BEFORE A HEARINGS PANEL
OF THE FAR NORTH DISTRICT COUNCIL

I MUA NGĀ KAIKŌMIHANA MOTUHAKE O TE HIKU O TE IKA

Under the	Resource Management Act 1991 (RMA)
In the matter	of a request for rezoning of land in the Kerikeri-Waipapa area under the proposed Far North District Plan

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STATEMENT OF EVIDENCE OF JONATHON MICHAEL RIX IN SUPPORT OF SECTION 42A REPORT FOR HEARING 15D

FLOODING

10 September 2025

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1. INTRODUCTION

1.1 My name is Jonathon Michael Rix. I am employed by Tonkin & Taylor Ltd (**T+T**), an environmental and engineering consultancy firm, and I have worked there since 2006.

1.2 I hold the degree of Bachelor of Science (Hons) (2001) and Master of Science in Geoenvironmental Engineering (2002) from the University of Wales, Cardiff.

1.3 I have 23 years of post-graduate experience relating to stormwater, flooding, natural hazard risk, catchment planning and numerical modelling. My relevant experience includes:

(a) lead author for the technical components of a risk assurance review of the categorisation processes adopted in Hawkes Bay, Gisborne and Auckland following Cyclone Gabrielle and the Auckland Anniversary floods. This was carried out for the Department of Prime Minister and Cabinet;

(b) technical Reviewer and project governance-group member for the South Dunedin Future programme, which is developing an adaptation plan to reduce the long-term risks associated with flooding, sea level rise, rising groundwater and landslides;

(c) expert witness testimony for local authority clients to contribute towards plan changes:

(i) Whangarei District Council (WDC) Natural Hazard Plan Change One (2024) – flooding expert to WDC;

(ii) Auckland Council Unitary Plan Hearings for flood related provisions (e.g. land use zoning provisions) – flooding expert to Auckland Council;

(iii) Hamilton City Council (HCC) Plan change 14 (Flood Hazards) (scheduled for later this year) – flooding expert to HCC;

(d) lead author for flood modelling guidelines for Kainga Ora (2023) and Taupo District Council (2025);

(e) project leadership roles for Nelson's Flood Risk Management Strategy and Greater Wellington Regional Council Floodplain Management Programme;

(f) technical lead for numerous flood hazard mapping studies across Auckland region including Mission Bay, Otara, Flat Bush, Parnell, CBD, One Tree Hill, Mangere Inlet, Slippery Creek, Otara and Henderson;

(g) concept design and business case lead for the two successful Phase 1 Blue-Green-Network projects in South Auckland. Projects reduce flood risk to hundreds of properties – Te Ararata Stream and Harania Creek. Construction-stage design underway; and

(h) assessment of flood effects for multiple subdivisions.

1.4 I hold the role of Principal Flood Risk and Adaptation Consultant at T+T and I am also the Finance and Insurance Sector Lead. I have worked in New Zealand for 20 years, the last 19 of which have been at T+T. I have previously held the role of Water Engineering Manager.

1.5 I have been asked to provide evidence in relation to flood hazards, to support the evaluation report prepared under s 42A of the RMA.

1.6 I was the lead author for T+T's 'proof of concept' review of a 2022 flood mitigation concept design, carried out by e2 Environmental, to support rezoning of the Kiwi Fresh Orange Limited (**KFO**) land. The T+T review was carried out for the Far North District Council (**Council**).

1.7 I have also read the statement of evidence of Robert Matthew William (Laddie) Kuta and I refer to aspects of his evidence in my own. Mr Kuta was also the author of the e2 Environmental report (2022).

1.8 I have read the evaluation report prepared in accordance with s 42A of the RMA.

1.9 I have read and am familiar with the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023. I have complied with the Code of Conduct in preparing my evidence and will continue to comply with it while giving oral evidence before the Hearings Panel. I confirm that my evidence is within my area of expertise except where I state that I am relying on the evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in my evidence.

2. SCOPE OF EVIDENCE

2.1 My evidence covers a review of the concept flood mitigation approach proposed by KFO. My evidence specifically considers the following technical information, which has been adopted by KFO to inform their approach:

(a) e2 Environmental. Kerikeri subdivision & flood scheme Investigation and Proof of Concept Design. Kiwi Fresh Orange Company Limited. 10 October 2022; and

(b) Statement of evidence of Robert Matthew William (Laddie) Kuta on behalf of KFO (16 June, 2025).

2.2 My evidence also refers to the flooding and natural hazard components of Ms Burnette O'Connor's planning evidence on behalf of KFO (30 June 2025) and I draw on comments raised by the Northland Regional Council (**NRC**) Rivers Team in their 7 May 2025 feedback on the draft Spatial Plan (compiled by James Griffin, Policy Specialist, NRC). A copy of the feedback is included as Annexure A.

2.3 My understanding of flood hazard at the site is based on my review of work carried out by others. I have not carried out my own flood hazard assessment. I also note that I have not visited the site before writing this evidence.

2.4 My evidence is structured as follows:

(a) site description and flood hazard;

(b) flood mitigation design concept;

(c) NRC comments dated 7 May 2025; and

(d) conclusion.

3. SUMMARY OF EVIDENCE

3.1 Approximately 90 ha of the 197 ha KFO site currently sits within the 1% AEP floodplain. A proposed flood "*modification to the natural floodway"* through the Site and a "*bund / Raised land on the true right bank of the Kerikeri River*" are proposed to reduce the extent of the 1% AEP floodplain by approximately 14ha thereby increasing the amount of land available for development.

3.2 Overall, the design lacks the level of detail required to support rezoning and there is little certainty of outcomes. Whilst some decisions can be deferred until later consenting phases, I consider that changes to the flood mitigation design could materially impact information relied on to support the rezoning decision.

3.3 Details on the ownership, and management of the flood protection scheme are fundamental, but I do not have a view on the extent to which this should be addressed at the rezoning or resource consent stage.

3.4 I consider that more land could be required for flooding and flood mitigation than currently indicated, making less land available for development. This is because additional land will likely be required for flood attenuation to:

(a) manage post-development peak flow rates to pre-development peak flow rates to account for the change in land use;

(b) mitigate downstream flood effects; and

(c) mitigate upstream effects on the state highway.

3.5 The critical information gaps that should be addressed at the rezoning stage are:

(a) confirmation on the use of stopbanks;

(b) confirmation of the appropriate level of protection for the flood protection scheme, including consideration of residual effects;

(c) downstream flooding effects on residential property; and

(d) an effects assessment on the wetland, as it could have significant impacts on the flood protection scheme design.

