BEFORE THE HEARING PANEL IN TIMARU

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of the hearing of submissions in relation to the Proposed Timaru District Plan

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STATEMENT OF PRIMARY EVIDENCE OF EOGHAN O'NEILL ON BEHALF OF PRIMEPORT TIMARU LIMITED AND TIMARU DISTRICT HOLDINGS LIMITED

HEARING STREAM E
STORMWATER

Dated: 23 January 2025

TABLE OF CONTENTS

EXECUTIVE SUMMARY

1. My full name is Eoghan Michael O'Neill. I am employed as Technical Director – Water Infrastructure with Pattle Delamore Partners Ltd.

2. I have prepared this statement of evidence on behalf PrimePort Timaru Limited (**PrimePort**) and Timaru District Holdings Limited (TDHL) in respect of matters arising from PrimePort's and TDHL's submissions and further submissions on the Proposed Timaru District Plan (**Proposed Plan**).

3. For the reasons set out below:

   (a) I consider that the stormwater chapter in the Proposed Plan seems an unnecessary addition given the other regulatory controls that Timaru District Council already has to implement their stormwater quantity and quality objectives through the stormwater connection process and stormwater bylaw.

   (b) I am of the opinion that the definition of "stormwater neutrality" should be altered to delete the references to management of pre-development volumes to no more than post-development volumes.

   (c) I consider that the 30m^2 additional impervious area provision for the implementation of stormwater neutrality provisions in SW-S2 is very stringent relative to other districts. A change to 150m^2, as per the change made to Table 7 would be more consistent with other districts.

   (d) I consider that, based on the supporting memo from WSP, the proposed approach to implementation of stormwater neutrality and calculation of storage volumes is very onerous when compared to practices in other districts.

   (e) I have concerns about the ability of most commonly used stormwater treatment devices to meet the minimum removal rates specified in the Proposed Plan. I also consider it very unusual for this type of technical detail to be included within a Proposed Plan.

   (f) I recommend that the contaminant removal standards specified in Table 7 are removed from the Proposed Plan and the standards incorporated into a design standards document or code of practice.

(g) I recommend that the definition of "impervious surface" is adjusted to better define the nature of impermeable surfaces and include additional common functional uses of compacted gravel surfaces.

INTRODUCTION

3. My full name is Eoghan Michael O'Neill

4. I am a Technical Director with Pattle Delamore Partners Ltd and have been employed in that capacity since October 2012. I am a Chartered Professional Engineer with approximately 25 years' experience in the planning and design of wastewater, water supply and stormwater infrastructure. I hold Bachelor of Engineering and Master of Engineering Science degrees awarded by University College Dublin. Much of my experience is related to the planning of infrastructure to facilitate development in New Zealand. I have prepared and presented evidence to Plan Change Hearings, Resource Consent Hearings and the Environment Court on numerous occasions. I have performed this role both as a Council employee and as a consultant on behalf of applicants.

5. In preparing this evidence I have read the following documents:

   (a) Stormwater Management Chapter of the Proposed Timaru District Plan.

   (b) Section 42A Report: Energy and Infrastructure, Stormwater and Transport by Mr Andrew Willis.

   (c) Memo from WSP on Stormwater Management appended to the Section 42A Report.

   (d) Memo from Mr Kevin Kemp on Stormwater Management appended to the Section 42A Report.

6. I am authorised to provide this evidence on behalf of PrimePort and TDHL.

Code of conduct

7. While this is a Council hearing, I have read the Code of Conduct for Expert Witnesses (contained in the 2023 Practice Note) and agree to comply with it. Except where I state I rely on the evidence of another person, I confirm that the issues addressed in this statement of evidence are within my area

of expertise, and I have not omitted to consider material facts known to me that might alter or detract from my expressed opinions.

Scope of evidence

8. My statement of evidence addresses the following matters:

   (a) The Stormwater Chapter of the Proposed Plan and its use as a mechanism for controlling stormwater discharge quality and quantity from new development.

   (b) Stormwater neutrality, its proposed definition and how it is applied in the Proposed Plan.

