

**IN THE ENVIRONMENT COURT
WELLINGTON REGISTRY**

**I TE KŌTI TAIAO O AOTEAROA
TE WHANGANUI-A-TARA ROHE**

ENV-2023-WLG-000005

UNDER the Resource Management Act 1991


IN THE MATTER the direct referral of applications for resource consents and notices of requirement under sections 87G and 198E of the Act for the Ōtaki to North of Levin Project

BY **WAKA KOTAHI NEW ZEALAND TRANSPORT AGENCY**
Applicant

**STATEMENT OF EVIDENCE OF PETER FREDERICK KINLEY ON BEHALF OF
MANAWATŪ-WHANGANUI REGIONAL COUNCIL AND GREATER WELLINGTON
REGIONAL COUNCIL**

HYDROLOGY AND FLOODING

Dated: 26 September 2023


Cooper Rapley Lawyers
227-231 Broadway Avenue
PO Box 1945
Palmerston North
DX PP80001

S Johnston / G Bailey
 06 353 5210
 06 356 4345
 sjohnston@crlaw.co.nz

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STATEMENT OF EVIDENCE OF PETER FREDERICK KINLEY

A. INTRODUCTION

[1] My name is Peter Frederick Kinley. I am an Associate and the New Zealand Water Leader at Arup New Zealand Limited. I have been in that position since February 2020.

[2] I prepared a report on the application required by section 87F of the Resource Management Act 1991 on behalf of Manawatū-Whanganui Regional Council (**Horizons**) and the Greater Wellington Regional Council (**GWRC**), dated 28 April 2023 (**s87F Report**).

[3] In my s87F Report, I reviewed the application from Waka Kotahi for resource consent applications lodged with Horizons and GWRC relating to the Ōtaki to North of Levin Highway Project (**Ō2NL Project** or **Project**). My s87F Report provided recommendations to improve or further clarify aspects of the resource consent application addressing hydrology and flooding.

[4] I confirm I have the qualifications and experience set out at paragraphs 6-10 of my s87F Report.¹

[5] On 9 August 2023, I participated in expert conferencing on hydrology and flooding producing a joint witness statement dated 9 August 2023 (**Hydrology and Flooding JWS**). I confirm the contents of the Hydrology and Flooding JWS.

I also attended further meetings post-mediation with the hydrology and flooding experts of Waka Kotahi and the District Councils on 31 August 2023 and 6 September 2023 respectively, to progress some remaining issues.

B. CODE OF CONDUCT

[6] I repeat the confirmation provided in my s87F Report that I have read and agree to comply with the Code of Conduct for Expert Witnesses contained in

¹ For completeness, I note that since the filing of my s87F Report I have provided advice to Waka Kotahi as part of the Transport Recovery - East Coast (TREC Alliance), as the Surface Water and Flooding Specialist Advisor for Waka Kotahi.

the Environment Court Practice Note 2023. This evidence has been prepared in accordance with that Code. Statements expressed in this evidence are within my area of expertise, except where I state I am relying on the opinion or evidence of other witnesses below.

C. SCOPE OF EVIDENCE

[7] My report will cover the following:

- (a) The extent to which issues identified in my s87F Report have been resolved through Waka Kotahi evidence, expert conferencing and mediation;
- (b) A response to section 274 party evidence and in particular, the evidence filed on behalf of the Prouse Property Partnership and Karen and Stephen Prouse (**Prouse evidence**) and Kāinga Ora; and
- (c) Conditions.

[8] In addition to the material I reviewed for my s87F Report, I have reviewed the following reports and data/information when preparing this evidence:

- (a) Statement of evidence of Dr John (Jack) McConchie on behalf of Waka Kotahi, dated 4 July 2023;
- (b) Statement of evidence of Nicholas John Keenan on behalf of Waka Kotahi dated 4 July 2023;
- (c) The s198D report of Mr John McArthur for the District Councils, dated 28 April 2023;
- (d) The Hydrology and Flooding Technical Assessment, authored by Mr Andrew Craig, attached as Technical Assessment F: Hydrology and Flooding as part of Volume IV of the Assessment of Environment Effects (**Technical Assessment F**);
- (e) The 'will say' statement of Phil Jaggard (witness for Kāinga Ora) relating to stormwater, hydrology and flooding, dated 1 August 2023;