4. SITE DESCRIPTION AND FLOOD HAZARD

4.1 The 197 ha KFO site is located within the large Kerikeri River catchment. The contributing catchment area at the site is approximately 50 km^2.[1]

4.2 Flood modelling of the catchment by NRC has highlighted that approximately 45% of the KFO site is subject to 1% AEP (Annual Exceedance Probability) flooding. More refined modelling around the KFO site (finer resolution to better represent the

1 Approximated from NZ River Names and Large Catchment REC2 (Webmap) https://data-niwa.opendata.arcgis.com/maps/f602ca28a88b4066af7ab65eb76a04db/explore

topography) by e2 Environmental (2022) shows similar baseline[2] flood extents. This means that nearly 90 ha of the 197 ha KFO site currently sits within the 1% AEP floodplain.

4.3 Based on Mr Kuta's evidence, the e2 Environmental report and a comparison with published floodplains from NRC, I agree with the general flood extent for this stage of a project and I support the following statement from the e2 Environmental report:

"*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*".

4.4 Mr Kuta's evidence provides a useful summary and description of the baseline flooding across the site, notably that "*During times of extreme flooding, the combined flow at State Highway 10 is forced to split with a portion of the flow continuing down the Kerikeri River and a near equal portion flowing down an existing natural floodway that passes across the Site.*"[3] This means that in addition to the floodplain of the permanent body of water in the Kerikeri River, there is an intermittent floodplain which passes through the site.

4.5 The model developed by e2 Environmental to present the floodplain is consistent with good practice and processes. It provides an understanding of the floodplain for scenarios between the 10% AEP and 1% AEP design events.

4.6 The e2 Environmental flood modelling shows that the "split" occurs in the most frequent storm event modelled, which is the 10% AEP event. It is likely that the floodplain will be activated more frequently, although this has not currently been quantified. The division of flows causes some areas on the KFO site to be surrounded by floodwaters (i.e. an island), most notable of which is the large area

2 "Baseline" flood hazard for my evidence means the flood hazard without mitigation measures. It includes existing and future climate. "Post-development" flood hazard includes flood mitigation and post development land form.

3 Statement of Evidence of Robert Matthew William (Laddie) Kuta on behalf of Kiwi Fresh Orange Company Limited (Flood Mitigation), 16 June 2025 (**Kuta Evidence**) at [16].

located on the northern side of the site which will become surrounded by the Kerikeri River floodplain to the north and east, and the floodway to the south.

4.7 I have reviewed e2 Environmental's modelling process and floodplain outputs for concept design and I consider that the model is suitable for the purposes of the rezoning request. It is suitable for this stage of the project because it helps to identify key flood-related themes and issues, which is the focus of my evidence. I distinguish this from subsequent design and consenting phases where a higher degree of detail would be available for the proposed development, and levels of confidence in the flood levels will need further consideration and additional peer review will be required, for example, before determining floor levels.

5. CONCEPT FLOOD MITIGATION DESIGN

Overview

5.1 KFO's concept design approach is to reduce the natural floodplain across the Site so that flood flows are restricted in between areas of higher ground (i.e. "recessed" as per the language in Mr Kuta's evidence). The higher ground is proposed to be both natural and man-made. The approach increases the amount of non-floodable land which KFO then proposes to develop on. The concept has been developed to manage flood flows up to the 1% AEP scenario, with an allowance for climate change.

5.2 Mr Kuta's evidence summarises the modifications as follows:[4]

"The modification to the natural floodway on the Site could involve further enhancements to the natural depressions in the Site's topography (i.e., practical excavation and recessing that is aligned with the natural topography), energy dissipation and riprap features in locations of high hydraulic energy to mitigate potential erosion, a naturalised designed control weir at the upstream end of the Site to ensure flow splits to the Site and Kerikeri River continue to work as they currently do (this could be independent of SH10 or worked into potential NZTA

4 Kuta Evidence at [26].

modifications to assist in mitigating the existing hazard on this important lifeline), appropriate crossing infrastructure to secure access on and off the Site during all times, as well as other possible amenity modifications that could add value to open space (i.e., potential low flow water take from Kerikeri River)."

5.3 Figure c2 of the e2 Environmental report also indicates a "*bund / Raised land on the true right bank of the Kerikeri River*", which I discuss later in my evidence.

5.4 Mr Kuta's evidence identifies that proposed modifications represented in the concept design could increase non-flooded land on the Site in a future 1% AEP scenario by 14ha (i.e. reduce the floodplain by 14ha), based on the following:

(a) an increase from 51ha to 54ha on the northern side of the modified floodway (i.e. 3 ha); and

(b) an increase from 57ha to 68ha on the southern side of the modified floodway (i.e. 11 ha).

5.5 Mr Kuta's comments are based on the modelling outputs, which I consider to be suitable for assessment of the rezoning request as set out above.

5.6 Many of New Zealand's Regional Council flood schemes are examples of floodplain modifications, which provide proof of the protection that they can offer. However, in general these schemes were established to protect existing urban or rural land uses from flooding (i.e. not to protect a new land use). While there are many examples of small-scale floodplain modifications that support development, I am unfamiliar with any recent floodplain modification schemes that protect new urban areas from 14ha of floodplain (or larger).

Design confidence and uncertainty

5.7 In T+T's high-level review of the e2 Environmental Kerikeri subdivision and flood scheme (which I was the author of), a concern was raised relating to the potential inclusion of stopbanks; this is due to the higher risk profile associated with

stopbanked flood protection schemes to that of general raising of ground levels. The higher risk profile is primarily due to the potential for structural failure and ongoing asset management requirements. It was also noted that "*developing hard protection structures to protect new development appears contrary to the Northland Regional Policy Statement (RPS) and therefore vesting ownership to NRC maybe unacceptable to them*". Mr Wyeth's evidence covers the Regional Policy Statement in more detail.

5.8 I note the following statement from Mr Kuta's evidence, which indicates that stopbanks are not the preferred approach:[5]

"The estimated depths under proposed conditions favour practical recess modifications to the existing floodway across the Site rather than the addition and inclusion of stopbanks. This extent of depth also suggests that any shallow bedrock could potentially be incorporated as features into the proposed floodway modifications and mitigate any need for erosion protection in these areas."

5.9 This evidence appears contrary to Figure c2 of the e2 Environmental report which generically indicates a "*bund / Raised land on the true right bank of the Kerikeri River*". I consider that a bund could be a stopbank.

5.10 I also consider there to be an ongoing risk that the KFO design concept intentions to raise land and recess the floodway could later be replaced with a stopbank flood protection scheme. As I understand it, the KFO proposal does not currently provide any certainty that stopbanks will not be used for the floodway. As noted above, the risk profile of a stopbanked flood protection scheme is higher compared to that of a general raising of ground levels. If stopbanks are proposed, my views could materially change.