   (c) The stormwater quality provisions of the Proposed Plan.

   (d) The definition of Impervious Surfaces and how that is applied within Rule SW-R4

9. I address each of these points in my evidence below.

STORMWATER MANAGEMENT CHAPTER

10. In general, I agree with the objective in the stormwater management chapter which is that subdivision, use and development within areas serviced by the Council's reticulated stormwater network do not increase peak demand on stormwater management systems or reduce water quality in the reticulated network.

11. However, I would note that, in my experience, the inclusion of water quality and water quality standards and triggers within the rules of a District Plan is unusual. It would be more typical for these technical standards to be contained within a set of Infrastructure Design Standards, Stormwater Management Plans or Codes of Practice. Connections to the stormwater network are typically controlled by stormwater bylaws which contain provisions requiring the owner or occupier of a property to reduce or prevent contaminants from entering the stormwater network in quantities or concentrations that exceed a standard via the installation of stormwater management devices. The bylaw will also typically reference relevant Council design guidelines or Codes of Practice.

12. In my view, the inclusion of these technical stormwater standards within the Proposed Plan as rules or standards, has the potential to make it quite

difficult for the Council to tweak or change any of these in the future if they are found to have any impracticalities in their application. Such a change would likely trigger a need for a notified Plan Change process which could be quite cumbersome and expensive compared to the more straightforward task of updating a Code of Practice or Infrastructure Design Standard.

13. Given the other regulatory controls that Timaru District Council already has to implement their stormwater quantity and quality objectives through the stormwater connection process and stormwater bylaw, the stormwater chapter in the proposed District Plan seems an unnecessary addition to the Proposed Plan. I am aware that Timaru District Council is in the process of applying for a global resource consent for stormwater in Timaru. Once this becomes operative there may be additional provisions that would need to be included into the relevant stormwater regulatory control mechanisms. I expect that his would be more easily achieved through a stormwater bylaw and code of practice review than a Plan Change process.

STORMWATER NEUTRALITY

14. I agree with and support the comments of WSP that, in general, achieving stormwater neutrality for new development is important for the management of stormwater flows in the downstream environment and to prevent the exacerbation of flooding.

15. However, I have some concern with the definition of "Stormwater Neutrality" in the Proposed Plan which *"means that post development stormwater runoff rates and volumes do not exceed the pre-development stormwater runoff rates and volumes*".

16. With respect to this definition, I fully agree that management of post-development flows to being less than pre-development flows is the cornerstone of stormwater neutrality. However, I would disagree with the inclusion of post-development runoff volume in the definition as a measure that should also be managed to not exceed pre-development volumes.

17. The creation of additional impermeable surfaces as part of a development results in an increase in the total volume of runoff from a site, due to the reduction in the infiltration of rainfall to ground which would have occurred over the previously permeable surfaces. The magnitude of this volumetric increase is typically dependent on both the percentage increase in impermeable surface and the pre-development infiltration capacity of the

soils. The runoff will also occur at a faster rate thereby significantly increasing the magnitude of the peak flow rate from the catchment of the development site.

18. This is demonstrated in the first graph below where the solid line represents the hydrograph of the unattenuated post-development flow from a typical site. The pre-development flow, represented by the dashed line, is a much wider curve by comparison with significantly less peak flow, indicating the slower speed of runoff over a longer time in the predeveloped state. The dotted line is the attenuated post-development flow, which is achieved via the use of a storage pond as a stormwater neutrality device to limit outflow from the site to no more than the magnitude of the pre-development flow. This is achieved by storing and slowly releasing the balance of the post-development volume over a longer period of time.

19. In the post-developed state, the detained outflow reaches the equivalent of the pre-development peak flow much sooner in than in the pre-developed state. This outflow flow is then maintained at that rate for an extended period through the storm event before eventually tailing off. The second graph below shows the storage volume detained in an attenuation pond, with the volume increasing to the maximum detained volume through the peak of the storm and then decreasing as the storm passes. Stormwater neutrality is achieved by the addition of the attenuation pond which ensures that the post development flow rate is no greater than the pre-development flow rate.

