Christchurch City Council

Stephen Timms, Principal Consents Planner
Environment Canterbury
PO Box 345
CHRISTCHURCH

17 October 2011

Dear Stephen

Thank-you for your letter of 29 September 2011 requesting further information in relation to the resource consent application to discharge stormwater in South-West Christchurch. This letter provides the Christchurch City Council's response to your letter, and as requested, includes a revised Monitoring Programme and draft consent conditions as part of this response. Christchurch City Council prepared this response in conjunction with Golder Associates (NZ) Ltd and Pattle Delamore Partners Ltd.

Responses to your questions, as numbered in the request for further information, are provided below.

Receiving Environment Objectives

1. *Please provide a finalised agreed version of 'Table 1' that is to be attached to the consent via proposed Condition 4.*

   Christchurch City Council's finalised version of Table 1, as discussed and agreed with Environment Canterbury representatives, is provided with the draft consent conditions (Attachment 1 to this letter).

Implementation of Proposed Stormwater Mitigation

2. *If details are available, please provide more information relating to how the Implementation Programme in Section 7.0 of the Stormwater Management Plan (SMP) has been developed, in particular an explanation of how areas with existing water quantity and water quality issues (requiring retrofit) are prioritised.*

   The Christchurch City Council has an ongoing programme in its Long Term Council Community Plan (LTCCP) for stormwater mitigation works within the South-West Area. This programme seeks to provide new facilities to mitigate future urban development as well as providing significant retrofit capacity where existing unmitigated urban development exists.

   Major stormwater facilities with retrofit capacity, which have already been constructed or are under construction, include the Douglas Clifford Basins, the Awatea North and Awatea South Basins, the Lower Milns Basin, the Owaka Basin and extending the existing Wigram Basin. Collectively these basins provide for over 600 hectares of existing or new urban development, most of which is retrofit. Significant areas of land have already been purchased from a strategic land Acquisition Fund to provide for the stormwater mitigation facilities, and important waterway corridors.

   The proposed 'spend' over the next 10 years, subject to continued Council funding, is about 10 million dollars per annum. The current list of facilities on the LTCCP list for Council implementation, or developer contribution payments to provide retrofit or an extended catchment beyond their own immediate development needs, includes:

   - Awatea North and South
   - Wigram Retention Basin upgrade

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- Lower Milns First Flush basin
- Kirkwood
- Carrs Road
- Wigram Aero
- Murphies/ Quaifes Road
- Rossendale
- Cashmere Worsleys
- Westmoreland East
- Cashmere Ponding Basin
- Cashmere Headwaters
- Owaka Basin
- Wilmers
- Marquess
- Creamery
- Greens
- Columbia
- Racetrack
- Dunbars Drain wetland
- Sutherlands/Milns
- Milns Drain Wetland

Prioritisation of facility funding for retrofit is largely related to 'piggy backing' onto the opening up of new Greenfield urban areas, but land acquisition opportunities have also dictated the programme. Special interest areas such as Milns Drain catchment have attracted accelerated funding for retrofit where known water quantity/quality issues exist.

3. *Similarly, please provide more information as to when a sub-catchment comes up for development, whether or not the implementation of facilities will occur prior to new development commencing, and if sub-catchment wide facilities in their entirety will be constructed when only a small part of a catchment will actually be changing (in terms of land-use).*

   Stormwater facilities for developments will always be provided in advance of development. If the development is staged then the stormwater facility may be staged also. This will depend on whether the land and/or budget are available for the full facility to be built in advance of the actual need for the facility.

Water Quantity

4. *Please provide the content for the apparent revised localised water balance for Scenario 2 for the unconfined or sub-catchments for soakage within the Project area, and how the effects will be addressed.*

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In section 7.7.2.3 of the Assessment of Effects on the Environment (AEE) small percentage increases in groundwater recharge are reported (e.g. a 4% increase in the recharge for the total area) as a result of the proposed stormwater management practices. This is an average change to the overall groundwater system within the South-West Area Plan (SWAP) area.

Section 7.2.2 in Appendix E of the AEE deals with stream baseflows and suggests a localised increase of 30% could occur. This is based on an assumed mix of land uses within the unconfined aquifer area in proximity to a springfed stream. The 30% change could correspond to a small change in flow in a small headwaters stream.

Therefore, the two numbers are consistent and based on the same information. The smaller percentage change refers to the overall groundwater system and the larger percentage change refers to a more localised effect within a smaller area as might occur from a particular soakage basin with an assumed distribution of land uses. This provides an indication of the variation in recharge patterns that will occur throughout the SWAP area.