- (f) Joint witness statement of planning experts dated 10, 11 and 14 August 2023 (**Planning JWS**);
- (g) The conditions filed by Waka Kotahi on 4 September 2023 (the **Waka Kotahi conditions**);
- (h) Statement of evidence of Phil Jaggard on behalf of Kāinga Ora dated 12 September 2023;
- (i) Statement of evidence of Karen Prouse dated 12 September 2023;
- (j) Statement of Planning Evidence of Anna Carter (for the Prouse Family) dated 15 September 2023;
- (k) Electronic files provided by Waka Kotahi on 30 July 2023, in a format that is compatible with geographical information systems (**GIS**), which provided “banded” information for the 10% AEP flood event and the 1% AEP plus climate change flood event on flood metrics including:
 - (i) Flood depths above 0.05m for the Baseline scenario;
 - (ii) Changes in flood depths due to the Project;
 - (iii) Increases in duration of flooding;
 - (iv) Flood hazard, which is a product of depth and velocity;
 - (v) Changes to flood hazard due to the Project;
 - (vi) Velocities; and
 - (vii) Changes to velocities due to the Project.
- (l) Additional GIS files, also provided by Waka Kotahi on 30 July 2023, showing the location of the proposed designation boundary and properties that have been purchased by Waka Kotahi to support the Project.

[9] At the meeting with Waka Kotahi's expert, Mr Andrew Craig, on 6 September 2023, I also had the opportunity to review the raw hydraulic flood modelling data held by Mr Craig and Waka Kotahi, along with Mr McArthur.

[10] I note that the focus of this evidence is on the effects of the Project on flood levels outside the designation boundary, unless clearly stated otherwise.

D. EXECUTIVE SUMMARY

[11] A number of the issues raised in my s87F Report have been resolved through the evidence of Waka Kotahi, expert conferencing, and subsequent discussions. However, I remain concerned at the level of effect on hydrology and flooding outside the designation in some instances.

[12] Given the conceptual nature of the design and related modelling, I am of the view that conditions limiting increases to existing flood hazards to specified levels, including flooding at floors, is necessary, and appropriate.

[13] A condition requiring the Project to be designed to be in general accordance with the hydrology modelling undertaken to date, in my view, authorises a level of effect which is not acceptable.

[14] In reaching this view, I have had regard to the location and magnitude of the effect outside the designation. I do not agree with Waka Kotahi's expert advisors that those effects are 'less than minor' in all cases.

[15] In my view, the design of the Project should be required to address those effects and provide parameters which must be met by the design. Specifically, I have recommended restrictions on flood level exceedances in urban and non-urban areas. These differ from the approach recommended by Dr McConchie. I agree with Dr McConchie and Mr McArthur regarding the management of flooding at floors. I also support Mr McArthur's recommendations as to the management of velocity.

[16] Compliance with stipulated standards would need to be demonstrated by Waka Kotahi. I am of the opinion that Waka Kotahi should provide certification of the modelling and provide full information on the modelling

to an independent reviewer before commencement of construction, to show how the Project design meets the requirements within the conditions.

E. FURTHER INFORMATION

[17] In my s87F Report I identified the need for further and more detailed information. Since then, I have received a range of information from Waka Kotahi, both before and following expert conferencing. This is described at paragraph [10]. As noted earlier, I also had the opportunity to review the modelling data informing Technical Assessment F in person with Mr Craig.

[18] The additional information has been helpful in informing my assessment of effects, and in some cases, has led to the resolution of issues in my s87F Report. As I set out below, however, there are still some remaining issues.

F. OUTSTANDING ISSUES

[19] On review of the issues identified in my s87F Report, the Hydrology and Flooding JWS, the Waka Kotahi conditions and further discussions, the following issues remain outstanding:

- (a) Selection of the threshold used to identify effects;
- (b) Review of whether the design meets the proposed thresholds;
- (c) The assessment of the effects of the works on flooding of buildings;
- (d) The approach to assessing the effects of scour protection; and
- (e) Request for a peer review.

