IN THE MATTER OF	the Resource Management Act 1991
AND	
IN THE MATTER OF	24 applications by 22 persons, hereinafter referred to as the Aupōuri Aquifer Water Permit Applicants (AAWUG), to Northland Regional Council under section 88 of the Resource Management Act 1991 for the purpose of taking groundwater from various aquifer management sub-units of the Aupōuri Aquifer.

Decision following the hearing of an application by 22 persons, collectively referred to as the Aupōuri Aquifer Water User Group (AAWUG), to Northland Regional Council for discretionary activity water resource consents under the Resource Management Act 1991, heard in Kaitaia at Te Ahu Centre, 1-3 September 2020.

APPLICATION NO.:	REQ-596300.01.01	
SUB APPLICATIONS:	APP.039859.01.01	Te Aupōuri Commercial Development Limited
	APP.040601.01.01	Waikopu Avocados Limited
	APP.017428.02.01	Henderson Bay Avocados Limited
	APP.040600.01.01	Far North Avocados Limited
	APP.041211.01.01	P McLaughlin
	APP.040121.01.01	N E Evans Trust & W J Evans & J Evans
	APP.040231.01.01	P & G Enterprises (P J & G W Marchant)
	APP.039644.01.01	M P Doody & D M Wedding
	APP.040397.01.01	A Matthews
	APP.040652.01.01	S E & L A Blucher
	APP.040919.01.01	N A Bryan Estate, S G Bryan, C L Bryan, K Y Bryan Valadares & D Bryan (Property No 1)
	APP.040979.01.01	M V Evans (Property No 2)
	APP.040558.01.01	M V Evans (Property No 1)
	APP.040130.01.01	Tuscany Valley Avocados Limited (M Bellette)
	APP.040918.01.01	N A Bryan Estate, S G Bryan, C L Bryan, K Y Bryan Valadares & D Bryan (Property No 2)
	APP.008647.01.06	Avokaha Limited (C/– K Paterson & A Nicholson)
	APP.039628.01.04	KSL Limited (C/– S Shine)
	APP.040361.01.01	Tiri Avocados Limited
	APP.040362.01.01	Valic NZ Limited

	APP.040363.01.01	Wataview Orchards (Green Charteris Family Trust)
	APP.039841.01.02	Mate Yelavich & Co Limited
	APP.040386.01.01	Robert Paul Campbell Trust
	APP.040364.01.01	Elbury Holdings Limited (C/– K J & F G King)
	APP.020995.01.04	Te Rarawa Farming Limited and Te Make Farms Limited

NATURE OF ACTIVITY: Groundwater abstraction.

LOCATION OF TAKES: Refer to Table 1 of *AAWUG Application – Technical Comments Report* included at Attachment 5

DURATION OF CONSENT SOUGHT:
APP.039859.01.01 – 20 years
APP.040231.01.01 – not stated
APP.020995.01.04 – 25 years

All other applications seek consent for a duration of 30 years

ACTIVITY CLASSIFICATION: Discretionary activity for groundwater take and use (Rule C.5.1.12 of the proposed Regional Plan for Northland (pRPN) and Rule 25.03.01 of the Regional Water and Soil Plan for Northland (RWSP)).

Proposal

To extract groundwater from new takes and increased volumes from existing takes as follows:

Map ID	Application number	Applicant	Daily volume (m^3/day)	Annual volume (m^3/year)	Aquifer sub-area
2	APP.040601.01.01*	Waikopu Avocados Limited	736	83,360	Waihopo
3	APP.017428.02.01*	Henderson Bay Avocados	178	19,000	Waihopo
4	APP.040600.01.01	Far North Avocados Limited	240	32,000	Waihopo
5	APP.041211.01.01	P McGlaughlin	700	78,400	Waihopo
1	APP.039859.01.01	Te Aupōuri Commercial Development Limited	10,400	1,170,000	Waihopo/ Houhora/ Other
6	APP.040121.01.01	N E Evans Trust & W J Evans & J Evans	1,675	160,000	Houhora
7	APP.040231.01.01	P & G Enterprises (P J & G W Marchant)	350	28,000	Houhora
8	APP.039644.01.01	M P Doody & D M Wedding	2,375	304,000	Houhora
9	APP.040397.01.01	A Matthews	95	12,000	Houhora
10	APP.040652.01.01	S E & L A Blucher	720	96,000	Houhora

11	APP.040919.01.01	N A Bryan Estate, S G Bryan, C L Bryan, K Y Bryan, Valdares and D Bryan (Property 1)	500	80,000	Houhora
12	APP.040558.01.01	M V Evans (Property 2)	1,125	126,000	Houhora
13	APP.040979.01.01	M V Evans (Property 1)	350	36,400	Houhora
14	APP.040130.01.01	Tuscany Valley Avocados Limited	375	36,000	Motutangi
15	APP.040918.01.01	N A Bryan Estate, S G Bryan, C L Bryan, K Y Bryan, Valadares & D Bryan (Property 2)	1,000	160,000	Motutangi
16	APP.008647.01.06*	Avokaha Limited	70	4,800	Motutangi
17	APP.039628.01.02*	KSL Limited	90	3,600	Motutangi
18	APP.040361.01.01	Tiri Avocados Limited	3,876	581,250	Paparore
19	APP.040362.01.01	Valic NZ Limited	1,158	173,700	Paparore
20	APP.040363.01.01	Wataview Orchards (Green Charteris Family Trust)	225	33,750	Paparore
21	APP.039841.01.02	Mate Yelavitch & Co Limited	450	52,000	Other
22	APP.040386.01.01	Robert Paul Campbell Trust	3,350	360,000	Other
23	APP.040364.01.01	Elbury Holdings Limited	1,875	200,000	Sweetwater
24	APP.020995.01.04*	Te Rarawa Farming Limited and Te Make Farms Limited	10,705	776,000	Sweetwater
		Cumulative Total	**43,168**	**4,606,260**	

The applications submitted by Waikopu Avocados Limited, Henderson Bay Avocados Limited, Avokaha Limited, KSL Limited, and Te Rarawa Farming Limited and Te Make Farms Limited (marked by an asterisk* in the above table) are for new consents for increased volumes from existing consented takes. The volumes listed in the above Table reflect the increase in volume sought above that already consented for these Applicants.

Following lodgement of the initial application documentation, the application by Te Aupōuri Commercial Development Limited was amended to include revised take volumes from three allocation zones within the Aupōuri Aquifer. Whilst the overall annual volume of water sought remains unchanged, the location and volume of the individual takes sought have been altered to focus most of the irrigation development to the south of the station for efficiency.

The resource consents sought are **GRANTED**. The reasons are set out below.

Hearing Commissioners:	David Hill (Chairperson) Peter Callander
Application numbers:	REQ-596300.01.01
Applicants:	Various (as above)

Site addresses:	Within the Waihopo, Houhora, Motutangi, Paparore, Sweetwater and Other management sub-units of the Aupōuri Aquifer
Initial lodgement:	Variously between 23 February 2018 and 28 August 2019
S92 Hold	23 March 2018
S92 Inf all received	29 August 2019
Limited notification:	3 October 2019
Submissions closed:	1 November 2019
Hearing commenced:	1 September 2020
Hearing adjourned	3 September 2020
Hearing closed:	2 July 2021
Appearances:	<u>For the Applicants[1]:</u> Jon Williamson (Hydrologist, Director - Williamson Water & Land Advisory (WWLA)). Martell Letica (Principal Planner, WWLA) <u>Submitters:</u> Ministry of Education - Keg Alexander (Hydrologist) Dr Alan Nunns Dr William Morris Douglas Calhoun Elizabeth Calhoun Richard van Alphen Gabriele Pfaender John Johnston Albert Burgoyne Elise Matich Far North District Council – Jessica Crawford Sandra King Kathleen Marshall Ronald Liddicoat Jim Bennett Wendy Thomas Jeffrey Walker Win van Wilsem Vos Ivan Stansich / Ian Fulton Leoni Carter Susan Williams Malcolm and Kevin Matthews Karen Nikora-Kerr

[1] We note that subsequent to the hearing the Applicants engaged Andrew Green and Rowan Ashton as counsel.

	Doolan and Kathleen Kerr Betsy Young Carol and Jeffrey Wagener Eric Wagener Tracey Ashby – Waiora Marae Marilyn Davy Theresa Burkhardt and Alan Macrae Joaline Subritzky <u>For the Department of Conservation:</u> Sarah Ongley (Counsel) Lisa Sutherland (Legal Adviser) Timothy Baker (Wetland hydrogeology) Dr David West (Wetland ecology) Tom Christie (Planning) <u>For Northland Regional Council:</u> Stephanie Kane (Consultant Planner) Brydon Hughes (Consultant Hydrogeologist) Alissa Sluys (Hearings Administrator)

Summary Decisions:

1. Pursuant to sections 104 and 104B of the Resource Management Act 1991, the individual discretionary activity water abstraction consents sought by the Aupōuri Aquifer Water User Group (AAWUG) are granted as specified in this decision.

Introduction

2. This decision is made on behalf of the Northland Regional Council (NRC) by Independent Hearings Commissioners David Hill (Chairperson) and Peter Callander appointed and acting under delegated authority under sections 34 and 34A of the Resource Management Act 1991 (the RMA).

3. This decision contains the findings from our deliberations on the applications for resource consent and has been prepared in general accordance with section 113 of the RMA.

4. However, as the previous water take consent applications related to the Motutangi-Waiharara Water Users Group (MWWUG) have been determined by the Court relatively recently[2], and the present commissioners determined those at first instance, and the aquifer characteristics and modelling undertaken by Williamson Water & Land Advisory Limited (WWLA) also underpinned those decisions, in the interests of brevity we do not consider it necessary to repeat all those details in this decision but note that we have taken the relevant findings etc of that decision into account in this decision. Furthermore, the issues raised by submitters on these applications were substantively the similar to those issues raised previously – albeit the

[2] Burgoyne v Northland Regional Council [2019] NZEnvC 028 and 137.

proposed abstraction locations are different and the takes additional to those already consented; matters that we do need to address directly including, relevantly, the relationship with the MWWUG consents.

5. While the application relates to 24 separate water abstractions, NRC preferred the applications to be managed as a single entity (in similar fashion as it had for the earlier MWWUG applications).

6. In similar vein we adopt the approach of issuing one composite decision for the 24 "sub-applications" – albeit we recognise that each application formally stands alone in terms of consent conditions and appeal rights.

7. The applications were limited notified to all property owners and occupiers in the modelled area of effects. However, only persons who had an existing groundwater or surface water take within the extent of the Aupōuri Aquifer were allowed to make a valid submission. Mandated Mana Whenua representatives and marae committees within the area of influence and the Department of Conservation were also notified.

8. At the time when submissions closed, on 1 November 2019, 113 submissions were received – 92 opposed; 7 neutral; 2 support, and 12 non-specific.

9. Eighteen late submissions were received. The s42A report (section 3.2.6) identifies those and confirmed that NRC had accepted those.

10. No written approvals were received.

11. The matter was heard in Kaitaia on 1-3 September 2020 and adjourned for further consideration of matters raised at the hearing (particularly related to the National Policy Statement for Freshwater Management 2020 and National Environmental Standard for Freshwater 2020 (NPS-FM and NES-F respectively). Those matters are discussed further in this decision and were, in short, the reason for such a lengthy adjournment. Following receipt of reports on those matters, responses, supplementary evidence and replies from the Department of Conservation (DoC), NRC and the Applicants' technical advisers, WWLA, along with a finalised set of draft conditions and written reply from legal counsel, the hearing was finally closed on 2 July 2021.

Section 42A report

12. The s42A RMA hearing report was prepared by Ms Stephanie Kane and Mr Brydon Hughes, planning and hydrogeological consultants respectively to NRC, and grouped the key issues raised in submissions under the following topic effect areas:

- allocation of water;
- long-term impacts on the aquifer;
- effect on existing bores;
- water quality and contamination;
- ecological impacts;
- saline intrusion;
- lack of consultation / public notification;

- inadequacy of assessment and monitoring;
- cultural considerations;
- procedural and judicial matters; and
- other issues.

13. The report then assessed the application under the following topic headings:

- adequacy of assessment;
- reasonable and efficient use of water;
- groundwater drawdown;
- effects on aquifer sustainability;
- effects on surface water;
- effects on existing / other groundwater users;
- saline intrusion;
- other water quality effects;
- land subsidence;
- social, economic and community effects;
- cultural and archaeological heritage effects
- ecological and natural character effects; and
- climate change consideration.

14. Finally, the s42A report discussed management and mitigation measures, including:

- the precautionary principle and adaptive management;
- the sub-regional management approach – i.e. the three sub-groupings of Northern, Middle and South-western groups;
- monitoring; and
- the statutory planning framework.

15. The report's overall conclusion[3] was that:

> *… the effects on the Aupōuri Aquifer and its composite sub-zones, existing users, communities and the environment concludes that the proposed water takes can occur in a manner that will not compromise the overall sustainability of groundwater resources within the Aupōuri Peninsula, will maintain the life-supporting capacity of the environment, and will meet the reasonably foreseeable needs of future generations. The proposals are broadly consistent with the relevant objectives and policies of the relevant statutory documents, along with the provisions of relevant non-statutory documents*.

16. Grants of consent with detailed conditions were recommended and with a duration of 13 years so that co-ordination with the November 2033 expiry date for the MWWUG consents and any application for renewal could then be undertaken and reviewed in light of all the monitoring data collected up to that point. On that basis the s42A report suggested this would allow some 8 years at full Stage 4 allocation (if the adaptive management conditions are met to allow development to occur through to Stage 4) such that monitoring data would, by then, provide a robust picture of any effects for the purpose of on-going allocation. We note that this expiry

[3] S42A report, para 253.

date was accepted by Ms Letica[4] and adopted in the final draft set of conditions provided with the June 2021 Reply.

17. Furthermore, a proposed draft condition requiring the surrender of existing consent(s) prior to exercising the new consents was recommended for consents granted to those parties seeking consent to increase and/or replace existing consents[5]. That requirement has not been carried forward into the final condition sets.

18. Ms Kane and Mr Hughes provided a supplementary written statement in opening, confirming their overall recommendation with a minor recommended change to the staging volumes proposed for Avokaha Limited (a minor reduction) to align with the overall methodology (which has been accepted in the final draft Middle Group Groundwater Monitoring and Contingency Plan (GMCP)). The report acknowledged that there was scope for additional refinement of the proposed conditions and GMCPs.

19. That report also addressed:

- The appropriateness of the cited Iwi Environmental Management Plans;
- Consistency with the NPS-FM and NES-F;
- Additional testing and monitoring; and
- NRC's lake monitoring network.

Site description

20. A summary description of the overall Aupōuri aquifer and the area covered by the applications is contained in section 2 of the s42A report. More site-specific descriptions are included in each of the 24 Individual application assessments prepared by WSP (Te Aupōuri Commercial Development Ltd and Te Rarawa Farming Ltd & Te Make Farms Ltd) and WWLA (the remainder) – and broadly summarised in Mr Williamson's evidence[6]. That overall description was not in dispute and, for the sake of brevity, we do not repeat that information in this decision.

21. The general location of the applications is shown in the following figure (with the abstraction points identified by the Map ID numbers shown in the Table on pages 2 and 3 of this decision):

[4] Letica. Supplementary statement of evidence, para 4.15, 31 August 2020.
[5] S42A report, para 267.
[6] Williamson, Statement of evidence, section 2.

Summary of applications and activity status

22. In short, the proposal is to abstract water for the purpose, in the main, of avocado horticulture at varying daily rates and annual amounts by 22 Applicants (including five applications to abstract an increased volume) from the following management sub-units of the Aupouri Aquifer – being proposed takes from the:

- Waihopo (332,760m^3/yr);
- Houhora (1,717,400m^3/yr);

- Motutangi (204,400m^3/yr);
- Paparore (788,700m^3/yr);
- Sweetwater (521,000m^3/yr);
- Ahipara (455,000m^3/yr); and
- Other (587,000m^3/yr) sub-units[7].

As sought the daily rates range from 70m^3/d to 10,705m^3/d, with corresponding annual volumes ranging from 3,600m^3/yr to 1,170,000m^3/yr.

23. Resource consent is required under the RWSP as follows:

Rule 25.03.01 states:

The taking, use or diversion of groundwater from an aquifer, and any associated discharge of groundwater onto or into land or into water, which does not meet the requirements of the permitted, controlled or non-complying activity rules is a discretionary activity.

That rule is explained as follows:

Explanation: *This rule applies to any new groundwater (including geothermal) takes from any aquifer and any existing but unlawful takes from those aquifers. The requirement for a water meter will be determined at the time of application. Rule 25.03.01 applies to all new applications and to any application for the replacement of an existing resource consent. The average annual recharge on the aquifer will be estimated using information collected from groundwater investigations from the Aupouri, Kaikohe, Maunu-Maungatapere-Whatitiri aquifers and using a simple water balance/model for other aquifers.*

24. Ms Letica's evidence notes[8] that all applications were lodged after the pRPN was notified on 6 September 2017; 18 were lodged and accepted by NRC before the decisions version was released on 4 May 2019; 2 were lodged after the decisions version was notified but before the appeals version was released in July 2019; and 4 were lodged after the appeals version was released in July 2019.

25. While the rule identifiers in the pRPN changed during the course of its progression – and Ms Letica acknowledged that not all of the applications accurately reflect those changes - overall the applications were assessed as a discretionary activity pursuant to RWSP rule 25.03.01.

26. That "approach" was not challenged by Council (nor any planning witness) and we note that under the more recently released appeals version of the pRPN rule C.5.1.12, taking water from an aquifer is a discretionary activity unless subject to any other rule.

27. We therefore find that, notwithstanding the lack of specific analysis on the matter, the applications are discretionary activities.

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[7] Williamson, Statement of evidence, para 17 and also S42A report, Table 1 of Attachment 5.
[8] Letica, Statement of evidence, paras 3.5-3.7.

Procedural and other matters

28. In the course of the commission we issued 8 directions and minutes, most of which (7) followed the adjournment on 3 September 2020 relating to the further information, tasks, expert conferencing and timetabling that we required.

29. Expert conferencing was directed by us to answer a number of questions that remained dangling at the adjournment – being:

    (a) Potential wetland risk due to the coming into operative effect of the National Policy Statement on Freshwater Management 2020 on 3 September 2020;

    (b) Further consultation with Waiora Marae in light of its submission to the hearing;

    (c) Further refinement of the consent conditions and respective Groundwater Monitoring and Contingency Plans and, in particular:

        (i) If the "new" consent applications within the Motutangi-Waiharara Water Users Group FMU are to be included under that GMCP without priority being "saved" for existing consent holders, as is proposed, confirmation from those existing consent holders that they accept that proposition and its implications in the event that abstraction reductions are required; and

        (ii) Mitigation for any adverse effect on existing bore users should the water level or pressure in their existing bore change materially.

30. In response, we received from Mr Williamson and Ms Letica an agreed summary task list and a proposed methodology for the assessment of potential unmapped wetlands, and a timeline for review, to which we added further directions including that:

    (a) The hydrogeologists for the Applicant, NRC and Department of Conservation (DoC), together with DoC's ecologist and, as necessary the Applicant's and NRC's ecologists, are to confer with the intention of developing an agreed plan to address the wetland issue.

    (b) When that plan is sufficiently developed, planners for those parties are to confer to determine whether, in their opinion, the plan is sufficient for the purpose, or could be with further indicated refinement, and advise the Panel accordingly.

31. As a result, we received further information by way of memoranda and joint witness statements on the agreed tasks, including:

    - Joint witness statement (JWS) hydrology and ecology - 22 September 2020 and 11 December 2020;
    - JWS shallow aquifer monitoring in relation to potential surface water impacts – 11 December 2020;
    - JWS additional monitoring and sampling – 11 December 2020;
    - JWS areas of interest for potential wetlands risk analysis - 16 December 2020;
    - JWS threatened species – 16 December 2020;
    - JWS planning – 20 May 2021.

32. We also agreed to DoC including two experts in the conferencing who had not provided evidence or appeared at the hearing – being Mr Herb Familton, an experienced departmental resource management planner, and Dr Tom Drinan, a departmental freshwater technical advisor.

33. We record our gratitude to those who participated in the expert conferencing and acknowledge that fundamental disagreements remained notwithstanding. Those disagreements have enabled us to focus this decision on a relatively small number of key issues – as discussed later in this decision.

34. We also record that it was agreed that a new GMCP for the Middle Group distinct from but cross-referenced to the MWWUG GMCP was the preferred approach.

Further consents required

35. In her supplementary s42A report Ms Kane raised a question as to whether additional consents may be required under the NES-F for works or bores located within 100m of a natural wetland – and queried whether such was within scope of the present applications to be granted.

36. Legal submission in reply from Ms Ongley and Ms Sutherland for DoC disagreed that such was open to the commission, and closing submissions from Mr Green and Mr Ashton for the Applicants agreed, emphasising that any consents granted would prevail in any event (per s43B(7) RMA) as the applications were notified before the NES-F regulations were gazetted.

37. We agree with the principle that we cannot enlarge the applications and grant consents that were not applied for, and that s43B RMA applies, and therefore consider that matter no further – noting that further land use consents will be required in due course for bore construction under the pNRP.

Relevant statutory provisions considered

38. In accordance with section 104 of the RMA we have had regard to the relevant statutory provisions, including, where relevant, the provisions of Part 2 and sections 104 and 104B.

Relevant standards, policy statements and plan provisions considered

39. In accordance with section 104(1)(b)(i)-(vi) of the RMA, we have had regard to the relevant policy statement and plan provisions of the documents noted below – the provisions of which are assessed in section 8 of Ms Letica's evidence and throughout section 4 of the s42A hearing report. The identification of these provisions was largely agreed.

40. Having reviewed those provisions and particularly the objectives and policies, we confirm and adopt them. Therefore, there is no need to repeat the details in this decision. Those provisions are contained in the following statutory documents:

- Regional Policy Statement for Northland (the RPS);
- the RWSP; and
- the pRPN.

41. The Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 also apply. The regulations require a permit holder that exceeds specified pumping rate thresholds to keep records that provide a continuous measurement of the water taken under a water permit, including water taken in excess of what the permit allows.

42. The NPS-FM and its companion NES-F came into effect during the hearing as we discuss later in this decision. We note that the May 2021 Court appeals version of the pRPN incorporates and gives effect to those documents insofar as aquifer management and surface water effects are concerned (the wetland protection policy of which has been incorporated into the July 2021 version of the pNRP as policy D.4.23).

43. The New Zealand Coastal Policy Statement 2010 (NZCPS) was referred to and, again, the key provisions of that document are now encapsulated and given effect in the May 2021 Court appeals version of the pRPN.

44. It is, therefore, the pRPN that we deem to be the over-riding document in terms of the weight to be given to the planning instruments and the principle set by the Court of Appeal in *RJ Davidson* regarding the need or otherwise to refer back to Part 2 of the RMA. The pRPN is the most up-to-date expression by the Court of that hierarchy at this time notwithstanding any further appeals.

45. No other national policy statements or environmental standard were identified as being relevant to these applications and we accept that to be the case.

46. We do not consider any other matter to be relevant and reasonably necessary to determine the applications in accordance with section 104(1)(c) of the RMA. While a number of submitters made reference to other non-statutory documents we were not persuaded that those added materially to the relevant provisions of those national and regional documents cited above.

Permitted Baseline / Existing Environment

47. With one exception, the MWWUG consents, there is no particularly relevant permitted baseline, including known unimplemented resource consents, which might have a bearing on this matter. Current allocation rights (including MWWUG) have been taken into account in the modelling and other work undertaken and, subject to appropriate limits and conditions, would not be adversely affected by a grant of consent. That also includes the matter of potentially stranded domestic bores – which is discussed further below.

Summary of evidence / representations / submissions heard

48. The s42A Hearing report by Council's reporting officers, Mr Hughes and Ms Kane, was circulated prior to the hearing and taken as read. That report attached two peer review letter reports[9] of the hydrogeology undertaken by Mr Brydon Hughes for NRC.

[9] LWP Water Permit Application – Aupōuri Aquifer Water User Group, dated 18 June 2020 and 27 July 2020 [Hearings Committee Agenda, Attachments 4 & 5].

49. The evidence presented at the hearing responded to the particular issues and concerns identified in the s42A recommendation report and submissions.

50. The evidence, all of which had been pre-circulated, presented by the Applicants' witnesses at the hearing are summarised below:

Jon Williamson, owner / director of Williamson Water & Land Advisory (WWLA), described the technical work undertaken relating to hydrogeological and surface water impacts (as he had previously done for the MWWUG consents). As he was largely in agreement with Mr Hughes' analysis and conclusions in the s42A report he did not seek to repeat that material or to summarise the detail provided in the respective application technical reports. Accordingly, his primary evidence focused on contextual scene setting and commentary on the s42a report, the Groundwater Monitoring and Contingency Plans (GMCPs), and the DoC submissions.

In terms of context, he noted that the c.4.6 billion litres of groundwater sought annually represented on average 0.16% of the estimated 2,850 billion litres of groundwater stored in the aquifer and 1.9% of the estimated annual rainfall recharge of the deeper aquifer system (calculated as 238 billion litres, being 35% of the estimated average annual rainfall of 687 billion litres).

He also noted that his model has undergone further structural refinement as a result of drilling and geophysical surveying on a number of properties as well as data from the monitoring bores drilled for the MWWUG consents. He advised that this means that the global model accuracy has increased with the root mean square error[10] (RMSE) decreasing from 1.89 for the 2019 model to 1.31 for the 2020 model.

Further refinements to the proposed consents and GMCPs were also indicated.

In his supplementary evidence, given on day 1 of the hearing, Mr Williamson responded to concerns expressed on behalf of the Ministry of Education relating to seven school bores and the need to ensure both water quantity and quality of supply. He also responded to the filed evidence from DoC's expert witnesses: Mr Blyth on modelling; Dr West on unmapped waterbodies, ephemeral wetlands and springs; and Mr Baker on test pumping and dune lake effects.

In his final reply evidence, Mr Williamson addressed criticisms of the sufficiency of the assessment of potential effects and of the monitoring regime to inform adaptive management.

As these matters are discussed below, we do not further summarise the evidence given at this point.

Martell Letica, principal planner with Williamson Water & Land Advisory Limited (WWLA), previously with WSP Opus consulting and who had initially overseen the preparation of two of the applications, gave planning evidence in support of granting the application. Ms Letica provided a summary of the applications and their lodgement history, a brief assessment against what she considered the relevant planning framework and statutory documents;

[10] In simple terms, the statistical metric that tells us how far apart the predicted values are from the observed values (on average).

indicated where she agreed with the s42A report, otherwise provided amended conditions with explanatory annotations, and corrected some factual errors (subsequently acknowledged and accepted by Ms Kane).

51. We received detailed representations from the submitters identified at the head of this Decision – primarily either in total or qualified opposition.

52. Submitters in opposition elaborated on their concerns, particularly about the potential effect on their existing consented bores; risks of saline intrusion, aquifer collapse, and surface subsidence; consideration for present and future domestic users; and perceived errors in the application documentation and evidence (including geological and hydrogeological interpretation, and soil absorption and rainfall recharge values).

53. Nearly all submitters expressed concern that the recent MWWUG consents had not yet had sufficient time either to reach full-stage production or to demonstrate conclusively that their abstractions achieved the negligible adverse surface effects predicted. The overall message conveyed to us was to await those proofs before contemplating further grants of consent.

54. Many of those submissions were again critical of both the Applicants and Council with respect to the consultation and limited notification submission process followed – even though it was not evident to us that either process fell outside of the RMA's requirements. While we have not referred specifically to many of the submitters who appeared, that should not be taken as being dismissive of their concerns. Rather, we have concentrated on the issues raised rather than who raised them in the following passages.

55. The Department of Conservation filed legal submissions, evidence and appeared as follows:

Sarah Ongley and Lisa Sutherland[11], counsel, made legal submissions opposing a grant of consent and, in particular, submitted that the adaptive management approach proposed was, at the time of hearing, deficient because (among other matters):

- cumulative adverse effects on surface water bodies had not been sufficiently assessed; and
- significant uncertainties remained – especially in terms of the modelling, and regarding potential adverse effects on threatened species dependent upon surface water bodies, and dune lakes.

Those concerns had not been significantly reduced through the expert conferencing and proposed condition amendments. In conclusion, Ms Ongley submitted[12] that the remaining level of risk was such that:

DOC's position remains that without further work on assessing potential adverse effects, and gathering baseline information, 'adaptive management' is pre-emptive – the framework set out Sustain Our Sounds is not adequately met. DOC does not consider there is an adequate evidential foundation, to establish that the proposed approach will sufficiently reduce uncertainty and adequately manage any remaining risk.

[11] For convenience we have referred subsequently to Ms Ongley.
[12] Ongley, Legal submissions in reply, paras 62 & 65.

and that:

DOC continues to differ from the s42A Supplementary assessment:

- *For the Northern and South-Western Groups, without further baseline information on the environment, consents should be declined.*
- *For the Middle Group, any consents granted must include appropriate trigger levels in the consent conditions themselves.*

James Blyth, water resource scientist and director at Taylor Collaborations Limited, gave evidence on his reviews of WWLA's water balance modelling report and Mr Williamson's evidence with particular regard to the Kaimaumau - Motutangi wetland complex. He remained critical, among other things, of the lack of inclusion of groundwater inflows in the model, the way in which wetlands had been spatially represented, and the lack of evidence supporting the assumption that the Kaimaumau wetland was rainfed.

Timothy Baker, consultant hydrogeologist with Jacobs NZ Limited, gave evidence regarding surface waterbodies on the Aupōuri Peninsula (noting at least 35 dune lakes and over 40 mapped wetlands) and their likely degree of connectivity to groundwater; and the modelled impacts on surface waterbodies and review of the assessment of effects on these waterbodies. He made recommendations for further refining the assessment of effects and a specific condition, if any consents are granted, requiring aquifer testing to confirm the accuracy of the pumping responses predicted.

Dr David West, a freshwater ecologist with DoC, gave evidence on wetlands, ephemeral wetlands, springs, streams, lakes and ponds, and threatened species, expressing concern that the potential for adverse effects on these had not been adequately assessed – particularly as there are several ecosystems and species that rely on ephemeral conditions or groundwater supplements. Dr West sought monitoring conditions, as a minimum, to demonstrate that reductions in groundwater did not result in adverse effects on those matters.

Thomas Christie, a planner with DoC, gave evidence about the higher order planning instruments (especially the NPS-FM and NZCPS) and was critical that the application paid insufficient attention to the approaches directed by those in light of the uncertainties that remained and the requirement to reduce environmental risk.

Mr Baker and Dr West provided further evidence in reply on those matters of concern – and which had not been entirely resolved to their satisfaction through the expert conferencing undertaken. Mr Baker concluded[13] that:

… a robust shallow groundwater, and surface water monitoring regime is warranted, and is informed by a sufficient degree of investigation into the connectivity of groundwater with springs, streams and wetlands …

56. **Ms Kane** provided a supplementary s42A report in May 2021 summarising the activities that had occurred since the hearing was adjourned in September 2020; clarifying Council's position

[13] Baker, Reply evidence, para 27.

on matters subsequently raised through the expert conferencing and legal memoranda; and making further recommendations regarding conditions.

57. Among other matters, Ms Kane confirmed her opinion that a more appropriate adaptive management regime was now available with the addition that monitoring data should be telemetered; noted that natural wetland areas of interest had now been identified and included in the GMCPs, and wetland delineation and survey procedures agreed; confirmed that Council accepted the proposed timeframes for completing the remaining tasks associated with those procedures; and noted Council's on-going role and wide discretion as proposed in the latest draft of conditions.

Principal issues in contention

58. In terms of section 104(1)(a) of the RMA, the actual and potential effects of allowing the activity on the environment, we note that there was little agreement regarding the nature and significance of related effects and whether those could be appropriately managed.

59. The principal matters in contention were as follows:

    (a) Hydrogeological Setting: The hydrogeological setting and the characteristics of the drawdown effects on the water table and its connection to surface water features.

    (b) Effects on surface waterways: Lakes, streams and wetlands, particularly with regard to the requirements of the NPS-FM and subsequent effects on threatened species.

    (c) Grouping of Consents: The subdivision of the consents into three separate groups (Northern, Middle Southern) and the management of drawdown effects that go beyond the boundaries of each group.

    (d) Effect on existing MWWUG consents: How the effects of the Middle group are managed so as not to cause an increase in the staged implementation approach that was approved for the MWWUG consents.

    (e) Effects on bores: Whether existing lawful bore owners will be compensated should levels drop below their pumping head, requiring deepened bores;

    (f) Irrigation limits: The allocation rates for irrigation and the areas used to calculate them;

    (g) Allocation Limits for the Aquifer: Overall allocation status, based on the limits set in the pRPN;

    (h) Monitoring regime and Trigger Levels: the monitoring regime and the process for setting trigger levels and reviewing them;

    (i) Whether an adaptive management approach is supportable; and

    (j) Uncertainty and precaution – how best to approach these matters.

60. These issues are discussed in the following section.

The hydrogeological setting

61. There is agreement amongst the technical experts that the Aupōuri Aquifer is a relatively thick and extensive sequence of sedimentary deposits underlain by low permeability basement

igneous rocks. The NRC Groundwater expert (Mr Hughes) described the strata as comprising a 40 – 120 m thickness of fine-grained sands, interspersed with sporadic iron pan, silt, gravel and shellbeds. In many areas the lower 5 – 30 m of the sequence (immediately overlying the igneous basement strata) comprises more permeable shellbeds that have a higher permeability and can support higher yielding bores that would be used as a source of irrigation water.

62. Whilst it is acknowledged that the strata are highly variable, the Applicants' groundwater expert (Mr Williamson) has developed a numerical groundwater flow model of the strata based on the following layers:

- An upper layer of sand/silt, 45 – 110 m thick, incorporating discontinuous lenses of iron pan and peat;
- An upper shellbed layer, 5 – 15 m thick;
- A thin layer of sand; and
- A lower shellbed commencing at depths of 80 – 145 m below ground level and varying from 5 – 30 m thick.

63. Mr Williamson's numerical model builds on earlier models developed for the Aupōuri Aquifer all of which have used a broadly similar approach and his current model has been peer reviewed by Mr Hughes. It is recognised that this represents a gross simplification of the actual hydrogeologic characteristics of the strata. That variability has been emphasised by the DoC's groundwater expert, Mr Baker, and Dr Nunns, a submitter with considerable geological expertise.

64. The three groundwater specialists (Williamson, Hughes and Baker) all acknowledge the variability in hydrogeologic conditions that occurs at a local scale, but also recognise that the numerical model is a helpful tool to understand the nature of the effects of the abstractions at a broad scale. In paragraph 68 of his primary statement of evidence, Mr Baker noted, "*The model appears to be a useful tool for assessing effects (drawdown, saline intrusion risk) and groundwater allocation at a regional scale. A peer review of the model was done for NRC by Mr Brydon Hughes of LWP and has concluded the same.*"

65. Mr Williamson presented information from 3 model scenario assessments undertaken to characterise the effects of the proposed abstractions. These are described in his summary AEE report[14] as:

- **Scenario 1: Naturalised** – the calibration model with no groundwater pumping included in the simulation.
- **Scenario 2 - Proposed Extraction** – the calibrated Scenario 1 model with the addition of all current and proposed groundwater totalling 14.4 million m^3 /year.

[14] Section 3 of Aupouri Aquifer Groundwater Take Applications – Assessment of Environmental Effects.

- **Scenario 3** - **Low Permeability - Proposed Extraction** – Groundwater extraction is the same as in Scenario 2 with horizontal hydraulic conductivity of Model Layer 2 decreased to $1x10^{-7}$ m/s to simulate a hard pan extending over the model area.

66. Scenario 2 provides an assessment of the effects of pumping on the water table which would correspond to effects on shallow wells in the area and surface water features that have a hydraulic connection to the water table. In contrast, Scenario 3 provides a conservative estimate of the drawdown effects in the deeper shellbed layers which would impact on other deep production bores in the area.

67. The aquifer is primarily recharged by rainfall that infiltrates through the soil surface. This varies considerably between seasons and due to longer term variability associated with the effects of plantation forestry at differing stages of growth and harvest and climate change. In particular, Mr Williamson noted that the vast majority of deep aquifer recharge is sourced within the Aupōuri Forest area on the western side of the peninsula[15].

68. As was the case in the previous MWWUG hearing, the expert witnesses and submitters have made us well aware that the Aupōuri Aquifer has a vulnerability due to its connection to the sea and the variable amounts of rainfall recharge described in the preceding paragraph. The lowering of groundwater levels due to more abstraction poses a risk of seawater intrusion, and a risk to the ability of existing users to abstract groundwater and on the health of surface waterways, including wetlands if they are hydraulically connected to the shallow water table that is affected by drawdown induced by the pumping of irrigation bores. All these aspects of the balance between aquifer recharge and abstraction and the risks that may result are inter-related for abstractions at any location and depth within the aquifer.

69. In his opening statement Mr Williamson provided information on the scale of the proposed abstractions, relative to the scale of the aquifer[16], noting that:

- The total volume of groundwater being sought by the applications is 4,606,260 m^3 /year.
- The proposed groundwater take is only 1.9% of the estimated 238 million cubic metres that is estimated to recharge the aquifer system annually (35% of rainfall).
- The proposed groundwater take is only 0.16% of the estimated 2,850 million cubic metres of groundwater stored within the aquifer in an average year.

Findings

70. We agree with the groundwater experts that the numerical model provides a useful indication of groundwater abstraction effects at a regional scale. Whilst there are varying types of strata, groundwater pressure changes can be transmitted across the vertical sequence of the unconsolidated sedimentary deposits that are linked by a direct hydraulic connection and should therefore be managed as a vertically integrated unit.

71. At a regional scale, the quantity of water sought by these applications is relatively small compared to the region wide scale of the aquifer water balance. However, we are mindful

[15] Williamson Reply evidence, para 2.3.
[16] Williamson, Statement of evidence, paras 18-22.

that localised effects could pose potential effects of concern and we consider those later in this decision.

Effects on surface waterways: Lakes, streams and wetlands

72. The potential effects of groundwater abstractions on surface waterbodies, including lakes, streams, springs and wetlands was raised as a matter of concern by many locally based submitters and DoC. Wetlands in particular have a much more significant level of protection due to the requirements of the NPS-FM which commenced during the course of this hearing, compounded by subsequent confusion regarding the definition of a wetland.

73. Following directions issued by us, there has been considerable expert conferencing on these matters. The technical evidence indicates that many surface water features, in particular the dune lakes and many wetlands, are perched above the fundamental water table and would therefore be unaffected by any of the proposed deep groundwater pumping effects.

74. The JWS of 22 September 2020 noted that:

> … *due to the inherent drainage characteristics of sand, many wetland features on the Aupōuri Peninsula are likely to occur in areas where subsurface drainage is impeded by low permeability iron pan or peat deposits (thereby reducing the potential for hydraulic connection with underlying groundwater). In these areas, wetlands and surface waterways are frequently associated with localised perched water tables that act independently of the regional water table. Such conditions are potentially widespread in areas of sandy soils to the north and west of Awanui (where fine clay and peaty clay soils predominate).*

75. A network of 56 groundwater monitoring bores with water level monitoring records, some extending back to the 1980s are described in the Applicants' "*Aupōuri Aquifer Groundwater Model Factual Technical Report – Modelling*" report dated 5 February 2020 and, in many areas, supports the concept of deep water table conditions with no direct hydraulic connection to overlying dune lakes.

76. Mr Williamson has used his groundwater model to assess the effects of the groundwater abstractions in terms of the pRPN Policy H.5 (now settled) which deals with management of groundwater and surface water connectivity. This showed that the effects of the abstractions are of sufficiently low magnitude as to fall outside the criteria by which the plan requires them to be included in the surface water allocation regime set by Policy H.4 (Environmental flows and levels), and therefore the takes are not subject to the stated surface water minimum flows and water level restrictions (which are defined for rivers, lakes and natural wetlands).

77. Mr Baker has raised concerns that this regional scale modelling approach may not adequately characterise some of the local effects that could occur around some bores, which we accept as a valid concern. In response to this, Ms Letica in her reply statement points out that Rule C.8.5.3(1) of the pRPN provides NRC with the ability to place pump testing requirements on bore consents, to provide a greater level of understanding about effects arising from particular bores[17]. However, while that mechanism could be implemented for any production bores that

[17] Letica, Reply evidence, para 2.8, 1.

still need to be drilled, it does not apply to any existing bores. Therefore, any requirements for site specific testing would need to be specified in the conditions of any consents granted.

78. Through the Joint Witness Statement Process, an agreed schedule of wetlands that should be further assessed or monitored has been defined, although this may need to be further refined when guidance from the Ministry for the Environment (MfE) on wetland definition becomes available. Because of this upcoming change, it will be important to establish an expert review panel to maintain a watching brief on the state of wetlands that are or could be hydraulically connected to a water table and that could potentially be impacted by these abstractions.

79. The agreed schedule of wetlands included monitoring at the Kaimaumau wetland, which is a particularly large and significant wetland that is still the focus of much debate amongst the experts.

80. The experts also agreed that "shallow aquifer monitoring is a pragmatic means to indicate any signs of potential effects on surface waters"[18].

Findings

81. Our assessment of the available evidence is that there are many instances of surface water features that are perched above the water table such that they would not be affected by the proposed abstractions. In those areas where there is a potential hydraulic connection the assessed level of effect is of a minor scale. That finding is consistent with the hydrogeologic setting of deep abstraction bores causing a broadly distributed but small effect at the water table in those areas where a hydraulic connection exists.

82. Having said that, we are mindful of the regional scale of that assessment and we share DoC's concern that there *could* be localised settings where more significant effects *could* develop. We also acknowledge that, whilst the Policy H.4 assessment does not require these abstractions to be subject to surface flow allocation and management criteria, there could still be small scale effects that impact on surface water features. In terms of our decision making, however, we received no probative evidence that any material adverse effect is likely to eventuate, so have no clear basis for declining one or more of the applications as many parties sought. Regardless, we need to ensure that the implementation of any consents granted occurs in a cautious manner which, we find, can be achieved through the adaptive management approach specified in the GMCPs (and as we discuss in this decision).

83. We are pleased that the experts have developed a schedule of priority wetlands, although we recognise this may need to be further modified. There is also agreement about the appropriateness of shallow groundwater monitoring. As described later in this decision, we propose to require pumping tests for larger abstractions where they are located in the vicinity of surface water features where the potential for hydraulic connection to the water table has been identified. We also recognise that there could be benefit in monitoring water levels within some wetlands to provide a comparison with nearby shallow water table monitoring. That approach has been helpful in understanding some of the influences on Kaimaumau

[18] Joint Witness Statement, para 7(a), dated 11 December 2020.

wetland. The exact locations for any such monitoring can be defined in the process of finalising the GMCPs.

84. Dr West, for DoC, had raised the issue of and need for threatened species assessments. At this point, however, we view such as contingent upon surface water level and water flow effects - which are not anticipated. Provided the activities are properly managed to avoid such effects there should be no issue of concern for threatened species due to these applications.

85. In that regard, we agree with Ms Kane's support at paragraph 37 of her supplementary s42A report for DoC's request for a technical review mechanism of the GMCP criteria and an independent expert review process involving a suitably qualified and experienced hydrogeologist and ecologist. We consider imposing such a requirement both pragmatic and lawful, and one that will assist to satisfy a number of the concerns raised by DoC and by many of the local submitters – and provide a reliable feedback mechanism in the event that unanticipated trends begin to emerge.

Grouping of Consents

86. Policy H.4.4 of the pRPN sets annual volume allocation limits for 10[19] sub-units within the Aupōuri Aquifer, as set out in Table 29 of the pRPN. As noted in our earlier MWWUG decision, we understand that all these sub-zones are part of a single continuous aquifer system of considerable extent, so the sub-zones represent rational, pragmatic user-management boundaries that have been defined based on a number of factors including land use, groundwater flow direction, topography and areas of high demand. However, in reality there is continuity of the aquifer strata across the sub-zone boundaries and these boundaries do not represent barriers to flow or drawdown interference effects. They are primarily a definition of smaller areas to aid in the administrative management of groundwater allocation.

87. A key part of the Applicants' management of effects arising from their proposed abstractions is an adaptive management strategy defined in and through the GMCPs. It is proposed to group the respective consent applications into three geographic areas, which cover different combinations of the sub-aquifer management units in Table 29 of the pRPN and do not exactly coincide with the sub-zone boundaries in the pRPN. Nevertheless, the NRC experts agree with that approach and as explained by Ms Kane, the rationale for the groups are based on, "*the amount of monitoring data available in the broader area of influence, geographic and spatial proximity of take locations and sub-aquifer divisions, and interfaces with existing large volume abstractions for the MWWUG*."[20]

88. The proposed groupings are:

- Northern Group, for 12 applications in the Waihopo, northern Houhora and "Other" sub-units.

[19] That is, 9 named sub-units plus 1 "Aupōuri - Other".
[20] Kane, Supplementary S42A report, para 31.

- Middle Group, for 10 applications in the Houhora, Motutangi, Paparore and "Other" sub-units. This group overlaps with the MWWUG consents and includes applications in proximity to the Kaimaumau wetland.
- South-western Group, for 2 larger consents in the Sweetwater and Ahipara sub-units.

Finding

89. We find the grouping of the applications into three separate GMCPs to be a reasonable and pragmatic approach that will focus management and monitoring on the consents most likely to have the greatest effect on the local area.

90. The fact that the GMCP groups do not exactly match the pRPN sub-zone boundaries is not an allocation limit concern as accounting of the allocations for each sub-zone is still able to be made based on the location of each zone. Similarly, the lack of a direct overlap with the MWWUG consent GMCP is not critical as Ms Letica advised us that consultation with the MWWUG consent holders concluded that their clear preference was for the existing GMCP to remain separate from any new GMCP that might underpin any grant of new consents in this area[21]. We agree that, at this time, it is appropriate to have a separate GMCP for the subsequent consents in the middle group, rather than a combined group of old and new consent holders. In that regard we note the acceptance of a common expiry date for both "new" and existing consents so that the whole can be reconsidered in 2033 – and which may then result in common GMCPs or equivalent.

91. We recognise that the drawdown effects of these abstractions will extend beyond the boundaries of each group, as is currently the case for all abstractions that occur in proximity to the sub-zone boundaries. That matter can be addressed by the way in which the adaptive management strategy is set up, as discussed later in this decision.

Effect on existing MWWUG consents

92. As noted above, the middle GMCP for these applications will overlap with, but be a separate GMCP, to the MWWUG group of consents that are currently operating under that type of adaptive management regime. The MWWUG GMCP involves detailed monitoring of water levels and water quality in groundwater bores and in the Kaimaumau wetland. Alert trigger levels have been set to show if the monitoring indicates the development of adverse effects. A schedule of gradually increasing permitted volumes of abstraction are thereby specified and enabled *provided* monitoring does not indicate adverse effects.