5.11 I refer to Ms O'Connor's evidence which identifies opportunities for naturalisation and ecological enhancement of the floodway (and public amenities such as walking and cycling paths). I support the inclusion of naturalisation and ecological

5 Kuta Evidence at [46].

enhancements and note that flood velocities are likely in the order of 2 m/s at the banks, which is suitable for planting.

5.12 The KFO concept design is shown in the e2 Environmental report and provides an indication of the floodway alignment, depths, widths and longitudinal grades. It also identifies that a maintenance accessway will be provided and presents a typical cross-section and conceptual design inlet. The post-development floodplains are based on the concept design.

5.13 Concept designs have inherent uncertainties due to the early-stage nature of the design, which is common across many civil-related projects. I consider it likely that the mitigation design will change during subsequent design phases, possibly significantly, and therefore the flood characteristics and spatial flood extents will also likely change. This is because decisions that impact hydraulics and hydrology are often influenced by other project risk-management factors such as geotechnical issues, wider consenting risks and cost (design and construction). There are also a range of external factors relating to stakeholders, asset ownership and maintenance agreements that could influence the design and operation.

5.14 I support approaches that allow flexibility in design through the project phases to help manage risks and to realise opportunities. However, I consider that the design for the floodway and the protections along the Kerikeri River have focussed on demonstrating a proof of concept for the flood hydraulics, and that the civil design aspects of the flood protection have been insufficiently considered. Despite providing my support for design flexibility throughout the design stage, I consider that the design lacks the level of detail required to support the rezoning request and the proposed precinct provisions do not provide any certainty of appropriate outcomes.

5.15 The evidence of Mr Kuta and Ms O'Connor identify a range of possibilities and potential outcomes for the flood protection scheme. In general, I support their comments, however, I remain uncertain that appropriate outcomes will be

assessed and secured in subsequent phases of work. For example, I highlight three important features from Mr Kuta's evidence which may not materialise:

(a) the opportunity to reduce the existing flood hazard at SH10;

(b) the potential to add value to open space by creating a low flow water take from Kerikeri River, which I have interpreted to mean that a permanent stream with riparian planting could be created through the KFO site; and

(c) (e2 Environmental Report) "*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"*

5.16 Similarly, earlier in this evidence I supported the inclusion of naturalisation and ecological enhancements which was included as an opportunity in the evidence of Ms O'Connor. Including these features will impact the floodway hydraulics and have not been tested by the current modelling. The flood hydraulics will be impacted because naturalisation and ecological enhancements will typically slow flows and increase water depths in comparison to what was modelled by e2 Environmental.

Level of service

5.17 Increasingly, issues associated with over-design events (e.g. Hawkes Bay flooding following Cyclone Gabrielle), misunderstood levels of service, asset management/maintenance and affordability have highlighted some of the problems with floodplain modification and urban protection. These are discussed further in the subsequent sections. In general, these issues (and others) are leading a trend towards 'making space for water' which allows watercourses and their floodplain to behave in an unmodified/less modified way which also helps to promote better environmental and ecological outcomes.

5.18 The proposed floodplain modification scheme forms an asset, which creates new and ongoing responsibilities and costs for the owner/s. Currently, I am unaware of

any agreements between KFO, the Council and NRC for asset ownership, design levels of protection or maintenance agreements.

5.19 I understand that the KFO land is included as a "Contingent Future Growth" area in the Kerikeri-Waipapa Spatial Plan, subject to the condition "*that comprehensive flood mitigation infrastructure is designed and funded by the developer*".[6] This must be met (along with other conditions) before the Site would be considered suitable for urban development.

5.20 This is a potentially useful condition and (irrespective of where the costs sit) has the potential to align organisational responsibility once the design objectives are clear. Parties may also need to consider whether there are aspects of "flood mitigation infrastructure" which need to be distinguished from other features (e.g. ecological enhancement, public amenities) and where the costs for long term management and maintenance lie.

5.21 The e2 Environmental report appears to have assumed that flood flows associated with a 1% AEP design storm (with climate change) will provide a sufficient level of protection for the proposed zoning for the floodway asset. This level of protection may or may not be appropriate and requires agreement. I highlight a general theme across New Zealand where flood protection schemes are being enhanced to meet increased design levels of service. I also highlight that the design levels of service are inconsistent across the country.

5.22 Prior to making agreements over design levels of service, I recommend that risk for extreme events is considered. For example, a design that passes 1% AEP design flows could also be assessed against 0.5%, 0.2%, 0.1% design flows or even PMF (Probable Maximum Flood), so that risk and potential liability associated with an over-design event is understood. If the risk is unacceptable, then it could be more beneficial to include additional capacity into the flood schemes; noting that there may also be other alternatives. Consideration of over-design events and "residual" risk are particularly important for areas which become surrounded by floodwaters (i.e. an island), such as the northern side of the site which will become surrounded

6 Te Pātukurea Spatial Plan for Kerikeri-Waipapa, page 36.

by floodwaters from the Kerikeri River and the modified floodway under extreme events. This may result, as an example, in much higher levels of service being a requirement for some bridges to provide access and egress to/from the area. I do not consider that the risk associated with extreme events has been adequately considered at this rezoning stage.

5.23 I note that Mr Kuta's evidence identifies that further protection can be provided by deepening the modified floodway. He identifies that this is likely to be in the order of 1m of additional depth to pass an additional 200m^3/s. I support the hydraulics behind the calculation, however, due to the potential presence of bedrock (Mr Kuta evidence and NRC technical memo (refer section 6 of the evidence)),[7] there may be a very high cost associated with achieving the additional level of protection. I note that the geotechnical investigations (LDE, 2022) carried out a range of CPT investigations although they were not located in the floodway. Bedrock was found at an average depth of 4m to 5m across the site, and a minimum depth of 3.36m (LDE, 2022). The depth to bedrock will be lower in the floodway due to the lower ground level.

5.24 The maximum event that could be accommodated with a deeper floodway has not been assessed by the submitter and I do not currently have sufficient information to comment on that.

Additional topics

5.25 My following evidence covers the themes outlined below:

(a) hydrology;

(b) wetland;

(c) state Highway overtopping; and

(d) flood risk.

