

21 May 2025
Job No: 1098025.0000

Far North District Council
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Attention: James Witham

Dear James

High Level Review

Kerikeri subdivision & flood scheme investigation and proof-of-concept design

Far North District Council (FNDC) commissioned Tonkin & Taylor Ltd (T+T) to provide a 'proof of concept' review of a flood mitigation scheme proposed by Kiwi Fresh Orange Company Ltd (KFOCL) in relation to rezoning of its 197-ha block of land (the site) on the western boundary of the Kerikeri township (location shown in Figure 1.1 below).



Figure 1.1: Location of the applicant's land (highlighted in yellow), and extent of inundation in 1% AEP+CC flood event (NRC modelling). Source: (E2 Environmental, 2022).

1 Background

Flood modelling of the wider catchment by Northland Regional Council (NRC) has highlighted that the site is vulnerable to significant flooding from the Kerikeri River. Therefore, KFOCL engaged E2 Environmental to assess the flood hazard and develop a concept flood mitigation design to support decisions relating to the rezoning of the land to facilitate residential and commercial development (E2 Environmental, 2022).

Specifically, the purpose of the E2 Environmental report (2022) was to:

- Better understand flood risk across the site, nearby transport links and the surrounding areas.
- Identify areas that will need to be excluded from development due to flood hazard.
- Conceptualise design opportunities to reduce the area of land subject to flood hazard and therefore be freed up for development.
- Demonstrate works on site will have a less than minor effect on flood risk beyond of the site boundaries.
- Identify opportunities to reduce flood risk outside of site through engagement with NRC.

E2 Environmental state that “*comparison of model results between the NRC flood model and the E2 flood model show that flood patterns, flood extents and flood levels are very much the same between the 10% AEP, 2% AEP and 1% AEP +CC flood events*”. The significant existing flood extent and severity of flooding is not under question.

The E2 Environmental report provides a full description of the proposed mitigation. In summary, there are two key design aspects to the proposed flood mitigation scheme:

- 1 *A “managed floodway” to convey floodwaters that spill across SH10 through the site. The floodway would be approximately 120 m wide and 1.8 m deep¹ and discharges to an existing natural wetland area, downstream of the on-site waterfalls but upstream of the Kerikeri River².*
- 2 *Floodwaters which spill from the true right bank of the Kerikeri River are proposed to be blocked off through raising on-site ground levels.*

To support the conclusions of the report (E2 Environmental, 2022) the following information is compared for existing and post-development scenarios for the 10% AEP, 2% AEP and 1% AEP +CC design storms:

- Changes in peak flows.
- Changes (greater than 50 mm) in flood levels.
- Changes in velocities.
- Changes in flood duration.

T+T’s scope of works is to review only the E2 Environmental report (2022). However, we note other reporting that may be relevant, which we have **not reviewed** but have listed in Appendix A.

2 T+T Review

We consider that the E2 Environmental report (2022) provides a clear and transparent record of its investigations, results and basis for conclusions. The report emphasises the “conceptual” design stage and that the design is likely to change over time, potentially with different results.

¹ Allows for 0.3 m freeboard above the 1% AEP +CC flood level.

² Reference location G in the E2 Environmental report.

We note that alignment between KFOCL, FNDC and NRC regarding the appropriate level of flood scheme design detail will be likely critical for the various stages of planning / rezoning / consenting process. This is particularly important where new assets will be created (e.g. the floodway), since there may be different perspectives on ownership agreements, levels of protection (including residual risk) and financing arrangements (for capital and operating expenditure). For example:

- E2 Environmental appear to have implicitly assumed that a 1% AEP design storm (with allowance for climate change) for the floodway asset will provide sufficient level of protection for the proposed rezoning. This may not be the case and we highlight a general theme across New Zealand where flood protection schemes are being enhanced to meet increased levels of service (e.g. an increase in protection from a 1% AEP to a 0.2% AEP event), higher flows (e.g. an increase in flow estimate for a 0.5% AEP event) or a combination of both.
- Developing hard protection structures to protect new development appears contrary to the Northland Regional Policy Statement (RPS) and therefore vesting ownership to NRC may be unacceptable to them. Policy 7.2.2 of the RPS relates to establishing the need for hard protection structures, and that *“New hard protection structures may be considered when:...(b) They will provide protection for concentrations of vulnerable existing development and the works form part of a long-term hazard management strategy that represents the best practicable option for the future...”*³