93. The Applicants' closing legal submissions address a matter raised by Ms Ongley in her reply, regarding whether the granting of the Middle group of consents creates a potential derogation of right issue for the MWWUG consent holders. The submission notes case authority from the Court of Appeal that rejects the legal principle of non-derogation of right with respect to water permits since those are not property rights as such and, in that particular instance, the issue was over-allocation. Mr Green concluded that this is not a matter of concern in the present instance because all the applications can be granted without exceeding the allocation limits for

[21] Letica, Reply evidence, para 8.3.

the Aupōuri Aquifer sub-zones specified in the pRPN[22]. We accept that conclusion while being mindful that the MWWUG consents are being implemented in a gradual staged regime of monitoring and trigger levels precisely as a means of addressing the uncertainty of effects – and that remains of concern to many members of the community and are an inherent aspect of these proposed groundwater developments and the potential risks that exist for the Aupōuri Aquifer and the Kaimaumau wetland.

94. The MWWUG adaptive management strategy was strengthened through the appeal of those consent decisions to the Environment Court. The Court noted:

We have concluded that the Adapative Management process amended as directed will, in this case, establish in due course an appropriate method for meeting the requirements of the Supreme Court, and NZCPS, NPSFM and the Act in relation to ensuring the avoidance of adverse effects on significant indigenous vegatation, freshwater ecosystem processes and on significant indigenous habitats and fauna. Moreover, we are also satisfied that, in doing so, this will seek to protect the wider attributes and values that contribute towards those areas that are either outside the Coastal Environment or do not contain the particular values and attributes recognised under NZCPS Policy 11 (a) or the Regional Plan documents.[23]

95. In its concluding comments the decision states:

To utilise an adaptive regime, adequate baseline information needs to be obtained and there needs to be a strict cautious regime in place as part of that plan taking effect. We have made directions that we consider would lead to the conditions of the consent avoiding such adverse effects in the interim period before trigger levels are met, and achieve the general enabling provisions of the Act.[24]

Finding

96. We note that it is important that the Middle GMCP for any granted applications does not interfere with the gradual implementation of the abstraction volumes that are currently in place for the MWWUG consents. We find that can be achieved by adopting a modified implementation regime for those consents that overlap with the MWWUG area. Contrary to some submissions, we do not consider that this requires that any new consents granted should await the full implementation of the MWWUG consents. Instead, we require the TL2 trigger levels for this new group of consents to be initiated *earlier* than the TL2 trigger values for the MWWUG consents, to effectively buffer any alert status. We also note that while a breach of TL2 requires a reduction in abstraction rates, condition 13 of the consents will allow the consent holder to propose and apply for a different pumping rate to that achieved by the default reduction. Such an alternative pumping rate could be achieved, for example, through an exchange of an unimplemented volume from the MWWUG staging regime - but only, of course, if that could occur within the staged implementation limits of each new consent.

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[22] Green / Ashton, Closing legal submissions, para 2.6-2.9
[23] Para 49 of Decision No. [2019] NZEnvC 028
[24] Para 79 of Decision No [2019] NZEnvC 028

Effects on water supply bores

97. As with the previous MWWUG consents, a number of submitters expressed concern about the implication of drawdown affecting their existing ability to pump from their bores.

98. In response, Ms Kane advised us that the relevant current regional policy (Policy 10.5.1 – Sustainable Use and Development - of the RWSP) promotes "efficient bore takes", which is explained by example to mean that the bore fully penetrates the water bearing layer and takes water from the base of the aquifer, not just from the top of the available lens (a definition of which is included in the GMCPs) – although there is no corresponding policy in the pRPN.

99. We are also aware that case law[25] has established the principle that where a pump is stranded (i.e. water level is lower than pump intake), the permit to access an aquifer for the purpose of abstraction is not frustrated if by using a different pumping system and/or by modifying the bore (e.g. by going deeper into the aquifer) that permit can still be exercised (regardless of whether doing so might require an additional consent). Clearly that would involve additional costs for those whose "non-efficient" bores are then stranded by any drawdown effect. While we acknowledge that consequence, that is not an effect that we have any power to either remedy or place conditions around – other than if the predictions prove incorrect. Whether the AAWUG consent holders see any obligation in that regard to assist is a matter that would need to be pursued individually.

100. Submitters also raised concerns about the long term future of the aquifer as an on-going source of supply for future users. That is a concern that is very prominent in the promotion of Te Mana o te Wai as a fundamental concept of the NPS-FM, and which is something that must be fully taken into account in granting any applications.

Finding

101. The modelling assessment provided by the Applicants suggests that drawdown should not be of such magnitude as to adversely impact on other users' ability to abstract water. That is not to say that people may not experience difficulties in obtaining a water supply from time to time. Such situations can arise when pumps break down or bores deteriorate over time. Such circumstances require repairs and in some instances the drilling of a replacement bore. However, based on the adaptive management approach adopted through the GMCPs there should always be sufficient aquifer strata available for existing and foreseeable future users to access a water supply for domestic and other casual permitted uses.

102. If the Applicants' predictions are wrong and greater drawdowns affect existing water supplies, the required monitoring will provide an early warning system if reality begins to vary from prediction. In that case a review of conditions can be initiated by the Council (s128 RMA), which could include an assessment of mitigation actions to be implemented by the relevant abstractor(s). Such mitigation might then also consider requiring a contribution to the deepening of a neighbouring abstraction bore in the event of a significant lowering.

103. We agree with submitter concerns about ensuring that the aquifer continues to be a viable source of water supply for future water users. Their concerns in this matter are properly and

[25] e.g. Opiki Water Action Group Inc v Manawatu Wanganui Regional Council (W64/2004)

appropriately raised, are fundamental to our decision, and is a matter on which we must be satisfied.

Irrigation application limits

104. Each application has provided information on the area of land to be irrigated and the proposed application rates. For the avocado orchards, most have adopted a consistent approach. However, for some of the applications the quantities applied for show a degree of variability and inconsistency in the calculation of daily and annual volumes.

105. Mr Ian Fulton presented comprehensive evidence, on behalf of the Ivan Stanisich and Ian Fulton Partnership, detailing the actual water requirements for avocado orchards in the area. He concluded that the nominal guideline figure of 400 mm per canopy ha per year used by some applications is too high and that high performing orchards in the Aupōuri Peninsula area should use no more than 320 mm per canopy hectare per year.

106. Technical experts for the Applicants and the NRC felt that the numbers presented by the Applicants were not unreasonable and advised that some orchards required greater applications than those suggested by Mr Fulton due to differing orchard management approaches, productivity targets, the degree to which mulch was used, and whether organic or non-organic orchard practices were followed.

107. There are two applications for a wider range of pastoral and horticultural irrigation activities, lodged by Te Aupōuri Commercial Development Ltd and Te Rarawa Farming Ltd and Te Make Farms Ltd. The daily and annual volumes for these applications have been justified within their applications, although the details of exactly what will be developed where seem to be loosely defined.

108. Some submitters expressed concern that some applicants were applying for larger quantities of water than they need, simply to secure the value that is associated with a consent for a water take and/or the increase in property value that a water take consent can provide.

Finding

109. The differing views on the appropriate water requirements for avocados and the fairly general nature of the two applications for a wider range of irrigation activities is of concern. It is important that the water granted through consents is used in an efficient manner. Indeed, that is now an explicit policy requirement. While the applications do justify the quantities set out in the following paragraphs, we think it appropriate to set out in consent conditions a process whereby regular checks are made on the way in which the water is used to ensure that occurs in a proper and efficient manner, and the submitter concerns around water "value banking" are negated (as discussed below).

110. With that process in place, and which includes a claw-back provision, we have decided to grant the requested quantities for the consent applications lodged by Te Aupōuri Commercial Development Ltd and Te Rarawa Farming Ltd and Te Make Farms Ltd. All other applications are solely for avocado orchards, which operate with efficient under-tree sprinkler or dripper irrigation and for which more detailed guideline information is available, leading us to adopt the approach set out below. For applications that expand on existing consents, the criteria

below are applied to the new total water use and orchard area (i.e. the combined total of the existing consent and the current application).

Daily Volumes

111. Based on the evidence we have heard, we adopt the same approach as for the MWWUG consents for the avocado consent applications, which is a maximum rate of 25m^3/ha/day applied to the Total Orchard Area. Whilst we agree that allocations should be based on canopy area (and have used that approach for the annual volumes discussed below), we recognise there are particularly hot days when extra water may be required and the Total Orchard Area, which can be up to 20% greater than the canopy area at full development, provides an allowance for extremely high water demand days. The allocation should, therefore, be a sufficiently generous allocation to cover all situations, recognising also the high water application efficiencies that can be achieved on avocado orchards. Based on the information provided by Mr Williamson, the daily rates we intend to impose (and the annual volumes discussed below) are within the range evaluated by his modelling exercise.

112. Therefore, we have used the following approach for setting daily allocations for the avocado consent applications:

- Applicants should not receive an allocation that is more than, and that is within the scope of, what they applied for - and which are the individual notified quantities provided by NRC;
- The 25m^3/ha/day metric is adopted as an appropriate volumetric, taking account of the reasons for variable irrigation approaches to the numbers presented by Mr Fulton (and the MWWUG metric);
- For the purpose of calculating a maximum daily allocation we define the Total Orchard Area as the smaller of:
    - The total property area; or
    - The area within which the tree canopy occupies 80%.

113. For those applications involving an expansion to an existing consent, these calculations were carried out for the combined area of both the existing consent and the current application.

114. Attachment 1 to this decision shows the calculated daily rate based on the notified daily volume and orchard areas. Shaded values show the calculations that exceed the guideline figure of 25m^3/ha/day. For those situations, our decision is to reduce the daily allocation so that it conforms to the 25m^3/ha/day allocation.

115. The Total Orchard Area multiplied by 25m^3/ha/day thereby defines the maximum daily volume for any orchard, with smaller daily volumes being applied to applicants who requested less, based on their notified daily volumes.

Annual Volumes

116. Taking all this information into account, we have adopted and applied the following limit principles to the annual volumes for the avocado consent applications:

- Applicants should not receive an allocation for more than, and that is within the scope of what, they applied for – and which are the individual notified quantities provided by NRC;
- The annual volume should not be more than the maximum daily rate taken for 149 days each irrigation season; and
- The fully developed orchard annual volume should not exceed 3,920m^3/canopy area in ha (equivalent to 392 mm).
- The Wataview annual volume was decreased from its original application based on a reassessment of its water requirements during the course of the hearing[26].

An allocation table is presented in Attachment 1 to this decision that shows the allocations determined for each of the AAWUG consents.

117. We recognise that this approach does not give all users what they asked for, and in extreme drought years (around 1 in 10 years) it may not be all the water they require. However, the water resource has a limited capacity and in the interests of a fair allocation to existing and future users it is important that the water is used in an efficient manner. To this end, we also impose a condition on all consents requiring water audits to be undertaken at the end of each of the implementation stages to ensure that appropriate water management measures are in place before approval is given to progress towards the next stage of implementation. We require the applicant group to form and fund an independent review panel to undertake these water audits.

118. The review panel should comprise a minimum of two irrigation experts who would prepare a review report on the annual water usage prior to the implementation of each new implementation stage. The objective of the review should be to ensure that the amount and timing of irrigation is managed to meet plant demands, minimise risk of leaching and runoff, and ensure efficient water use. This objective should be achieved by ensuring compliance with the following:

- Irrigation systems are designed and installed in accordance with industry codes of practice and standards;
- The performance of irrigation systems is assessed by the irrigation operator throughout the year, and irrigation systems are maintained and operated to apply irrigation water at their optimal efficiency;
- The timing and depth of irrigation water applied takes account of crop requirements and is justified through soil moisture monitoring or soil water budgets and climatic information; and
- Irrigation staff are trained in the operation, maintenance and use of irrigation systems.

119. The final make-up of the review panel will require certification by the NRC. We also see the potential benefit of an independent review panel meeting with users, as a group and

[26] Williamson, Statement of supplementary evidence, para 48.

individually, to help them to achieve a high standard of efficient water use.

120. As noted above, we have also imposed a consent condition that allows the NRC to review consents and claw back some of the allocations if it is demonstrated that the quantities granted in consents, or used inefficiently, are not actually required taking efficient use into account. We expect that these audit and claw-back measures should avoid users "gaming" the system to minimise the impact of restrictions, or banking water, which was a concern raised by some submitters.

Allocation Limits for the Aquifer

121. The Aupōuri Aquifer is subdivided into 10 separate sub-aquifers for water allocation. Policy H4.4 of the pRPN specifies annual allocation limits for each sub zone. The abstractions being considered for this hearing are located in seven of those zones. The allocation situation for each zone, based on the annual volumes we have determined in Attachment 1 to this decision are summarised in the following Table:

Status of Aupōuri Allocation Zones (m^3/year)					
Zone	Allocation Limits	AAWUG	Current Allocation	Total	% Allocated
Waihopo	1,278,200	637,352	188,690	846,042	66%
Houhora	3,211,950	1,384,152	1,423,954	2,808,106	87%
Motutangi	1,604,400	187,280	958,842	1,146,122	71%
Paparore	3,787,500	756,960	1,211,252	1,968,212	52%
Sweetwater	4,675,000	412,980	4,206,982	4,619,962	99%
Ahipara	922,500	560,000	117,532	677,532	73%
Other		561,260	91,918	653,178	
Total		4,519,984	8,199,170	12,719,154	

Notes:

(a) Allocation limits are as specified in Table 29 of the pRPN. We note that at the time of the previous MWWUG decision, allocation limits for these groundwater management sub-units ranged from 10% – 35% of estimated rainfall recharge. Through the plan change process, the limits for the smaller groups have been increased so that they now range from 12% – 35% of estimated rainfall recharge.

(b) Annual Volumes are as determined in this decision and set out in Attachment 1.

(c) Current allocations are as set out in Table 2 of Brydon Hughes' (LWP) letter to NRC dated 27 July 2020 (Attachment 5 to the S42A Officers report).

(d) The Applicants' groundwater expert, Mr Williamson, reported that current consented use for the Sweetwater allocation zone was actually smaller than this number due to the double counting of some takes[27].

[27] Verbal comment during presentation of evidence.

122. This information shows that the subject consent applications all fit within the allocation quantities specified in the proposed plan. We were also advised by Council officers that the allocation limits are not subject to any live appeals.

123. Attachment 5 of the s42A report presented an amended version of the allocation chart, which redistributed the allocations for each bore *across* zones to allow for groundwater drawdown effects across the boundaries of the sub-zones. Whilst there is some merit in taking that cross-boundary effect into consideration, the method used by NRC is based simply on the *size* of the allocation volume and does not take into consideration any hydrogeologic factors, so it is not a realistic representation of actual cross-boundary effects that might occur. For that reason, we have not tried to apply that method to our annual volumes in the Table above. However, based on the information in Table 3 of Mr Hughes' letter we note that such an approach results in a smoothing of the allocations across the zones and makes the allocation numbers generally fit more comfortably within the limits. Both Mr Williamson and Mr Hughes therefore agree that those absolute % allocation numbers are conservative (i.e. upper bounds).

124. The key point is that, from an allocation rule perspective, the abstractions can appropriately be considered a discretionary activity based on Rule C.5.1.12 of the pRPN (whereas if they exceeded the allocation limits, they would be a Prohibited Activity under Rule C.5.1.17).

Monitoring regime and Trigger Levels

125. To address the issue of uncertainty around effects, the Applicant's WWLA technical advisers propose specific monitoring checks throughout the aquifer, based on the general approach established for the MWWUG consents by the Environment Court (Burgoyne v Northland Regional Council [2019] NZEnvC 28). There was considerable submitter concern about the uncertainties of this approach which, from a technical expert perspective, were raised by DoC's witnesses. These concerns were further amplified by the commencement of the NPS-FM during the course of the hearing. To help refine the technical differences, we directed further conferencing between the experts who appeared for the Applicant, DoC and the NRC. The outcome of that process was a more robust monitoring and trigger level regime, although this still did not satisfy all the concerns raised by DoC.

126. The regime proposed is set out in the GMCPs that are imposed for each of the three groupings of consents: Northern, Middle and South-western. This involves representative environmental monitoring throughout the area for the following parameters:

- Groundwater levels in both shallow and deep layers of the aquifer to indicate the drawdown effects caused by the consented abstraction bores;
- Shallow groundwater levels that would indicate effects on surface water features, including wetlands, that have a good hydraulic connection between the shallow groundwater and the surface water features;
- Electrical conductivity and water chemistry of coastal groundwater, as an indicator of any sea water intrusion into the aquifer;
- Monitoring of water levels and water quality at the consented production bores; and

- Monitoring of wetland vegetation for those wetlands that could be impacted by groundwater abstraction.

127. For the monitored bores, a 2-tier trigger level alert is proposed; tier 1 (TL1) being an alert (limit approaching); tier 2 (TL2) being an alarm (significant departure). These trigger levels are already defined for those bores that have more than 12 months of monitoring data, or will be specified in the future for new monitoring bores, after the first 12 months of monitoring has been completed.

128. If the trigger levels are breached, then investigations are implemented to understand the cause of the breach and, if it is a significant departure (TL2), then reductions in pumping rates are imposed on the consent holder(s).

129. Coupled with this monitoring programme is a 4-stage implementation of the consented abstractions. For new orchards the uptake of water will progress as follows:

- Stage 1 (Year 1): up to 25% uptake of total volume granted to each consent;
- Stage 2 (Years 2 – 3): up to 50% uptake of total volume granted to each consent;
- Stage 3 (Years 4 – 8): up to 75% uptake of total volume granted to each consent; and
- Stage 4 (Years 9 – full consent term): 100% uptake of total volume granted to each consent.

130. For existing orchards, the Applicants have proposed a modified progression, based on the state of development that has already occurred.

131. Prior to the commencement of a new stage of increased abstraction, experts appointed by NRC are required to review the available monitoring data and abstraction records to confirm that it is appropriate to increase the level of abstraction.

132. For each consent holder / group, an annual Environmental Monitoring Report must be prepared detailing information on groundwater quantities abstracted and the response of the aquifer in terms of any changes in groundwater levels and groundwater quality. This report will be submitted to the NRC each year and will be available to all submitters.

133. The Director-General of Conservation is a party to each GMCP to ensure that DoC's responsibilities are not jeopardised by any of the groundwater abstractions and to provide an oversight that the Objectives of the GMCP that are of relevance to DoC's interests, are met.

134. Our intention is to grant new consents for each application (except for Avokaha which is a change to a consent condition; which existing consent is not part of the GMCP process). Therefore, each new consent will follow the same 4 stage implementation programme listed above, without modification based on any existing level of development.

Finding

135. We share the concerns raised by DoC that the trigger levels formulae proposed in the GMCPs could lead to trigger levels being set that are inconsistent with the written description of what the TL1 and TL2 limits should achieve. We have therefore modified the GMCPs to define a calculation method to better achieve consistency with the written description, as discussed later in this decision.

136. We also acknowledge the concerns raised by DoC and many of the other submitters about the uncertainty of effects, noting that uncertainty around the exact nature of effects is not uncommon in consent decision making. As noted previously we heard no persuasive evidence that the potential effects of concern were more likely than not to eventuate. We are satisfied that the monitoring and trigger level regime, coupled with staged implementation, is an appropriate means of dealing with the uncertainty such that it will ensure that sustainable management of the resource is achieved.

Adaptive Management

137. At the heart of the opposition to the present applications were questions around the appropriateness and ability to adaptively manage the aquifer abstractions without generating adverse surface water effects, or compromising existing shallow bores or any aspect of the highly valued Aupōuri groundwater system.

138. The proposition that the requirements for an adaptive management approach are not met was initially raised in Ms Ongley's opening submissions for DoC, in which she also noted[28] that DoC was not, in principle, opposed to an adaptive management regime of the kind developed for the Kaimaumau wetland under the MWWUG consents.

139. However, in referencing the example of adaptive management taken from the EEZ and Continental Shelf (Environmental Effects) Act 2012 as determined by the Court of Appeal in *Trans Tasman Resources Limited v Taranaki Whanganui Conservation Board* ([2020] NZCA 86) and the principles earlier developed by the Supreme Court in *Sustain our Sounds v Marlborough District Council* ([2014] NZSC 40), Ms Ongley submitted that the application was, at that point in time (i.e. 2 September 2020), deficient.

140. To remind ourselves, in that latter case for resource consents sought by NZ King Salmon in the coastal marine area and therefore subject to the NZCPS, the Supreme Court had, in the course of its discussion as to whether a precautionary approach required prohibition rather than adaptive management, said[29] that would depend upon an assessment of a combination of four factors, being:

(a) the extent of the environmental risk (including the gravity of the consequences if the risk is realised);

(b) the importance of the activity (which could in some circumstances be an activity it is hoped will protect the environment);

(c) the degree of uncertainty; and

(d) the extent to which an adaptive management approach will sufficiently diminish the risk and the uncertainty.

[28] Ongley, Opening legal submissions, paras 39-44.
[29] [2014] NZSC 40, para [129].

141. Furthermore, we note for completeness, in the context of that case, the Court accepted as appropriate[30] the factors identified by that Board of Inquiry with respect to assessing what the Court had defined as factor (d) above, being

(a) there will be good baseline information about the receiving environment;

(b) the conditions provide for effective monitoring of adverse effects using appropriate indicators;

(c) thresholds are set to trigger remedial action before the effects become overly damaging; and

(d) effects that might arise can be remedied before they become irreversible.

142. In reply[31], Ms Ongley further articulated DoC's concerns. In summary she submitted that:

> … the uncertainty, risk and consequence of granting consent is magnified by the proposed use in both the existing MWWUG and AAWUG context. If further consents are to be granted in the face of such uncertainty they should only be granted on a very precautionary basis, and, for the Northern and South-Western groups, more information would be required.

143. That conclusion was based on three stated key issues:

(a) insufficient analysis (prediction) of potential adverse effects on an individual and cumulative basis;

(b) insufficient evidence to support the adequacy of the monitoring regime that will inform the adaptive management system; and

(c) submitters are not given surety that effects will be managed appropriately - due to vital decisions being delegated from the decision-maker to the NRC executive.

144. Fundamental to Ms Ongley's (and DoC's experts') concerns is an understanding of the existing allocation status of the rivers and streams that *may* be affected, including the threatened species that *may* also occur in those water bodies. As those species have not been identified, Ms Ongley submitted that we must assume their existence and decide accordingly.

145. Ms Ongley reminded us that the NPS-FM requires avoidance of adverse effects on natural wetlands, and that the pRPN Policy H.4.2 requires no change in dune lake levels underscoring a precautionary approach regardless of whether it strictly applies or not. Furthermore, she noted[32]:

> if an applicant wishes to rely heavily upon monitoring in the absence of a comprehensive effects assessment, very robust monitoring indeed would be required.

146. Ms Ongley concludes DoC's position, being:

> … without further work on assessing potential adverse effects, and gathering baseline information, 'adaptive management' is pre-emptive – the framework set out [in] Sustain Our Sounds is not adequately met. DOC does not consider there is an adequate evidential foundation, to establish that the proposed approach *will sufficiently reduce uncertainty and adequately manage any remaining risk*.

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[30] [2014] NZSC 40 para [133].
[31] Ongley, Legal submissions in reply, para 6.
[32] Ongley, Legal submissions in reply, para 40.

147. Ms Kane addressed this matter in her supplementary s42A report. While agreeing that there is inherent uncertainty in groundwater modelling and assessment, and that reversibility of adverse effects, or remediation prior to the point of irreversibility, is a key tenet of adaptive management, she concludes[33]:

> Council's position, based on the proposed conditions of consent and GMCPs, is that adaptive management is appropriate and can be implemented in a manner consistent with case law. The proposed regime allows for incremental increases in takes at a rate that enables effects to be measured and monitored as takes come online. Progression of takes to subsequent stages is through a defined process that requires additional assessment and agreement from Council. Trigger level breaches are managed through a defined process that includes investigative and remedial actions, along with potential suspension or cessation of takes if necessary. The scope for review of conditions and consent parameters is unrestricted. These matters constitute an appropriate level of precaution based on the probability, risk, extent and magnitude of the effects assessed.

148. In closing legal submissions for the Applicants, Mr Green submitted that:

> Commissioners have "*an adequate evidential foundation to have reasonable assurance that the adaptive management approach will achieve its goals of sufficiently reducing uncertainty and adequately managing any remaining risk*" such that the Supreme Court's threshold test in Sustain Our Sounds for the availability of adaptive management is met. The ground truthing of potential wetlands within the key AOIs is not required prior to the grant of consent in order for there to be an adequate evidential foundation for adaptive management, it is the foundation of hydrogeological information that is crucial. [*emphases in the original*]

149. Furthermore, Mr Green submitted[34] that:

> … the precedent which is on point in regard to these issues under the RMA is that of the Environment Court in *Burgoyne v Northland Regional Council* [2019] NZEnvC 28. That decision expressly endorsed the framework proposed in these applications as a lawful adaptive management regime. Those findings can be relied upon by the Panel.

Findings

150. We acknowledge the concerns raised by many submitters regarding the risks of these applications abstracting too much water creating risks to surface waterways, lakes, wetlands, drinking-water wells, causing subsidence or threatening the whole viability of the Aupōuri Aquifer. These are all valid issues that must be guarded against. However, the technical evidence did not indicate that any of these risks are likely to eventuate to an extent that is more than minor. To the contrary, the evidence was that if any of these effects were to occur they would be of a very minor scale, would likely be intercepted via monitoring, and that the abstractions are within the scale that is allowed for in the pRPN.

151. We also acknowledge that there is not perfect knowledge of the groundwater system to accurately predict the scale of effects with 100% certainty. A degree of uncertainty is not uncommon when dealing with groundwater issues and is best addressed by managing the gradual implementation of the abstractions accompanied by a detailed monitoring and review

[33] Supplementary s42A report for closing, para 18.
[34] Green, Closing legal submissions, para 5.2.

system. That is the approach adopted by the Environment Court for the previous MWWUG consents – and which we have further refined.

152. There was no dispute on the question as to whether an adaptive management approach is available in this instance. We understood the parties to accept that such was "on the table". The question, rather, was over the extent to which the relevant factors identified by the Courts were satisfied.

153. As we have noted above, we are satisfied that with the additional work that has been undertaken post-hearing and the refinements now made to the conditions (both Master and particular consents and GMCPs), consents can be established that meet the requirements to recognise and manage the uncertainty, both by active monitoring and telemetered feedback, such that the risks to surface water bodies and associated ecosystems is diminished and any effect on dune lakes, for example, is avoided.

154. Furthermore, we intend to impose additional conditions around water use efficiency and condition review (including independent technical review) to tighten up the ability for the consent authority to intervene pro-actively if the circumstance warrants. That continues the approach of cautious aquifer use and management.

Uncertainty and precaution

155. As noted above, one of the ever-present issues raised by submitters concerns, is the inherent uncertainty of groundwater (and therefore groundwater modelling). That is a matter that we have had to weigh very carefully in terms of the potential for adverse surface water effects (caused by drawdown of the water table) and wider drawdown effects in the aquifer affecting its use as a source of water supply. The modelling suggests that these risks are of low probability but would have high potential impact if such eventuate – particularly on wetlands, of which there are very many across the aquifer's extent. The former (surface water effect) is at the heart of DoC's concerns; the latter (shallow aquifer effects) for many submitters.

156. Ms Ongley noted[35] that the pRPN definition of precautionary approach has recently been amended by the Environment Court to read:

> ***D.2.18[36] Precautionary approach to managing effects on significant indigenous biodiversity***
>
> *Decision makers adopt a precautionary approach where the adverse effects of proposed activities are uncertain, unknown or little understood, on:*
>
> - *Indigenous biodiversity, including significant ecological areas, significant bird areas and other areas that are assessed as significant under the criteria in Appendix 5 of the Regional Policy Statement;*
> - *The coastal environment where the adverse effects are potentially significantly adverse, particularly in relation to coastal resources vulnerable to the effects of climate change.*

[35] Ongley, Submissions in reply, para 10.
[36] D.2.20 in the pRPN May 2021 version.

157. RPS policy 6.1.2, while not strictly relevant to these applications as that policy deals with climate change and GMOs, explains a precautionary approach for the purpose of the RPS as follows:

Taking a precautionary approach means that where there are threats of significant or irreversible adverse effects, and there is scientific uncertainty as to the extent of those effects, decision-makers shall assume the threat of significant or irreversible effects is a reality. The response should be in proportion to the degree of significance and irreversibility of the threat and the degree of scientific uncertainty

and notes that the following criteria may be applied:

Consideration of the degree of significance or irreversibility:

- *the scale of the threat;*
- *the value of the threatened environment;*
- *whether the possible adverse effects are able to be managed or contained;*
- *the level of public concern; and*
- *whether there is a rational or scientific basis for the concern.*

Consideration of the degree of scientific uncertainty:

- *what would constitute sufficient evidence;*
- *the level of scientific uncertainty; and*
- *the potential to reduce scientific uncertainty.*

158. We accept that explanation as properly and accurately describing the precautionary approach.

Finding

159. While we accept DoC's submission that granted consents must avoid adverse effects on wetlands, as is required by the NPS-FM, the evidence we have before us, which we accept is the best available information, is that:

(a) those effects are unlikely; and

(b) should they begin to manifest, the conditions of consent contain monitoring and alert mechanisms designed to ensure that the activity will avoid those effects propagating.

160. We therefore agree with Mr Green's submission in reply[37] that:

… shallow aquifer monitoring is an appropriate proxy for identifying any effects on surface water bodies. This is how avoidance of adverse effects is achieved as required by the policy framework.

161. If the extra monitoring information required by consent conditions and the GMCPs was to reveal occurrences of unacceptable adverse effects then consent holders must be prepared to accept the possible consequences of reduced abstraction rates, or in the extreme case, the loss of their consent. The available information does not indicate that is an expected outcome, but due to the degree of uncertainty we feel it is important to point out that the consent holders are subject to that risk.

[37] Green, closing legal submissions, para 1.8

162. We also note that consents are only being issued to 2033 and, notwithstanding s104(2A) RMA (which directs consideration of the value of investment made when determining a consent renewal application), there is no automatic right of renewal at that time.

Sections 104 RMA

163. We have found that the actual and/or potential adverse effects on the environment, conditioned within an adaptive management framework, will be generally minor or less – and will enable the avoidance of adverse effects on those water bodies as required under the NPS-FM. In that regard, granting the applications in the manner we have does not offend the relevant provisions of those instruments identified in s104(1)(b) RMA. The corresponding positive effects, in terms of economic and social environmental outcomes, are clearly considerable.

164. In finding such we repeat what we said when deciding the MMWUG consents at first instance back in 2018. This is a finding limited to the abstraction activity. We are aware that submitters have other concerns related to monocultural horticulture, application of supplements, visual amenity, and so forth. Those, however, are not matters for us in this decision.

Part 2 RMA

165. As noted earlier, the July 2021 appeals version of the pRPN gives effect to the higher order documents as their most recent expression. While the evidence and s42A report traversed Part 2 matters, concluding that the applications were consistent with it, following *Davidson* [[2018] NZCA 316], we see no need for or benefit from reference back to Part 2.

166. However, lest we subsequently be found to err in that conclusion, we paraphrase the following.

167. Section 6 RMA matters of national importance (generally (a-c) and (e)) and section 8 Treaty of Waitangi principles were identified by submitters as being engaged by these applications. We are satisfied that those matters have been addressed appropriately as far as there is jurisdiction to do so.

168. Of the section 7 other matters to which particular regard is to be had, the following were identified as being relevant:

    (a) Kaitiakitanga;

    (b) the efficient use and development of natural ... resources;

    (c) the maintenance and enhancement of amenity values; and

    (f) maintenance and enhancement of the quality of the environment.

169. Those matters were rehearsed in the respective documentation, evidence and representations made, and regard to them has been had in this decision.

170. When put into the wider context of the Part 2 sustainable management purpose of the RMA and the s30 RMA functions of regional councils, we are satisfied that both the aquifer and the relevant ecological and aquatic interests can sustain the abstractions that we are prepared to

grant. While we heard much concern about the potential for things to go awry, the technical evidence – including the ability to place significant monitoring and allied conditions around those takes - does not support that concern.

171. Specifically, we find that the applications do not conflict with the promotional sustainable management purpose of the RMA, in particular as that is expressed through the relevant national and regional planning provisions, and can be granted.

Conditions and GMCPs

172. The conditions and GMCPs are annexed as Attachments 2 and 3 to this Decision and are based upon the sets of conditions provided by the Applicants in its right of reply, annotated with Council and DoC comments where agreement was not reached. We have further modified those drafts.

173. For the Northern and South-western Groups, these are the first GMCPs for those areas, as far as we are aware. However, a GMCP already exists for the MWWUG (Middle) area. As noted earlier in our decision, to avoid interfering with the development of groundwater for the MWWUG consents, this decision provides for a separate GMCP for the new consents in the Middle Group. Also as noted previously in this decision, the Middle Group of consents have TL2 values that are triggered earlier than those for the MWWUG group so as not to increase the rate of groundwater development that was previously consented at times when the monitoring bores are showing low groundwater levels and/or increased electrical conductivity.

174. In most cases allocation volumes are based on the criteria described earlier in the application and these are subject to the 4-stage implementation schedule:

- Stage 1 (Year 1): up to 25% uptake;
- Stage 2 (Years 2 – 3): up to 50% uptake;
- Stage 3 (Years 4 – 8): up to 75% uptake; and
- Stage 4 (Years 9 – full consent term): 100% uptake.

175. This sometimes leads to a smaller consented volume than requested in the consent applications, although in most cases the difference is relatively small. For those consents where our decision is for a more significant reduction in volume, we provide the following explanation.

Northern Group

176. For the Te Aupōuri Commercial Development Ltd, we note that the distribution of the takes between the various sub-units of the Aupōuri Aquifer is different to what was indicated in the application information. However, we accept that change as something that can be adequately managed through the Staged Implementation and Monitoring Review (SIMPR) process set out in the GMCPs and the consent conditions.

177. For Te Aupōuri Commercial Development Ltd in the Waihopo sub-unit, the Applicants' version of the GMCP notes in footnote 2 that,

"The allocation from these bores is intended for a mixture of pasture and market gardening which will require the full amount of allocation dependent on the areas planted in each crop."

178. The staged development of the aquifer and the trigger level system is designed to manage the effects on the resource to address the uncertainties that are of significant concern to many water users and their technical advisers. We are not persuaded that the unspecified requirements of crop development should be a reason to change that careful development of the resource. We conclude that the development of the agricultural activities will need to be managed within the framework of the SIMPR process.

179. Henderson Bay Avocados Ltd seeks an increased rate of allocation for Stages 1 and 2 on the basis that they are an existing well-established orchard. However, as noted above, our decision is based on the gradual and carefully monitored development of groundwater use that was promoted by the Applicants' technical experts, with which we agree, and the development of crops will need to be modified to match that approach.

180. MV Evans (Property No 1) also seeks an increased allocation over and above the standard staged implementation because:

"Trees were planted in 2019/2020 or have to be planted in the 2020/2021 period due to ordering system"

181. We do not consider this a valid reason for allowing an increased rate of development of the groundwater resource over that being applied to all other users. The risk of ordering an excess of trees over confirmed allocated water is one that, we assume, was carefully, if inadvisably, assessed and taken.

Middle Group

182. Tuscany Valley Avocados Ltd and Tiri Avocados Ltd requested increased allocation during the staged implementation because of the following explanation:

"Well established orchards with existing consented allocation which now requires further water. The applicant of APP.040361.01.01 [Tiri Avocados Ltd] *indicates that they have an existing consent to take and use surface water but that this expires in 2021 and will not replace it if they have consent to take groundwater of sufficient amount in the first years to irrigate their established crop."*

183. However, as noted above, our focus is on the carefully managed and monitored staged development of the groundwater resource and we do not think the reason given above is sufficient justification to deviate from that.

184. Avokaha Ltd hold an existing consent, which was granted before the MWWUG consents, and its application is to change the daily rate and annual volume of groundwater that can be abstracted from its bore. The details of the change sought are:

(a) to increase the maximum daily volume from 160m^3/day to 230 m^3/day; and

(b) to increase the annual volume from 26,400 m^3/year to 31,200 m^3/year.

185. Those numbers are based on an expert irrigation design assessment included in the application, however they represent water application rates that are much higher than other orchards in the area. The orchard has a total area of 8 ha and a canopy area of 6.5 ha. Consequently, Avokaha Ltd is seeking a daily rate of 28.75 m^3/ha/day based on its total orchard area and an annual volume of 4,800 m^3/ha/year based on its canopy area. Both these numbers exceed the criteria we have describe earlier in this decision, based on the review of all the evidence presented to us. We note that the Avokaha irrigation design report has used *maximum* values for evapotranspiration and crop coefficients. That is in significant contrast to the evidence of Mr Ian Fulton who indicated that such maxima are not required and that actual usage figures from successful orchards in the area are much lower. There is nothing in the Avokaha application to indicate any unusual conditions that would justify the quantities sought.

186. Based on the allocation criteria determined earlier in this decision it would be appropriate for the daily rate for Avokaha to be increased from 160 m^3/day to 203 m^3/day (an increase of 43 m^3/day). However, the already consented annual volume of 26,400m^3 is sufficient for a canopy area of 6.5 ha and no increase is warranted. This change can most easily by achieved by varying the daily rate in condition 1(a) of existing consent AUT.008647.01.04 from 160 to 203 cubic metres per day. Because there is no new annual volume for Avokaha it has been removed from the GMCP for the Middle group of consents, and it is not subject to the standard conditions being used for the other consents described in this decision.

South-western Group

187. The South-western Group is dominated by the consent application by Te Rarawa Farming Limited and Te Make Farms Limited to replace water permit AUT.020995.01.03, which expired in May 2021, for an annual allocation of 2,317,000 m^3 to be taken from up to 14 bores. The replacement application seeks an increased annual volume of 3,093,000 m^3, but the AEE shows that to date only 2 bores have been drilled and that actual water use from 2014/15 – 2017/18 ranged from 265,502 m^3 – 404,099 m^3.

188. The Applicant has assumed that the existing consented quantity can carry on in an unrestricted manner and that only the increased volume of 776,000 m^3 should be subject to the staged implementation regime. However, given the information presented to us about the state of the aquifer, the need for cautious development and the concerns about water banking, we consider that all of the future unused quantity of water should be subject to the staged implementation regime. The exact split of the total allocation between the Sweetwater and Ahipara sub-units is not clear to us (and may not be known to the Applicant either). So, for the purpose of the GMCP we have simply listed the two sub-units as a single entry. That gives a Stage 1 annual volume of 773,250 m^3, which should comfortably accommodate the current level of water use.

Other matters

189. Apart from these changes to the annual allocation volumes specified in the GMCP's there are other measures we want to see implemented. Based on the comments from the groundwater experts, we consider it prudent to require pumping tests for all larger abstractions exceeding 864 m^3/day from a single bore field (i.e. a single bore or cluster of bores within 100 m of each

other), to be undertaken prior to the first exercise of their consent, unless existing nearby pumping test data is already available. This will allow a check on local conditions and the consistency with the predictions of the numerical groundwater model. The constant rate test must involve pumping the bore at its maximum rate, for at least 24 hours (but no longer than 72 hours of pumping), whilst monitoring water levels in the pumped bore and neighbouring bores of varying depths to determine aquifer parameters and enable a long-term prediction of drawdown effects on surrounding bores and surface water features.

190. For the Middle Group of Applicants, the GMCP for the consents granted for this AAWUG application needs to be a separate document from the GMCP for the MWWUG consents - so as not to interfere with the latter's staged implementation programme. In particular, we propose TL2 values that are midway between the MWWUG TL1 and TL2 values to ensure that, if necessary, restrictions are imposed on these new consents before the existing MWWUG consents are restricted.

191. We note that we are relying on future monitoring and the Independent Water Resource Effects Review Panel (described below) to ensure that effective trigger levels are put in place to ensure that unacceptable adverse effects do not occur. To this end we note that the GMCP states:

- "TL1 – The first-tier trigger level establishes whether the parameter of concern is approaching outer limits of baseline data." This means that TL1 must be set within, but towards the outer end of, the range of measurements at each monitoring point. The formulae proposed by the Applicant can result in trigger levels that fall outside the range of measured values which is inconsistent with the definition above. Therefore we have redefined the way in which TL1 values are calculated in the GMCP. This includes a new definition in the Glossary for, "Natural Baseline Values".

- "TL2 – The second-tier trigger level is set at a threshold defining a 'significant' departure from baseline conditions and/or conditions where the risks of adverse environmental effects are increased." This means that the initial, Stage 1, TL2 values should be set at, or just outside the outer range of measurements at each monitoring point. In a similar manner to the TL1 criteria, our view is that the default approach for calculating TL2 proposed by the Applicant can lead to values that represent a very large change compared to what is currently being measured. We have modified the initial GMCP TL2 criteria to establish limits that represent a more moderate level of change. TL2 values in subsequent years will need to be evaluated based on the monitoring data that is gathered as development of the resource progresses.

- The MWWUG consents have their trigger levels set for the Waiharara, Motutangi and Houhora sub-areas of the Aupōuri Aquifer Management Unit. Whilst it is outside the scope of this decision to change the current MWWUG trigger levels, we would encourage those Consent Holders, Council and Council's independent expert reviewers to revise the MWWUG trigger levels to be consistent with the calculation approach we have described in these GMCPs, to ensure that the trigger level values are consistent with the words that describe them and that they represent an appropriately cautious approach to resource development. To avoid interference with the staged implementation of the MWWUG consents, the TL2 values for the new consents for those monitoring points are set midway between the TL1 and MWWUG TL2 values, calculated using our revised approach.

192. We recognise there is current uncertainty regarding many of the trigger level values that have yet to be defined. In some cases TL1 and TL2 values are specified in the Applicants' proposed GMCPs, although those values need to be altered, based on the preferred approach that we have spelt out in the GMCPs. For other monitoring points the Applicants have listed the trigger levels as TBC (to be confirmed). These trigger level values will be established when sufficient monitoring data has been collected. We expect the guidelines in the three bullet points above to be followed when setting those trigger level values, and for the existing trigger levels to be reviewed to ensure consistency with that approach.

193. One confounding matter for defining the Natural Baseline Values (as defined in the GMCPs), on which the trigger level calculations are based is the variable effect of rainfall recharge to the aquifer, arising from the cyclical nature of forestry production and harvesting. That will need to be accounted for as the monitoring record grows and may lead to some modification of the trigger level values. Such is the nature of an adaptive management regime. However, in all cases, the trigger levels need to be related to the measured values at each monitoring point and represent limits that are consistent with the written description of what TL1 and TL2 represent.

194. We also recognise that as more monitoring is undertaken and more refined wetland identification is completed that there might be a requirement for modifications to the number and frequency of monitoring points. Such changes can be proposed by the Applicants, DoC, the Independent Water Resource Effects Review Panel or the Council, and can include alternative groundwater or surface water monitoring if that is shown to be required. The adaptive management approach needs to be responsive to all appropriate changes as new information comes to hand.

195. We also note that, in response to the submission from the Ministry of Education, we have added the Waiharara school water supply bore to the monthly manual water level monitoring schedule for the Middle GMCP.

Independent review panel

196. Two independent review panels will be established. One is to ensure that water is used efficiently and not in a wasteful manner. This is referred to as the Independent Irrigation Efficiency Review Panel. This will comprise two irrigation experts who will review water usage records to ensure water is being used efficiently and not wasted. If their assessments show that the quantity allocated to users in these consents is more than what is reasonably required to meet the water demand in 9 years out of 10, then they should recommend to NRC that a reduction in water allocation should occur.

197. The second independent review panel will review the monitoring information of effects on the water resources (including the pumping tests mentioned above) to ensure that no unacceptable adverse effects are occurring. This Independent Water Resource Effects Review Panel will comprise a hydrogeologist and an ecologist, to adequately cover concerns regarding wetlands. They can make recommendations to NRC if changes are required to the monitoring regime, to the trigger level values, or if reductions in abstraction rates are required to avoid unacceptable effects.

198. Both these review panels must confirm that acceptable effects are occurring before consent holders can progress to their next stage of development.

Need for a bond

199. The question as to whether a bond should be considered and imposed was raised by Ms Kane[38] in her supplementary s42A report:

> *In the context of these applications and the proposed conditions, a bond could be sought to guarantee the construction of all monitoring bores and instruments or the implementation of any necessary ecological surveys, or to provide security for remediation of unanticipated impacts on freshwater habitat or other water users. Given the nature of the activities, it is unlikely any bond would need to continue beyond the expiration of the consents (if granted).*

200. We do not consider such a performance bond necessary, regardless of the practicability of determining and imposing a bond across 22 individual consent holders. While we acknowledge the potential costs of remediation in the event that things go "awry", the practical difficulty of anticipating what that cost might be and fairly apportioning it is problematic – and we received no evidence on that. We are satisfied that the Council's enforcement and prosecution powers are sufficiently robust that, should such action be required, those matters can be pursued as appropriate.

Consent duration

201. While the Applicants sought varying terms of up to 35 years in their lodged applications, by the close of the hearing it had been accepted that these consents and those granted to the MWWUG should expire at the same time in 2033. This will enable a comprehensive review of the aquifer to be undertaken when any renewal applications are made, and any emergent effects can then be taken into account based on the comprehensive monitoring data collected during the term of the consents granted.

202. While the option of doing this pursuant to a s128 RMA condition review across the board was considered that, of course, does not enable a reconsideration of the duration (refer s132(1) RMA) – which may be in issue. That option is not therefore pursued. We also note that under s104(2A) RMA the consent authority, when considering an application for renewal under s124 RMA, must have regard to the value of the investment of the existing consent holder.

Summary conclusion

203. While the sum total abstraction determined by us (i.e. c4.52 million m^3/yr) is large in terms of pure quantity, the evidence clearly indicates that it is relatively small in comparison to the annually available "throughput" of the aquifer and is sustainable from that point of view. Furthermore, we are satisfied on the evidence that any localised connectivity between the layers can be adequately monitored in real time with appropriately peer reviewed and set trigger levels that will alert parties and Council to unanticipated variations in sufficient time to avoid adverse surface effects. Furthermore, the conditions imposed carry real risk for the consent holders in that their ability to abstract the totals sought is not guaranteed should

[38] Supplementary s42A report, para 42.

monitoring show that the system behaves in a materially differently way to that modelled by WWLA.

Decisions

204. In exercising delegated authority under sections 34 and 34A of the Resource Management Act 1991 (RMA) and having regard to the foregoing matters, sections 104 and 104B of the RMA, the 24 individual discretionary activity water abstraction consents sought by the Aupōuri Aquifer Water User Group Applicants are granted as specified in the Attachments (below) to this decision.