The effects will be managed by monitoring of groundwater levels to determine the change in groundwater levels that actually result. Mitigation of effects will be achieved by having the provision to divert water from the soil soakage basins direct to surface waterways (if less groundwater recharge is preferred) or to direct the later flow from storm events into rapid soakage chamber systems (if more groundwater recharge is preferred). This adaptive management approach is expected to be the most pragmatic and effective way to manage any uncertainties regarding the effects of the change in recharge patterns arising from the SWAP stormwater management systems.

5. *The Halswell Drainage scheme is sensitive to increased groundwater levels and baseflows. Please provide information on what effect increases in groundwater levels would have on the downstream drains and Halswell River in the upper and middle reaches of the Halswell River catchment.*

The Halswell catchment largely occurs within the confined section of the SWAP area where stormwater will be detained and discharged into surface waterways. In such settings it is generally expected that the localised effects from residential developments cause less water to enter the near surface groundwater. It is captured by the impervious surfaces and transported away by the conveyance system. This has been a concern of many developments where small streams have tended to dry up following development.

Baseflow for the overall Halswell catchment is more related to the upwelling of water from the wider aquifer systems under the Canterbury plains as they come nearer to the coast. This wider scale effect is demonstrated by the relationship established between Halswell River baseflow and groundwater levels shown in the Figure below, which has been taken from the Canterbury Strategic Water Study (August 2002 report). This very good correlation is based on well M36/0255 which is located near Rolleston, approximately 10 – 15 km from the Halswell River, related to the river flow measured at Ryans Bridge.

This wider scale effect is not altered by development and will continue to provide base flows in the natural steams. No water is being put to ground in the Halswell catchment so the long term groundwater flows are not likely to be significantly increased as a result of the development. There will however be longer duration controlled flows in the Halswell after rainfall events as the water which would otherwise have been absorbed by the ground and evaporated, is channelled to the streams. The first 25 mm of each rainfall event is captured by the first flush basins which ensure these minor flows are managed.

If monitoring data demonstrates that problems arising from changed baseflow in the Halswell have been caused by the changed surface drainage patterns due to the SWAP development then they can be managed by the same approach applied to the potential variability in groundwater recharge. That is, by having the provision to divert water from the basins direct to

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surface waterways (if less groundwater recharge is preferred) or to direct the later flow from storm events into rapid soakage chamber systems (if more recharge is preferred).

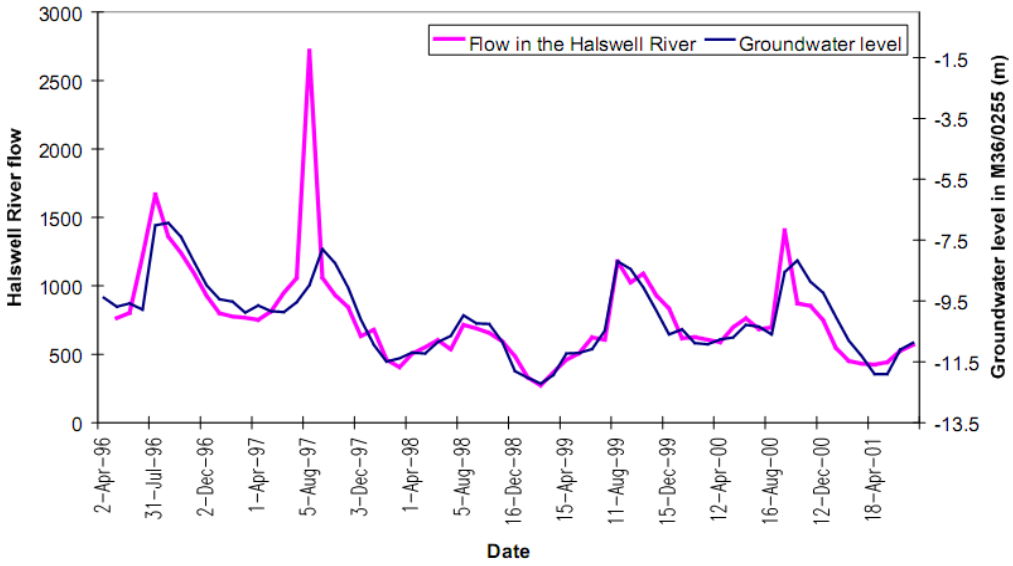

Figure 10-1: Example of relationship between average monthly spring-fed stream flow and groundwater level

Preliminary Stormwater Management Scheme (SWMS)

6. *Please clarify if the Full Flood Attenuation (FFA) basins will have capacity and controls to mitigate as far as practicable increases in volumes and peak flows as a result of development for more frequent storm events up to a two percent annual exceedance probability (2% AEP).*

When considering the South-West Area SMP, it is noted that it is a catchment wide integrated scheme, where individual mitigation facilities need to be considered in context of the fully implemented collection of facilities. The SMP proposes facilities which will provide capacity beyond the immediate sub-catchment needs to make up for some areas (particularly areas of existing urban development) where full mitigation is not possible and/or practical for a number of reasons. Notwithstanding the need to look beyond the exact specifications for individual facilities, the general requirements related to outlet controls and capacity for mitigation facilities are outlined below.