Furthermore, a concept design inherently has considerable uncertainties and therefore the design is likely to change in the future. Therefore, modelled flood characteristics and flood extents may change considerably. The flood scheme may never be constructed, and therefore in combination with the previous comments we do not recommend incorporating any changes to the mapped NRC floodplains within the FNDC District Plan Change.

We have not specifically reviewed the model developed by E2 Environmental. However, their reported process (including validation checks against the NRC model) are in line with good practice and the model appears a very useful tool for assessment of design options. We recommend that a detailed model review should be carried out as a part of a Resource Consent application (including checks for consistency with the proposed design). We note *“there is particular sensitivity around the floodway inlet”* which will be a critical design aspect for the feasibility of the proposed flood mitigation scheme.

The following topics provide additional review commentary:

- **Hydrology.** The assessment considers the management of flood hazard and has not considered stormwater quantity changes due to land use changes on the site itself (as acknowledged in E2 Environmental limitations section (1.1)). Due to the location of the site within the greater catchment, there may not be any increase in flood hazard due to land use change. However, this needs further evaluation.
- **Wetland.** The proposed floodway discharges into a location identified as an existing natural wetland (site reference G in report). The report identifies significant peak flow increases

³ Policy 7.2.2 reads in full: “Priority will be given to the use of non-structural measures over the use / construction of hard protection structures when managing hazard risk. New hard protection structures may be considered appropriate when: (a) The level of hazard risk reduction that the proposed structural asset is seeking to achieve is appropriate and cannot reasonably be achieved through non-structural options; OR (b) They will provide protection for concentrations of vulnerable existing development and the works form part of a long-term hazard management strategy that represents the best practicable option for the future; and (c) The financial costs of non-structural measures (compared to the costs of the hard protection structure that will achieve the desired level of hazard risk reduction) are too high for the community; and (d) It can be demonstrated that the benefits of mitigation outweigh the adverse effects and that the form and location of the hard protection structure is such that any adverse effects on the environment are minimised.”

(relative and absolute) at the wetland⁴ and there are also changes to the discharge locations. These changes require specific effects assessment.

- **State Highway overtopping.** The flood modelling shows flooding of the State Highway in the 10% AEP, 2% AEP and 1% AEP events. As a result of the proposed development, flooding across the state highway is shown to increase in the 2% AEP event (Figure D9) and in the 1% AEP roughness sensitivity assessment (Figure D14). The conceptual flood mitigation scheme assumes that there will be no changes to the flooding characteristics across the State Highway and therefore NZTA are an important stakeholder to have this assumption validated. This is important because any changes to the hydraulics at the State Highway will likely influence downstream flooding and the suitability for the proposed flood mitigation scheme design requirements.
- **Building platforms v stopbanks.** We consider there to be a risk that the intention to raise building platforms alongside the true right bank of the Kerikeri River could be replaced with a stopbank protection scheme. An earthworks plan that demonstrates that the cut/fill balances have been considered will help mitigate this concern. We raise this because the risk profile of a stopbanked flood protection scheme is different (higher) to that of a general raising of ground levels.
- **Downstream extent of assessment.** NRC's flood mapping downstream of the model extents suggests that there may be additional flood risk. Much of this risk may be associated with coastal hazard, however, although this should be confirmed.
- **Flood risk.** The reporting identifies changes in flood levels and peak flood flows, however, additional information about the flood risk (i.e. the consequences of flood hazard, e.g. building flooding, road overtopping) are required for a more complete flooding effects assessment.
- **E2 Environmental recommendations.** We highlight and support the following recommendation and topic from the E2 Environmental report:
 - The “*floodway should be fully designed and constructed prior to the development of the site for residential or commercial purposed in areas of existing flood risk*”.
 - There “*may be opportunities to undertake further work around the local catchment, in conjunction with this proposed subdivision, to provide betterment to the wider catchment*”.

