scouring or erosion, create an increase in pest plant infestation.

The proposed activities include some earthworks and vegetation clearance from the river margins of the L1 and L2 Rivers. As has been discussed above, the proposed stormwater management and associated mitigation measures will result in an overall improvement in the vegetation and fauna habitat in the river margins and an improvement in the overall amenity values. Therefore, it is considered that the proposal is consistent with the policy framework for Rivers and their margins

10.3 Te Runanga o Ngai Tahu Freshwater Policy Statement (1999)

6.2 Objective. *Restore, maintain and protect the mauri of freshwater resources.*

Policy 1. Accord priority to ensuring the availability of sufficient quantities of water of appropriate water quality to restore, maintain and protect the mauri of the waterbody.

Policy 2. Restore and enhance the mahinga kai values of lakes, rivers, streams, wetlands, estuaries and riparian margins.

Policy 4. Restore access to freshwater resources for cultural activities including the harvest of mahinga kai.

10.4 Te Taumutu Runanga Natural Resource Management Plan (2003)

Te Taumutu Runanga Natural Resource Management Plan contains the framework for understanding tangata whenua values, including protecting the mauri of rivers and waterways from the mixing of water, maintaining ecosystems, and riparian and wetland enhancement.

The policy framework in Section 3.3 O Te Whenua seeks to maintain and enhance the values of the land. This section of the Plan seeks to ensure that stormwater is discharged to land and advocates the planting of riparian margins to minimised adverse effects resulting from the discharge of contaminants. The proposal seeks to provide an integrated stormwater management system with stormwater being discharged either to land or to surface water following appropriate attenuation and treatment. The proposed mitigation measures will result in an overall improvement in the vegetation and fauna habitat of the waterways and their margins.

With regard to Section 3.3.3 Earthworks, the proposal will result in earthworks occurring within close proximity of waterways. An accidental discovery protocol will be followed when earthworks are being undertaken and all areas will be replanted once works are completed.

The policy framework in Section 3.4 O Te Wai seeks to maintain and enhance the mauri of water. The policies in this section seeks restrictions on pollutants entering waterways and to minimise disturbance and damage to river beds and banks, maintaining sufficient water level, flow and quality to maintain aquatic ecosystems, maintain groundwater quality, and protect taonga species.

The proposal seeks to establish an integrated stormwater management system to ensure the efficient and effective treatment and disposal of stormwater within the global consent area. As has been discussed, the proposal will employ a number of mitigation measures to minimise disturbance to the bed and banks of the L1 and L2 waterways, minimise contaminant loadings in discharged stormwater, and result in an overall improvement in

the quality of water in waterways and aquatic habitat. Additional mitigation measures are also to be adopted to protect wahi taonga, including the creation of a separate springs waterway above the proposed wetland.

Overall, it is considered that the proposal is consistent with the policy framework for Te Taumutu Runanga Natural Resource Management Plan.

10.5 Te Waihora Joint Management Plan (2005)

The Te Waihora Joint Management Plan seeks to provide for the integrated management of the area around Te Waihora and its catchment. The purpose of the Plan is to manage water quality and quantity of the Lake and the surrounding tributaries. Given that the proposal seeks to provide integrated management of stormwater within the wider Te Waihora catchment, it is considered that the proposal is consistent with this Management Plan.

11.0 The Resource Management Act 1991

11.1 Overview

The Resource Management Amendment Act 1991 sets out the framework for the management of the effects of activities on the environment. Under section 9(3) no person may use land in a manner that contravenes a rule in a Regional or Proposed Regional Plan unless expressly allowed by a resource consent (or section 20). Under section 15(1) no person may discharge any contaminant or water into water or discharge any contaminant onto or into land unless the discharge is expressly allowed by a rule in a Regional Plan.

Under the provisions of the RMA in determining whether a resource consent can be granted under Sections 104A and 104B of the Act, the consent authority must consider the matters listed in Section 104(1) of the Act.

Under section 104B the consent authority may grant or refuse consent for a discretionary activity at their discretion and may impose conditions on the consent under Section 108. The approval of a non-complying activity is subject to meeting the threshold test set out in section 104D, and if granted, conditions may be imposed under section 108.

Applications are required to include an Assessment of Environmental Effects under Section 88 of the Act, and the Fourth Schedule lists a range of matters that should be covered in an Assessment of Environmental Effects. These matters are to be described in detail commensurate to the effects of a proposal.

11.2 Part 2 of the Act – Purpose and Principles

Section 5 of the RMA sets out that its purpose is to promote the sustainable management of natural and physical resources. In determining whether a proposal promotes sustainable management, Part 2 of the RMA directs reference to the following specific matters (in order of significance):

1) Matters of National Importance (Section 6);

2) The Treaty of Waitangi (Section 8).

3) Other Matters (Section 7);

Section 5: Purpose

The secton identifies that “sustainable management” means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while -

5(2)(a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

5(2)(b) Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

5(2)(c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment.

Section 6: Matters of national importance

The section sets out the requirement to provide as a matter of national importance for (in respect to relevance to this application):

a) The preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development;

(d) The maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers;

e) The relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga.

Section 7: Other matters

Sets out the requirement to have particular regard to:

a) Kaitiakitanga;

aa) The ethic of stewardship;

b) The efficient use and development of natural and physical resources;

ba) The efficiency of the use of energy;

c) The maintenance and enhancement of amenity values;

d) Intrinsic values of ecosystems;

f) Maintenance and enhancement of the quality of the environment;

g) Any finite characteristics of natural and physical resources.

Section 8: Treaty of Waitangi

The requirement to take into account the principles of the Treaty of Waitangi is stated in section 8.

11.2.1 Assessment against Part 2 of the Act

This application addresses the management of the stormwater from a managed area. The activity will result in a considered and sustainably managed system rather than an ad hoc methodology with uncertain adverse effects. As such the application embraces Section 5 and the purpose of the Act. By managing the effects of stormwater discharges proactively the potential to meet the needs of future generations is addressed. Additionally this application takes account of the life supporting capacity nthrough testing and addressing the likely effects in respect to the receiving environment.

11.3 Section 104 to 107 – Consideration of Application

Before making a decision on a discretionary activity pursuant to Section 104A or 104B of the Act, Council must consider the proposal in terms of Section 104 of the Act.

Section 104(1) outlines the following matters, which are relevant to Council's consideration of the application:

"(a) any actual and potential effects on the environment of allowing the activity; and

(b) any relevant provisions of-;

(iii) a regional policy statement or proposed regional policy statement:

(iv) a plan or proposed plan; and

(c) any other matter the consent authority considers relevant and reasonably necessary to determine the application".

Sections 104B and 104D refer in detail to applications for Non-complying Activities:

104B Determination of applications for discretionary or non-complying activities

After considering an application for a resource consent for a discretionary activity or non-complying activity, a consent authority—

(a) may grant or refuse the application; and

(b) if it grants the application, may impose conditions under section 108.

104D Particular restrictions for non-complying activities

(1) Despite any decision made for the purpose of section 95A(2)(a) in relation to adverse effects, a consent authority may grant a resource consent for a non-complying activity only if it is satisfied that either—

(a) the adverse effects of the activity on the environment (other than any effect to which section 104(3)(a)(ii) applies) will be minor; or

(b) the application is for an activity that will not be contrary to the objectives and policies of—

(i) the relevant plan, if there is a plan but no proposed plan in respect of the activity; or

(ii) the relevant proposed plan, if there is a proposed plan but no relevant plan in respect of the activity; or

(iii) both the relevant plan and the relevant proposed plan, if there is both a plan and a proposed plan in respect of the activity.

(2) To avoid doubt, section 104(2) applies to the determination of an application for a non-complying activity.

In relation to section 104D it is considered that the application, as assessed in this document, meets the requirements of subsections 1(a) to (b)(iii).

Section 107 of the Act states:

107 Restriction on grant of certain discharge permits

(1) Except as provided in subsection (2), a consent authority shall not grant a discharge permit or a coastal permit to do something that would otherwise contravene section 15 or section 15A allowing—

(a) the discharge of a contaminant or water into water; or

(b) a discharge of a contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water; or

(ba) the dumping in the coastal marine area from any ship, aircraft, or offshore installation of any waste or other matter that is a contaminant,—

if, after reasonable mixing, the contaminant or water discharged (either by itself or in combination with the same, similar, or other contaminants or water), is likely to give rise to all or any of the following effects in the receiving waters:

(c) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials:

(d) any conspicuous change in the colour or visual clarity:

(e) any emission of objectionable odour:

(f) the rendering of fresh water unsuitable for consumption by farm animals:

(g) any significant adverse effects on aquatic life.

(2) A consent authority may grant a discharge permit or a coastal permit to do something that would otherwise contravene section 15 or section 15A that may allow any of the effects described in subsection (1) if it is satisfied—

(a) that exceptional circumstances justify the granting of the permit; or

(b) that the discharge is of a temporary nature; or

(c) that the discharge is associated with necessary maintenance work—

and that it is consistent with the purpose of this Act to do so.

(3) In addition to any other conditions imposed under this Act, a discharge permit or coastal permit may include conditions requiring the holder of the permit to undertake such works in such stages throughout the term of the permit as will ensure that upon the expiry of the permit the holder can meet the requirements of subsection (1) and of any relevant regional rules.

There are not expected to be any of the effects stated in (1)(c) to (1)(g). It is therefore considered that there is no significant effect.

12.0 Proposed Consent Conditions (*Draft*)

CLIENT NAME: Selwyn District Council

A DISCHARGE PERMIT: To discharge contaminants to land and to surface water.

CONSENT LOCATION: Global Consent, Lincoln, SELWYN

CONSENT DURATION: 35 years

Limits

(1) The discharge shall be limited to stormwater from:

a. Roofs, roading and hardstand areas (impervious areas) and pervious areas within the Global Consent area (Plan CRC******) associated with:
   i. development that existed prior to the commencement of this consent ('existing sites');
   ii. re-development of 'existing sites';
   iii. new residential development; and
   iv. new commercial and industrial development.

b. Exposed soils during construction of any new development site or re-development of an existing site within the Global Consent area shown on Plan CRC******.

(2) Notwithstanding Condition 1 the consent excludes discharges from sites in one or more of the following categories:

a. with activities or industries listed and which are not excluded by the criteria set out in Schedule WQL9 attached, which forms part of this consent;
b. from sites that have been registered by the Canterbury Regional Council on its Listed Land Use Register (LLUR) as a 'verified', 'contaminated for', 'significant adverse environmental effects', or 'managed for' site;
c. that is located on, or bounded by, land that has been historically used as a landfill;
d. consents or activities that, at the discretion of Selwyn District Council, are unfavourable

(3) Stormwater shall be discharged into the existing SDC stormwater drainage network or via a new stormwater management system onto and into land and/or into water within the Global Consent Area shown on Plan CRC******.

(4) The consent holder shall ensure that:

(a) All personnel working within the Global Consent area; and

(b) All landowners or occupiers within the Global Consent area;

are aware of and have access to the contents of this consent document, and all associated documents.

Definitions

(5) For the purposes of this consent:

a. ***Stormwater***: means rain-sourced or routine wash down sourced runoff, which may contain contaminants typical of urban or site construction stormwater such as suspended

sediments, organic matter, nutrients, heavy metals, hydrocarbons, micro-organisms and traces of hazardous substances that are entrained as the runoff or wash down water that flows over land or hard surfaces. It excludes discharges to water or onto and into land of runoff from spilled or deliberately released hazardous substances and wash down of such spillage or releases. Advice Note: With respect to sites or collection areas where stormwater is sourced from land not in the ownership of the consent holder (being the SDC), the point of discharge is where the contaminant or water leaves the effective control of the discharger, which includes but is not limited to the point of entry into the SDC stormwater drainage network. It is therefore the responsibility of individual owners and/or occupiers of land, for example private industrial sites, to ensure that their discharge of stormwater into the SDC stormwater drainage network complies with the above definition of stormwater.

b. ***Stormwater drainage network***: means the reticulated piped and open network, including kerb and channel, sumps, pipes, swales and manholes; and any stormwater management device that the Selwyn District Council assumes responsibility for.

c. ***Stormwater management device;*** is a constructed or proprietary device which by function attenuates, detains or treats stormwater.

d. Key sump; means any sump which directly discharges to a stormwater management device e.g. where the discharge has no other form of primary treatment.

e. ***Water***: means fresh water in a river, ephemeral water course, artificial drain, pond, lake, stream, wetland or aquifer, or any part thereof, that is not located within the coastal marine area.

f. ***Temporary systems:*** Are stormwater management devices, which are constructed as an interim measure before the construction of the ultimate Council system is complete.

g. ***Manager***: means the Canterbury Regional Council (CRC), RMA Compliance and Enforcement Manager, or nominated CRC staff acting on the Manager's behalf.

h. ***Construction***: means all bulk earthworks and earthworks associated with the construction of the subdivision including house sites.

i. ***Earthworks***: means the disturbance of land surfaces by blading, contouring, ripping, moving, removing, placing or replacing soil and earth, or by excavation, or by cutting or filling operations.

j. ***Bulk earthworks***: means major cut/fill/waste works which expose an area exceeding 2000m^2.

k. ***Stabilised***: means an area inherently resistant to erosion such as rock (excluding sedimentary rocks), or rendered resistant to erosion by the application of aggregate, geotextile, vegetation or mulch. Where vegetation is to be used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once 80 percent vegetation cover has been established.

l. ***Recognised Design Guides***: Refers to the Auckland Regional Council, Stormwater Management Devices: Design Guidelines Manual, May 2003, Technical Publication No.10, Christchurch City Council, Waterways, Wetlands and Drainage Guide, Part B: Design, February 2003, On-Site Stormwater Management Guideline, October 2004, New Zealand Water Environment Research Foundation and other industry recognised and accepted stormwater design guidelines.

m. ***E&SCG***: means Environment Canterbury's Erosion and Sediment Control Guidelines for the Canterbury Region, Report No. R06/23, February 2007 or any amendments to this document.

Construction Phase

(6) The discharge during construction shall be via best practicable erosion and sediment control measures undertaken to minimise erosion of land, and the discharge of sediment-laden stormwater, into the SDC stormwater drainage network, to land or to water.

(7) An Erosion and Sediment Control Plan (E&SCP) for bulk earthworks shall be prepared and submitted to the Manager at least ten working days prior to the commencement of construction.

(8) The ESCP shall include as a minimum the following:

a. Contour information at suitable intervals;
b. Erosion and sediment controls to be used;
c. Supporting calculations;
d. Catchment boundaries for the sediment controls;
e. Location of the works, and cut and fill operations;
f. Details of construction method to be employed including timing and duration;
g. A programme for managing exposed soil area including progressive stabilisation considerations; and
h. Monitoring and maintenance schedules.

(9) Prior to bulk earthworks commencing, the consent holder shall submit to the Manager, a certificate signed by a suitably qualified and experienced engineer to certify that the erosion and sediment control measures have been constructed in accordance with the ESCP and conditions of this consent.