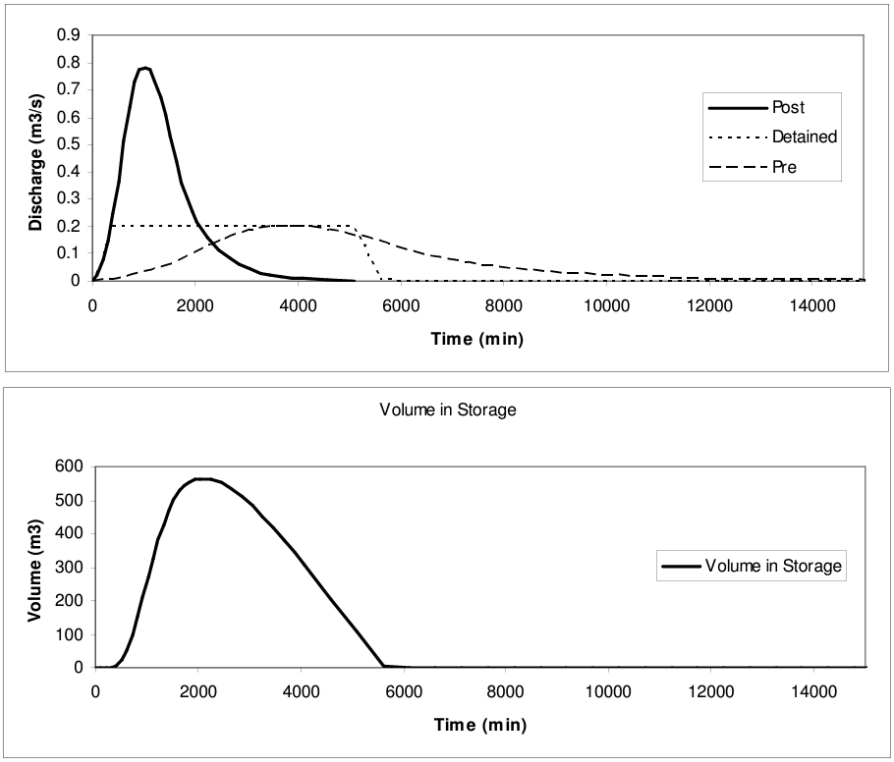

Figure 1 Pre- and Post-development hydrographs from a typical site

20. The above example demonstrates how stormwater neutrality devices such as attenuation basins are used to limit post development flows to the pre-development state. This is consistent with the definition of a "stormwater neutrality device" in the Proposed Plan. The definition says that stormwater neutrality devices are a *"device or natural system which retains (re-use) or detains the stormwater discharge from the site and slows the release of the stormwater at a rate that is no more than the site's original discharge*".

21. However, in my opinion, the definition for a "stormwater neutrality device" is inconsistent with the definition provided for stormwater neutrality which states that *"post development stormwater runoff rates and volumes do not exceed the pre-development stormwater runoff rates and volumes".* Management of post-development volumes to pre-development levels would suggest that no more total volume than the pre-development magnitude can be discharged during the total storm event. In my experience, this is not typically how stormwater neutrality is considered. It could be interpreted as requiring that any additional volume generated as a result of development to be retained and re-used in some fashion on the same site. This reuse could be achieved to a degree at a household scale with individual on-site storage tanks that supplement garden irrigation, but this would be extremely difficult to achieve at a larger scale. I do not expect

that the definition was intended to require retention and re-use of additional volume generated, but a literal interpretation of it could cause it to be applied in such a way. In my view, a requirement to reduce post-development volume to no more than a pre-development volume would be both onerous and unnecessary. This is because the key principle of stormwater neutrality is to achieve neutrality of flows in order to manage adverse effects which can arise from an exceedance of the flow capacity receiving infrastructure and environment downstream of a discharge. I would recommend that the references to volume are removed from the definition of stormwater neutrality.