7 NRC memo dated 7 May 2025; Draft Spatial Plan Kerikeri-Waipapa – NRC Staff Feedback.

Hydrology

5.26 In T+T's high-level review of the Kerikeri subdivision and flood scheme (which I was the author of), it was noted that "*The assessment considers the management of flood hazard and has not considered stormwater quantity changes due to land use changes on the site itself*". Subsequently, I support the statement in paragraph 52 of Mr Kuta's evidence that "*Any change in land use will require an appropriately designed stormwater reticulation network to treat and attenuate any increase in flows resulting from the change in land use and the land's runoff conditions so that the runoff impact of pre vs. post are less than minor"*. I support his comments that this can be carried out later, while also highlighting that attenuation of stormwater and flood flows will likely require storage. Flood storage will likely require large amounts of land, which is not shown on a design. This will reduce the amount of land available for development.

Wetland

5.27 The proposed floodway discharges into a location identified as an existing natural wetland (site reference G in the e2 Environmental report). The report identifies significant peak flow increases (relative and absolute) at the wetland[8] and there are also changes to the discharge locations. These changes require specific effects assessment since adverse effects on the wetland could have significant impacts on the design concept.

State Highway overtopping

5.28 The e2 Environmental flood modelling shows flooding of the State Highway in the 10% AEP, 2% AEP and 1% AEP events.

5.29 Furthermore, and as a result of the proposed development, flooding across the state highway is shown to increase in the 2% AEP event and in the 1% AEP roughness sensitivity assessment. I consider it unlikely that the adverse effect on State Highway will be acceptable, although this is a topic for NZTA to comment on. I agree with Mr Kuta's comments, including the uncertainty that "*modifications to*

8 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.

the land around the upstream end of the Site could result in this hazard being more certain and controlled with potential to minimise this hazard and possibly reduce the existing hazard through detailed design".[9]

5.30 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, particularly around the floodway inlet. This further highlights the importance of NZTA as a stakeholder, however I also note Mr Kuta's comments that *"any future changes that NZTA perform to add resilience to SH10 must ensure flood hazard is not increased to other properties both upstream and downstream of the highway"*.[10]

5.31 While there are considerable risks from the KFO project relating to the effects of their development on the State Highway, I believe that these can be resolved at resource consent stage. Mitigation of the effects could require a reduction in developable area at the western end of the KFO land.

Flood risk

5.32 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. The importance of this is exemplified in Figure 1, which shows buildings and private property located in the 100 year ARI floodplain (NRC Priority Rivers model) downstream of the Site. The e2 Environmental report and Mr Kuta's evidence acknowledge increases to the flood flows and water levels downstream of the Site in the area around Peacock Garden Drive shown in Figure 1. Therefore, any increases in water level and flow have the potential to adversely impact properties and buildings already located in the 1% AEP floodplain.

9 Kuta Evidence at [45].
10 Kuta Evidence at [45].

5.33 I refer my earlier comments regarding the high degree of design uncertainty and I consider there to be a risk that future modifications could increase downstream flood flows and water levels further. This could occur if upstream flood conveyance was improved, for example through further channelisation of flows. Typically, the Resource Consent phase will address mitigation of effects. However, I am concerned that changes to the flood mitigation design could materially impact information relied on to support the rezoning decision. Based on the information provided and uncertainty of design I do not support the conclusion by Mr Kuta that the effects are less than minor.

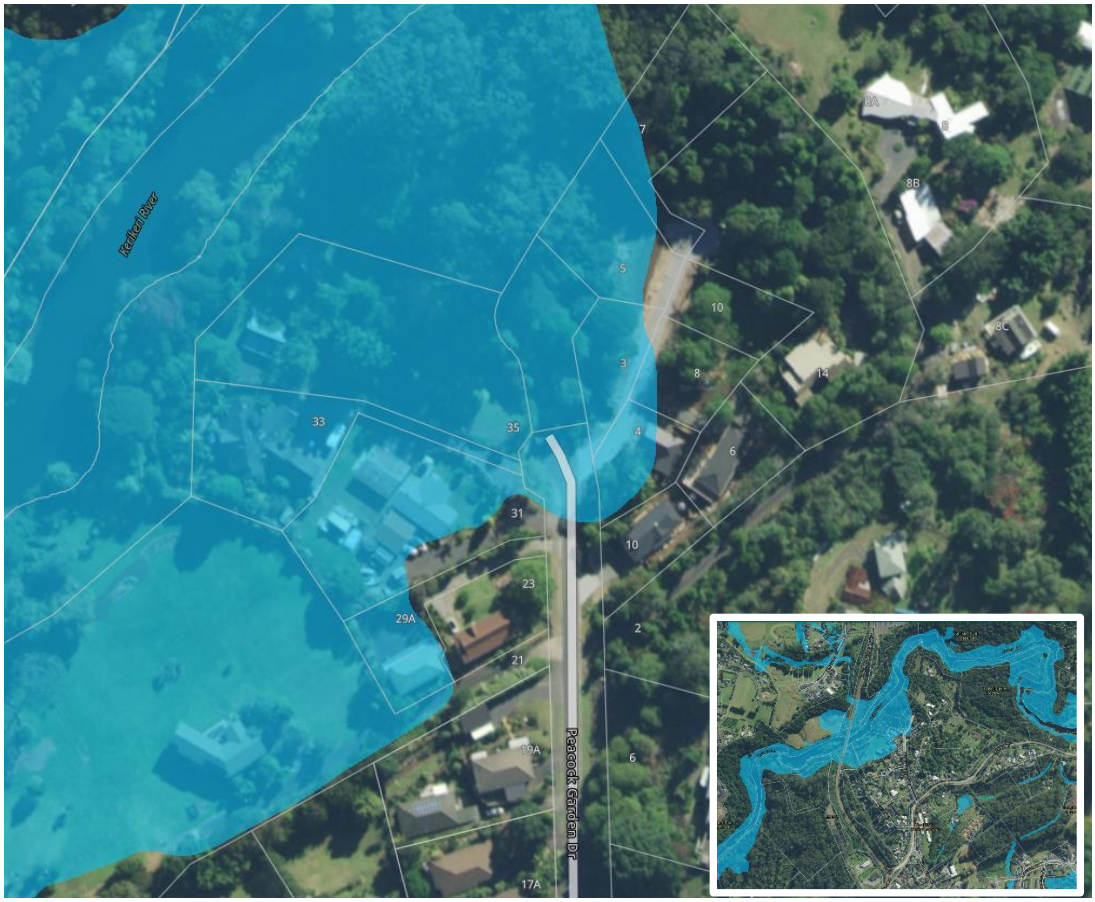


Figure 1 1% AEP Floodplain (Priority Rivers Model) at Peacock Garden Drive (Source: NRC Natural Hazards portal)

6. NORTHLAND REGIONAL COUNCIL COMMENTS DATED 7 MAY 2025

6.1 My following comments relate to topics within my area of expertise raised by NRC in their memorandum dated 7 May 2025, titled "Draft Spatial Plan Kerikeri-Waipapa – NRC Staff Feedback". In making my comments, I have also considered

the response from Mr Kuta on the topics. My comments are grouped by the same themes used in the NRC memo:

(a) the proposed flood mitigation concept for Scenario F, in relation to the proposed future urban land use;

(b) the reality and consentability of the proposed flood mitigation concept, including potential for off-site effects; and

(c) residual risk to urban development with proposed flood mitigation in place.

