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21 March 2023

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By Email

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Kia ora Helen and Mark,

Otaki to north of Levin Highway Project - APP-2021203231.00

We write to advise that following lodgement of the applications for resource consents and notices of requirement for the Ō2NL Project on 2 November, discussions about the Project have continued with Council, iwi partners and the Department of Conservation. As an outcome of these discussions, and in addition to our response to the request for further information, we have refined approaches to the management of some potential adverse effects and identified changes to some of the conditions we have proposed to apply to the designations and resource consents.

This letter collates the outcome of these processes, as follows:

1. The conditions that we proposed to revise, with changes shown as track changes are provided as **Attachment 1**. In summary the following conditions are modified:
 - a) Condition DLV1 – updated to include a percentage canopy coverage standard, as agreed in the response to the District Councils’ request for further information;
 - b) Condition RTE7 – updated to require that indigenous buffer planting to occur prior to the commencement of construction activities where it is practicable to do so, as agreed in the response to the District Councils’ request for further information;
 - c) Condition RWB3 – updated to include a percentage canopy coverage standard, as agreed in the response to the Regional Councils’ request for further information;
 - d) Condition REM10 (and Schedule 7) – updated to provide clearer process for managing relocation of lizards relative to the construction of the Project;
 - e) Condition RWT1 – updated to provide clearer limits on any abstraction from the Koputaroa in line with technical assessments;
 - f) Condition RGW3 – to clarify that the condition refers to the groundwater monitoring bores that have been installed by Waka Kotahi; and

- g) Minor incidental cross referencing and typographical errors.
2. Communication with Regional Council staff in respect of water abstraction requirements, which provides further explanation around the proposed abstraction from Koputaroa Stream and the Waitohu Stream:
- a) **Attachment 2:** Memorandum from Dr Jack McConchie to Mike Thompson which provides further context in respect of the effect of proposed abstraction of construction water from the Waitohu Stream, dated 26 January 2023.
 - b) **Attachment 3:** Memorandum from Dr Jack McConchie to Michaela Stout which provides clarification of how the proposed abstraction from Koputaroa Stream could be managed, dated 31 January 2023.
 - c) **Attachment 4:** Email communication from Dr Jack McConchie to Michaela Stout, Horizons Regional Council on 27 February 2023.

If you would like to discuss any aspect of the above, then please do not hesitate to contact Caitlin Kelly on Caitlin.Kelly@nzta.govt.nz or Greg Lee on Greg.Lee2@nzta.govt.nz.



Caitlin Kelly
Principal Planner
Waka Kotahi NZ Transport Agency

Attachment 1: Revised Conditions

The following sets out the proposed conditions for the Ō2NL Project that Waka Kotahi seek to revise or correct following lodgement of the applications for resource consents and notices of requirement for designations.

Base version: The base document is the conditions as notified (being the 28 November version provided to the Councils).

Revised version: Further amendments to these conditions that are suggested in the Waka Kotahi response to further information requests, refined through discussions with the Councils, iwi partners and stakeholders or correct minor typographical or editing errors. The revisions are presented as red underlined or ~~red strikethrough~~.

PROPOSED CONDITIONS

Drafting notes

The following sets out the proposed conditions for the Ō2NL Project that Waka Kotahi seek to revise or correct following lodgement of the applications for resource consents and notices of requirement for designations.