[20] I address the outstanding issues in turn below.

[21] As to the selection of the largest storm event (which had also been identified as an outstanding issue), the Hydrology and Flooding JWS records that the 1.0% AEP plus climate change to 2013 is an appropriate basis for assessing effects. This agreement records my technical opinion and experience. However, I note that both myself and Mr McArthur, for the District Councils, recorded in that JWS that this approach should be subject to a planning

review to ensure it was consistent with the regional and district council planning requirements. My concern was to ensure that the approach was consistent with both Policy 9-3 and Policy 9-5 of the One Plan. I discuss the reasons for this reservation in the Hydrology and Flooding JWS below.

Selection of the threshold to identify effects

[22] All experts agree in the Hydrology and Flooding JWS that the conditions do not provide any provision for design standards for flood effects, and that these standards should be added to the conditions. The experts also agreed that a condition relating to habitable floor levels would be appropriate.

[23] While accepting that design standards for flood effects should be included in the conditions, the experts could not agree on the approach to address the concerns. The different approaches are set out in the Hydrology and Flooding JWS.² In summary:

- (a) Dr McConchie for Waka Kotahi seeks an approach which requires the design which is consistent with (in general accordance with) the flood modelling results set out in Technical Assessment F.
- (b) Mr McArthur and I preferred a zone-based approach with stipulated thresholds that cannot be exceeded by the design. The condition, as recorded in the Hydrology and Flooding JWS, requires Waka Kotahi in the design of the Project to achieve the following:
 - (i) No increase of more than 0.05m (50mm) in flood level on land zoned urban where there is no existing dwelling;
 - (ii) No increase of more than 0.1m (100mm) on non-urban land;
and
 - (iii) Compliance to be demonstrated through flood modelling of the existing environment and with the project in place for the 10% AEP flood event and the 1% AEP plus climate

² Annexure A, Hydrology and Flooding Joint Witness Statement, 9 August 2023, page 1.

change or another large flood event that is consistent with the Horizons and Horowhenua District Plan requirements.

- [24] When having regard to the condition proposed as part of the Hydrology and Flooding JWS, I note:
- (a) My understanding at the time was that urban land was land that was zoned for urban (residential) use; and non-urban was zoned for rural use. This is an important point of clarification that needs to be reflected in the condition set, or supporting information.
 - (b) The reference in (i) to "land zoned urban where there is no existing dwelling" is not intended to be the equivalent to "an empty urban Lot". The 0.05m limit for increases would apply to all urban allotments whether they have an existing dwelling or not, but only to the part of the land that is not occupied by a dwelling (where the "flooding at floors" threshold would apply instead).
- [25] The condition set attached to the Planning JWS³ did not contain any hydrology conditions, nor did the Waka Kotahi conditions.
- [26] Since mediation there has been further discussions with Dr McConchie and Andrew Craig, for Waka Kotahi. A focus of the discussions has been on the standards (flood level exceedances) the Project design should be required to meet, and how the regulatory authorities can be provided assurance that the design meets those standards.
- [27] As explained earlier, as part of the discussions, Mr McArthur and I met with Mr Craig where he presented the raw flood modelling data held by himself and Waka Kotahi. Previously, data outputs had been provided to us classified in bands with a precision of between 0.05m and 0.5m, as opposed to having the raw data (the output itself), which has a precision of 0.001m (1mm). This is relevant when considering the appropriateness of thresholds for assessing adverse effects. Seeing the raw data allowed us to identify the areas where there were exceedances of the thresholds we had identified (0.05m in urban

³ Planning Joint Witness Statement dated 10,11 and 14 August 2023.

and 0.1m in non-urban) and consider whether the effects were in a location, and of a nature and magnitude, that required management going forward.

[28] As discussed below, when considering velocity and the potential of scour effects, a similar exercise was completed by Mr McArthur for velocity outputs in the model. Mr McArthur addresses this in his evidence.

[29] In my review of the flood data bands provided to us by Waka Kotahi, I had identified 139 properties where exceedances of the above recommended flooding thresholds would occur along the Project. One of those locations includes the property at 1024 Queen Street East (the **Prouse Property**).