The proposed flood mitigation concept for Scenario F, in relation to the proposed future urban land use.

6.2 NRC comments relating to lack of information relation to ownership, operation and maintenance of the flood mitigation assets over the life of the asset are consistent with themes included in my evidence.

6.3 It is not within my area of expertise to comment on where the costs for vested assets should sit.

The reliability and consentability of the proposed flood mitigation concept, including potential for off-site effects.

6.4 I consider that the NRC topics relating to confidence in the model regarding new LiDAR availability and the peer review are covered in my earlier comments (paragraph 4.7):

"I have reviewed e2 Environmental's modelling process and floodplain outputs for concept design and I consider that the model is suitable for the purposes of the rezoning request. It is suitable for this stage of the project because it helps to identify key flood-related themes and issues, which is the focus of my evidence. I distinguish this from subsequent design and consenting phases where a higher

degree of detail would be available for the proposed development, and levels of confidence in the flood levels will need further consideration and additional peer review will be required, for example before determining floor levels."

6.5 In addition to my earlier comments, I recommend that modelling to support any subsequent stages of work should adopt the latest available LIDAR information.

6.6 NRC comments relating to "*changes in flood flows downstream*" where it "*appears the net increase in downstream flows is approximately 10m3/s"* and *"the flood level increases are in the order of 50-60mm downstream for the 1% AEP CC event*" are consistent with my thematic comments made in paragraphs 5.32 and 5.33. Mr Kuta's response in his evidence provides additional information regarding the receiving environment but he has not provided additional information on downstream risks to people and property. It would be preferable to understand the risks and how they can be managed prior to rezoning.

6.7 NRC comments relating to flood level increases at SH10 are consistent with my comments earlier in my evidence, at paragraphs 5.29 and 5.30. Furthermore, NRC's comments relating to increased risk to vehicles is consistent with my evidence regarding the need to provide additional information about flood risk (i.e. consequences of the change in flood hazard). Refer also my evidence in paragraph 5.32.

6.8 I support the comments made by NRC and the responses from Mr Kuta regarding the potential impact of the development on NZTA. My evidence covers these topics further in paragraphs 5.28 to 5.31.

Residual Risk to Urban Development with Proposed Flood Mitigation in Place

6.9 Within NRC's feedback, it indicated that the management of floor height for buildings set well back from the riverbank could be an approach to management of residual risk. There are a wide range of approaches to managing residual risk and I urge caution until the hazard and risk has been further evaluated. The floor height and setback approach may prove appropriate; however, I believe that there is

insufficient information to support this approach at this stage. Management of residual risk needs to consider access and egress, flood characteristics, building location, emergency access, building control consistency and changes to future risk for example.

6.10 I support the comments made by NRC regarding consideration of over-design events.

6.11 I support NRC's comments regarding the proposed floodway. I note their comment that there may be bedrock encountered at shallow depths. Mr Kuta indicated in his evidence that flood resilience to a "super-design" event (indicatively 200 m^3/s greater than the 1% AEP) could be accommodated with an additional 1m flood depth. This is important because there may be considerable cost implications to excavate a channel in bedrock to provide agreed levels of service. This is an example of a likely scenario for a future design phase where the design may need to change significantly once geotechnical investigations have been carried out.

6.12 I support NRC comments regarding access, particularly in relation to bridge crossings. I highlight my earlier evidence (paragraph 5.22) regarding careful consideration of "islands" surrounded by floodwater and the likely need to provide higher levels of service for access and egress to/from these areas.

7. CONCLUSION

7.1 I consider that the floodplain modelling produced by e2 Environmental and covered in Mr Kuta's evidence is suitable for considering the rezoning of land for urban uses. The model and its outputs are suitable for assessing the pre-development and post-development floodplain for rezoning purposes because it helps to identify key flood-related themes and issues, which has been the focus of my evidence. Further modelling and review is needed for subsequent design and consenting phases.

7.2 I consider the flood scenarios assessed by Mr Kuta as suitable for evaluation of effects on other parties. However, I consider that additional "over-design"

scenarios should be considered on the KFO land to support decisions regarding design levels of service (e.g. for access and egress, building risk, infrastructure), asset ownership and cost-allocation. The e2 Environmental report has assumed that flood flows associated with a 1% AEP design storm (with climate change) will provide sufficient level of protection for the proposed zoning for the floodway asset. This level of protection may or may not be appropriate and requires further agreement. In particular, I am concerned about development in areas which become surrounded by floodwaters without safe access or egress.

7.3 I consider that the design for the floodway and the protections along the Kerikeri River have demonstrated a proof of concept for the flood hydraulics, although the civil design aspects of the flood protection scheme have been insufficiently considered. Overall, the design lacks the level of detail required to support rezoning and there is little certainty of outcomes. There are a range of features and potential opportunities identified in the evidence of Mr Kuta and Ms O'Connor that have not been incorporated into a design. In particular, I consider there to be a risk that recessed floodway concept and raised building platforms could later be replaced with a stopbank flood protection scheme, which has a higher risk profile.

7.4 The flood assessment of the proposed design identifies adverse flood effects on an upstream asset owner (NZTA) and potential effects on downstream residential property owners at Peacock Garden Drive. I note "potential" downstream effects because, although an increase in water level and flow has been identified, the effects have not been assessed.

7.5 I consider it likely that the upstream flood effects on NZTA can be managed in the future through the resource consent processes, resulting in some loss of developable land. However, the proposed approach to improve flood conveyance along the floodway could require significant modification to mitigate potential downstream flood effects on residential property and the wetland. The effects on these areas has not been considered, and I consider that there is moderate potential for adverse effects. Furthermore, given the high levels of design uncertainty, I consider it possible that future design changes would further increase downstream flood risk, for example if the floodway was narrowed and deepened.

7.6 Overall, I consider that more land could be required for flooding and flood mitigation than currently indicated, making less land available for development. This is because additional land will be required for flood attenuation to:

(a) manage post-development peak flow rates to pre-development peak flow rates to account for the change in land use;

(b) mitigate downstream flood effects; and

(c) mitigate upstream effects on the state highway.