Summary reasons for the decision

205. After having regard to the actual and potential effects on the environment of allowing the proposed activity, and taking into account the relevant statutory provisions, we find that consents for the proposed activities should be granted for the reasons discussed throughout this decision and, in summary, because:

    (a) the proposed activities are consistent with the provisions of the relevant statutory document(s) and, with the conditions imposed, will avoid, remedy or mitigate as required the adverse effects that might otherwise be created;

    (b) the amount of water to be abstracted is within the parameters established by the best information currently available;

    (c) granting consent is consistent with the sustainable management purpose and principles of the RMA and Council's integrated management functions under section 30 of the RMA; and

    (d) granting consent better meets the purpose of the RMA.

206. Overall, we find that granting consents for the applications is appropriate.

David Hill
Independent Hearings Commissioner (Chair)

and for Commissioner Peter Callander

Date: 31 August 2021

Attachment 1: Allocation Table

													the lessor of			
Map id	Application Number	Applicant	FMU	Status	Use	Total Irrigation Area or Orchard area (ha)	Canopy Area (ha)	Ratio Canopy / Total Area	Application Daily Maximum (m3/day)	Calculated m3/ha/day	Decision on Daily Volume	Application Annual Volume (m3/yr)	Max daily rate for 149 days	3920m3 / canopy area	Decision on annual volume (m3/yr)	
1	APP.039859.01.01	Te Aupouri Commercial Development Ltd			Currently sheep & beef. 3 sub-areas to be converted to horticulture, cropping & market gardening	Te Raite station = 1849 ha			10400.0	40.0	10400	1,170,000	1,549,600		1,170,000	
			Aupouri-other	New	Horticulture	35	NA	NA				157,500			157,500	
			Waihopo	New	Horticulture/ Cropping	100	NA	NA				450,000			450,000	
			Houhora	New	Horticulture/ Cropping	125	NA	NA				562,500			562,500	
2	APP.040601.01.01	Waikopu Avocados Ltd	Waihopo	Expansion	Avocados	28	22.4	80%	736	26.3	736	83,360			80,800	
					New combined total	*40*	*32*	*80%*	*1,000*	*25.0*		*128,000*	*149,000*	***125,440***		
3	APP.017428.02.01	Henderson Bay Avocados Ltd	Waihopo	Expansion	Avocados	7.12	5.7	80%	178	25.0	178	19,000			18,360	
					New combined total	*10*	*8*	*80%*	*250*	*25.0*		*32,000*	*37,250*	***31,360***		
4	APP.040600.01.01	Far North Avocados	Waihopo	New	Avocados	9.6	8	83%	240	24.0	240	32,000	35,760	**31,360**	31,360	
5	APP.041211.01.01	Paul McLaughlan	Waihopo	New	Avocados	28	19.6	70%	700	28.6	613	78,400	91,263	**76,832**	76,832	
6	APP.040121.01.01	NE Evans Trust & WJ Evans & J Evans	Houhora	New	Avocados	67	40	60%	1,675	33.5	1250	160,000	186,250	**156,800**	156,800	
7	APP.040231.01.01	P & G Enterprises	Houhora	New	Avocados	11.3	7	62%	350	40	219	28,000	32,594	**27,440**	27,440	
8	APP.039644.01.01	Diane Wedding & Martin Doody	Houhora	New	Avocados	95	76	80%	2,375	25.0	2375	304,000	353,875	**297,920**	297,920	
9	APP.040397.01.01	A Matthews	Houhora	New	Avocados	3.8	3	79%	95	25.3	94	12,000	13,969	**11,760**	11,760	
10	APP.040652.01.01	SE & LA Blucher	Houhora	New	Avocados	28.8	24	83%	720	24.0	720	96,000	107,280	**94,080**	94,080	
11	APP.040919.01.01	NA Bryan Estate, SG Bryan, CL Bryan, KY Bryan Valadares & D Bryan (Property No 1)	Houhora	New	Avocados	25	20	80%	500	20.0	500	80,000	**74,500**	78,400	74,500	
12	APP.040979.01.01	MV Evans (Property No 2)	Houhora	New	Avocados	45	31.5	70%	1,125	28.6	984	126,000	146,672	**123,480**	123,480	
13	APP.040558.01.01	MV Evans (Property No 1)	Houhora	New	Avocados	14	9.1	65%	350	30.8	284	36,400	42,372	**35,672**	35,672	
14	APP.040130.01.01	Tuscany Valley Avocados Ltd (M Bellette)	Motutangi	New	Avocados	15	9	60%	375	33.3	281	36,000	41,906	**35,280**	35,280	
15	APP.040918.01.01	NA Bryan Estate, SG Bryan, CL Bryan, KY Bryan Valadares & D Bryan (Property No 2)	Motutangi	New	Avocados	50	40	80%	1,000	20.0	1000	160,000	**149,000**	156,800	149,000	
16	APP.008647.01.06	Avokaha Ltd (c/- K Paterson & A Nicholson)	Motutangi	Expansion	Avocados				70		43	4,800			0	
					New combined total	*8*	*6.5*	*81%*	*230*	*28.3*	203	***31,200***	*34,270*	*25,480*		
17	APP.039628.01.04	KSL Ltd (c/- S Shine)	Motutangi	Increase application rate, no new area	Avocados	10	7.5	75%	90		74	3,600			3,000	
						10	7.5	75%	250	*26.7*	234	30,000	34,922	**29,400**		
18	APP.040361.01.01	Tiri Avocados Ltd.	Paparore	New	Avocados	155	145	94%	3,876	21.4	3876	581,250	577,524	**568,400**	568,400	
19	APP.040362.01.01	Valic NZ Ltd	Paparore	New	Avocados	46	43	93%	1,158	21.5	1158	173,700	172,542	**168,560**	168,560	
20	APP.040363.01.01	Wataview Orchards (Green Charteris Family Trust)	Paparore	New	Avocados	9	8.4	93%	225	21.4	225	20,000	33,525	**32,928**	20,000	
21	APP.039841.01.02	Mate Yelavich & Co Ltd	Auopuri-Other	New	Avocados	18	13	72%	450	27.7	406	52,000	60,531	**50,960**	50,960	
22	APP.040386.01.01	Robert Paul Campbell Trust	Auopuri-Other	New	Avocados	134	90	67%	3,350	29.8	2813	360,000	419,063	**352,800**	352,800	
23	APP.040364.01.01	Elbury Holdings Ltd (C/-K J & F G King)	Sweetwater	New	Avocados	75	50.25	67%	1,875	29.9	1570	200,000	233,977	**196,980**	196,980	
24	APP.020995.01.04	Te Rarawa Farming Ltd and Te Make Farms Ltd	Sweetwater	Expansion					10,705		10,705	216,000	443,982		216,000	
			Ahipara									560,000	1,151,063		560,000	
				New Total Combined Activity	*Pasture (360 ha), Avocado or other horticultue (430 ha)*	*830*	*NA*	*NA*	*26,230*	*32*		*3,093,000*	*3,908,270*			

Notes:

1. Where the calculated rate in m3/ha/day is greater than 25, the decision on the daily rate is to reduce that value so that it matches a rate of 25 m3/ha/day. These cells are shaded.

Attachment 2: Master Consent

APPENDIX A –MASTER CONSENT CONDITIONS

General

1MC. The consented activity must not, individually or cumulatively, result in:

(a) Adverse effects of saltwater intrusion into the Aupōuri aquifer;

(b) Adverse effects on the hydrological functioning, including changes to water levels[1], of natural wetlands, springs and dune lakes, including the Kaimaumau-Motutangi wetland;

(c) Alterations to the extents of rivers, natural wetlands, springs and/or dune lakes, including the Kaimaumau-Motutangi wetland;

(d) Adverse effects on the significant indigenous vegetation and habitats in (terrestrial and freshwater environments of) dune lakes, springs and natural wetlands, including the Kaimaumau-Motutangi wetland;

(e) Adverse effects on the flow levels and flow variability of rivers and streams and springs so that their habitat quality and sustainable mahinga kai, recreational, and other social and cultural values, are maintained (including sufficient flows and flow variability to maintain their habitat quality, including to flush rivers of deposited sediment and nuisance algae and macrophytes and support the natural movement of indigenous fish and valued introduced species such as trout); and

(f) Lowering of the groundwater levels of the Aupōuri aquifer such that existing efficient bore takes operating as a permitted activity or in accordance with resource consent conditions cannot access the authorised volume of groundwater.

2MC. The Consent Holder shall, for the purpose of discussing the results of monitoring required under the most recent revision of the Groundwater Monitoring and Contingency Plan (GMCP), form and maintain (including providing all administrative support) a Kaitiaki Liaison Group. The Kaitiaki Liaison Group shall comprise the Consent Holders listed in the GMCP, Waiora marae, Ngāi Takoto Iwi, Te Aupōuri Iwi, and Te Rarawa Iwi, and the Northland Regional Council. The Consent Holder shall hold a meeting of the Kaitiaki Liaison Group not less than once every year in September following the preparation of the Annual Environmental Monitoring Report required to be prepared in accordance with Section 3.6 of the GMCP's.

3MC. The meeting shall be held at a time convenient for the majority of the Kaitiaki Liaison Group members.

Advice Note: *It is the intended that all consent holders listed in the GMCP form a single Kaitiaki Liaison Group. The aim of the Kaitiaki Liaison Group shall be to share information relevant to the management of the Aupōuri aquifer and to make recommendations to the Northland Regional Council on any actions required under their review authority to address any identified adverse effects. Such recommendations may be incorporated into the adaptive management plan. The minutes of the meeting shall be made available to all interested parties.*

[1] Avoiding "change" means that as a result of the abstraction of water; median water levels, mean annual water level fluctuations and patterns of water level seasonality (relative summer vs winter) remain unchanged.

Prior to the Exercise of Consent

4MC. Prior to the exercise of this consent, new bores and all associated monitoring equipment required to be installed for the purposes of monitoring the baseline effects in accordance with the GMCP shall be constructed and installed by a suitably qualified person(s). All monitoring bores must be of sufficient depth to accommodate water level fluctuations so that all the required monitoring can occur.

5MC. Where the GMCP requires that the frequency of monitoring for a parameter is continuous, then the monitoring equipment shall be installed as follows:

(a) For groundwater level recording, to the requirements of the National Environmental Monitoring Standards Water Level: Water Level Field Measurement Standard, Version 3.0.0, dated July 2019;

(b) Monitoring bores must be of sufficient depth to allow measurements across the full range of water level fluctuations;

(c) For conductivity sensors they must be able to record "Specific Conductance" (corrected to 25 degrees Celsius), have available software for field calibration, and be able to record across the whole expected conductivity range for the water body measured;

(d) Sensors must be installed in a secure manner to ensure stationarity over time;

(e) Instantaneous reading recorded every five (5) minutes;

(f) Recording to NZ Standard Time (NZST);

(g) Water Level readings compensated for barometric pressure prior to transmission;

(h) Telemetered to Northland Regional Council with a minimum of hourly transmission of data; and

(i) Reference points levelled to One Tree Point datum and New Zealand Vertical Datum.

6MC. Prior to the exercise of this consent, the Consent Holder shall provide to the Council's assigned monitoring officer the installation details from the suitably qualified person(s) of all monitoring equipment that has been installed in accordance with Condition 5MC. This information will be used by the Council to determine compliance with Conditions 4MC and 5MC.

7MC. Prior to the exercise of this consent, a suitable approach to detecting and responding to saline intrusion effects during Stage 1 (Year 1) shall be prepared. The Council's Compliance Manager shall certify that the approach to detecting and responding to saline intrusion will give effect to Condition 1MC. The certified information shall be inserted into the GMCP through the process set out in Condition 10MC prior to the exercise of this consent.

Monitoring and Contingency Measures

8MC. This consent shall be exercised and monitored in accordance with the GMCP.

9MC. The Consent Holder shall, at all times, provide safe and easy access to the production bore wellhead(s) for the purpose of undertaking monitoring on the bore(s), as set out in the GMCP.

10MC. Excluding the Staged Implementation and Monitoring Programme Review (SIMPR) process, the GMCP may be amended at any time by the following process:

(a) Subject to Condition 10MC(d), the Council may amend the GMCP by providing notice in writing to the Consent Holder that the GMCP has been amended and providing a copy of the amended GMCP to the Consent Holder.

(b) Subject to Condition 10MC(d), the Consent Holder may submit a request for an amendment by giving written notice to the Council of the proposed amendment along with any supporting technical documents.

(c) Prior to making any decision to amend the GMCP or not, the Council will seek input on any proposed amendment from the Consent Holder and from the Director-General of Conservation.

(d) The Council will not approve any amendment to the GMCP unless the technical assessment of the proposed change clearly indicates that the change will not result in a breach of Condition 1MC.

Attachment 3: Consent Conditions by Group and Groundwater Monitoring and Contingency Plans

Northern Group

Consent conditions

AAWUG Conditions – Northern Group

This framework comprises conditions applicable to the following applications:

APP.040601.01.01	Waikopu Avocados Limited
APP.017428.02.01	Henderson Bay Avocados
APP.040600.01.01	Far North Avocados Ltd
APP.041211.01.01	P McGlaughlin
APP.039859.01.01	Te Aupōuri Commercial Development Ltd
APP.040121.01.01	NE Evans Trust & WJ Evans & J Evans
APP.040231.01.01	P & G Enterprises (PJ & GW Marchant)
APP.040652.01.01	SE & LA Blucher
APP.039644.01.01	MP Doody & DM Wedding
APP.040397.01.01	A. Matthews
APP.040558.01.01	MV Evans (Property 1)
APP.040979.01.01	MV Evans (Property 2)

Note: *Pursuant to Section 116 of the Resource Management Act 1991, the date of commencement of this consent is* ***XX XX 20XX****.*

[CONSENT HOLDER]

AUT.XX **To take and use groundwater from the Waihopo, Houhora and Other sub-aquifers of the Aupōuri Aquifer for horticultural irrigation purposes.**

LOCATION

Address of Site

[Insert address reference]

Legal Description of Site

Site of take: [Insert legal descriptions]

Sites of use: [Insert legal descriptions]

Map Reference (New Zealand Transverse Mercator Projection)

[Bore 1:XXE XXN]

[Bore 2:XXE XXN]

Note: An error accuracy of +/- 50 metres applies to these map references.

CONSENT DURATION

This consent is granted for a period expiring on **30 November 2033.**

CONDITIONS OF AUT.XX

1 The Consent Holder shall pay all charges relating to the recovery of cost for the administration, monitoring and supervision of this consent fixed by Council under Section 36 of the Resource Management Act 1991.

2 The exercise of this consent is bound by the Master Consent conditions **attached** as Appendix A. The Master Consent uses an alternate numbering system '1MC, 2MC, 3MC…'.

3 Subject to compliance with the conditions of this consent, the activity authorised by this consent shall be carried out in accordance with the application and documents submitted as part of the application, including the following documents:

(a) [Insert original AEE document for the specific application];

(b) Assessment of Environmental Effects prepared by Williamson Water & Land Advisory Ltd: *Aupōuri Aquifer Groundwater Take Consent Applications, Assessment of Environmental Effects – Aupōuri Aquifer Water User Group. WWLA0184: Rev. 2*, dated 27 February 2020;

(c) Model Report prepared by Williamson Water & Land Advisory Ltd: *Aupōuri Aquifer Groundwater Model, Factual Technical Report – Modelling – Aupōuri Aquifer Water User Group. WWLA0184: 3*, dated 5 February 2020.

For the avoidance of doubt, where information contained in the application documents is contrary to the conditions of this consent and those in the Master Consent (Appendix A), or where the information contained in the application documents is internally inconsistent, the conditions of this consent and the Master Consent shall prevail over any other submitted information.

4 This consent operates under an adaptive management regime. The detail of that adaptive management regime is set out in the Groundwater Monitoring and Contingency Plan for the Other, Waihopo and (northern) Houhora sub-aquifers of the Aupōuri Aquifer Management Unit, **Dated: [XX XX 2021] ("GMCP")**. The primary purpose of the GMCP is to set out the procedures by which the abstraction will be monitored and managed to ensure compliance with Condition 1MC. For the purpose of this consent, the GMCP is the most recent version of the GMCP amended under Condition 10MC.

5 In the event that any of the provisions of the GMCP conflict with the requirements of these conditions of consent, these conditions of consent shall prevail. Where there is no conflict, the consent holder must comply with the GMCP at all times.

6 The consent shall be exercised in a staged manner as follows:

(a) Stage 1, which shall be a period during which:

- 12 months of monitoring baseline data has been collected and used to define all the trigger levels specified in the GMCP; and
- irrigation has occurred for one full irrigation season where the irrigation water has been sourced, as far as practicable, from the Stage 1 annual volume as set out in Condition 9;

(b) Stage 2, which shall be for the minimum period of two consecutive full irrigation seasons;

(c) Stage 3, which shall be for the minimum period of five consecutive full irrigation seasons;

(d) Stage 4 which shall be from the full irrigation season immediately following written approval from the Council to progress from Stage 3 until the expiry of the consent, unless Conditions 12-17 apply

7 The combined daily volume of water taken across all bores shall not exceed the following:

(a) [XX] cubic metres in any 24 consecutive hours unless Conditions 12(b), 14, 16 or 17 of this consent apply; and

(b) That required to replace soil moisture depleted by evapotranspiration over the irrigated area.

8 The Consent Holder shall take all practicable steps to ensure that:

(a) The volume of water used for irrigation does not exceed soil field capacity of the irrigated areas;

(b) The irrigation does not cause surface runoff that would discharge into natural waterbodies;

(c) There is no leakage from pipes and structures;

(d) The use of water is confined to targeted areas;

(e) Irrigation induced soil erosion and soil pugging does not occur;

(f) Soil quality is not degraded as a consequence of irrigation; and

(g) Loss of water, nutrients, and agrichemicals by percolation to groundwater is minimised.

Compliance with this condition will be demonstrated by the Water Use Efficiency conditions 24– 30 and the outcome of the Irrigation Efficiency Review Panel tasks described in the GMCP.

9 Unless conditions 12 – 17 require a reduced volume, then the annual volume of water taken from Bore [xx] for each stage shall not exceed the following:

(a) Stage 1: [XX] cubic metres between 1 July in a year and 30 June in the following year;

(b) Stage 2: [XX] cubic metres between 1 July in a year and 30 June in the following year;

(c) Stage 3: [XX] cubic metres between 1 July in a year and 30 June in the following year;

(d) Stage 4: [XX] cubic metres between 1 July in a year and 30 June in the following year.

10 Progress to the next stage shall only occur where written approval is given by the Council's Compliance Manager; and

(a) This written approval will only be given if the Council is satisfied that the Staged Implementation and Monitoring Review prepared in accordance with the GMCP confirms that the groundwater abstraction complies with Condition 1MC and that decision has been informed by independent hydrogeological, ecological and irrigation efficiency expert reviews; and

(b) A decision on written approval will not be made until the Council has consulted with the Consent Holder and the Director-General of Conservation over the Staged Implementation and Monitoring Review; and

(c) Notwithstanding Condition 10(b), written approval to progress from Stage 1 to Stage 2 will not be considered unless all the monitoring trigger levels required by the GMCP have been set and agreed to by the independent hydrogeological and ecological reviewers; and

(d) A report detailing the reasons for the Council's decision in regard to progressing to the next stage, including the identification and discussion of any matters raised during the consultation described in Condition 10(b), will be provided to the Consent Holder and the Director-General of Conservation.

Breaching of Trigger Levels

11 In the event of a Trigger Level 1 (TL1) in the GMCP being exceeded, the following actions and requirements shall be initiated:

(a) The Consent Holder shall liaise with the Council to ensure that additional monitoring of water levels and water quality is undertaken to better understand the pattern of low water levels and/or poorer water quality and the contribution that bore abstractions are making to this pattern. This extra monitoring will take the form of more frequent measurements and additional monitoring points in the vicinity of the locations where TL1 values have been exceeded.

(b) The measures specified in the GMCP for an exceedance of TL1.

12 In the event of a Trigger Level 2 (TL2) in the GMCP being exceeded, the following actions and requirements shall be initiated:

(a) The Council will notify the Consent Holder in writing that a TL2 has been breached within 24 hours, or as soon as practicable, of it becoming aware of the breach;

(b) Upon receipt of this notice, the Consent Holder shall immediately reduce its daily abstraction to 50% of the current average daily quantity, as advised by the Council in the notice. The current average daily quantity will be calculated using the previous month's water use records as required by Condition 22. If the exceedance occurs within one month of a Consent Holder first taking water for irrigation purposes within an irrigation season, then the average shall be calculated using the water use records for this period only;

(c) The measures specified in the GMCP for an exceedance of TL2, including that the Council will commission a Groundwater Trigger Exceedance Report (GTER) to assess why the trigger level has been breached, identify the pumping bores in the area of effect, and review all of the available data collected in the affected area(s).

13 Once Condition 12(b) has been complied with, the Consent Holder may apply to the Council's Compliance Manager for an alternative reduction in its daily water take volume. Council's approval of an alternative reduction value will only be given if it is satisfied, based on the results of the GTER, that a TL2 exceedance that is attributable to this consent will not occur. The applicable alternative reduction value is the value that is contained in the recommendations made in the GTER required to be prepared by Condition 12(c).

14 If the TL2 trigger levels are still exceeded after 21 days, then the Consent Holder shall reduce its daily abstraction to 25% of the current average daily quantity calculated for Condition 12(b). The Council will notify the Consent Holder in writing of any continued exceedance and the required further reduction in the daily water take volume.

15 Once Condition 14 has been complied with, the Consent Holder shall also comply with the recommendations contained in the revised and updated GTER commissioned by the Council which will be prepared for the purpose of specifying a programme of actions to achieve compliance with Condition 1MC.

16 If the TL2 trigger levels continue to be exceeded after the implementation of the remedial measures required under Conditions 12-15, the Council shall either require the Consent Holder to suspend the exercise of this consent, or continue its daily abstraction at a further specified reduced rate, until such time as the Council issues written notice that the Consent may be exercised again in accordance with the requirements of any subsequently revised and updated GTER.

17 Any abstraction that results in non-compliance with Condition 1MC must be suspended.

Notification of Irrigation

18 When irrigation is to commence for the first time each season, the Consent Holder shall advise the Council's assigned Monitoring Officer in writing at least five working days prior to the exercise of this consent.

Backflow Prevention

19 Prior to the first exercise of this consent, a backflow prevention system shall be installed on all horticultural irrigation systems that draw water directly from a production bore and are also used to apply animal effluent, agrichemical or nutrients to prevent the backflow of contaminants to groundwater.

Metering and Abstraction Reporting

20 Prior to the first exercise of this consent, a meter, shall be installed and maintained to measure at least every 15 minutes the volume of water taken, in cubic metres, from each production bore. Each meter shall:

(a) Be telemetered to the Northland Regional Council;

(b) Be sealed and as tamper-proof as practicable;

(c) Be installed at the location from which the total volume of water is taken;

(d) Have an accuracy of +/-5%,

(e) Have an international accreditation or NZ equivalent calibration endorsement, and

(f) Be installed and maintained throughout the duration of the consent in accordance with the manufacturer's instructions to ensure the meter is fully functional at all times.

The Consent Holder shall, at all times, provide safe and practical access to each meter installed for Council to undertake visual inspections, data retrieval, and record water take measurements.

21 The Consent Holder shall verify that the meter required by Condition 20 is accurate. This verification shall be undertaken prior to 30 June:

(a) Following the first taking of water from each production bore in accordance with this consent; and

(b) At least once in every five years thereafter.

Each verification shall be undertaken by a person who, in the opinion of the Council's Compliance Manager, is suitably qualified. Written verification of the accuracy shall be provided to the Council's assigned Monitoring Officer no later than 31 July following the date of each verification.

22 The Consent Holder shall keep a record of the daily volume of water taken from each production bore in cubic metres, including all nil abstractions, using the readings from the meter(s) required by Condition 20.

23 A copy of the records required to be kept under Condition 22 shall be forwarded to the Council's assigned Monitoring Officer annually by the 31 July, for the previous period 1 July to the 30 June.

In addition, a copy of these records shall be forwarded immediately to the Council's assigned Monitoring Officer on written request. The records shall be in an electronic format that has been agreed to by the Council.

Water Use Efficiency

24 The Consent Holder shall prepare an Irrigation Scheduling Plan (ISP) that outlines how irrigation decisions will be made. The purpose of the ISP is to set out how the irrigation will be undertaken to ensure that at least 80 percent of the annual volume of water applied to the irrigable area is retained in the soil in the root zone of the crop, compared to the average gross depth of water applied to the crop. The ISP shall be prepared by a suitably qualified and experienced person and submitted to the Council's Compliance Manager for written certification that it will achieve the purpose of this condition. The ISP shall, as a minimum, address:

- Water balance and crop water requirements;
- Subsurface drainage;
- Measures for continuous improvement in water efficiency; and
- Overall irrigation strategy.

For each irrigation area, the ISP shall include:

(a) A map of the irrigation area;

(b) A description of how water requirements for each irrigation cycle are calculated;

(c) Method(s) for assessing current soil moisture levels;

(d) Method(s) for assessing potential evapotranspiration (PET) and rainfall to date;

(e) Soil moisture target to be maintained in each zone by irrigation;

(f) How measured data will be used to assess irrigation requirements over the next irrigation cycle;

(g) A description of proposed method(s) for remaining within consent limits at each borehole or group of boreholes; and

(h) Continuous improvement in water efficiency.

25 The Consent Holder shall not exercise this consent until the ISP required by Condition 24 has been certified by the Council's Compliance Manager. That certification shall be informed by an Independent Irrigation Efficiency Review Panel comprising two independent irrigation experts appointed by Northland Regional Council and be funded by the Consent Holder.

26 The ISP certified in accordance with Condition 24 shall be implemented prior to the first irrigation season, unless a later date has been approved in writing by the Council's Compliance Manager.

27 The Consent Holder must comply with the ISP at all times.

28 The Consent Holder shall, within six months of the first exercise of this consent, undertake an audit of the irrigation system and of the certified ISP. The audit shall be undertaken by a suitably qualified and experienced person. The irrigation system audit shall be prepared in accordance with Irrigation New Zealand's "Irrigation Evaluation Code of Practice" (dated 12 April 2010), and shall include recommendations on any improvements that should be made to the system to increase water efficiencies or any amendments to the ISP. The results of the audit and its recommendations shall be submitted in writing to the Council's assigned Monitoring Officer within one month of the audit being undertaken. Any recommended amendments to the ISP shall be submitted to the Council's Compliance Manager for written certification that it will achieve the condition 24 purpose of the ISP before they take effect. A follow-up audit shall occur at five yearly intervals throughout the term of this consent with the intent of confirming an irrigation efficiency of at least 80 percent.

29 The Consent Holder shall, within three months of notification in writing by the Council's Compliance Manager, implement any amendments certified under Condition 28.

30 The reticulation system and its component parts shall be maintained in good working order to minimise leakage and wastage of water.

31 The rate at which water is applied to the irrigated area shall not result in ponding of irrigated water within any irrigated area, or runoff from either surface or subsurface drainage to a water body, as a result of the exercise of this consent.

Advice Note: *The ISP seeks to ensure that at least 80 percent of the annual volume of water applied to the irrigable area is retained in the soil in the root zone of the crop, compared to the average gross depth of water applied to the crop.*

Review Condition

32 In addition to any reviews otherwise required under the above conditions of this consent, the Council may, in accordance with Section 128 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the conditions of this consent at any time for any one or more of the following purposes:

(a) To deal with any adverse effects on the environment that may arise from the exercise of the consent and which it is appropriate to deal with at a later stage – including matters stated in Master Consent condition 1MC; or

(b) To insert or amend trigger level thresholds established in accordance with the GMCP as conditions of consent; or

(c) To reduce the abstraction quantity authorised by this consent if the water use is determined to be inefficient or surplus to needs; or

(d) To review the allocation of the resource; or

(e) In response to any other relevant reason for review identified in Section 128 of the Resource Management Act.

A review of this consent may be carried out separately or together with reviews of other consents for the purpose of managing the effects of the activities carried out under those resource consents.

The Consent Holder shall meet all reasonable costs of any such review.

Lapsing Condition

33 This consent shall lapse five (5) years after the date that the consent commences in accordance with section 116(1) of the Resource Management Act 1991, unless the consent has been given effect to before this date.

Northern Group

Northern Group GMCP

Groundwater Monitoring and Contingency Plan for the Other, Waihopo and (northern) Houhora sub-aquifers of the Aupōuri Aquifer Management Unit

31 August 2021

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GLOSSARY OF TERMS

Saline/saltwater intrusion	For the purposes of this Groundwater Monitoring and Contingency Plan, saline/saltwater intrusion refers to changes in salinity at nominated monitoring locations that exceed thresholds established to indicate elevated potential for adverse effects on groundwater quality for potable supply and/or irrigation use and effects on freshwater ecosystems.
Efficient bore takes	An efficient bore take is when a bore fully penetrates the water bearing layer and takes water from the base of the aquifer.
Sub-aquifer	The Aupōuri Aquifer system is divided into 10 separate sub-aquifer units for the purposes of setting tailored aquifer-specific allocation limits.[1]
First in-first served	Under the Resource Management Act 1991, applications for water takes are processed in the order in which they are lodged. The rights of parties associated with this Groundwater Monitoring and Contingency Plan are prioritised according to the order in which their permits are granted and added to this Plan.
Stage 1	The period during which: • 12 months of monitoring baseline data has been collected and used to define all the trigger levels specified in this GMCP; and • irrigation has occurred for one full irrigation season where the irrigation water has been sourced, as far as practicable, from the Stage 1 annual volume specified in Table 1 of this GMCP, as applied for each individual take/consent
Full irrigation season	Irrigation that occurs within the entire period of a water year, being 1 July to 30 June, when irrigation is required, whether or not the full allocation for a stage is irrigated during a water year.
Sentinel bore	A monitoring bore specifically established to monitor groundwater levels and salinity indicators in a specified location. For the purposes of this

[1] Policy H.4.4 (Table 29) of the Proposed Regional Plan for Northland (Updated Appeals Version) May 2021.

	Groundwater Monitoring and Contingency Plan, sentinel bores are those established and/or proposed monitoring bores (not production bores) in which piezometers are installed to measure groundwater levels and salinity indicators in the deep shellbed aquifer and/or the shallow sand aquifer.
Natural Baseline Values	Measured values from monitoring points that reflect the natural range of fluctuations in water levels and water chemistry, unaffected by abstractions.

1. INTRODUCTION

1.1 Scope and Objective of the GMCP

This document comprises a groundwater monitoring and contingency plan for the Other, Waihopo and (northern) Houhora sub-aquifers of the Aupōuri aquifer management unit ("the GMCP"). Much of the approach outlined in this GMCP has been informed by the technical assessment presented in the *Aupouri Aquifer Groundwater Model, Factual Technical Report – Modelling – Aupouri Aquifer Water User Group. WWLA0184, Rev 3*, dated 5 February 2020 and prepared by Williamson Water & Land Advisory Ltd (hereafter referred to as the AAWUG Report).

The GMCP covers the implementation and monitoring of the groundwater take consents listed in **Table 1** (the Consent Holders) and is a programme of adaptive management that is suitable to provide a platform for the implementation of the abstractions listed in **Table 1**.

An adaptive management regime requires clear objectives against which the effects and management progress may be evaluated. The objective of this GMCP is that;

Objective 1: **The abstractions must, individually and cumulatively, avoid:**

- **(a) adverse effects of saltwater intrusion into the Aupōuri aquifer;**
- **(b) adverse effects on the hydrological functioning, including changes to water levels[2], of natural wetlands, springs and dune lakes;**
- **(c) alterations to the extents of rivers, natural wetlands, springs and/or dune lakes;**
- **(d) adverse effects on the significant indigenous vegetation and habitats in (terrestrial and freshwater environments of) dune lakes, springs and natural wetlands;**
- **(e) Adverse effects on the flow levels and flow variability of rivers and streams and springs so that their habitat quality and sustainable mahinga kai, recreational, and other social and cultural values, are maintained (including sufficient flows and flow variability to maintain their habitat quality, including to flush rivers of deposited sediment and nuisance algae and macrophytes and support the natural movement of indigenous fish and valued introduced species such as trout); and**
- **(f) lowering of the groundwater levels of the Aupouri aquifer such that existing efficient bore takes operating as a permitted activity or in accordance with resource consent conditions cannot access the authorised volume of groundwater.**

[2] Avoiding "change" means that as a result of the abstraction of water; median water levels, mean annual water level fluctuations and patterns of water level seasonality (relative summer vs winter) remain unchanged.

Extensive environmental monitoring is required to confirm avoidance of the effects listed above, and to facilitate an 'adaptive management' approach including the staged implementation of groundwater extraction. The purpose of the GMCP is to provide a framework that meets the requirements and principles of adaptive management. The GMCP provides a methodology for implementing adaptive management and prescribes specific monitoring requirements, establishes groundwater level and groundwater quality monitoring triggers and outlines a process for implementation of appropriate mitigation and remediation measures if nominated trigger values are exceeded.

The GMCP is intended to allow the early detection of any impact to the Other, Waihopo and (northern) Houhora sub-aquifers of the Aupōuri aquifer management unit and surface water bodies associated with the exercise of groundwater take consent(s), by:

- Requiring regular monitoring of the groundwater system both on and off-site;
- Setting monitoring criteria to indicate potential adverse impacts on the groundwater system and surface water bodies;
- Implementing mitigation measures including changes to the pumping regime if trigger levels are reached to ensure that Objective 1 continues to be met;
- Reviewing monitoring data before and after a step level increase in pumping rate;
- Ensuring that the monitoring data is available for regular review by the Council;
- Detailing a Contingency Plan to be implemented if an unanticipated impact(s) is identified;
- Providing information to quantify the actual effects of the abstraction on the groundwater resource; and
- Enabling validation of the numerical model by the Consent Holders for any replacement groundwater take consent applications.

1.2 Parties Associated with this GMCP

The parties who have been deemed to be associated with this GMCP at its inception are the Northland Regional Council ("the Council"), the Consent Holders in **Table 1**, and the Director-General of Conservation.

The following sections provide a brief description of the roles and responsibilities of each party associated with this GMCP.

Should any of these parties change during the implementation of this GMCP, either through addition or removal, the process as set out in **Section 1.3** below shall be applied.

The rights of Consent Holders associated with this GMCP are prioritised according to the order in which their consents are granted and added to this GMCP, in accordance with the first in-first served approach to water allocation under the Resource Management Act 1991.

1.2.1 Northland Regional Council

The Council will undertake the ongoing monitoring requirements of the GMCP on behalf of the Consent Holders. The actual and reasonable cost of undertaking the ongoing monitoring of these consents will be charged to each Consent Holder in accordance with Council's Charging Policy.

The installation of sentinel bores and monitoring equipment is the responsibility of the Consent Holders.

1.2.2 Consent Holders

The Consent Holders identified in **Table 1** of this GMCP are required to exercise their consents in accordance with this GMCP except as required by condition 3 of the Northern Group consents.

The exercise of the consents will be in accordance with Council-initiated instructions which will be issued once the actions and process established through this GMCP have been undertaken.

The Consent Holders may seek changes to the GMCP through either of the processes set out in **Section 1.3**.

1.2.3 Director-General of Conservation

The Director-General of Conservation is responsible for administering land and waterbodies subject to reserve status under the Reserves Act 1977 and conservation or stewardship area status under the Conservation Act 1987, along with native fish and functions relating to protected species under the Wildlife Act 1953. Within the Other, Waihopo and (northern) Houhora sub-aquifers of the Aupōuri Aquifer management units these areas include:

- The Te Ramanuka Conservation Area.

The Director-General of Conservation is a party to this GMCP to ensure that the relevant provisions of these Acts, which the Director-General of Conservation administers, in particular that matters identified in Objective 1 of the GMCP are to be met.

It is also relevant to note that the Ngāti Kuri Claims Settlement Act 2015, NgāiTakoto Claims Settlement Act 2015, and the Te Aupōuri Claims Settlement Act 2015 all contain provisions relating to a 'korowai redress' which set-out co-governance arrangements for conservation land known as the 'Korowai for Enhanced Conservation'. The Korowai for Enhanced Conservation recognises the historical, spiritual and cultural association NgāiTakoto, Te Aupōuri, Te Rarawa and Ngāti Kuri iwi have with conservation land and the roles that the hapū and marae of each undertake as kaitiaki of the whenua and taonga of the conservation estate.

1.3 Changes to the GMCP

This GMCP may be amended at any time to:

- Incorporate new or replacement water permits, or remove water permits, within the Other, Waihopo and (northern) Houhora sub-aquifers of the Aupōuri aquifer management unit that have overlapping and/or additional monitoring requirements or which are subject to different trigger levels or trigger levels based on monitoring described in this GMCP;
- Alter the nature and scope of the required monitoring (i.e. monitoring frequency and intensity (type and number of samples)) and associated trigger levels as is determined from final decisions of the Council under the Staged Implementation Monitoring Programme Review, Annual Environment Monitoring Report, and Groundwater Trigger-Level Exceedance Report;
- Incorporate or remove parties who are, or may need to be, a part of this GMCP to ensure Objective 1 is met.

If either the Council or a Consent Holder wishes to amend the GMCP, then it must provide notice in writing of the proposed changes, along with any supporting technical documents, to the other Consent Holders, and the Director-General of Conservation.

A suitably qualified and experienced hydrogeologist and ecologist (i.e. 2 people) shall be nominated by Council to act as an independent technical expert for the purpose of peer reviewing proposed changes to the GMCPs. They shall be known as the **Independent Water Resource Effects Review Panel**. The nominated technical expert shall, within 20 working days, provide a report to the Council, the Consent Holders and the Director-General of Conservation on the proposed changes to the GMCP.

If any party does not agree with the outcome of the report on the proposed change, that party shall notify the Council of the reasons for the disagreement within 20 working days from the date that the review report was received.

Any change to the GMCP will only be authorised by Council if the review of the proposed change clearly indicates that the change will meet Objective 1 of the GMCP.

The Council will notify the Consent Holders and the Director-General of Conservation of the decision, detailing the reasons for its decision, including the identification and discussion of areas of agreement and disagreement.

If any changes are made to the GMCP, then a date-stamped copy of the amended GMCP will be provided to the Consent Holders and the Director-General of Conservation.

2. FRAMEWORK FOR ADAPTIVE MANAGEMENT

In summary, the following adaptive management techniques are applied in this GMCP;

(a) **Baseline monitoring** – a monitoring programme has been developed for Stage 1 of the **Table 1** abstractions to establish a robust existing environment baseline. This monitoring programme is contained in this GMCP, however, some monitoring detail is still required and this is indicated by the acronym 'TBC'.

As part of the baseline information, a constant rate pumping test of at least 24 hours duration (but no more than 72 hours duration) shall be carried out at the peak pumping rate for all bore fields (i.e. a single bore or cluster of bores within 100 m of each other) abstracting more than 864 m^3/day (10 L/s) located within 2 kilometres of a community water supply bore or a wetland or lake (unless monitoring data shows these surface water features are perched above the fully saturated groundwater system). The test must monitor groundwater levels in neighbouring bores at varying depths to allow determination of aquifer parameters and an assessment of drawdown effects in the deep shellbed aquifer, at the water table and the change in level and/or flow in any surface water feature (wetland, stream or lake) within 2 kilometres of the abstraction point. The results of the test must be reviewed by an independent hydrogeologist appointed by the Council and the results of that review may be used as a basis to review consent conditions under s 128 RMA. Prior to undertaking the test, it will be prudent for the Consent Holder(s) to get the design of the test reviewed by the independent hydrogeologist that Council will use to later review the test analysis, to ensure it is fit for purpose. If a suitable nearby pumping test has been completed this may satisfy this testing requirement, if approved by the independent hydrogeologist.

(b) **Early warning systems** – trigger levels (TLs) will be established to set up an early warning system that provides a response mechanism when differences between predicted and actual water levels and/or salinity concentrations occur. A trigger level is an environmental criterion that, if reached or met, requires a certain response to be actioned.

(c) **Staged development** – abstraction volumes will progressively be increased in a staged manner, with expansion contingent on compliance with yet to be established trigger levels and on regular reviews of groundwater level, freshwater and wetland ecology, hydrology, and salinity monitoring results. It is noted that the consent documentation requires that all development starts at Stage 1 volumes whether or not others have progressed to Stage 2 or further, and that takes must be implemented for the minimum period of Stage 1 before progressing to Stage 2. This is an essential mechanism for staging as an adaptive management response.

(d) **Management of consents being exercised immediately after commencement** – until such time as there is adequate data to base the adaptive management on and for Objective 1 of this GMCP to be achieved, the abstractions that occur immediately after commencement (i.e. in the first year) will be subject to interim groundwater level and saline trigger levels and Groundwater Trigger Exceedance Report procedures.

(e) **Tiered approach to monitoring** – monitoring requirements will increase if trigger levels are exceeded. Likewise, monitoring intensity may decrease with evidence of sustained compliance and stability or to reflect improved characterisation of the hydrogeological environment by way of the process outlined in **Section 1.3** of this GMCP; and

(f) **Ongoing adaptive management** – the abstractions will be managed adaptively within the term of consent and, in the event of trigger level exceedance, through the implementation of the recommendations of a Groundwater Trigger Exceedance Report prepared by Council.

(g) **Suspension of abstractions** – should compliance with Objective 1 of this GMCP not be achieved, then the exercise of some or all of the consents to abstract and use groundwater will be suspended until such time as Council confirms in writing that compliance can be achieved.

(h) **Consent review** – this GMCP does not override the ability for consents and/or consent conditions to be reviewed in circumstances stipulated in condition 32 of the Northern Group of water take consents, or section 128 of the Resource Management Act 1991.

The following sections provide detailed information relating to the adaptive management framework to be imposed for the exercise of the consents listed in **Table 1**.

2.1 Staged Implementation

The uptake of water by the Consent Holders will be over four (4) stages in accordance with the following factors:

- ***Level of current orchard development*** – where existing consents authorising the take and use of water are proposed to be replaced or varied.
- ***Rate of orchard development*** – will occur at differing rates depending on the owner's cashflow and access to plants; and
- ***Tree maturity*** – approximately nine years to full maturity and plant water usage, hence irrigation requirements commensurately increase with tree growth.

The progressive increase in irrigation requirements on developing orchards provides an opportunity to apply an adaptive management approach that establishes a baseline and allows the original hypotheses of avoidance of effects to be periodically re-evaluated to ensure Objective 1 of this GMCP continues to be met as development occurs.

The management approach provides a series of responses to be taken based on the monitoring results, including where monitoring shows that Objective 1 of this GMCP is not being met, as discussed in **Section 2.2**.

The uptake by Consent Holders of the consented total authorised water volumes will be permitted in four stages, taking a minimum of nine years, as shown in **Table 1** below, unless the outcome of the Staged Implementation and Monitoring Programme Review detailed in **Section 2.1.1** shows that there should be a delay in moving to the next stage, or that the next stage should not occur.

The development stages reflect:

- A combination of horticultural and pasture irrigation development for APP.039859.01.01
- Anticipated planting schedules and resultant increases in water demand for horticultural irrigation associated with remaining water permit applications.

Table 1. Summary of staged implementation annual volumes

Application Number	Consent Holder	Indicated year of irrigation start	Allowable Annual Volume (m^3)			
			Stage 1 (Year 1)[1]	Stage 2 (Year 2-3)[1]	Stage 3 (Year 4-8)[1]	Stage 4 (Year 9- full consent term)[1]
Other sub-aquifer						
APP.039859.01.01	TE AUPŌURI COMMERCIAL DEVELOPMENT LTD	2021/2022	43,750	96,500	152,350	175,000
		Total (m^3/year)	**43,750**	**96,500**	**152,350**	**175,000**
		Total (% allocated per stage)	**25%**	**50%**	**75%**	**100%**
Waihopo sub aquifer						
APP.039859.01.01	TE AUPŌURI COMMERCIAL DEVELOPMENT LTD	2021/2022	30,000	60,000	90,000	120,000
APP.040601.01.01	WAIKOPU AVOCADOS LTD	2020/2021	20,200	40,400	60,600	80,800
APP017428.02.01	HENDERSON BAY AVOCADOS LTD	2020/2021	4,590	9,180	13,770	18,360
APP.040600.01.01	FAR NORTH AVOCADOS LTD	2021/2022	8,000	16,000	24,000	32,000
APP.041211.01.01	P MCLAUGHLIN	2022/2023	19,208	38,416	57,624	76,832
		Total (m^3/year)	**81,998**	**163,996**	**245,994**	**327,994**
		Total (% allocated per stage)	**25%**	**50%**	**75%**	**100%**
Houhora sub-aquifer						
APP.039859.01.01	TE AUPŌURI COMMERCIAL DEVELOPMENT LTD	2021/2022	218,750	437,500	656,250	875,000
APP.040121.01.01	NE EVANS TRUST & WJ EVANS & J EVANS	2021/2022	39,200	78,400	117,600	156,800
APP 040231.01.01	P & G ENTERPRISES (PJ & GW MARCHANT)	2023/2024	6,860	13,720	20,580	27,440
APP 040652.01.01	SE & LA BLUCHER	2020/2021	23,520	47,040	70,560	94,080
APP.039644.01.01	MP DOODY & DM WEDDING	2021/2022	74,480	148,960	223,440	297,920
APP.040397.01.01	A MATTHEWS	2020/2021	2,940	5,880	8,820	11,760
APP.040558.01.01	MV EVANS (1)	2020/2021	8,918	17,836	26,754	35,672
APP040979.01.01	MV EVANS (2)	2020/2021	30,870	61,740	92,610	123,480
		Total (m^3/year)	**405,538**	**811,076**	**1,216,614**	**1,622,152**
		Total (% allocated per stage)	25%	50%	75%	100%

Application Number	Consent Holder	Indicated year of irrigation start	Allowable Annual Volume (m^3)			
			Stage 1 (Year 1)[1]	Stage 2 (Year 2-3)[1]	Stage 3 (Year 4-8)[1]	Stage 4 (Year 9- full consent term)[1]
Notes: [1]The staged implementation is based on years when irrigation occurs following the granting of the consents.						

2.1.1 Staging: Implementation and Monitoring Programme Review

A Staged Implementation and Monitoring Programme Review ("the SIMPR") will be required for Council to decide whether Consent Holders proceed to the next allocation stage. At the following times, the volume of abstraction authorised will be reviewed against the staged implementation outlined in **Section 2.1** at the minimum intervals of:

- **End of Stage 1:** A period during which:
  - 12 months of monitoring baseline data has been collected and used to define all the trigger levels specified in this GMCP; and
  - irrigation has occurred for one full irrigation season where the irrigation water has been sourced, as far as practicable, from the Stage 1 annual volume specified in Table 1 of this GMCP, as applied for each individual take/consent;
- **End of Stage 2:** Three (3) irrigation seasons following date of commencement of the consents; and
- **End of Stage 3:** Eight (8) irrigation seasons following date of commencement of the consents.