[30] Having inspected the raw modelling data for these locations with Mr Craig and Mr McArthur, while, in some cases, the increase in water level (either greater than 0.05m or 0.1m) may be acceptable to a particular receptor due to where it occurs (in the context of the land characteristics (topography etc), land use, and duration), in my view, more often than not the increase is of concern and would result in effects that are unacceptable.

[31] I understand that Waka Kotahi considers these exceedances to be 'less than minor' in the context of the Project. Dr McConchie and Mr Craig are of the view that these exceedances should be able to be managed through design or engineering solutions in a manner which would decrease the effects.

[32] This approach is reflected in Dr McConchie's evidence, which acknowledges that Waka Kotahi is:⁴

...seeking to consent a 'concept design' and an umbrella of potential effects. The final design might be different to what is currently illustrated, but any effects will be no greater than indicated.

[33] I remain of the view that a condition requiring the design to meet the levels in water surface elevation as presently modelled by Waka Kotahi is not appropriate to manage flooding effects for the Project. Specifically:

⁴ Statement of evidence of Dr John (Jack) McConchie, dated 4 July 2023, paragraph [117], pg 30.

- (a) The model prepared by Waka Kotahi is conceptual only, as is the design, with both the design and model anticipated by Waka Kotahi and its experts to change.⁵ The uncertainty associated with the modelling, due to the concept stage of design and modelling, means that it is not appropriate for use as a baseline for the conditions. While Waka Kotahi experts anticipate improved performance at many locations in detailed design, there is presently nothing within the conditions which requires improvements in effects, nor which provides the regulatory authorities with assurance that the detailed design meets anticipated or required flood level thresholds.
- (b) The modelled outcomes presently show a level of effect which is unacceptable in some instances.

[34] The condition I recommended through the Hydrology and Flooding JWS is intended to provide some allowance for the nature of the Project, and the conceptual modelling approach adopted by Waka Kotahi. Initially, my s87F Report sought no (zero) increases in flood levels beyond the designation boundary. This is consistent with my experience in other roading projects. It is also consistent with the assumption that the Tara-Ika development will have no effect on existing flood levels, which Waka Kotahi has relied on for in its assessment. However, I agree with Mr McArthur (for the District Councils) that some allowance for computational accuracy is appropriate. For this, and the reasons I explain further below, I consider the thresholds of 0.05m and 0.1m reasonable in the circumstances of this Project.⁶

⁵ As discussed at the meeting with Waka Kotahi's expert, Mr Andrew Craig, on 6 September 2023.

⁶ It is also consistent with the informal guideline used by GWRC of 0.1m for rural (non-urban) areas and 0.05m for urban areas when assessing the significance of flood events.

- [35] My review of the hydraulic modelling, more recently with Mr Craig and Mr McArthur, alongside the July information, identified the following:
- (a) The effects of the Project at 19 properties are mitigated by Waka Kotahi's purchase of affected properties;
 - (b) The effects of the Project at 42 properties are not real effects of the Project because they are more likely than not due to "model noise", errors in the modelling, or errors in the design. Model noise occurs when the software used to undertake the calculations generates erroneous results, due to rounding errors within the software code. Modelling noise is characterised by low depths, small areas, and random patterns that occur outside main areas of flooding; and
 - (c) The effects of the Project at 14 properties are not of a sufficient magnitude to warrant intervention. That is that the flood level exceedances are adverse, but not considered to be of a nature, extent, and duration of sufficient significance to be of concern.
- [36] There are 40 properties that have increases in flood levels that are above the values I have recommended for urban (0.05m) and non-urban (0.1m) land. At some locations the measured area covers multiple properties. The Project will increase flood levels by more than the values I have recommended on 69,230m² of land outside the designation boundary.
- [37] Waka Kotahi have described these increases in flood levels as "less than minor" in evidence.⁷ I have considered this threshold of "less than minor", when reviewing the hydrology modelling data. In doing so, I have also had regard to the guidance in Waka Kotahi's internal documentation. In particular:
- (a) The "NZTA P46 Stormwater Specification"⁸ (Culvert Specification) states (emphasis added):

⁷ Statement of evidence of Dr John (Jack) McConchie, 4 July 2023, at paragraphs [27] – [33].