22. Stormwater Standard SW-S2 sets out the required standards that need to be applied to achieve stormwater neutrality in the Port Zone and other commercial/industrial areas. Tables 5 and 6 in standard SW-S2 detail the Annual Recurrence Interval (ARI) of the storm event and the relevant storm duration that need to be attenuated in order to achieve stormwater neutrality. Neither table references the Port Zone. However, on the assumption that this is an error and Table 5 should reference the Port Zone[1], for developments resulting in an impervious area increase of greater than 500m^2, stormwater neutrality must be achieved for the 1 in 50-year ARI, 24-hour duration event. For additional impervious areas of between 30m^2 and 500m^2, the standard is a 1 in 50-year ARI, 1-hour duration event. The impervious area trigger of 30m^2 is quite onerous relative to other Councils with similar rules. For example, in Christchurch City, the minimum impervious area trigger is 150m^2 for flat (i.e. < 5^o slope) commercial sites less than 5000m^2 in area. This is alongside a requirement that the additional impervious area must also result in greater than 70% total coverage of the site with impermeable area.

23. With respect to the 1 in 50-year ARI containment standard for stormwater neutrality, I consider this to be reasonable and consistent with the standard applied by other councils. The 1 in 50-year standard is typical for the protection of downstream properties from increased flood risk. I do however have significant concerns with how this standard may be applied in Timaru. In reference to the application of Standard SW-S3, the WSP memo (page 18) states as follows:

[1] Given Clause 2 of Standard SW-S2 specifically references the Port Zone.

The Annual Exceedance Probabilities used in SW-S3 are for bigger events than the stormwater levels of service. Requiring stormwater neutrality for events greater than the reticulated network capacity is sensible as Council is interested in the overall stormwater management system, which includes how stormwater is managed when the capacity of the reticulated network is exceeded. However, using a single Annual Exceedance Probability event greater than that of the network capacity means that during a smaller event similar to the capacity of the network, the stormwater runoff would likely exceed pre-development rates and could impact network capacity and flooding (which is inconsistent with the chapter objective SW-O1). The limiting pre-development discharge rate would need to be calculated for an Annual Exceedance Probability similar to the capacity of the reticulated network (i.e. 1 in 5-year for residential areas and 1 in 10-year for commercial/industrial areas) to avoid impacting network capacity and flooding. Though sizing of the stormwater neutrality device could still be required for a larger 1 in 50-year annual exceedance probability event.

24. The above approach suggests that stormwater neutrality devices should be sized for a 50-year ARI rainfall event volume, but that the peak pre-development flow (i.e. the post development peak discharge) should be set to the equivalent of a 5-year ARI or 10-year ARI event for residential or commercial/Industrial areas respectively. This means that the post development discharge flow from the site would be far smaller than the pre-development flow in the 50-year event. The resulting basin storage volume would be much larger than a basin sized using a typical stormwater neutrality approach of matching or not exceeding pre-development for the event being considered. In my opinion this approach is not seeking a neutral position of stormwater discharge but rather a greatly reduced post-development low compared to pre-development flow.

25. The above approach is far more onerous than any other approach to stormwater neutrality that I have encountered in New Zealand. I am aware of some Councils considering setting attenuation basin outflows to 80% of pre-development flows for the design ARI event, which is not unreasonable in areas of significant existing downstream flood risk. Some Councils (e.g. Auckland Council) also direct an approach where multiple outlets are used to match pre-development and post development flows across a range of event ARIs. This results in a larger basin volume compared to sizing for a single ARI event with a critical storm duration which is the most commonly

employed approach. It also however achieves true stormwater neutrality across a range of storm event ARIs.

26. However, in my understanding, this is not the approach described in the WSP memo. In my opinion, the approach described by WSP is overly onerous and does not consider the stormwater conveyance network as a whole. It is focussed on the primary network i.e. the stormwater pipe network and does not consider the higher level of service provided by the secondary network i.e. surface flows on roads, which conveys by far the bulk of stormwater flows in larger storm events. An exceedance of the capacity of the primary network does not typically result in property flooding because secondary conveyance networks, such as a road or protected overland flowpaths, are designed to manage conveyance of larger flows (e.g. though the kerb and channel).