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Designation conditions

Condition Number	Condition								
Landscape and Visual									
DLV1	<p>Landscape planting</p> <p>a) The landscape planting shown on the Planting Concept Plans: Indicative Typology and the Planting Concept Plans: RMA Purpose Type included in the 'Notices of Requirement for a Designation' dated 1 November 2022 'Volume III Drawings and Plans' must be undertaken:</p> <ol style="list-style-type: none"> i. where practicable, prior to commencement of construction activities; or ii. as soon as construction works are completed in the relevant area and seasonal conditions are appropriate; and iii. within eighteen (18) months of the Project being open for public use. <p>b) Landscape planting must be implemented, maintained, monitored and replaced to achieve a 90% survival rate <u>and 80% canopy coverage of the ground</u> at five (5) years following the date that initial planting commenced; and</p> <p>c) The landscape planting must consist of plant material sourced from the rohe in which it is to be planted or be otherwise sourced from the ecological district of the site.</p>								
Operational Road-Traffic Noise									
DRN1	<p>Low-noise road surfaces</p> <p>b) Except where Condition DRN3 applies, the low-noise road surfaces in Table DRN-1 must be installed within eighteen (18) months from the date the Project opened for public use.</p> <p>Table DRN-1 – Low-Noise Road Surfaces</p> <table border="1"> <thead> <tr> <th>Location</th> <th>Chainage</th> <th>Length</th> <th>Surface Type</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Location	Chainage	Length	Surface Type				
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DRN2	<p>Noise barriers</p> <p>a) Except where Condition DRN_3 applies, the noise barriers in Table DRN_2 must be installed prior to the Project being opened for public use.</p> <p>Table DRN_2 – Noise Barriers</p> <table border="1"> <thead> <tr> <th>Location</th> <th>Chainage</th> <th>Length</th> <th>Barrier type</th> </tr> </thead> <tbody> <tr> <td>Levin Rail bridge, southbound</td> <td>CH10700-CH11500</td> <td>810m</td> <td>1.1m high concrete safety barrier</td> </tr> <tr> <td>Waihou Road</td> <td>CH13900-CH15000</td> <td>1.2km</td> <td>1.1m high concrete safety barrier</td> </tr> <tr> <td>Waiauti Stream and South Manakau Road bridge, northbound</td> <td>CH29700-CH30400</td> <td>530m</td> <td>1.1m high concrete safety barrier</td> </tr> <tr> <td>Waiauti Stream and South Manakau Road bridge, southbound</td> <td>CH29700-30700</td> <td>1.1km</td> <td>1.1m high concrete safety barrier</td> </tr> <tr> <td>North Ōtaki overbridge, northbound</td> <td>CH33600-CH34200</td> <td>600m</td> <td>1.1m high concrete safety barrier</td> </tr> </tbody> </table>	Location	Chainage	Length	Barrier type	Levin Rail bridge, southbound	CH10700-CH11500	810m	1.1m high concrete safety barrier	Waihou Road	CH13900-CH15000	1.2km	1.1m high concrete safety barrier	Waiauti Stream and South Manakau Road bridge, northbound	CH29700-CH30400	530m	1.1m high concrete safety barrier	Waiauti Stream and South Manakau Road bridge, southbound	CH29700-30700	1.1km	1.1m high concrete safety barrier	North Ōtaki overbridge, northbound	CH33600-CH34200	600m	1.1m high concrete safety barrier
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Regional resource consent conditions

Condition Number	Condition		
Terrestrial Ecology			
RTE7	<p>Indigenous buffer planting</p> <p>a) Subject to landowner agreement where the planting is on private property, indigenous buffer planting must be provided where the Project is adjacent to the habitats listed in Table RTE-7:</p> <p>Table RTE-7: Indigenous Buffer Planting</p> <table border="1"> <thead> <tr> <th>Adjacent Habitat</th> <th>Habitat type reference*</th> </tr> </thead> <tbody> </tbody> </table>	Adjacent Habitat	Habitat type reference*
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Ecology Management Offset and Compensation											
REM1	<p data-bbox="359 1216 670 1249">Ecology Management Plan</p> <p data-bbox="359 1256 1455 1346">a) An Ecology Management Plan must be prepared to achieve the objectives, and include the content, set out in Schedule 47 to these conditions of resource consent and must be certified in writing as set out in Condition REM2.</p> <p data-bbox="359 1352 1455 1420">b) The Ecology Management Plan required by clause (a) must be prepared in consultation with the Project Iwi Partners and the Department of Conservation.</p>										
REM2	<p data-bbox="359 1458 813 1491">Ecology Management Plan certification</p> <p data-bbox="359 1498 1455 1588">a) The Ecology Management Plan required by Condition REM1 must be provided to the Regional Council for technical certification at least forty (40) working days prior to the commencement of construction activities.</p> <p data-bbox="359 1594 1455 1684">b) Certification, or withholding certification, is based on whether the Ecology Management Plan meets the requirements of the relevant conditions of these resource consents, including as set out in Schedule 47.</p> <p data-bbox="359 1691 1455 1848">c) If twenty (20) working days have passed since the Ecology Management Plan has been provided to the Regional Council and the Regional Council has not certified the Ecology Management Plan or provided advice that the Ecology Management is not suitable to certify, then the Ecology Management Plan is deemed certified and the consent holder may commence work in accordance with the Ecology Management Plan as provided.</p> <p data-bbox="359 1854 1455 1944">d) Notwithstanding clause (c), and subject to the requirements of other conditions of these resource consents, work may commence at any time following the certification of the Ecology Management Plan.</p>										