The main purpose of the SIMPR is to assess whether proceeding to the next stage would comply with Objective 1 of the GMCP.

The SIMPR will be commissioned by the Council and shall be prepared by the **Independent Water Resource Effects Review Panel**, with input from an **Irrigation Efficiency Review Panel**, comprising two irrigation experts appointed by the Council. The Council will endeavour to ensure that all the nominated technical experts have experience and knowledge of the locality and must be independent of the consent holders.

The SIMPR shall include a detailed assessment of all environmental monitoring data including groundwater levels, salinity indicators, and water quality, and include consideration of spatial and temporal trends including potential effects of groundwater abstraction on water levels in a dune lake or wetland. If the potential for more than minor effects on a dune lake or wetland is identified, then the SIMPR will also include assessment of the likely significance of those effects prepared by a suitably qualified ecologist. The **Irrigation Efficiency Review Panel** will ensure that water is being used in an efficient manner and not in a way that causes any excessive or wasteful abstraction. The SIMPR shall assess whether Objective 1 of this GMCP is being met at the current level of abstraction, and whether Objective 1 will be met at the next stage level of abstraction. The SIMPR may also consider the nature and scope of continued monitoring (i.e. monitoring frequency and intensity (type and number of samples)) and associated trigger levels.

The SIMPR will provide recommendations based on the assessment of the environmental monitoring data to date on:

- the setting or alteration of the trigger levels;
- whether any changes to the monitoring programme are required;
- whether any reduction in consented abstraction quantities is appropriate, in relation to either environmental effects and/ or efficient water use; and
- whether to advance to the next stage of abstraction or to remain at the current level of abstraction, or to reduce the level of abstraction.

A copy of the SIMPR will be provided to the Consent Holders listed in **Table 1** and the Director-General of Conservation a minimum of three (3) months prior to the anticipated commencement of the subsequent irrigation season utilising volumes defined for the subsequent development stage as stated in **Table 1**.

The Consent Holders and Director-General of Conservation have 20 working days to provide a response to the Council on the conclusions and recommendations of the SIMPR.

If any party does not agree with the conclusions and recommendations of the SIMPR, then a report by a suitably qualified hydrogeologist and/or ecologist, both with experience and knowledge of the locality if possible, detailing the reasons for the disagreement shall be provided to Council within 30 working days from the date that the copy of the SIMPR was sent to the party.

An increase in the volume of abstraction to the next development stage and any change to the monitoring programme will only be authorised by Council if the technical assessment of the monitoring data clearly indicates that the increase in the allocation and any necessary change to the GMCP would meet Objective 1 of this GMCP.

Council will provide a report to the Consent Holders and the Director-General of Conservation detailing the reasons for its decision, including the identification and discussion of areas of agreement and disagreement within twenty (20) working days from the date they receive a report on points of disagreement about the SIMPR.

If any changes are made to the GMCP as a result of the SIMPR, then a copy of the amended GMCP will be provided to the Consent Holders and the Director General of Conservation within five (5) working days of the change being authorised as final.

A summary of the above process is also included in the conditions of each consent that is covered by this GMCP.

2.1.2 Stage 1 (Year 1) Management Regime

Stage 1, from a management perspective, is the initial development stage following commencement of the consents listed in **Table 1**. During this development stage abstraction will be at a very low level while baseline information is collected to enable monitoring of groundwater levels and quality (at monitoring sites not already established) to enable setting of trigger levels.

Where Sentinel bores have already been installed and trigger levels established, they will need to be revised based on the approach described in section 2.2.2, so they can be utilised to manage the takes in **Error! Reference source not found.**. For newly established sentinel bores, during Stage 1 interim triggers for groundwater levels and salinity indicators will be established following the methodology outlined in Section 2.1.2.1.

The Council is to notify the Consent Holders and the Director-General of Conservation of the interim trigger levels (and default management parameters) for Stage 1 (Year 1) three (3) months prior to the commencement of abstraction. The Consent Holders and Director-General of Conservation have 10 working days to provide responses to the Council on the default management parameters once notified.

The monitoring specified in Section 3 will be undertaken during Stage 1 to ensure interim triggers are not exceeded (i.e., to ensure compliance with Objectives 1(a - f)). Exceedance of interim trigger levels during Stage 1 will result in the implementation of the trigger level exceedance measures outlined in **Section 4** below.

The interim management regime established for Stage 1 (Year 1) may be superseded by the Monitoring and Trigger Level Setting components set out in **Section 2.2** of this GMCP.

2.1.2.1 Saline Intrusion & Groundwater Level: Monitoring and Triggers

Saline intrusion monitoring for Stage 1 (Year 1) is proposed within the sentinel and monitoring bores identified in **Table 5** of this GMCP. As each sentinel or monitoring bore is drilled, groundwater level and salinity indicators will be measured and recorded. This information will be used to set interim trigger levels for these parameters as per the methodology established in **Section 2.2** below. Interim trigger levels must be set prior to exercise of any of the consents subject to this GMCP.

The saline intrusion and groundwater level monitoring trigger levels for Stage 1 (Year 1) shall be inserted into the GMCP through the process set out in **Section 1.3** of this GMCP prior to the exercise of any consents.

2.1.2.2 Trigger Level Responses

In the event of an exceedance of a trigger level applicable in Stage 1 (Year 1), the Trigger Level Exceedance response plan contained in **Section 4** of this GMCP shall apply.

2.1.2.3 Ceasing Interim Stage 1 (Year 1) Management Regime

This interim management regime shall remain in place until such time as the setting of trigger levels as per **Section 2.2** below has been given effect to through amendment to this GMCP in accordance with the change process established in **Section 1.3** above.

2.2 Trigger Level System

2.2.1 Timeframe for setting of trigger levels

The setting of trigger level values for each parameter (where TBC is indicated in the monitoring plan tables in **Section 3** Monitoring Programme) will be based either on current baseline data (for sites with existing monitoring) or data collected during the first implementation stage after 12 months of monitoring data has been collected and within 15 months of the date of commencement of these consents. This approach recognises that:

- There is historical monitoring data available for some parameters to characterise the response of groundwater levels and quality to current levels of abstraction.
- In some areas, no baseline data has been established by the Consent Holders or any of the key stakeholders in the area; and
- The manifestation of any effects from the exercising of these consents will steadily progress with time in accordance with the staged development process outlined in **Table 1**. The scale of abstraction during the baseline data collection period (i.e. generally 12 months following commencement of consent) will not vary significantly from existing conditions.

2.2.2 Method for setting of trigger levels

A two-tier trigger level system will be implemented on the consents:

- **TL1** – The first-tier trigger level establishes when an individual monitoring parameter is exhibiting a departure from baseline conditions It must be within the range of measured fluctuations in Natural Baseline Values to achieve this purpose. For water level measurements it is to be set at the lowest 10th percentile of natural baseline water level measurements that show no obvious effects of drawdown interference from neighbouring pumping bores. For electrical conductivity it shall be within 1 mS/m of the maximum measured Natural Baseline Values and an equivalent basis is to be used for any other water chemistry TL1 limits. If this trigger level is breached, then additional monitoring will be undertaken by the Council and the consent holders. This additional monitoring will assist characterisation of the nature and significance of changes to the baseline condition of the groundwater resource.
- **TL2 –** The second-tier trigger level is set at a threshold defining a 'significant' departure from baseline conditions and/or conditions where the risks of adverse environmental effects are increased. If this trigger level is breached, then the Consent Holders will be required to reduce their daily water take volume in a staged manner over a set period of time. The criteria for setting TL2 values is as follows:
    - TL2 Criteria for water levels
    - For shallow water table areas hydraulically connected to natural wetlands, the TL2 value is to be set at the lowest natural baseline water level measurements that show no obvious effects of drawdown interference from neighbouring pumping bores. For all other water level monitoring points, the TL2 values are to be set at the smallest exceedance of the natural baseline range that results from the following criteria:
        - A variation of 20% of the range of natural baseline fluctuations beyond the lowest measured natural baseline water level;
        - A decline of 0.5 m beyond the lowest natural baseline water level;
        - In coastal monitoring bores, the Ghyben-Herzberg water level limit required to protect against sea-water intrusion;
        - Any shallower limit required to ensure that Objective 1 of this GMCP is achieved.
    - TL2 Criteria for water quality parameters
    - The smallest exceedance of the natural baseline range that results from the following criteria:
        - The median electrical conductivity value + 50%;
        - An increase of 20 mS/m in the electrical conductivity above the maximum Natural Baseline Value;
        - For parameters other than electrical conductivity a change of a similar scale to the two preceding points;
        - Any smaller increase required to ensure that Objective 1 of this GMCP is achieved.

The trigger level parameters required under this GMCP for the various suites are summarised in **Table 2.**

Table 2: Summary trigger level parameters by monitoring suite

Monitoring Suite	Parameters
Groundwater level and salinity monitoring	Groundwater level, electrical conductivity
Saline intrusion monitoring	Electrical conductivity, chloride, sodium, total dissolved solids.

2.2.3 Response to exceeding trigger levels

The actions required should trigger levels be exceeded are set out in **Section 4** (Contingency Plan).

3. MONITORING PROGRAMME & TRIGGER LEVEL SETTING

3.1 Bore Locations and Details

A consolidated summary of the schedule of bores that are required to be monitored as part of this GMCP is provided in **Table 3.** Along with the bores identified for monitoring, the table provides key details relating to the bores' physical attributes and parameters to be monitored. The locations of the monitoring bores are shown on **Figure 1.** Additions to this Table can be made at a later date to incorporate any natural wetlands that are subsequently identified as requiring monitoring.

The following sections of the GMCP provide the monitoring schedules (frequency and trigger levels) for the bores. The monitoring schedule comprises three components:

- Two sentinel monitoring sites along the coastal margin, seaward of areas where abstraction is concentrated. The sentinel bores will provide the primary reference sites for monitoring and management of potential saline intrusion effects. Each sentinel bore will comprise two piezometers, accessing the shallow unconfined aquifer and the deep shellbed aquifer respectively. Instrumentation in each piezometer will enable continuous monitoring of groundwater levels and electrical conductivity (EC) and provide for telemetry of monitoring data to the Council.
- Manual monitoring of groundwater levels in the unconfined and shellbed aquifers on a monthly basis at selected locations inland of Pukenui and in the Waihopo area. This monitoring will be undertaken either in existing bores (if suitable sites can be identified and access obtained) or in new piezometers. These sites will enable ongoing monitoring of groundwater levels and provide data to characterise both localised and cumulative drawdown in response to abstraction and be used to inform the staged implementation process.
- Measurement of salinity indicators on a quarterly basis in each piezometer at the two sentinel bores, augmented by an additional monitoring bore in the Waihopo area. These sites will be monitored on a quarterly basis for the parameters listed in **Table 2** and provide a secondary baseline to characterise any changes in aquifer salinity along the coastal margin.

The locations of the production bores in **Table 3** are also shown in **Figure 1**. An error accuracy level of +/- 50 metres is applicable to these bore locations. Any differentiation in the location by greater than 50 metres will result in a requirement for an application to the Council for a change of consent condition pursuant to Section 127 of the Resource Management Act 1991 (RMA). Assessment of the effects on the environment of the change will be required pursuant to Schedule 4 of the RMA.

Table 3: Schedule of monitoring facility and production bore details.

MONITORING BORES									
Bore Details		Bore Owner	Coordinates (NZTM 2000)		Depth (m)	Dia. (mm)	Piezo. No.	Target aquifer	Purpose*
Name (Fig 1)	NRC ref.		Easting	Northing					
Fishing Club	LOC.200250	NRC	1611411	6146928	79			Shellbed	SI;
Waterfront	LOC.200210	NRC	1611712	6146689	19	32	1	Unconfined	GL_c, EC
Waterfront	LOC.200210	NRC	1611712	6146689	74	32	4	Shellbed	GL_c, EC_c
Houhora Sentinel (shallow)	TBC	NRC	1609900	6149600	<10	50	1	Unconfined	GL_c; EC_c, SI
Houhora Sentinel (deep)	TBC	NRC	1609900	6149600	80-100 (TBC)	50	2	Shellbed	GL_c; EC_c, SI
Lamb Road (shallow)[a]	TBC	NRC	1609750	6147300	<20	50	1	Unconfined	GL_m
Lamb Road (deep)[a]	TBC	NRC	1609750	6147300	80-100	50	2	Shellbed	GL_m
Burnage Road	LOC.200209	NRC	1611325	6145090	17	50	1	Unconfined	GL_m
			1611325	6145090	97	50	4	Shellbed	GL_m
Browne	LOC.200208	NRC	1610733	6144031	16	50	1	Unconfined	GL_m
			1610733	6144031	59	50	4	Shellbed	GL_m
Waihopo Level/Quality[a]	TBC	TBC	1606950	6153600	TBC	TBC		Shellbed	GL_m, SI
Houhora Heads[b]	LOC.200068	Private	1613368	6146558	21.3	100		Unconfined	GL_m, SI
PRODUCTION BORES									
Bore Details		Bore Owner	Coordinates (NZTM 2000)		Depth (m)	Dia. (mm)	Piezo No.	Target	Purpose
Name (Figure 1)	NRC Ref.		Easting	Northing					
Henderson Bay Avocados	TBC	Henderson Bay Avocados	1605623	6154872				Shellbed	GL_m, EC_m
Far North Avocados	TBC	Far North Avocados	1605981	6154581				Shellbed	GL_m, EC_m
Waikopu Avocados	TBC	Waikopu Avocados	1603347	6153388				Shellbed	GL_m, EC_m

Te Raite Station - Other	TBC	Te Aupōuri commercial development ltd	1603898	6151179				Shellbed	GL_m, EC_m
Te Raite Station - Waihopo 1	TBC		1605333	6151462				Shellbed	GL_m, EC_m
Te Raite Station - Waihopo 2	TBC		1607102	6150752				Shellbed	GL_m, EC_m
McGlaughlin	TBC	McGlaughlin	1606049	6150294				Shellbed	GL_m, EC_m
P&G Enterprises	TBC	P & G Enterprises (PJ & GW Marchant)	1609182	6148952				Shellbed	GL_m, EC_m
Te Raite Station - Houhora 1	TBC	Te Aupōuri Commercial Development Ltd	1608383	6148854				Shellbed	GL_m, EC_m
Te Raite Station - Houhora 2	TBC		1607182	6148084				Shellbed	GL_m, EC_m
Te Raite Station - Houhora 3	TBC		1609287	6148271				Shellbed	GL_m, EC_m
Te Raite Station - Houhora 4	TBC		1609016	6147852				Shellbed	GL_m, EC_m
Te Raite Station - Houhora 5	TBC		1607771	6147949				Shellbed	GL_m, EC_m
Te Raite Station - Houhora 6	TBC		1609655	6147078				Shellbed	GL_m, EC_m
Te Raite Station - Houhora 7	TBC		1609296	6147373				Shellbed	GL_m, EC_m
Evans Trust	TBC	NE Evans Trust & WJ Evans & J Evans	1609492	6148850				Shellbed	GL_m, EC_m
S&L Blucher	TBC	S. & L. Blucher	1610145	6148091				Shellbed	GL_m, EC_m
A. Matthews	TBC	A. Matthews	1611038	6146087				Shellbed	GL_m, EC_m
Wedding & Doody	TBC	MP Doody & DM Wedding	1610297	6145328				Shellbed	GL_m, EC_m
M Evans 1 & 2	TBC	MV Evans	1610554	6145121				Shellbed	GL_m, EC_m

Notes:

[a] Nominal location only

[b] Private bore subject to access agreements

TBC = to be confirmed within 15 months of the date of commencement of these consents.

* Purpose key:

GL_c = Continuous Groundwater Level;

GL_m = Manual (monthly) Groundwater Level;

EC_c = Continuous Electrical Conductivity;

EC_m = Manual (monthly) Electrical Conductivity;

SI = Salinity Indicators (quarterly);

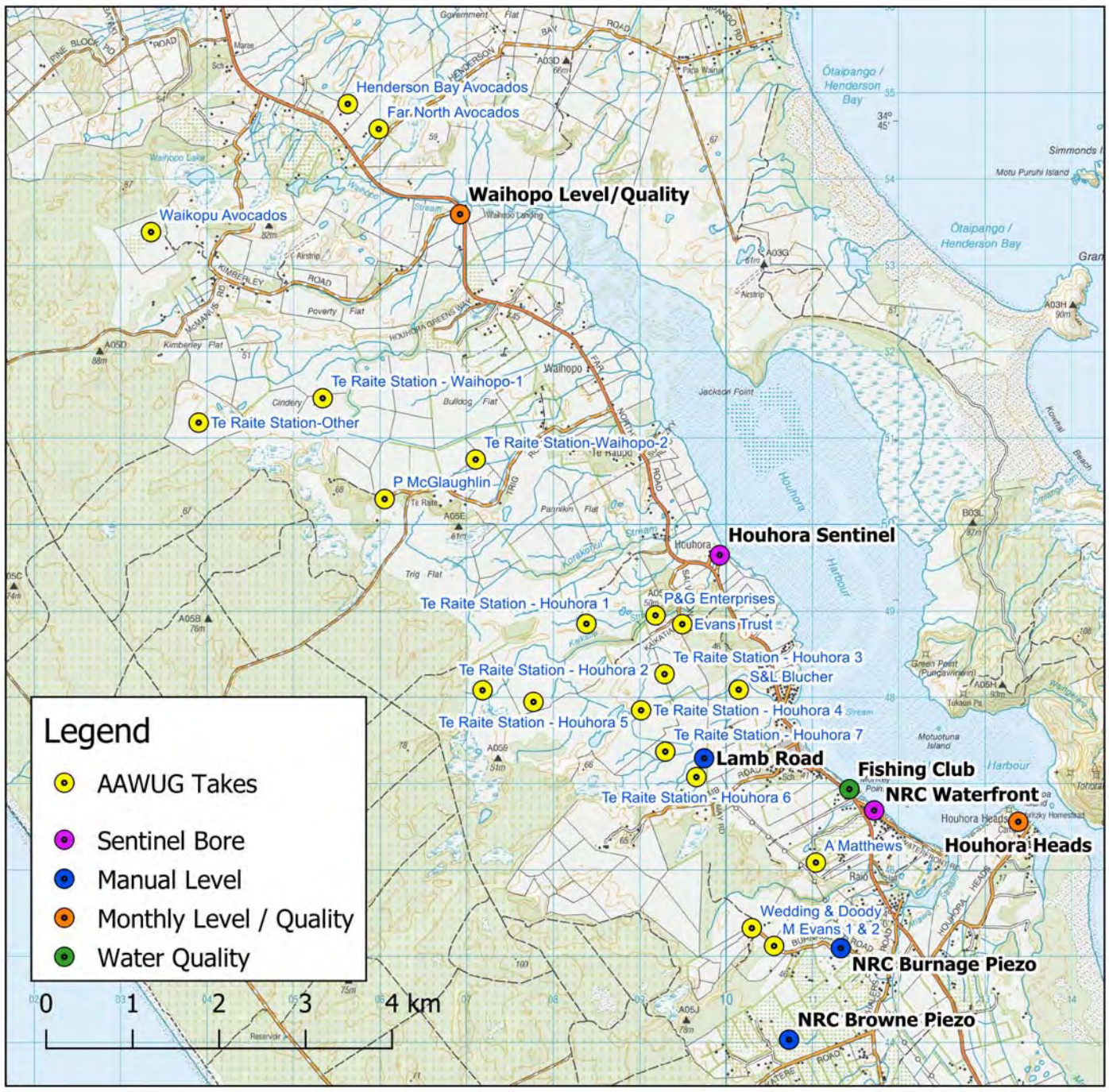


Figure 1.Monitoring and Production Bore Location Map

3.2 Groundwater Level Monitoring & Establishment of Trigger Levels

3.2.1 Continuous Groundwater Level Monitoring

Sentinel bores will collect data continuously for water levels and electrical conductivity in individual piezometers and will be utilised as the primary reference sites for regional monitoring of potential effects associated with saline intrusion. Data will be telemetered to the Council.

Groundwater levels will be monitored in the shallow sand and deep shellbed aquifers to quantify the magnitude of drawdown resulting from the proposed abstraction in the deep shellbed and unconfined shallow sand aquifers to ensure it is within the magnitude anticipated in the AEE and meets Objective 1 of this GMCP.

These bores will provide early detection or warning of:

- Groundwater levels around the coastal margin approaching a threshold that could indicate a greater risk of saline intrusion; and
- Any reduction in water quality that could indicate the landward migration of the saline interface; and
- Groundwater levels in the shallow sand aquifer lowering and having a potential adverse effect on surface water bodies, springs, dune lakes or natural wetlands.

Details of the sentinel bores are summarised in **Table 4** below.

All sentinel monitoring bores listed in **Table 4** will be installed prior to the exercise of the consents and must be of sufficient depth to allow monitoring to occur at all times (i.e. to accommodate both high and low water level conditions).

Checking of the sensors required for continuous monitoring will be undertaken on a monthly basis, and any faults will be recorded and remedied immediately. Data will be collected, processed and managed in accordance with the Council's quality standards.

3.2.2 Manual Groundwater Level Monitoring

Groundwater levels will be monitored manually in the shallow sand and deep shellbed aquifers to:

- Quantify the magnitude of drawdown resulting from the proposed abstraction in the deep shellbed and shallow sand aquifers to ensure it is within the magnitude anticipated in the AEE and does not result in adverse effects on surface water environments, existing groundwater users and long-term aquifer storage volumes.
- Ensure coastal groundwater levels are not adversely affected by the proposed abstractions.

Details of the groundwater level monitoring bores are listed in **Table 4**. The bores include two existing NRC piezometer installations (Burnage Road (LOC.200209) and Browne (LOC.200208)) plus new piezometers to be installed at Lamb Road and Waihopo. An existing private bore at Houhora Heads is also included (subject to access agreement).

No trigger levels will be established for manual groundwater level monitoring sites. The primary value of data collected from manual groundwater level monitoring will be to establish medium to longer-term variations in groundwater levels in response to groundwater abstraction. This information will be utilised to inform the SIMPR (Section **2.1.1**) and the Annual Environmental Monitoring Report (**Section 3.6**).

Table 4: Schedule of Manual Groundwater Monitoring Bores.

Sentinel Bore Name	NRC ID	Depth (m)	Piezo. No.	Target aquifer	Units	Frequency
NRC Burnage Road	LOC.200209	17	-	Unconfined	mAMSL	Monthly
		97	-	Shellbed	mAMSL	Monthly
NRC Browne piezo	LOC.200208	16	-	Unconfined	mAMSL	Monthly
		59	-	Shellbed	mAMSL	Monthly
Lamb Road	TBC	<20	-	Unconfined	mAMSL	Monthly
	TBC	80-100	-	Shellbed	mAMSL	Monthly
Houhora Heads	LOC.200068	21.3	-	Unconfined	mAMSL	Monthly
Waihopo	TBC	TBC	-	Shellbed	mAMSL	Monthly

Notes:

TBC = to be confirmed within 15 months of the date of commencement of these consents.

GL TL1s (where provided) have been calculated from long term monitoring data.

GL TL2s (where provided) have been interpolated from Table F1, WWA Groundwater Modelling Report

3.2.3 Schedule of Groundwater Level Monitoring & Trigger Levels

A two-tier system for trigger level 1 ("TL1") and trigger level 2 ("TL2") for groundwater levels will be set in the bores identified in **Table 5**. Electrical conductivity trigger levels for these bores are contained in **Table 6**.

The Council will set trigger levels for groundwater levels in the shallow sand aquifer in each of the sentinel bores. TL1 and TL2 trigger levels for groundwater level in the NRC Waterfront piezometers are to be specified in **Table 5** below as sufficient data has been collected from these facilities for this purpose. As a general guide TL2 for the shallow sand aquifer should be no less than 1.0 mAMSL at sentinel monitoring sites (noting that changes in electrical conductivity ("EC") are also a key indicator of saline intrusion and are provided for below in **Section 3.3**). If necessary, water level records for individual sentinel bores will be correlated with existing monitoring sites to provide historical context for estimating the trigger levels.

Groundwater level triggers at the Lamb Road monitoring site will be based on measured static water levels prior to exercise of the water permits listed in **Table 1** minus the maximum magnitude of cumulative drawdown calculated to result from the proposed abstraction outlined in the AAWUG Report. As a general guide TL2 for deep shellbed groundwater levels should be no less than 1.5 mAMSL (noting that changes in EC are also a key indicator of saline intrusion).

Table 5: Continuous Monitoring & Trigger Levels – Groundwater Levels.

Sentinel Bore Name	Depth (m)	Piezo. No.	Target aquifer	Units	Frequency	Trigger Levels	
						TL1	TL2
Waterfront (LOC.200210)	21	4	Unconfined	mAMSL	Continuous	TBC	TBC
	72	1	Shellbed	mAMSL	Continuous	TBC	TBC
Houhora (TBC)	<10	1	Unconfined	mAMSL	Continuous	TBC	TBC
	80-100 (TBC)	2	Shellbed	mAMSL	Continuous	TBC	TBC

Notes:

TBC = to be confirmed within 15 months of the date of commencement of these consents.

GL TL1s (where provided) have been calculated from long term monitoring data.

GL TL2s (where provided) have been interpolated from Table F1, WWA Groundwater Modelling Report

The setting of TL1 and TL2 trigger levels values for remaining piezometers will be undertaken during Stage 1 after 12 months of monitoring data has been collected and within 15 months of the date of commencement of these consents and will replace the interim trigger levels established through the process described at **Section 2.1.2.1** above.

3.3 Saline Intrusion Monitoring & Establishment of Trigger Levels

Sentinel bores will be utilised as the primary reference sites for monitoring of potential effects associated with saline intrusion. These bores will be positioned between existing/proposed abstraction and the coastline to provide early detection or warning of:

- Groundwater levels around the coastal margin approaching a threshold that could indicate a greater risk of saline intrusion; and
- Any reduction in water quality that could indicate the landward migration of the saline interface.

Details of the sentinel bores are summarised in **Table 6** below.

3.3.1 Stage 1 Monitoring

During the initial 12-month monitoring period, sampling for the following salinity indicators in the bores listed in **Table 6** below will be undertaken at 6-weekly intervals[3]:

- Electrical conductivity;
- Chloride;
- Sodium;
- Total Dissolved Solids.

[3] This frequency applies to the initial 12-month monitoring period for the establishment of baseline information. The frequencies specified in Table 6 are for ongoing monitoring specifications.

3.3.2 Ongoing Monitoring

Ongoing monitoring of groundwater and electrical conductivity levels will be undertaken continuously via individual piezometers in sentinel monitoring bores. Monitoring data will be telemetered to the Council on a twice-daily basis. Sampling at the frequencies specified for the following salinity indicators will take place in the bores listed in **Table 6** below:

- Electrical conductivity;
- Chloride;
- Sodium;
- Total Dissolved Solids.

3.3.3 Schedule of Saline Intrusion Monitoring & Trigger Levels

The monitoring and trigger levels as discussed in this section are provided in **Table 6** below. Data will be collected, processed and managed in accordance with the Council's quality standards and *A National Protocol for State of the Environment Groundwater Sampling in New Zealand* (Ministry for the Environment, 2006).

A two-tier trigger level system (TL1 and TL2) for groundwater levels and electrical conductivity will be set in these bores.

As an initial guide, trigger levels for individual determinants will be established using the same criteria as defined in section 2.2.2.

The setting of TL1 and TL2 trigger levels for the piezometers listed in **Table 6** will be undertaken during the first implementation stage after 12 months of monitoring data has been collected and within 15 months of the date of commencement of these consents and replace the interim trigger levels outlined in **Section 2.1.2.1** above.

All sentinel monitoring bores listed in **Table 6** will be installed prior to the exercise of the consents.

Table 6: Monitoring & Trigger Levels – Saline Intrusion.

Bore Name	Depth (m)	Piezo. No.	Target aquifer	Parameter*	Units	Frequency	Trigger Levels	
							TL1	TL2
Fishing Club (LOC.200250)	79	1	Shellbed	EC	µS/cm	Quarterly	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC
Waterfront (LOC.200210)	21	4	Unconfined	EC	µS/cm	Continuous	TBC	TBC
	72	1	Shellbed	EC	µS/cm	Continuous	TBC	TBC
Houhora Sentinel (TBC)	<20	1	Unconfined	EC	µS/cm	Continuous	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC
	80-100	2	Shellbed	EC	µS/cm	Continuous	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
Waihopo (TBC)	TBC	1	TBC	EC	mS/m	Quarterly	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC

Bore Name	Depth (m)	Piezo. No.	Target aquifer	Parameter*	Units	Frequency	Trigger Levels	
							TL1	TL2
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC
Houhora Heads (LOC.200068)	21.3	1	Unconfined	EC	mS/m	Quarterly	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC

Notes:

* Parameter key: GL = Groundwater Level; EC = Electrical Conductivity; SI = Salinity Indicators; TDS = Total Dissolved Solids.

TBC = to be confirmed within 15 months of the date of commencement of these consents.

3.4 Production Bore Monitoring

3.4.1 Stage 1 Monitoring

During the initial 12-month monitoring period, sampling for salinity indicators in the bores listed in **Table 7** below will be undertaken at 6-weekly intervals[4].

3.4.2 Ongoing monitoring

After the initial 12 month monitoring period, monthly water level monitoring will be undertaken in the production bores listed in **Table 7** during the winter months (nominally May to September). This monitoring will provide information to identify any inter-annual variations in aquifer storage which may be anomalous compared to regional trends.

Electrical conductivity ("EC") values will also be measured at monthly intervals from the production bores during the irrigation season to check on any changes in salinity induced by the pumping. Requirements to continue monitoring of groundwater levels and electrical conductivity in individual production bores after Stage 1 will be addressed in the SIMPR (**Section 2.1.1**).

3.4.3 Schedule of Production Bore Monitoring & Trigger Levels

The schedule of monitoring and trigger levels as discussed in this section are provided in **Table 7** below. Data will be collected, processed and managed in accordance with Council's quality standards and *A National Protocol for State of the Environment Groundwater Sampling in New Zealand* (Ministry for the Environment, 2006).

EC trigger levels will be established in the production bores listed in **Table 7** below.

During the initial 12-month monitoring period EC trigger levels will be no greater than:

- **TL1** – Departure exceeding 25% of the EC value from the initial monitoring round
- **TL2** – Departure exceeding 37.5% of the EC value from the initial monitoring round

[4] This frequency applies to the initial 12-month monitoring period for the establishment of baseline information. The frequencies specified in Table 6 are for ongoing monitoring specifications.

Long-term EC triggers for individual production bores will be established following the initial 12-month monitoring period based on an assessment of spatial and temporal variation in EC observed during the initial period, in a manner consistent with EC trigger levels established in the sentinel monitoring bores.

No trigger levels will be established for groundwater levels in the production bores as water levels in the production bores can be impacted by well efficiency and pumping schedules so are not necessarily representative of groundwater levels in the surrounding aquifer.

Table 7: Monitoring & Trigger Levels - Production Bores.

Bore Name (NRC ID)	Depth (m)	Target aquifer	Parameter*	Units	Frequency	EC Trigger Levels	
						TL1	TL2
Henderson Bay Avocados	TBC	Shellbed	EC	mS/m	Monthly	TBC	TBC
			GL	mAMSL	Monthly	TBC	TBC
Far North Avocados	TBC	Shellbed	EC	mS/m	Monthly	TBC	TBC
			GL	mAMSL	Monthly	TBC	TBC
Waikopu Avocados	TBC	Shellbed	EC	mS/m	Monthly	TBC	TBC
			GL	mAMSL	Monthly	TBC	TBC
Te Raite Station - Other	TBC	Shellbed	SI	TBC	Monthly	TBC	TBC
			GL	mAMSL	Monthly	TBC	TBC
Te Raite Station - Waihopo 1	TBC	Shellbed	EC	mS/m	Monthly	TBC	TBC
			GL	mAMSL	Monthly	TBC	TBC
Te Raite Station - Waihopo	TBC	Shellbed	EC	mS/m	Monthly	TBC	TBC
			GL	mAMSL	Monthly	TBC	TBC
McGlaughlin	TBC	Shellbed	EC	mS/m	Monthly	TBC	TBC
			GL	mAMSL	Monthly	TBC	TBC
P&G Enterprises	TBC	Shellbed	EC	mS/m	Monthly	TBC	TBC
			GL	mAMSL	Monthly	TBC	TBC
Te Raite Station - Houhora 1	TBC	Shellbed	EC	mS/m	Monthly	TBC	TBC
			GL	mAMSL	Monthly	TBC	TBC
Te Raite Station - Houhora 2	TBC	Shellbed	GL,	mAMSL	Monthly	TBC	TBC
			EC	mS/m	Monthly	TBC	TBC
Te Raite Station - Houhora 3	TBC	Shellbed	SI	TBC	Continuous	TBC	TBC
			EC	mS/m	Monthly	TBC	TBC
			GL	mAMSL	Monthly	TBC	TBC
Te Raite Station - Houhora 4	TBC	Shellbed	EC	mAMSL	Monthly	TBC	TBC
			GL	mS/m	Monthly	TBC	TBC
Te Raite Station - Houhora 5	TBC	Shellbed	EC	mAMSL	Monthly	TBC	TBC
			GL	mS/m	Monthly	TBC	TBC
Te Raite Station - Houhora 6	TBC	Shellbed	EC	mAMSL	Monthly	TBC	TBC
			GL	mS/m	Monthly	TBC	TBC
Te Raite Station - Houhora 7	TBC	Shellbed	EC	mAMSL	Monthly	TBC	TBC
			GL	mS/m	Monthly	TBC	TBC
Evans Trust	TBC	Shellbed	EC	mAMSL	Monthly	TBC	TBC
			GL	mS/m	Monthly	TBC	TBC
S&L Blucher	TBC	Shellbed	EC	mAMSL	Monthly	TBC	TBC
			GL	mS/m	Monthly	TBC	TBC

Bore Name (NRC ID)	Depth (m)	Target aquifer	Parameter*	Units	Frequency	EC Trigger Levels	
						TL1	TL2
A. Matthews	TBC	Shellbed	EC	mAMSL	Monthly	TBC	TBC
			GL	mS/m	Monthly	TBC	TBC
Wedding & Doody	TBC	Shellbed	EC	mAMSL	Monthly	TBC	TBC
			GL	mS/m	Monthly	TBC	TBC
M Evans 1	TBC	Shellbed	EC	mAMSL	Monthly	TBC	TBC
			GL	mS/m	Monthly	TBC	TBC
M Evans 2	TBC	Shellbed	EC	mAMSL	Monthly	TBC	TBC
			GL	mS/m	Monthly	TBC	TBC
Notes: * Purpose key: GL = Groundwater Level; EC = Electrical Conductivity; SI = Salinity Indicators All trigger limit values in this Table to be confirmed by Council.							

3.5 Unmapped Natural Wetlands

Under the National Policy Statement for Freshwater Management 2020 (NPS-FM) natural wetland means a wetland (as defined in the RMA) that is not:

(a) a wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing or former natural wetland); or

(b) a geothermal wetland; or

(c) any area of improved pasture that, at the commencement date, is dominated by (that is more than 50% of) exotic pasture species and is subject to temporary rain derived water pooling.

Some natural wetlands in this area have been mapped from prior studies and surveys[5], however, there are sites that may be classified as natural wetland that are currently unmapped.

In cases of uncertainty or dispute about the existence or extent of a natural inland wetland, the NPS-FM directs that regard must be had to the Wetland Delineation Protocols[6] as a robust method for delineating wetlands. This protocol uses three criteria for identifying and delineating wetlands: vegetation, soils, and hydrology.

3.5.1 Unmapped Wetland Delineation Procedure

The Wetland Delineation Procedure is deemed appropriate for identifying whether three Areas of Interest (AoI) (**Appendix A**) contain natural inland wetland areas in the Waihopo, Other, and (northern) Houhora sub-aquifers. The Wetland Delineation Procedure is therefore replicated in **Table 8** below.

Procedures which were completed prior to the commencement of the consent are referenced as having been completed and no further action is required against those particular procedures.

For all other procedures which were not completed prior to commencement of the consents, **Table 8** contains the steps that shall be taken to complete that procedure within this adaptive management regime.

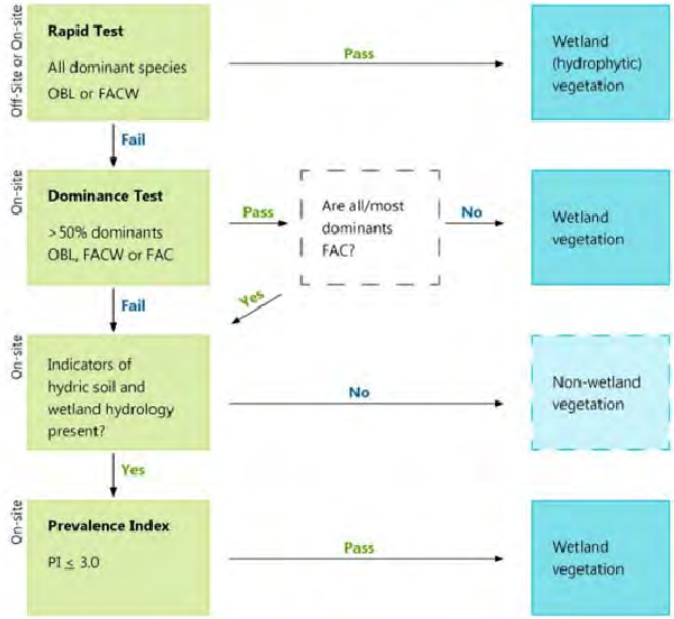
[5] Northland Regional Council top wetland study, Protected Natural Areas Programme survey reports.

[6] https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/wetland-delineation-protocols.pdf

Table 8: Unmapped wetland delineation procedure.

No.	Delineation Procedure	Completed Prior to Commencement of Consents (Yes/No)	Comment
1.	Determine the project area (the putative wetland).	Yes	See Areas of Interest map attached (**Appendix A**).
2.	Decide if 'normal circumstances' are present, i.e., typical climatic/hydrologic conditions, and no recent disturbances or modifications to the project area. If yes, proceed to step 3. If no, proceed to step 7.	Yes	Area N contains three high-risk sites, as generally shown in the aerial below. Areas (N)2 and 3 have been allocated to the Middle Aupōuri Aquifer Consent Holder group.  Area N1 is on a Recreation Reserve administered by the Far North District Council. Modification occurred between 2007-2009 to clear an area which is now visible as a grassed paddock (see below). Given the time that has elapsed since this last modification, this area is considered to be in 'normal circumstance'.

No.	Delineation Procedure	Completed Prior to Commencement of Consents (Yes/No)	Comment
			
3.	Identify and map the major vegetation types using aerial photographs, maps, contours, inventory reports, other data, and, if necessary, on-site field verification.	No	Within one month of commencement of the consents, the Council, in consultation with the Director-General of Conservation and the Consent Holders, will commission a suitably qualified and experienced ecologist to undertake the desktop and field analysis established under Procedures 4, 5 and 6. A Wetland Delineation Report (WDR) containing details of the assessment approach and outcomes shall be prepared by the same ecologist commissioned to undertake the desktop and field analysis. The WDR shall be circulated to the Consent Holders listed in Table 1 and the Director-General of Conservation a minimum of 40 working days prior to the anticipated commencement of the subsequent irrigation season. The Consent Holders and Director-General of Conservation have 20 working days to provide a response to the Council on the conclusions and recommendations of the WDR. If any party does not agree with the conclusions and recommendations of the WDR, then a report by a suitably qualified hydrogeologist and/or an ecologist, both with experience and knowledge of the locality, detailing the reasons for the disagreement shall be provided to Council within 30 working days from the date that the assessment was sent to the party. Council has the final authority over the delineation of a natural wetland and will provide a report to the Consent Holders and the Director-General of
4.	**Off-site methods** to identify wetland presence and sketch approximate boundaries. Wetlands may be confirmed without an on-site inspection depending on: i. the amount and quality of data (vegetation, soils, hydrology, topography) ii. wetland ecological expertise to interpret the data.	No	
5.	**On-site methods** to delineate wetland presence and accurate boundaries: i. for small areas (≤2 ha), establish a representative plot in each major vegetation type and record the plot vegetation in three strata: tree, sapling/shrub, herb ii. for larger areas, establish representative plots along transects (as per Clarkson 2014) and sample the vegetation in three strata: tree, sapling/shrub, herb.	No	
6.	**Hydrophytic vegetation determination**. Based on the data gathered, conduct a	No	

No.	Delineation Procedure	Completed Prior to Commencement of Consents (Yes/No)	Comment
	hydrophytic vegetation determination using the following flow chart (figure 1). **Figure 1: Flow chart of steps for hydrophytic (wetland) vegetation determination. Wetland indicator status abbreviations: FAC= facultative; FACW = facultative wetland; OBL = obligate wetland.**  Wetland indicator status ratings for species are in Clarkson et al. 2013 and subsequent updates.		Conservation detailing the reasons for its decision, including the identification and discussion of areas of agreement and disagreement within 10 working days of receipt of the disagreeing parties report.

3.5.2 Repeat Survey

For sites delineated as natural wetland from the procedure set out at **Section 3.5.1**, the Council shall commission, in consultation with the Director-General of Conservation and the Consent Holders, a suitably qualified and experienced ecologist to undertake wetland vegetation survey and subsequent reporting within five (5) years from the original date of survey at around the same time of year as the original delineation survey. The repeat surveys must be designed in a way that enables ecologically meaningful and statistically robust scoring of the wetland condition in order to analyse changes to the wetland's condition resulting from the groundwater abstraction.

This repeat survey must be completed once after the initial delineation Wetland Delineation Procedure (to provide an accurate baseline) but thereafter will only take place every five (5) years where technical assessment carried out according to **Section 2.1.1** confirms that there is an adverse decline in wetland levels resulting from groundwater abstraction.

A decline in wetland water level attributable to groundwater abstraction will be determined from the monitoring and analysis of temporal groundwater level variations in the sentinel bores set out in **Table 5**.

3.6 Environmental Monitoring Report

At the end of each irrigation season, the Council will commission the preparation of an Annual Environmental Monitoring Report (AEMR) by the Independent Water Resource Effects Review Panel and the Independent Irrigation Efficiency Review panel. The Council will endeavour to ensure that, if possible, these nominated technical experts have experience and knowledge of the locality. A copy of the AEMR will be provided to the Consent Holders and the Director-General of Conservation by 31 July each year.

The purposes of the AEMR are:

- To provide a summary of the monitoring results for the previous year, including trends, against Objective 1 of the GMCP;
- To assess the monitoring undertaken over the previous year against the standards set out in Objective 1;
- To identify any changes/amendments to monitoring locations/parameters/frequencies that could be incorporated in future SIMPRs;
- To report on any issues apparent with the monitoring; and
- To identify any improvement that could be made with respect to the monitoring.

The AEMR will also contain an evaluation of whether the observed effects of the groundwater takes are consistent with the predictions of environmental response contained in the AAWUG Report.

The AEMR's primary function is to provide a summary of the monitoring information from the prior year's monitoring. The AEMR may contain recommendations for changes to monitoring and the appropriate abstraction quantities for each consent holder, but the SIMPR is the point at which these recommendations will be decided on by Council.

4. CONTINGENCY PLAN

Exercise of the consents is subject to compliance with Objective 1 of this GMCP.

As described in **Section 2**, a trigger level system is used to define environmental criteria that signal changes may be occurring outside of what is normal (TL1) or at a point where remedial action is required to avoid Objective 1 not being met (TL2).

This section details the responses that will be undertaken where trigger levels are exceeded under any of the monitoring suites discussed in **Sections 2.1.2.1, 3.2, 3.3, and 3.4**.

Where a trigger level is exceeded, the Council will commission a Groundwater Trigger Exceedance Report ("GTER"), if required. The objective of the GTER is to establish the cause of a trigger level exceedance and to recommend a programme of action to end the exceedance.

A GTER shall include:

- Review of the monitoring results collected (including quantity of water abstracted) and establish why the exceedance has occurred;
- Set out requirements for increased monitoring of the exceedance;
- Set out environmental monitoring to detect effects of the exceedance, such as changes in extent of rivers, natural wetlands, springs or dune lakes;
- Update the report on a regular basis as more data becomes available; and
- Recommend actions to end the trigger level exceedance, which could include:
    - A staged reinstatement of abstraction to pre-exceedance rates and volumes;
    - Reduced levels of abstraction for all or some of the consent holders covered by the GMCP;
    - Suspension of abstraction by all or some of the consent holders covered by the GMCP.

4.1 Exceedance of TL1

In the event of a TL1 exceedance, which may represent declining groundwater levels or rising salinity indicators, the following actions must be undertaken:

(a) The Council will notify the Consent Holders in writing within 24 hours, or as soon as practicable, of when the TL1 exceedance became known.

(b) If the exceedance is of a salinity indicator in the bores listed in **Table 6**, then sampling of the monitoring bore(s) in exceedance shall immediately be upgraded to a weekly frequency for four (4) weeks following the first exceedance of the TL1. Weekly monitoring shall continue until sample results are consistently below TL1 values for a period of four (4) weeks or as directed by Council.

(c) If after four (4) weeks following the first exceedance of the TL1, the initiation of seawater intrusion and/or water level decline cannot be discounted to the satisfaction of the Council, then a GTER by the nominated technical expert (and ecologist if the exceedance concerns a surface water body) shall be commissioned by the Council.

(d) The GTER shall assess the significance of the exceedance against the requirements of Objective 1 of the GMCP. The GTER shall assess why trigger levels have been breached, identify the pumping bores in the area(s) of effect and will review all of the available data collected in the affected area(s), in particular the data collected pursuant to this GMCP.

4.2 Exceedance of TL2

In the event of a TL2 exceedance, which represents a significant departure from normal groundwater conditions, with either continuously declining groundwater levels or rising salinity indicators:

(a). The Council will inform the Consent Holders in writing within 24 hours, or as soon as practicable, of a TL2 exceedance becoming known.

(b). Consent Holders must reduce their abstraction to 50% of the current average daily quantity, as calculated using the previous month's water use records required to be kept in accordance with the conditions of its groundwater take consent as directed by Council. If the exceedance occurs within one month of a Consent Holder first taking water for irrigation purposes within an irrigation season, then the average shall be calculated using the water use records for this period only. The Council will advise the Consent Holder in writing of the required reduction in the daily water take volume.

Given the geographic distribution of water permits included in this GCMP, direction by Council for individual Consent Holders to reduce their abstraction will include consideration of:

- The location, nature and extent of the trigger level exceedance;
- State and trends in the same or related indicator parameters at other monitoring sites listed in **Table 5, Table 6,** and **Table 7**; and
- The location, rate, and volume of abstraction by individual Consent Holders.