27. The WSP memo notes that the above approach is required in order to comply with Objective SW-01 of the Proposed plan which states:

Subdivision, use and development within areas serviced by the Council's reticulated stormwater network do not increase peak demand on stormwater management systems or reduce water quality in the reticulated stormwater network.

28. In my opinion, Councils "stormwater management systems" include both the primary and secondary stormwater networks. This would agree with the text from the WSP memo in Paragraph 23 above:

Requiring stormwater neutrality for events greater than the reticulated network capacity is sensible as Council is interested in the overall stormwater management system, which includes how stormwater is managed when the capacity of the reticulated network is exceeded

In my opinion, consideration of only "network capacity" or the capacity of primary pipe network when applying stormwater neutrality provisions is not consistent with the above Objective.

29. I also consider that achieving stormwater neutrality (in terms of flows) for every site is not a positive outcome in all cases. Depending on the location of a development site relative to the discharge location for the overall catchment, a better outcome can sometimes be achieved by not attenuating the flow from the site but rather allowing the stormwater to quickly flow into the receiving environment prior to the arrival of the peak flow from the

upstream catchment. The Port Zone would be a classic example of this where potential development sites are very close to the discharge location for the greater stormwater catchment and the receiving environment i.e. the coast is not particularly sensitive to receiving high flows. By contrast, a surface water receptor (i.e. a creek or stream) has the potential to be significantly affected by increased flows and water levels which can cause it to break its banks and threaten property. The coast is not similarly affected, as it effectively has an infinite capacity to receive additional flow without impacting water levels.

30. Attenuating flow within the Port Zone, and discharging for longer at a pre-development flow rate, has the potential to increase the peak flows being discharged at an outfall and peak surface flows along secondary flow paths. If a site within the Port Zone was attenuated to pre-development flows, those storage pond flows would be discharged from the site over a longer period of time. This creates a higher likelihood of the extended duration pond discharge coinciding with the peak flow from the overall catchment. This could result in a higher total flow compared to the unattenuated scenario.

31. It is relatively common practice to carry out these types of modelling assessments in coastal areas, or even with some river discharges, to determine whether or not provision of stormwater attenuation has a beneficial impact on the flows in the receiving environment. The provisions in the Proposed Plan appear to preclude the possibility for this type of relief to be provided if it could be shown that attenuation in certain parts of the catchment actually results in worse outcomes. Removal of the design standards from the Proposed Plan text itself and their inclusion in a Council Design Standard document or Code of Practice would be more in line with common practice elsewhere in New Zealand.

STORMWATER QUALITY

32. I agree that the implementation of stormwater treatment in newly developed impermeable areas is important to mitigate the impacts of stormwater generation and discharge on water quality in receiving environments. However, I have some concerns with the stormwater quality standards being proposed in the stormwater chapter.

33. I note that the minimum treatment contaminant removal rates detailed in Table 7 appear to be relatively high when compared to the published removal data for a number of commonly used proprietary treatment devices. Also, while a number of devices are capable of meeting the minimum requirements for some of the parameters, they fail to meet others. For example, the AtlanFilter from Atlan Stormwater Ltd claims verified performance of 85% removal for Total Suspended Solids (TSS). However, the removal rates for copper provided by Atlan are 61%, which is less than that specified in the Proposed Plan. Similar rates for these parameters have been published for the Stormwater360 StormFilter which is also very commonly used, as well as the Stormwater360 Jellyfish device. All of these devices are considered to best practice devices and are approved for used by Councils in New Zealand and elsewhere. Each device will have certifications from independent providers for percentage removal of various contaminants which will have been independently tested and verified within audited laboratory processes and, in some cases, in the field. I recommend that the proposed removal rates are reviewed for their appropriateness against the more commonly available treatment devices on the market. Alternatively, Timaru District Council could prepare a list of approved treatment devices or methods that, in their view, meet their requirements.