Condition Number	Condition																		
REM8	<p>Replacement tree planting</p> <p>a) Where any tree species listed in Table REM-83 with a diameter at breast height of more than ten (10) centimetres is removed from the indigenous treeland habitats identified as 'ITT01', 'ITT02', 'ITT03', 'ITT04', 'ITT05', and 'ITT06' on the Ecology Plans included in the 'Notices of Requirement for a Designation and Application for Resource Consents' dated 1 November 2022 'Volume III Drawings and Plans', replacement planting must be undertaken at the ratios relative to tree diameter in Table REM-3.</p> <p style="text-align: center;">Table REM-83: Tree Replacement Ratios</p> <table border="1"> <thead> <tr> <th>Diameter at breast height</th> <th>Replacement Ratio</th> </tr> </thead> <tbody> <tr> <td colspan="2" style="text-align: center;">Tītoki, hinau, white maire, totara, pukatea, rewarewa</td> </tr> <tr> <td>10-20 cm</td> <td>10 to 1</td> </tr> <tr> <td>21-35 cm</td> <td>20 to 1</td> </tr> <tr> <td>36-49 cm</td> <td>30 to 1</td> </tr> <tr> <td>50+ cm</td> <td>50 to 1</td> </tr> <tr> <td colspan="2" style="text-align: center;">Māhoe, tarata, kāpuka/broadleaf</td> </tr> <tr> <td>10-20 cm</td> <td>5 to 1</td> </tr> <tr> <td>21+</td> <td>10 to 1</td> </tr> </tbody> </table> <p>b) For the duration of five (5) years from the completion of the planting required by clause (a), any dead tree must be replanted in the next planting season so that 90% survival rate is achieved at five (5) years following the date when initial planting commenced.</p>	Diameter at breast height	Replacement Ratio	Tītoki, hinau, white maire, totara, pukatea, rewarewa		10-20 cm	10 to 1	21-35 cm	20 to 1	36-49 cm	30 to 1	50+ cm	50 to 1	Māhoe, tarata, kāpuka/broadleaf		10-20 cm	5 to 1	21+	10 to 1
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REM10	<p>Lizards Relocation Area</p> <p>a) Prior to the commencement of lizard surveys required by Condition RTE5, a predator-proof fence enclosing a minimum area of four (4) hectares of forest must be installed;</p> <p>b) Pest animal management within the predator-proof fence area must be undertaken immediately for two (2) years following the completion of the fence installation required by clause (a) (i) and to achieve the following performance targets:</p> <ol style="list-style-type: none"> possums, rats, feral cats, feral pigs, hedgehogs and mustelids must be eradicated; mice must be maintained at or below a 5% tracking tunnel index. <p>c) Pest animal management required by clause (b) and mMonitoring of the enclosed area for pest animal incursions must be undertaken until the completion of the period set out in Table REM10-140 for a period of two (2) years following eradication of possums, rats, feral cats, feral pigs, hedgehogs and mustelids.</p> <p style="text-align: center;">Table REM10-1: Lizard Relocation Area Management and Monitoring Period</p> <table border="1"> <thead> <tr> <th>Number of lizards captured and relocated</th> <th>Duration (from relocation of last lizard)</th> </tr> </thead> <tbody> <tr> <td>Less than twenty (20) lizards</td> <td>Two (2) years</td> </tr> <tr> <td>Between twenty (20) and fifty (50) lizards</td> <td>Three (3) years</td> </tr> <tr> <td>More than fifty (50) lizards</td> <td>Five (5) years</td> </tr> </tbody> </table> <p>d) Habitat within the enclosed area must be enhanced through the provision of natural and/or artificial refugia.</p> <p>e) The enclosed area must be managed in accordance with the Lizard Relocation Area Management Plan that forms part of the Ecology Management Plan required by Condition RTE8.</p>	Number of lizards captured and relocated	Duration (from relocation of last lizard)	Less than twenty (20) lizards	Two (2) years	Between twenty (20) and fifty (50) lizards	Three (3) years	More than fifty (50) lizards	Five (5) years										
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Condition Number	Condition								
REM11	<p>Measures to offset residual effects on freshwater ecology</p> <p>a) Except where revised through the process set out in Condition ROCEM18, residual adverse effects on freshwater ecology must be offset to result in no net loss of ecological function through the provision of the following:</p> <ol style="list-style-type: none"> i. 2,197m² of new stream channel constructed and planted to a maximum width of twenty (20) metres and no less than five (5) metres; and ii. riparian planting of 17,380m² of existing streambed area with a width of between three (3) metres and twenty (20) metres on both banks. <p>b) The offset measures required by clause (a) must achieve the following standards:</p> <ol style="list-style-type: none"> i. fencing must exclude livestock; ii. stream creation and enhancement measures must be generally consistent with the design for stream diversions shown on the Stormwater: Typical Details Swales and Open Channels included in the 'Notices of Requirement for a Designation and Application for Resource Consents' dated 1 November 2022 'Volume III Drawings and Plans', and implemented within three (3) years of the completion of construction; and iii. all plant material must be sourced from the rohe in which it is to be planted or be otherwise eco-sourced except, where it is not practicable to do so, the Ecology Offset Site Layout Plan must set out a process of consultation with the Project Iwi Partners and the Regional Council to confirm an alternative source. <p>c) Where the offsetting measures required by clause (a) are subject to a 'Flood Control Drainage' value in Schedule B of the One Plan, consultation must be undertaken with the Horizons flood protection engineer.</p>								