(10) The ESCP may be amended at any time. Any amendments shall be:
a. Only for the purpose of maintaining or improving the efficacy of the erosion and sediment control measures and shall not result in reduced discharge quality; and
b. Consistent with the conditions of this resource consent; and
c. Submitted in writing to the Manager, prior to any amendment being implemented.

(11) Prior to commencement of any bulk earthworks, the consent holder or their agent, shall arrange and conduct a pre-construction site meeting between the Canterbury Regional Council, people responsible for the design of the Erosion and Sediment Control Plan (ESCP) and the primary contractor. At a minimum, the following shall be covered at the meeting:
a. Scheduling and staging of the works;
b. Responsibilities of all relevant parties;
c. Contact details for all relevant parties;
d. Expectations regarding communication between all relevant parties;
e. Procedures for implementing any amendments;
f. Site inspection; and
g. Confirmation that all relevant parties have copies of the contents of this consent document and all associated erosion and sediment control plans and methodology.

(12) If the water quality in the receiving environment becomes adversely affected during the construction phase, the consent holder shall:
a. Undertake an investigation and assessment to determine if the effect is a result of bulk earthworks from within the global consent area;
b. Inform the Canterbury Regional Council Manager;

c. Install further erosion and sediment control measures, and/or
d. Implement a water chemical treatment plan prepared in accordance with Auckland Regional Council's Technical Publication No. 227 The Use of Flocculants and Coagulants to Aid the Settlement of Suspended Sediment in Earthworks Runoff: Trials, Methodology and Design, June 2004.

Decommissioning or abandonment

(13) Erosion and sediment control measures shall not be decommissioned until the site is stabilised and the stormwater system for the developed site is functioning.

(14) Where a permanent stormwater management device is used for erosion and sediment control purposes, sediment generated from the bulk earthworks shall be removed.

(15) If the consent holder abandons work on-site, they shall first take adequate preventative and remedial measures to control sediment discharges, and shall thereafter maintain those measures for so long as necessary to prevent sediment discharge from the site.

Stormwater system design

(16) Existing stormwater system, which existed prior to the commencement of this consent:
a. Existing discharges are permitted under this consent;
b. Retrofitting of existing discharges with treatment and/or attenuation systems is permitted under this consent but not required; and
c. Any proposals to retrofit or improve existing stormwater systems shall be covered within the management report required under condition (36) of this consent.

(17) Future stormwater system

The ***stormwater drainage network*** shall, in series, provide primary and secondary treatment (treatment train). Each device shall be designed as follows:

a. Each ***key sump*** shall be fitted with submerged or trapped outlet capable of trapping hydrocarbons.

b. Each ***treatment swale*** shall be designed and constructed:
    i. To have a hydraulic residence time of at least nine minutes during a design rainfall intensity of 10 millimetres per hour;
    ii. In general accordance with recognised design guides.

c. Each ***Infiltration basin*** shall be designed and constructed:
    i. To contain and treat all stormwater generated from the first 20 millimetres of rain from any rain event;
    ii. To detain and dispose of all stormwater generated from a two percent Annual Exceedence Probability (2%AEP) rain event of any duration;
    iii. Designed to minimise the effect of groundwater mounding on the basin;
    iv. To have an infiltration rate not exceeding 112 millimetres per hour as determined using a double ring infiltrometer test, or not exceeding 75 millimetres as determined using a flooded basin test;
    v. In general accordance with recognised design guides.

d. Each ***detention basin (including a attenuation swale)*** shall be designed and constructed:
   i. To treat all stormwater generated from the first 20 millimetres of rain from any rain event;
   ii. To attenuate outgoing flows to predevelopment levels up to a two precent Annual Exceedence Probability (2% AEP) rain event of any duration';
   iii. Designed to minimise the effect of groundwater mounding on the basin;
   iv. In general accordance with recognised design guides.

e. Each ***wetland*** shall be designed and constructed:
   i. To attenuate flows so that the post-development peak discharge rate does not exceed the pre-development discharge rate for the 2, 10 and 50 year design storm events for durations up to including 12hrs (LII catchment).
   ii. To have capacity to treat the first 20 millimetres of rain from all hardstand areas and roading;
   iii. Provide an average hydraulic residence time of 24 hours; and
   iv. In general accordance with recognised design guides.

f. Each ***hydrodynamic*** separator shall be designed and constructed:
   i. To treat 10mm/hr before bypassing; and
   ii. Remove at least 75 percent of total suspended solids.

g. Each ***oil interceptor*** shall:
   i. Be an API or Coalescing Plate type Interceptor, or similar device capable of removing the same or greater amounts of hydrocarbons from stormwater;
   ii. Be designed for a design storm intensity of 10 millimetres per hour;
   iii. Reduce the concentration of total petroleum hydrocarbons in the discharge to below 15 milligrams per litre averaged over a rainfall event; and
   iv. In general accordance with recognised design guides.

h. Each ***outlet structure*** shall be designed to minimise scour and erosion.

i. Each ***soakpit*** shall be designed as a minimum to dispose the ten percent Annual Exceedence Probability (10% AEP) critical duration storm.

j. Temporary systems shall be designed in accordance with the design standards provided by condition (17a - 17i) of this consent.

(18) At least one month prior to the construction of the stormwater system(s) the consent holder shall submit to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, design plans of the stormwater system(s) to be installed.

Certification

(19) Within twenty working days of the installation of the stormwater system(s), a certificate signed by a Certified Professional Engineer (CPEng) with stormwater system construction experience shall be submitted to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, to certify that the stormwater system(s) complies with Conditions (16) to (18) of this consent.

Maintenance

(20) Within six months of the commencement of this consent, the consent holder shall prepare and implement a routine maintenance programme for the discharges authorised by this consent excluding private properties. Any updates to the routine maintenance programme shall be provided to the Manager as per condition 35.

(21) ***Sumps*** and ***outlet structures*** shall be inspected at least once every 12 months.
a. Any visible hydrocarbons and debris or litter shall be removed within 15 working days of the inspection.
b. Any accumulated sediment in sumps shall be removed when the sediment occupies more than one half of the depth below the invert of the outlet pipe.
c. Any scour or erosion in the stormwater system shall be repaired within ten working days of the inspection.

(22) ***Treatment Swales, attenuation swale, Infiltration basins, and detention basins*** shall be:
a. Maintained so that vegetation and/or grass is in a healthy and uniform state;
b. Replanted where erosion or die-off has resulted in bare or patchy soil cover; and
c. Where grassed, mown to ensure grass is at a length between 40 and 150 millimetres.

(23) ***Wetlands and wetponds*** shall be inspected at least once every three months.
a. Any visible hydrocarbons, accumulated sediment, and litter or debris in the stormwater system shall be removed within 15 working days.
b. The removal of any blockage within a structural component within 15 working days;
c. Repair of any scouring or erosion within 20 working days of the inspection;
d. Repair of any spalling or corrosion of components and non-return valve malfunctioning within four weeks of inspection;
e. Maintenance of healthy vegetation, including the removal of weed vegetation and replanting where vegetation has died; and
f. Removal of accumulated sediment in the wetland when the depth of accumulated sediment is affecting performance.

(24) The ***hydrodynamic separators*** shall be:
a. Cleaned at least annually or when filled to a depth of at least 200 millimetres with sediment, whichever is the most frequent;
b. Cleaned out following any spills; and
c. Maintained in accordance with the manufacturers' instructions.

(25) ***oil interceptors*** shall be:
a. Cleaned at least annually;
b. Cleaned out following any spills; and
c. Maintained in accordance with the manufacturers' instructions.

(26) ***Soakholes*** shall be inspected at least once every 2 years.
a. Any visible hydrocarbons and debris or litter shall be removed within 15 working days of the inspection.

Disposal of Material

(27) Any material removed, including sediment, hydrocarbons and other contaminants, in the exercising of this consent shall be disposed of at a facility authorised to receive such material.

Monitoring and Performance Standards

(28) Soil samples shall be taken from representative infiltration basins, detention basins and attenuation swale.
   a. At least once every five years;
   b. From a depth of between zero and 50 millimetres below the ground surface at the point of lowest elevation;
   c. By a person who has at least a tertiary science or engineering qualification that required the equivalent of at least one year of full-time study and has at least two years environmental investigation professional work experience post-qualification.

(29) Soil samples shall be analysed for the following contaminants:
   a. Copper
   b. Zinc
   c. Benzo(a)pyrene
   d. TPH C7-C9
   e. TPH C10-C14
   f. TPH C15-C36

   In milligrams per litre (mg/L) using the United States Environmental Protection Agency method 1312, Synthetic Precipitation Leaching Procedure (SPLP), using reagent water, by a laboratory accredited by Telarc for the appropriate methods, compared against the Leachate Trigger Concentrations, as listed in Condition (30).

(30) The results of analyses undertaken in accordance with Conditions (28) and (29) shall be compared against the following trigger concentrations: Leachate Trigger Concentration (milligrams per litre)

a.	Copper	401
b.	Zinc	302
c.	Benzo(a)pyrene	0.0141
d.	TPH C7-C9	3603
e.	TPH C10-C14	73
f.	TPH C15-C36	143

1. 20xMAV Drinking Water Standards 2008 - health significance
2. 20xMAV Drinking Water Standards 2008 - aesthetic
3. Refer to CRC090961 decision Amalgamated Holdings Ltd.

(31) If any of the trigger concentrations listed in Condition (30) are exceeded, the soils shall be considered to be contaminated and:
   a. Additional sampling to determine the lateral and vertical extent of contamination, with respect only to the contaminant(s) that exceeded a trigger concentration, shall be carried out;
   b. All contaminated soils identified in accordance with Condition (31a) shall be removed; and
   c. The effected infiltration basin(s), retention basin(s) and attenuation swale(s) shall be reconstructed.

(32) Aquatic ecology monitoring shall be carried out every five years and include.

   a. A programme that ensures that at least three sites are measured including
      i. L1 Creek at weir,
      ii. L2 River upstream of L1 Creek confluence and
      iii. L2 River downstream of Lincoln Main Drain confluence.
   b. In-stream sediment testing for metals including
      i. Copper,
      ii. Lead,
      iii. Zinc,
      iv. TKN,

v. Ammonia,
vi. Nitrates, and
vii. Total phosphates

c. A physical habitat recording and scoring system to record the habitat quality changes with a focus on substrate condition;
d. A faunal community measure that tracks the MCI (as an indicator of sensitive species) and QMCI as a measure of the communities' change.

(33) Each year, on two occasions separated by at least 3 months, the following shall occur:

a. Water samples shall be collected from:
   i. The LII drain within 50 metres downstream of the Lincoln Main Drain confluence, at map reference (E1,558,957, N 5,166,143);
   ii. Smarts Drain at the intersection of Ellesmere Road, at map reference (E1,560,643, N 5,168,274);
b. Samples shall be collected:
   i. from both sites, as identified in (a) above, on the same day and within two hours of each other; and
   ii. during or no later than two hours following a rainfall event

c. **LII River** The samples shall be analysed, in milligrams per litre, for the contaminants listed below, and the annual average event mean contaminant concentrations shall not exceed the following trigger values:

i.	Total Suspended Solids	50
ii.	Dissolved Zinc	0.03
iii.	Dissolved Lead	0.0112
iv.	Dissolved Copper	0.0036
v.	Total Petroleum Hydrocarbons	0.7

Note: Trigger values set in recognition of the short-term and intermittent nature of discharges from the wetland systems. Trigger values have been set at twice the level of the ANZECC Guideline 90% trigger values for metals.

d. **Smarts Drain** The samples shall be analysed, in milligrams per litre, for the contaminants listed below, and the annual average event mean contaminant concentrations shall not exceed the following trigger values:

i.	Total Suspended Solids	50
ii.	Total Zinc	0.144
iii.	Total Lead	0.027
iv.	Total Copper	0.018
v.	Total Petroleum Hydrocarbons	0.7

Not: Trigger values set in recognition of discharge to rural degraded ephemeral drain.

e. Be collected using either a grab sampling or fixed sampling method;

f. Be collected by a person who has:

   i. at least a tertiary science or engineering qualification that required the equivalent of at least one year of full-time study, or a National Certificate in water or wastewater treatment; or
   ii. Hold unit standards 17890: Undertake sampling and testing procedures for water treatment and 24927: Describe, and undertake sampling and testing procedures for wastewater; and
   iii. at least one years professional work experience post-qualification.

g. All samples taken shall be analysed using the most appropriate scientifically recognised and current method by a laboratory that is accredited for that method of analysis;

(34) If the discharge from the Global Consent area exceeds the trigger values given in condition (33) of this consent, the consent holder shall:

a. Investigate the likely source of the contaminants;
b. Investigate likely effects of contaminants on receiving environment; and
c. Undertake all practical measures to address the exceedence.

Recording and Reporting

(35) A monitoring plan shall be submitted to the Manager, within 6 months after exercising this consent, detailing how Conditions (28) – (34) shall be complied with. The plan shall include, but not be limited to, the following:

(a) The full suite of variables to be sampled or monitored;

(b) Locations, including a map, where monitoring will be undertaken;

(c) Methods for undertaking monitoring, including frequency and timing;

(d) Details on how the monitoring results will be analysed and compared with the trigger levels, baseline data and previous monitoring results;

(e) Reporting procedures; and

(f) A timetable for reporting to the Canterbury Regional Council.

(36) Commencing in the year after the consent is made active; the consent holder shall submit a stormwater management report each following year to the Manager. The report shall detail the following from monitoring undertaken within the prior 12 month period:

a. Maintenance works undertaken in accordance with Condition (20) – (27).
b. Updates to the monitoring plan developed in condition (35) of this consent.
c. Results of monitoring carried out each year including:
    i. the name of the person who collected the samples, the date and time the samples collected;
    ii. The weather and flow conditions at the time of sampling,
    iii. an interpretation of any seasonal or long term trends.
    iv. The rainfall data associated with sampling events, including, but not limited to, date, time, duration and rainfall depth of the storm event;
    v. The laboratory analysis results;
    vi. An interpretation of the trends in water quality including comparisons to previous years monitoring; and
    vii. Documentation of trigger value exceedences and further action taken in response to exceedences.
d. A summary of any remedial or improvement of works carried out to improve the quality of the discharges from each year.
e. Describe any future proposals to improve the management of stormwater within the global consent area.

Administration

(37) The Canterbury Regional Council may, on any of the last five days of September each year, serve notice of its intention to review the conditions of the consent for the purposes of:

a. Dealing with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage;
b. Requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment; or
c. Requiring the consent holder to carry out monitoring and reporting instead of, or in addition to that required by the consent.

13.0 Conclusions

SDC believes that the proposal and its associated environmental and cultural effects outlined and assessed in this document provide the best solution to meet the stormwater objective for the Lincoln global consent area and to manage current and future stormwater demands. Extensive consultation with various stakeholders and the public has been carried out and broad consensus has been reached.

Improvements of ecological, amenity and cultural values are expected and adverse environmental effects of the discharges and associated ancillary activities have been assessed to be no more than minor.

