

Before an Independent Hearings Panel
Appointed by Waimakariri District Council

under: the Resource Management Act 1991

in the matter of: Submissions and further submissions on the Proposed
Waimakariri District Plan

and: Hearing Stream 12D: Ōhoka rezoning request

and: **Carter Group Property Limited**
(Submitter 237)

and: **Rolleston Industrial Developments Limited**
(Submitter 160)

Supplementary statement of evidence of Eoghan O'Neill
(Stormwater)

Dated: 13 June 2024

Reference: J M Appleyard (jo.appleyard@chapmantripp.com)
LMN Forrester (lucy.forrester@chapmantripp.com)

chapmantripp.com
T +64 3 353 4130
F +64 4 472 7111

PO Box 2510
Christchurch 8140
New Zealand

Auckland
Wellington
Christchurch



SUPPLEMENTARY STATEMENT OF EVIDENCE OF EOGHAN O'NEILL

INTRODUCTION

- 1 My full name is Eoghan Michael O'Neill.
- 2 My area of expertise, experience, and qualifications are set out in my statement of evidence dated 5 March 2024 for this hearing stream.
- 3 The purpose of this supplementary evidence is to respond to matters raised in the Officer's Report dated 31 May 2024 relevant to my evidence.

CODE OF CONDUCT

- 4 Although this is not an Environment Court hearing, I note that in preparing my evidence I have reviewed the Code of Conduct for Expert Witnesses contained in Part 9 of the Environment Court Practice Note 2023. I have complied with it in preparing my evidence. I confirm that the issues addressed in this statement of evidence are within my area of expertise, except where relying on the opinion or evidence of other witnesses. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

RESPONSE TO OFFICER'S REPORT

- 5 In my evidence below I have focussed on the key matters raised in the evidence of Mr Roxburgh, namely:
 - 5.1 Above Ground Basins and Assessment of changes to downstream flows.
 - 5.2 Suitability of Site for Rain Gardens.
 - 5.3 Suitability of Outline Development Plan.

Above Ground Basins and Assessment of changes to downstream flows

- 6 I agree with Mr Roxburgh's statement in paragraph 25 and 26, that stormwater attenuation basins are conventionally constructed partially below ground. The proposal, in this instance, to construct the basins above ground is driven by the need to keep the base of the basins above highest groundwater level and ensure that they do not trigger a consent requirement.
- 7 I also agree with Mr Roxburgh's comment that such an approach is very uncommon. Mr Roxburgh notes that he is aware of above ground basins constructed downstream of developments such that the full development can fall into them. I would suggest that this proposed development is no different to that example. This

proposal is a very large development made up of a series of smaller sub-catchments which each drain to a single basin. It is effectively a collective of the type of smaller developments which Mr Roxburgh describes in paragraph 26 of his evidence.

8 Mr Throssel has commented extensively with respect to downstream flows and flood levels in both his main evidence and his supplementary evidence. With respect to paragraphs 24 to 32 of Mr Roxburgh's evidence, I comment as follows:

8.1 Extensive modelling and proof of concept work has been undertaken as part of the preparation of this proposal, significantly more detail has been provided than would typically be required for a Plan Change.

8.2 As noted in paragraph 37 of my evidence, the volume of attenuation storage calculated is considered to be very conservative due to the approach we have deliberately taken. A sensibility check against outputs of the model has indicated that the required storage could be less than half of that calculated and allowed for within the site.

8.3 More detailed hydrological modelling within the site will be undertaken at resource consent stage to show, across a range of event magnitudes and durations that the proposed development scenario will not exacerbate peak flows and peak water levels downstream of the development.

8.4 It is appropriate that this work is undertaken at resource consent stage once the detail of the developed subdivision design has been sufficiently progressed.

Suitability of Site for Rain Gardens

9 I note the comments of Mr Roxburgh in relation to the Christchurch City Council (CCC) Rain Garden Construction and Maintenance Manual (*Manual*), the notes contained therein, as well as the comments of the CCC engineer. I would disagree, however with their relevance to the evidence which I have presented. The general approach to the use of rain gardens by CCC is that they are primarily used as a partial soakage system. To facilitate this they are not sealed at the base, but are open to the subsoil beneath. This provides the opportunity for treated stormwater to drain vertically downwards through the subsoil into groundwater, if circumstances allow. Alternatively, if the discharge exceeds the infiltration capacity of the soil beneath the raingarden, an under-drainage system at the base of the raingarden will collect and convey the outflow to a surface water outfall.