⁸ NZTA P46 Stormwater Specification, April 2016, at section 7.4a.

The design shall allow for regional/catchment scale flood issues, consent requirements and **not create unacceptable adverse effects on the upstream and downstream properties outside the designation** or land owned by NZTA for events up to the 100 year ARI flood.

- (b) The Bridge Manual SP/M/022⁹ (Bridge Manual) states (emphasis added):

The bridge or major culvert **shall not cause an unacceptable increase in flood risk on properties outside of the designation** both upstream and downstream of the structure. This shall be in accordance with regional council or territorial authority requirements.

[38] As a part of my review, I have accounted for the conceptual nature of the design at this time. In my experience it is common for a concept design to require optimisation of culvert sizes, and for further work to be necessary during subsequent design phases to shape flow paths and correctly redistribute flows. These design processes have the potential to reduce the increases in flood levels, and if properly implemented, such design changes could enable Waka Kotahi to meet the thresholds I have recommended.

[39] However, I am concerned that the Waka Kotahi conditions do not currently provide sufficient impetus to Waka Kotahi to meet specific performance targets for avoiding or minimising adverse effects. To the contrary, the condition recorded by Dr McConchie in the Hydrology and Flooding JWS only requires Waka Kotahi to demonstrate that effects do not exceed what is currently modelled for the land outside the designation boundary. As I have explained above, the modelled effects presently represent, in some cases (due to the conceptual nature of the design) modelling and design errors. In my opinion, such a condition does not drive better design outcomes in order to manage the effects that have been identified outside the designation.

⁹ Bridge Manual SP/M/022 third edition, version 4, dated May 2022, at section 2.3.4b.

[40] As a matter of good practice, I continue to support a 0.05m threshold for adverse effects on urban land that is not occupied by a building:¹⁰

- (a) The same 0.05m threshold is applied or is proposed to be applied through resource consent conditions on other current projects, including Airport to Botany and Drury to Pukekohe in Auckland.
- (b) GWRC use the same 0.05m threshold, as a guideline when assessing flood effects.¹¹
- (c) A threshold of 0.05m is sufficient to accommodate tolerances relating to model accuracy.
- (d) The nature of the predominant land use in urban areas – being residential, and the infrastructure that supports it – necessitates a far lower tolerance of flood level exceedances.

[41] Similarly, I remain of the opinion that a 0.1m threshold for adverse effects on non-urban land that is not occupied by a building is appropriate:

- (a) GWRC use the same 0.1m threshold, as a guideline when assessing flood effects.¹²
- (b) A threshold of 0.1m is sufficient to accommodate tolerances relating to model accuracy.
- (c) The non-urban areas traversed by the Project are primarily served by rivers, streams and ephemeral watercourses. Land within these watercourses or adjacent to them is subject to less frequent occupation and involves different land use, so it is less sensitive to increases in flood levels in an extreme flood event than urban land.
- (d) Flooding of non-urban land can have effects apart from the increase in flood levels and increase flood durations. Flood levels are a useful proxy for increased flood frequency. An increase in flood depth also

¹⁰ See also my s87F Report, dated 28 April 2023, at paragraphs [34] – [45].

¹¹ Statement of evidence of Dr John (Jack) McConchie, 4 July 2023, at paragraph [25].

¹² Statement of evidence of Dr John (Jack) McConchie, 4 July 2023, at paragraph [183(b)].

increases the area that is impacted. Further, when flooding occurs more often, the ground becomes wetter. This can lead to lower value pasture, can be subject to pugging which decreases pasture life and can create sediment-laden runoff, and could lead to increased maintenance requirements for farm infrastructure. More frequent flooding with greater depths can also increase the effort required to clean up after each flood. An increase in flood depth will also increase the area that is subject to these effects.