The design process is still ongoing and therefore only indicative design, sizing and location of stormwater devices and flow rates can be submitted. However, the concept has been confirmed and SDC seeks the flexibility within consent conditions to further specify the design, sizing and exact locations.

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Appendix A

Integrated Stormwater Management Plan

Appendix B

Ecological Assessment - Surface Water

Appendix C

Stormwater Modelling Report

Appendix D

Cultural Impact Assessment

Appendix D Cultural Impact Assessment

Appendix E

Discharge Locations

Appendix E Discharge Locations

All coordinates are New Zealand Transverse Mercator Grid and are approximate only. The final locations will be subject to detailed design.

Current Stormwater Discharges (unconsented)

Waterway	E	N
L1 Creek	1,558,450	5,168,210
L1 Creek	1,558,480	5,168,170
L1 Creek	1,558,510	5,168,040
L1 Creek	1,558,520	5,168,000
L1 Creek	1,558,520	5,167,960
L1 Creek	1,558,640	5,167,740
L1 Creek	1,558,820	5,167,490
L1 Creek	1,558,940	5,167,230
L1 Creek	1,558,440	5,168,340
L1 Creek	1,559,470	5,167,620
Lincoln Main Drain	1,558,310	5,167,540
Lincoln Main Drain	1,557,520	5,167,460
Lincoln Main Drain	1,558,110	5,167,540

There may further stormwater discharge outlets where the location is not known.

Proposed Stormwater Discharges

Waterway	E	N
Ephemeral Stream	1,559,650	5,167,870
Ephemeral Stream	1,559,830	5,167,680
Ephemeral Stream	1,560,110	5,167,650
Ground	1,558,900	5,169,410
Ground	1,559,020	5,168,190
L1 Creek	1,558,450	5,168,240
L1 Creek	1,559,410	5,166,950
Lincoln Main Drain	1,557,210	5,166,910
Lincoln Main Drain	1,558,210	5,166,670
Smarts Drain	1,560,120	5,168,780
Smarts Drain	1,559,680	5,169,080
Upper L2 River	1,559,370	5,166,620
Upper L2 River	1,559,220	5,166,410

Ancillary Activity 1: Intercept, Divert and Discharge Groundwater

Description	E	N
Spring waterway discharge point (upper L2 River)	1,559407	5,166,953
Spring waterway and wetland Construction	1,559,585	5,166,807
Groundwater interception and diversion during stormwater system construction	Anywhere within global consent area	

Ancillary Activity 2: Dam and Divert Surface Water

Description	E	N
Ephemeral Stream: Point 1 Point 2	 1,559,381 1,560,290	 5,168,111 5,167,623
Discharge point into SDC drain	1,560,123	5,167,301

Ancillary Activity 3: Stream Enhancement

All streams within the Lincoln global consent area might be subject to stream enhancement works as described in Section 3.4.2.

The location of streams classified in the NRRP are:

Description	E	N
Ephemeral Stream: Point 1 Point 2	 1,559,381 1,560,290	 5,168,111 5,167,623
L1 Creek Point 1 Point 2	 1,558,163 1,559,116	 5,168,928 5,166,330
L2 River Point 1 Point 2	 1,559,423 1,558,982	 5,167,267 5,166,190

Activity 4: Construction of Stormwater Outfall Structures

The location of outfall structures will be identical with those for existing and proposed discharges as detailed above.

Appendix F

Relevant Statutory Plans - Objectives and Policies

Appendix F Relevant Statutory Plans - Objectives and Policies

Regional Policy Statement

Chapter 9 Water

Issue 3: Land uses, and discharges of contaminants into water or onto or into land

Objective 3:

Enable present and future generations to gain cultural, social, recreational, economic, health and other benefits from the water quality in Canterbury's water bodies and coastal waters, while

(i) safeguarding the existing value of water bodies for efficiently providing sources of drinking water for people;

(ii) safeguarding the life-supporting capacity of water, including its associated: aquatic ecosystems, significant habitats of indigenous fauna and areas of significant indigenous vegetation;

(iii) safeguarding their existing value for providing mahinga kai for Tangata Whenua;

(iv) protecting wahi tapu and other wahi taonga of value to Tangata Whenua

(v) preserving the natural character of lakes and rivers and protecting them from inappropriate us and development;

(vi) protecting outstanding natural features and landscapes from inappropriate use and development

(vii) protecting significant habitat of trout and salmon; and

(viii) maintaining, and where appropriate, enhancing amenity values.

Related Policies:

Policy 9: *To manage point and non-point source discharges and set water quality conditions and standards and terms in plans and conditions on resource consents, that achieve (a) to (h) of Objective 3. Adverse effects of discharges on existing water quality should be avoided, remedied or mitigated and, where appropriate, degraded water quality should be enhanced.*

Policy 10(a): *In relation to water quality, natural character and cultural and amenity values, to investigate and provide for water bodies which should be sustained as far as possible in their natural state.*

Policy 10(b): *Progressively improve degraded water bodies and degraded coastal waters. To achieve this, water quality standards should be established where needed to resolve competing demands for Canterbury's water bodies and coastal waters. Over the next ten years priority for standard setting should be given to the following water resources:*
…
Lake Ellesmere (Te Waihora), lake Forsyth (Wairewa), and their tributaries and associated groundwater.
…

Policy 13: *Where numerical or narrative water quality standards for a contaminant have not been specified for a water body or coastal water, the granting of a consent for point source discharges of the*

contaminant into the water body or the coastal water should not preclude existing reasonable uses of the water body or the coastal water.

Policy 14: *Where a resource consent is for an activity which involves mixing of water from different water bodies, information on the effects of the activity on the environment should include effects of the mixing on the cultural values of Tangata Whenua.*

Chapter 10 Beds of Rivers and Lakes and their Margins

Policy 3: *Retain, and promote the establishment of, riparian vegetation particularly indigenous vegetation along the margins of rivers and lakes, to reduce the adverse effects of land use on water quality and to enhance conservation and amenity values.*

Chapter 12 Settlement and the Built Environment

Chapter 12 Settlement and the Built Environment deals with urban development and the physical expansion of settlements and their significant effects on the sustainable management of natural and physical resources.

Issue 1: Adverse effects of urban development, physical expansion of settlements and the use and provision of network utilities on the environment

Objective 1:

Enable urban development and the physical expansion of settlements and the use and provision of network utilities to occur while avoiding, remedying or mitigating adverse effects on the environment, including in particular effects on:

14.1.2 *uses and values associated with water quality of water bodies*

14.1.3 *flow and level regimes of water bodies, including the flow regimes of spring-fed streams*

14.1.4 *air quality*

14.1.5 *natural character of coastal environments, wetlands, lake and river margins that meet the criteria of sub-chapter 20.4*

14.1.6 *natural features and landscapes that meet the criteria of sub-chapter 20.4.*

14.1.7 *areas of significant indigenous and native vegetation and significant habitats of indigenous or native fauna including native fish, for example, inanga (whitebait), tuna (eel), including those that meet the criteria of sub-chapter 20.4.*

14.1.8 *ancestral land, water, sites, wahi tapu, and wahi taonga of value to Tangata Whenua.*

14.1.9 *amenity values of sites, buildings, places and areas that meet the criteria of sub-chapter 20.4.*

14.1.10 *heritage values of sites, buildings, places and areas that meet the criteria of sub-chapter 20.4.*

14.1.11 *recreational resources that meet the criteria of sub-chapter 20.4.*

14.1.12 *energy use.*

Related Policies:

Policy 2: Discouragement of use of land for urban development and the physical expansion of settlements and minimising adverse effects on network utilities under conditions such as:

- contamination of drinking water sources

- adverse effects on flows and level regimes of water bodies
- adverse effects on natural character meeting certain criteria
- adverse effects on ancestral land and water sites

Proposed Natural Resources Regional Plan (NRRP)

The proposed NRRP contains the following objectives and policies which are relevant to the integrated management of surface water runoff for Lincoln:

Objective WQL1.1 Rivers

(1) To maintain in a natural state, the water quality and the bed of rivers within land administered for conservation purposes by the Department of Conservation.

(2) (a) In rivers where the outcomes in Table WQL5 are being achieved, maintain the existing quality of the water and the bed; and

(b) In rivers where one or more of the outcomes in Table WQL5 are not being achieved, progressively improve the existing quality of the water and the bed.

Policy WQL1: Point source discharges that may enter surface water.

(1) Before allowing a point source discharge of:

(a) a contaminant, excluding those contaminants specified in Policy WQL 2, into surface water or onto land where a contaminant may enter surface water, ensure that:

(i) good practice measures shall be carried out to minimise the volume and concentration of the contaminant. These include minimising the production of the contaminants, the reuse, recovery, and recycling of materials and the treatment of waste, and

(ii) the discharge to another existing treatment and discharge system or network is not a practical alternative, and a discharge into or onto land cannot be undertaken in accordance with Policy WQL6; or

(b) water into surface water or onto land where it may enter surface water, including water from one catchment being discharged into another part of the same catchment or into another catchment, ensure that:

(i) the mixing of the waters as a result of the discharge avoids significant adverse effects on Ngāi Tahu cultural values; and

(ii) the discharge of water will not facilitate the movement of fish or unwanted organisms into catchments where they are not already present.; and

(2) If the requirements of Policy WQL1(1) are satisfied and:

(a) the existing receiving water quality meets the relevant standards in Schedule WQL1 and any applicable water conservation order, the discharge of a contaminant or water that may enter water in a river or lake, must meet these standards outside of the Mixing Zone; or

(b) the existing receiving water quality does not meet the relevant standards in Schedule WQL1 or any applicable water conservation order, the discharge shall only be allowed if:

(i) the discharge, outside of the Mixing Zone,

1. does not result in further decline in water quality; or

2. has no significant adverse effect on any purpose of management or outcome in Table WQL5 for a river or Table WQL6 for a lake; or

(ii) the adverse effects on a water body with natural state water quality are no more than minor; or

(iii) the discharge is from an existing local authority network and there is a substantial commitment to progressively improve the quality of the discharge so that, as soon as practicable but no later than

year 2025, the discharge will not breach the water quality standards for the receiving water, or prevent achievement of the outcomes in Table WQL5 for a river or Table WQL6 for a lake;

(3) The following criteria shall apply when determining the size of a Mixing Zone:

(i) the measures to be applied to ensure the size of the Zone is as small as practicable;

(ii) the Zone, either alone, or in combination with other Mixing Zones shall not occupy a major significant proportion of the receiving water body;

(iii) the Zone shall not create a barrier to the migration of fish;

(iv) the Zone shall not limit contact recreation in areas listed in Schedule WQL7;

(v) the Zone shall not result in a significant effect on Ngāi Tahu cultural values;

(vi) the discharge shall not result in the production of offensive or objectionable odours in the Zone; and

(vii) the discharge shall not result in the accumulation of toxic or

persistent contaminants in within the Zone of Non-Compliance.

Policy WQLX Effects on water quality and the river bed caused by a change to the flow of a river

(1) There shall be no adverse effects on water quality from any activity leading to a change in flow in a natural state river.

(2) For any other river, where the water quality or the bed of a river is likely to be affected by a change to the flow of a river as a result of a proposed activity or flow regime, any such change must not have a significant adverse effect on the water quality or the purpose of management and outcomes identified in Table WQL5.

(3) When deciding an application for a replacement resource consent for an existing lawful activity that has changed the flow of a river 203and has had significant adverse effects on instream values or water quality,204 impose conditions to restore instream values and water quality, as far as practicable, to those that existed before the flow of the river was changed.

(4) Any change to the quality of river water recharging groundwater should not prevent the achievement of Objective WQL2.205

Policy WQL5: Management of riparian zones

(1) Maintain or improve water quality, the quality of river bed substrate, and aquatic habitats in a river, lake, or wetland by:

(a) ensuring activities that disturb or deposit soil or clear vegetation in the riparian zone of a river, lake, or adjacent wetland are undertaken in ways that minimise:

(i) the discharge of sediment into water; and

(ii) the risk of induced erosion of the bed or banks of the water body.

(b) promoting the retention maintenance or planting of native or exotic riparian vegetation that effectively:

(i) minimises the supply of sediment from bank erosion;

(ii) reduces the concentration of nutrients, sediment and animal faecal matter in overland flow from adjacent land; and

(iii) shades water and controls the excessive growth of macrophytes or algae, or limits large fluctuations in the daily water temperature.

(2) When giving effect to Policy WQL5 (1)(b), the retention, maintenance or planting of riparian vegetation should, as far as practicable:

(a) contribute to the indigenous biodiversity of the area, particularly plant communities that are threatened or under-represented;

(b) provide for a diversity of habitats for indigenous fauna, in particular the spawning habitat for indigenous fish species:

(c) improve or establish connections between riparian plant communities which create corridors for wildlife dispersal;

d) not reduce the flood carrying capacity of a river, or cause adverse effects on the stability or performance of essential structures;

(e) avoid the establishment of pest plant and animal species, and implement measures to control the spread of pest species;

(f) not impede existing public access to or along a river or lake; and

(g) not impede existing access to, or give rise to any adverse effects on, existing network utility infrastructure.

Policy WQL 6: Point source discharges onto or into land which affect soil or groundwater quality.

(1) A point source discharge of a contaminant onto or into land is to be managed as follows:

(a) before allowing a point source discharge of a contaminant onto or into land where a contaminant may enter groundwater, ensure that:

(i) good practice measures are carried out to minimise the volume and concentration of the contaminant in the discharge. These include minimising the production of the contaminant, or the reuse, recovery, and recycling of materials and the treatment of waste; and

(ii) the discharge to another existing waste treatment and discharge system, or network is not a practical alternative; and

(b) if, after the application of Policy WQL6(1), a point source discharge onto or into land is to be authorised, the discharge shall be applied in a way and at a rate that:

(i) does not, except for a period of up to two hours following the application, exceed the infiltration capacity of the soil or subsoil at the site of the discharge; and

(ii) does not exceed the capacity of physical properties, or chemical and biological processes in the soil or subsoil, to reduce the contaminant concentration in the soil drainage water and to minimise the concentration of any contaminant entering groundwater; and

(iii) avoids the risk of public health; and

(iv) will not result in the accumulation of a contaminant in the soil which will limit the future use of land beyond the boundary of the treatment area; and

(c) if, after the application of Policy WQL6(1)(a) and WQL6(1)(b), a point source discharge onto or into land is likely to result in a contaminant:

(i) entering groundwater, including groundwater that emerges as surface water, then:

1. adverse effects on the drinking water quality of groundwater,including the risk to public health or the palatability of the water, in a well adjacent to, or down-gradient of the discharge, or as a result of pumping from a well, are to be avoided;

2. the best practicable option is adopted to ensure that any resulting contaminant plume in groundwater is as small as practicable;

3. the discharge shall not result in the accumulation of a persistent or toxic contaminant in groundwater;

4. the effects of the discharge, either alone or combination with any other discharge, must meet Objectives WQL1 and WQL2; and

(ii) entering the Coastal marine area in a contaminant plume, the effects of the discharge, either alone or combination with any other discharge must meet the requirements of Policy 7.1 or 7.2 of the Proposed Regional Coastal Environment Plan.