7.7 Details on the ownership and management of the flood protection scheme are fundamental, but I do not have a view on the extent to which this is addressed at the rezoning or resource consent stage.

7.8 The critical information gaps that should be addressed at the rezoning stage are:

(a) confirmation on the use of stopbanks;

(b) confirmation of the appropriate level of protection for the flood protection scheme, including consideration of residual effects;

(c) downstream flooding effects on residential property; and

(d) an effects assessment on the wetland, as it could have significant impacts on the flood protection scheme design.

Jonathon Michael Rix

10 September 2025

Annexure A – Draft Spatial Plan Kerikeri-Waipapa, NRC Staff Feedback

7 May 2025

Draft Spatial Plan Kerikeri-Waipapa – NRC Staff Feedback

From: Northland Regional Council

To: Jaye Michalick - Team Leader - Growth Planning & Placemaking
Far North District Council

NRC Contact: James Griffin – Policy Specialist

Dear Jaye

Re: Draft Spatial Plan Kerikeri-Waipapa

The Northland Regional Council staff welcome the opportunity to provide feedback on the Draft Spatial Plan Kerikeri-Waipapa and respond to your specific technical questions (**Attachment**). We have responded to your four respective questions (*italics*) below.

NRC Rivers Team comments

Please note that these comments don't constitute a peer review, but should one be undertaken, it is recommended that issues raised here are considered.

Q1. *Approximately 45% of the KFO* [Kiwi Fresh Orange Company Limited] *site is subject to flooding. A preliminary flood mitigation concept has been developed to support the PDP* [Proposed District Plan] *submission for KFO. We would appreciate NRC's views on the proposed flood mitigation in relation to a proposed future urban use of the land, views on the suitability of considering a site for urban development when flood mitigation is not currently a reliable option (i.e. not consented or funded), views on the consentability of the proposed mitigation given the historical issues around gaining consent for flood mitigation in this area and the potential for downstream effects? And finally, views on any residual risk (to urban development) should that mitigation be achievable? (refer from pg 387 to 452 of their PDP submission for flood mitigation information)*

Draft Kerikeri Waipapa spatial plan – Te Pātukurea: Flood Related aspects and the e2 Environmental Consulting Civil Engineers Report 2022:

The proposed flood mitigation concept for Scenario F, in relation to the proposed future urban land use:

Information on the flood mitigation concept, including a summary of the works and their impacts, is provided in the e2 Environmental – Consulting Civil Engineers report: 'Kerikeri Subdivision & Flood Scheme Investigation and Proof-of-Concept Design', (October 2022). Noting that NRC has had limited time to consider this proposed concept.

In brief, the concept includes a floodway to convey SH10 overflows through the site, and a stopbank along the true right bank of the Kerikeri River downstream of the SH10 to prevent overflows into the site from the Kerikeri River. The performance of this combination of flood mitigation works has been assessed with a scaled-down replica of the NRC catchment flood model (sourced from NRC), for a range of flood events to assess both on-site and off-site effects.

The objective of the proposed works has been to reduce on-site flood extents whilst minimising off-site effects. To achieve this, the designers have sought to mitigate the effect of blocking right bank overflows downstream of the SH10 by diverting a larger proportion of SH10 overflows into a new high capacity spillway, that runs from the SH10 to 'on-site waterfall #2'.

The proposal differs from the spillway scheme previously investigated by NRC, in that the benefits are largely limited to the subject site, and flood risk for Waitotara Drive, Waipapa Road, and Rainbow Falls Road is not significantly reduced. In Section 7 of the e2 Environmental report, potential opportunities to reduce wider catchment flood risk are identified, however these have not been explored or assessed further.

It appears from the KFO submission that there is no information relating to ownership, operation or maintenance of the proposed flood mitigation assets over life of the asset. If the intention is for the assets to be vested in either of the Councils, costs to the rate payer would be more justifiable if there were wider catchment benefits to areas North of the river. It is acknowledged that reducing flood risk to areas North of the river where catchment overflows occur in large events would likely increase the potential for adverse effects (increased flows, flood levels) downstream along the lower reach of the Kerikeri River. Further mitigation measures would be required to off-set these downstream effects.

The Reliability and Consentability of the Proposed Flood Mitigation Concept, including potential for off-site effects:

It is assumed that the cost of flood mitigation works for this site would be borne by the developer. NRC funding for the previously proposed spillway scheme was withdrawn in 2017 and it is only likely that an NRC contribution would be considered if there were wider catchment benefits. Based on the e2 Environmental report findings, that off-site effects are less than minor, consenting may be less challenging than for the previous NRC flood scheme option. Consenting risks are not something we are able to comment on as part of the feedback. However, there are a number of potential issues that have been identified in the limited time available:

i) The e2 Environmental modelling is based on an older model version that uses LIDAR flown in 2007. Any development or changes in landform within the catchment since that time may not be represented in the flood model. NRC has been working on a replacement catchment flood model, built using more up to date LIDAR (2018-2020).

ii) The e2 Environmental modelling has not been peer reviewed and is recommended. Based on a cursory view of the figures in the report, it appears that the flood extents are slightly less than in the NRC modelling. It is noted that some changes to mesh sizing have been made.

iii) Changes in flood flows downstream are shown in figure 5. Peak flows at this site (Wharepuke Falls) are not tabulated but it appears the net increase in downstream flows is approximately $10m^3/s$. It is reported that flood level increases are in the order of 50-60mm downstream for the 1% AEP CC event.

iv) There are predicted flood level increases at the SH10 for the larger flood events. There is also a potentially significant increase (of 0.4m/s) in velocity of flows overtopping the SH10 for the 10% AEP event. This may increase the risk to vehicles if the SH10 is not closed. Potentially the proposed roading network through the site may offer a

suitable diversion route from the SH10 at Puketotara Road intersection via Waitotara Drive to Waipapa.

v) The proposed flood scheme may reduce options for NZTA to increase the resilience of the SH10 to flooding in future, for instance, if NZTA was to increase the level of the SH10, the proposed flood mitigation concept proposed by KFO would not operate as intended. NZTA should be considered an affected party, and along with NRC it may have an interest in contributing to measures that reduce flood risk at the State Highway, such as new box culvert/s under the SH10 to direct flows into the floodway. Further mitigation measures may be required to off-set any downstream effects.