- [42] In my opinion the thresholds recommended for urban land and non-urban land are also applicable to roads and public spaces. In my view, where a public road that is controlled by a District Council crosses the Project in an underpass, the thresholds I have identified should apply even though the public road is within the designation.
- [43] Overall, I remain of the opinion that a condition requiring the design of the Project to not exceed specified flood level exceedances, is appropriate. The evidence of Mr St Clair contains a number of conditions to address hydrology matters. I have had input into, and support, the proposed conditions.

Habitable buildings

- [44] Waka Kotahi state that *"No buildings outside the proposed designations are impacted by the modelled increase in flood levels for the 1:100 AEP with climate change RCP 6.0 to 2130."*¹³
- [45] I agree that it is important there are no buildings outside the designation boundary impacted by increases in flood levels in the 1% AEP plus climate change flood event. In my view, the hydraulic modelling data does indicate the risk of buildings being impacted, and a condition to prevent this is therefore critical.
- [46] All experts agreed in the Hydrology and Flooding JWS that a condition relating to habitable floor levels was appropriate.

¹³ In paragraph [12(b)].

- [47] I understand from discussions with Waka Kotahi post mediation that it will be proposing a condition that prevents the Project design from resulting in an increase in internal flooding level of an existing habitable floor by more than 0.01m (10mm). While I would prefer there be no increase in flooding level at habitable buildings, I understand that 0.01m is proposed to provide for margins of error (computational accuracy) within the modelling software. The 0.01m is considered to be small. I support the proposed value.
- [48] The condition proposed by Waka Kotahi refers to internal flooding of habitable floors. This creates complexities in demonstrating (and assessing) compliance with the standards within the condition. Waka Kotahi will need to assess both whether a building is habitable or non-habitable and establish the internal floor level. My concerns include:
- (a) It is not appropriate to determine whether a building is habitable solely from a review of aerial photography. This is because buildings that were originally intended to be non-habitable are upgraded to be habitable, such as garages being converted to sleep-outs. Reviewing and assessing building control data held by district councils can provide further information for a desktop assessment, however this can be incomplete, or unavailable for older buildings. Where a desktop approach is unable to determine that a floor is non-habitable, individual site visits are the most reliable means of confirming the status of a floor; and
 - (b) The most reliable method for determining the internal floor level of a building is through topographical survey. This requires permission from the owner and, if rented, the occupier. Where a building is built on a piled floor it is desirable to avoid flooding of the structural bearers and joists, and the process of establishing their levels is often dangerous and physically challenging.
- [49] Given these difficulties, I would prefer to see the imposition of a condition that controls increases in flood levels adjacent to buildings. Such an approach would still achieve the same flood management outcomes for habitable buildings, but without the compliance complexities.

[50] I note that Mr Jaggard has proposed conditions relating to the flooding of habitable floors. I support the intent of these conditions, although in my view, they are more complicated than necessary to avoid adverse effects. In particular, I note Mr Jaggard's proposed conditions would require Waka Kotahi to differentiate between differing uses of buildings (whether they are dwellings, or community facilities, commercial or industrial buildings), and identify the relationship between existing flood levels and existing floor levels. The proposed conditions also use both fixed values and formulae to determine whether effects are acceptable.

[51] As I discuss below, it will also be necessary for the Regional Councils to receive independent confirmation of compliance with the standard before construction commences.

Flooding flow velocity

[52] The Hydrology and Flooding JWS signalled that further flow velocity information would be provided to assist in the review of the effect of the Project on changes in flow velocity during the design event. This is relevant when considering the potential for scour effects from the Project.

[53] This matter is addressed in more detail in the evidence of Mr McArthur. I support the analysis and conclusions reached by Mr McArthur.

Review of the Project design

[54] I consider it necessary, and appropriate, for the Regional Councils to receive independent confirmation that the detailed design meets the conditions relating to flooding before construction. The purpose of the independent confirmation is to ensure that the standards relating to flood levels, building floors, flow velocities, and compliance with Waka Kotahi manuals and specifications are satisfied.