⁴ Table 6 identifies increases at the on-site waterfall #2 which is located upstream of the wetland for the 10% AEP (+5.6m³/s), 2% AEP (+10.2 m³/s), and 1% AEP+CC (+47 m³/s), events.

3 Applicability

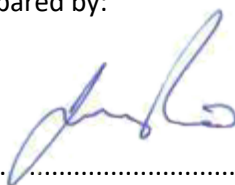
This report has been prepared for the exclusive use of our client Far North District Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

This T+T review was a form of peer review, undertaken on a level-of-effort basis, to provide additional assurance to Far North District Council as to the quality of the Kerikeri Subdivision & Flood Scheme Investigation and Proof-of-Concept Design Report for the proposed development. The responsibility for the Report (and the associated modelling) remains fully with the Principal Consultant (E2 Environmental), and T+T's review does not constitute a means by which the responsibility for that can be passed on to T+T. This letter report has been prepared on behalf of, and for the exclusive use of Far North District Council, and is subject to, and issued in accordance with, the provisions of the contract between T+T and Far North District Council. T+T accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this letter report by any third party.

We understand and agree that this report will be used by Far North District Council in undertaking its regulatory functions in connection with the Proposed District Plan Change.

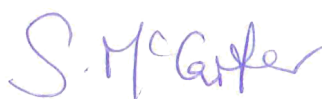
Tonkin & Taylor Ltd

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21-May-25

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Appendix A Additional reports (not reviewed)

-  1. S554 Kiwifresh Orange Company Limited Summary.pdf
-  2. S554 Kiwifresh Orange Company Limited Appendix A - Submission Area.pdf
-  3. S554 Kiwifresh Orange Company Limited Appendix B - Landholdings.pdf
-  4. S554 Kiwifresh Orange Company Limited Appendix C - Submission on the provisions of the PDP.pdf
-  5. S554 Kiwifresh Orange Company Limited Appendix D - Proposed Brownlie Land Precinct.pdf
-  6. S554 Kiwifresh Orange Company Limited Structure Plan.pdf
-  7. S554 Kiwifresh Orange Company Limited Section 32 analysis for Brownlie Land Proposal.pdf
-  8. S554 Kiwifresh Orange Company Limited Geotechnical, prepared by LDE.pdf
-  9. S554 Kiwifresh Orange Company Limited Survey, prepared by Terrain Surveying Limited.pdf
-  10. S554 Kiwifresh Orange Company Limited Soils investigation, prepared by Hanmore Land Management.pdf
-  11. S554 Kiwifresh Orange Company Limited Archaeology, prepared by Origin Archaeology.pdf
-  11. S554 Kiwifresh Orange Company Limited Preliminary Site Investigation, prepared by NZ Environmental.pdf
-  12. S554 Kiwifresh Orange Company Limited Ecology, prepared by Bioresearches.pdf
-  13. S554 Kiwifresh Orange Company Limited Hydrology, prepared by E2 Environmental.pdf
-  13. S554 Kiwifresh Orange Company Limited Hydrology, prepared by E2 Environmental-compressed.pdf
-  14. S554 Kiwifresh Orange Company Limited Economic Assessment, prepared by Urban Economics.pdf
-  15. S554 Kiwifresh Orange Company Limited Infrastructure servicing, prepared by Infir.pdf
-  16. S554 Kiwifresh Orange Company Limited Infrastructure servicing peer review, prepared by GWE.pdf
-  17. S554 Kiwifresh Orange Company Limited Landscape, prepared by Littoralis.docx
-  18. S554 Kiwifresh Orange Company Limited Transport, prepared by TEAM.pdf
-  19. S554 Kiwifresh Orange Company Limited Communications record.pdf
-  Proposed-District-Plan-Submission-554-Kiwifresh-Orange-Company-Limited.docx
-  Proposed-District-Plan-Submission-554-Kiwifresh-Orange-Company-Limited.pdf