(c). A GTER by the nominated technical expert (and ecologist if the exceedance concerns a dune lake or natural wetland) shall be commissioned by Council. The GTER shall assess why the TL2 has been breached, identify the pumping bores in the area of effect, and include a review of all available data collected for the affected area(s), in particular, the data collected under this GMCP.

(d). Once (b) above has been complied with, the Consent Holder may apply to the Council's Compliance Manager for an alternative reduction in its daily water take volume. The Council's approval of an alternative reduction value will only be given if it is satisfied that relevant TL2 values will not be exceeded. The Council will use the GTER to inform its decision on any alternative reduction value for a Consent Holder.

(e). If the TL2 exceedance is in a bore(s) that is/are not continuously monitored, then weekly groundwater level measurements and/or sampling of saline intrusion (depending on which trigger level is breached) in all bores where TL2 trigger levels are breached will commence within one week of the TL2 trigger level exceedance. Monitoring will continue until such time as:

- Three consecutive samples in an individual monitoring bore are below all TL2 thresholds established for that piezometer; or
- As directed by the Council.

(f). If salinity indicators continue to increase or groundwater levels continue to decline after 21 days following the implementation of (b), then the Consent Holder's abstraction must be reduced to 25% of the current average daily quantity, as calculated for (b) above. The Council will advise the Consent Holder in writing of this further reduction and the required reduction in the daily water take volume.

(g). If (f) is implemented, then the Council will commission a review and update of the GTER report by the nominated technical expert with a longer-term programme of recommended responses incorporating observed responses to interim pumping rate reductions. The updated GTER will include a specific programme (including timeframes) of actions which would achieve compliance with Objective 1 of this GMCP. The actions may include, but not be limited to incremental reductions in the daily quantity of groundwater taken as a percentage of the allowable daily pumped volume, as well as testing of domestic/stock water supplies in bores that are efficiently utilising the aquifer and are potentially impacted by saline intrusion, and if necessary, the provision of temporary water supplies to any affected parties (excluding any of the Consent Holders) in the event that Chloride concentrations exceed 250 mg/L (being the guideline value for taste prescribed in New Zealand Drinking Water Standards for New Zealand 2005 (Revised 2008)). The GTER will also identify a methodology which the Council will utilise to increase abstraction back to the volumes applicable to the relevant stage of taking (see **Section 2.1**), where this can be done such that Objective 1 of this GMCP will be met. If it is not possible to increase abstraction back to the relevant stage of taking, then the GTER will identify a methodology to increase abstraction to a lesser volume such that Objective 1 of the GMCP will be met.

(h). Actions arising from the GTER shall continue as long as the issue continues.

(i). Implement additional remedial measures as directed by Council, including the suspension of taking.

5. REFERENCES

Clarkson, B.R., Sorrell, B.K., Reeves, P.N., Champion, P.D., Partridge, T.R., Clarkson, B.D. (2003). Handbook for monitoring wetland condition (Revised October 2004).

Retrieved from

https://www.landcareresearch.co.nz/publications/researchpubs/handbook_wetland_condition.pdf.

Ministry for the Environment. (2006). A National Protocol for State of the Environment Groundwater Sampling in New Zealand.

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http://www.mfe.govt.nz/sites/default/files/national-protocol-groundwater-dec06-updated.pdf

APPENDIX A – Areas of Interest for Wetland Delineation

Area of Interest - Overview
Land Cover and Wetland Risk - Excluding High Producing Grassland

N

WILLIAMSON WATER & LAND ADVISORY

Houhora
Lamb
Waterfront
Waterfront
NRC Waterfront Rd Piezo
Houhora Heads
Burnage
Browne
NRC Forest Piezo
N
M
Wetland
MWWUG Kaimaumau Wetland North
Motutangi
NRC Hukatere Piezo
MWWUG Kaimaumau Wetland South
Honeytree
Kaimaumau Settlement
K
Kaimaumau
Shine
P
J
Paparore
Valic-2
Valic-3
NRC Paparore Rd Piezo
H
Valic-1
NRC Ogle Drive
G
Q
NRC Lake Heather No.2
NRC Lake Heather No.3
Lake
NRC Lake Heather No.1
Waipapakauri
Sweetwater MW1
MW1a
MW2a
Sweetwater MW2
D
MW4a
MW6
E
Sweetwater MW5
MW5a
Ahipara
AUPOURI FOREST

Legend

- Shallow Monitoring Bore
- Deep Monitoring Bore
- Production Bore
- Wetlands (FENZ/NRC/LUCAS/LCDB5)
- Coastline
- Area of Interest

Land cover
- High Producing Exotic Grassland

Risk
- High
- Moderate

Data Provenance
Freshwater Ecosystems geo-database (FENZ)
Known Wetlands (Northland Regional Council)
Wetlands (LUCAS NZ Land Use Map)
NZ Top 50 Gridless Map (Land Information New Zealand)
1m Lidar Survey Dataset (Northland Regional Council)
Land cover database-5.0 (IRIS)

0 5 10 km

Land Cover and Wetland Risk-Excluding High Producing Grassland - Area M

N

WILLIAMSON
WATER & LAND ADVISORY

M

L

Legend

- Production Bore
- State Highway
- River / Stream
- Lake
- Wetlands (FENZ/NRC/LUCAS/LCDB5)
- Coastline
- Removed Area of Interest
- Area of Interest

Land cover

- High Producing Exotic Grassland

Risk

- High
- Moderate

Data Provenance
Freshwater Ecosystems geo-database (FENZ)
Known Wetlands (Northland Regional Council)
Wetlands (LUCAS NZ Land Use Map)
NZ Top 50 Gridless Map (Land Information New Zealand)
1m Lidar Survey Dataset (Northland Regional Council)
Land cover database-5.0 (IRIS)

0 0.5 1 km

Land Cover and Wetland Risk-Excluding High Producing Grassland - Area N

N

WILLIAMSON
WATER & LAND ADVISORY

N

Legend

- State Highway
- River / Stream
- Lake
- Wetlands (FENZ/NRC/LUCAS/LCDB5)
- Coastline
- Area of Interest

Land cover

- High Producing Exotic Grassland

Risk

- High
- Moderate

Data Provenance
Freshwater Ecosystems geo-database (FENZ)
Known Wetlands (Northland Regional Council)
Wetlands (LUCAS NZ Land Use Map)
NZ Top 50 Gridless Map (Land Information New Zealand)
1m Lidar Survey Dataset (Northland Regional Council)
Land cover database-5.0 (IRIS)

0 0.5 1 km

Middle Group

Consent conditions

AAWUG Conditions – Middle Group

This framework comprises conditions applicable to the following applications:

APP.040919.01.01	NA Bryan Estate, SG Bryan, CL Bryan, KY Bryan, Valdares and D Bryan (Property 1)
APP.040130.01.01	Tuscany Valley Avocados Ltd
APP.040918.01.01	NA Bryan Estate, SG Bryan, CL Bryan, KY Bryan, Valadares & D Bryan (Property 2)
APP.039628.01.02	KSL Ltd
APP.040361.01.01	Tiri Avocados Ltd
APP.040362.01.01	Valic NZ Ltd
APP.040363.01.01	Green Charteris Family Trust
APP.039841.01.02	Mate Yelavitch & Co Ltd
APP.040386.01.01	Robert Paul Campbell Trust

Note: *Pursuant to Section 116 of the Resource Management Act 1991, the date of commencement of this consent is* ***XX XX 20XX****.*

[CONSENT HOLDER]

AUT.XX **To take and use groundwater from the Paparore, Waiparera, Motutangi, and Houhora sub-aquifers of the Aupōuri-Aquifer management unit for horticultural irrigation purposes.**

LOCATION

Address of Site

[Insert address reference]

Legal Description of Site

Site of take: [Insert legal descriptions]

Sites of use: [Insert legal descriptions]

Map Reference (New Zealand Transverse Mercator Projection)

Bore 1: XXE XXN

Bore 2: XXE XXN

Note: An error accuracy of +/- 50 metres applies to these map references.

CONSENT DURATION

This consent is granted for a period expiring on **30 November 2033.**

CONDITIONS OF AUT.XX

1 The Consent Holder shall pay all charges relating to the recovery of cost for the administration, monitoring and supervision of this consent fixed by Council under Section 36 of the Resource Management Act 1991.

2 The exercise of this consent is bound by the Master Consent conditions **attached** as Appendix A. The Master Consent uses an alternate numbering system '1MC, 2MC, 3MC…'.

3 Subject to compliance with the conditions of this consent, the activity authorised by this consent shall be carried out in accordance with the application and documents submitted as part of the application, including the following documents:

(a) [Insert original AEE document for the specific application];

(b) Assessment of Environmental Effects prepared by Williamson Water & Land Advisory Ltd: *Aupōuri Aquifer Groundwater Take Consent Applications, Assessment of Environmental Effects – Aupōuri Aquifer Water User Group. WWLA0184: Rev. 2*, dated 27 February 2020; and

(c) Model Report prepared by Williamson Water & Land Advisory Ltd: *Aupōuri Aquifer Groundwater Model, Factual Technical Report – Modelling – Aupōuri Aquifer Water User Group. WWLA0184: 3*, dated 5 February 2020.

For the avoidance of doubt, the conditions of this consent and the Master Consent shall prevail over any other submitted information.

4 This consent operates under an adaptive management regime. The detail of that adaptive management regime is set out in the Groundwater Monitoring and Contingency Plan for the Middle Group of the Aupōuri Aquifer Water User Group Consents, **Dated: [XX XX 2021] ("GMCP")**. The primary purpose of the GMCP is to set out the procedures by which the abstraction will be monitored and managed to ensure compliance with Condition 1MC. For the purpose of this consent, the GMCP is the most recent version of the GMCP amended under Condition 10MC.

5 In the event that any of the provisions of the GMCP conflict with the requirements of these conditions of consent, these conditions of consent shall prevail. Where there is no conflict, the Consent Holder must comply with the GMCP at all times.

6 The consent shall be exercised in a staged manner as follows:

(a) Stage 1, which shall be a period during which:

- 12 months of monitoring baseline data has been collected and used to define all the trigger levels specified in the GMCP; and
- irrigation has occurred for one full irrigation season where the irrigation water has been sourced, as far as practicable, from the Stage 1 annual volume as set out in Condition 9;

(b) Stage 2, which shall be for the minimum period of two consecutive full irrigation seasons;

(c) Stage 3, which shall be for the minimum period of five consecutive full irrigation seasons;

(d) Stage 4 which shall be from the full irrigation season immediately following written approval from the Council to progress from Stage 3 until the expiry of the consent, unless Conditions 12-17 apply.

7 The combined daily volume of water taken across all bores shall not exceed the following:

(a) [XX] cubic metres in any 24 consecutive hours unless Conditions 12(b), 14, 16 or 17 of this consent apply; and

(b) That required to replace soil moisture depleted by evapotranspiration over the irrigated area.

8 The Consent Holder shall take all practicable steps to ensure that:

(a) The volume of water used for irrigation does not exceed soil field capacity of the irrigated areas;

(b) The irrigation does not cause surface runoff that would discharge into natural waterbodies;

(c) There is no leakage from pipes and structures;

(d) The use of water is confined to targeted areas;

(e) Irrigation induced soil erosion and soil pugging does not occur;

(f) Soil quality is not degraded as a consequence of irrigation; and

(g) Loss of water, nutrients, and agrichemicals by percolation to groundwater is minimised.

Compliance with this condition will be demonstrated by the Water Use Efficiency conditions 24 – 30 and the outcome of the Irrigation Efficiency Review Panel tasks described in the GMCP.

9 Unless conditions 12 – 17 require a reduced volume, then the annual volume of water taken from Bore [xx] for each stage shall not exceed the following:

(a) Stage 1: [XX] cubic metres between 1 July in a year and 30 June in the following year;

(b) Stage 2: [XX] cubic metres between 1 July in a year and 30 June in the following year;

(c) Stage 3: [XX] cubic metres between 1 July in a year and 30 June in the following year;

(d) Stage 4: [XX] cubic metres between 1 July in a year and 30 June in the following year.

10 Progress to the next stage shall only occur where written approval is given by the Council's Compliance Manager; and

(a) This written approval will only be given if the Council is satisfied that the Staged Implementation and Monitoring Review prepared in accordance with the GMCP confirms that the groundwater abstraction complies with Condition 1MC and that decision has been informed by independent hydrogeological, ecological and irrigation efficiency expert reviews; and

(b) A decision on written approval will not be made until the Council has consulted with the Consent Holder and the Director-General of Conservation over the Staged Implementation and Monitoring Review; and

(c) Notwithstanding Condition 10(b), written approval to progress from Stage 1 to Stage 2 will not be considered unless all the monitoring trigger levels required by the GMCP have been set and agreed to by the independent hydrogeological and ecological reviewers; and

(d) A report detailing the reasons for the Council's decision in regard to progressing to the next stage, including the identification and discussion of any matters raised during the consultation described in Condition 10(b), will be provided to the Consent Holder and the Director-General of Conservation.

Breaching of Trigger Levels

11 In the event of a Trigger Level 1 (TL1) in the GMCP being exceeded, the following actions and requirements shall be initiated:

(a) The Consent Holder shall liaise with the Council to ensure that additional monitoring of water levels and water quality is undertaken to better understand the pattern of low water levels and/or poorer water quality and the contribution that bore abstractions are making to this pattern. This extra monitoring will take the form of more frequent measurements and additional monitoring points in the vicinity of the locations where TL1 values have been exceeded.

(b) The measures specified in the GMCP for an exceedance of TL1.

12 In the event of a Trigger Level 2 (TL2) in the GMCP being exceeded, the following actions and requirements shall be initiated:

(a) The Council will notify the Consent Holder in writing that a TL2 has been breached within 24 hours, or as soon as practicable, of it becoming aware of the breach;

(b) Upon receipt of this notice, the Consent Holder shall immediately reduce its daily abstraction to 50% of the current average daily quantity, as advised by the Council in the notice. The current average daily quantity will be calculated using the previous month's water use records as required by Condition 22. If the exceedance occurs within one month of a Consent Holder first taking water for irrigation purposes within an irrigation season, then the average shall be calculated using the water use records for this period only;

(c) The measures specified in the GMCP for an exceedance of TL2, including that the Council will commission a Groundwater Trigger Exceedance Report (GTER) to assess why the trigger level has been breached, identify the pumping bores in the area of effect, and review all of the available data collected in the affected area(s).

13 Once Condition 12(b) has been complied with, the Consent Holder may apply to the Council's Compliance Manager for an alternative reduction in its daily water take volume. Council's approval of an alternative reduction value will only be given if it is satisfied that a TL2 exceedance that is attributable to this consent will not occur. The applicable alternative reduction value is the value that is contained in the recommendations made in the GTER required to be prepared by Condition 12(c). Approval for an alternative reduction will be given to the MWWUG Consent Holders first, as identified in the GMCP.

14 If the TL2 trigger levels are still exceeded after 21 days, then the Consent Holder shall reduce its daily abstraction to 25% of the current average daily quantity calculated for Condition 12(b). The Council will notify the Consent Holder in writing of any breach and the required reduction in the daily water take volume.

15 Once Condition 14 has been complied with, the Consent Holder shall also comply with the recommendations contained in the revised and updated GTER commissioned by the Council, which will be prepared for the purpose of specifying a programme of actions to achieve compliance with Condition 1MC.

16 If the TL2 trigger levels continue to be exceeded after the implementation of the remedial measures required under Conditions 12-15, the Council shall either require the Consent Holder to suspend the exercise of this consent, or continue its daily abstraction at a further specified reduced rate, until such time as the Council issues written notice that the Consent may be exercised again in accordance with the requirements of any subsequently revised and updated GTER. Any increase in abstraction will be provided to the MWWUG Consent Holders first, as identified in the GMCP.

17 Any abstraction that results in non-compliance with Condition 1MC must be suspended.

Notification of Irrigation

18 When irrigation is to commence for the first time each season, the Consent Holder shall advise the Council's assigned Monitoring Officer in writing at least five working days prior to the exercise of this consent.

Backflow Prevention

19 Prior to the first exercise of this consent, a backflow prevention system shall be installed on all horticultural irrigation systems that draw water directly from a production bore and are also used to apply animal effluent, agrichemical or nutrients to prevent the backflow of contaminants to groundwater.

Metering and Abstraction Reporting

20 Prior to the first exercise of this consent, a meter and datalogger(s) with at least 12 months data storage able to record the rate and volume of take, and the date and time this water was taken, shall be installed and maintained to measure at least every 15 minutes the volume of water taken, in cubic metres, from each production bore. Each meter shall:

(a) Be telemetered to the Northland Regional Council;

(b) Be sealed and as tamper-proof as practicable;

(c) Be installed at the location from which the total volume of water is taken;

(d) Have an accuracy of +/-5%,

(e) Have an international accreditation or NZ equivalent calibration endorsement, and

(f) Be installed and maintained throughout the duration of the consent in accordance with the manufacturer's instructions to ensure the meter is fully functional at all times.

The Consent Holder shall, at all times, provide safe and practical access to each meter installed for Council to undertake visual inspections, data retrieval, and record water take measurements.

21 The Consent Holder shall verify that the meter required by Condition 20 is accurate. This verification shall be undertaken prior to 30 June:

(a) Following the first taking of water from each production bore in accordance with this consent; and

(b) At least once in every five years thereafter.

Each verification shall be undertaken by a person who, in the opinion of the Council's Compliance Manager, is suitably qualified. Written verification of the accuracy shall be provided to the Council's assigned Monitoring Officer no later than 31 July following the date of each verification.

22 The Consent Holder shall keep a record of the daily volume of water taken from each production bore in cubic metres, including all nil abstractions, using the readings from the meter(s) required by Condition 20.

23 A copy of the records required to be kept under Condition 22 shall be forwarded to the Council's assigned Monitoring Officer annually by the 31 July, for the previous period 1 July to the 30 June.

In addition, a copy of these records shall be forwarded immediately to the Council's assigned Monitoring Officer on written request. The records shall be in an electronic format that has been agreed to by the Council.

Water Use Efficiency

24 The Consent Holder shall prepare an Irrigation Scheduling Plan (ISP) that outlines how irrigation decisions will be made. The purpose of the ISP is to set out how the irrigation will be undertaken to ensure that at least 80 percent of the annual volume of water applied to the irrigable area is retained in the soil in the root zone of the crop, compared to the average gross depth of water applied to the crop. The ISP shall be prepared by a suitably qualified and experienced person and submitted to the Council's Compliance Manager for written certification that it will achieve the purpose of this condition. The ISP shall, as a minimum, address:

- Water balance and crop water requirements;
- Subsurface drainage;
- Measures for continuous improvement in water efficiency; and
- Overall irrigation strategy.

For each irrigation area, the ISP shall include:

(a) A map of the irrigation area;

(b) A description of how water requirements for each irrigation cycle are calculated;

(c) Method(s) for assessing current soil moisture levels;

(d) Method(s) for assessing potential evapotranspiration (PET) and rainfall to date;

(e) Soil moisture target to be maintained in each zone by irrigation;

(f) How measured data will be used to assess irrigation requirements over the next irrigation cycle;

(g) A description of proposed method(s) for remaining within consent limits at each borehole or group of boreholes; and

(h) Continuous improvement in water efficiency.

25 The Consent Holder shall not exercise this consent until the ISP required by Condition 24 has been certified by the Council's Compliance Manager. That certification shall be informed by an Independent Irrigation Efficiency Review Panel comprising two independent irrigation experts appointed by Northland Regional Council and be funded by the Consent Holder.

26 The ISP certified in accordance with Condition 24 shall be implemented prior to the first irrigation season, unless a later date has been approved in writing by the Council's Compliance Manager.

27 The Consent Holder must comply with the ISP at all times.

28 The Consent Holder shall, within six months of the first exercise of this consent, undertake an audit of the irrigation system and of the certified ISP. The audit shall be undertaken by a suitably qualified and experienced person. The irrigation system audit shall be prepared in accordance with Irrigation New Zealand's "Irrigation Evaluation Code of Practice" (dated 12 April 2010), and shall include recommendations on any improvements that should be made to the system to increase water efficiencies or any amendments to the ISP. The results of the audit and its recommendations shall be submitted in writing to the Council's assigned Monitoring Officer within one month of the audit being undertaken. Any recommended amendments to the ISP shall be submitted to the Council's Compliance Manager for written certification that it will achieve the condition 24 purpose of the ISP before they take effect. A follow-up audit shall occur at five yearly intervals throughout the term of this consent with the intent of confirming an irrigation efficiency of at least 80 percent.

29 The Consent Holder shall, within three months of notification in writing by the Council's Compliance Manager, implement any amendments certified under Condition 28.

30 The reticulation system and its component parts shall be maintained in good working order to minimise leakage and wastage of water.

31 The rate at which water is applied to the irrigated area shall not result in ponding of irrigated water within any irrigated area, or runoff from either surface or subsurface drainage to a water body, as a result of the exercise of this consent.

Advice Note: *The ISP seeks to ensure that at least 80 percent of the annual volume of water applied to the irrigable area is retained in the soil in the root zone of the crop, compared to the average gross depth of water applied to the crop.*

Review Condition

32 In addition to any reviews otherwise required under the above conditions of this consent, the Council may, in accordance with Section 128 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the conditions of this consent at any time for any one or more of the following purposes:

(a) To deal with any adverse effects on the environment that may arise from the exercise of the consent and which it is appropriate to deal with at a later stage – including matters stated in Master Consent condition 1MC; or

(b) To insert or amend trigger level thresholds established in accordance with the GMCP as conditions of consent; or

(c) To reduce the abstraction quantity authorised by this consent if the water use is determined to be inefficient or surplus to needs; or

(d) To review the allocation of the resource; or

(e) In response to any other relevant reason for review identified in Section 128 of the Resource Management Act.

A review of this consent may be carried out separately or together with reviews of other consents for the purpose of managing the effects of the activities carried out under those resource consents.

The Consent Holder shall meet all reasonable costs of any such review.

Lapsing Condition

33 This consent shall lapse five (5) years after the date that the consent commences in accordance with section 116(1) of the Resource Management Act 1991, unless the consent has been given effect to before this date.

Middle Group

Middle Group GMCP

Groundwater Monitoring and Contingency Plan for the Middle Group of the Aupōuri Aquifer Water User Group Consents

31 August 2021

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GLOSSARY OF TERMS

Saline/saltwater intrusion	For the purposes of this Groundwater Monitoring and Contingency Plan, saline/saltwater intrusion refers to changes in salinity at nominated monitoring locations that exceed thresholds established to indicate elevated potential for adverse effects on groundwater quality for potable supply and/or irrigation use, and effects on freshwater ecosystems
Efficient bore takes	An efficient bore take is when a bore fully penetrates the water bearing layer and takes water from the base of the aquifer.
Sub-aquifer	The Aupōuri Aquifer system is divided into 10 separate sub-aquifer units for the purposes of setting tailored aquifer-specific allocation limits.[1]
First in-first served	Under the Resource Management Act 1991, applications for water take are processed in the order in which they are lodged. The rights of parties associated with this Groundwater Monitoring and Contingency Plan are prioritised according to the order in which their permits are granted and added to this Plan.
Stage 1	The period during which: • 12 months of monitoring baseline data has been collected and used to define all the trigger levels specified in this GMCP; and • irrigation has occurred for one full irrigation season where the irrigation water has been sourced, as far as practicable, from the Stage 1 annual volume specified in Table 1 of this GMCP, as applied for each individual take/consent
Full irrigation season	Irrigation that occurs within the entire period of a water year, being 1 July to 30 June, when irrigation is required, whether or not the full allocation for a stage is irrigated during a water year.

[1] Policy H.4.4 (Table 29) of the Proposed Regional Plan for Northland (Updated Appeals Version) May 2021.

Sentinel bore	A monitoring bore specifically established to monitor groundwater levels and salinity indicators in a specified location. For the purposes of this Groundwater Monitoring and Contingency Plan, sentinel bores are those established and/or proposed monitoring bores (not production bores) in which piezometers are installed to measure groundwater levels and salinity indicators in the deep shellbed aquifer and/or the shallow sand aquifer.
Natural Baseline Values	Measured values from monitoring points that reflect the natural range of fluctuations in water levels and water chemistry, unaffected by abstractions.

1. INTRODUCTION

1.1 Scope and Objective of the GMCP

This document comprises a groundwater monitoring and contingency plan for the middle group of the Aupōuri Aquifer Water User Group (AAWUG) which includes bores located within the (southern) Houhora, Motutangi, Paparore, and Other sub-aquifers of the Aupōuri aquifer management unit ("the GMCP"). Much of the approach outlined in this GMCP has been informed by the technical assessment presented in the *Motutangi-*[Waiparera]*Waiharara Groundwater Model, Factual Technical Report – Modelling. Motutangi-*[Waiparera]*Waiharara Water User Group. WWA0026: Final – Rev. 9*, dated 31 August 2017 (herein referred to as the **MWWUG Report**) and the *Aupouri Aquifer Groundwater Model, Factual Technical Report – Modelling – Aupouri Aquifer Water User Group. WWLA0184, Rev 3*, dated 5 February 2020 (herein referred to as the **AAWUG Report**). Both reports were prepared by Williamson Water & Land Advisory Ltd.

The GMCP covers the implementation and monitoring of the groundwater take consents listed in **Table 1** (hereafter referred to as the Consent Holders) and is a programme of adaptive management that is suitable to provide a platform for the implementation of these abstractions.

The Consent Holders listed in **Table 1** are a group of consents that have been jointly granted subsequent to the previous tranche of consents granted to other consent holders within the Motutangi-Waiharara Water User Group (MWWUG), which are subject to separate conditions and a separate GMCP. The MWWUG consents, and the AAWUG consents to which this GMCP applies, are distributed across a similar geographic area, abstracted from (generally) the same sub-aquifers, and share a similar radius of potential effects.

In accordance with the *first in-first served* approach to water allocation under the Resource Management Act 1991, applications for a resource are determined in the order in which they are lodged with Council. The MWWUG consents have been granted with a staged implementation of abstraction to coincide with monitoring of water quantity and water quality changes within the aquifer. This Middle GCMP overlaps with the MWWUG area so it is important that the progression of abstraction in this group does not interfere with that current adaptive management strategy for development of the groundwater resource. Therefore, the consent conditions and this GMCP include clauses designed to retain the primacy of the MWWUG consents where remedial measures, including reductions, cessations, and staggered reactivation of takes, are required.

An adaptive management regime requires clear objectives against which the effects and management progress may be evaluated. The objective of this GMCP is that:

Objective 1: **The abstractions must, individually and cumulatively, avoid:**

- **(a) Adverse effects of saltwater intrusion into the Aupōuri aquifer;**
- **(b) Adverse effects on the hydrological functioning, including changes to water levels[2], of natural wetlands, springs and dune lakes;**
- **(c) Alteration to the extents of rivers, natural wetlands, springs and/or dune lakes;**
- **(d) Adverse effects on the significant indigenous vegetation and habitats in (terrestrial and freshwater environments of) dune lakes, springs and natural wetlands; and**

[2] Avoiding "change" means that as a result of the abstraction of water; median water levels, mean annual water level fluctuations and patterns of water level seasonality (relative summer vs winter) remain unchanged.

(e) Adverse effects on the significant indigenous vegetation and significant habitats of indigenous fauna in terrestrial and freshwater environments of the Kaimaumau-Motutangi wetland; and

(f) Adverse effects on the flow levels and flow variability of rivers and streams and springs so that their habitat quality and sustainable mahinga kai, recreational, and other social and cultural values, are maintained (including sufficient flows and flow variability to maintain their habitat quality, including to flush rivers of deposited sediment and nuisance algae and macrophytes and support the natural movement of indigenous fish and valued introduced species such as trout; and

(g) Lowering of the groundwater levels of the Aupōuri aquifer such that existing efficient bore takes operating as a permitted activity or in accordance with resource consent conditions cannot access the authorised volume of groundwater.

Extensive environmental monitoring is required to achieve avoidance of the effects listed above, and to support the proposed 'adaptive management' approach including a staged implementation of groundwater extraction. The purpose of the GMCP is to provide a framework that meets the requirements and principles of adaptive management. The GMCP provides a methodology for implementing adaptive management and prescribes specific monitoring requirements, establishes groundwater level and groundwater quality monitoring triggers and outlines a process for implementation of appropriate mitigation and remediation measures if nominated trigger values are exceeded.

The GMCP is intended to allow the early detection of any impact to the (southern) Houhora, Motutangi, Waiparera, Paparore, and Other sub-aquifers of the Aupōuri aquifer management unit, the Kaimaumau-Motutangi wetland (Kaimaumau Wetland) and surface water bodies associated with the exercise of groundwater take consent(s), by:

- Requiring regular monitoring of the groundwater system both on and off-site;
- Setting monitoring criteria to indicate potential impact(s) on the groundwater system, Kaimaumau Wetland and surface water bodies;
- Implementing mitigation measures including changes to the pumping regime if trigger levels are reached to ensure that Objective 1 continues to be met;
- Reviewing monitoring data before and after a step level increase in pumping rate;
- Ensuring that the monitoring data is available for regular review by the Council;
- Detailing a Contingency Plan to be implemented if an unanticipated impact(s) is identified;
- Providing information to quantify the actual effects of the abstraction on the groundwater resource; and
- Enabling validation of the numerical model by the Consent Holders for any replacement groundwater take consent applications.

1.2 Parties Associated with this GMCP

The parties who have been deemed to be associated with this GMCP at its inception are Northland Regional Council ("the Council"), the Consent Holders in **Table 1**, and the Director-General of Conservation.

The following sections provide a brief description of the roles and responsibilities of each party associated with this GMCP.

Should any of these parties change during the implementation of this GMCP, either through addition or removal, the process as set out in **Section 1.3** below shall be applied.

The rights of Consent Holders associated with this GMCP are prioritised according to the order in which their permits are granted and added to this GMCP, in accordance with the first in-first served approach to water allocation under the Resource Management Act 1991.

1.2.1 Northland Regional Council

The Council will undertake the ongoing monitoring requirements of the GMCP on behalf of the Consent Holders. The actual and reasonable cost of undertaking the ongoing monitoring of these consents for the Consent Holders will be charged in accordance with Council's Charging Policy.

The installation of sentinel bores and monitoring equipment is the responsibility of the Consent Holders.

1.2.2 Consent Holders

The Consent Holders identified in **Table 1** of this GMCP are required to exercise their consents in accordance with this GMCP except as required by condition 3 of the Middle Group consents.

The exercise of the consents will be in accordance with Council initiated instructions which will be issued once the actions and process established through this GMCP have been undertaken.

The Consent Holders may seek changes to the GMCP through either of the processes set out in **Section 1.3**.

1.2.3 Director-General of Conservation

The Director-General of Conservation is responsible for administering land and waterbodies subject to reserve status under the Reserves Act 1977 and conservation or stewardship area status under the Conservation Act 1987, along with native fish and functions relating to protected species under the Wildlife Act 1953. Within the (southern) Houhora, Motutangi, Waiparera, Paparore and Other sub-aquifers of the Aupōuri Aquifer management unit; these areas include:

- Kaimaumau Wetland

The Director-General of Conservation is a party to this GMCP to ensure that the relevant provisions of these Acts, which the Director-General of Conservation administers, and in particular the matters identified in Objective 1 of the GMCP, are met.

It is also relevant to note that the Ngāti Kuri Claims Settlement Act 2015, Te Aupōuri Claims Settlement Act 2015, NgāiTakoto Claims Settlement Act 2015, and the Te Rarawa Claims Settlement Act 2015 all contain provisions relating to a 'korowai redress' which set-out co-governance arrangements for conservation land known as the 'Korowai for Enhanced Conservation'. The Korowai for Enhanced Conservation recognises the historical, spiritual and cultural association NgāiTakoto, Te Aupōuri, Te Rarawa and Ngāti Kuri iwi have with conservation land and the roles that the hapū and marae of each undertake as kaitiaki of the whenua and taonga of the conservation estate.

1.3 Changes to the GMCP

This GMCP may be amended at any time to:

- Incorporate new or replacement water permits, or remove water permits, in the (southern) Houhora, Motutangi, Waiparera, Paparore, or Other sub-aquifers of the Aupōuri aquifer management unit that occur in the same general area and have overlapping and/or additional monitoring requirements or which are subject to different trigger levels or trigger levels based on monitoring described in this GMCP:
- Alter the nature and scope of the required monitoring (i.e. monitoring frequency and intensity (type and number of samples)) and associated trigger levels as is determined from final decisions of the Council under the Staged Implementation Monitoring Programme Review, Annual Environment Monitoring Report, and Groundwater Trigger-Level Exceedance Report;
- Incorporate or remove parties who are, or may need to be, a part of this GMCP to ensure Objective 1 is met.

If either the Council or a Consent Holder wishes to amend the GMCP, then it must provide notice in writing of the proposed changes, along with any supporting technical documents, to the other Consent Holders, and the Director-General of Conservation.

A suitably qualified and experienced hydrogeologist and ecologist (i.e. 2 people) shall be nominated by Council to act as an independent technical expert for the purpose of peer reviewing proposed changes to the GMCPs. They shall be known as the **Independent Water Resource Effects Review Panel**. The nominated technical expert shall, within 20 working days, provide a report to the Council, the Consent Holders and the Director-General of Conservation on the proposed changes to the GMCP.

If any party does not agree with the outcome of the report on the proposed change, that party shall notify the Council of the reasons for the disagreement within 20 working days from the date that the review report was received.

Any change to the GMCP will only be authorised by Council if the review of the proposed change clearly indicates that the change will meet Objective 1 of the GMCP.

The Council will notify the Consent Holders and the Director-General of Conservation of the decision, detailing the reasons for its decision, including the identification and discussion of areas of agreement and disagreement.

If any changes are made to the GMCP, then a date-stamped copy of the amended GMCP will be provided to the Consent Holders and the Director-General of Conservation.

2. FRAMEWORK FOR ADAPTIVE MANAGEMENT

In summary, the following adaptive management techniques are applied in this GMCP:

(a) **Baseline monitoring** – a monitoring programme has been developed for Stage 1 of the **Table 1** abstractions to establish a robust existing environmental baseline. This monitoring programme is contained in this GMCP, however, some monitoring detail is still required and this is indicated by the acronym 'TBC'.

As part of the baseline information, a constant rate pumping test of at least 24 hours duration (but no more than 72 hours duration) shall be carried out at the peak pumping rate for all bore fields (i.e. a single bore or cluster of bores within 100 m of each other) abstracting more than 864 m^3/day (10 L/s) located within 2 kilometres of a community water supply bore or a wetland or lake (unless monitoring data shows these surface water features (wetland, stream or lake) are perched above the fully saturated groundwater system). The test must monitor groundwater levels in neighbouring bores at varying depths to allow determination of aquifer parameters and an assessment of drawdown effects in the deep shellbed aquifer, at the water table and the change in level and/or flow in any surface water feature within 2 kilometres of the abstraction point. The results of the test must be reviewed by an independent hydrogeologist appointed by the Council and the results of that review may be used as a basis to review consent conditions under s 128 RMA. Prior to undertaking the test, it will be prudent for the Consent Holder(s) to get the design of the test reviewed by the independent hydrogeologist that Council will use to later review the test analysis, to ensure it is fit for purpose. If a suitable nearby pumping test has been completed this may satisfy this testing requirement, if approved by the independent hydrogeologist.

(b) **Early warning systems** – Trigger levels (TLs) will be established to set up an early warning system that provides a response mechanism when differences between predicted and actual water levels and/or salinity concentrations occur. A trigger level is an environmental criterion that if, reached or met, requires a certain response to be actioned.

(c) **Staged development** – Abstraction volumes will progressively be increased in a staged manner, with expansion contingent on compliance with yet to be established trigger levels and on regular reviews of groundwater level, freshwater and wetland ecology, hydrology, and salinity monitoring results. It is noted that the consent documentation requires that all development starts at Stage 1 volumes whether or not others have progressed to Stage 2 or further. This is an essential mechanism for staging as an adaptive management response.

(d) **Management of consents being exercised immediately after commencement** – Until such time as there is adequate data to base the adaptive management on actual data and for Objective 1 of this GMCP to be achieved, the abstractions that occur immediately after commencement (i.e. in the first year) will be subject to interim wetland water level and saline trigger levels and Groundwater Trigger Exceedance Report procedures.

(e) **Tiered approach to monitoring** – Monitoring requirements will increase if and when site trigger levels are approached or exceeded. Likewise, monitoring intensity may decrease with evidence of sustained compliance and stability and only by way of the process outlined in **Section 1.3** of this GMCP; and

(f) **Ongoing adaptive management** – The abstractions will be managed adaptively within the term of consent, and in the event of trigger level exceedance through the implementation of the recommendations of a Groundwater Trigger Exceedance Report (GTER) prepared by Council.

(g) **Suspension of abstractions** – Should compliance with Objective 1 of this GMCP not be achieved, then the exercise of the consents to abstract and use groundwater will be suspended until such time as Council confirms in writing that compliance can be achieved.

(h) **Consent review** – this GMCP does not override the ability for consents and/or consent conditions to be reviewed in circumstances stipulated in condition 32 of the Middle Group of water take consents, or section 128 of the Resource Management Act 1991.

The following sections provide detailed information relating to the adaptive management framework to be imposed for the exercise of the consents.

2.1 Staged Implementation

This GMCP covers the new applications for the AAWUG which are being granted as separate consents. The uptake of water by the Consent Holders will be over four (4) stages of 25%, 50%, 75%, 100%.

The progressive increase in irrigation requirements on developing orchards, provides an opportunity to apply an adaptive management approach that establishes a baseline and allows the original hypotheses of avoidance of effects to be periodically re-evaluated to ensure Objective 1 of this GMCP continues to be met as development occurs.

The management approach provides a series of responses to be taken based on the monitoring results, including where monitoring shows that Objective 1 of this GMCP is not being met, as discussed in **Section 2.2**.

The uptake by Consent Holders of the consented total allowable water volumes will be permitted in four stages, taking a minimum of nine years, as shown in **Table 1** below, unless the outcome of the Staged Implementation and Monitoring Programme Review detailed in 2.1.1 shows that there should be a delay in moving to the next stage, or that the next stage should not occur.

Table 1. Summary of staged implementation annual volumes

Application Number	Consent Holder	Indicated year of irrigation start	Allowable Annual Volume (m3)			
			Stage 1 (Year 1)[1]	Stage 2 (Year 2-3)[1]	Stage 3 (Year 4-8)[1]	Stage 4 (Year 9- full consent term)[1]
Houhora sub area management unit						
APP.040919.01.01	NA BRYAN ESTATE, SG BRYAN, CL BRYAN, KY BRYAN VALADARES &D BRYAN (1)	2022/2023	18,625	37,250	55,875	74,500
		Total (m^3/year)	**18,625**	**37,250**	**55,875**	**74,500**
		Total (% allocated per stage)	**25%**	**50%**	**75%**	**100%**
Motutangi sub area management unit						
APP.040130.01.01	TUSCANY VALLEY AVOCADOS LTD (M BELLETTE)	2020/2021	8,820	17,640	26,460	35,280
APP.040918.01.01	NA BRYAN ESTATE, SG BRYAN, CL BRYAN, KY BRYAN VALADARES &D BRYAN (2)	2023/2024	37,250	74,500	111,750	149,000
APP.039628.01.04[3]	KSL LTD	2020/2021	750	1,500	2,250	3,000
		Total (m^3/year)	**46,820**	**93,640**	**140,460**	**187,280**
		Total (% allocated per stage)	**25%**	**50%**	**75%**	**100%**
Paparore sub area management unit						
APP.040361.01.01[2]	TIRI AVOCADOS LTD	2020/2021	142,100	284,200	426,300	568,400
APP.040362.01.01[2]	VALIC NZ LTD	2020/2021	42,140	84,280	125,420	168,560
APP.040363.01.01[2]	WATAVIEW ORCHARDS (GREEN CHARTERIS FAMILY TRUST)	2020/2021	5,000	10,000	15,000	20,000
		Total (m^3/year)	**189,240**	**378,480**	**567,720**	**756,960**

Application Number	Consent Holder	Indicated year of irrigation start	Allowable Annual Volume (m3)			
			Stage 1 (Year 1)[1]	Stage 2 (Year 2-3)[1]	Stage 3 (Year 4-8)[1]	Stage 4 (Year 9- full consent term)[1]
		Total (% allocated per stage)	**25%**	**50%**	**75%**	**100%**
Aupōuri - Other sub area management unit						
APP.039841.01.02[4]	MATE YELAVICH & CO LTD	2020/2021	12,740	25,480	38,220	50,960
APP.040368.01.01	ROBERT PAUL CAMPBELL TRUST	2022/2023	88,200	176,400	264,600	352,800
		Total (m^3/year)	**100,940**	**201,880**	**302,820**	**403,760**
		Total (% allocated per stage)	**25%**	**50%**	**75%**	**100%**

Notes:

[1]The staged implementation is based on years when irrigation occurs following the granting of the consents.

2.1.1 Staging: Implementation and Monitoring Programme Review

A Staged Implementation and Monitoring Programme Review ("the SIMPR") will be required for Council to decide whether Consent Holders proceed to the next allocation stage. At the following times, the volume of abstraction authorised will be reviewed against the staged implementation outlined in Section 2.1 at the minimum intervals of:

- **End of Stage 1:** A period during which:
  - 12 months of monitoring baseline data has been collected and used to define all the trigger levels specified in this GMCP; and
  - irrigation has occurred for one full irrigation season where the irrigation water has been sourced, as far as practicable, from the Stage 1 annual volume specified in Table 1 of this GMCP, as applied for each individual take/consent;
- **End of Stage 2:** Three (3) irrigation seasons following date of commencement of the consents; and
- **End of Stage 3:** Eight (8) irrigation seasons following date of commencement of the consents.

The main purpose of the SIMPR is to assess whether proceeding to the next stage would comply with Objective 1 of the GMCP.

- The SIMPR will be commissioned by the Council and shall be prepared by the **End of Stage 1:** A period during which:
  - 12 months of monitoring baseline data has been collected and used to define all the trigger levels specified in this GMCP; and
  - irrigation has occurred for one full irrigation season where the irrigation water has been sourced, as far as practicable, from the Stage 1 annual volume specified in Table 1 of this GMCP, as applied for each individual take/consent;
- **End of Stage 2:** Three (3) irrigation seasons following date of commencement of the consents; and
- **End of Stage 3:** Eight (8) irrigation seasons following date of commencement of the consents.

Independent Water Resource Effects Review Panel), with input from an **Irrigation Efficiency Review Panel**, comprising two irrigation experts appointed by the Council. The Council will endeavour to ensure that all the nominated technical experts have experience and knowledge of the locality and must be independent of the consent holders.

The SIMPR will include a detailed assessment of all environmental monitoring data including groundwater levels, salinity indicators, and water quality, and include consideration of spatial and temporal trends including potential effects of groundwater abstraction on water levels in dune lakes and natural wetlands. The **Irrigation Efficiency Review Panel** will ensure that water is being used in an efficient manner and not in a way that causes any excessive or wasteful abstraction. The SIMPR will assess whether Objective 1 of this GMCP is being met at the current level of abstraction, and whether Objective 1 will be met at the next stage level of abstraction. The SIMPR may also consider the nature and scope of continued monitoring (i.e. monitoring frequency and intensity (type and number of samples)) and associated trigger levels.

The SIMPR will provide recommendations based on the assessment of the environmental monitoring data to date on:

- the setting or alteration of the trigger levels;
- whether any changes to the monitoring programme are required;
- whether any reduction in consented abstraction quantities is appropriate, in relation to either environmental effects and/ or efficient water use; and
- whether to advance to the next stage of abstraction or to remain at the current level of abstraction, or to reduce the level of abstraction.

A copy of the SIMPR will be provided to the Consent Holders and the Director-General of Conservation a minimum of three (3) months prior to the anticipated commencement of the subsequent irrigation season utilising volumes defined for the subsequent development stage as stated in **Table 1**. The Consent Holders and Director-General of Conservation have 20 working days to provide a response to the Council on the conclusions and recommendations of the SIMPR.

If any party does not agree with the conclusions and recommendations of the SIMPR, then a report by a suitably qualified hydrogeologist and/or an ecologist, both with experience and knowledge of the locality if possible, detailing the reasons for the disagreement shall be provided to Council within 30 working days from the date that the copy of the SIMPR was sent to the party.

An increase in the volume of abstraction to the next development stage and any change to the monitoring programme will only be authorised by Council if the technical assessment of the monitoring data clearly indicates that the increase in the allocation and any necessary change to the GMCP would meet Objective 1 of this GMCP.

Council will provide a report to the Consent Holders and the Director General of Conservation detailing the reasons for its decision, including the identification and discussion of areas of agreement and disagreement within twenty (20) working days from the date they receive a report on points of disagreement about the SIMPR.

If any changes are made to the GMCP as a result of the SIMPR, then a copy of the amended GMCP will be provided to the Consent Holders and the Director General of Conservation within five (5) working days of the change being authorised as final.

A summary of the above process is also included in the conditions of each consent that is covered by this GMCP.

2.1.2 Stage 1 (Year 1) Management Regime

Stage 1, from a management perspective, is the initial development stage following first commencement of the new consented quantities listed in **Table 1**. This adaptive management plan recognises that the level of Stage 1 development occurring immediately upon commencement will be small, volumetrically, but that interim trigger levels will still be required prior to exercise of consents where levels have not been established through the minimum baseline monitoring timeframe.

Where Sentinel bores have already been installed through the implementation of the MWWUG GMCP and trigger levels established, they will need to be revised based on the approach described in section 2.2, so they can be utilised to manage the takes in **Table 1**. For newly established sentinel bores, during Stage 1 interim triggers for groundwater levels and salinity indicators will be established following the methodology outlined in Section 2.1.2.1.

The Council is to notify the Consent Holders and the Director-General of Conservation of the interim trigger levels (and default management parameters) for Stage 1 (Year 1) three (3) months prior to the commencement of abstraction. The Consent Holders and Director-General of Conservation have 10 working days to provide responses to the Council on the default management parameters once notified.

The monitoring specified in Section 3 will be undertaken during Stage 1 to ensure interim triggers are not exceeded (i.e., to ensure compliance with Objectives 1(a - g)). Exceedance of interim trigger levels during Stage 1 will result in the implementation of the trigger level exceedance measures outlined in **Section 4** below.

The interim management regime established for Stage 1 (Year 1) may be superseded by the Monitoring and Trigger Level Setting components set out in **Section 2.2** of this GMCP.

2.1.2.1 Paparore Sentinel Bore Saline Intrusion & Groundwater Level: Monitoring and Triggers

Interim trigger levels for minimum groundwater levels and salinity indicators will need to be set in the new Paparore Sentinel bore identified in **Table 4 and Table 6** for Stage 1. Ongoing monitoring will be required to ensure that Objectives 1(a - g) are met by implementing trigger level exceedance measures.