34. In addition to the published removal rates of commonly used devices, and their ability to comply with the minimum treatment contaminant removal rates detailed in Table 7, I also have concerns about the specification of these rates as minimum target rates in the Proposed Plan. This would suggest that the devices should be capable of achieving these removal rates in all circumstances. It is important to note that the published removal rates associated with proprietary treatment devices are not “minimal removal rates” and should not be considered as such. In my experience, suppliers of proprietary treatment devices would certainly not claim that the published removal rates for their devices could be considered to be minimum removal rates, applicable in all circumstances.

35. In my experience, many factors influence the contaminant removal efficiency of these devices in the field. The primary factors being the nature and concentration of the stormwater influent. The TSS percentage removal rates for proprietary filtration devices are predominantly influenced by both the TSS concentration of the stormwater influent, the Particle Size Distribution (PSD) of the stormwater influent and the appropriate sizing of

the device relative to the catchment size and flow. Typically, the higher the TSS influent concentration, the higher the average removal rate up and above to the published percentage removal rate. If influent TSS concentrations are already relatively low, then the removal efficiency can also drop. In many circumstances, particularly on sites with relatively low TSS loads in the stormwater runoff, greater than 80% removal rate of TSS will not be achieved by a typical proprietary treatment device.

36. This has been reported in a number of studies and is also noted in the performance data of treatment device suppliers. For example, on their website, Stormwater 360 detail a study undertaken as part of the certification process of their StormFilter device by Washington State Department of Ecology. The study assessed two StormFilter installations across 22 separate storm events. The results of that study note that for events which had an influent Event Mean Concentration (EMC) of less than 100 mg/L the TSS the removal efficiency was 61%, compared to a removal rate of 89% for events which had an influent EMC of greater than 100 mg/L. The lowest recorded removal rate was 15% for one of the rainfall events.

37. Another significant influence on the removal efficiency of TSS is PSD, this is a proportional grading of range of particle size within the water sample and is very informative with respect to the relationship between TSS and clarity/turbidity of the water sample. Two different water samples, one dominated by larger sandy particles, and one dominated by smaller silty/clay particles, can have the same TSS concentration but will look very different in terms of clarity and turbidity. Stormwater that is dominated by small diameter particle sizes will typically be very turbid, as the small and light particles will be very easily held in suspension. Stormwater that is dominated by larger heavier particles will typically be far less turbid in comparison and will usually clear quickly as the particles settle under their own mass. Stormwater influent which is dominated by very small particle size (i.e. less than 10 µm) is much more difficult to treat by filtration devices such as common media filters (StormFilter, AtlanFilter, Hynds Upflow etc) as the finer particles will often pass through the device.

38. The above discussion is focussed on TSS, which is a primary parameter of concern, but research has shown that stormwater devices also typically have reduced removal efficiencies for heavy metals and nutrients where the influent concentrations are relatively low. The specification of a minimum removal efficiency to be achieved by a device is therefore a very high bar, if

that minimum efficiency is to be taken literally by a planner when reviewing an application or by a compliance officer reviewing monitoring data from a treatment device installation. In my opinion, there are no proprietary devices available in New Zealand which could claim to meet the minimum removal rates specified in Table 7 under all circumstances.

39. I would recommend that the contaminant removal standards specified in Table 7 are removed from the Proposed Plan and the standards incorporated into a design standards document or code of practice. The stormwater bylaw and connection process could continue to be used as the regulatory tools for requiring water quality and water quantity provisions to be implemented. They would need to be designed and specified in accordance with the standards outlined in the appropriate documents.

IMPERVIOUS SURFACE

40. "Impervious Surface" is defined in the Proposed Plan as follows:

> *"means an area with a surface which prevents or significantly reduces the soakage or filtration of water into the ground. It includes:*
> - *Roofs;*
> - *Paved areas including driveways and sealed or compacted metal parking areas and patios;*
> - *sealed outdoor sports surfaces;*
> - *sealed and compacted-metal roads;*
> - *Engineered layers such as compacted clay.*
>
> *It excludes:*
> - *Grass or bush areas;*
> - *Gardens and other landscaped areas;*
> - *Permeable paving and green roofs;*
> - *Permeable artificial surfaces, fields or lawns, including permeable crop protection cloth;*
> - *Slatted decks;*
> - *Swimming pools, ponds and dammed water; and*
> - *Rain tanks."*

41. The above definition has a partial focus on functional use in citing examples that are included or excluded from consideration as impermeable surface rather than a focus on the nature of the surface itself. For example, compacted metal roads and compacted metal parking areas are included in the definition of impervious area but other uses such as compacted metal yards are not identified.