Groundwater									
RGW3	<p>Groundwater monitoring</p> <p>a) Groundwater must be monitored to confirm compliance with Condition RGW2 as follows:</p> <ol style="list-style-type: none"> i. at all existing groundwater monitoring bores installed as part of the Project, except those that must be decommission because they are within the Project footprint; ii. at the existing sampling frequency; iii. for the duration of construction and for a year following the Project being open for public use. <p>b) A summary report of the groundwater monitoring required by clause (a) must be provided to the Regional Council in the annual report required by Condition RGA3.</p>								
Surface Water									
RWT1	<p>Surface water abstraction</p> <p>a) The taking abstraction of surface water for to support construction activities must not exceed the maximum abstraction volumes or maximum abstraction rates in Table RWT-1:</p> <p style="text-align: center;">Table RWT-1 Maximum Abstraction Volume and Rate</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Water body</th> <th>Maximum abstraction volume</th> <th>Maximum abstraction rate</th> </tr> <tr> <th>m³/day</th> <th>L/s</th> </tr> </thead> <tbody> <tr> <td>Koputaroa Stream</td> <td style="text-align: center;">231</td> <td style="text-align: center;">6</td> </tr> </tbody> </table>	Water body	Maximum abstraction volume	Maximum abstraction rate	m ³ /day	L/s	Koputaroa Stream	231	6
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	<p>b) The maximum abstraction volumes specified in table RWT-1 can be exceeded when water flow in the water body is volumes are above <u>the</u> median flows specified in Table RWT-2.</p> <p style="text-align: center;">Table RWT-2 Median Flows</p> <table border="1"> <thead> <tr> <th rowspan="2" style="background-color: #1a3d4d; color: white;">Water body</th> <th colspan="2" style="background-color: #1a3d4d; color: white;">Median flows</th> </tr> <tr> <th colspan="2" style="background-color: #1a3d4d; color: white;">m³/sec</th> </tr> </thead> <tbody> <tr> <td>Koputaroa Stream</td> <td colspan="2">0.059</td> </tr> <tr> <td>Ohau River</td> <td colspan="2">4.15</td> </tr> <tr> <td>Waikawa Stream</td> <td colspan="2">0.95</td> </tr> <tr> <td>Manakau and Waiauti Stream</td> <td colspan="2">0.14</td> </tr> <tr> <td>Waitohu</td> <td colspan="2">0.54</td> </tr> </tbody> </table>	Water body	Median flows		m ³ /sec		Koputaroa Stream	0.059		Ohau River	4.15		Waikawa Stream	0.95		Manakau and Waiauti Stream	0.14		Waitohu	0.54	
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	<p>c) The taking-abstraction of surface water set out in clause (a) must occur at the locations shown on the Accommodation Works Plans included in the 'Notices of Requirement for a Designation and Application for Resource Consents' dated 1 November 2022 'Volume III Drawings and Plans'.</p> <p>d) The taking-abstraction of surface water must occur at a rate of not more than ten (10) percent of the mean daily flow in the water body on the preceding day stream discharge on any particular day measured at the flow gauge metres required by clause (e).</p> <p>e) The taking-abstraction of surface water must cease when:</p> <ul style="list-style-type: none"> i. except as provided by clause (e)(II), a Regional Plan minimum flow level is reached; ii. except that for the Koputaroa Stream, <u>the minimum flow, calculated using the same method as the Regional Plan, at Tavistock Road is reached, water abstraction must cease when the Manawatū River is below 12,240L/s.</u> <p>f) <u>In addition to the requirements of clauses (a), (b) and (e), the abstraction of surface water from the Koputaroa Stream must be proportionate to the catchment area upstream of the abstraction point relative to the catchment area upstream of the flow recorder at Tavistock Road at any time flow is between the minimum and median flows set out in Table RWT-2.</u></p> <p>gf) For each water take, a flow metre meter must be installed and maintained and must:</p> <ul style="list-style-type: none"> i. be located on the abstraction line; ii. have a pulse counter output traceably calibrated to plus or minus (+/-) five (5) percent or better; and iii. be capable of providing daily water use as well as pulse counter data. <p>hg) A record of the daily water volumes abstracted and rates of water abstracted must be maintained and provided to the Regional Council and Project Iwi Partners on request.</p>																				
Works in the Bed of Water Bodies																					