10 I agree that it would not be advisable to construct this type of open base rain garden within areas of high groundwater for the reasons outlined in the CCC Manual, detailed by Mr Roxburgh in paragraphs 34 and 40.

- 11 As per paragraph 26 of my evidence, it is proposed that the rain gardens at Ōhoka are installed within sealed concrete chambers. These are proprietary devices supplied and used throughout New Zealand by Councils and Developers. The precast concrete chambers are sealed tanks. Their associated pipe outlet connections are designed to be completely sealed during construction and can be air tested to verify that this has been achieved. This is the same testing procedure that is currently used and accepted for verification of all wastewater and stormwater manholes and pipelines constructed within every development in the Waimakariri District.
- 12 Rain gardens within concrete chambers are commonly used within New Zealand. A quick search of the Stormwater360 website,¹ a company which supplies such proprietary devices, references installations in Rolleston town centre, Hereford St Apartments in Christchurch City Centre (operational since 2017) as well as other installations in Auckland and Frankton.
- 13 I agree with the statement of Mr Roxburgh in paragraph 37 that the same factors that exist for wastewater and stormwater infrastructure which intercept groundwater are relevant to the proposed rain gardens. I acknowledge that wastewater and stormwater infrastructure systems, which are fully sealed following construction, have the potential to deteriorate over time and allow some seepage of groundwater to occur.
- 14 If this was to occur at the pipe penetrations to the proposed concrete raingarden chamber, there may be some small seepage of groundwater into the drainage pipework at the base of the raingarden. However, this would not have any impact on the treatment capacity of the raingarden itself. Any potential seepage would be a tiny fraction of the flow capacity of the underdrainage system and would immediately drain away and be collected by the site's treated stormwater conveyance system. The proposed system would be appropriately designed such that any seepage that enters the system in the future does not directly enter the downstream basins or cause maintenance issues within them.
- 15 It should also be noted that these rain gardens are very shallow. The pipe penetrations for the outfall pipe are approximately 450mm below ground level. Therefore, the ability for groundwater to seep through any deteriorating pipe seals in the future will be very limited.
- 16 With respect to bioscapes, I am of the view that these can be constructed with appropriate heavy duty impermeable Polyethylene liners to exclude groundwater. However, I agree with Mr Roxburgh that maintenance, in particular the replacement of media, provides some degree of risk with respect to damage to the liner if

¹ <https://stormwater360.co.nz/projects/>
<https://stormwater360.co.nz/products/filtterra/>

appropriate care is not taken by the contractor. This is not the case for the proposed raingardens which are heavy duty concrete chambers.

- 17 As noted in paragraph 27 of my evidence, I am aware of two locations where CCC are in the early stages of designing bioscapes as part of stormwater treatment facilities. One location is at Deans Avenue, to the west of South Hagley Park, the other is part of the Avon River Corridor between Anzac Drive and Waitaki Street. The second location would be considered an area of very high groundwater. As noted in my evidence, bioscapes are one type of device which could be considered for this site, however, if they were not considered suitable in this location by the Council then they would not be used, with raingardens being used instead. As discussed above, in my opinion rain gardens within sealed concrete tanks are considered appropriate in this location.
- 18 I disagree with the reasoning outlined by Mr Roxburgh in paragraphs 40 (a) to (f) as follows:
- 18.1 Paragraph 40 (a) and (b): The proposed raingardens are not intended to have open bases, as per the standard CCC approach, hence the CCC guidance with respect to high groundwater is not applicable. The raingardens would always have a positive drainage pathway so that the treatment media would never be permanently saturated, and the treatment performance would not be affected.
- 18.2 Paragraph 40 (c) and (d): I agree that the proposal (i.e. sealed raingardens) provides a pathway for potential groundwater interception. Drainage of very small groundwater flows are possible as the pipe seals may deteriorate over an extended period of time. At the time of construction, the system will undergo a standard testing procedure to prove that it is sealed at the time of construction. Any drainage of groundwater as a result of leakage in the pipe connections at rain garden chambers would be considered the equivalent of infiltration of groundwater into the stormwater reticulation network or wastewater reticulation network. I am not aware that this is currently considered a consenting issue by Environment Canterbury. It is a situation that currently exists throughout most of Christchurch and the Waimakariri Districts' wastewater and stormwater networks. If, in the future, the seals begin to seep, the flows would be a tiny fraction of the capacity of the system the system and drainage will be designed to ensure there is no flow of this seepage directly into the dry basins.
- 18.3 Paragraph 40 (e): I acknowledge the points of Mr Roxburgh that there are a number of examples where certain systems have been poorly conceived or inappropriately constructed