(2) (...)

Rule WQL8: Discharge of stormwater onto or into land or into a river, lake or artificial watercourse – stormwater management plan

Activity	Conditions	Matters for Control	Cross reference
The discharge of stormwater: (a) onto or into land; and/or (b) into a river, lake or artificial watercourse; ~~from~~in accordance with a stormwater management ~~area~~plan;[857] is – 1. a **controlled activity** if the discharge	1. ~~The area which is being serviced by the stormwater network shall be included in an integrated~~A stormwater ~~catchment~~ management plan, ~~which has been~~shall be prepared in accordance with Section 4.7.3.2 of this Chapter, for the area from which stormwater is collected and conveyed to the point(s) of discharge, and ~~any discharge shall comply the requirements of that plan~~t shall form part of the discharge permit application.[862] 2. Where the discharge is to a river or a lake in areas other than those identified in Condition (5), the discharge shall, outside of the ~~Zone of Non-Compliance~~ Mixing Zone[863], meet the water quality	[moved below]	~~Policies~~ ~~WQL1~~ ~~WQL2~~ ~~WQL6~~ ~~WQL8~~ ~~WQL12~~[871]
complies with all of the conditions of this Rule; 2. a **restricted discretionary activity** if the discharge does not comply with any one or more of Conditions 1, ~~to~~-3, 4 or 6[858] of this Rule, ~~in which case a resource consent under either Rules WQL 56 or WQL 57 is required;~~ ~~3. a discretionary activity if the discharge does not comply with Condition 4 of this Rule, in which case a resource consent under Rule WQL 55 is required;~~ 43. a **non-complying activity** if the discharge does not comply with Condition 2 or [859]5 of this Rule, ~~in which case a resource consent under Rule WQL 60 is required.~~ ~~For the purposes of this rule:~~ ~~(i) "stormwater management area" means:~~ ~~(1) a settlement; or~~ ~~(2) a watershed catchment of a river named on New Zealand Map Series 260-1:50,000 scale, or a tributary of that river upstream of the confluence of the tributary and any other river where 30 percent or more of the catchment is identified in a district plan for residential, commercial or industrial activities, or any~~	standards for the receiving water as set out in Schedule WQL1. 3. A discharge to a river, lake or an artificial watercourse water shall ~~not~~: (a) not exceed a concentration of total suspended solids of: (i) 50 grams per cubic metre, where the discharge is to any Spring-fed river, Banks Peninsula river, or to a lake; or (ii) 100 grams per cubic metre where the discharge is to any other river, or to an artificial watercourse; and ~~have a maximum total suspended sediment concentration of more than 125 percent of the maximum total suspended sediment concentration that occurred from the catchment before the land became a stormwater management area; or~~[864] (b) not increase the flow in the receiving water body by more than five percent of a flood event for that water body with an Annual Exceedance Probability of 20 percent ~~(one in five year event)~~.[865] 4. There shall be no discharge in the areas identified as ~~Zone 1A, Zone 1B, or Zone 1C of the Christchurch Groundwater Recharge Zone~~ Christchurch Groundwater Protection Sub-Zones 1A, 1B, 1C or 1D[866], on Map Volume - Part 1 Planning Maps. 5. ~~Where the discharge is to a river or a lake~~There shall be no discharge within any of the following areas: (a) within ~~one kilometre~~500 metres upstream on a river, artificial watercourse, or within ~~one kilometre~~500 metres[867] on a lake, from an intake for a community drinking water supply listed in Schedule WQL2; or ~~(b) a significant spawning reach for salmon listed in Schedule WQN14;~~[868] (b) in a Community Drinking Water Supply Protection Zone for a well specified in Schedule WQL2. ~~the discharge shall meet the water quality standards for the receiving water as set out in Schedule WQL1 at the point of discharge.~~[869] 6. An application for a discharge permit for a discharge that existed at 1 November 2010 must be complete and accepted by Environment Canterbury within five years of the date the rule becomes operative.[870]	~~Service~~ ~~In accordance with section 94D(3) RMA 1991, notice of an application for a resource consent required by this rule does not need to be served on those persons identified under Section 94(1) of that Act.~~	WQL13 WQL14 WQL15 WQL16 WQL18 WQL19 WQL20 WQL21[872]

	Matters for Control
~~combination of these activities;~~ ~~(ii) "settlement" means an existing or proposed collection of residences or workplaces, or any combination of these activities, with a population of 200 or more people. This includes any proposed settlement or extension to an existing settlement.~~[860]	Where the activity is classified as a **controlled activity**, Environment Canterbury has reserved control over the following matters in imposing any conditions: 1. Rate and volume of discharge and the changes to the flow regime of a river, flood frequency, including flooding of land or dwellings, erosion of river bank and channels. 2. Concentration of contaminants and adverse effects, including cumulative effects on the receiving water quality of surface and groundwater, aquatic ecosystems, Ngāi Tahu cultural[873] values and other existing uses of the water, including takes and discharges. 3. Measures to: ~~(a) avoid or minimise the entry of contaminants into stormwater; or~~ ~~(b)~~(a) reduce the volume and concentration of contaminants in the discharge; ~~(c) minimise the volume of water in the discharge; or~~[874] ~~(d)~~(b) ensure volume and rate of discharge do not exceed: (i) the capability of the soil and subsoil layers at the site to reduce contaminant concentrations in the discharge; (ii) the infiltration capacity of the soil and subsoil layers at the site. ~~(e)~~(c) avoid the accumulation of toxic or persistent contaminants in the soil or subsoil layers; and (d) minimise suspended sediment in stormwater from activities involving earthworks.[875] 4. Implementation of the integrated catchment management plan. ~~5. Ensuring that the water quality standards for the receiving water will be observed out side of the Zone of Non-Compliance~~[876] ~~6~~5. The monitoring of the activity and its effects. ~~7~~6. The requirement for financial contributions, or bonds. ~~8~~7. The duration of any consent granted. ~~9~~8. The frequency and reasons to review consent conditions, including changes to the scale and intensity of activities.
Where rule applies ~~This rule applies everywhere in the Canterbury region, excluding the Coastal marine area~~ For discharges onto or into land this rule applies everywhere in the Canterbury region, excluding the Coastal Marine Area. For discharges to a surface water body this rule does not apply to all areas/situations in the Canterbury region - see Table WQL7: Index of rules.[861]	
Information to be provided An application for a resource consent under this rule must meet the information requirements set out in Section 1.3.4 and Section 4.7.	
	Restriction of Discretion Where the activity is classified as a **restricted discretionary activity**, Environment Canterbury has restricted its discretion to the following matters: 1. Rate and volume of discharge and the changes to the flow regime of a river, flood frequency, including flooding of land or dwellings, erosion of river bank and channels. 2. Concentration of contaminants and adverse effects, including cumulative effects on the receiving water quality of surface and groundwater, aquatic ecosystems, Ngāi Tahu cultural values and other existing uses of the water, including takes and discharges. 3. Measures to: (a) reduce the volume and concentration of contaminants in the discharge; (b) ensure volume and rate of discharge do not exceed: (i) the capability of the soil and subsoil layers at the site to reduce contaminant concentrations in the discharge;

	(ii) the infiltration capacity of the soil and subsoil layers at the site. (c) avoid the accumulation of toxic or persistent contaminants in the soil or subsoil layers; and (d) minimise suspended sediment in stormwater from activities involving earthworks. 4. Implementation of the integrated catchment management plan. 5. The monitoring of the activity and its effects. 6. The requirement for financial contributions, or bonds. 7. The duration of any consent granted. 8. The frequency and reasons to review consent conditions, including changes to the scale and intensity of activities.[877]
Cross reference: This rule contributes to the implementation of Policies WQL1, WQL2, WQL6, WQL8 and WQL12.[878]	

Rule WQL29: Vegetation clearance within a riparian zone or adjacent to a wetland boundary

Activity	Conditions	~~Cross reference~~
The use of land to clear vegegation: (i) [1292] in a ~~margin~~ riparian zone outside the bed [1293] of a river or lake, or (ii) adjacent to a wetland boundary~~where the land has a dominant slope and is within the setback distances specified in Rule Table WQL 3229, for vegetation clearance;~~ [1294] is - 1. a **permitted activity** if such use complies with all of the conditions of this Rule; 2. a **restricted discretionary activity** if such use does not comply with any one or more of conditions of this Rule, ~~in which case a resource consent under Rule WQL 34 is required.~~	~~1. The vegetation clearance is only undertaken:~~ ~~(a) for the repair or maintenance of:~~ ~~(i) public network utilities;~~ ~~(ii) public roads, tracks, or railway tracks;~~ ~~(iii) legally established stream or river crossings;~~ ~~(iv) legally established private tracks;~~ ~~(v) firebreaks required under the Forest & Rural Fires Act 1977;~~ ~~(vi) public reserves established under the Reserves Act 1977 or National Parks Act 1980 Wildlife Act 1953;~~ ~~(vii) flood control structures or flood control plantations or access to these;~~ ~~(b) for the management of farm assets;~~ ~~(c) to establish survey lines or install an instrument to monitor water flow and levels;~~ ~~(d) for the restoration or enhancement of riparian vegetation to maintain or improve water quality, indigenous biodiversity, salmonid habitat, cultural or amenity values ; or~~ ~~(e) to comply with the requirements of the Regional Pest Management Strategy, a national pest management strategy, or the Biosecurity Act 1993.~~ [1295]	~~Policy~~ ~~WQL1~~ ~~WQL5,~~ ~~WQL12~~
For the purposes of this rule: 1. vegetation clearance does not include: (i) mowing of groundcover vegetation where no bare ground is exposed; (ii) pruning or trimming of vegetation; (iii) harvesting of crops other than trees; (iv) spraying of pest plants. [1296] 2. a wetland includes any wetland that has not been assessed in accordance with Appendix WTL1. [1297]	~~2~~1. ~~Except for those activities identified in Conditions 1(d) and 1(e), t~~The [1303] ~~total~~ area of vegetation clearance shall not exceed 10 per cent of the area within the relevant setback distance specified in Rule Table WQL29 in any individual property during any period of 12 months, ~~be less than 100 square metres in any kilometre length of the margin of a river or a lake in any consecutive six month period.~~ [1304] 2. All practicable measures shall be taken to avoid debris generated by the vegetation clearance being: (a) deposited in the bed of a river or lake, [1305] a wetland [1306] or the Coastal marine area; or (b) on land in a position where it is likely to enter a river or lake, [1307] a wetland [1308] or the Coastal marine area. [1309]	

~~, a river means a permanently or intermittently flowing river, but not an ephemeral watercourse.~~ [1298]	~~3. No vegetation, slash or plant debris with a diameter greater than 75 millimetres, or longer than two metres shall be:~~ ~~deposited into the bed of a river, or lake; or~~ ~~placed on land in a position where it is likely to enter a river, or lake.~~ [1310] ~~4. All practicable measures shall be taken to avoid vegetation, slash or plant debris, with a diameter less than 75 millimetres or length less than two metres, soil or any other debris being deposited in the bed of a river or lake.~~ [1311]	
Where rule applies This rule does not apply to all areas/ situations in the Canterbury region – see Table WQL 7: Index of rules	~~5.~~3. ~~Except for those activities identified in Condition 1, t~~The [1312] vegetation clearance shall not take place on land above an elevation of 900 metres above sea level.	
Rule Table WQL ~~3229~~ [1299] : ~~Riparian Zone~~Setback distances for vegetation clearance	~~6.~~4. The ~~vegetation clearance is undertaken for the maintenance or~~removal ~~harvesting~~ [1313] of trees, or any part of a tree ~~planted in a production forest that was established at the date of notification of this rule~~shall meet the following conditions ~~provided~~ [1314] , except where to ensure human safety it is not practicable to do so [1315]:	

~~Dominant land s~~Slope ~~(degrees)~~	Setback distance from the ~~edge~~bed of a river (metres)	Setback distance from the ~~edge~~bed of a lake or wetland boundary [1301] (metres)
of the land within 50 metres of the edge of the water body bed of a river or lake, or wetland boundary and within which the activity will occur. [1300]		
~~0 to~~Less than 3	1	10
~~4 to 8~~	~~3~~	~~15~~
~~9~~3 to 20	~~10~~5	~~20~~10
Greater than 20	~~20~~10	~~50~~20 [1302]

(a) trees shall be~~are~~ [1316] felled away from:
(i) any permanently flowing river; or
(ii) any river with an average bed width greater than two metres in the area where the clearance is occurring, or
(iii) a lake or wetland; [1317] and
(b) no logs or tree trunks shall be dragged through or across the bed of a lake or a permanently flowing river, or a wetland ~~; and~~ [1318]
~~(c) Environment Canterbury shall be notified in writing of the location and timing of the harvesting, at least five working days prior to the commencement of the harvesting.~~ [1319]

~~7. There shall be no vegetation clearance for the maintenance or harvesting of trees planted in a production forest after the date of notification of this rule.~~ [1320]

5. Any area of bare ground exposed as a result of the vegetation clearance shall:
(a) be replanted as soon as practical and no later than three months after the vegetation is cleared; and
(b) have at least 80 percent groundcover re-established within 24 months of the vegetation being Cleared; and
(c) have at least 80 percent groundcover established before any further clearance can be undertaken in

	accordance with Condition 1 on the same land.[1321]	
Information to be provided An application for a resource consent under this rule must meet the information requirements set out in Section 1.3.4 and Section 4.7.[1322]	6. The vegetation clearance shall not occur within (a) one metre of the bed of a river within a significant spawning reach for salmon listed in Schedule WQN14; or[1323] (b) an inanga spawning area listed in Schedule WQN17 in Chapter 5.[1324]	
	7. Except on land covered by the Land and Vegetation Management Regional Plan Part IV, the use of burning for vegetation clearance shall meet the following conditions: (a) The land to be burnt shall not have been burnt in the previous ten years; and (b) Burning of vegetation shall only occur between 1 July and 31 October; and (c) The vegetation cover of the burnt area shall be re-established within 3 months of burning.[1325]	
	8. Vegetation clearance that involves:[1326] (a) earthworks, must meet the requirements for a permitted activity under Rule WQL30; and;[1327] (b) disturbance of flood control vegetation must be authorised by Rule BLR8 in Chapter 6.[1328]	
	Restriction of Discretion	
	Where the activity is classified as a **restricted discretionary activity**, Environment Canterbury has restricted its discretion to the following matters: 1. The area, timing and location of the activity. 2. Measures to avoid, remedy or mitigate any adverse effects of the activity, including ongoing adverse effects on the water body following the completion of the activity, on: (a) the water quality of the receiving water body, including ~~sedimentation~~siltation[1329] of the bed; and	