Full Flood Attenuation (FFA) basin capacity and outlet controls are designed primarily to provide for the critical 50 years design storm. Because of the varying soil types across the South-West area, a simplified approach for preliminary design and basin sizing has been adopted which does not rely on comparing predevelopment peak runoff flow rates and volumes; often referred to as 'extra over' design.

For the SMP preliminary facility designs, an assessment of the runoff volume is made for the fully developed facility sub-catchment using the critical duration, 50 year return period design storm for the greater catchment (i.e., 36 hour storm for the Heathcote River and 60 hour storm for the Halswell River). Using this volume, an average release rate over several days, is determined. This results in a conservative outcome for areas of low permeability soils and provides a standard approach for areas of high permeability soils where possibly little or no runoff would have occurred pre- development.

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For new development areas where soakage to ground is possible, there will be no discharges downstream for the more frequent storm events, up to the critical 50 year return period storm. The design criteria requires a combination of soakage to ground capacity (both soil absorption and rapid infiltration), and surface detention storage. To ensure ongoing mitigation capacity, even when soakage rates reduce over time, a minimum storage volume capable of containing the runoff from a 10 year return period, 18 hour storm will typically be required.

For existing unmitigated urban areas where retrofit is possible through the construction of soakage basins, a very significant proportion of existing flows to surface waters will be 'cut off'. This will result in a reduction of existing peak flows for most storms up to the 50 year return period in the receiving waterway. The most significant example of this is the implementation of the Awatea North and Awatea South facilities, which are designed to restrict the peak flow from the 300 plus hectare urban area downstream in the Heathcote River to less than 0.5 m^3/s. Current peak flows could exceed 5 m^3/s; a 90% reduction in peak flows. For lesser, more frequent storm events, no discharge would occur downstream.

For facilities which discharge to surface water, total detention storage for the preliminary design facility is calculated by determining both a first flush or water quality volume and a total storm runoff volume. Average release rates over 96 hours for first flush volume and full storm runoff volume is then assessed. Using these rates the total volume released during the storm event (i.e. 36 or 60 hours depending on the River catchment) is determined. Deducting this volume from the total storm runoff volume determines total detention volume required.

As the detention sizing and outlet controls will be based on the 50 year design storm, the benefit of peak flow rate and volume discharge reduction during the actual storm diminishes for the smaller more frequent events. However, because quite significant detention volumes are involved, it is possible to mitigate this possibility with multiple staged discharge outlets. For many of the storm events up to the 5 year return period, the first flush volume will be sufficient to completely contain all of the sub-catchment runoff.

7. *Please confirm if the volumes for the water quantity facilities have been sized based on rational formula calculations.*

Preliminary concept designs for the water quantity mitigation facilities have been sized using the Rational Method. Critical storm durations had been previously assessed for the Heathcote River catchment using a DHI 'Mouse, Mike 11' hydrological/hydraulic model. For the Halswell River catchment, the critical storm duration was taken from historical Catchment Board work.

Testing the impact of the overall mitigation system concept on flood levels in Henderson's Basin and in the Heathcote River has been possible using the available model. Christchurch City Council do not have a suitable model however, for the Halswell River catchment, and rely on the conservative approach taken with preliminary sizing.

Considerable investigation has been undertaken by Christchurch City Council over the last few years on improving the reliability of the Rational Method as a quick and conservative approach to catchment stormwater runoff analysis. This has involved analysis of typical imperious area percentages for different land use zonings and how these relate to runoff coefficients. This work has been compared/ validated with simple generic DHI 'Mouse' models of small to medium urban catchment areas. As such Christchurch City Council has a high level of confidence in the initial sizing of Water Quantity Mitigation facilities using the Rational Method, borne out by the detailed hydrological/hydraulic modelling undertaken in final basin sizing and outlet design undertaken for the last three major basin designs undertaken and implemented, or about to be implemented, in the South West Area. (Douglas Clifford, Awatea North and Lower Milns)

As with the three detailed basin designs identified above, and notwithstanding the use of the Rational Method for initial concept designs, detailed design work and testing of basin performance under a range of storm events will be required with final basin design and

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implementation. This will typically require the building of a hydrological/hydraulic model for each of the major facilities/sub catchment areas.

8. *The extra-over Partial Flood Attenuation (PFA) standard for development on the hills only requires the detention of the volume in excess of the critical duration 2% AEP event prior to development. If only partially mitigated what are the effects of increases in peak flows and water levels in downstream waterways for events up to the 2% AEP?*

   The increased runoff from development of hill areas is generally only a relatively small percentage of what can already discharge from undeveloped hillsides during the longer duration storm events which cause flooding in the Heathcote and Halswell Rivers. As such it is possible to provide storage of sufficient size to prevent increases in peak flow rates in the downstream waterways.