Residual Risk to Urban Development with Proposed Flood Mitigation in Place:

There are several residual risk associated with re-zoning the site for residential and commercial use would need to be addressed.

i) **Use of hard protection structures:** There are residual risks associated with stopbanks, including over-topping and structural failure. The Northland RPS sections 3.13 (e), 7.2.2 (b), and Proposed Regional Plan section D6.1 2) c) clarify that the use of hard protection structures such as stopbanks are only supported for protection of existing development where the works form part of a long-term hazard management strategy. As a strategy has not been put in place, managing floor high of buildings set well back from the river bank, is a mitigation approach that should be considered.

ii) **Over-design events:** The e2 Environmental report does not discuss or consider over-design events. Following a series of exceptionally large floods across New Zealand there is a move towards adopting a more conservative approach for land use planning in floodplains, and flood scheme design. For instance, the 'Report of the Hawke's Bay Independent Flood Review' (July 2024), includes recommendations #2, 3, 5, 24 and 26 that relate to assessing over-design events and the impacts of flood protection asset failure. These recommendations appear to be particularly pertinent to rezoning rural land in flood plains, and to the proposed use of hard protection structures to protect new urban development.

iii) **The proposed floodway:** It is not clear if the floodway would be formed from excavation or bunding, or a combination of the two. Excavation would reduce residual risks and allow for drainage, including overland flows from the South. It is noted that there may be bedrock encountered at shallow depth. Some landscaping is proposed along the floodway and the costs of re-instatement following floods / maintenance of the proposed reserve should be considered as a resilience aspect in any future design process.

iv) **Access:** The Infir Servicing report on page 519 of the submission includes a proposed Structure Plan Land Use plan (Appendix sheet A007) that shows proposed local roads and cycleways through the site. Three of these routes from the site cross major water courses and the 4th route connects to the SH10 at the Puketotara Road intersection. All access routes may be affected during large flood events. All new bridge crossings would need to have sufficient freeboard above design flood levels to mitigate debris blockage risk. The proposed road to the North would require a bridge crossing over the Kerikeri River between the North corner of the site and Waitotara Drive. Given that this crossing is in the vicinity of the 90 degree bend in the river near the old

Culinary Institute (CINZ), any new bridge constructed at this location should allow for future works on the true right bank, such as a floodway, to increase flow capacity at the bend. The river bend is the lowest capacity section of the river between the SH10 and Rainbow Falls.

Flood Management Implications associated with other Scenarios Considered for the Spatial Plan:

The six scenarios have been briefly considered from a flood risk perspective:

Scenario A: Growth within existing urban areas only. Whilst flood risk is not likely to be significantly increased, it is noted that there are existing urban areas subject to flood risk.

Scenario B: Growth within existing urban areas and a new growth area on the South side of Waipapa Road, extending between SH10 and the Heritage Bypass road. Part of this area is subject to flood risk from the Kerikeri River and Whiriwhiritoa Stream. It would be preferable to defer significant intensification within this area until flood risks had been mitigated, particularly around the Waipapa Road area between the Whiriwhiritoa Stream and Rainbow Falls Road, and along Waitotara Drive.

Scenario C: Growth within existing urban areas and a new growth area on the North side of Waipapa Road, extending between SH10 and Landing Road, and extending South from Waipapa Road between the Heritage Bypass Road and Landing Road. Part of this area is subject to flood risk from the Kerikeri River and Whiriwhiritoa Stream. It would be preferable to defer significant intensification within this area until flood risks had been mitigated, particularly around the Waipapa Road area between the Whiriwhiritoa Stream and Rainbow Falls Road.

Scenario D: Growth within existing urban areas and a new growth area on the South side of the CBD, along both sides of the Kerikeri Road. This new growth area is considered to be at relatively low flood risk.

Scenario E: Growth within existing urban areas and a new growth area on the East side of Waipapa, between the SH10 and the old Culinary Institute on Waipapa Road. This potential growth area extends from the Kerikeri River north to the Waipapa Stream. Part of this area is subject to flood risk from the Kerikeri River and Whiriwhiritoa Stream. It would be preferable to defer significant intensification within this area until flood risks had been mitigated, particularly around the Waipapa Road area between the Whiriwhiritoa Stream and the old Culinary Institute, and along Waitotara Drive.

Scenario F: Growth within existing urban areas and a new growth area on the South side of the Kerikeri River, between the SH10 and Rainbow Falls. Part of this area is subject to flood risk from the Kerikeri River and whilst a credible flood mitigation option has been proposed, there is an opportunity to seek a flood mitigation solution that provides wider benefits to both the North and the South of the Kerikeri River. This would allow for future growth to be supported in Scenario Areas B, C and F.

Q2. *Is the draft Te Pātukurea Spatial Plan consistent with regional planning objectives, specifically in relation to well-functioning urban environment and supporting appropriate urban form?*

The Spatial Plan provides useful guidance for a well-planned urban expansion of Kerikeri and Waipapa over the next 30 years and consistency with the broader strategic direction, as outlined in page 6 of Te Pātukurea.

Q3. *Approximately 89% of land within scenario F is LUC3, considering the current National Policy Statement for Highly Productive Land, does NRC have views on the viability of converting this to urban zoned land when a viable alternative has been proposed (the hybrid scenario in the draft spatial plan)?*

Government has signalled intention to remove LUC3 in mid-2025 from the definition of highly productive land. However, LUC3 is a valuable resource and a significant part of productive soil in Northland. Also, the RPS policy (including 5.1.1(f)) regarding maintaining productive land/versatile soils in the region and this was identified in key issue 2.4 in the RPS. Therefore, a scenario that provides for maintenance of productive land would better reflect this policy.

Q4. Other comments in relation to the draft spatial plan that NRC may feel are relevant?

i) The consideration of natural hazards in the options assessment / when coming up with a preferred scenario is endorsed, particularly regarding flooding e.g. RPS objective 3.13 and policy 7.1.1.
ii) The use of blue green networks to enable mobility, connection to the environment and natural hazard management. We note Te Pātukurea objective 4 aims to not only protect but also enhance natural values. While enhanced public access and positive social and cultural outcomes are promoted, it isn't clear whether enhanced natural values will be delivered e.g. through a goal of development providing for no net loss and preferably a net biodiversity gain. Such a position would better reflect NPSIB direction and RPS provisions e.g. objective 3.4. We also note RPS policy 4.4.1 includes floodplains.
iii) As referenced in Q3 response above, we recognise the value of horticulture to Kerikeri and the region (RPS policy 5.1.1) and agree with the general approach to provide for growth within the existing urban area and maintain rural productivity on Kerikeri's high quality horticultural land.
iv) The promotion of a variety of housing types, providing for various ages and stages of life is consistent with Policy 5.1.1.
v) The promotion of walking and cycling and endorse the aim of providing safe, accessible walking and cycling infrastructure, goal is consistent with aspirations of RLTP and has environmental and social benefits.
vi) We also note that greater urban density is beneficial in respect to the provision of public transport. Design and construction of streets should consider multi modal transport options including public transport and accommodating buses on likely future public transport routes.