	(b) aquatic ecosystems, salmonid spawning areas, archaeological or historic sites, or Ngāi Tahu cultural[1330] values; and (c) sources of drinking water 3. Remediation and maintenance of the site after the activity has ceased. 4. The requirement for financial contributions, or bonds. 5. Review of resource consent conditions. 6. The duration of the land use consent. 7. The frequency and reasons to review consent conditions.[1331]	
Cross reference: This rule contributes to the implementation of Policies WQL4, WQL5 and WQL12.[1332]		

For Information Only

(i) Vegetation clearance may also need to meet the requirements of rules under the relevant District Plan.[1333]

(ii) A discharge to air must meet the requirements for a permitted activity under NRRP Chapter 3 Rules AQL28 or AQL29, and AQL35A, or be authorised by Rules AQL34, AQL35, or AQL35B.[1334]

Rule WQL30: Earthworks or cultivation within a riparian zone or adjacent to a wetland

Activity	Conditions	~~Cross reference~~
The use of land for earthworks or cultivation; (i) [1338]in a ~~margin~~ riparian zone outside the bed[1339] of a river or lake, or (ii) adjacent to a wetland boundary~~where the land has a dominant slope and is within the setback distances specified in Rule Table WQL 3330 and such use results in the disturbance or deposition of soil;~~ in circumstances that may result in sediment entering water in a river, lake or wetland,[1340] is - 1. a **permitted activity** if such use complies with all of the conditions of this Rule; 2. a **restricted discretionary activity** if such use does not comply with	1. The extent of earthworks or cultivation in the area determined by the relevant setback distances specified in Rule Table WQL30 in any individual property shall not at any time exceed: (a) an area of 500 square metres, or 10 percent of the area, whichever is the lesser; or (b) a volume of 50 cubic metres in Zone BP shown on the Map Volume Part 1 – Planning Maps, or 100 cubic metres elsewhere in the region.[1345] ~~1~~2. All practicable measures shall be taken to avoid soil being deposited into the bed of a river~~,~~ or ~~a~~ lake, or into a wetland, or placed in a position where it is likely to enter a river~~,~~ ~~or~~ lake or wetland.[1346] ~~2~~3. Any discharge of ~~soil~~sediment associated with the activity into[1347] the water in a river~~,~~ ~~or a~~ lake, wetland[1348] or the Coastal marine area~~from the use of the land~~ shall not ~~result~~	~~Policies~~ ~~WQL4~~ ~~WQL5~~ ~~WQL12~~

any one or more of conditions of this Rule~~, in which case a resource consent under Rule WQL 34 is required~~;	~~in~~outside the Mixing Zone, cause a change in colour of more than five Munsell Units, or a decrease in clarity of more than 20 per cent, for up to eight hours in any 24 hour period, and shall not exceed 24 hours in total in any 6 month period.	
For the purposes of this rule~~:, a river means a permanently or intermittently flowing river, but not an ephemeral watercourse.~~[1341] 1. earthworks do not include the disturbance of soil by livestock.[1342] 2. a wetland includes any wetland that has not been assessed in accordance with Appendix WTL1.[1343] 3. The 'Mixing Zone' shall extend 50 metres from the point of discharge in a lake or the Coastal marine area, and either 200 metres or ten times the width of the flow, whichever is the smaller distance, in a river at the time of the activity.[1344]	(a) ~~a conspicuous change to the colour or clarity of the receiving water for more than 60 consecutive minutes in any 24 hour period compared with the colour or clarity of the river immediately upstream of the activity, or the natural colour or clarity of the lake in the area of the activity; or~~ (b) ~~the embeddedness of the river or lake bed substrate increasing by more than ten percent.~~[1349] ~~3~~4. All excavations, batters, side-castings or other ~~areas of~~ soil disturbance or deposition resulting from the activity shall; (a) be stabilised to prevent slumping~~, or~~and protected from soil erosion by revegetation or other methods as soon as practicable. ~~These protection or stabilisation works shall commence~~and no later than ~~within two~~three months of the ~~activity ceasing~~, excavation or disturbance~~and be completed with one month after commencing.~~; and (b) have at least 80 per cent groundcover re-established before any further excavation or disturbance can be undertaken in accordance with Condition 1 on the same land.[1350] ~~4~~5. Stormwater run-off controls, water table cut-offs, sediment traps and culverts are to be installed and maintained on tracks and roads to minimise erosion of the land surface and surface run-off.	

Rule Table WQL ~~33~~30 : ~~Riparian Zone~~
Setback distances for earthworks or cultivation[1351]

~~Dominant land s~~Slope ~~(degrees)~~ of the land within 50 metres of the ~~edge of the water body~~ bed of a river or lake, or wetland boundary and within which the activity will occur.[1352]	Setback distance from the ~~edge~~bed[1353] of a river (metres)	Setback distance from the ~~edge~~bed of a lake or a wetland boundary[1354] (metres)
0 to 3	1	~~10~~2
~~4 to 8~~	~~3~~	~~15~~
~~9~~3 to 20	~~10~~5	~~20~~10
Greater than 20	~~20~~10	~~50~~20[1355]

Where rule applies
This rule does not apply to all areas/ situations in the Canterbury region –

~~5~~6. Any trenches excavated for infrastructure shall be back-filled and compacted within ~~three~~ten[1356] days of being excavated.

~~6. Cultivation shall be undertaken across the contour of the land and a permanent vegetation cover shall be maintained between the cultivation activity and the edge of the river or lake.~~[1357]

~~7. The extent of soil disturbance or the volume of soil excavated or deposited when the activity is located:~~
~~(a) within three kilometres upstream on a river, or within one kilometre on a lake, from an intake for a community drinking water supply listed in Schedule WQL2; or~~
~~(b) Zone BP shown on the Map Volume Part 1- Planning Maps; and shall not exceed an area of 200 square metres, or a volume of 20 cubic metres in any continuous kilometre length of the margin of a river or lake in a consecutive six month period.~~[1358]

~~8. The extent of soil disturbance or the volume of soil excavated or deposited, where the activity is located outside of Zone BP shown on the Map Volume Part 1- Planning Maps, shall not exceed:~~
~~(a) an area of 500 square metres; or~~
~~(b) a volume of 40 cubic metres;~~
~~in any kilometre length of the margin of the river or lake in a consecutive six month period.~~[1359]

~~9~~7. The activity shall not occur within ~~the following areas:~~
~~(a)~~ a significant spawning reach for salmon listed in Schedule WQN14; or
~~(b) a site registered on the Environment Canterbury Listed Use Land Register.~~[1360]
(c) an inanga spawning area listed in Schedule WQN17 in Chapter 5.[1361]

8. Any earthworks or cultivation shall not destabilise, damage or disturb any lawfully established flood control structure, unless the activity is expressly authorised by Rule BLR8 in Chapter 6.[1362]

see Table WQL 7: Index of rules

Restriction of Discretion

Information to be provided
An application for a resource consent under this rule must meet the information requirements set out in Section 1.3.4 and Section 4.7.[1363]

Where the activity is classified as a **restricted discretionary activity**, Environment Canterbury has restricted its discretion to the following matters:
1. The area, timing and location of the activity.
2. Measures to avoid, remedy or mitigate any adverse effects of the activity, including ongoing adverse effects on the water body following the completion of the activity, on:
   (a) the water quality of the receiving water body, including ~~sedimentation~~siltation[1364] of the bed; and
   (b) aquatic ecosystems, salmonid spawning areas, archaeological or historic sites, or Ngāi Tahu cultural[1365] values; and
   (c) sources of drinking water
3. Remediation and maintenance of the site after the activity has ceased.
4. The requirement for financial contributions, or bonds.
5. Review of resource consent conditions.
6. The duration of the land use consent.
7. The frequency and reasons to review consent conditions.

Cross reference: This rule contributes to the implementation of Policies WQL4, WQL5 and WQL12.[1366]

For information only
1. This rule does not authorise the disturbance of any archaeological site registered with the New Zealand Archaeological Association, or a site registered with the New Zealand Historic Places Trust.
2. Earthworks may also need to meet the requirements of rules under the relevant District Plan and NRRP Chapter 3 Rules AQL38, AQL42 or AQL42B if the earthworks are undertaken on industrial or trade premises or are part of an industrial or trade process.[1367]

Rule WQL36: Excavation of land in the Coastal Confined Aquifer System, or over an unconfined or semi-confined aquifer

Activity	Conditions	~~Restriction of Discretion~~	~~Cross reference~~
~~Except where the use of land is a prohibited activity under Rule WQL62, t~~The use of land to excavate more than 100 cubic metres of material in any 12 month period from land:[1397] (a) over an unconfined or semi-confined aquifer; ~~and~~ ~~(i) where~~ the depth of excavation: (1) exceeds five metres; or (2) is deeper than the highest groundwater level which can reasonably be expected to occur at the site, based upon the relevant and available groundwater data; ~~and~~ ~~(3) where the volume of material excavated exceeds 100 cubic metres within any consecutive 12 month period~~; or (b) ~~within~~ the Coastal Confined Gravel Aquifer System, ~~where~~ there is less than one metre of undisturbed ~~sediment~~material between the base of the excavation and Aquifer 1; is – (c) **a restricted discretionary activity** if such use complies	1. The use of land shall not occur within: (a) ~~10~~50 metres of the ~~edge~~bed of ~~any~~ permanently or intermittently flowing river, or a lake; or (b) ~~10~~50 metres of ~~the boundary of~~ a wetland boundary; or[1400] ~~(i) listed in *Schedule WTL1: Moderate and higher significance wetlands*; or~~[1401] ~~(ii) any other wetland unless the taking, use, damming or diversion of water is permitted under Rule WTL2 or Rule WTL3~~[1402] ~~; or~~[1403] (c) a Community Drinking Water Supply Protection Zone for a well listed in Schedule WQL2, or ~~(d) the Christchurch Groundwater Recharge Zone, excluding the land in Zone 1C, as shown on the Map Volume Part 1- Planning Maps.~~ (d) Christchurch Groundwater Protection Sub-Zone 1B or Zone 2, as shown on the Map Volume Part 1- Planning Maps. (e) Christchurch Groundwater Protection Zone 1, Sub-Zone 1A, 1C or 1D as shown on the Map Volume Part 1- Planning Maps. **Restriction of Discretion**	[moved below] ~~Notification and service~~ ~~In accordance with section 94D(2) RMA 1991, an application for resource consent required by this rule does not need to be notified, and in accordance with Section 94(3) RMA 1991, notice of such an application does not need to be served on those persons identified under Section 94(1) of that Act.~~	~~Policies WQL 10 WQL12 WQL13~~ WQL14 ~~WQL18~~[1404]

with all of the conditions of this Rule; (d) a discretionary activity if such use complies with conditions 1(a), (b), (c), but does not comply with condition 1(d) in which case a resource consent under Rule WQL55 is required. ~~(d)~~(e) a non-complying activity if, with the exception of condition 1(d), such use does not comply with any one or more of ~~the~~ conditions 1(a), (b), (c) or (e) [1398] of this Rule, ~~in which case a resource consent under Rule WQL 62 is required~~.[1399] For the purposes of this rule, excavation of land does not include the drilling or disturbance of land to construct or maintain a bore. **Where rule applies** This rule applies everywhere in the Canterbury region, excluding the Coastal marine area **Information to be provided** An application for a resource consent under this rule must meet the information requirements set out in Section 1.3.4 and Section 4.7.	Where the activity is classified as a **restricted discretionary activity**, Environment Canterbury has restricted its discretion to the following matters: 1. The location, extent, and depth of the excavation. 2. Measures to avoid, remedy or mitigate any adverse effects of the activity on: (a) water quality; (b) other users of the water resource; (c) a site of significance to Ngāi Tahu; (d) an archaeological site or a site registered with the New Zealand Historic Places Trust. 3. Measures to avoid, remedy or mitigate any adverse effects of the excavation on adjacent landowners. 4. Measures to prevent contaminants entering groundwater via the excavation of the land, including: (a) restrictions on the storage and use of hazardous substances. (b) the management of stormwater; (c) preventing leakage into groundwater; (d) decommissioning of bores; or (e) monitoring. 5. Measures needed to rehabilitate the site following the completion of the excavation. 6. The requirement for financial contributions, or bonds. 7. The duration of the land use consent. 8. Review of consent conditions.		
Cross reference: This rule contributes to the implementation of Policies WQL10 and WQL12.[1405]			

Rule WQN21: Diverting of water via land drainage

Activity	Conditions	~~Cross ref.~~
~~1.~~ The diverting of surface or subsurface water not in the bed of a surface water body[1216] for purposes of land drainage is - (a) a **permitted activity** provided the activity complies with all the conditions in this rule. ~~2.~~ (b) a **restricted**[1217] **discretionary activity** ~~W~~where either or both condition 1 or 2 is not complied with ~~the activity is a discretionary activity under Rule WQN41~~.	1. The diversion shall not affect any wetland, except where this is ~~permitted in accordance with~~ authorised under Rule WTL2 ~~or Rule WTL3~~[1218] as a permitted acitivty[1219]. ~~2. The discharge of the drainage water is a permitted activity in accordance with Rule WQL1.~~[1220] 2. The activity shall not flood land or property owned or occupied by another person without the written permission of the landowner.[1221]	~~Policies WQN1, WQN2, WQN3 and WQN4.~~[1222]
Resource consent information requirements Any application for resource consent under this rule must meet the information requirements set out in 5.7.2 and 5.7.3.1[1223]	**Restriction of discretion** Where an activity is classified as a **restricted discretionary activity**, Environment Canterbury has restricted its	

Where rule applies ~~This rule does not apply to all areas/ situations in the Canterbury Region – see Table WQN2 Index of rules~~ This rule applies everywhere in the Canterbury Region except where the activities are expressly authorised by rules in the following regional plans: (a) Opihi River Regional Plan (b) Waimakariri River Regional Plan[1227] (c) Waitaki Catchment Water Allocation Regional Plan[1228]	discretion to the following matters: 1. The effects on wetlands. 2. The effects of flooding.[1224] 3. Financial contributions or bonds as specified in Part 5.11 of this chapter.[1225] 4. Consent duration.[1226]
Cross reference: This rule contributes to the implementation of Policies WQN1, ~~WQN2,~~[1229] WQN3, and WQN4.[1230]	

For information only:

1. Registered archaeological sites are protected under the Historic Places Act 1993. All persons carrying out activities are also bound by the requirements of this Act.[1231]

2. The discharge of the water will need to meet permitted activity conditions for discharge in Chapter 4 or be subject to a resource consent.[1232]