   An existing example of an appropriate mitigation facility which achieves this is the Van Asch Basin facility, upstream of Quarry Park in Halswell. This facility is set up such that the 'extra over' flow of post first flush storm discharge volume is 'bled' off from the main flow into 'off line' storage, via a weir device. This volume is then released slowly back into the waterway, thereby attenuating the discharge flow rate.

   For the shorter duration, higher rainfall intensity storms, development would result in a faster stormwater runoff response. The SMP water quality proposal however includes the requirement of first flush capture and detention. The first flush volume is sufficient to capture and detain most storm events up to a five year return period, which would deal with the vast majority of these lesser storms.

9. *Please provide further information to support the "reduced flood levels" statement for the Halswell catchment.*

   Christchurch City Council has sought advice from Environment Canterbury who have been developing a model of the Halswell catchment to confirm the 60 hour critical duration of the Halswell River and facilities have been designed to mitigate flood flows up to that duration. Reduced flood levels will come from mitigation of existing and unmitigated developments over time as these facilities are constructed. Examples of proposed retrofit facilities planned for the Halswell catchment over the next ten years include Owaka Basin, Murphies/Quaifes, and Greens.

   The more frequent freshes in the drains may also reduce in peak flow as all of the developed and mitigated catchments will have a first flush basin which will attenuate the first 25 mm of each storm, and this represents about 80% of the rainfall on the catchments of Christchurch.

10. *Please provide information if any future modelling calibration will occur.*

    The Heathcote catchment model has been undergoing development for more than 10 years and NIWA, who were contracted by Christchurch City Council to carry out the modelling for this project, have calibrated the model to the *main stem of the river* for the purposes of investigating the effects of the catchment development and mitigation strategies in this catchment.

    Prior to the earthquakes, NIWA were contracted to review the calibration of the model to calibrate it to other points in the catchment. The earthquakes have altered the topography to come extent so the models are being re-run - more particularly to determine flood levels for setting floor levels. In addition to this, the modelling technology is being upgraded to a 2D system which allows for a faster turnaround of flood extents and other scenarios. With this change in technology the model calibration will be checked and revised. Therefore as time goes by, more data is collected in terms of rainfall and flow information, so there is more ability to match the

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model performance against the performance of the real catchment, and thus allow the model to be checked against the wider range of events. In short, the models are continually being reviewed and upgraded as new data and new technologies becomes available, and as new investigations are needed in the catchment.

Monitoring Programme – Appendix J – Questions 11 - 20

Thank-you for the suggested amendments to the Monitoring Programme, provided as questions 11 - 13, 15 - 17 and 19 - 20 of the further information request. These suggested changes are agreed with, and have been incorporated into the revised Monitoring Programme attached to this letter (Attachment 2). Questions 14 and 18, which also relate to the Monitoring Programme, are answered below.

Groundwater Quantity

14. *Please either update the monitoring programme to address potential lowering of groundwater levels, or provide further clarification as to how this issue will be addressed.*

This question raises a concern about risks arising from lower groundwater levels. It is important to recognise that the overall large scale changes in groundwater levels will be driven by the overall patterns of aquifer recharge beyond the SWAP area. For example, the Christchurch City Council experiences of the late 1970s were that groundwater levels can rise as a result of rainfall in the upper catchment over which this stormwater management scheme has no control. So recharge, or the lack of it, from outside the catchment is a key factor.

Changes arising from the SWAP stormwater management create more localised changes. If this were to result in lower levels in the upper Heathcote catchment, the scheme has the potential to alter the amount of water that is sent to ground by way of the infiltration basins (particularly in the Awatea Rd facility) and this allows the stormwater management scheme to vary the amount of water directed to ground or surface streams in the Heathcote catchment in the light of experience as the scheme develops into the future.

It is worth noting that the Upper Heathcote catchment strategy jointly developed by Christchurch City Council and Environment Canterbury very clearly indicates that as much as possible of the upper catchment water should be put to ground for the purposes of reducing flood levels downstream and maintaining base flows. The current consent application is the implementation of this agreed strategy.

18. *Please provide further information that justifies the soil monitoring of contaminants being limited to only zinc, for the three adsorption basins chosen and in particular the basin that will receive stormwater from an industrial catchment.*

The suite of parameters to be analysed in the soil samples has been expanded. The revised suite of parameters is in keeping with the soil monitoring programme currently undertaken as part of the Interim Global Stormwater Consent held by Christchurch City Council. The parameters for the industrial land use follows guidance given in the MfE (2004) Contaminated Land Management Guidelines No. 5 – Site Investigation and Soil Analysis, as recommended in the Calm Before the Storm (Environment Canterbury 2009). Further details of the locations and type of stormwater treatment system to be sampled have also been provided. All of these changes are reflected in Section 6.0 of the revised Monitoring Programme.