Once the Paparore Sentinel bore is drilled, groundwater level and salinity indicators will be measured and recorded. This information will be used to set interim trigger levels for these parameters as per the methodology established in **Section 2.2** below and shall be inserted into the GMCP through the process set out in **Section 1.3**. Interim trigger levels must be set prior to exercise of consents[3] located within the Paparore sub-aquifer unit.

2.1.2.2 Trigger Level Responses

In the event of an exceedance of a trigger level in the Paparore Sentinel bore applicable in Stage 1 (Year 1), the Trigger Level Exceedance response plan contained in **Section 4** of this GMCP shall apply.

2.1.2.3 Ceasing Interim Stage 1 (Year 1) Management Regime

This interim management regime shall remain in place until such time as the setting of trigger levels as per **Section 2.2** below has been given effect to through amendment to this GMCP in accordance with the change process established in **Section 1.3** of this GMCP.

[3] APP.04361.01.01, APP.040362.01.01, APP.040363.01.01.

2.2 Trigger Level System

2.2.1 Timeframe for setting of trigger levels

The setting of trigger level values for each parameter (where TBC is indicated in the monitoring plan tables in **Section 3**) will be undertaken during the first implementation stage after 12 months of monitoring data has been collected and within 15 months of the date of commencement of these consents. This approach recognises that:

- There is historical monitoring data available for most parameters;
- In some areas, no baseline data has been established by the Consent Holders or any of the key stakeholders in the area; and
- The manifestation of any effects from the exercising of these new consented quantities will steadily progress with time in accordance with the staged development process outlined in Error! Reference source not found.. The scale of abstraction during the baseline data collection period (i.e. generally 12 months following commencement of consent) will not vary significantly from existing conditions.

2.2.2 Method for setting of trigger levels

A two-tier trigger level system will be implemented on the consents:

- TL1 – The first-tier trigger level establishes whether the parameter of concern is approaching outer limits of baseline data. It must be within the range of measured fluctuations in Natural Baseline Values to achieve this purpose. For water level measurements it is to be set at the lowest 10th percentile of natural baseline water level measurements that show no obvious effects of drawdown interference from neighbouring pumping bores. For electrical conductivity it shall be within 1 mS/m of the maximum measured Natural Baseline Values and an equivalent basis is to be used for any other water chemistry TL1 limits. If this trigger level is breached, then additional monitoring will be undertaken by the Council and the consent holders. This additional monitoring will assist characterisation of the nature and significance of changes to the baseline condition of the groundwater resource.
- TL2 – The second-tier trigger level for the MWWUG consents is set at a threshold defining a 'significant' departure from baseline conditions and/or conditions where the risks of adverse environmental effects are increased. To avoid interfering with the staged progression of the MWWUG consents, the TL2 levels for this group shall be set midway between the TL1 and MWWUG TL2 values (or equivalent). If this trigger level is breached, then the Consent Holders will be required to reduce their daily water take volume in a staged manner over a set period of time. Because the reference point for the TL2 values for this group of consents is determined by using the MWWUG TL2 values, the following points set out how the MWWUG TL2 limits should be specified:

  MWWUG TL2 Criteria for water levels

  - For shallow water table areas hydraulically connected to natural wetlands, the TL2 value is to be set at the lowest natural baseline water level measurements that show no obvious effects of drawdown interference from neighbouring pumping bores. For all other water level monitoring points, the TL2 values are to be set at the smallest exceedance of the natural baseline range that results from the following criteria:
    - A variation of 20% of the range of natural baseline fluctuations beyond the lowest measured natural baseline water level;

- A decline of 0.5 m beyond the lowest natural baseline water level;
- In coastal monitoring bores, the Ghyben-Herzberg water level limit required to protect against sea-water intrusion;
- Any shallower limit required to ensure that Objective 1 of this GMCP is achieved.

- MWWUG TL2 Criteria for water quality parameters
  - The smallest exceedance of the natural baseline range that results from the following criteria:
    - The median electrical conductivity value + 50%;
    - An increase of 20 mS/m in the electrical conductivity above the maximum Natural Baseline Value;
    - For parameters other than electrical conductivity a change of a similar scale to the two preceding points;
    - Any smaller increase required to ensure that Objective 1 of this GMCP is achieved.

The trigger level parameters required under this GMCP for the various suites are summarised in **Table 2**.

Table 2: Summary trigger level parameters by monitoring suite

Monitoring Suite	Parameters
Groundwater level and salinity monitoring	Groundwater level, electrical conductivity
Saline intrusion monitoring	Electrical conductivity, chloride, sodium, total dissolved solids.
Kaimaumau-Motutangi Wetland and any other wetland of concern that is hydraulically connected to the water table, as determined by hydrogeology and ecological experts	Groundwater level in shallow sand aquifer. Wetland surface water levels.

2.2.3 Response to exceeding trigger levels

The actions required should trigger levels be exceeded are set out in **Section 4** (Contingency Plan).

3. MONITORING PROGRAMME & TRIGGER LEVEL SETTING

3.1 Bore Locations and Details

A consolidated summary of the schedule of bores that are required to be monitored as part of this GMCP is provided in **Table 3**. Along with the bores identified for monitoring, the table provides key details relating to the bores' physical attributes and parameters to be monitored. The resultant wetland monitoring locations are to be hydrologically connected with the full range of water levels in the open water habitat of the Kaimaumau Wetland or any other natural wetlands that are subsequently identified as required to be monitored. The following sections of the GMCP provide the monitoring schedules (frequency and trigger levels) for the bores.

The locations of the production bores in **Table 3** are shown in Figure 1.

Table 3: Schedule of monitoring facility and production bore details.

Bore Name		Bore Owner	Coordinates (NZTM 2000)		Depth (m)	Dia. (mm)	Piezo. No.	Target aquifer	Purpose*
Generic	NRC ref.		Easting	Northing					
MONITORING BORES									
Fishing Club	LOC.200250	NRC	1611411	6146928	79			Deep shellbed	SI; MI
Waterfront	LOC.200210	NRC	1611712	6146689	19	32	1	Shallow sand	GLc, ECc
			1611712	6146689	74	32	4	Deep shellbed	GLc, ECc
Motutangi	TBC	NRC	1615677	6139811	<10	50	1	Shallow sand	GLc; ECc
			1615676	6139821	80-100 (TBC)	50	2	Deep shellbed	GLc; ECc
Norton Road	TBC	NRC	1619875	6134377	80-100 (TBC)	50	2	Deep shellbed	GLc; ECc
Kaimaumau	LOC.316222	NRC	1622445	6134482	20		1	Shallow sand	GLc; ECc; SI; MI
	LOC.315766	NRC	1622426	6134466	72		2	Deep shellbed	GLc; ECc; SI; MI
Kaimaumau Wetland	TBC	NRC	1616379	6140758	<1.5	50	1	Standing water in wetland	GLc
Honeytree	TBC	NRC	1618911	6136120	6	50	2	Shallow sand	GLc
Paparore	TBC	NRC	1619100	6130600	<10			Shallow sand	GLc; ECc
	TBC	NRC	1619100	6130600	80-100 (TBC)			Deep shellbed	GLc; ECc
Kaimaumau Settlement	TBC	NRC	1624250	6135897	<20		1	Shallow sand	GLm, SI
	TBC	NRC	1624250	6135897	>50 (TBC)		2	Deep shellbed	GLm, SI

Bore Name		Bore Owner	Coordinates (NZTM 2000)		Depth (m)	Dia. (mm)	Piezo. No.	Target aquifer	Purpose*
Generic	NRC ref.		Easting	Northing					
PRODUCTION BORES									
Bryan Estate 1	TBC	NA Bryan Estate, SG Bryan, CL Bryan, KY Bryan Valdares & D Bryan (1)	1613415	6143424	TBC		1	Deep shellbed	GLm, ECm
Bryan Estate 2	TBC	NA Bryan Estate, SG Bryan, CL Bryan, KY Bryan Valdares & D Bryan (1)	1613901	6142132	TBC		1	Deep shellbed	GLm, ECm
KSL	TBC	KSL Ltd	1614333	6138477	TBC		1	Deep shellbed	GLm, ECm
Tuscany Avocados	TBC	Tuscany Valley Avocados Ltd	1614490	6138367	TBC		1	Deep shellbed	GLm, ECm
Robert Campbell	TBC	Robert Paul Campbell Trust	1615813	6135787	TBC		1	Deep shellbed	GLm, ECm
Yelavich	TBC	Mate Yelavich & Co Ltd	1616833	6133996	TBC		1	Deep shellbed	GLm, ECm
Wataview	TBC	Wataview Orchards (Green Charteris Family Trust)	1619441	6132282	TBC		1	Deep shellbed	GLm, ECm
Tiri 1	TBC	Tiri Avocados Ltd	1618056	6130290	TBC		1	Deep shellbed	GLm, ECm
Tiri 2	TBC	Tiri Avocados Ltd	1618856	6130196	TBC		2	Deep shellbed	GLm, ECm
Valic 4	TBC	Valic NZ Ltd	1617589	6129130	TBC		1	Deep shellbed	GLm, ECm
Waiharara School		Ministry of Education						Shallow Sand	GLm

Notes:

TBC = to be confirmed within 15 months of the date of commencement of these consents.

* Purpose key:

GLc = Continuous Groundwater Level;

GLm = Manual (monthly) Groundwater Level;

ECc = Continuous Electrical Conductivity;

ECm = Manual (monthly) Electrical Conductivity;

SI = Salinity Indicators (quarterly);

MI = Major Ions (quarterly).

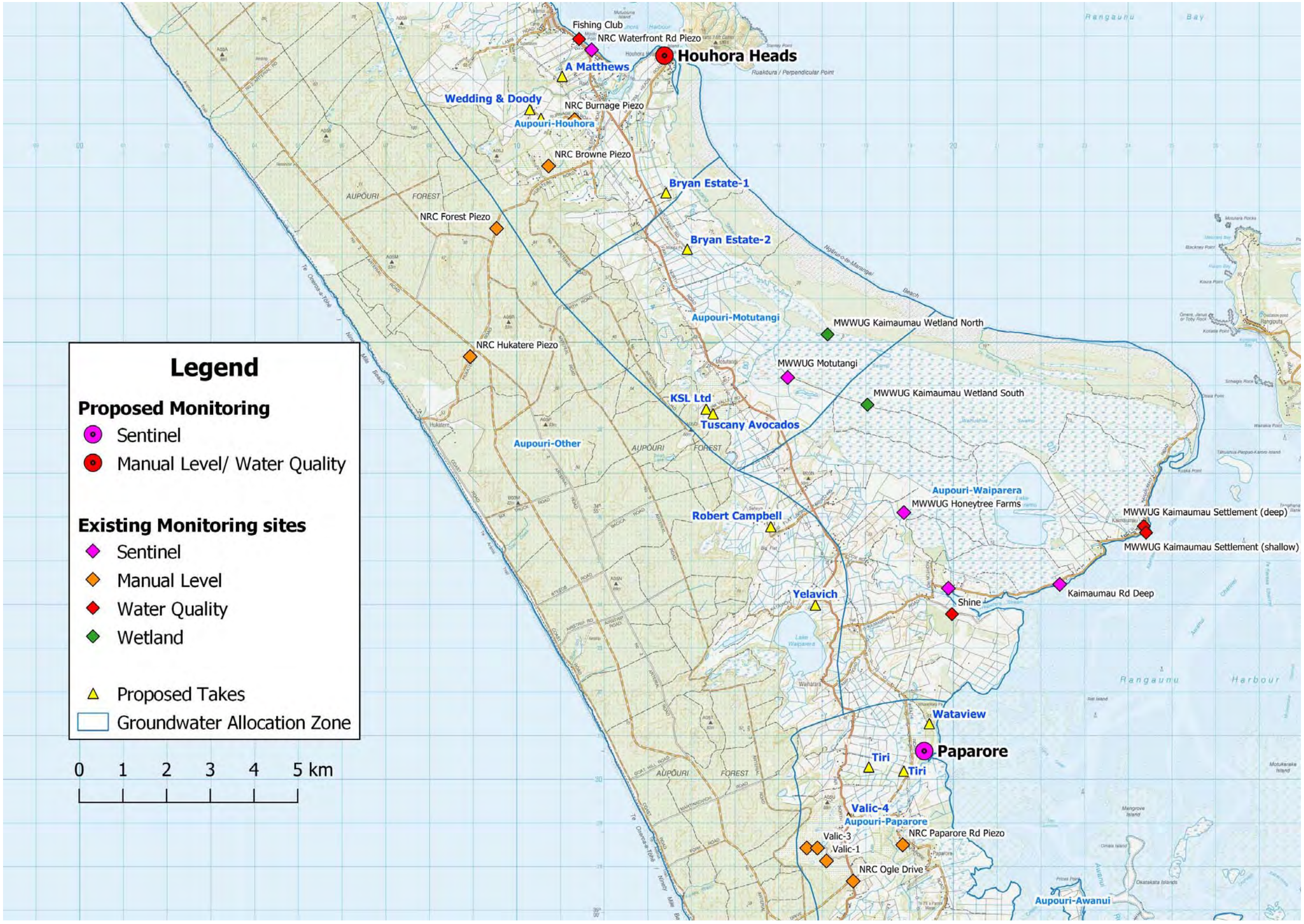

Figure 1.Monitoring and Production Bore Location Map.

3.2 Groundwater Level Monitoring & Establishment of Trigger Levels

3.2.1 Continuous Groundwater Level Monitoring

Sentinel bores will collect data continuously for water levels and electrical conductivity in individual piezometers and will be utilised as the primary reference sites for regional monitoring of potential effects associated with saline intrusion. Data will be telemetered to the Council.

Groundwater levels will be monitored in the shallow sand and deep shellbed aquifers to quantify the magnitude of drawdown resulting from the proposed abstraction in the deep shellbed and unconfined shallow sand aquifers to ensure it is within the magnitude anticipated in the AEE and meets Objective 1 of this GMCP.

These bores will provide early detection or warning of:

- Groundwater levels around the coastal margin approaching a threshold that could indicate a greater risk of saline intrusion; and
- Any reduction in water quality that could indicate the landward migration of the saline interface; and
- Groundwater levels in the shallow sand aquifer lowering and having a potential adverse effect on surface water bodies, springs, dune lakes or natural wetlands.

Details of the sentinel bores are summarised in Table 4 below. All sentinel monitoring bores listed in **Table 4** will be installed prior to the exercise of the consents and must be of sufficient depth to allow monitoring to occur at all times (i.e. to accommodate both high and low water level conditions).

Checking of the sensors required for continuous monitoring will be undertaken on a monthly basis, and any faults will be recorded and remedied immediately. Data will be collected, processed and managed in accordance with the Council's quality standards.

In addition to these continuous measurements, manual measurements will be made at the bores where that is identified in the tables of this GMCP.

3.2.2 Schedule of Groundwater Level Monitoring & Trigger Levels

The two-tier trigger level system (TL1 and TL2) for groundwater levels in all Sentinel bores, excluding the new Paparore Sentinel bore, is set-out in **Table 4**. Electrical conductivity trigger levels for these bores are contained in **Table 6**.

Groundwater level triggers will be established in the deep shellbed aquifer in the new Paparore sentinel bore as follows:

- Using the baseline groundwater level data gathered during the initial 12 months following the commencement of consents in **Table 1**, allowing for the predicted magnitude of drawdown resulting from existing and proposed abstraction outlines in the AAWUG Model Report, as refined by any pumping tests that are undertaken.

As a general guide TL2 for the shallow sand aquifer should be no less than 1.0 mAMSL and 1.5 mAMSL for deep shell bed groundwater levels (noting that changes in electrical conductivity are also a key indicator of saline intrusion). If necessary, water level records for individual sentinel bores will be correlated with existing monitoring sites to provide historical context for estimating the trigger levels in the new Paparore Sentinel bore.

Table 4. Monitoring & Trigger Levels – Groundwater Levels.

Bore Name	Depth (m)	Piezo. No.	Target aquifer	Parameter*	Units	Frequency	Trigger Levels	
							TL1	TL2
Waterfront (LOC.200210)	21	4	Shallow sand	GL	mAMSL	Continuous	TBC	TBC
							TBC	TBC
	72	1	Shellbed	GL	mAMSL	Continuous	TBC	TBC
							TBC	TBC
Motutangi (LOC.323721)	8	1	unconfined	GL	mAMSL	Continuous	TBC	TBC
				EC	µS/cm		TBC	TBC
Motutangi (LOC.323720)	83	2	Shellbed	GL	mAMSL	Continuous	TBC	TBC
				EC	µS/cm		TBC	TBC
Norton Road (LOC.323722)	80-100 (TBC)	1	Shellbed	GL	mAMSL	Continuous	TBC	TBC
				EC	µS/cm		TBC	TBC
Paparore	<20	1	unconfined	GL	mAMSL	Continuous	TBC	TBC
				EC	µS/cm		TBC	TBC
	80-100	2	Shellbed	GL	mAMSL	Continuous	TBC	TBC
				EC	µS/cm		TBC	TBC
Kaimaumau Road (LOC.316222)	20	1	unconfined	GL	mAMSL	Continuous	TBC	TBC
				EC	µS/cm		TBC	TBC
Kaimaumau Road (LOC.315766)	72	2	Shellbed	GL	mAMSL	Continuous	TBC	TBC
				EC	µS/cm		TBC	TBC

Notes:

* Parameter key: GL = Groundwater Level; EC = Electrical Conductivity;

TBC = to be confirmed within 15 months of the date of commencement of these consents.

GL TL1s (where provided) have been calculated from long term monitoring data.

GL TL2s (where provided) have been interpolated from Table F1, WWA Groundwater Modelling Report.

3.3 Kaimaumau Wetland

3.3.1 Water Level Monitoring and Trigger Levels

Available data indicate significant spatial and temporal variability in water levels both in the Kaimaumau Wetland and the underlying shallow sand aquifer. This variability makes it very difficult (if not impossible) to establish an appropriate reference against which departure from 'relative water level' can be assessed on the basis of the current water level monitoring.

As a proxy measure, the relative rate of decline in static water levels in Kaimaumau Wetland was adopted for the interim wetland water level triggers that would indicate hydrological function of the wetland is departing from 'natural' conditions. Given the lack of a suitable alternative, this approach has been retained for setting trigger levels, with the magnitude of water level recession amended to reflect data collected over the 2019-20 summer, which was an extreme drought event.

Table 5: Kaimaumau Wetland Water Level Triggers

Monitoring site	TL1	TL2
Kaimaumau Wetland - North	n/a*	n/a*
Kaimaumau Wetland - South	7-day moving average water level recession exceeding 7 mm/day	7-day moving average water level recession exceeding 8 mm/day

NOTES

* Due to access constrains at the northern site (helicopter access only), interim wetland water level triggers are proposed for the Kaimaumau Wetland - South monitoring site only. Available data indicates temporal response at both sites are virtually identical. If TL1 is exceeded at the Kaimaumau Wetland – South monitoring site, data will be collected from the Kaimaumau Wetland – North site to confirm trigger exceedance.

3.3.2 Vegetation Survey

An initial survey of the Kaimaumau Wetland was carried out in April 2020.

This GMCP requires that Council commission, in consultation with the Director-General of Conservation and the Consent Holders, a suitably qualified and experienced ecologist to undertake wetland vegetation survey and subsequent reporting every five (5) years from the original date of survey at around the same time of year as the original survey. The repeat survey(s) must be designed in a way that enables ecologically meaningful and statistically robust scoring of the wetland condition in order to analyse changes to the wetlands condition resulting from the groundwater abstraction.

This repeat survey must be completed once after the initial vegetation survey (to provide an accurate baseline) but thereafter will only take place where technical assessment carried out according to **Section 2.1.1** confirms that there is a decline in standing water level of the Kaimaumau Wetland resulting from groundwater abstraction.

A decline in standing water level of the Kaimaumau Wetland attributable to groundwater abstraction will be determined from the monitoring and analysis of temporal groundwater level variations in the shallow Motutangi piezometer in relation to the Kaimaumau Wetland Standing Wetland Water Level facilities as described in

Table 5 above.

3.4 Saline Intrusion Monitoring & Establishment of Trigger Levels

Sentinel bores will be utilised as the primary reference sites for monitoring of potential effects associated with saline intrusion. These bores are/will be positioned between existing/proposed abstraction and the coastline to provide early detection or warning of:

- Groundwater levels around the coastal margin approaching a threshold that could indicate a greater risk of saline intrusion; and
- Any reduction in water quality that could indicate the landward migration of the saline interface.

Details of the sentinel bores are summarised in **Table 6** below.

3.4.1 Stage 1 Monitoring

During the initial 12-month monitoring period, sampling for the following salinity indicators in the new sentinel bore at Paparore will be undertaken at 6-weekly intervals[4]:

- Electrical conductivity;
- Chloride;
- Sodium;
- Total Dissolved Solids.

3.4.2 Ongoing Monitoring

Ongoing monitoring of groundwater and electrical conductivity levels will be undertaken continuously via individual piezometers in sentinel monitoring bores. Monitoring data will be telemetered to the Council on a twice-daily basis. Sampling at the frequencies specified for the following salinity indicators will take place in the bores listed in **Table 6** below:

- Electrical conductivity;
- Chloride;
- Sodium;
- Total Dissolved Solids.

3.4.3 Schedule of Saline Intrusion Monitoring & Trigger Levels

The monitoring and trigger level as discussed in this section are provided in **Table 6** below. Data will be collected, processed and managed in accordance with the Council's quality standards and *A National Protocol for State of the Environment Groundwater Sampling in New Zealand* (Ministry for the Environment, 2006).

A two-tier trigger level system (TL1 and TL2) for groundwater levels and electrical conductivity will be set in these bores.

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[4] This frequency applies to the initial 12-month monitoring period for the establishment of baseline information. The frequencies specified in Table 6 are for ongoing monitoring specifications.

As an initial guide, trigger levels for individual determinants will be established using the same criteria as defined in section 2.2.2.

For the existing Sentinel bores, where trigger levels have been set as part of the MWWUG GMCP, these trigger levels will be utilised for the purposes of this GMCP as shown in **Table 6**, with the TL2 value modified to be midway between the MWWUG TL1 and TL2 values.

The setting of TL1 and TL2 trigger levels for the remaining piezometers will be undertaken during the first implementation stage after 12 months of monitoring data has been collected and within 15 months of the date of commencement of these consents and replace the interim trigger levels outlined in **Section 2.1.2.1** above.

All sentinel monitoring bores listed in **Table 6**, will be installed prior to the exercise of the consents.

Checking of the sensors required for continuous monitoring will be undertaken on a monthly basis, and any faults will be recorded and remedied immediately. Data will be collected, processed and managed in accordance with the Council's quality standards.

Table 6: Monitoring & Trigger Levels – Saline Intrusion.

Bore Name	Depth (m)	Piezo. No.	Target aquifer	Parameter*	Units	Frequency	Trigger Levels	
							TL1	TL2
Fishing Club	79	1	shellbed	EC	mS/m	Quarterly	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC
Kaimaumau Road (LOC.316222)	20	1	unconfined	EC	mS/m	Continuously	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC
Waterfront (LOC.200210)	21	4	unconfimed	EC	µS/cm	Continuous	TBC	TBC
	72	1	shellbed	EC	µS/cm	Continuous	TBC	TBC
Kaimaumau Road (LOC.315766)	72	2	shellbed	EC	µS/cm	Continuous	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC
	20	1	unconfined	EC	µS/cm	Continuous	TBC	TBC
Kaimaumau Settlement (ID TBC)	<20 (12)	1	unconfined	EC	mS/m	Quarterly	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC
	>50 (TBC)	2	shellbed	EC	mS/m	Quarterly	NA**	
				Chloride	mg/L	Quarterly		
				Sodium	mg/L	Quarterly		

Bore Name	Depth (m)	Piezo. No.	Target aquifer	Parameter*	Units	Frequency	Trigger Levels	
							TL1	TL2
				TDS	mg/L	Quarterly		
Motutangi (LOC.323721)	8	1	unconfined	EC	µS/cm	Continuous	TBC	TBC
Motutangi (LOC.323720)	83	2	shellbed	EC	µS/cm	Continuous	TBC	TBC
Norton Road (LOC.323722)	80-100	1	shellbed	EC	µS/cm	Continuous	TBC	TBC
Paparore (Sentinel) (ID TBC)	<20	1	unconfined	EC	µS/cm	Continuously	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC
	80-100	2	shellbed	EC	µS/cm	Continuously	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC
Elbury Holdings (ID TBC)	TBC	1	shellbed	EC	mS/m	Quarterly	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC

Notes:

* Parameter key: GL = Groundwater Level; EC = Electrical Conductivity; SI = Salinity Indicators; TDS = Total Dissolved Solids.

**As part of the trigger level review for the MWWUG GMCP, no trigger levels were proposed for this piezometer. This is because the existing groundwater quality at this site is almost identical to sea water. While reasons for the presence of groundwater with significantly elevated salinity at depth below Kaimaumau Settlement are (at present) uncertain, observed concentrations of indicator parameters at this site are unlikely to change as a result of seawater ingress, given current water quality.

TBC = to be confirmed within 15 months of the date of commencement of these consents.

3.5 Production Bores - Monitoring & Trigger Level Establishment

3.5.1 Stage 1 Monitoring

During the initial 12-month monitoring period, sampling for salinity indicators in the bores as set out in **Table 7** below will be undertaken at 6-weekly intervals[5] for those production bores drilled during this period.

3.5.2 Ongoing monitoring

After the initial 12 month monitoring period, monthly water level monitoring will be undertaken in the production bores listed in **Table 7**. During the winter months (nominally May to September) this monitoring will provide information to identify any inter-annual variations in aquifer storage which may be anomalous

[5] This frequency applies to the initial 12-month monitoring period for the establishment of baseline information. The frequencies specified in Table 6 are for ongoing monitoring specifications.

compared to regional trends. During the irrigation season, water level measurements will be undertaken a minimum of eight hours following the cessation of pumping.

Electrical conductivity ("EC") values will also be measured at monthly intervals from the production bores during the irrigation season to check on any changes in salinity induced by the pumping.

Continuous water level monitoring is required in a shallow observation bore adjacent to the production bore for AUT.038471.01.01 to quantify any localised drawdown effects in the shallow sand aquifer in the vicinity of a relatively large abstraction proximal to Kaimaumau Wetland. This shallow sand aquifer monitoring will enable comparison between the shallow sand aquifer impact as modelled in the AAWUG Report and the data from the shallow piezometers in the sentinel bores listed in **Table 7**.

3.5.3 Schedule of Production Bore Monitoring & Trigger Levels

The schedule of monitoring and trigger levels as discussed in this section are provided in **Table 7** below. Data will be collected, processed and managed in accordance with Council's quality standards and *A National Protocol for State of the Environment Groundwater Sampling in New Zealand* (Ministry for the Environment, 2006).

EC trigger levels will be established in the production bores listed in **Table 7** below.

During the initial 12-month monitoring period EC trigger levels will be no greater than:

- **TL1** – Departure exceeding 25% of the EC value from the initial monitoring round
- **TL2** – Departure exceeding 37.5% of the EC value from the initial monitoring round

Long-term EC triggers for individual production bores will be established following the initial 12-month monitoring period based on an assessment of spatial and temporal variation in EC observed during the initial period, in a manner consistent with EC trigger levels established in the sentinel monitoring bores.

For the existing production bores, where trigger levels have been set as part of the MWWUG GMCP, these trigger levels will be utilised for the purposes of this GMCP to provide a consistent approach to managing the potential adverse effects of groundwater abstraction within the central part of the Aupōuri Aquifer, as shown in **Table 7**. This approach also recognises that the MWWUG consents were granted prior to these consents.

No trigger levels will be established for groundwater levels in the production bores as water levels in the production bores can be impacted by well efficiency and pumping schedules so are not necessarily representative of groundwater levels in the surrounding aquifer.

Table 7: Monitoring & Trigger Levels – Production Bores.

Bore Name	Depth (m)	Piezo. No.	Target aquifer	Parameter*	Units	Frequency	Trigger Levels	
							TL1	TL2
Thomas and O'Connor	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Valadares	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
McLarnon	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Elbury Holdings	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Huanui	TBC	1	Deep shellbed	GL	mAMSL	Monthly	610	730
				EC		Monthly	TBC	TBC
Ngāi Takoto	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Cypress	TBC	1	Deep shellbed	GL,	mAMSL	Monthly	TBC	TBC

Bore Name	Depth (m)	Piezo. No.	Target aquifer	Parameter*	Units	Frequency	Trigger Levels	
							TL1	TL2
Hills				EC		Monthly	TBC	TBC
Stanisich	95	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Honeytree	112	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
	6	2	Shallow sand	GL	mAMSL	Continuous	TBC	TBC
				EC		Continuous	TBC	TBC
	111	3	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Watson	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
L J King Limited	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Mapua	111	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
	122	2	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
	97	3	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Hewitt	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Shine	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Largus	94	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Covich	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC				
	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Thomas	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Bryan Estate 1	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Bryan Estate 2	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
KSL	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Tuscany Avocados	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Robert Campbell	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Yelavich	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Wataview	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Tiri 1	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Tiri 2	TBC	2	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC
Valic 4	TBC	1	Deep shellbed	GL	mAMSL	Monthly	TBC	TBC
				EC		Monthly	TBC	TBC

Notes:

* Purpose key: GL = Groundwater Level; EC = Electrical Conductivity.

All trigger limit values in this Table to be confirmed by Council.

3.6 Unmapped Natural Wetlands

Under the National Policy Statement for Freshwater Management 2020 (NPS-FM) natural wetland means a wetland (as defined in the RMA) that is not:

(a) a wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing or former natural wetland); or

(b) a geothermal wetland; or

(c) any area of improved pasture that, at the commencement date, is dominated by (that is more than 50% of) exotic pasture species and is subject to temporary rain derived water pooling.

Some natural wetlands in this area have been mapped from prior studies and surveys[6], however, there are sites that may be classified as natural wetland that are currently unmapped.

In cases of uncertainty or dispute about the existence or extent of a natural inland wetland, the NPS-FM directs that regard must be had to the Wetland Delineation Protocols[7] as a robust method for delineating wetlands. This protocol uses three criteria for identifying and delineating wetlands: vegetation, soils, and hydrology.

3.6.1 Unmapped Wetland Delineation Procedure

The Wetland Delineation Procedure is deemed appropriate for identifying whether Areas of Interest (AoI) (**Appendix A**) contain natural inland wetland areas. The Wetland Delineation Procedure is therefore replicated below in **Table 8.**

Procedures which were completed prior to the commencement of the consent are referenced as having been completed and no further action is required against those particular procedures.

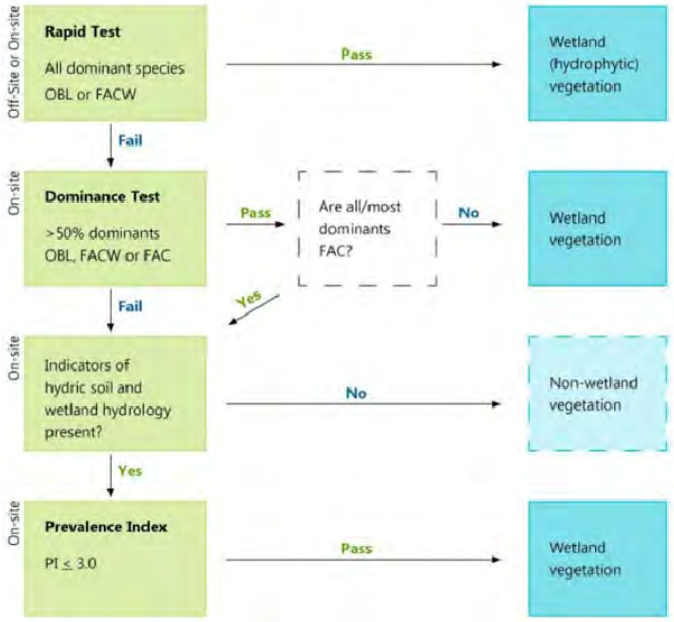
For all other procedures which were not completed prior to commencement of the consents, **Table 8** contains the steps that shall be taken to complete that procedure within this adaptive management regime.

[6] Northland Regional Council top wetland study, Protected Natural Areas Programme survey reports.
[7] https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/wetland-delineation-protocols.pdf

Table 8: Unmapped wetland delineation procedure.

No.	Delineation Procedure	Completed Prior to Commencement of Consents (Yes/No)	Comment
1.	Determine the project area (the putative wetland).	Yes	See Areas of Interest map attached (Appendix A).
2.	Decide if 'normal circumstances' are present, i.e., typical climatic/hydrologic conditions, and no recent disturbances or modifications to the project area. If yes, proceed to step 3. If no, proceed to step 7.	Yes	Area N contains three high-risk sites, as generally shown in the aerial below. Area (N)1 has been allocated to the Northern GMCP group.  Area N2 extends over privately owned orchard and residential properties. All residential development has been in place on the properties since 2007 however clearance of some hedging is visible between 2016-2018. No major modifications are observable on the orchard property. All sites shall be considered to be in 'normal circumstance' based on the land use activities which have been in existence at this site since at least 2007.

No.	Delineation Procedure	Completed Prior to Commencement of Consents (Yes/No)	Comment
			 Area N3 is on a generally undeveloped property with built development sporadically disbursed across the property joined by a primary access road. The high risk area mapped in the AoI is located in an area that was transitioned from viticulture crop (or other form of vine crop) to grass paddock between 2009-2013. No further modifications are visible in this environment.
3.	Identify and map the major vegetation types using aerial photographs, maps, contours, inventory reports, other data, and, if necessary, on-site field verification.	No	Within one month of commencement of the consents, the Council, in consultation with the Director-General of Conservation and the Consent Holders, will commission a suitably qualified and experienced ecologist to undertake the desktop and field analysis established under Procedures 4, 5 and 6. A Wetland Delineation Report (WDR) containing details of the assessment approach and outcomes shall be prepared by the same ecologist commissioned to undertake the desktop and field analysis. The WDR shall be circulated to the Consent Holders listed in **Table 1** and the Director-General of Conservation a minimum of 40 working days prior to the anticipated commencement of the subsequent irrigation season. The Consent Holders and Director-General of Conservation have 20 working days to provide a response to the Council on the conclusions and recommendations of the WDR. If any party does not agree with the
4.	**Off-site methods** to identify wetland presence and sketch approximate boundaries. Wetlands may be confirmed without an on-site inspection depending on: i. the amount and quality of data (vegetation, soils, hydrology, topography) ii. wetland ecological expertise to interpret the data.	No	
5.	**On-site methods** to delineate wetland presence and accurate boundaries: i. for small areas (≤2 ha), establish a representative plot in each major vegetation type and record the plot vegetation in three strata: tree, sapling/shrub, herb	No	

No.	Delineation Procedure	Completed Prior to Commencement of Consents (Yes/No)	Comment
	ii. for larger areas, establish representative plots along transects (as per Clarkson 2014) and sample the vegetation in three strata: tree, sapling/shrub, herb.		conclusions and recommendations of the WDR, then a report by a suitably qualified hydrogeologist and/or an ecologist, both with experience and knowledge of the locality, detailing the reasons for the disagreement shall be provided to Council within 30 working days from the date that the assessment was sent to the party. Council has the final authority over the delineation of a natural wetland and will provide a report to the Consent Holders and the Director-General of Conservation detailing the reasons for its decision, including the identification and discussion of areas of agreement and disagreement within 10 working days of receipt of the disagreeing parties report.
6.	**Hydrophytic vegetation determination**. Based on the data gathered, conduct a hydrophytic vegetation determination using the following flow chart (figure 1). **Figure 1: Flow chart of steps for hydrophytic (wetland) vegetation determination. Wetland indicator status abbreviations: FAC= facultative; FACW = facultative wetland; OBL = obligate wetland.**  Wetland indicator status ratings for species are in Clarkson et al. 2013 and subsequent updates.	No	

3.6.2 Repeat Survey

For sites delineated as natural wetland from the procedure set out at **Section 3.6.1**, the Council shall commission, in consultation with the Director-General of Conservation and the Consent Holders, a suitably qualified and experienced ecologist to undertake wetland vegetation surveys and subsequent reporting within five (5) years from the original date of survey at around the same time of year as the original delineation survey. The repeat surveys must be designed in a way that enables ecologically meaningful and statistically robust scoring of the wetland condition in order to analyse changes to the wetland's condition resulting from the groundwater abstraction.

This repeat survey must be completed once after the initial delineation Wetland Delineation Procedure (to provide an accurate baseline) but thereafter will only take place every five (5) years where technical assessment carried out according to **Section 2.1.1** confirms that there is an adverse decline in wetland levels resulting from groundwater abstraction.

A decline in wetland water level attributable to groundwater abstraction will be determined from the monitoring and analysis of temporal groundwater level variations in the sentinel bores set out in **Table 4**.

3.7 Environmental Monitoring Report

At the end of each irrigation season, the Council will commission the preparation of an Annual Environmental Monitoring Report (AEMR) by the Independent Water Resource Effects Review Panel and the Independent Irrigation Efficiency Review panel). The Council will endeavour to ensure that, if possible, these nominated technical experts have experience and knowledge of the locality. A copy of the AEMR will be provided to the Consent Holders and the Director-General of Conservation by 31 July each year.

The purposes of the AEMR are :

- To provide a summary of the monitoring results for the previous year, including trends, against Objective 1 of the GMCP;
- To assess the monitoring undertaken over the previous year against the standards set out in Objective 1;
- To identify any changes/amendments to monitoring locations/parameters/frequencies that could be incorporated in future SIMPR;
- To report on any issues apparent with the monitoring; and
- To identify any improvement that could be made with respect to the monitoring.

The AEMR will also contain an evaluation of whether the observed effects of the groundwater takes are consistent with the predictions of environmental response contained in the the AAWUG and MWWUG Reports.

The AEMR's primary function is to provide a summary of the monitoring information from the prior year's monitoring. The AEMR may contain recommendations for changes to monitoring and the appropriate abstraction quantities for each consent holder, but the SIMPR is the point at which these recommendations will be decided on by Council.

4. CONTINGENCY PLAN

Exercise of the consents is subject to compliance with Objective 1 of this GMCP.

As described in **Section 2**, a trigger level system is used to define environmental criteria that signal changes may be occurring outside of what is normal (TL1) or at a point where remedial action is required to avoid Objective 1 not being met (TL2).

This section details the responses that will be undertaken where trigger levels are exceeded under any of the monitoring suites discussed in this GMCP.

Where a trigger level is exceeded the Council will commission a Groundwater Trigger Exceedance Report (GTER), if required. The objective of the GTER is to establish the cause of a trigger level exceedance and to determine a programme of action to end the exceedance.

A GTER shall include:

- Review of the monitoring results collected (including quantity of water abstracted) and establish why the breach has occurred;
- Set out requirements for more intensive monitoring of the breach;
- Set out environmental monitoring to detect effects of breach, such as changes in extent of rivers, natural wetlands, springs and/or dune lakes;
- Update the report on a regular basis as more data becomes available; and
- Recommend actions to end the breach, this could include;
    - A staged reinstatement of abstraction levels to pre-breach levels,
    - Reduced levels of abstraction for all or some of the consent holders covered by the GMCP, or
    - Suspension of abstraction by all or some of the consent holders covered by the GMCP.

4.1 Exceedance of TL1

In the event of a TL1 exceedance, which may represent declining groundwater levels, Kaimaumau Wetland water levels, or rising salinity indicators, the following actions must be undertaken:

(a) The Council will notify the Consent Holders within 24 hours, or as soon as practicable, of when the TL1 exceedance became known.

(b) If the exceedance is of a salinity indicator in the bores listed in **Table 6**, then sampling of the monitoring bore(s) in exceedance shall immediately be upgraded to a weekly frequency for four (4) weeks following the first exceedance of the TL1. Weekly monitoring shall continue until sample results are consistently below TL1 values for a period of four weeks or as directed by Council.

(c) If after four (4) weeks following the first exceedance of the TL1, the initiation of seawater intrusion and/or water level decline cannot be discounted to the satisfaction of the Council, then a Groundwater Trigger Exceedance Report ("the GTER") by the nominated technical expert (and ecologist if the exceedance concerns a wetland) shall be commissioned by the Council.

(d) The GTER shall assess the significance of the exceedance against the requirements of Objective 1 of the GMCP. The GTER shall assess why trigger levels have been breached, identify the pumping bores in the area(s) of effect and will review all of the available data collected in the affected area(s), in particular the data collected pursuant to this GMCP.

4.2 Exceedance of TL2

In the event of a TL2 exceedance, which represents an obvious departure from normal groundwater and/or wetland conditions, with either continuously declining groundwater levels and/or wetland water levels, or rising salinity indicators:

(a) The Council will inform the Consent Holders in writing within 24 hours, or as soon as practicable, of a TL2 exceedance becoming known.

(b) Consent Holders must reduce their abstraction to 50% of the current average daily quantity, as calculated using the previous months water use records required to be kept in accordance with the conditions of its groundwater take consent. If the exceedance occurs within one month of a Consent Holder first taking water for irrigation purposes within an irrigation season, then the average shall be calculated using the water use records for this period only. The Council will advise the Consent Holder in writing of the required reduction in the daily water take volume.

(c) A GTER by the nominated technical expert (and ecologist if the exceedance concerns a wetland) shall be commissioned by Council. The GTER shall assess why the TL2 has been breached, identify the pumping bores in the area of effect, and include a review of all available data collected for the affected area(s), in particular, the data collected under this GMCP.

(d) Once (b) above has been complied with, a Consent Holder may apply to the Council's Compliance Manager for an alternative reduction in its daily water take volume. The Council's approval for an alternative reduction value will only be given if it is satisfied that relevant TL2 values will not be exceeded. Approval for an alternative reduction will be given to MWWUG Consent Holders first. The Council will use the GTER to inform its decision on any alternative reduction value for a Consent Holder.

(e) If the TL2 exceedance is in a bore(s) that is/are not continuously monitored, then weekly groundwater level measurements and/or sampling of saline intrusion (depending on which trigger level is breached) in all bores where TL2 trigger levels are breached will commence within one week of the TL2 trigger level exceedance. Monitoring will continue until such time as:

- Three consecutive samples in an individual monitoring bore are below all TL2 thresholds established for that piezometer; or
- As directed by the Council.

(f) If salinity indicators continue to increase or groundwater levels continue to decline after 21 days following the implementation of (b), then Consent Holders' abstraction must be reduced to 25% of the current average daily quantity, as calculated for (b) above. The Council will advise the Consent Holder in writing of this further reduction and the required reduction in the daily water take volume.

(g) If (f) is implemented, then the Council will commission a review and update of the GTER report by the nominated technical expert (and ecologist if the exceedance concerns a wetland) with a longer-term programme of recommended responses incorporating observed responses to interim pumping rate reductions. The updated GTER will include a specific programme (including timeframes) of actions which would achieve compliance with Objective 1 of this GMCP. The actions may include, but not be

limited to incremental reductions in the daily quantity of groundwater taken as a percentage of the allowable daily pumped volume, as well as testing of domestic/stock water supplies in bores that are efficiently utilising the aquifer and are potentially impacted by saline intrusion, and if necessary, the provision of temporary water supplies to any affected parties (excluding any of the Consent Holders) in the event that Chloride concentrations exceed 250 mg/L (being the guideline value for taste prescribed in New Zealand Drinking Water Standards for New Zealand 2005 (Revised 2008)). The GTER will also identify a methodology which the Council will utilise to increase abstraction back to the volumes applicable to the relevant stage of taking (see Section 2.1), where this can be done such that Objective 1 of this GMCP will be met. If it is not possible to increase abstraction back to the relevant stage of taking, then the GTER will identify a methodology to increase abstraction to a lesser volume such that Objective 1 of the GMCP will be met. Any increase in abstraction will be provided to MWWUG Consent Holders first.

(h) Actions from the GTER shall continue as long as the issue continues.

(i) Implement additional remedial measures as directed by Council, including of the suspension of taking.

5. REFERENCES

Clarkson, B.R., Sorrell, B.K., Reeves, P.N., Champion, P.O., Partridge, T.R., Clarkson, B.D. (2003). Handbook for monitoring wetland condition (Revised October 2004).

Retrieved from

https://www.landcareresearch.co.nz/publications/researchpubslhandbook_wetland_condition.pdf.

Ministry for the Environment. (2006). A National Protocol for State of the Environment Groundwater Sampling in New Zealand.

