

**BEFORE THE CANTERBURY REGIONAL COUNCIL**

**UNDER THE**

Resource Management Act 1991

**AND**

**IN THE MATTER**

of application CRC190445 by the Christchurch City Council for a comprehensive resource consent to discharge stormwater from within the Christchurch City area and Banks Peninsula settlements on or into land, into water and into coastal environments

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**EVIDENCE SUMMARY**

**PETER FRANCIS CALLANDER FOR CHRISTCHURCH CITY COUNCIL**

**5 November 2018**

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**TABLED AT HEARING**

Application: CRC190445

Date: 6 Nov 2018

CHRISTCHURCH CITY COUNCIL  
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## **INTRODUCTION**

1. My full name is Peter Francis Callander. I here summarise key points of my evidence which relates to the groundwater effects arising from the Council's proposed management of stormwater. I am not aware of any areas of disagreement between my opinion and that expressed by or on behalf of submitters and in the s42A report.

## **ENVIRONMENTAL SETTING**

2. The Christchurch groundwater setting is strongly influenced by the geological strata that occurs across the Christchurch area. High permeability alluvial deposits of gravels and sands occur on the western side of the urban area and also form confined aquifers in the central and eastern parts of the urban area. The confined section of the aquifers are overlain by relatively low permeability marine and estuarine sands and silts. To the south of the urban area, the Banks Peninsula volcanoes form a low permeability consolidated rock mass that represents a barrier to the groundwater flow that occurs more easily through the unconsolidated alluvial gravel deposits that occur across the plains section of the city.
3. The groundwater table tends to occur at depths of a few metres in the west of the city and away from the rivers, but closer to the ground surface in the east. Groundwater moves through this strata and the gravel aquifers are used by abstraction bores to provide the Council reticulated water supply. This groundwater is primarily recharged by seepage losses from the Waimakariri River and rainfall infiltrating through the more permeable strata in the western part of the city.
4. Discharge from the groundwater system provides the baseflow to the springfed streams that flow through the city, primarily the Avon, Heathcote, Styx and Halswell Rivers.
5. Groundwater quality is generally good, with particularly low concentrations of dissolved chemicals in the northern part of the city which is dominated by recharge from the Waimakariri River. Further south more elevated concentrations of chemicals occur and there is an area of poorer quality groundwater associated with old gravel pits that were used as landfills and the former Islington Freezing Works.

## **EFFECTS OF STORMWATER MANAGEMENT ON GROUNDWATER QUANTITY**

6. The infiltration of rainwater provides an important contribution to the Christchurch groundwater system. Urban development changes the natural pattern of rainfall infiltration by creating less pervious surfaces (i.e. replacing the natural soil cover with roof and hardstand areas), which generates more stormwater runoff. An important principle of stormwater management that contributes to the maintenance of the groundwater system, along with the associated springfed streams, is to manage urban stormwater in a similar way to the natural system that existed prior to development. Namely, to promote stormwater infiltration to ground in areas of permeable surface strata where the depth to water allows infiltration to occur, as is typically the case in the west of the city and to use stormwater detention basins with discharge to surface waterways in areas of less permeable surface strata and high water tables.
7. The use of infiltration basins where ground conditions allow this to occur helps to maintain the quantity of water within the Christchurch aquifer system and to maintain groundwater levels and springfed stream flows. A mounding of the water table will occur below an infiltration basin but this effect tends to be of a small and localised scale and should not cause any problems for appropriately sited and designed basins. Groundwater also interacts with surface discharge detention basins, but this occurs at an even smaller scale due to the less permeable strata that tends to occur in the areas where surface discharge is used.
8. In areas of shallow groundwater, the underground pipe networks associated with urban development can intercept the water table and change the permeability of the natural strata. In some circumstances the occurrence of these underground pipes can disrupt the flow of groundwater that feeds spring discharges. Council design criteria are in place to minimise this disruption to the natural groundwater flow system.

## **EFFECTS OF STORMWATER MANAGEMENT ON GROUNDWATER QUALITY**

9. Stormwater infiltrating into the ground can affect groundwater quality. Microbial contaminants, as indicated by *E. coli*, pose the main threat to drinking water quality, along with the risk of accidental spillage of chemicals. Stormwater infiltration basins will typically provide treatment of the first flush of stormwater, which tends to have the highest contaminant loads, by infiltration through the basin media. The filtration and adsorption characteristics of the soil in an infiltration basin significantly reduce the concentration of dissolved and particulate contaminants in the stormwater. However

some contaminants will pass into the underlying groundwater. Therefore it is appropriate to maintain a separation distance, both laterally and vertically between and infiltration facility and a well that is used for drinking water purposes. This provides for attenuation of contaminants so as to avoid water supply contamination problems. The appropriate separation distances has been a topic of discussion between myself and the Environment Canterbury groundwater scientist and is discussed later in this summary.

## **MANAGEMENT AND MONITORING OF STORMWATER INFILTRATION FACILITIES**

10. The Council have useful design guides for the siting, design, construction and operation of stormwater management facilities, including the use of infiltration basins. All these facilities are reviewed by Council engineers as part of the Council's internal design approval process, as operator of the stormwater network. The Council stormwater design philosophy is set out in their Infrastructure Design Standard.
11. As part of this consent application, the Council has prepared an Environmental Monitoring Plan that includes monitoring of groundwater levels and groundwater quality across the city. In addition, the Council will undertake a detailed assessment of three infiltration basins to provide more specific data as to the localised effects occurring during and in between storm discharge events.
12. Direct observation of the basins filling and drainage patterns during storm events provides a good basis for understanding how a basin is performing and whether any maintenance of the soil and vegetative matter is required.
13. Management of stormwater is best achieved through good management practices within the contributing catchments and having well located, designed and maintained facilities for the treatment and discharge of stormwater. The Council has very good systems in place, which coupled with the proposed consent conditions, can be expected to achieve good outcomes for stormwater management in Christchurch.

## **EXPERT DISCUSSION**

14. Following the completion of my evidence-in-chief I have had a constructive discussion with Environment Canterbury's groundwater scientist, Mr Zeb Etheridge. We have agreed on an approach to separation distances between infiltration facilities and drinking-water wells that utilises the separation distances in Schedule 1 of the LWRP

as a guide and applies all the distances specified in that schedule for small discharges and the conservatively large separation distance of 2km for large infiltration devices, with the option of applying smaller separation distances based on site specific details and a certification process from Environment Canterbury.

15. We have agreed on some other small adjustments to the wording of consent conditions to ensure that the best approach to managing stormwater and protecting groundwater are achieved. These changes are incorporated into the proposed conditions of consent.

### **CONCLUDING COMMENT**

16. Good and effective management of stormwater is an important component of the management of water resources of Christchurch city. Utilising a stormwater management system that encourages infiltration where that can be achieved by the natural ground conditions is important to provide replenishment of the underground water resources of the city. However this must be achieved by providing treatment through infiltration media and safe separation distances from drinking-water supply wells. This is achieved by the proposed consent conditions and the management systems that the Council has in place, including monitoring of stormwater basins and the receiving groundwater environment.

**PETER CALLANDER**

5 November 2018