Water Quantity

21. *Please provide information on how progress towards the water quantity environmental outcome described in Condition 7 will be determined as development occurs and once the SWMS is fully developed.*

The key performance indicator for the surface water management scheme is to manage the flooding in the mid reaches of the Heathcote River. To this end there are continuous water level

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recordings being made at Ferniehurst St (since 1996) and at other sites further downstream. Ferniehurst St is regarded as the outlet point of the South-West catchment for the Heathcote River. These long-term continuous records are a means of comparing the past performance with the flood levels in the future and are the key monitoring and calibration points of the computer model. There is also continuous water level monitoring on the major detention facilities of Wigram Detention Basin and Halswell detention basin. The network of sites are gauged and managed by NIWA on behalf of Christchurch City Council.

Other

22. *Please confirm how catchment protection areas/zones will be addressed by any specific mitigation or management approaches and update the SMP accordingly.*

The protection methods outlined in the Aquatic Values report for key ecological areas (Table 5.3 of Appendix D of the AEE) are not specifically referred to as a whole in the SMP. However, the intent of these protection methods is included in a number of sections of the SMP, as well as in a number of other existing Christchurch City Council documents and these methods are not limited to within catchment protection areas. The issues identified in Table 5.3 are listed below, with reference to the relevant sections of the SMP.

Sediment entering waterway
Sediment input is kept to a minimum during river bank works by the use of appropriate erosion and sediment control measures. These are required as part of the global consent for works in the beds and margins of waterways (CRC100750). In terms of sediments in stormwater, the SMP outlines the facilities that will be used to provide water quality mitigation, including basins, wetlands and wet ponds as outlined in the SMP (Section 5.3) and also deals with sediment and erosion control during construction (Section 5.5).

Stormwater contamination and quantity control
As above, the SMP details the strategy for providing stormwater quality and quantity mitigation using detention and retention basins, wetlands and wet ponds (Section 5.3).

Habitat fragmentation
This is not covered in the SMP, but could be included by the suggested update to Section 5.8 of the SMP, provided below.

River maintenance
The methods and frequency of waterway maintenance are covered elsewhere, in the Council's waterway maintenance contract with City Care.

Impermeable area
The City Plan provides rules that limit the percentage of a site that may be covered by impermeable surfaces.

Stream restoration
Section 5.8 of the SMP describes the Council's approach to waterway enhancement. Further details on design aspects are available in the Council's Waterways, Wetlands and Drainage Guide (CCC, 2003). Additional wording is proposed below to insert into the SMP to recognise the importance of the identified catchment protection areas.

The waterway enhancement programme is an important management measure that Christchurch City Council is implementing throughout Christchurch. Information on ecological values and catchment protection zones will be used to inform the prioritisation of sites for waterway enhancement. Waterways within South-West Christchurch will be prioritised along with other waterways outside of South-West Christchurch for enhancement within the existing budgets. Waterway enhancement plans will incorporate appropriate site specific measures to reduce

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habitat fragmentation, and to improve riparian vegetation and instream habitat quality with guidance from the Waterways, Wetlands and Drainage Guide (CCC, 2003).

Unrecognised values
Christchurch City Council is working with Environment Canterbury for environmental education as outlined in Section 5.6 of the SMP.

23. *Please confirm the timeframe for the industrial site audit timeframe.*

As proposed in Condition 5 of the draft consent conditions, and agreed at consultation meetings with Environment Canterbury representatives prior to lodging the resource consent application, Christchurch City Council proposes to develop a site audit programme for potentially high risk industrial sites within **one year** of the granting of the resource consent. It is then proposed to complete these audits within **ten years** as part of an overall programme to audit all high risk sites in Christchurch. It is considered more appropriate to incorporate the South-West site audits into the overall programme for Christchurch, rather than carrying out all of the South-West audits first (including the lower risk sites), to ensure that the highest risk sites across the city can be prioritised above lower risk sites.

24. *Please clarify the intention of the application with respect to the limits on areas of development for the construction discharges sought.*

As proposed in Condition 2, any stage of development[1] will be limited to 5 ha on flat land not on the Port Hills, and 1 ha on the Port Hills. There was an error in Section 2.1 the AEE where these areas where incorrectly stated as 5 ha on the Port Hills and 1 ha on flat land.

It is noted that the 1 ha and 5 ha limits do not limit the overall size of any development. 'Stage of development' refers to the area of land that can be disturbed at any one time within a larger, staged development.