Rule WQN25: Damming of water in the bed of a surface water body

Activity	Conditions	~~Cross ref.~~
1. The damming of water in the bed of a surface water body that is not classified by Rule WQN22 is; (a) a **permitted activity** provided the activity complies with all the conditions in this rule.; (b) a **restricted discretionary activity** where any one or more of conditions 4, 5 or 7 is not complied with;[1282] ~~2.~~ (c) a **discretionary activity** ~~W~~where; (i) any one or more of conditions 1, ~~or~~ 3, ~~to~~ 6 or 8[1283] ~~is~~ are not complied with, ~~or the activity is a discretionary activity under Rule WQN41.~~ (ii) condition 2 or 9[1284] is not complied with and the activity has been lawfully established;[1285] ~~3.~~ (d) a **non-complying activity** ~~W~~where condition 2 is not complied with and the activity is not lawfully established[1286] or where the activity is an exception in condition 9[1287], ~~the activity is a non-complying activity under Rule WQN42.~~ (e) a **prohibited activity** where condition 9 is not complied with and the activity is not lawfully established.[1288]	1. The catchment area above the dam or weir shall not exceed ~~50~~ 100 hectares, or the mean annual flow of the river being dammed shall not exceed 200~~300~~ litres per second~~, whichever is the lesser~~.[1289] 2. The dam shall not be located in a ~~natural state or~~ high naturalness water body listed in Tables WQN16 or WQN17 of Schedule WQN5, or a water body listed in Schedule WQN6.[1290] 3. The maximum volume of impounded water shall not exceed ~~1~~5,000[1291] cubic metres and the damming of water shall not cause water flow to fall below the minimum flow for the surface water body. 4. The ~~dammed water~~ activity shall not flood land or property owned or occupied by another person ~~except with their~~ without the written permission of the land or property owner.[1292] 5. The damming shall not prevent water being taken by any domestic or stock water supply, or on any group or community drinking water supply. 6. The dam structure ~~shall comply with conditions in~~ must be authorised under Rules BLR~~1~~3 and BLR~~2~~4 as a permitted acitivty[1293]. 7. If passage for indigenous fish and for other migratory species occurred prior to damming, that passage shall be maintained.[1294] 8. The activity shall not occur within any section of the waterbody that is backed up by the tide.[1295]	~~Policies WQN1, WQN2, WQN3 and WQN4.~~[1297]

	9. The dam shall not be located in a high naturalness water body listed in Table WQN18 of Schedule WQN5 except where the dam is for flood or riverbank erosion protection, access (e.g. roads, bridges and fords), or the research or enhancement of the outstanding characteristics listed in Table WQN18.[1298]	
Resource consent information requirements Any application for resource consent under this rule must meet the information requirements set out in 5.7.2 and 5.7.3.1.[1299]	**Restriction of discretion** Where the activity is classified as a restricted discretionary activity, Environment Canterbury has restricted its discretion to the following matters: 1. The effects of flooding. 2. The effects on the affected water supply. 3. The effects on the passage of migratory species.[1299] 4. Financial contributions or bonds as specified in Part 5.11 of this chapter.[1300] 5. Consent duration.[1301]	

Where rule applies ~~This rule does not apply to all areas/situations in the Canterbury Region – see Table WQN2 Index of rules~~ This rule applies everywhere in the Canterbury Region except where the activities are expressly authorised by rules in the following regional plans: (a) Opihi River Regional Plan (b) Waimakariri River Regional Plan[1302] (c) Waitaki Catchment Water Allocation Regional Plan[1303]		
Cross reference: This rule contributes to the implementation of Policies WQN1, ~~WQN2,~~[1304] WQN3 and WQN4.[1305]		

For information only:
1. The Water Conservation Orders listed in Schedule WQN6 are detailed in full in Appendix WQN3.[1306]

Rule BLR4: Erection or placement, and use of structures

Activity	Conditions	~~Cross ref~~
1. The erection or placement of a new structure, ~~or part of any~~ and use of that[256] structure in, on, over or under the bed of a lake or river; or 2. any excavating, drilling, tunnelling or other disturbance, planting or removal of any plant or part of any plant~~,~~ or depositing of a substance or reclamation of the bed necessary ~~required~~[257] to undertake the activities in (1) above; 3. The discharge of sediment to water necessary to undertake the activities in 1 and 2 above;[258] is: (a) a **permitted activity** provided the activity complies with all the conditions of this rule; (b) ~~a permitted activity~~ where the activity does not comply with ~~c~~Condition ~~(1)~~ of this rule ~~is not complied with, but~~ the activity is classified by ~~complies with all the conditions of~~ Rule BLR~~6~~7; ~~(c) a discretionary activity where condition (1) is not complied with, and the activity does not comply with the conditions in Rule BLR6, in which case the activity requires resource consent under rule BLR8;~~	1. The activity shall not be undertaken ~~within~~ in, on, under or over[261] the beds of any ~~natural state or~~ high naturalness water body~~bodies~~ listed in ~~s~~Schedule WQN5 or Schedule BLR6[262]. 2. For culvert crossings ~~or bridges with abutments in the bed,~~ the width of the bed at the point of crossing shall be less than 5 metres wide; and (a) the activity shall not be undertaken within an area identified in Schedule BLR5 Drainage Scheme Areas, unless it is undertaken by or on behalf of Environment Canterbury's Regional Engineer in charge of the Scheme; and (b) the culvert length (inlet to outlet) shall be no greater than 7.5 metres; and (c) culverts shall be single or double barrels only and the minimum culvert diameter shall be 300 millimetres for single barrel culverts and 1 metre per culvert for double barrel culverts; and (d) the minimum fill height over the culvert shall be either 500 millimetres, or the diameter of the culvert, whichever is the greater; and (e) the culvert inlet and outlet shall be protected against erosion; and (f) the culvert shall be installed at a level no higher than bed level, and no lower than 100 millimetres below the level of the bed of the river, stream or lake; and (g) the culvert shall provide a fifty percent annual exceedance probability flood flow capacity without increasing upstream water levels; and (h) the culvert shall provide a five percent annual exceedance probability flood flow capacity without increasing water levels to an extent and degree that will cause flooding of upstream, adjacent, or downstream properties; and[263] (i) the location is not within any urban area or settlement.[264] 3. Any bridge shall be single span, ~~spanning a bed greater than five metres wide at the point of crossing,~~ and shall not have piers ~~or abutments~~[265] within the bed; and (a) the bridge span shall be no more than 10 metres long; and	~~Policy~~ ~~BLR1~~ 272

(c) a **non-complying** activity where Condition 8 is not complied with;[259] (d) a **prohibited activity** where ~~c~~Condition ~~(7)~~ is not complied with, ~~in which case no consent can be applied for under Rule BLR9~~; or (e) a **discretionary activity** where any other condition is not complied with~~; in which case the activity requires resource consent under Rule BLR8~~.[260]	(b) any such bridge and the approaches shall be designed so that a five percent annual exceedance probability flood event shall not cause any increase in upstream water levels; and (c) the soffit (underside) of any bridge shall be higher than the top of the river bank, and at least[266] ~~600 millimetres above the level of fullest flow (without overtopping its banks)~~ 500 millimetres above the five percent annual exceedance probability flood level; and[267] (d) no excavation of the banks or the bed of a river or stream shall be carried out; and (e) the bridge abutments shall be constructed parallel to the flow.[268] 4. The catchment area above any dam or weir shall not exceed ~~50~~ 100 hectares, or the mean annual flow of the river being dammed shall not exceed 200~~300~~ litres per second~~, whichever is the lesser~~.[269] 5. Any dam or weir shall not be capable of impounding more than ~~1000~~ 5000[270] cubic metres of water, and shall be less than three meters in total height above the bed. 6. The activity shall not be the erection or placement of a jetty or whitebait stand. 7. No plant species identified in Schedule BLR1 of this chapter shall be planted or introduced.	
Where Rule Applies:		

This rule does not apply to all areas/situations in the Canterbury region - see Table BLR32[273]. Index of rules.	8. Crack willow shall only be planted or introduced for flood control purposes within those flood control rating district scheme areas where it already exists, as identified in Schedule BLR4: Extent of flood control rating district scheme areas with crack willow.[271] ~~8~~9. The activity and any associated equipment, materials or debris shall not obstruct or alter the passage of water in a manner that causes: (a) any more than minor[274] increase in the risk or potential for flooding of surrounding lands; (b) any more than minor[275] destabilising of lawfully established flood control structures or flood control vegetation or any other lawfully established structures ~~within~~ in, on, under or over[276] the bed of a lake or river; (c) any more than minor[277] increase in erosion of the river or lake bed; or (d) drainage of water from the bed or diversion of flows within the bed.[278] ~~9~~10. Any discharge of sediment into water associated with the activity shall not after reasonable mixing cause a change in colour of more than five Munsell Units, or a decrease in clarity of more than 20%, for more than eight hours in any 24 hour period, and shall not exceed 40 hours in total in any calendar month. For the purposes of this condition "reasonable mixing" shall be 50m from the point of discharge in a lake, and either 200m or ten times the width of the current flow of the river, whichever is the lesser from the point of discharge, in a river or stream. ~~A discharge of sediment into water shall not:~~ ~~(a) for more than a total of 60 minutes in any consecutive 24 hour period:~~ ~~(i) change the colour by more than five Munsell Units; or~~ ~~(ii) decrease the clarity by more than 20 percent; or~~ ~~(b) increase the embeddedness of the bed substrate by more than ten percent.~~[279] ~~10~~11. ~~The activity shall not adversely affect flood control vegetation.~~ No vegetation used for flood control or bank stabilisation shall be disturbed, removed, damaged or destroyed, except by or on behalf of the person or agency responsible for maintaining that vegetation for flood control purposes.[280]	
	~~11~~12. The activity shall not restrict access to lawfully established structures, including flood protection works ~~control structures~~[281], or to flood control vegetation, for the purposes of their use,[282] repair or maintenance. ~~12~~13. The activity shall not obstruct the passage of fish both upstream and downstream, or be undertaken within any significant salmon spawning sites listed in Schedule WQN14 in Chapter 5[283]. ~~13~~14. The activity and any associated equipment, materials or debris shall not obstruct or alter the navigation of the bed or water body in a manner that ~~may~~ has the potential to[284] cause injury to any person. 15. The structure shall be kept in sound condition for the purpose for which it was constructed and be kept clear of accumulated debris.[285] 16. Any substance deposited in, on, under or over the bed associated with the activity, shall be of inert materials, uncontaminated with any hazardous substance and shall not be deposited into surface water or at or below the water table. 17. Any deposited substance in, on, under or over the bed associated with the activity, such as riprap, fill material, retaining walls or anchored tree protection, which remains visible once the activity is complete shall be of colour and material type that blends with the surrounding natural environment.[286] 18. The activity shall not occur within any section of the waterbody that is backed up by the tide.[287] 19. The activity shall not include any refuelling of machinery or vehicles on the bed.[288] ~~14~~20. Upon completion of the activity: (a) any reject, surplus or unused bed material stored in the bed shall be spread out; (b) any excavated areas shall be left with battered slopes not exceeding a 3:1 slope angle (3 horizontal to 1 vertical); and (c) all equipment and temporary structures associated with the activity shall be removed from the bed.	
Cross reference: This rule contributes to the implementation of Policy BLR1[289], Policy WQL3[290]		

For information only:

1. Any discharge of sediment, caused by the activities classified in Rule BLR4, that complies with the Condition 10 of this rule is a permitted activity for the purposes of s15 RMA. Where the discharge of sediment does not comply with Condition 10 a discharge permit and land use consent are required. The discharge of any other contaminant to water must ~~associated with the activity may have to~~ comply with ~~relevant discharge rules set out~~ the water quality rules in ~~Proposed NRRP~~ Chapter 4 ~~Water Quality~~.[291]
2. Any diversion associated with the activity may have to comply with relevant diversion rules set out in Proposed NRRP Chapter 5 Water Quantity.
3. Any taking, use, damming or diversion of water may have to comply with relevant rules set out in Proposed NRRP Chapter 7 Wetlands.
4. The design of any structure may have to comply with New Zealand Building Act requirements. Plan users should contact the local district council to enquire as to the need to gain building consent.
5. Any erection or placement of a structure may also need to meet requirements of rules or seek resource consent under the relevant District Plan or City Plan.[292]
6. The storage of hazardous substances, including fuel and oil, is addressed by Chapter 4.[293]
7. Technical information on annual exceedance probability and flood flow return periods may be available from Environment Canterbury or can be sought from a technical specialist.[294]
8. Persons exercising this rule should be aware that permission may need to be obtained at their own expense from the legal owner or administering body of the bed and of the resource and/or the owner of land via which access to the riverbed is obtained.[295]

Rule BLR5: Excavation, drilling, tunnelling, depositing, reclamation, drainage or disturbance in, or, under or over the bed

Activity	Conditions	Cross-ref
1. The excavating, drilling, tunnelling, depositing, reclamation, drainage or disturbance (but not including excavation of materials for the erection, reconstruction, placement, use, alteration, extension, demolition or removal of a structure classified ~~as a permitted activity~~[298] by rRules BLR2, BLR13, or BLR24 or BLR7)[299] in, on, over or under the bed of a lake or river, ~~or~~ ~~2. any depositing of excavated material on the bed associated with the undertaking of activities in (1) above (but not including excavation of materials for the erection, reconstruction, placement, use, alteration, extension, demolition or removal of a structure classified as a permitted activity by rule BLR1 or BLR2) in, on, over or under the bed of a lake or river,~~ is: (a) **a permitted activity** provided the activity complies with all the conditions of this rule; ~~(b) a permitted activity where condition (1) is not complied with, but the activity complies with all the conditions of Rule BLR6;~~[300] (~~c~~b) **a discretionary activity** where cCondition ~~(1)~~ is not complied with~~, and~~	1. The activity shall not be undertaken ~~within~~ in, on, or under[301] the beds of any ~~natural state~~high naturalness lakes listed in ~~table 3~~Table WQN18[302] of cSchedule WQN5 in Chapter 5[303] or Schedule BLR6[304]; 2. No part of the activity shall occur within surface water or at or below the water table.[305] ~~2~~3. The activity shall not involve the disturbance or removal ~~of~~ of any rocks with a diameter greater than 500 millimetres ~~in any direction~~ on any axis[306]. 4. The activity shall not include the deposition of any substance, other than bed material, on the bed. 5. The activity shall not be, or result in, the reclamation of the bed. ~~3~~6. The volume excavated by any person or on behalf of any person, organisation or corporation: (a) in the bed of any river or lake shall not exceed ~~10~~ 20 cubic metres per week and not more than 50 cubic metres in any 12 consecutive months or, (b) between 1 February and 31 August, in the beds listed in Schedule BLR2, shall not exceed 50 cubic metres per month and not more than ~~1~~250 cubic metres in any 12 consecutive months period; or, (c) between 1 February and 31 August, in the beds listed in Schedule BLR3, shall not exceed 100 cubic metres per month and not more than ~~300~~ 500 cubic metres in any 12 consecutive months period.[307] 7. Any excavation undertaken in accordance with Condition 6 above will include the removal of excavated material (other than surplus or reject material) from the bed within ten days of that material being excavated.[308] ~~4~~8. The Customer Service Centre of Environment Canterbury shall be notified before ~~A~~any excavation of more than 50 cubic metres in any four weeks is undertaken in accordance with cConditions ~~3~~5(b) or (c) of this rule~~, will require the Customer Service Centre of Environment Canterbury to be notified, before the activity takes place~~. This notification must state~~, as to~~ the location of the excavation site, the quantity of material to be excavated, the approximate dates when the activity is to be undertaken and a contact ~~address and~~[309] phone number of the person undertaking the activity.	~~Policy: BLR1~~ 310
~~the activity does not comply with the conditions in Rule BLR6, in which case the activity requires resource consent under rule BLR8; or~~[311] (c) a prohibited activity where Condition 12 is not complied with; or (d) a restricted[312] **discretionary activity** where any other condition is not complied with~~, in which case the activity requires resource consent under Rule BLR8~~.[313] This rule does not apply to activities in artificial lakes and treatment and detention lakes classified by Rule BLR1.[314]	~~5~~9. To avoid destabilising any lawfully established structure in, on, under or over the bed of a lake or river the activity shall: (a) be undertaken at a distance greater than 50 metres from any lawfully established dam, weir, culvert crossing, bridge,[315] surface water intake plant or network utility pole or[316] pylon and 150 metres from any lawfully established water level recorder; and; (b) not be undertaken ~~at a distance from~~ within 5 metres of any existing flood ~~control structures~~ protection works ~~or~~ flood control vegetation[317] ~~and~~ or to a depth~~, not exceeding~~ 1 metre ~~the depth as determined in the following table~~.[318]	
Where Rule Applies: This rule does not apply to all areas/situations in the Canterbury region - see Table BLR3~~2~~[319]: Index of rules.	~~**Table BLR3: Setback distances**~~ ~~Distance, in metres, from flood protection works or flood protection vegetation~~ | ~~0 - 3m~~ | ~~3 - 5m~~ | ~~5 - 10m~~ | ~~10m or greater~~ ~~Depth, in metres, below ground level immediately surrounding the excavation. (not to be exceeded).~~ | ~~0m~~ | ~~0.3m~~ | ~~0.6m~~ | ~~1.2m~~[320] ~~6~~10. The activity, or any associated equipment, materials or debris shall not obstruct or alter the passage of water in a manner that causes: (a) any more than minor[321] increase in the risk or potential for flooding of surrounding lands; (b) any more than minor[322] destabilising of lawfully established flood control structures or flood control vegetation or any other lawfully established structures ~~within~~ in, on, or under or over[323] the bed of a lake or river; (c) any more than minor[324] increase in erosion of the river or lake bed; or (d) drainage of water from the bed or diversion of flows within the bed.[325] ~~7~~11. ~~The activity shall not destabilise flood control vegetation.~~ No vegetation used for flood control or bank stabilisation shall be disturbed, removed, damaged or destroyed, except by or on behalf of the person or agency responsible for maintaining that vegetation for flood control purposes.[326]	