Retrieved from

http://www.mfe.govt.nz/sites/default/files/national-protocol-groundwater-dec06-updated.pdf

APPENDIX A – Areas of Interest for Wetland Delineation

Area of Interest - Overview
Land Cover and Wetland Risk - Excluding High Producing Grassland

N

WILLIAMSON WATER & LAND ADVISORY

Houhora
Lamb
Waterfront
Waterfront
NRC Waterfront Rd Piezo
Houhora Heads
Burnage
Browne
NRC Forest Piezo
N
M
Wetland
MWWUG Kaimaumau Wetland North
Motutangi
NRC Hukatere Piezo
MWWUG Kaimaumau Wetland South
Honeytree
Kaimaumau Settlement
K
Kaimaumau
Shine
P
J
Paparore
Valic-2
Valic-3
NRC Paparore Rd Piezo
H
Valic-1
NRC Ogle Drive
G
Q
NRC Lake Heather No.2
NRC Lake Heather No.3
Lake
NRC Lake Heather No.1
Waipapakauri
Sweetwater MW1
MW1a
MW2a
Sweetwater MW2
D
MW4a
MW6
E
Sweetwater MW5
MW5a
Ahipara
AUPOURI FOREST

Legend

- Shallow Monitoring Bore
- Deep Monitoring Bore
- Production Bore
- Wetlands (FENZ/NRC/LUCAS/LCDB5)
- Coastline
- Area of Interest

Land cover
- High Producing Exotic Grassland

Risk
- High
- Moderate

Data Provenance
Freshwater Ecosystems geo-database (FENZ)
Known Wetlands (Northland Regional Council)
Wetlands (LUCAS NZ Land Use Map)
NZ Top 50 Gridless Map (Land Information New Zealand)
1m Lidar Survey Dataset (Northland Regional Council)
Land cover database-5.0 (IRIS)

0 5 10 km

Land Cover and Wetland Risk-Excluding High Producing Grassland - Area G

N

H

G

WILLIAMSON
WATER & LAND ADVISORY

Legend

- State Highway
- River / Stream
- Wetlands (FENZ/NRC/LUCAS/LCDB5)
- Coastline
- Area of Interest

Land cover

- High Producing Exotic Grassland

Risk

- High
- Moderate

Data Provenance
Freshwater Ecosystems geo-database (FENZ)
Known Wetlands (Northland Regional Council)
Wetlands (LUCAS NZ Land Use Map)
NZ Top 50 Gridless Map (Land Information New Zealand)
1m Lidar Survey Dataset (Northland Regional Council)
Land cover database-5.0 (IRIS)

0 0.5 1 km

Land Cover and Wetland Risk-Excluding High Producing Grassland - Area H

N

WILLIAMSON
WATER & LAND ADVISORY

H

G

Legend

- State Highway
- River / Stream
- Lake
- Wetlands (FENZ/NRC/LUCAS/LCDB5)
- Coastline
- Area of Interest

Land cover

- High Producing Exotic Grassland

Risk

- High
- Moderate

Data Provenance
Freshwater Ecosystems geo-database (FENZ)
Known Wetlands (Northland Regional Council)
Wetlands (LUCAS NZ Land Use Map)
NZ Top 50 Gridless Map (Land Information New Zealand)
1m Lidar Survey Dataset (Northland Regional Council)
Land cover database-5.0 (IRIS)

0 0.5 1 km

Land Cover and Wetland Risk-Excluding High Producing Grassland - Area J

N

K

P

J

I

WILLIAMSON
WATER & LAND ADVISORY

Legend

- Production Bore
- Deep Monitoring Bore
- State Highway
- River / Stream
- Lake
- Wetlands (FENZ/NRC/LUCAS/LCDB5)
- Coastline
- Removed Area of Interest
- Area of Interest

Land cover

- High Producing Exotic Grassland

Risk

- High
- Moderate

Data Provenance
Freshwater Ecosystems geo-database (FENZ)
Known Wetlands (Northland Regional Council)
Wetlands (LUCAS NZ Land Use Map)
NZ Top 50 Gridless Map (Land Information New Zealand)
1m Lidar Survey Dataset (Northland Regional Council)
Land cover database-5.0 (IRIS)

0 0.5 1 km

Land Cover and Wetland Risk-Excluding High Producing Grassland - Area K

N

WILLIAMSON
WATER & LAND ADVISORY

K

P

J

Legend

- Shallow Monitoring Bore
- Production Bore
- State Highway
- River / Stream
- Wetlands (FENZ/NRC/LUCAS/LCDB5)
- Coastline
- Area of Interest

Land cover

- High Producing Exotic Grassland

Risk

- High
- Moderate

Data Provenance
Freshwater Ecosystems geo-database (FENZ)
Known Wetlands (Northland Regional Council)
Wetlands (LUCAS NZ Land Use Map)
NZ Top 50 Gridless Map (Land Information New Zealand)
1m Lidar Survey Dataset (Northland Regional Council)
Land cover database-5.0 (IRIS)

0 0.5 1 km

Land Cover and Wetland Risk-Excluding High Producing Grassland - Area M

N

WILLIAMSON
WATER & LAND ADVISORY

M

L

Legend

- Production Bore
- State Highway
- River / Stream
- Lake
- Wetlands (FENZ/NRC/LUCAS/LCDB5)
- Coastline
- Removed Area of Interest
- Area of Interest

Land cover

- High Producing Exotic Grassland

Risk

- High
- Moderate

Data Provenance
Freshwater Ecosystems geo-database (FENZ)
Known Wetlands (Northland Regional Council)
Wetlands (LUCAS NZ Land Use Map)
NZ Top 50 Gridless Map (Land Information New Zealand)
1m Lidar Survey Dataset (Northland Regional Council)
Land cover database-5.0 (IRIS)

0 0.5 1 km

Land Cover and Wetland Risk-Excluding High Producing Grassland - Area N

N

WILLIAMSON
WATER & LAND ADVISORY

N

Legend

- State Highway
- River / Stream
- Lake
- Wetlands (FENZ/NRC/LUCAS/LCDB5)
- Coastline
- Area of Interest

Land cover

- High Producing Exotic Grassland

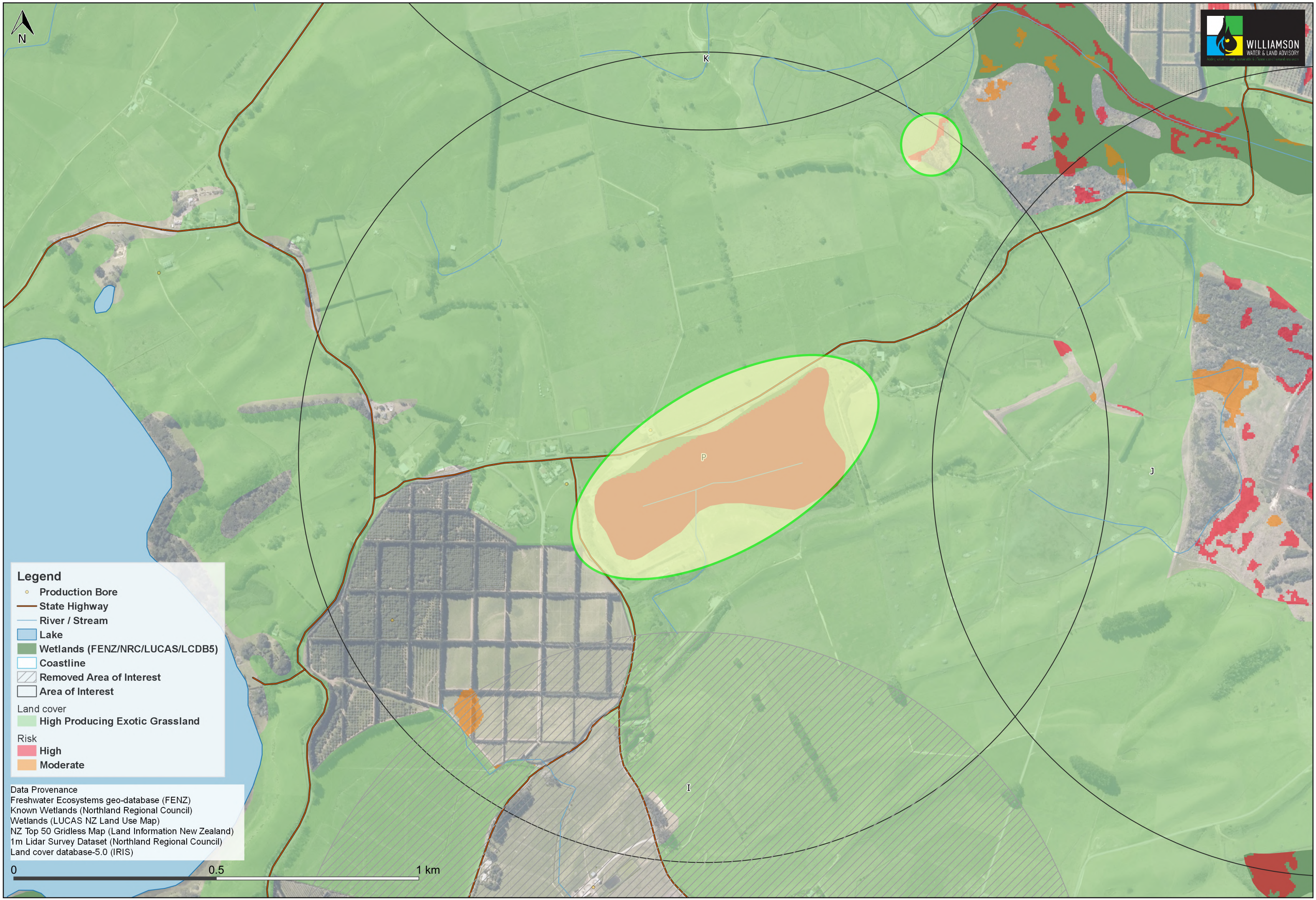
Risk

- High
- Moderate

Data Provenance
Freshwater Ecosystems geo-database (FENZ)
Known Wetlands (Northland Regional Council)
Wetlands (LUCAS NZ Land Use Map)
NZ Top 50 Gridless Map (Land Information New Zealand)
1m Lidar Survey Dataset (Northland Regional Council)
Land cover database-5.0 (IRIS)

0 0.5 1 km

Land Cover and Wetland Risk-Excluding High Producing Grassland - Area P



South-western Group

Consent conditions

AAWUG Conditions – South-western Group

This framework comprises conditions applicable to the following applications:

APP.040364.01.01	Elbury Holdings Ltd
APP.020995.01.04	Te Rarawa Farming Ltd and Te Make Farms Ltd

Note: *Pursuant to Section 116 of the Resource Management Act 1991, the date of commencement of this consent is* ***XX XX 20XX****.*

[CONSENT HOLDER]

AUT.XX **To take and use groundwater from the Sweetwater and Ahipara sub-aquifers of the Aupōuri-Aquifer management unit for horticultural irrigation purposes.**

LOCATION

Address of Site

[Insert address reference]

Legal Description of Site

Site of take: [Insert legal descriptions]

Sites of use: [Insert legal descriptions]

Map Reference (New Zealand Transverse Mercator Projection)

Bore 1: XXE XXN

Bore 2: XXE XXN

Note: An error accuracy of +/- 50 metres applies to these map references.

CONSENT DURATION

This consent is granted for a period expiring on **30 November 2033.**

CONDITIONS OF AUT.XX

1 The Consent Holder shall pay all charges relating to the recovery of cost for the administration, monitoring and supervision of this consent fixed by Council under Section 36 of the Resource Management Act 1991.

2 The exercise of this consent is bound by the Master Consent conditions **attached** as Appendix A. The Master Consent uses an alternate numbering system '1MC, 2MC, 3MC…'.

3 Subject to compliance with the conditions of this consent, the activity authorised by this consent shall be carried out in accordance with the application and documents submitted as part of the application, including the following documents:

(a) [Insert original AEE document for the specific application];

(b) Assessment of Environmental Effects prepared by Williamson Water & Land Advisory Ltd: *Aupōuri Aquifer Groundwater Take Consent Applications, Assessment of Environmental Effects – Aupōuri Aquifer Water User Group. WWLA0184: Rev. 2*, dated 27 February 2020;

(c) Model Report prepared by Williamson Water & Land Advisory Ltd: *Aupōuri Aquifer Groundwater Model, Factual Technical Report – Modelling – Aupōuri Aquifer Water User Group. WWLA0184: 3*, dated 5 February 2020.

For the avoidance of doubt, where information contained in the application documents is contrary to the conditions of this consent and those in the Master Consent (Appendix A), or where the information contained in the application documents is internally inconsistent, the conditions of this consent and the Master Consent shall prevail over any other submitted information.

4 This consent operates under an adaptive management regime. The detail of that adaptive management regime is set out in the Groundwater Monitoring and Contingency Plan for the South-western Group of the Aupōuri Aquifer Water User Group Consents, **Dated: [XX XX 2021] ("GMCP")**. The primary purpose of the GMCP is to set out the procedures by which the abstraction will be monitored and managed to ensure compliance with Condition 1MC. For the purpose of this consent, the GMCP is the most recent version of the GMCP amended under Condition 10MC.

5 In the event that any of the provisions of the GMCP conflict with the requirements of these conditions of consent, these conditions of consent shall prevail. Where there is no conflict, the consent holder must comply with the GMCP at all times.

6 The consent shall be exercised in a staged manner as follows:

(a) Stage 1, which shall be a period during which:

- 12 months of monitoring baseline data has been collected and used to define all the trigger levels specified in the GMCP; and
- irrigation has occurred for one full irrigation season where the irrigation water has been sourced, as far as practicable, from the Stage 1 annual volume as set out in Condition 9;

(b) Stage 2, which shall be for the minimum period of two consecutive full irrigation seasons;

(c) Stage 3, which shall be for the minimum period of five consecutive full irrigation seasons;

(d) Stage 4 which shall be from the full irrigation season immediately following written approval from the Council to progress from Stage 3 until the expiry of the consent, unless Conditions 12-17 apply.

7 The combined daily volume of water taken across all bores shall not exceed the following:

(a) [XX] cubic metres in any 24 consecutive hours unless Conditions 12(b), 14, 16 or 17 of this consent apply; and

(b) That required to replace soil moisture depleted by evapotranspiration over the irrigated area.

8 The Consent Holder shall take all practicable steps to ensure that:

(a) The volume of water used for irrigation does not exceed soil field capacity of the irrigated areas;

(b) The irrigation does not cause surface runoff that would discharge into natural waterbodies;

(c) There is no leakage from pipes and structures;

(d) The use of water is confined to targeted areas;

(e) Irrigation induced soil erosion and soil pugging does not occur;

(f) Soil quality is not degraded as a consequence of irrigation; and

(g) Loss of water, nutrients, and agrichemicals by percolation to groundwater is minimised.

Compliance with this condition will be demonstrated by the Water Use Efficiency conditions 24 – 30 and the outcome of the Irrigation Efficiency Review Panel tasks described in the GMCP.

9 Unless conditions 12 – 17 require a reduced volume, then the annual volume of water taken from Bore [xx] for each stage shall not exceed the following:

(a) Stage 1: [XX] cubic metres between 1 July in a year and 30 June in the following year;

(b) Stage 2: [XX] cubic metres between 1 July in a year and 30 June in the following year;

(c) Stage 3: [XX] cubic metres between 1 July in a year and 30 June in the following year;

(d) Stage 4: [XX] cubic metres between 1 July in a year and 30 June in the following year.

10 Progress to the next stage shall only occur where written approval is given by the Council's Compliance Manager; and

(a) This written approval will only be given if the Council is satisfied that the Staged Implementation and Monitoring Review prepared in accordance with the GMCP confirms that the groundwater abstraction complies with Condition 1MC and that decision has been informed by independent hydrogeological, ecological and irrigation efficiency expert reviews; and

(b) A decision on written approval will not be made until the Council has consulted with the Consent Holder and the Director-General of Conservation over the Staged Implementation and Monitoring Review; and

(c) Notwithstanding Condition 10(b), written approval to progress from Stage 1 to Stage 2 will not be considered unless all the monitoring trigger levels required by the GMCP have been set and agreed to by the independent hydrogeological and ecological reviewers; and

(d) A report detailing the reasons for the Council's decision in regard to progressing to the next stage, including the identification and discussion of any matters raised during the consultation described in Condition 10(b), will be provided to the Consent Holder and the Director-General of Conservation.

Breaching of Trigger Levels

11 In the event of a Trigger Level 1 (TL1) in the GMCP being exceeded, the following actions and requirements shall be initiated:

(a) The Consent Holder shall liaise with the Council to ensure that additional monitoring of water levels and water quality is undertaken to better understand the pattern of low water levels and/or poorer water quality and the contribution that bore abstractions are making to this pattern. This extra monitoring will take the form of more frequent measurements and additional monitoring points in the vicinity of the locations where TL1 values have been exceeded.

(b) The measures specified in the GMCP for an exceedance of TL1.

12 In the event of a Trigger Level 2 (TL2) in the GMCP being exceeded, the following actions and requirements shall be initiated:

(a) The Council will notify the Consent Holder in writing that a TL2 has been breached within 24 hours, or as soon as practicable, of it becoming aware of the breach;

(b) Upon receipt of this notice, the Consent Holder shall immediately reduce its daily abstraction to 50% of the current average daily quantity, as advised by the Council in the notice. The current average daily quantity will be calculated using the previous month's water use records as required by Condition 22. If the exceedance occurs within one month of a Consent Holder first taking water for irrigation purposes within an irrigation season, then the average shall be calculated using the water use records for this period only;

(c) The measures specified in the GMCP for an exceedance of TL2, including that the Council will commission a Groundwater Trigger Exceedance Report (GTER) to assess why the trigger level has been breached, identify the pumping bores in the area of effect, and review all of the available data collected in the affected area(s).

13 Once Condition 12(b) has been complied with, the Consent Holder may apply to the Council's Compliance Manager for an alternative reduction in its daily water take volume. Council's approval of an alternative reduction value will only be given if it is satisfied, based on the results of the GTER, that a TL2 exceedance that is attributable to this consent will not occur. The applicable alternative reduction value is the value that is contained in the recommendations made in the GTER required to be prepared by Condition 12(c).

14 If the TL2 trigger levels are still exceeded after 21 days, then the Consent Holder shall reduce its daily abstraction to 25% of the current average daily quantity calculated for Condition 12(b). The Council will notify the Consent Holder in writing of any continued exceedance and the required further reduction in the daily water take volume.

15 Once Condition 14 has been complied with, the Consent Holder shall also comply with the recommendations contained in the revised and updated GTER commissioned by the Council which will be prepared for the purpose of specifying a programme of actions to achieve compliance with Condition 1MC.

16 If the TL2 trigger levels continue to be exceeded after the implementation of the remedial measures required under Conditions 12-15, the Council shall either require the Consent Holder to suspend the exercise of this consent, or continue its daily abstraction at a further specified reduced rate, until such time as the Council issues written notice that the Consent may be exercised again in accordance with the requirements of any subsequently revised and updated GTER.

17 Any abstraction that results in non-compliance with Condition 1MC must be suspended.

Notification of Irrigation

18 When irrigation is to commence for the first time each season, the Consent Holder shall advise the Council's assigned Monitoring Officer in writing at least five working days prior to the exercise of this consent.

Backflow Prevention

19 Prior to the first exercise of this consent, a backflow prevention system shall be installed on all horticultural irrigation systems that draw water directly from a production bore and are also used to apply animal effluent, agrichemical or nutrients to prevent the backflow of contaminants to groundwater.

Metering and Abstraction Reporting

20 Prior to the first exercise of this consent, a meter and datalogger(s) with at least 12 months data storage able to record the rate and volume of take, and the date and time this water was taken, shall be installed and maintained to measure at least every 15 minutes the volume of water taken, in cubic metres, from each production bore. Each meter shall:

(a) Be telemetered to the Northland Regional Council;

(b) Be sealed and as tamper-proof as practicable;

(c) Be installed at the location from which the total volume of water is taken;

(d) Have an accuracy of +/-5%,

(e) Have an international accreditation or NZ equivalent calibration endorsement, and

(f) Be installed and maintained throughout the duration of the consent in accordance with the manufacturer's instructions to ensure the meter is fully functional at all times.

The Consent Holder shall, at all times, provide safe and practical access to each meter installed for Council to undertake visual inspections, data retrieval, and record water take measurements.

21 The Consent Holder shall verify that the meter required by Condition 20 is accurate. This verification shall be undertaken prior to 30 June:

(a) Following the first taking of water from each production bore in accordance with this consent; and

(b) At least once in every five years thereafter.

Each verification shall be undertaken by a person who, in the opinion of the Council's Compliance Manager, is suitably qualified. Written verification of the accuracy shall be provided to the Council's assigned Monitoring Officer no later than 31 July following the date of each verification.

22 The Consent Holder shall keep a record of the daily volume of water taken from each production bore in cubic metres, including all nil abstractions, using the readings from the meter(s) required by Condition 20.

23 A copy of the records required to be kept under Condition 22 shall be forwarded to the Council's assigned Monitoring Officer annually by the 31 July, for the previous period 1 July to the 30 June.

In addition, a copy of these records shall be forwarded immediately to the Council's assigned Monitoring Officer on written request. The records shall be in an electronic format that has been agreed to by the Council.

Water Use Efficiency

24 The Consent Holder shall prepare an Irrigation Scheduling Plan (ISP) that outlines how irrigation decisions will be made. The purpose of the ISP is to set out how the irrigation will be undertaken to ensure that at least 80 percent of the annual volume of water applied to the irrigable area is retained in the soil in the root zone of the crop, compared to the average gross depth of water applied to the crop. The ISP shall be prepared by a suitably qualified and experienced person and submitted to the Council's Compliance Manager for written certification that it will achieve the purpose of this condition. The ISP shall, as a minimum, address:

- Water balance and crop water requirements;
- Subsurface drainage;
- Measures for continuous improvement in water efficiency; and
- Overall irrigation strategy.

For each irrigation area, the ISP shall include:

(a) A map of the irrigation area;

(b) A description of how water requirements for each irrigation cycle are calculated;

(c) Method(s) for assessing current soil moisture levels;

(d) Method(s) for assessing potential evapotranspiration (PET) and rainfall to date;

(e) Soil moisture target to be maintained in each zone by irrigation;

(f) How measured data will be used to assess irrigation requirements over the next irrigation cycle;

(g) A description of proposed method(s) for remaining within consent limits at each borehole or group of boreholes; and

(h) Continuous improvement in water efficiency.

25 The Consent Holder shall not exercise this consent until the ISP required by Condition 24 has been certified by the Council's Compliance Manager. That certification shall be informed by an Independent Irrigation Efficiency Review Panel comprising two independent irrigation experts appointed by Northland Regional Council and be funded by the Consent Holder.

26 The ISP certified in accordance with Condition 24 shall be implemented prior to the first irrigation season, unless a later date has been approved in writing by the Council's Compliance Manager.

27 The Consent Holder must comply with the ISP at all times.

28 The Consent Holder shall, within six months of the first exercise of this consent, undertake an audit of the irrigation system and of the certified ISP. The audit shall be undertaken by a suitably qualified and experienced person. The irrigation system audit shall be prepared in accordance with Irrigation New Zealand's "Irrigation Evaluation Code of Practice" (dated 12 April 2010), and shall include recommendations on any improvements that should be made to the system to increase water efficiencies or any amendments to the ISP. The results of the audit and its recommendations shall be submitted in writing to the Council's assigned Monitoring Officer within one month of the audit being undertaken. Any recommended amendments to the ISP shall be submitted to the Council's Compliance Manager for written certification that it will achieve the condition 24 purpose of the ISP before they take effect. A follow-up audit shall occur at five yearly intervals throughout the term of this consent with the intent of confirming an irrigation efficiency of at least 80 percent.

29 The Consent Holder shall, within three months of notification in writing by the Council's Compliance Manager, implement any amendments certified under Condition 28.

30 The reticulation system and its component parts shall be maintained in good working order to minimise leakage and wastage of water.

31 The rate at which water is applied to the irrigated area shall not result in ponding of irrigated water within any irrigated area, or runoff from either surface or subsurface drainage to a water body, as a result of the exercise of this consent.

Advice Note: *The ISP seeks to ensure that at least 80 percent of the annual volume of water applied to the irrigable area is retained in the soil in the root zone of the crop, compared to the average gross depth of water applied to the crop.*

Review Condition

32 In addition to any reviews otherwise required under the above conditions of this consent, the Council may, in accordance with Section 128 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the conditions of this consent at any time for any one or more of the following purposes:

(a) To deal with any adverse effects on the environment that may arise from the exercise of the consent and which it is appropriate to deal with at a later stage – including matters stated in Master Consent condition 1MC; or

(b) To insert or amend trigger level thresholds established in accordance with the GMCP as conditions of consent; or

(c) To reduce the abstraction quantity authorised by this consent if the water use is determined to be inefficient or surplus to needs; or

(d) To review the allocation of the resource; or

(e) In response to any other relevant reason for review identified in Section 128 of the Resource Management Act.

(f) A review of this consent may be carried out separately or together with reviews of other consents for the purpose of managing the effects of the activities carried out under those resource consents.

(g) The Consent Holder shall meet all reasonable costs of any such review.

Lapsing Condition

33 This consent shall lapse five (5) years after the date that the consent commences in accordance with section 116(1) of the Resource Management Act 1991, unless the consent has been given effect to before this date.

South-western Group

South-western Group GMCP

Groundwater Monitoring and Contingency Plan for the Sweetwater and Ahipara sub-aquifers of the Aupōuri Aquifer Management Unit

31 August 2021

DOCUMENT FIGURES

DOCUMENT TABLES

GLOSSARY OF TERMS

Saline/saltwater intrusion	For the purposes of this Groundwater Monitoring and Contingency Plan, saline/saltwater intrusion refers to changes in salinity at nominated monitoring locations that exceed thresholds established to indicate elevated potential for adverse effects on groundwater quality for potable supply and/or irrigation use and effects on freshwater ecosystems.
Efficient bore takes	An efficient bore take is when a bore fully penetrates the water bearing layer and takes water from the base of the aquifer.
Sub-aquifer	The Aupōuri Aquifer system is divided into 10 separate sub-aquifer units for the purposes of setting tailored aquifer-specific allocation limits.[1]
First in-first served	Under the Resource Management Act 1991, applications for water takes are processed in the order in which they are lodged. The rights of parties associated with this Groundwater Monitoring and Contingency Plan are prioritised according to the order in which their permits are granted and added to this Plan.
Stage 1	The period during which: • 12 months of monitoring baseline data has been collected and used to define all the trigger levels specified in this GMCP; and • irrigation has occurred for one full irrigation season where the irrigation water has been sourced, as far as practicable, from the Stage 1 annual volume specified in Table 1 of this GMCP, as applied for each individual take/consent
Full irrigation season	Irrigation that occurs within the entire period of a water year, being 1 July to 30 June, when irrigation is required, whether or not the full allocation for a stage is irrigated during a water year.
Sentinel bore	A monitoring bore specifically established to monitor groundwater levels and

[1] Policy H.4.4 (Table 29) of the Proposed Regional Plan for Northland (Updated Appeals Version) May 2021.

	salinity indicators in a specified location. For the purposes of this Groundwater Monitoring and Contingency Plan, sentinel bores are those established and/or proposed monitoring bores (not production bores) in which piezometers are installed to measure groundwater levels and salinity indicators in the deep shellbed aquifer and/or the shallow sand aquifer.
Natural Baseline Values	Measured values from monitoring points that reflect the natural range of fluctuations in water levels and water chemistry, unaffected by abstractions.

1. INTRODUCTION

1.1 Scope and Objective of the GMCP

This document comprises a groundwater monitoring and contingency plan for the Sweetwater and Ahipara sub-aquifers of the Aupōuri aquifer management unit (GMCP). Much of the approach outlined in this GMCP has been informed by the technical assessment presented in the *Aupouri Aquifer Groundwater Model, Factual Technical Report – Modelling – Aupouri Aquifer Water User Group. WWLA0184, Rev 3, prepared by Williamson Water & Land Advisory Ltd, and dated 5 February 2020 (*hereafter referred to as the AAWUG Report*)*.

The GMCP covers the implementation and monitoring of the groundwater take consents listed in Table 1 (the Consent Holders) and is a programme of adaptive management that is suitable to provide a platform for the implementation of the abstractions listed in Table 1.

An adaptive management regime requires clear objectives against which the effects and management progress may be evaluated. The objective of this GMCP is that;

Objective 1: **The abstractions must, individually and cumulatively, avoid:**

- **(a) adverse effects of saltwater intrusion into the Aupōuri aquifer;**
- **(b) adverse effects on the hydrological functioning, including changes to water levels[2], of natural wetlands, springs and dune lakes;**
- **(c) alterations to the extents of rivers, natural wetlands, springs and/or dune lakes;**
- **(d) adverse effects on the significant indigenous vegetation and habitats in (terrestrial and freshwater environments of) dune lakes, springs and natural wetlands;**
- **(e) Adverse effects on the flow levels and flow variability of rivers and streams and springs so that their habitat quality and sustainable mahinga kai, recreational, and other social and cultural values, are maintained (including sufficient flows and flow variability to maintain their habitat quality, including to flush rivers of deposited sediment and nuisance algae and macrophytes and support the natural movement of indigenous fish and valued introduced species such as trout; and**
- **(f) lowering of the groundwater levels of the Aupouri aquifer such that existing efficient bore takes operating as a permitted activity or in accordance with resource consent conditions cannot access the authorised volume of groundwater.**

Extensive environmental monitoring is required to confirm avoidance of the effects listed above, and to facilitate an 'adaptive management' approach including a staged implementation of groundwater extraction. The purpose of the GMCP is to provide a frameworks that meets the requirements and principles of adaptive management. The GMCP provides a methodology for implementing adaptive management and prescribes specific monitoring requirements, establishes groundwater level and groundwater quality monitoring triggers

[2] Avoiding "change" means that as a result of the abstraction of water; median water levels, mean annual water level fluctuations and patterns of water level seasonality (relative summer vs winter) remain unchanged.

and outlines a process for implementation of appropriate mitigation and remediation measures in the event that nominated trigger values are exceeded.

The GMCP is intended to allow the early detection of any impact to the Sweetwater and Ahipara sub-aquifers of the Aupōuri aquifer management unit and surface water bodies associated with the exercise of groundwater take consent(s), by:

- Requiring regular monitoring of the groundwater system both on and off-site;
- Setting monitoring criteria to indicate potential adverse impacts on the groundwater system and surface water bodies;
- Implementing mitigation measures including changes to the pumping regime if trigger levels are reached to ensure that Objective 1 continues to be met;
- Reviewing monitoring data before and after a step level increase in pumping rate;
- Ensuring that the monitoring data is available for regular review by the Council;
- Detailing a Contingency Plan to be implemented if an unanticipated impact(s) is identified;
- Providing information to quantify the actual effects of the abstraction on the groundwater resource; and
- Enabling validation of the numerical model by the Consent Holders for any replacement groundwater take consent applications.

1.2 Parties Associated with this GMCP

The parties who have been deemed to be associated with this GMCP at its inception are the Northland Regional Council ("the Council"), the Consent Holders in **Table 1**, and the Director-General of Conservation.

The following sections provide a brief description of the roles and responsibilities of each party associated with this GMCP.

Should any of these parties change during the implementation of this GMCP, either through addition or removal, the process as set out in **Section 1.3** below shall be applied.

The rights of Consent Holders associated with this GMCP are prioritised according to the order in which their consents are granted and added to this GMCP, in accordance with the first in-first served approach to water allocation under the Resource Management Act 1991.

1.2.1 Northland Regional Council

The Council will undertake the ongoing monitoring requirements of the GMCP on behalf of the Consent Holders. The actual and reasonable cost of undertaking the ongoing monitoring of these consents will be charged to each consent holder in accordance with Council's Charging Policy.

The installation of sentinel bores and monitoring equipment is the responsibility of the Consent Holders.

1.2.2 Consent Holders

The Consent Holders identified in **Table 1** of this GMCP are required to exercise their consents in accordance with this GMCP except as required by condition 3 of the South-western group consents.

The exercise of the consents will be in accordance with Council initiated instructions which will be issued once the actions and process established through this GMCP have been undertaken.

The Consent Holders may seek changes to the GMCP through either of the processes set out in **Section 1.3**.

1.2.3 Director-General of Conservation

The Director-General of Conservation is responsible for administering land and waterbodies subject to reserve status under the Reserves Act 1977 and conservation or stewardship area status under the Conservation Act 1987, along with native fish and functions relating to protected species under the Wildlife Act 1953. Within the Sweetwater and Ahipara sub-aquifers of the Aupōuri Aquifer these areas[3] include:

- The Sweetwater Dune Lakes Conservation Area;
- Lake Ngatu Recreation Reserve;
- Waipapakauri Beach Scenic Reserve;
- Scenic Reserve.

The Director-General of Conservation is a party to this GMCP to ensure that the relevant provisions of these Acts, which the Director-General of Conservation administers, in particular that matters identified in Objective 1(b) and 1(c) of the GMCP are met.

It is also relevant to note that the Ngāti Kuri Claims Settlement Act 2015, Te Aupōuri Claims Settlement Act 2015, NgāiTakoto Claims Settlement Act 2015, and the Te Rarawa Claims Settlement Act 2015 all contain provisions relating to a 'korowai redress' which set-out co-governance arrangements for conservation land known as the 'Korowai for Enhanced Conservation'. The Korowai for Enhanced Conservation recognises the historical, spiritual and cultural association NgāiTakoto, Te Aupōuri, Te Rarawa and Ngāti Kuri iwi have with conservation land and the roles that the hapū and marae of each undertake as kaitiaki of the whenua and taonga of the conservation estate.

1.3 Changes to the GMCP

This GMCP may be amended at any time to:

- Incorporate new or replacement water permits, or remove water permits, within the Sweetwater and Ahipara sub-aquifers of the Aupōuri aquifer management unit that occur in the same general area and have overlapping and/or additional monitoring requirements or which are subject to different trigger levels or trigger levels based on monitoring described in this GMCP;
- Alter the nature and scope of the required monitoring (i.e. monitoring frequency and intensity (type and number of samples)) and associated trigger levels as is determined from final decisions of the

[3] Parts of the NgāiTakoto Claims Settlement Act 2015 and Te Rarawa Claims Settlement Act 2015 contain provisions which identify areas that will cease to be a conservation area under the Conservation Act 1987.

Council under the Staged Implementation Monitoring Programme Review, Annual Environment Monitoring Report, and Groundwater Trigger-Level Exceedance Report;

- Incorporate or remove parties who are, or may need to be, a part of this GMCP to ensure Objective 1 is met.

If either the Council or a Consent Holder wishes to amend the GMCP, then it must provide notice in writing of the proposed changes, along with any supporting technical documents, to the other Consent Holders, and the Director-General of Conservation.

A suitably qualified and experienced hydrogeologist and ecologist (i.e. 2 people) shall be nominated by Council to act as an independent technical expert for the purpose of peer reviewing proposed changes to the GMCPs. They shall be known as the **Independent Water Resource Effects Review Panel**. The nominated technical expert shall, within 20 working days, provide a report to the Council, the Consent Holders and the Director-General of Conservation on the proposed changes to the GMCP.

If any party does not agree with the outcome of the report on the proposed change, that party shall notify the Council of the reasons for the disagreement within 20 working days from the date that the review report was received.

Any change to the GMCP will only be authorised by Council if the review of the proposed change clearly indicates that the change will meet Objective 1 of the GMCP.

The Council will notify the Consent Holders and the Director-General of Conservation of the decision, detailing the reasons for its decision, including the identification and discussion of areas of agreement and disagreement.

If any changes are made to the GMCP, then a date-stamped copy of the amended GMCP will be provided to the Consent Holders and the Director-General of Conservation.

2. FRAMEWORK FOR ADAPTIVE MANAGEMENT

In summary, the following adaptive management techniques are applied in this GMCP;

(a) **Baseline monitoring** – existing environmental and resource consent compliance monitoring in the Sweetwater sub-aquifer provides a baseline for evaluating the potential effects of the proposed abstraction. The monitoring programme developed for Stage 1 of the Table 1 abstractions is intended to continue key components of the existing monitoring programme while also providing greater focus on monitoring and management of groundwater levels and quality along the coastal margin. This monitoring programme is contained in this GMCP, however, some monitoring detail is still required and this is indicated by the acronym 'TBC'.

As part of the baseline information, a constant rate pumping test of at least 24 hours duration (but no more than 72 hours duration) shall be carried out at the peak pumping rate for all bore fields (i.e. a single bore or cluster of bores within 100 m of each other) abstracting more than 864 m^3/day (10 L/s) located within 2 kilometres of a community water supply bore or a wetland or lake (unless monitoring data shows these surface water features are perched above the fully saturated groundwater system). The test must monitor groundwater levels in neighbouring bores at varying depths to allow determination of aquifer parameters and an assessment of drawdown effects in the deep shellbed aquifer, at the water table and the change in level and/or flow in any surface water feature (wetland, stream or lake) within 2 kilometres of the abstraction point. The results of the test must be reviewed by an independent hydrogeologist appointed by the Council and the results of that review may be used as a basis to review consent conditions under s 128 RMA. Prior to undertaking the test, it will be prudent for the Consent Holder(s) to get the design of the test reviewed by the independent hydrogeologist that Council will use to later review the test analysis, to ensure it is fit for purpose. If a suitable nearby pumping test has been completed this may satisfy this testing requirement, if approved by the independent hydrogeologist.

(b) **Early warning systems** – trigger levels (TLs) will be established to set up an early warning system that provides a response mechanism when differences between predicted and actual water levels and/or salinity concentrations occur. A trigger level is an environmental criterion that if reached or met, requires a certain response to be actioned.

(c) **Staged development** – abstraction volumes will progressively be increased in a staged manner, with expansion contingent on compliance with yet to be established trigger levels and on regular reviews of groundwater level, freshwater and wetland ecology, hydrology, and salinity monitoring results. The proposed staging recognises that, whilst a significant portion of the abstraction covered by this GMCP is already authorised by recently expired water permit AUT.020995.01.03 most of that allocation has yet to be utilised and so can now fit in the staged implementation regime for the area.

It is noted that the consent documentation requires that all development starts at Stage 1 volumes whether or not others have progressed to Stage 2 or further, and that takes must be implemented for the minimum period of Stage 1 before progressing to Stage 2. This is an essential mechanism for staging as an adaptive management response.

(d) **Management of consents being exercised immediately after commencement** – until such time as there is an adequate monitoring record to establish trigger levels in new monitoring bores, the abstractions that occur immediately after commencement (i.e., in the first year) will be subject to interim groundwater level and saline trigger levels and Groundwater Trigger Exceedance Report procedures.

(e) **Tiered approach to monitoring** –monitoring requirements will increase if site trigger levels are approached or exceeded. Likewise, monitoring intensity may decrease with evidence of sustained compliance and stability or to reflect improved characterisation of the hydrogeological environment by way of the process outlined in **Section 1.3** of this GMCP; and

(f) **Ongoing adaptive management** – the abstractions will be managed adaptively within the term of consent, and in the event of trigger level exceedance, through the implementation of the recommendations of a Groundwater Trigger Exceedance Report ("GTER") prepared by Council.

(g) S**uspension of abstractions** – should compliance with Objective 1 of this GMCP not be achieved, then the exercise of some or all of the consents to abstract and use groundwater may be suspended until such time as Council confirms in writing that compliance can be achieved.

(h) **Consent review** – this GMCP does not override the ability for consents and/or consent conditions to be reviewed in circumstances stipulated in condition 32 of the South-western Group of water take consents, or section 128 of the Resource Management Act 1991.

The following sections provide detailed information relating to the adaptive management framework to be imposed for the exercise of the consents listed in **Table 1**.

2.1 Staged Implementation

The uptake by Consent Holders of the consented total allowable water volumes will be permitted in four (4) stages over nine (9) years, in accordance with the following factors:

- ***Level of current orchard development*** – where existing consents authorising the take and use of water are proposed to be replaced or varied, or where existing authorised abstraction will be subject to the provisions of this GMCP.
- ***Rate of orchard/horticultural development*** – will occur at differing rates depending on the owner's cashflow and access to plants; and
- ***Tree/crop maturity*** – approximately nine years to full maturity and plant water usage, hence irrigation requirements commensurately increase with tree growth.

The progressive increase in irrigation requirements provides an opportunity to apply an adaptive management approach that establishes a baseline and allows the original hypotheses of avoidance of effects to be periodically re-evaluated to ensure Objective 1 of this GMCP continues to be met as development occurs.

The management approach provides a series of responses to be taken based on the monitoring results, including where monitoring shows that Objective 1 of this GMCP is not being met, as discussed in **Section 2.2**.

The uptake by Consent Holders of the consented total authorised water volumes will be permitted in four stages taking a minimum of nine years as shown in Table 1 below, unless the outcome of the Staged Implementation and Monitoring Programme Review detailed in Section 2.1.1 shows that there should be a delay in moving to the next stage, or that the next stage should not occur.

The development stages reflect:

- A combination of existing allocation (2,317,000 m^3/year) that has used less than the proposed Stage 1 volume in Table 1 (below) and proposed future development of pastoral and horticultural irrigation activity for APP.020995.01.04; and

- The progressive increase in water requirements for the proposed orchard associated with AUT.040364.01.01.

Table 1. Summary of staged implementation annual volumes.

Application Number	Consent Holder	Allowable Annual Volume (m3)			
		Stage 1 (Year 1)*	Stage 2 (Year 2-3)*	Stage 3 (Year 4-8)*	Stage 4 (Year 9 - full consent term)*
Sweetwater and Ahipara sub-aquifer management units					
AUT.040364.01.01	ELBURY HOLDINGS LTD (C/- KJ & FG KING)	49,245	98,490	147,735	196,980
AUT.020995.01.04	TE RARAWA FARMING LTD AND TE MAKE FARMS LTD	773,250	1,546,500	2,319,750	3,093,000
	TOTAL (m3/year)	**822,495**	**1,644,990**	**2,467,485**	**3,289,980**
	Total (% allocated per stage)	**25**%	**50%**	**75%**	**100%**
Notes: *The staged implementation is based on years when irrigation occurs following the commencement of the consents.					

2.1.1 Staging: Implementation and Monitoring Programme Review

A Staged Implementation and Monitoring Programme Review ("the SIMPR") will be required for Council to decide whether Consent Holders proceed to the next allocation stage. At the following times, the volume of abstraction authorised will be reviewed against the staged implementation outlined in Section 2.1 at the minimum intervals of:

- **End of Stage 1:** A period during which:
  - 12 months of monitoring baseline data has been collected and used to define all the trigger levels specified in this GMCP; and
  - irrigation has occurred for one full irrigation season where the irrigation water has been sourced, as far as practicable, from the Stage 1 annual volume specified in Table 1 of this GMCP, as applied for each individual take/consent;
- **End of Stage 2:** Three (3) irrigation seasons following date of commencement of the consents; and
- **End of Stage 3:** Eight (8) irrigation seasons following date of commencement of the consents.

The main purpose of the SIMPR is to assess whether abstraction increasing to the subsequent development stage would remain compliant with Objective 1 of the GMCP.

The SIMPR will be commissioned by the Council and shall be prepared by the **Independent Water Resource Effects Review Panel**), with input from an **Irrigation Efficiency Review Panel**, comprising two irrigation experts appointed by the Council. The Council will endeavour to ensure that all the nominated technical experts have experience and knowledge of the locality and must be independent of the consent holders.

The SIMPR shall include a detailed assessment of all environmental monitoring data including groundwater levels, salinity indicators, and water quality, and include consideration of spatial and temporal trends including potential effects of groundwater abstraction on water levels in dune lakes and natural wetlands. If the potential for more than minor effects on a surface water body is identified, then the SIMPR will also include

assessment of the likely significance of those effects prepared by a suitably qualified ecologist. The **Irrigation Efficiency Review Panel** will ensure that water is being used in an efficient manner and not in a way that causes any excessive or wasteful abstraction. The SIMPR shall assess whether Objective 1 of this GMCP is being met at the current level of abstraction, and whether Objective 1 will be met at the next stage level of abstraction. The SIMPR may also consider the nature and scope of continued monitoring (i.e. monitoring frequency and intensity (type and number of samples)) and associated trigger levels.

The SIMPR will provide recommendations based on the assessment of the environmental monitoring data to date on:

- the setting or alteration of the trigger levels;
- whether any changes to the monitoring programme are required;
- whether any reduction in consented abstraction quantities is appropriate, in relation to either environmental effects and/ or efficient water use; and
- whether to advance to the next stage of abstraction or to remain at the current level of abstraction, or to reduce the level of abstraction.

A copy of the SIMPR will be provided to the Consent Holders listed in **Table 1** and the Director-General of Conservation a minimum of three (3) months prior to the anticipated commencement of the subsequent irrigation season utilising volumes defined for the subsequent development stage as stated in **Table 1**. The Consent Holders and Director-General of Conservation have 20 working days to provide a response to the Council on the conclusions and recommendations of the SIMPR.

If any party does not agree with the conclusions and recommendations of the SIMPR, then a report by a suitably qualified hydrogeologist and/or ecologist, both with experience and knowledge of the locality if possible, detailing the reasons for the disagreement shall be provided to Council within 30 working days from the date that the copy of the SIMPR was sent to the party.

An increase in the volume of abstraction to the next development stage and any change to the monitoring programme will only be authorised by Council if the technical assessment of the monitoring data clearly indicates that the increase in the allocation and any necessary change to GMCP would meet Objective 1 of this GMCP.

Council will provide a report to the Consent Holders and the Director-General of Conservation detailing the reasons for its decision, including the identification and discussion of areas of agreement and disagreement within twenty (20) working days from the date they receive a report on points of disagreement about the SIMPR.

If any changes are made to the GMCP as a result of the SIMPR, then a copy of the amended GMCP will be provided to the Consent Holders and the Director General of Conservation within five (5) working days of the change being authorised as final.

A summary of the above process is also included in the conditions of each consent that is covered by this GMCP.

2.1.2 Stage 1 (Year 1) Management Regime

Stage 1, from a management perspective, is the initial development stage following commencement of the consents listed in **Table 1**. For those consents that are part of this GMCP, this stage is intended to maintain abstraction at similar levels to what has occurred to date while trigger levels are established for all sentinel monitoring bores.

Where Sentinel bores have already been installed and trigger levels established, they will need to be revised based on the approach described in section 2.2, so they can be utilised to manage the takes in **Error! Reference source not found.**. For newly established sentinel bores, during Stage 1 interim triggers for groundwater levels and salinity indicators will be established following the methodology outlined in Section 2.1.2.1.

The Council is to notify the Consent Holders and the Director-General of Conservation of the default management parameters for Stage 1 (Year 1) three (3) months prior to the commencement of abstraction. The Consent Holders and the Director-General of Conservation have 10 working days to provide responses to the Council on the default management parameters once notified.

Ongoing monitoring will be required to ensure that Objectives 1(a -f) are met by implementing trigger level exceedance measures. These trigger level exceedance measures are identified in **Section 4** below.

The interim management regime established for Stage 1 (Year 1) may be superseded by the Monitoring and Trigger Level Setting components set out in **Section 2.2** of this GMCP.

2.1.2.1 Saline Intrusion & Groundwater Level: Monitoring and Triggers

To ensure that Objective 1 is met during Stage 1 (Year 1) interim trigger levels for minimum groundwater levels and salinity indicators will be established in all new sentinel bores identified in **Table 3**.

These trigger levels will be established either based on existing baseline data (for existing compliance monitoring bores associated with Water Permit AUT.020995.01.03) or determined from preliminary data once each new sentinel bore is installed, following the methodology established in **Section 2.2** below. Interim trigger levels must be set prior to the exercise of any of the consents and apply to Stage 1 (Year 1) only.

The saline intrusion and groundwater level monitoring trigger levels for Stage 1 (Year 1) shall be inserted into the GMCP through the process set out in **Section 1.3** of this GMCP prior to the exercise of any consents subject to this GMCP.

For clarity, the unmapped wetlands, delineated through the procedure set out in **Section 3.5.1,** do not require interim trigger levels, as identification of adverse effects on the hydrological functioning of these wetlands, and therefore their ecological integrity, because of the exercise of these consents, will be provided for through the interim trigger levels for minimum groundwater levels.

2.1.2.2 Trigger Level Responses

In the event of an exceedance of a trigger level applicable in Stage 1 (Year 1), the Trigger Level Exceedance response plan contained in **Section 4** of this GMCP shall apply.

2.1.2.3 Ceasing Interim Stage 1 (Year 1) Management Regime

This interim management regime shall remain in place until such time as the setting of trigger levels as per **Section 2.2** below through amendment to this GMCP in accordance with the change process established in **Section 1.3** of this GMCP.

2.2 Trigger Level System

2.2.1 Timeframe for setting of trigger levels

The setting of trigger level values for each parameter (where TBC is indicated in the monitoring plan tables in **Section 3** (Monitoring Programme)) will be undertaken based either on current baseline data (for sites with existing monitoring) or data collected during Stage 1. This approach recognises that:

- There is significant historical monitoring data available to characterise the response of groundwater levels and quality (salinity) to current levels of abstraction;
- The manifestation of any effects from the exercising of these consents will steadily progress with time in accordance with the staged development process outlined in **Table 1**. The scale of abstraction during the baseline data collection period (i.e. generally 12 months following commencement of consent) will not vary significantly from existing conditions.