We trust that this provides the necessary information to continue processing the resource consent application. Should you have any further questions please contact Jacqui Todd (email jtodd@golder.co.nz or phone (03) 377 5696)

Yours sincerely

Graham Harrington
Senior Surface Water Planner
Asset and Network Planning

Attachments:
1 - Draft Consent Conditions, 17 October 2011.
2 - Monitoring Programme for South-West Christchurch Stormwater Management Plan. 17 October 2011

[1] Stage of development is defined as the phase of development of any one development area which is completed prior to any other stage of development commencing. A stage of development is deemed to be finished following the completion of construction activities and when the development area has been 'stabilised'

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ATTACHMENT 1
DRAFT CONSENT CONDITIONS - SOUTH-WEST CHRISTCHURCH STORMWATER MANAGEMENT PLAN
17 OCTOBER 2011
(Changes made to conditions submitted with AEE are shown)

For the purpose of this consent the following definitions and abbreviations apply to all conditions:
critical duration means the time at which it takes peak water levels to be reached in the Heathcote or Halswell Rivers as agreed upon by Environment Canterbury and CCC and based on the most up-to-date information or modelling.

development area means any individual area made up of a site or sites that is undergoing development and construction activities. Includes areas specified in a subdivision permit.

new greenfield urban development means the construction of subdivisions, buildings, roads and associated network services.

brownfield urban development means the redevelopment of more than 1 hectare of existing residential, commercial or industrial land.

Full Flood Attenuation means (for land on the flat as defined in Plan A) all the flood water will be attenuated through a storage facility and slowly discharged during and after a storm event.

Partial Flood Attenuation means (for land on the Port Hills as shown on Plan A) attenuating the water which is in excess of what would otherwise have run off under normal flood flow conditions which exist at the commencement of the consent.

site means an allotment title and any balance of land or adjacent land or allotment titles held by the same owner or ownership with an affiliated interest, for example a family trust or company.

stage of development means the phase of development of any one development area which is completed prior to any other stage of development commencing. A stage of development is deemed to be finished following the completion of construction activities and when the development area has been 'stabilised'.

area of disturbance means an area where site clearance or earthworks are actively taking place and where the land has not been stabilised.

stabilised an area sufficiently covered by erosion-resistant material such as a good cover of grass, mulch, weed matting, bark, sand/aggregate, or paving by asphalt or concrete etc, in order to prevent erosion of the underlying soil.

SMP means stormwater management plan.

stormwater means runoff that has been channelled, diverted, intensified or accelerated by human modification of the land surface or runoff from the external surface of any structure as a result of precipitation or from routine washdown events. This definition excludes discharges of spilled or deliberately released hazardous substances and the subsequent washdown of such spills or releases

stormwater network means Class 3 and 4 waterways as identified in the South-West Christchurch SMP and as shown on Plan C attached to this consent, and includes the reticulated piped network, including kerb and channel, sumps, pipes and manholes, and any stormwater conveyance and mitigation system for which Christchurch City Council are responsible for operation, maintenance and upgrade.

SWMS means Stormwater Management Scheme as defined in the South-West Christchurch SMP.

QMCI means Quantitative Macroinvertebrate Community Index

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SCOPE

(1) The discharge shall be only stormwater discharged from the area identified as South-West Christchurch as shown on Plan A[2] which forms part of this consent, including stormwater that:

(a) Enters the Christchurch City Council stormwater network (including stormwater discharges which existed prior to 1 August 2011 which are from areas adjacent to the area shown in Plan A, but reticulated into the South-West Christchurch network) and is discharged onto or into land or into surface water or groundwater; or

(b) Is from roofs, located within zones 1 to 5, 7, 8, 9 and 11 as defined in Plan B "Stormwater Disposal Options for individual sites", and is discharged onto or into land via one of the preferred options for the zone it occupies, as described in Plan B on an individual property basis; or

(c) Is from residential hard-standing areas, located within residential zones 1 to 5, 7, 8, 9 and 11 as defined in Plan B "Stormwater Disposal Options for individual sites", and is discharged onto or into land via one of the preferred options for the zone it occupies as described in Plan B on an individual property basis; or

(d) Is generated from development areas and is discharged onto or into land, or into the Christchurch City Council stormwater network and into surface water or groundwater, but excludes discharges from the areas specified in Condition (2).

Advisory Note: Condition 1(a) ~~only authorises stormwater discharges (including industrial discharges) which enter the Christchurch City Council stormwater network before discharging to surface water or land. It~~ does not authorise industrial discharges which discharge directly to land or water, and bypass the Christchurch City Council network.

(2) There shall be no discharge to surface water from the following development areas:

(a) A stage of development with an area of disturbance greater than 5 hectares of land not on the Port Hills zone as shown on Plan A.

(b) A stage of development with an area of disturbance greater than 1.0 hectares on the Port Hills zone as shown on Plan A.