[55] I understand that Waka Kotahi has recently indicated support for a condition which, prior to commencement of construction activities, requires Waka Kotahi to model the design of the Project to confirm:

- (a) It is in general accordance with the latest modelling results [to be shown on the latest model results plans] for the 1% AEP flood event, which includes the effects of climate change RCP 6.0 to 2130.
- (b) It does not result in an increase in internal flooding levels of an existing habitable floor by more than 0.01m.

[56] The results of the modelling would be provided to the Regional Council.

[57] In principle, I support the intent of the condition. For the reasons I have set out above, I would prefer the review to assess compliance against the hydrology conditions proposed by the regional and district councils, including standards for urban and non-urban areas and habitable buildings.

[58] I also recommend a peer review of the Waka Kotahi modelling by an independent suitably qualified person, including compliance with the standards set out in the (proposed) hydrology consent conditions.

G. DESIGN STORM EVENTS

[59] As recorded in the Hydrology and Flooding JWS I agree that the 1.0% AEP is an appropriate basis for assessing effects.

[60] The Hydrology and Flooding JWS also records my view that the design storm event used for assessing effects should be considered against the relevant plan frameworks.

[61] As explained in discussions with Dr McConchie (and subsequently recorded in his evidence),¹⁴ Dr McConchie considers that the 1% AEP flood event, increased to allow for the potential effects of 100–years of climate change (assuming RCP 6.0), “...is about ...25% larger” than the 0.5% AEP (the 1 in 200 year event) as is required under the One Plan. Dr McConchie is of the view that this meets the requirements of the One Plan (referring to Policy 9-2).¹⁵

¹⁴ Statement of Evidence, Dr McConchie, 4 July, paragraphs [164] – [167], at pages 42–43.

¹⁵ Statement of Evidence, Dr McConchie, 4 July, paragraphs [164] – [167], at pages 42-43.

[62] I understand that Policy 9-3 of the One Plan is the relevant policy for the Horizons region. Whether the approach of Waka Kotahi satisfies the requirements of that policy is a planning matter.¹⁶

[63] I also note Policy 9-5 of the One Plan. The JWS Hydrology and Flooding does not record a position as to the whether the precautionary approach has been applied in accordance with Policy 9-5.

[64] Dr McConchie records in his evidence that the 'growth factors' used to account for the potential effects of climate change on both flow and rainfall by 2130 reflect a precautionary approach:¹⁷

The 'growth factors' used to account for the potential effects of climate change on both flow and rainfall by 2130 were 35% and 47%, assuming RCP 6.0 and RCP 8.5 respectively. It should be noted that these increases in the drivers of flooding are significantly higher than those adopted for the PP20 Expressway (26.4%) and Te Ahu a Turanga (~20%). In my opinion, the adjustments for the potential effects of climate change reflect a precautionary approach.

[65] I am of the view that Policy 9-5 needs to be considered in addition to Policy 9-3. In my view, the adjustment factor for climate change of 1.35, as calculated by Waka Kotahi, is consistent with the precautionary approach required by Policy 9-5, as well as with Waka Kotahi's requirements in the Bridge Manual and the Culvert Specification. Whether its application to a 1% AEP flood event is consistent with Policy 9-3 is a planning matter.

[66] Mr St Clair addresses these policies in his evidence.

H. RESPONSE TO SECTION 274 PARTY EVIDENCE

[67] I have reviewed the section 274 party evidence of the Prouse family, and Kāinga Ora as it relates to flooding. At a general level, I note that the evidence is concerned about increases in flooding on their land, due to the Project.

¹⁶ This was the reservation recorded in the Hydrology and Flooding JWS, dated 9 August 2023, at pg 1 of the table.

¹⁷ At paragraph [169].