within the District. Mr Roxburgh and I have discussed these examples as part of expert conferencing in the past. In my opinion, the instances which Mr Roxburgh identifies are not comparable to the proposal at hand. My understanding of the example of the "dry basin" being constructed below the water table is that it involved the use of an "impermeable" clay liner on its base to act as a barrier against the upflow of the underlying groundwater. A clay liner is never "impermeable", it merely has properties which have extremely low rates of permeability. If groundwater is high underneath the liner, water will still seep through very slowly and cause the base of the basin to be marshy or have standing water. This example was very poorly conceived with little chance of ever being successful. In the instance of buried concrete septic tanks, these are typically built on private properties under the Building Act and are not subject to the more rigorous testing and approvals that are required of infrastructure to be adopted by Councils. As noted above, the proposed rain gardens are large concrete chambers with sealed pipe connections, they are far more comparable to stormwater or wastewater manholes and pipework which are regularly constructed at or below the water table and tested for water tightness following construction.

- 18.4 Paragraph 40 (f): I agree with the comment of Mr Roxburgh that bioscapes within areas of high groundwater areas present a degree of risk, compared to low groundwater areas, as the liner material could be susceptible to damage, particularly during the replacement of media, if sufficient care is not taken by the contractor. I am aware of two proposed bioscapes being designed by CCC, at least one of those locations is in an area of known high groundwater. In contrast, the proposed raingardens are effectively large shallow concrete manholes fitted with an under-drainage system and treatment media. The systems themselves, with outlet pipes located approximately 450mm below ground level, are extremely shallow compared to wastewater and stormwater manholes which are typically a minimum of 900m below ground level. Any seepage of groundwater which may occur over the lifetime of the asset would be very small and would not compromise the treatment capacity of the asset or impact downstream infrastructure or trigger consent requirements. In my view, raingardens within concrete chambers will operate very successful at this site.

Suitability of Outline Development Plan

- 19 In paragraphs 41 to 45 of his evidence, Mr Roxburgh raises concerns with respect to the Outline Development Plan (*ODP*). Mr Roxburgh questions the lack of detail with respect to the sizing and locations of the proposed stormwater management areas (*SMAs*). He also queries the omission of an overland flow path in the

southern portion of the site and the absence of the water supply headworks.

- 20 I am aware that Mr Walsh and Mr McLeod have both commented in some detail on these issues. I have read their supplementary evidence and would agree with the evidence provided by both.
- 21 In my experience, ODP's are very high level and indicative plans. Certain aspects, such as key roadways and site entry points are typically "locked in", but other items such as SMA locations and representative scale sizing are often indicative at best. Infrastructure such as wastewater pump stations or water supply headworks are typically not shown at all as their locations are often dictated by subdivision design solutions and flexibility as to their final location is important.
- 22 Mr McLeod has provided comment in his supplementary evidence with respect to the old flow channel on the southern side of the site, which was indicated as a flood hazard area on the Council Flood Hazard Model outputs. I agree with the comments of Mr McLeod that this appears to be an old and now obsolete channel which has been replaced with a formed drain along the southern boundary of the site. I also agree that this replacement drain will be picked up in the detailed hydrological modelling required at subdivision consent stage.

Dated: 13 June 2024

Eoghan O'Neill