(3) There shall be no discharge to land or surface water from the following areas:

(a) Any development area or SWMS on a site that the Canterbury Regional Council identifies in writing to the consent holder as being contaminated or having a high risk of being contaminated; and

(b) Any development area or SWMS on a site on the Canterbury Regional Council's Listed Land Use Register, unless the soil has been analysed for the appropriate contaminants and has been shown to be 'Not contaminated' or 'Remediated' and accepted by Canterbury Regional Council as 'Not contaminated or 'Remediated'.

(c) Any site listed on the attached Schedule 1 'Sites excluded from the South-West SMP consent' where Christchurch City Council has excluded the site via the surrender of

[2] Plans A, B and C are unchanged from those provided in the resource consent application.

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their respective land parcels by the Canterbury Regional Council pursuant to 138 of the Resource Management Act 1991.

Advisory note: The purpose of conditions (2) and (3) is to identify sites where stormwater quality may compromise the outcomes this consent seeks to achieve and where feasible, discourage such discharges. If such discharges cannot be avoided and consent is sought, the consents process provides applicants the opportunity to demonstrate that their discharge will not compromise the outcomes specified in the conditions of this consent.

ENVIRONMENTAL OUTCOMES

Water Quality

(4) The consent holder shall use reasonable endeavours to achieve the water quality objectives set out in Table 1 for all rivers marked as Class 1 and 2 on Plan C.

Advisory note: If, over the course of the consent, the objectives in Table 1 are not being met, consultation is to occur between Christchurch City Council and Environment Canterbury to discuss the reasons and determine whether reasonable endeavours have been used, and whether any further action is necessary to ensure the objectives are met in the future. This consultation shall occur in accordance with the Planning and Consents Protocol for Surface Water Management (Kingett Mitchell 2008) which is available at www.ccc.govt.nz.

(5) Within one year of the granting of this consent the consent holder shall:

(a) Undertake and report on the outcomes of a desktop based identification of potentially high risk industrial sites which require auditing;

(b) Identify clear priorities for auditing on potential high risk sites; and

(c) Develop a programme for completing audits of all potential high risk industrial sites. The programme shall include a site visit to identify:

(i) Site environmental practices, including spill prevention/control, minimisation or elimination of contaminants at source;

(ii) Any data on discharge quality, or identify the need for the site owner (and/or site occupier) to carry out monitoring of their stormwater discharge; and

(iii) Adequacy of the sites stormwater system including stormwater treatment.

(iv) All sites that present an unacceptable risk and are to be removed from this consent in accordance with Condition (3)(c).

(6) The programme developed in Condition (5)(c) shall be undertaken and completed within ten years of the grant of this consent.

Water Quantity

(7) When the SWMS is fully developed, flood levels in the Heathcote River shall not increase more than 30 millimetres above the levels which would have occurred in a 50 year critical duration event of the Heathcote River ~~or Halswell River~~ for 1991 impervious surfaces.

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(8) All water quality mitigation facilities constructed after commencement of this consent for new greenfields urban development shall be designed to treat the first flush of rainfall from the contributing impervious areas of the site or sub-catchment by:

(a) Filtration through soil adsorption basins and discharge to land; or

(b) Filtration through soil adsorption basins and discharge to surface water via a subsurface under-drain; or

(c) Sedimentation within sedimentation basins followed by wetlands (or wet ponds) and surface water discharge.

(9) All water quantity mitigation facilities constructed after commencement of this consent for new greenfields urban development shall:

(a) For facilities discharging to surface water:

(i) provide Full Flood Attenuation for the post development 50 year critical duration events of the Heathcote River or Halswell River; and

(ii) for Port Hills (as defined in Plan A) provide Partial Flood Attenuation for the post development 50 year critical duration events of the Heathcote River or Halswell River.

(b) For facilities that discharge to ground provide retention of all events up to and including the 50 year critical duration event of the Heathcote River or Halswell River.

(10) In addition to the minimum design standards specified in Condition (9), any mitigation facilities constructed shall include best practice design features that capture and contain as much as practically possible of any spills of contaminants contained within stormwater entering the facility.

MONITORING

Monitoring Programme

(11) The consent holder shall ~~prepare a~~ undertake monitoring in accordance with the Monitoring Programme for South-West Christchurch to investigate the effects of stormwater discharges on groundwater levels, groundwater quality, surface water quality, stream sediment quality, the ecology of surface waterways and soil quality within the South-West Christchurch SMP area. The Monitoring Programme shall also:

(a) Be sufficient to detect any trends in groundwater levels, groundwater quality, surface water quality, stream sediment quality, the ecology of surface waterways and soil quality.

(b) For surface water monitoring programmes, be sufficient to measure compliance with the objectives for Class 1 and 2 waterways prescribed in Table 1.