12. No plant species identified in Schedule BLR1 of this chapter shall be planted or introduced.

~~8. No part of the activity shall occur within surface water or at or below the water table.~~ [327]

~~9.~~13. The activity and any associated equipment, materials or debris shall not obstruct or alter the navigation of the bed or water body in a manner that has the potential to cause injury to any person.

14. The activity shall not include any refuelling of machinery or vehicles on the bed.[328]

~~10.~~15. Upon completion of the activity:

(a) all reject surplus or unused bed material stored in the bed shall be spread out;

(b) stripped areas shall be left with battered slopes not exceeding a 3:1 slope angle (3 horizontal to 1 vertical) and any flow channels disturbed during the activity shall be reinstated; and

(c) all equipment and temporary structures associated with the activity shall be removed from the bed.

16. The activity shall not occur within any section of the waterbody that is backed up by the tide.[329]

Restriction of Discretion

Where the activity is classified as a **restricted discretionary activity**, Environment Canterbury has restricted its discretion to the following matters:

1. Effects on the stability and integrity of lawfully established structures.
2. The volume of bed material to be extracted or deposited.
3. The depth of excavation.
4. Effects on the risk of flooding, including:
   a. effects on upstream and downstream flood carrying capacity; and
   b. the cumulative impact in conjunction with other similar activities in the catchment.
5. Effects on sediment load and transport, including cumulative effects in conjunction with other similar activities in the catchment.
6. Effects on the stability of bed or banks, including any increased risk of erosion and any cumulative impacts in conjunction with other similar activities in the catchment.
7. Effects of the activity, including management of vehicles and materials, on the integrity and effectiveness of flood control works or flood control vegetation.
8. Effects on other activities, including commercial and recreational activities, on or over the bed or on land adjacent to the bed.
9. Effects on water quality and aquatic life.
10. Effects on the habitat of trout and salmon.
11. Effects on indigenous vegetation and habitat for indigenous fauna, including: disturbance or loss of fish passage, spawning habitat or nesting and breeding habitat for indigenous birds.
12. Effects on natural character and braided river systems.
13. Any impacts on heritage sites or sites of significance to Ngai Tahu.
14. Effects arising from the extent of excavation.
15. Financial contributions or bonds as specified in Part 6.13 of this chapter.[330]

Cross reference: This rule contributes to the implementation of Policy BLR1[331]

For information only:

1. Persons exercising this rule should be aware that permission may need to be obtained at their own expense from the legal owner or administering body of the bed and of the resource and/or the owner of land via which access to the riverbed is obtained.
2. The activity may need to comply with ~~relevant discharge standards set out~~ water quality rules in ~~Proposed NRRP~~ Chapter 4 ~~Water Quality~~.[332]
3. ~~Figure BLR4 (below) indicates the fairway, where activities should be able to be undertaken while complying with conditions 6, 7 and 9.~~[333]
3. Any deposition or excavation may also need to meet requirements of rules or seek resource consent under the relevant District Plan or City Plan.[334]
4. The storage of hazardous substances, including fuel and oil, is addressed by Chapter 4.[335]

Rule BLR6: Planting and Disturbance of Vegetation

Activity	Conditions	~~Cross ref~~
1. The introduction, ~~or~~ planting, disturbance, removal, harvesting, damage or destroying of any plant or part of any plant in, on or under the bed of a lake or river, including any associated disturbance of the bed, or deposition of plant material on the bed, (but not including the planting, removal or disturbance of any plants for the use, erection, placement, reconstruction, alteration, extension, demolition or removal of structures classified by Rule BLR2,[335] BLR3 or BLR4). 2. the discharge of sediment to water necessary to undertake the activities in 1 above;[339] is: (a) **a permitted activity** provided the activity complies with all the conditions of this rule; (b) ~~**a permitted activity** where~~ ~~c~~Condition ~~(1)~~ is not complied with~~, but~~ the activity ~~complies with all the conditions of~~ is classified by Rule BLR6~~7~~; (c) **a non-complying** activity where condition 3 is not complied with;[340] ~~(c) a discretionary activity where condition (1) is not complied with, and the activity does not comply with the conditions in Rule BLR6, in which case the activity requires resource consent under rule BLR8;~~	1. The activity shall not be undertaken ~~within~~ in, on, or under[341] the beds of any ~~natural state or~~ high naturalness water ~~body~~bodies listed in ~~c~~Schedule WQN5 in Chapter 5[342] or Schedule BLR6[343]. 2. No plant species identified in Schedule BLR1 of this chapter shall be planted or introduced. 3. Crack willow shall only be planted or introduced for flood control purposes within those flood control rating district scheme areas where it already exists, as identified in Schedule BLR4: Extent of flood control rating district scheme areas with crack willow.[344] ~~3~~4. The activity shall not obstruct the passage of fish both upstream and downstream, or be undertaken within any significant salmon spawning sites listed in Schedule WQN14 in Chapter 5[345]. ~~4~~5. The activity ~~planting or introduction~~ and any associated equipment or materials shall not obstruct or alter the passage of water in a manner that causes: (a) any more than minor[346] increase in the risk or potential for flooding of surrounding lands; (b) any more than minor[347] destabilising of lawfully established flood control structures or flood control vegetation or any other lawfully established structures ~~within~~ in, on, under or over[348] the bed of a lake or river; (c) any more than minor[349] increase in erosion of the river or lake bed; or (d) drainage of water from the bed or diversion of flows within the bed.[350] ~~5~~6. The activity shall not restrict access to lawfully established structures, including flood protection works ~~control structures~~[351], or to flood control vegetation, for the purposes of their use,[352] repair or maintenance. 7. No vegetation used for flood control, or bank stabilisation shall be disturbed, removed, damaged or destroyed except by or on behalf of the person or agency responsible for maintaining that vegetation for flood control purposes.	~~Policy: BLR1~~[353]
(d) **a prohibited activity** where ~~c~~Condition ~~(2)~~ is not complied with ~~and no consent can be applied for under Rule BLR9~~; or (e) a **restricted**[354] **discretionary activity** where any other condition is not complied with~~, in which case the activity requires resource consent under Rule BLR8~~.[355] **Where Rule Applies:**	~~6~~8. Any discharge of sediment into water associated with the activity shall not after reasonable mixing cause a change in colour of more than five Munsell Units, or a decrease in clarity of more than 20%, for more than eight hours in any 24 hour period, and shall not exceed 40 hours in total in any calendar month. For the purposes of this condition "reasonable mixing" shall be 50m from the point of discharge in a lake, and either 200m or ten times the width of the current flow of the river, whichever is the lesser from the point of discharge, in a river or stream. ~~A discharge of sediment into water shall not:~~ ~~(a) for more than a total of 60 minutes in any consecutive 24 hour period:~~ ~~(i) change the colour by more than five Munsell Units; or~~ ~~(ii) decrease the clarity by more than 20 percent; or~~	
This rule does not apply to all areas/situations in the Canterbury region - see Table BLR3~~2~~[301]: Index of rules.	~~(b) increase the embeddedness of the bed substrate by more than ten percent.~~[356] ~~7~~9. The planting or introduction ~~shall not contravene~~ of plants for plantation forestry must be authorised under Rules ~~WQN45~~WQN27 or ~~WQN46~~WQN28[357] as a permitted activity ~~under Chapter 5 of this Proposed NRRP~~.[358] 10. No disturbed or cut vegetation shall be disposed of in, on, over or under the bed of a lake or river, or left in a position where it could enter surface water.[359] 11. The activity shall not include any refuelling of machinery or vehicles on the bed.[360]	
	Restriction of Discretion Where the activity is classified as a **restricted discretionary activity**, Environment Canterbury has restricted its discretion to the following matters: 1. Effects on the stability and integrity of lawfully established structures. 2. Effects on the risk of flooding, including effects on upstream and downstream flood carrying capacity. 3. Effects on sediment load and transport. 4. Effects on the stability of bed or banks, including any increased risk of erosion. 5. Effects on the integrity and effectiveness of flood control works or flood control vegetation. 6. Any disruption or loss of access to flood control works or flood control vegetation for their maintenance. 7. Effects on indigenous vegetation and habitat for indigenous fauna, including disturbance or loss of fish passage, spawning habitat or nesting habitat for indigenous birds. 8. Effects on natural character. 9. Effects arising from the extent of excavation. 10. Financial contributions or bonds as specified in Part 6.13 of this chapter.[362]	
Cross reference: This rule contributes to the implementation of Policy BLR1[363], Policy WQL3[364]		

2. Any taking, use, damming or diversion of water may have to comply with relevant rules set out in Proposed NRRP Chapter 7 Wetlands.
3. The activity may need to comply with all relevant discharge standards set out in ~~Proposed NRRP, Chapter 4 (Water Quality) and~~[365] Chapter 3 Air Quality.
4. Vegetation situated on the berms may assist in reducing the velocity of flood flows, thereby protecting flood protection structures.[366]
5. Any discharge of sediment, caused by the activities classified in Rule BLR6, that complies with the Condition 8 of this rule is a permitted activity for the purposes of s15 RMA. Where the discharge of sediment does not comply with Condition 8 a discharge permit and land use consent are required. The discharge of any other contaminant to water must comply with the water quality rules in Chapter 4.[367]
6. Crack willow is a pest plant under the National Pest Plant Accord 2006 and cannot be propagated or planted by anyone without an exemption from Biosecurity New Zealand.[368]
7. The storage of hazardous substances, including fuel and oil, is addressed by Chapter 4.[369]
8. Persons exercising this rule should be aware that permission may need to be obtained at their own expense from the legal owner or administering body of the bed and of the resource and/or the owner of land via which access to the riverbed is obtained.[370]

Schedule WQL9: Activities or industries likely to produce contaminated stormwater

Schedule WQL9 Activities or industries likely to produce contaminated stormwater

This Schedule does not apply to an activity or industry, including any related transfer, transport or handling of materials, that takes place:

1. entirely within the confines of a building;

2. in premises that are exclusively retail premises; or

3. in a dwelling or on a property used exclusively for residential purposes.

Description of activity or industry
Abrasive blasting – carried out at any one site more than once in any one month period
Animal stock sale yards
Asphalt or bitumen manufacture or bulk storage – manufacturing asphalt or bitumen, or bulk storage of these products, (excludes single-use site used by a mobile asphalt plant)
Battery manufacture or recycling – assembling, disassembling, manufacturing or recycling batteries
Biofuel industries or storage, including biofuel production, blending plant or refinery, retail or commercial refuelling facility, and facilities for recovery, reprocessing or recycling biofuel materials, and bulk storage above and below ground
Brake lining manufacturers, repairers and recyclers (excludes mobile machining operations provided all work is carried out undercover)
Chemical manufacture, formulation and bulk storage
Coal and coke storage yards that are uncovered or exposed to stormwater
Concrete or cement manufacture and bulk cement storage, including washing activities and waste storage from manufacturing processes.
Dairy products processing and the bulk storage of dairy products
Drum and tank reconditioning or recycling including drum or tank washing or decontamination and repainting of drums or tanks
Dry cleaning premises - where dry cleaning is carried out and solvents or petroleum based fuels are stored or used
Electrical transformers containing PCBs or oil – manufacture, repair or disposal of electrical transformers or other heavy electrical equipment
Electronics manufacturing
Engine or radiator manufacture, maintenance or reconditioning workshops
Fertiliser (includes inorganic and agricultural) manufacture or bulk storage, excluding storage on production land

Description of activity or industry
Furniture and wood product manufacturing premises (excluding those with solely internally housed conveying and collection systems)
Lime processing – manufacturing or processing lime from limestone material using a kiln and storing wastes from the manufacturing process
Meat processing abattoirs and freezing works
Metal recovery or recycling premises and automotive dismantling premises
Metal treatment or coating – including smelting or refining, commercial production of metal products – fusing or melting metalliferous ores or polishing, anodising, galvanising, pickling, electroplating, heat treatment using cyanide compounds and finishing
Mining and extractive industries and mineral processing – including chemically or physically extracting metalliferous ores, storage of hazardous wastes, including waste dumps and tailings dams, excluding gravel extraction and gravel processing plants
Paint manufacture, formulation and bulk storage
Paper and paper products manufacture
Pesticide and agrichemical manufacture (including animal poisons, insecticides, fungicides and herbicides) and storage, or formulating proprietary pesticides or the associated use of premises for filling and washing out tanks or equipment or vehicle washing
Petroleum, petroleum hydrocarbon or petrochemical industries or storage, including oil production and operating a petroleum depot, terminal, blending plant or refinery, retail or commercial refuelling facility, and facilities for recovery, reprocessing or recycling petroleum based materials and bulk storage (excluding liquid petroleum gas storage)
Plastic or rubber manufacture, recycling or reconstituting
Printing – commercial printing, using metal type, inks and dyes, or solvents
Tannery, fellmongery or hide curing, wool scouring or washing or commercially finishing leather
Vehicle or truck washing facilities including car washes and valet services