Thank you for the opportunity to comment and your commitment to ongoing engagement with NRC over Te Pātukurea and the development of implementation plans and provisions.

Signed on behalf of Northland Regional Council

Northland REGIONAL COUNCIL
Te Kaunihera ā rohe o Te Taitokerau

James Griffin
Policy Specialist

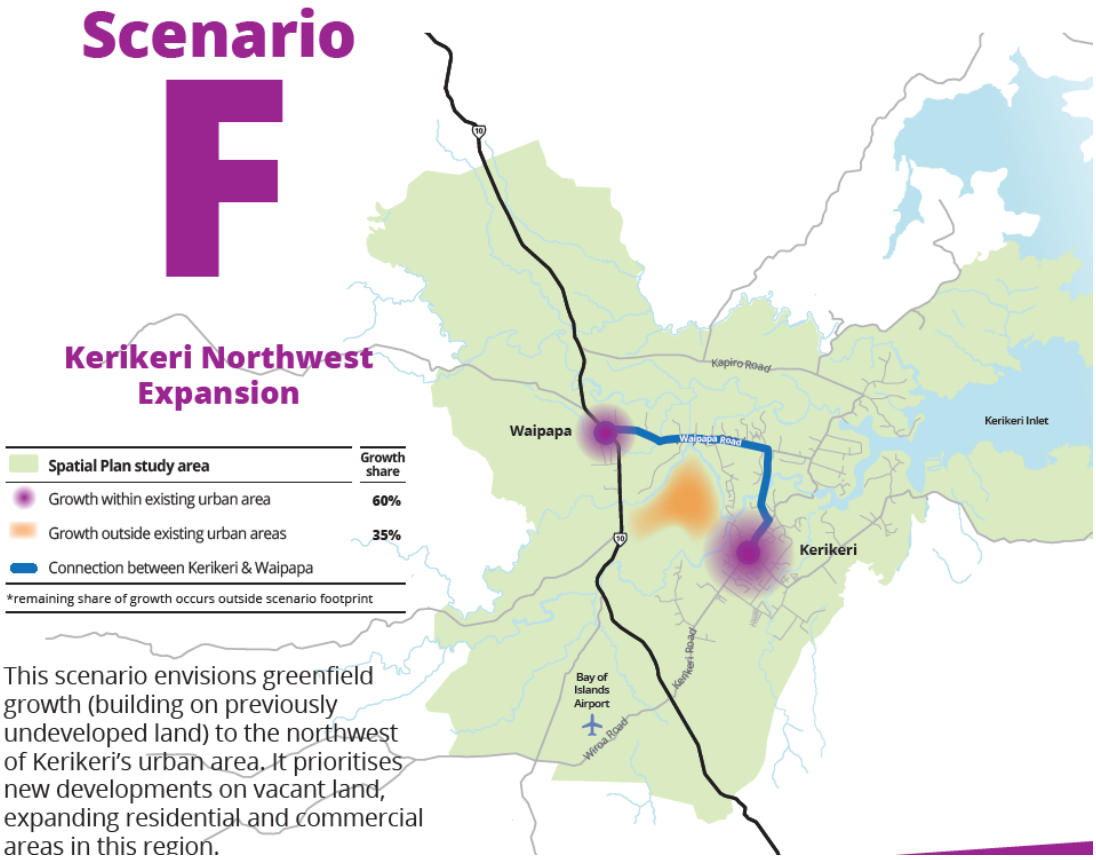
Attachment

From: Jaye Michalick <Jaye.Michalick@fndc.govt.nz>
Sent: Tuesday, 29 April 2025 5:48 pm
To: James Griffin <JamesG@nrc.govt.nz>
Cc: Azman Reuben <Azman.Reuben@fndc.govt.nz>; Giles Dodson <Giles.Dodson@fndc.govt.nz>
Subject: Seeking NRC comment to inform deliberations stage of the draft spatial plan for Kerikeri Waipapa - Te Pātukurea

Kia ora James,

Thanks for discussing the progress of the draft Kerikeri Waipapa spatial plan – Te Pātukurea with me today.

As you know, we carried out formal public consultation on the draft spatial plan from 20 May 2025 to 22 April 2025. We have received a number of submissions both in support and opposition and we are now collating further information to support Elected Members to deliberate on changes that may be required to the draft spatial plan before it becomes adopted as final.



We also received a number of submissions supporting Scenario F, which was one of six options for growth that we took out for public engagement in late 2024. Scenario F contemplated future urban development of currently rural zoned land on the Kiwi Fresh Orange Company (KFO) site (refer image below of scenario F below). Following evaluation of

all six growth options, Scenario F was not identified as the preferred location for growth and is effectively out of scope in the draft spatial plan. KFO has also lodged a submission to the Proposed District Plan (PDP) seeking to rezone this land for urban development: Link.

Given the nature of the submissions received, we would appreciate Northland Regional Council's technical views on a few matters to help inform deliberations to determine appropriate changes to the draft spatial plan:

1. Approximately 45% of the KFO site is subject to flooding. A preliminary flood mitigation concept has been developed to support the PDP submission for KFO. We would appreciate NRC's views on the proposed flood mitigation in relation to a proposed future urban use of the land, views on the suitability of considering a site for urban development when flood mitigation is not currently a reliable option (i.e. not consented or funded), views on the consentability of the proposed mitigation given the historical issues around gaining consent for flood mitigation in this area and the potential for downstream effects? And finally, views on any residual risk (to urban development) should that mitigation be achievable? (refer from pg 387 to 452 of their PDP submission for flood mitigation information)
2. Is the draft Te Pātukurea Spatial Plan consistent with regional planning objectives, specifically in relation to well-functioning urban environment and supporting appropriate urban form?
3. Approximately 89% of land within scenario F is LUC3, considering the current National Policy Statement for Highly Productive Land, does NRC have views on the viability of converting this to urban zoned land when a viable alternative has been proposed (the hybrid scenario in the draft spatial plan)?
4. Other comments in relation to the draft spatial plan that NRC may feel are relevant?

We would value any feedback you are able to provide. Please let us know if you would like any additional information or meetings to assist with your review, and we request that you provide us with your input by 8 May.

Ngā mihi nui,

Jaye Michalick
Team Leader - Growth Planning & Placemaking
P 6494015391 | Jaye.Michalick@fndc.govt.nz
Te Kaunihera o Te Hiku o te Ika | Far North District Council

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