(c) Be sufficient to demonstrate that reasonable endeavours have been used to achieve the water quality objectives set out in Conditions (4) to (6) inclusive.

(d) Include the industrial sites audit programme developed in accordance with Condition (5).

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(e) Be sufficient to demonstrate compliance with the water quantity objectives set out in Conditions (7) to (10) inclusive.

(12) ~~The Monitoring Programme shall be submitted to the RMA Compliance and Enforcement Manager of the Canterbury Regional Council and certified as complying with the requirements of Condition (11) before first exercise of this consent.~~ Any amendments to the Monitoring Programme may not replace the certified version until the Monitoring Programme has been certified by the RMA Compliance and Enforcement Manager of the Canterbury Regional Council as complying with the requirements of Condition (11).

Responses to Monitoring

(13) If groundwater levels monitored in accordance with the groundwater level monitoring carried out in accordance with Condition (11) show that groundwater reaches the ground surface the consent holder shall:

(a) Identify if the groundwater reaching the ground surface is a result of discharges authorised by this consent; and

(b) If the monitoring identifies an on-going trend of elevated groundwater levels as a result of stormwater discharges authorised by this consent which are causing an adverse effect:

(i) Develop a remediation programme to reduce the amount of stormwater discharging to ground to avoid or mitigate the adverse effects; and

(ii) Include in the reporting requirements of Condition (16) a summary of these investigations and the proposed remediation.

(14) In the event the monitoring results identify that the objectives set out in Table 1 are not being met, the consent holder shall investigate the reason for the objectives not being met and where these result from the discharges authorised by this consent, review its implementation of reasonable endeavours to achieve progressive improvements in water quality and ecology.

(15) If investigations demonstrate that the objectives are not met as a result of discharges from an industrial site and the consent holder determines that the site shall be added to Schedule 1, the Schedule shall be updated.

REPORTING

(16) The consent holder shall provide an annual report to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager by 31 March each year. The report shall summarise the results of monitoring carried out under Conditions (11) and (12) and the responses carried out under Conditions (13) to (15) including the supply of an updated Schedule 1.

ADMINISTRATIVE

(17) The Canterbury Regional Council may, on any of the last five days of March or September each year, serve notice of its intention to review the conditions of this consent for the purposes of:

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(a) Dealing with any adverse effect on the environment which may arise from the exercise of this consent and which it is appropriate to deal with at a later stage; or

(b) Achieving reasonable endeavours to make improvements to water quality; or

(c) Complying with the requirements of a relevant rule in an operative regional plan.

Table 1

Objectives (based on Stormwater Management Plan objectives)	**River water quality management unit***	**Measure/Target**	**Basis for Measure/Target**
Protect and otherwise enhance ecological values.	Banks Peninsula	Minimum QMCI score 4 - 5	Water quality outcomes in Table WQL5 of Chapter 4 of the Natural Resources Regional Plan (2011). QMCI is an indicator of aquatic ecological health.
	Spring-fed – plains	Minimum QMCI score 4.5 - 5	
	Spring-fed – plains urban	Minimum QMCI score 3.5	
	Maximum cover of bed		
No ecological impacts from construction activities.	Banks Peninsula	Fine sediment – 30%	Water quality outcomes in Table WQL5 of Chapter 4 of the Natural Resources Regional Plan (2011). Fine sediment, macrophyte and periphyton cover are indicators of the quality of aquatic habitat. Improvement towards macrophyte and periphyton targets can be achieved by reduction in nutrient concentrations or other means such as riparian planting to shade waterways. Fine sediment cover to be measured against pre-development concentrations (2011).
		Macrophytes – 30%	
		Filamentous algae – 20%	
	Spring-fed plains	Fine sediment – 30-40%	
		Macrophytes – 50%	
		Filamentous algae 30%	
	Spring-fed plains-urban	Fine sediment – 30-40%	
		Macrophytes – 60%	
		Filamentous algae – 30%	
Meet USEPA water quality criteria for metals and improve water quality towards the national guidelines for copper, lead and zinc.	All river water quality management units	Dissolved Copper < 0.0032 g/m^3	USEPA (2006) criteria continuous concentrations (chronic criteria) for protection of aquatic life. Improvements will also be measured against pre-development concentrations (2011) with long-term target of reducing below national guidelines (ANZECC) for level of ecosystem protection outlined in Table WQL16 of NRRP (Schedule WQL1).
		Dissolved Lead <0.00066 g/m^3	
		Dissolved Zinc < 0.043 g/m^3	
Reduce nutrient concentrations.	All river water quality management units	Reduced nitrogen and phosphorus concentrations in waterways after new treatment systems installed or retrofitted.	Measured against pre-development concentrations (2011).

* As defined in Chapter 4 of the Natural Resources Regional Plan (2011)

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