Description of activity or industry	
Waste management sites - municipal sites and sites used to store, collect, sort and dispose of waste including land disposal of waste (excludes the use of bio-solids as soil conditioners)	
Water blasting on a commercial basis but excluding that carried out on dwellings	
Wood processing, treatment or preservation or bulk storage of treated timber	
Any site where a specified hazardous substance is stored or handled in an area where the substance may become entrained in stormwater, and the aggregate quantity of substances exceeds the following:	
Hazardous substance	**Aggregate Quantity**
Diesel, Petrol, Kerosene	5000L
All other specified hazardous substances	1000L

For the purposes of this Schedule a specified hazardous substance is any:

(a) petroleum hydrocarbon, including those used for cooling purposes, but excluding liquefied petroleum gas;

(b) chlorinated hydrocarbon;

(c) pesticide;

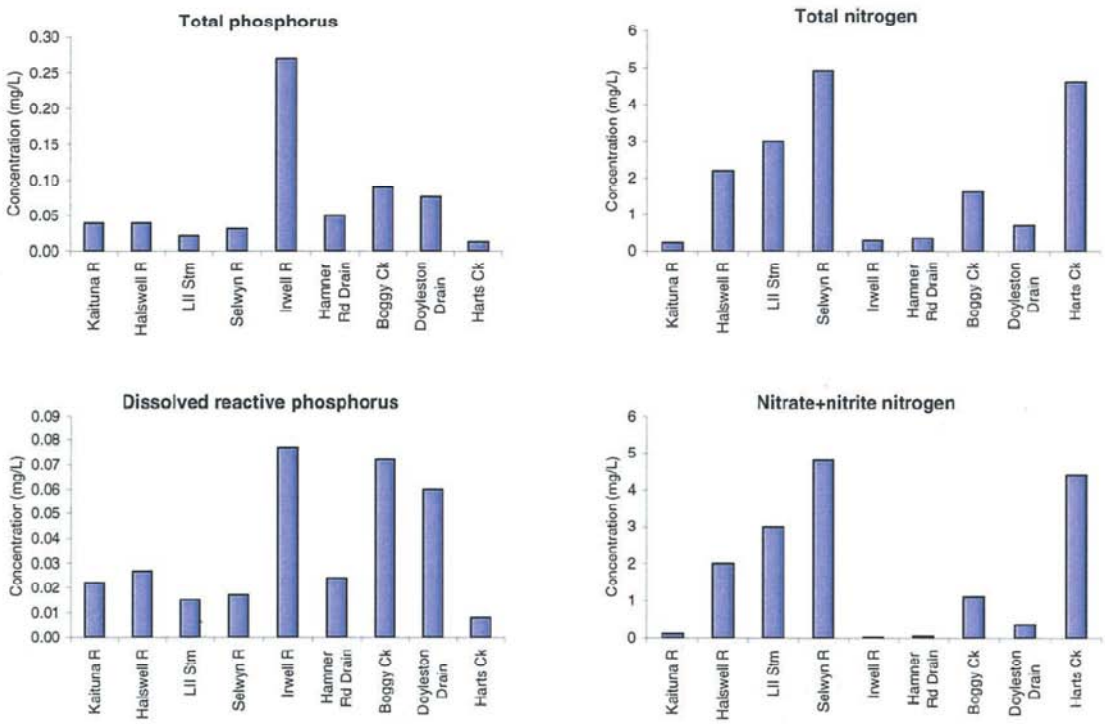
(d) timber preservative; or

(e) substance containing any one or more of the following; arsenic, cadmium, chromium, cyanide, lead, mercury, nickel or selenium.[2109]

Appendix G

Water Quality Data in Lake Ellesmere Tributaries

Appendix G Water Quality Data in Lake Ellesmere and its Tributaries



Median Nutrient Concentration (2005/2006) for the nine tributaries (Source: ECan)

Table 5 **Summary of water quality data for four sites on Lake Ellesmere/Te Waihora, July 2005-May 2006. Note that turbidity is only measured at the Taumutu site.**

Site	TEMP °C	DO mg/L	DOSAT %	Salinity ‰	NH3N mg/L	NNN mg/L	DIN mg/L	TN mg/L	DRP mg/L	TP mg/L	TSS mg/L	Secchi m	TURB NTU	CHLA µg/L	FC n/100 ml
Lake Ellesmere south of Timber Yard Point															
Minimum	7.2	8.4	95.8	2.7	0.003	0.003	0.010	1.4	0.002	0.11	80	0.08		35.2	5
Median	**15.5**	**10.2**	**107.8**	**6.7**	**0.018**	**0.010**	**0.034**	**1.8**	**0.005**	**0.17**	**130**	**0.16**		**64.4**	**5**
Maximum	19.9	12.6	110.6	7.2	0.058	0.028	0.073	2.5	0.023	0.34	410	0.21		116.8	70
Long-term median	12.6	10.9	106	6.2	0.015	0.026	0.048	2.1	0.004	0.23	180	0.11		85.05	9.5
Lake Ellesmere mid lake															
Minimum	7.1	8	91.2	3.2	0.003	0.003	0.012	1.3	0.002	0.11	55	0.07		37.3	5
Median	**15.9**	**10.2**	**102.1**	**7.0**	**0.023**	**0.016**	**0.038**	**2.0**	**0.005**	**0.19**	**130**	**0.16**		**57.3**	**5**
Maximum	19.7	12	115.8	7.5	0.032	0.033	0.062	2.7	0.014	0.40	450	0.80		92.4	20
Long-term median	12.65	10.7	102.6	6.8	0.019	0.020	0.049	2.1	0.004	0.24	212	0.10		86.1	5
Lake Ellesmere off Selwyn R mouth															
Minimum	7.7	7.7	88.5	2.6	0.003	0.003	0.011	1.4	0.001	0.10	51	0.07		53.7	5
Median	**14.5**	**10.6**	**107.2**	**6.6**	**0.015**	**0.013**	**0.028**	**1.9**	**0.004**	**0.18**	**130**	**0.14**		**64.6**	**10**
Maximum	20.1	12.6	123.2	7.4	0.040	0.640	0.643	2.8	0.017	0.39	450	0.25		117.3	150
Long-term median	12.5	10.85	104.3	6.15	0.017	0.052	0.082	2.2	0.004	0.22	170	0.11		82	25
Lake Ellesmere at Taumutu (at gauge)															
Minimum	7.5	6.6	96.1	2.8	0.003	0.003	0.005	1.5	0.001	0.11	81	0.08	20	30.8	5
Median	**14.9**	**9.9**	**102.5**	**6.8**	**0.015**	**0.007**	**0.025**	**1.9**	**0.003**	**0.18**	**160**	**0.13**	**48**	**56.4**	**20**
Maximum	19.3	12.7	108.9	9.1	0.080	0.023	0.097	2.5	0.016	0.32	370	0.20	180	103.4	40
Long-term median	12.0	11.1	107.0	6.5	0.017	0.023	0.045	2.1	0.003	0.22	180	0.11	76	77.2	15

Source: ECan

Appendix H

Summary of Existing Stormwater Discharge Consents within Integrated Stormwater Management Area

Appendix H Summary of Existing Stormwater Discharge Consents within Integrated Stormwater Management Area

Consent No Consent Holder	Catchment Size	Name of Development	Receiving Environment	Location	Description of Treatment	Design Size	Comment
CRC064308.1 Selwyn District Council	1.2 ha residential subdivision	Liffey Fields Stage 2	Land	Birchs Road Pt Lot 1 DP33700	Roofs: sealed system to kerb and channel Hardstand: overland flow to kerb and channel Private access ways: kerb and channel Kerb and channel into sumps then piped into network within road reserve, then via swale into infiltration basin Overflow from infiltration basin to Heathridge Place via Council Reserve	Stormwater system: 1 in 10 year Infiltration basin: 5000 m3	Under construction
CRC062216.1 Fulton Hogan Land Development	9.217 ha residential subdivision		Smarts Drain (L2 Catchment)	Edward Street Portion of Lot 2 DP 65371 and Lot 1 DP 8294	Kerb and channel, first flush pond (640 m3), infiltration and collection by underdrains, discharge via rock and vegetation armoured outfall. Excess stormwater Secondary pond (760 m3), discharge via a weir to Smarts Drain.	First flush pond: (25 mm) Discharge limit from secondary pond: 0.193 m3/s, at least 24h retention Stormwater system: all 1 in 50 year events 75% suspended sediment removal	Not built yet. Smarts Drain does not drain into the Halswell River catchment as suggested by the AEE document. It drains into Hudsons Road Drain and then into the L2 River.
CRC061169 Grange Enterprises Ltd	10.88 ha Residential subdivision	Paparua County	Land	Birchs Road Pt RS 3041	Roofs: on-site soakage areas Hard-stand: overland flow to adjacent vegetated areas and gardens Roads and vehicle access points: kerb and channel, sumps, pipes, two infiltration basins	Roof soakage up to 1 in 5 year, 1 hour duration, if greater to roads Up to 1 in 50 year, 1 hour: all stormwater directed to roading network and infiltration basins Greater 1 in 50 year, 1 hour: secondary flow paths in road reserve or swale	
CRC060451.2 Selwyn District Council	10.76 ha residential subdivision	Liffey Fields	Land	Birchs Road PT Lot 1 DP33700	Roofs: via soakage systems to land Hard-stand: vegetated strips within the lot, as far as practicable Excess and roads: vegetated swales, and infiltration basin	Swales: any duration up to 1 in 5 years Infiltration basin: 1 in 50 year, any duration	Under construction
CRC052811 Certificate of Compliance with NRRP Rule WQL6 Kajens Trading and Development	6 lot rural-residential subdivision		L1 Creek	Allendale Lane Lot 118 DP 329124 Lot 119 DP 329124	Kerb and channel, pipes, vegetated swale with underdrains discharging into sumps, piped discharge into L1 Creek. Complies with Rule WQL6	Swales designed for 2% AEP, silt trap 75% removal of suspended sediments.	
CRC052372.1 Body Corporate No 81987	1.11 ha residential subdivision 0.56 ha reserve		Land	James Street DP 81241	Kerb and channel and pipe network, overland flow paths Contaminant trap (vegetated filter strip) which also acts as first flush basin on reserve area. Infiltration of first flush through basin. Overflow to soakage pit	Piped system: 2% AEP Infiltration basin for first 25mm rain Soakhole designed for discharge up 2% AEP all events.	
CRC050522 Suburban Estates			Lincoln Main Drain	Hasendene Drive	Kerb and channel and pipe network, overland flow paths Swale (20m long, surface area of at least 80m2) Detention Area (519 m3)	Pipe network: 20% AEP. Retention basin for first flush or 20% AEP (25mm) 75% sediment removal Discharge within 24 hours (rate limited to 7L/sec) Overflow weir for extreme storms	During site walkover the base of the retention basin was found to be damp and water logged with the grass cover died off. Some earth work was ongoing.
CRC041846.3 Brian Gillman Ltd	10.41 ha residential subdivision	Lincoln Vale	L1 Creek and Smarts Drain	Edward Street Lot 1 and 2 DP75082	Construction Phase: treatment and flood retention basin Piped to first flush treatment pond with sub-surface flow wetland/gravel filter at outlet Secondary flood detention basin	First flush and secondary flood detention up to 1 in 50 year, 6 hours Greater than 1 in 50 year, 6 hours: secondary flow path to Smarts Drain Peak discharge rates limited to pre-development discharge rate for events from 1 in 5 year to 1 in 50 year, 6 hour duration	
CRC001074 Kajens Trading		Ryelands	L1 Creek	Discharge at NZMS 260 M35:6923-2887	Master traps and sediment filter, ponds		

Consent No Consent Holder	Catchment Size	Name of Development	Receiving Environment	Location	Description of Treatment	Design Size	Comment
and Development Ltd							
CRC990543 Mr D J Tucker	3.26 ha residential subdivision	Fife Tuscan	L1 Creek	Millstream Drive M36:673-288	Kerb and channel, pipes, swale, existing pipe and outfall structure, retention basin for higher flows	Flow restrictions, in 20% AEP 40% increase in peak flow, 75% removal of suspended solids for 1 in 2 year intensities	
CRC930513 University			Unnamed drain		Oil interceptors and silt traps	Flow limited to 170 L/s SS <= 150g/m3 during construction and 50g/m3 thereafter	
CRC094144 Lincoln High School			Liffey Stream	25 Boundary Road, Lincoln	Soakage trenches	Discharge from outlet limited to 30 L/s	Expires 01/09/2044
CRC092408 Lincoln Baptist Church	8110 m^2		Land	530 Birch's Road, Lincoln	Soak pits and swales.	Soak pit: designed for a 10yr-1hr storm & first 25 mm of SW. Swale: designed for a 10yr-1hr storm & base sunk 100mm into free-draining soils.	Expires 09/02/2044
CRC092128.1 Lincoln University Joint Venture Ltd and Ngai Tahu Property Joint Venture Ltd		LLD (Dairy) Block	Lincoln Main Drain	Gerald Street, Springs Road	Runoff from residential development, construction and industrial development Communal wet pond and wetlands, swales	50 year AEP	
CRC083107 Food Stuffs South Island Ltd	10,012m^2	New World Supermarket	Lincoln Main Drain	Gerald Street	Roof water to dry detention basin Hardstand areas swale to dry detention basin Discharge from dry detention basin via subsoil drainage system and restricted outlet Sumps with trapped or submerged outlets	Swale: 10 year ARI, 10 hours duration Pond: 50 year ARI, 10 hours duration	

Appendix I

Major Changes from Previous AEE (June 2009)

Appendix I Major Changes from Previous AEE (June 2009)

The following summarises the main changes made since the previous AEE was submitted to Environment Canterbury in June 2009:

- The AEE and ISMP are now separate documents. The ISMP forms Appendix 1 of the AEE.
- AEE 2011 revised and assessed according to October 2010 decisions on proposed NRRP
- Additional investigations relating to aquatic ecology, cultural impacts and expected stormwater quantity
- More water quality data added
- Revised information on future urban development according to Outline Development Plans prepared under proposed Plan Change 7 to the District Plan
- Since 2009 a number of stormwater discharge consents within the global consent area have been granted to other applicants by Environment Canterbury.
- More details on the configuration on the future stormwater system.
- Discharge to Smarts Drain (part of the wider Halswell River catchment) is now required (was not included in previous application)

Appendix J

Excerpts from Erosion and Sediment Control Guidelines

Appendix J Excerpts from Erosion and Sediment Control Guidelines

Appendix K

Outline Development Plans

Appendix L

Full Size Figures