42. This is particularly relevant to the Port Zone and how that definition is applied within Rule SW-R4. A large proportion of the Port Zone is covered

in compacted gravel surfaces which are used for container storage or as general yards. From a stormwater runoff perspective, these areas are no different to the example of compacted metal parking areas listed in the definition, in that both surfaces have similar levels of artificially reduced permeability and hence generate increased stormwater runoff compared to natural undisturbed surfaces.

43. For clarity, I consider the definition could be amended to simply state that compacted metal surfaces are considered to be impermeable. A suggested wording is as follows:

> *"means an area with man-made surfaces, such as compacted gravel, chip seal or asphalt which prevents or significantly reduces the soakage or filtration of water into the ground. It includes:*
> - *Roofs;*
> - *Paved areas including driveways and sealed or compacted metal parking areas and patios;*
> - *sealed outdoor sports surfaces;*
> - *sealed and compacted-metal roads , carparks and yards;*
> - *Engineered layers such as compacted clay.*
>
> *It excludes:*
> - *Grass or bush areas;*
> - *Gardens and other landscaped areas;*
> - *Permeable paving and green roofs;*
> - *Permeable artificial surfaces, fields or lawns, including permeable crop protection cloth;*
> - *Slatted decks;*
> - *Swimming pools, ponds and dammed water; and*
> - *Rain tanks."*

44. This would be consistent with a standard definition for "Hardstand" surfaces used by Environment Canterbury in recent consents e.g. CRC231034 for Waka Kotahi. In this consent, "*Hardstand" means man-made surfaces, such as compacted gravel, chip seal or asphalt*."

CONCLUSION

45. In conclusion, I consider that the stormwater chapter in the proposed District Plan seems an unnecessary addition given the other regulatory controls that Timaru District Council already has to implement their stormwater quantity and quality objectives through the stormwater connection process and stormwater bylaw.

46. With respect to stormwater neutrality, I am of the opinion that the definition should be altered to delete the references to management of pre-development volumes to no more than post-development volumes. I

consider that the 30m^2 additional impervious area provision for the implementation of stormwater neutrality provisions in SW-S2 is very stringent relative to other districts. A change to 150m^2, as per the change made to Table 7 would be more consistent with other districts.

47. The technical detail with respect to how stormwater neutrality is intended to be applied is not obvious in the Proposed Plan. The supporting memo from WSP would suggest that the proposed approach to implementation of stormwater neutrality and calculation of storage volumes is very onerous when compared to practices in other districts.

48. With respect to stormwater quality provisions, I note that the specification of minimum removal rate standards for treatment standards is inconsistent with how published removal rates for stormwater devices are measured and defined. I have concerns about the ability of most commonly used stormwater treatment devices to meet the minimum removal rates specified in the Proposed Plan. I also consider it very unusual for this type of technical detail to be included within a Proposed Plan.

49. I recommend that the contaminant removal standards specified in Table 7 are removed from the Proposed Plan and the standards incorporated into a design standards document or code of practice. The stormwater bylaw and connection process could continue to be used as the regulatory tools for requiring water quality and water quantity provisions to be implemented. They would need to be designed and specified in accordance with the standards outlined in the appropriate documents.

50. In my opinion the current definition of impervious surface is deficient, with a partial focus on functional use in citing examples that are included or excluded from consideration as impermeable surface rather than a focus on the nature of the surface itself. I recommend that the definition is adjusted to better define the nature of impermeable surfaces and include additional common functional uses of compacted gravel surfaces.

Date: 23/01/2024

Eoghan O’Neill