Prouse Property

- [68] I addressed the Prouse family submission in my s87F Report.¹⁸ I noted the increase to flood levels at the Prouse property, at 1024 Queen Street East and commented that I did not accept Waka Kotahi's statement that the effects will be "no more than minor".
- [69] Information provided by Waka Kotahi subsequent to the preparation of my s87F Report shows that flood depths will be increased by up to 1.0m outside the designation, and that the area of the property that is subject to increases of more than 0.05m is 3,874m².
- [70] I understand that the Prouse property is residentially zoned, and therefore under the thresholds I have proposed above, flood level exceedances would be limited to 0.05m. I am of the view that this threshold should be able to be met through further design improvements during detailed design.
- [71] In her evidence, Ms Prouse discusses some additional work proposed by Waka Kotahi to address the increased flood levels,¹⁹ which is said to involve the construction of two additional culverts. I have not been provided with information on the location of these culverts or on their effect on flooding at 1024 Queen Street East and downstream properties.
- [72] I note that the offer is for additional infrastructure, and Waka Kotahi do not appear to have committed to achieving specific design thresholds.
- [73] I remain of the opinion that the increase in flood levels at 1024 Queen Street East are an adverse effect, which is more than minor.

Kāinga Ora

- [74] I have reviewed the s274 party evidence of Phil Jaggard.

¹⁸ Section 87F Report, at paragraph [85]. See also the Statement of Evidence of Dr McConchie, 4 July 2023, at paragraphs [87] – [92].

¹⁹ Statement of evidence of Karen Prouse, dated 12 September 2023, at paragraph [34].

[75] I note Mr Jaggard's opinion that there are insufficient controls to ensure that buildings and people are protected from changes to flood hazards arising from the proposed road. I agree with Mr Jaggard's view on this matter.

[76] Except as noted within my evidence, I support the intent of the conditions provided by Mr Jaggard and take the view that the conditions I have proposed will achieve the same or better outcomes.

I. CONDITIONS

[77] I have reviewed the Waka Kotahi conditions. There are no conditions addressing hydrology. For the reasons I explain above, I am of the opinion that conditions to control the effects of flooding are necessary.

[78] I have reviewed the condition proposed by Mr McArthur in his evidence.²⁰ I support this condition as shown below, which reflects the approach and flood thresholds in the Hydrology and Flooding JWS. I also support the addition of the velocity requirements proposed by Mr McArthur.

(a) The Project must be designed to achieve the following flooding outcomes immediately outside the designation footprint (except where noted below) and main waterway boundaries:

(i) No increase of more than 0.01m in flood level for existing floors that are already subject to flooding and no existing floors to be newly flooded by the post-Project floodplain.

(ii) No increase of more than 0.05m in flood level on land zoned urban.

(iii) No increase of more than 0.10m in flood level on land zoned non-urban.

(iv) No more than a 10% increase in flood hazard (defined as the product of flow depth and velocity) at all Council road locations (within and outside the designation boundary) where existing depth is greater than 0.3 m or

²⁰ Statement of evidence of John McArthur, at paragraph [37].

existing velocity is greater than 2.0 m/s or the product of existing velocity and depth is greater than 0.5 m²/s.

(b) Compliance with clauses (a)(i) to (iv) must be demonstrated prior to the commencement of construction activities through existing (pre-Project) and Project detailed design flood modelling of the critical 1% AEP design storm event incorporating a climate change scenario in accordance with the Waka Kotahi NZ Transport Agency's Bridge Manual current at the time of the detailed design.

(c) A copy of a report confirming compliance with (b), prepared by a suitably qualified person must be provided to the District Council, and must be included in the material submitted to the District Council as part of any outline plan. Where more than one outline plan is prepared and submitted to the District Council, there shall be no requirement to provide repeat reports that address the same Project elements.

(d) An independent peer review and certification of the flood modelling is required. This must be undertaken by a suitably qualified person who is different to the suitably qualified person preparing the report in (c) and independent to the detailed design, who must be required to certify whether there is compliance with clauses (a)(i) to (iv), in the manner described in clause (b). The independent peer review and the certification must be included in the material submitted to the District Council as part of any outline plan.

[79] I consider that condition RWB2(g) should be changed to read:

Remediation of erosion, scour or instability of the water body bed or banks (including any overland flowpath) that is attributable to the ~~construction~~ works authorised by these resource consents must be undertaken within ten (10) working days or as soon as practicable.

[80] The purpose of this recommendation is to ensure that ephemeral watercourses are protected from additional scour caused by the Project.

[81] With the additional requirements inserted into the Waka Kotahi conditions, I am of the view that the effects of flooding can be appropriately managed.

26 September 2023

Peter Frederick Kinley