2.2.2 Method for setting of trigger levels

A two-tier trigger level system will be implemented on the consents:

- **TL1** – The first-tier trigger level establishes when an individual monitoring parameter is exhibiting a departure from baseline conditions. It must be within the range of measured fluctuations in Natural Baseline Values to achieve this purpose. For water level measurements it is to be set at the lowest 10th percentile of natural baseline water level measurements that show no obvious effects of drawdown interference from neighbouring pumping bores. For electrical conductivity it shall be within 1 mS/m of the maximum measured Natural Baseline Values and an equivalent basis is to be used for any other water chemistry TL1 limits. If this trigger level is breached, then additional monitoring will be undertaken by the Council and the consent holders. This additional monitoring will assist characterisation of the nature and significance in changes to the baseline condition of the groundwater resource;
- **TL2** – The second-tier trigger level is set at a threshold defining a 'significant' departure from baseline conditions and/or conditions where the risks of adverse environmental effects are increased. If this trigger level is breached, then the Consent Holders will be required to reduce their daily water take volume in a staged manner over a set period of time. The criteria for setting TL2 values is as follows:
    - TL2 Criteria for water levels
    - For shallow water table areas hydraulically connected to natural wetlands, the TL2 value is to be set at the lowest natural baseline water level measurements that show no obvious effects of drawdown interference from neighbouring pumping bores. For all other water level monitoring points, the TL2 values are to be set at the smallest exceedance of the natural baseline range that results from the following criteria:

- A variation of 20% of the range of natural baseline fluctuations beyond the lowest measured natural baseline water level;
- A decline of 0.5 m beyond the lowest natural baseline water level;
- In coastal monitoring bores, the Ghyben-Herzberg water level limit required to protect against sea-water intrusion;
- Any shallower limit required to ensure that Objective 1 of this GMCP is achieved.

- TL2 Criteria for water quality parameters

o The smallest exceedance of the natural baseline range that results from the following criteria:

- The median electrical conductivity value + 50%;
- An increase of 20 mS/m in the electrical conductivity above the maximum Natural Baseline Value;
- For parameters other than electrical conductivity a change of a similar scale to the two preceding points;
- Any smaller increase required to ensure that Objective 1 of this GMCP is achieved.

The trigger level parameters required under this GMCP for the various suites are summarised in **Table 2**.

Table 2: Summary trigger level parameters by monitoring suite.

Monitoring Suite	Parameters
Groundwater level and salinity monitoring	Groundwater level, electrical conductivity
Saline intrusion monitoring	Electrical conductivity, chloride, sodium, total dissolved solids.

2.2.3 Response to exceeding trigger levels

The actions required should trigger levels be exceeded are set out in **Section 4** (Contingency Plan).

3. MONITORING PROGRAMME & TRIGGER LEVEL SETTING

3.1 Bore Locations and Details

A consolidated summary of the schedule of bores that are required to be monitored as part of this GMCP is provided in **Table 3**. Along with the bores identified for monitoring, the table provides key details relating to the bores' physical attributes and parameters to be monitored. The locations of the monitoring bores are shown on **Figure 1**[4]. Additions to this Table can be made at a later date to incorporate any natural wetlands that are subsequently identified as requiring monitoring.

The following sections of the GMCP provide the monitoring schedules (frequency and trigger levels) for the bores.

The monitoring schedule comprises four components:

- Three sentinel bores located along the coastal margin seaward of areas where abstraction is concentrated. The sentinel bores will provide the primary reference sites for monitoring and management of potential saline intrusion effects. Each sentinel bore will comprise two piezometers accessing the shallow unconfined aquifer and the deep shellbed aquifer respectively. Instrumentation in each piezometer will enable continuous monitoring of groundwater levels and electrical conductivity (EC), and provide for telemetry of monitoring data to the Council. All sentinel monitoring bores listed in

[4] Note: the locations shown for the two new sentinel bores are indicative. Final locations may depend on physical access available for piezometer installation.

Table 6 will be installed prior to the exercise of the consents.

- An existing NRC piezometer with a long monitoring record (Lake Heather No. 1 (105 m)) will be the primary reference site for management of cumulative well interference effects. Instrumentation in the piezometer will enable continuous monitoring of groundwater levels and provide for telemetry of monitoring data to NRC.
- Manual monitoring of groundwater levels on a monthly basis in existing compliance monitoring bores on Sweetwater Station, along with an existing NRC piezometer at Lake Heather (Lake Heather No. 1 (29 m)) and a private bore at Sweetwater Nursery (LOC.201424). These sites will provide ongoing monitoring of groundwater levels and provide data to characterise both localised and cumulative drawdown in response to abstraction and be used to inform the staged implementation process.
- Measurement of salinity indicators on a quarterly basis in each piezometer at the three sentinel bores, augmented by an additional monitoring bore at Waipapakauri Beach (if access to a suitable existing bore can be established). These sites will be monitored on a quarterly basis for the parameters listed in **Table 2** and provide a secondary baseline to characterise any changes in aquifer salinity along the coastal margin.

The locations of the production bores in **Table 3** are also shown in **Figure 1**. An error accuracy level of +/- 50 metres is applicable to these bore locations. Any differentiation in their locations by greater than 50 metres will result in a requirement for an application to the Council for a change of consent condition pursuant to Section 127 of the Resource Management Act 1991 (RMA). Assessment of the effects on the environment of the change will be required pursuant to Schedule 4 of the RMA.

Table 3: Schedule of monitoring bore details.

MONITORING BORES								
Bore Details		Bore Owner	COORDINATES (NZTM 2000)		Depth (m)	Dia. (mm)	Target Aquifer	Purpose*
Name (Fig 1)	NRC Ref.		Easting	Northing				
MW1a	LOC.210522	Sweetwater Station	1617843	6119772	13.3		Unconfined	GLm
MW1b	LOC.209755	Sweetwater Station	1617597	6119793	94.0		Shellbed	GLm
MW2a	LOC.210523	Sweetwater Station	1620419	6120014	15.0		Unconfined	GLm
MW2b	LOC.210524	Sweetwater Station	1620422	6120015	59.0		Shellbed	GLm
MW4a	LOC.210527	Sweetwater Station	1616386	6119031	25.0		Unconfined	GLc, ECc, SI
MW4b	LOC.209753	Sweetwater Station	1616404	6119040	92.0		Shellbed	GLc, ECc, SI
MW5a		Sweetwater Station	1617811	6114690	6.0		Unconfined	GLm
MW5b	LOC.209759	Sweetwater Station	1617644	6114898	61.0		Shellbed	GLm
MW6	LOC.320452	Sweetwater Station	1617451	6118946	14.4		Unconfined	GLm
Lake Heather No 1 (29 m)	LOC.200226	NRC	1617605	6121325	29		Unconfined	GLm
Lake Heather No 1 (105 m)		NRC			105.5		Shellbed	GLc
Waipapapakauri Sentinel (shallow)	TBC	NRC	1616020	6121100	TBC		Unconfined	GLc, ECc, SI
Waipapapakauri Sentinela (deep)	TBC	NRC	1616020	6121100	TBC		Shellbed	GLc, ECc, SI
Waipapakauri Quality[a]	TBC	Private?	1615500	6122500	TBC		Shellbed	SI
Ahipara Sentinel (shallow)	TBC	NRC	1615750	6112150	TBC		Unconfined	GLc, ECc, SI
Ahipara Sentinel (deep)	TBC	NRC	1615750	6112150	TBC		Shellbed	GLc, ECc, SI
Sweetwater Nursery[a]	LOC.201424	Private	1618734	6122288	82		Shellbed	GLm

a Monitoring site equivalent to that specified in Schedule 1 to AUT.25683.01.03

* Purpose Key

GLc = Continuous Groundwater Level (Telemetered)

GLm = Manual (monthly) groundwater level

ECc = Continuous Electrical Conductivity (Telemetered)

SI = Salinity Indicatory (Quarterly)

MI = Major Ions (Quarterly)

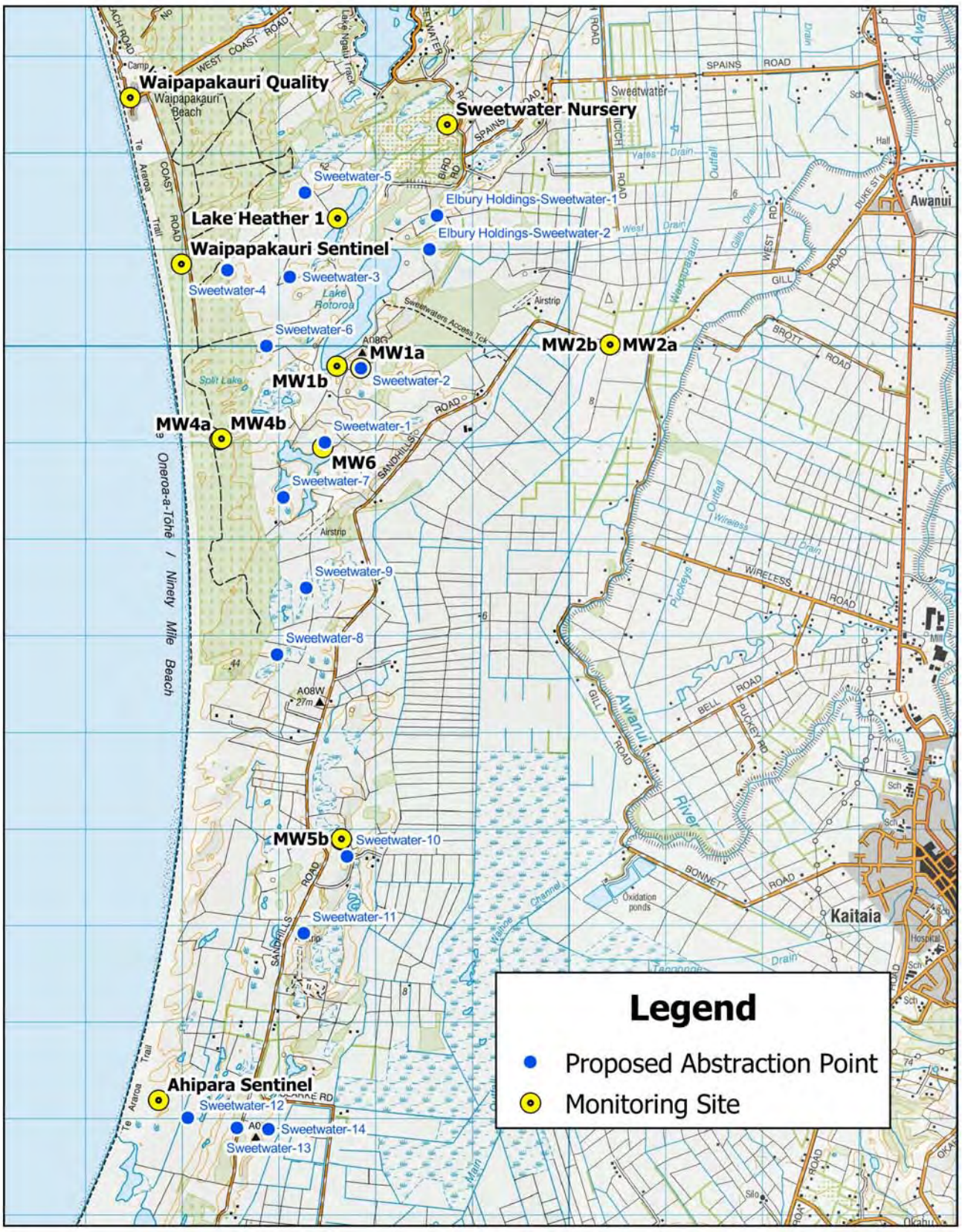


Figure 1.Groundwater Monitoring and Production Bore Location Map

3.2 Groundwater Level Monitoring & Establishment of Trigger Levels

3.2.1 Continuous Groundwater Level Monitoring

Sentinel bores as described in **Table 5** will collect data continuously for water levels and electrical conductivity in individual piezometers and will be utilised as the primary reference sites for regional monitoring of potential effects associated with saline intrusion. Data will be telemetered to the Council.

Groundwater levels will be monitored in the shallow sand and deep shellbed aquifers to quantify the magnitude of drawdown resulting from the proposed abstraction in the deep shellbed and unconfined shallow sand aquifers to ensure it is within the magnitude anticipated in the AEE and meets Objective 1 of this GMCP.

These bores will provide early detection or warning of:

- Groundwater levels around the coastal margin approaching a threshold that could indicate a greater risk of saline intrusion; and
- Any reduction in water quality that could indicate the landward migration of the saline interface; and
- Groundwater levels in the shallow sand aquifer lowering and having a potential adverse effect on surface water bodies, springs, dune lakes or natural wetlands.

Details of the sentinel bores are summarised in **Table 5** below. The existing NRC Lake Heather No.1 (105 m) piezometer will be utilised as the primary reference site to determine the magnitude of cumulative well interference effects. Groundwater levels will be monitored on a continuous basis and telemetered to the Council.

All sentinel monitoring bores listed in **Table 5** will be installed prior to the exercise of the consents and must be of sufficient depth to allow monitoring to occur at all times (i.e. to accommodate both high and low water level conditions).

Checking of the sensors required for continuous monitoring will be undertaken on a monthly basis, and any faults will be recorded and remedied immediately. Data will be collected, processed and managed in accordance with the Council's quality standards.

3.2.2 Manual Groundwater Level Monitoring

Groundwater levels will be monitored manually in the shallow sand and deep shellbed aquifers to:

- Ensure groundwater abstraction does not result in a reduction in the reliability of supply for AUT.025683.01.03; and
- Quantify the magnitude of drawdown resulting from the proposed abstraction in the deep shellbed and shallow sand aquifers to ensure it is within the magnitude anticipated in the AEE and does not result in adverse effects on the surface water environment, existing groundwater users and long-term aquifer storage volumes.

Details of the groundwater level monitoring bores are listed in **Table 4** below. The majority of the bores listed (MW1a to MW6) are existing compliance monitoring bores on Sweetwater Station that have been monitored manually on a monthly basis since 2013 as part of consent compliance for Water Permit AUT.020995.01.03. It

is proposed to continue the existing monitoring regime for these bores, with the addition of the existing NRC Lake Heather No 1 (29 m) piezometer and a private bore at Sweetwater Nursery.

No trigger levels will be established for manual groundwater level monitoring sites. The primary value of data collected from manual groundwater level monitoring will be to establish medium to longer-term variations in groundwater levels in response to groundwater abstraction. This information will be utilised to inform the SIMPR (**Section 2.1.1**) and Annual Environmental Monitoring Report (**Section 3.6**).

Table 4. Schedule of Manual Groundwater Monitoring Bores.

Monitoring Bore	NRC ID	Easting	Northing	Depth (m)	Aquifer	Units	Frequency
MW1a	LOC.210522	1617843	6119772	13.3	Unconfined	mAMSL	Monthly
MW1b	LOC.209755	1617597	6119793	94.0	Shellbed	mAMSL	Monthly
MW2a	LOC.210523	1620419	6120014	15.0	Unconfined	mAMSL	Monthly
MW2b	LOC.210524	1620422	6120015	59.0	Shellbed	mAMSL	Monthly
MW5a		1617811	6114690	6.0	Unconfined	mAMSL	Monthly
MW5b	LOC.209759	1617644	6114898	61.0	Shellbed	mAMSL	Monthly
MW6	LOC.320452	1617451	6118946	14.4	Unconfined	mAMSL	Monthly
Lake Heather No. 1 (29 m)	LOC.200226	1617605	6121325	29.0	Unconfined	mAMSL	Monthly
Sweetwater Nursery	LOC.201424	1618734	6122288	82.0	Shellbed	mAMSL	Monthly

3.2.3 Continuous Groundwater Level Monitoring & Trigger Levels

A two-tier system for trigger level 1 ("TL1") and trigger level 2 ("TL2") for groundwater levels will be set in the bores identified in **Table 5**. Electrical conductivity trigger levels for these bores are contained in **Table 6**.

Trigger levels for cumulative drawdown will be established and, if required, utilised to manage cumulative pumping rates to ensure priority access to the groundwater resource by existing groundwater users is not impeded by the proposed abstraction. Trigger levels will be established subject to agreement between parties to this GMCP and FNDC (holders of water permit AUT.25683.01.03).

The Council will set trigger levels for groundwater levels in the shallow sand aquifer in each of the three sentinel bores. As a general guide TL2 for the shallow sand aquifer should be no less than 1.0 mAMSL and 1.5 mAMSL for deep shell bed groundwater levels (noting that changes in electrical conductivity ("EC") are also a key indicator of saline intrusion and are provided for below in **Section 3.3**). If necessary, water level records for individual sentinel bores will be correlated with existing monitoring sites to provide historical context for estimating the trigger levels.

In the three sentinel bores, TL1 and TL2 will be based on historical groundwater levels, allowing for the predicted magnitude of drawdown resulting from existing and proposed abstraction outlined in the AAWUG Model Report, in proportion to the staged implementation regime, and provided that it does not cause effects contrary to Objective 1, including impacts on any natural wetland in which case no new drainage effect is allowed to occur. If necessary, water level records for individual sentinel bores will be correlated with existing monitoring sites to provide historical context for estimating the trigger levels.

Table 5: Continuous Monitoring & Trigger Levels – Groundwater Levels

Bore Name	Depth (m)	Piezo. No.	Target aquifer	Units	Frequency	Trigger Levels	
						TL1	TL2
MW4	25	must be of sufficient depth to allow monitoring to occur at all times (i.e. to accommodate both high and low water level conditions).a	Unconfined	mAMSL	Continuous	TBC	TBC
	92	b	Deep shellbed	mAMSL	Continuous	TBC	TBC
Waipapakauri Sentinel	TBC	1	Unconfined	mAMSL	Continuous	TBC	TBC
	>50 (TBC)	2	Deep shellbed	mAMSL	Continuous	TBC	TBC
Ahipara Sentinel	TBC	1	Unconfined	mAMSL	Continuous	TBC	TBC
	> 50 TBC	2	Deep Shellbed	mAMSL	Continuous	TBC	TBC
TBC = to be confirmed within 15 months of the date of commencement of these consents. GL TL1s (where provided) have been calculated from long term monitoring data. GL TL2s (where provided) have been interpolated from Table F1, WWA Groundwater Modelling Report							

The setting of TL1 and TL2 trigger levels values for these piezometers will be undertaken during Stage 1 after 12 months of monitoring data has been collected and within 15 months of the date of commencement of these consents and will replace the interim trigger levels established through the process described at **Section 2.1.2.1** above.

3.3 Saline Intrusion Monitoring & Establishment of Trigger Levels

Sentinel bores will be utilised as the primary reference sites for monitoring of potential effects associated with saline intrusion. These bores will be positioned between existing/proposed abstraction and the coastline to provide early detection or warning of:

- Groundwater levels around the coastal margin approaching a threshold that could indicate a greater risk of saline intrusion; and
- Any reduction in water quality that could indicate the landward migration of the saline interface.
- Details of the sentinel bores are summarised in **Table 6** below.

3.3.1 Stage 1 Monitoring

During the initial 12-month monitoring period, sampling for the following salinity indicators in the bores listed in **Table 6** below will be undertaken at quarterly intervals[5]:

[5] This frequency applies to the initial 12-month monitoring period for the establishment of baseline information. The frequencies specified in Table 6 are for ongoing monitoring specifications.

- Electrical conductivity;
- Chloride;
- Sodium;
- Total Dissolved Solids.

The samples will be collected in accordance with A National Protocol for State of the Environment Groundwater Sampling in New Zealand (Ministry for the Environment, 2006).

3.3.2 Ongoing Monitoring

Ongoing monitoring of groundwater and electrical conductivity levels will be undertaken continuously via individual piezometers in sentinel monitoring bores. Monitoring data will be telemetered to the Council on a twice-daily basis. Sampling at the frequencies specified for the following salinity indicators will take place in the bores listed in **Table 6** below:

- Electrical conductivity;
- Chloride;
- Sodium;
- Total Dissolved Solids.

3.3.3 Schedule of Saline Intrusion Monitoring & Trigger Levels

The monitoring and trigger levels as discussed in this section are provided in **Table 6** below. Data will be collected, processed and managed in accordance with the Council's quality standards and *A National Protocol for State of the Environment Groundwater Sampling in New Zealand* (Ministry for the Environment, 2006).

A two-tier trigger level system (TL1 and TL2) for groundwater levels and electrical conductivity will be set in these bores.

As an initial guide, trigger levels for individual determinants will be established using the same criteria as defined in section 2.2.2.

TL1 and TL2 trigger levels for groundwater level and EC in MW4b will be specified in **Table 6** below. The setting of TL1 and TL2 trigger levels for the remaining piezometers will be undertaken during the first implementation stage after 12 months of monitoring data has been collected and within 15 months of the date of commencement of these consents, and will replace the interim trigger levels outlined in **Section 2.1.2.1** above.

The current trigger levels that are shown in **Table 6** are based on existing data and will be reconfirmed by the Council when the other trigger levels are confirmed.

All sentinel monitoring bores listed in **Table 6** will be installed prior to the exercise of the consents.

Table 6: Monitoring Schedule – Saline Intrusion.

Bore Name	Depth (m)	Piezo. No.	Target aquifer	Parameter*	Units	Frequency	Trigger Levels	
							TL1	TL2
MW4	25	a	Unconfined	EC	µS/cm	Continuously	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC
	92	b	Deep shellbed	EC	µS/cm	Continuously	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
Waipapakauri Sentinel	TBC	1	Unconfined	EC	µS/cm	Continuous	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC
	>50 (TBC)	2	Deep shellbed	EC	µS/cm	Continuous	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC
Ahipara Sentinel	TBC	1	Unconfined	EC	µS/cm	Continuous	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC
	> 50 TBC	2	Deep Shellbed	EC	µS/cm	Continuous	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC
Waipapakauri Quality	TBC	1	Deep shellbed	EC	µS/cm	Continuous	TBC	TBC
				Chloride	mg/L	Quarterly	TBC	TBC
				Sodium	mg/L	Quarterly	TBC	TBC
				TDS	mg/L	Quarterly	TBC	TBC

Notes:

* Parameter key: GL = Groundwater Level; EC = Electrical Conductivity; SI = Salinity Indicators; TDS = Total Dissolved Solids.

TBC = to be confirmed within 15 months of the date of commencement of these consents.

3.4 Production Bore Monitoring

3.4.1 Stage 1 Monitoring

During the initial 12-month monitoring period, sampling for the following salinity indicators in the bores listed in **Table 7** below will be undertaken at 6-weekly intervals[6].

[6] This frequency applies to the initial 12-month monitoring period for the establishment of baseline information. The frequencies specified in Table 6 are for ongoing monitoring specifications.

3.4.2 Ongoing monitoring

After the initial 12 month monitoring period, monthly water level monitoring will be undertaken in the production bores listed in **Table 7**. During the winter months (nominally May to September) this monitoring will provide information to identify any inter-annual variations in aquifer storage which may be anomalous compared to regional trends. During the irrigation season, water level measurements will be undertaken for a minimum of eight hours following the cessation of pumping.

Electrical conductivity ("EC") values will also be measured at monthly intervals from the production bores during the irrigation season to check on any changes in salinity induced by the pumping. Requirements to continue monitoring of groundwater levels and electrical conductivity in individual production bores after Stage 1 will be addressed in the SIMPR (**Section 2.1.1**).

3.4.3 Schedule of Production Bore Monitoring & Trigger Levels

The schedule of monitoring and trigger levels as discussed in this section are provided in **Table 7** below. Data will be collected, processed and managed in accordance with Council's quality standards and *A National Protocol for State of the Environment Groundwater Sampling in New Zealand* (Ministry for the Environment, 2006).

EC trigger levels will be established in the production bores listed in **Table 7** below.

During the initial 12-month monitoring period EC trigger levels will be no greater than:

- **TL1** – Departure exceeding 25% of the EC value from the initial monitoring round
- **TL2** – Departure exceeding 37.5% of the EC value from the initial monitoring round

Long-term EC triggers for individual production bores will be established following an initial 12-month monitoring period, based on an assessment of observed spatial and temporal variation in EC in baseline and sentinel bore monitoring data, in a manner consistent with EC trigger levels established in the sentinel monitoring bores.

No trigger levels will be established for groundwater levels in the production bores as water levels in the production bores can be impacted by well efficiency and pumping schedules so are not necessarily representative of groundwater levels in the surrounding aquifer.

Table 7: Monitoring & Trigger Levels – Production Bores

Bore Name (NRC ID)	Depth (m)	Target aquifer	Parameter*	Units	Frequency	Trigger Levels	
						TL1	TL2
Sweetwater 1	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA
Sweetwater 2	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA
Sweetwater 3	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA
Sweetwater 4	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA
Sweetwater 5	TBC	Shellbed	GL	mASL	Monthly	NA	NA

Bore Name (NRC ID)	Depth (m)	Target aquifer	Parameter*	Units	Frequency	Trigger Levels	
						TL1	TL2
			EC	mS/m	Monthly	NA	NA
Sweetwater 6	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA
Sweetwater 7	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA
Sweetwater 8	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA
Sweetwater 9	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA
Sweetwater 10	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA
Sweetwater 11	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA
Sweetwater 12	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA
Sweetwater 13	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA
Sweetwater 14	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA
Elbury Holdings Sweetwater-1	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA
Elbury Holdings	TBC	Shellbed	GL	mASL	Monthly	NA	NA
			EC	mS/m	Monthly	NA	NA

Notes:

* Purpose key: GL = Groundwater Level; EC = Electrical Conductivity.

All trigger limit values in this Table to be confirmed by Council.

3.5 Unmapped Natural Wetlands

Under the National Policy Statement for Freshwater Management 2020 (NPS-FM) natural wetland means a wetland (as defined in the RMA) that is not:

(a) a wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing or former natural wetland); or

(b) a geothermal wetland; or

(c) any area of improved pasture that, at the commencement date, is dominated by (that is more than 50% of) exotic pasture species and is subject to temporary rain derived water pooling.

Some natural wetlands in this area have been mapped from prior studies and surveys[7], however, there are sites that may be classified as natural wetland that are currently unmapped.

[7] Northland Regional Council top wetland study, Protected Natural Areas Programme survey reports.

In cases of uncertainty or dispute about the existence or extent of a natural inland wetland, the NPSFM directs that regard must be had to the Wetland Delineation Protocols[8] as a robust method for delineating wetlands. This protocol uses three criteria for identifying and delineating wetlands: vegetation, soils, and hydrology.

3.5.1 Unmapped Wetland Delineation Procedure

The Wetland Delineation Procedure is deemed appropriate for identifying whether three Areas of Interest (AoI) (**Appendix A**) contain natural inland wetland areas in the Ahipara and Sweetwater sub-aquifers. The Wetland Delineation Procedure is therefore replicated in **Table 8** below.

Procedures which were completed prior to the commencement of the consent are referenced as having been completed and no further action is required against those particular procedures.

For all other procedures which were not completed prior to commencement of the consents, **Table 8** contains the steps that shall be taken to complete that procedure within this adaptive management regime.

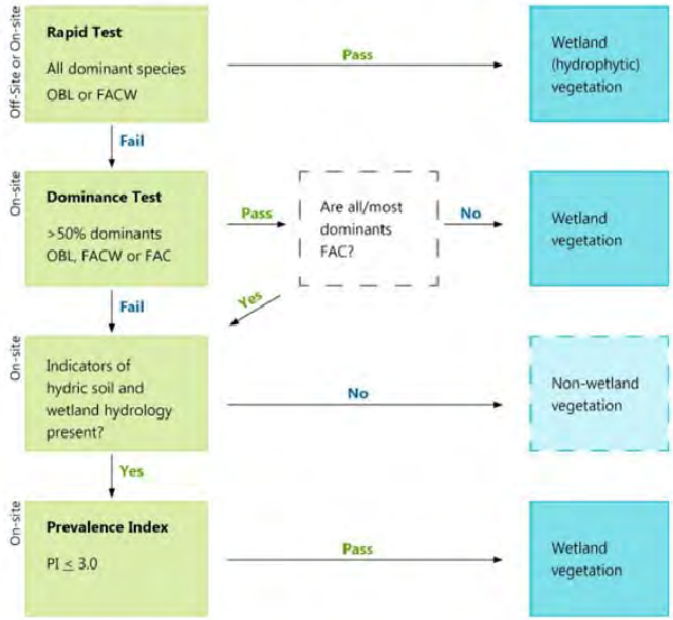
[8] https://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/wetland-delineation-protocols.pdf

Table 8: Unmapped wetland delineation procedure.

No.	Delineation Procedure	Completed Prior to Commencement of Consents (Yes/No)	Comment
1.	Determine the project area (the putative wetland).	Yes	See Areas of Interest map attached (**Appendix A**).
2.	Decide if 'normal circumstances' are present, i.e., typical climatic/hydrologic conditions, and no recent disturbances or modifications to the project area. If yes, proceed to step 3. If no, proceed to step 7.	Yes	Area D is a back-beach area behind a foredune to Te Onerohe a Tohe. Area E is farmland which according to historic aerial imagery has been in this state for some time. Parts of Area Q are identified as swamp in Topo250/50 maps and have not been altered according to aerial imagery. Historical aerial imagery shows that the orchard within Area Q was developed between December 2002 to December 2003. 

No.	Delineation Procedure	Completed Prior to Commencement of Consents (Yes/No)	Comment
			  Area Q

No.	Delineation Procedure	Completed Prior to Commencement of Consents (Yes/No)	Comment
3.	Identify and map the major vegetation types using aerial photographs, maps, contours, inventory reports, other data, and, if necessary, on-site field verification.	No	Within one month of commencement of the consents, the Council, in consultation with the Director-General of Conservation and the Consent Holders, will commission a suitably qualified and experienced ecologist to undertake the desktop and field analysis established under Procedures 4, 5 and 6. A Wetland Delineation Report (WDR) containing details of the assessment approach and outcomes shall be prepared by the same ecologist commissioned to undertake the desktop and field analysis. The WDR shall be circulated to the Consent Holders listed in Table 1 and the Director-General of Conservation a minimum of 40 working days prior to the anticipated commencement of the subsequent irrigation season. The Consent Holders and Director-General of Conservation have 20 working days to provide a response to the Council on the conclusions and recommendations of the WDR. If any party does not agree with the conclusions and recommendations of the WDR, then a report by a suitably qualified hydrogeologist and/or an ecologist, both with experience and knowledge of the locality, detailing the reasons for the disagreement shall be provided to Council within 30 working days from the date that the assessment was sent to the party. Council has the final authority over the delineation of a natural wetland and will provide a report to the Consent Holders and the Director-General of Conservation detailing the reasons for its decision, including the identification and discussion of areas of agreement and disagreement within 10 working days of receipt of the disagreeing parties report.
4.	**Off-site methods** to identify wetland presence and sketch approximate boundaries. Wetlands may be confirmed without an on-site inspection depending on: i. the amount and quality of data (vegetation, soils, hydrology, topography) ii. wetland ecological expertise to interpret the data.	No	
5.	**On-site methods** to delineate wetland presence and accurate boundaries: i. for small areas (≤2 ha), establish a representative plot in each major vegetation type and record the plot vegetation in three strata: tree, sapling/shrub, herb ii. for larger areas, establish representative plots along transects (as per Clarkson 2014) and sample the vegetation in three strata: tree, sapling/shrub, herb.	No	
6.	**Hydrophytic vegetation determination**. Based on the data gathered, conduct a hydrophytic vegetation determination using the following flow chart (figure 1).	No	

No.	Delineation Procedure	Completed Prior to Commencement of Consents (Yes/No)	Comment
	Figure 1: Flow chart of steps for hydrophytic (wetland) vegetation determination. Wetland indicator status abbreviations: FAC= facultative; FACW = facultative wetland; OBL = obligate wetland.  Wetland indicator status ratings for species are in Clarkson et al. 2013 and subsequent updates.		

3.5.2 Repeat Survey

For sites delineated as natural wetland from the procedure set out at **Section 3.5.1**, the Council shall commission, in consultation with the Director-General of Conservation and the Consent Holders, a suitably qualified and experienced ecologist to undertake wetland vegetation survey and subsequent reporting within five (5) years from the original date of survey at around the same time of year as the original delineation survey. The repeat surveys must be designed in a way that enables ecologically meaningful and statistically robust scoring of the wetland condition in order to analyse changes to the wetland's condition resulting from the groundwater abstraction.

This repeat survey must be completed once after the initial delineation Wetland Delineation Procedure (to provide an accurate baseline) but thereafter will only take place every five (5) years where technical assessment carried out according to **Section 2.1.1** confirms that there is an adverse decline in wetland levels resulting from groundwater abstraction.

A decline in wetland water level attributable to groundwater abstraction will be determined from the monitoring and analysis of temporal groundwater level variations in the sentinel bores set out in

Table 6.

3.6 Environmental Monitoring Report

At the end of each irrigation season, the Council will commission the preparation of an Annual Environmental Monitoring Report (AEMR) by the Independent Water Resource Effects Review Panel and the Independent Irrigation Efficiency Review panel. The Council will endeavour to ensure that, if possible, these nominated technical experts have experience and knowledge of the locality. A copy of the AEMR will be provided to the Consent Holders and the Director General of Conservation by 31 July each year.

The purposes of the AEMR are;

- To provide a summary of the monitoring results for the previous year, including trends, against Objective 1 of the GMCP;
- To assess the monitoring undertaken over the previous year against the standards set out in Objective 1;
- To Identify any changes/amendments to monitoring locations/parameters/frequencies that could be incorporated in future SIMPRs;
- To report on any issues apparent with the monitoring; and
- To identify any improvement that could be made with respect to the monitoring.

The AEMR will also contain an evaluation of whether the observed effects of the groundwater takes are consistent with the predictions of environmental response contained in the AAWUG Report.

The AEMR's primary function is to provide a summary of the monitoring information from the prior year's monitoring. The AEMR may contain recommendations for changes to monitoring and the appropriate abstraction quantities for each consent holder, but the SIMPR is the point at which these recommendations will be decided on by Council.

4. CONTINGENCY PLAN

Exercise of the consents is subject to compliance with Objective 1 of this GMCP. It is however noted that the exercise of AUT.020995.01.04 is not subject to the measures set out in this Contingency Plan up until the point at which their annual take exceeds 2,317,000 m^3/year.

As described in **Section 2**, a trigger level system is used to define environmental criteria that signal changes may be occurring outside of what is normal (TL1) or at a point where remedial action is required to avoid Objective 1 not being met (TL2).

This section details the actions that will be undertaken where trigger levels are exceeded under any of the monitoring suites discussed in **Sections 2.1.2.1, 3.3,** and **3.4**.

Where a trigger level is exceeded the Council will commission a Groundwater Trigger Exceedance Report (GTER), if required. The objective of the GTER is to establish the cause of a trigger level exceedance and to recommend a programme of action to end the exceedance.

A GTER shall include:

- Review of the monitoring results collected (including quantity of water abstracted) and establish why the exceedance has occurred;
- Set out requirements for increased monitoring of the exceedance;
- Set out environmental monitoring to detect effects of the exceedance, such as changes in extent of rivers, natural wetlands, springs or dune lakes;
- Update the report on a regular basis as more data becomes available; and
- Recommend actions to end the trigger exceedance, which could include;
    - A staged reinstatement of abstraction levels to pre-exceedance levels,
    - Reduced levels of abstraction for all or some of the consent holders covered by the GMCP, or
    - Suspension of abstraction by all or some of the consent holders covered by the GMCP.

4.1 Exceedance of TL1

In the event of a TL1 exceedance, which may represent declining groundwater levels or rising salinity indicators, the following actions must be undertaken:

(a) The Council will notify the Consent Holders in writing within 24 hours, or as soon as practicable, of when the TL1 exceedance became known.

(b) If the exceedance is of a salinity indicator in the bores listed in

Table 6, then sampling of the monitoring bore(s) in exceedance shall immediately be upgraded to a weekly frequency for four (4) weeks following the first exceedance of the TL1. Weekly monitoring shall continue until sample results are consistently below TL1 values for a period of four (4) weeks or as directed by Council.

(c) If after four (4) weeks following the first exceedance of the TL1, the initiation of seawater intrusion and/or water level decline cannot be discounted to the satisfaction of the Council, then a GTER by the nominated technical expert (and ecologist if the exceedance concerns a surface water body) shall be commissioned by the Council.

(d) The GTER shall assess the significance of the exceedance against the requirements of Objective 1 of the GMCP. The GTER shall assess why trigger levels have been breached, identify the pumping bores in the area(s) of effect and will review all of the available data collected in the affected area(s), in particular the data collected pursuant to this GMCP.

4.2 Exceedance of TL2

In the event of a TL2 exceedance, which represents a significant departure from normal groundwater conditions, with either continuously declining groundwater levels or rising salinity indicators:

(a). The Council will inform the Consent Holders in writing within 24 hours, or as soon as practicable, of a TL2 exceedance becoming known.

(b). All Consent Holders must reduce their abstraction to 50% of the current average daily quantity, as calculated using the previous month's water use records required to be kept in accordance with the conditions of its groundwater take consent. If the exceedance occurs within one month of a Consent Holder first taking water for irrigation purposes within an irrigation season, then the average shall be calculated using the water use records for this period only. The Council will advise the Consent Holder in writing of the required reduction in the daily water take volume.

(c). A GTER by the nominated technical expert (and ecologist if the exceedance concerns dune lakes or natural wetlands) shall be commissioned by Council. The GTER shall assess why the TL2 has been breached, identify the pumping bores in the area of effect, and include a review of all available data collected for the affected area(s), in particular, the data collected under this GMCP.

(d). Once (b) above has been complied with, the Consent Holder may apply to the Council's Compliance Manager for an alternative reduction in its daily water take volume. The Council's approval of an alternative reduction value will only be given if it is satisfied that relevant TL2 values will not be exceeded. The Council will use the GTER to inform its decision on any alternative reduction value for a Consent Holder.

(e). If the TL2 exceedance is in a bore(s) that is/are not continuously monitored, then weekly groundwater level measurements and/or sampling of saline intrusion (depending on which trigger level is breached) in all bores where TL2 trigger levels are breached will commence within one week of the TL2 trigger level exceedance. Monitoring will continue until such time as:

- Three consecutive samples in an individual monitoring bore are below all TL2 thresholds established for that piezometer; or
- As directed by the Council.

(f). If salinity indicators continue to increase or groundwater levels continue to decline after 21 days following the implementation of (b), then the Consent Holder's abstraction must be reduced to 25% of

the current average daily quantity, as calculated for (b) above. The Council will advise the Consent Holder in writing of this further reduction and the required reduction in the daily water take volume.

(g). If (f) is implemented, then the Council will commission a review and update of the GTER report by the nominated technical expert (and ecologist if the exceedance concerns a dune lake or natural wetland) with a longer-term programme of recommended responses incorporating observed responses to interim pumping rate reductions. The updated GTER will include a specific programme (including timeframes) of actions which would achieve compliance with Objective 1 of this GMCP. The actions may include, but not be limited to incremental reductions in the daily quantity of groundwater taken as a percentage of the allowable daily pumped volume, as well as testing of domestic/stock water supplies in bores that are efficiently utilising the aquifer and are potentially impacted by saline intrusion, and if necessary, the provision of temporary water supplies to any affected parties (excluding any of the Consent Holders) in the event that Chloride concentrations exceed 250 mg/L (being the guideline value for taste prescribed in New Zealand Drinking Water Standards for New Zealand 2005 (Revised 2008)). The GTER will also identify a methodology which the Council will utilise to increase abstraction back to the volumes applicable to the relevant stage of taking (see **Section 2.1**), where this can be done such that Objective 1 of this GMCP will be met. If it is not possible to increase abstraction back to the relevant stage of taking, then the GTER will identify a methodology to increase abstraction to a lesser volume such that Objective 1 of the GMCP will be met.

(h). Actions arising from the GTER shall continue as long as the issue continues.

(i). Implement additional remedial measures as directed by Council, including the suspension of taking.

5. REFERENCES

Clarkson, B.R., Sorrell, B.K., Reeves, P.N., Champion, P.O., Partridge, T.R., Clarkson, B.D. (2003). Handbook for monitoring wetland condition (Revised October 2004).

Retrieved from

https://www.landcareresearch.co.nz/publications/researchpubslhandbook_wetland_condition.pdf

Ministry for the Environment. (2006). *A National Protocol for State of the Environment Groundwater Sampling in New Zealand*. Retrieved from http://www.mfe.govt.nz/sites/default/files/national-protocol-groundwater-dec06-updated.pdf

APPENDIX A – Areas of Interest for Wetland Delineation

Area of Interest - Overview
Land Cover and Wetland Risk - Excluding High Producing Grassland

N

WILLIAMSON WATER & LAND ADVISORY

Houhora
Lamb
Waterfront
Waterfront
NRC Waterfront Rd Piezo
Houhora Heads
Burnage
Browne
NRC Forest Piezo
N
M
Wetland
MWWUG Kaimaumau Wetland North
Motutangi
NRC Hukatere Piezo
MWWUG Kaimaumau Wetland South
Honeytree
Kaimaumau Settlement
K
Kaimaumau
Shine
P
J
Paparore
Valic-2
Valic-3
NRC Paparore Rd Piezo
H
Valic-1
NRC Ogle Drive
G
Q
NRC Lake Heather No.2
NRC Lake Heather No.3
Lake
NRC Lake Heather No.1
Waipapakauri
Sweetwater MW1
MW1a
MW2a
Sweetwater MW2
D
MW4a
MW6
E
Sweetwater MW5
MW5a
Ahipara
AUPOURI FOREST

Legend

- Shallow Monitoring Bore
- Deep Monitoring Bore
- Production Bore
- Wetlands (FENZ/NRC/LUCAS/LCDB5)
- Coastline
- Area of Interest

Land cover
- High Producing Exotic Grassland

Risk
- High
- Moderate

Data Provenance
Freshwater Ecosystems geo-database (FENZ)
Known Wetlands (Northland Regional Council)
Wetlands (LUCAS NZ Land Use Map)
NZ Top 50 Gridless Map (Land Information New Zealand)
1m Lidar Survey Dataset (Northland Regional Council)
Land cover database-5.0 (IRIS)

0 5 10 km

Land Cover and Wetland Risk-Excluding High Producing Grassland - Area D

N

WILLIAMSON
WATER & LAND ADVISORY

D

Legend

- Shallow Monitoring Bore
- Deep Monitoring Bore
- Lake
- Wetlands (FENZ/NRC/LUCAS/LCDB5)
- Coastline
- Area of Interest

Land cover

- High Producing Exotic Grassland

Risk

- High
- Moderate

Data Provenance
Freshwater Ecosystems geo-database (FENZ)
Known Wetlands (Northland Regional Council)
Wetlands (LUCAS NZ Land Use Map)
NZ Top 50 Gridless Map (Land Information New Zealand)
1m Lidar Survey Dataset (Northland Regional Council)
Land cover database-5.0 (IRIS)

0 0.5 1 km

Land Cover and Wetland Risk-Excluding High Producing Grassland - Area E

N

E

WILLIAMSON
WATER & LAND ADVISORY

Legend

- State Highway
- River / Stream
- Lake
- Wetlands (FENZ/NRC/LUCAS/LCDB5)
- Coastline
- Area of Interest

Land cover

- High Producing Exotic Grassland

Risk

- High
- Moderate

Data Provenance
Freshwater Ecosystems geo-database (FENZ)
Known Wetlands (Northland Regional Council)
Wetlands (LUCAS NZ Land Use Map)
NZ Top 50 Gridless Map (Land Information New Zealand)
1m Lidar Survey Dataset (Northland Regional Council)
Land cover database-5.0 (IRIS)

0 0.5 1 km

Land Cover and Wetland Risk-Excluding High Producing Grassland - Area Q

N

WILLIAMSON
WATER & LAND ADVISORY

F

Q

Legend

- State Highway
- River / Stream
- Lake
- Wetlands (FENZ/NRC/LUCAS/LCDB5)
- Coastline
- Removed Area of Interest
- Area of Interest

Land cover

- High Producing Exotic Grassland

Risk

- High
- Moderate

Data Provenance
Freshwater Ecosystems geo-database (FENZ)
Known Wetlands (Northland Regional Council)
Wetlands (LUCAS NZ Land Use Map)
NZ Top 50 Gridless Map (Land Information New Zealand)
1m Lidar Survey Dataset (Northland Regional Council)
Land cover database-5.0 (IRIS)

0 0.5 1 km

Avokaha Ltd Consent

AVOKAHA LIMITED

To undertake the following activity on Lot 3 DP 178824 (70 Turk Valley Road), at or about location co-ordinates 1614553E 6138575N:

Note: All location coordinates referred to in this document are Geodetic Datum 2000, New Zealand Transverse Mercator Projection.

AUT.008647.01.06 Take water from a bore for the purposes of horticultural irrigation on that property.

Subject to the following conditions:

1 The quantity taken from the bore shall not exceed:

(a) ~~**160**~~ **203** cubic metres per day, being any 24 consecutive hours; nor

(b) 26,400 cubic metres per year, being 1 July to 30 June.

2 The Consent Holder shall install and maintain a meter with an accuracy of ±5% to measure the quantities taken from the bore.

3 The Consent Holder shall keep written records of the quantities of water taken daily from the bore. A copy of these records for the previous 12 month period (1 July to 30 June) shall be forwarded to the council by 31 July each year, and also immediately upon written request by the council.

***Advice Note**: In the event that no water is abstracted for the previous irrigation season, the Consent Holder is still requested to notify the council in writing of the NIL abstraction.*

4 Easy access for a water level probe shall be provided and maintained at the wellhead to enable the measurement of static water levels in the bore.

5 The council may, in accordance with Section 128 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the conditions of this consent. Such notice may be served annually during the month of June. The review may be initiated for any one or more of the following purposes:

(a) To deal with any adverse effects on the environment that may arise from the exercise of the consent and which it is appropriate to deal with at a later stage, or to deal with any such effects following assessment of the results of the monitoring of the consent and/or as a result of the council's monitoring of the state of the environment in the area;

(b) To require the adoption of the best practicable option to remove or reduce any adverse effect on the environment;

(c) To deal with any inadequacies or inconsistencies the council considers there to be in the conditions of the consent, following the establishment of the activity the subject of the consent;

(d) To deal with any material inaccuracies that may in future be found in the information made available with the application. (Notice may be served at any time for this reason); and/or

(e) To review Condition 1 to ensure the efficient allocation of the resource.

The Consent Holder shall meet all reasonable costs of any such review.

EXPIRY DATE: 30 NOVEMBER 2025