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RWB3	<p>Natural character planting</p> <p>a) Subject to landowner agreement where the planting is on private property, natural character planting on the Planting Concept Plans: Indicative Typology and the Planting Concept Plans: RMA Purpose Type included in the 'Notices of Requirement for a Designation and Application for Resource Consents' dated 1 November 2022 'Volume III Drawings and Plans':</p> <ul style="list-style-type: none"> i. must be undertaken: <ul style="list-style-type: none"> A. where practicable, prior to commencement of construction activities; or B as soon as construction works are completed in the area and seasonal conditions are appropriate; and C. within eighteen (18) months of the Project being open for public use. ii. Natural character planting must be implemented, maintained, monitored and replaced to achieve a 90% survival rate <u>and 80% canopy coverage of the ground</u> at five (5) years following the date that initial planting commenced; and; and iii. consist of plant material sourced from the rohe in which it is to be planted or be otherwise sourced from the ecological district of the site.

SCHEDULE 7: Objectives and content of the Ecology Management Plan

Objectives	Related Conditions/ Standards	Minimum Content
Ecology Management Plan		
<p>The objective of the Ecology Management Plan is to address the potential adverse effects of the Ō2NL Project, including construction activities, on ecology and indigenous biological diversity values, including by achieving the standards in the relevant conditions of these resource consents.</p>	<p>RTE1, RTE2, RTE3, RTE4, RTE5, RTE6, RTE7, REM1, REM4, REM5, REM6, REM7, REM8, REM9, REM11, REM12, REM13, REM19</p>	<p>The Ecology Management Plan must include, but not be limited to:</p> <ul style="list-style-type: none"> a) the identification of key personnel, including their roles and responsibilities; b) a summary of the ecology and indigenous biodiversity values of the Project Area and the potential adverse effects of the Project on these values; c) a summary of the approaches taken to the management of adverse effects on ecology and indigenous biodiversity values; d) site staff induction procedures in respect of ecology, including measures to prevent the introduction of pest plants and pest animals; d) a description of consultation undertaken with the Project Iwi Partners and the Department of Conservation, including details of how the Ecology Management Plan responds to matters raised during consultation; e) approaches to the management of vegetation clearance through: <ul style="list-style-type: none"> i. vegetation clearance protocols that include demarcation, timing of clearance; and supervision requirements; ii, setbacks for the storage of sawdust, chip or mulch near water bodies; ii. procedures and timing for the direct transfer of raupō reedland, indigenous fernland (weltand), and rautahi sedgeland; iii. opportunities for the salvage and reuse of plant material and soils; f) vegetation type, planting descriptions, outcomes and methods for establishments including: <ul style="list-style-type: none"> i. a planting guide that sets out: <ul style="list-style-type: none"> A. the source of plants from the rohe or relevant ecological districts, including a propagation guide or, where this is not possible, a process to confirm alternative sources with the Project Iwi Partners and the Regional Council;

Objectives	Related Conditions/ Standards	Minimum Content
		<ul style="list-style-type: none"> B. plant specifications; C. species mix; D. nursery requirements; E. methods, plant numbers, spacing, density and timing of planting; F. approaches to livestock exclusion. ii. pest plant and animal management; iii. an establishment programme and performance targets; iv. planting monitoring and maintenance approach and timeline; v. the location and legal arrangements for the planted areas; vi. approaches to reducing the potential for bird strike from vehicles through plant species selection along the highway; and vii. opportunities for the participation of the community in planting. g) measures to manage the biosecurity requirements in Condition RTE11; h) the procedures for pre-construction avifauna surveys; i) approaches to the management of potential effects on indigenous birds specific to species and habitat type including: <ul style="list-style-type: none"> i. constraints on vegetation clearance; ii. deterrents; iii. exclusion zones; iv. supervision; and v. responses to accidental harm. j) a description of the methodology for lizard survey, capture, transfer and release, including: <ul style="list-style-type: none"> <u>i. the identification of habitats for survey;</u> <u>ii. protocols for lizard salvage prior to, and during, vegetation clearance; and</u> <u>iii. protocols for surveys post clearance in any location where more than ten (10) lizards are found;</u> k) approaches to lizard injury and/or mortality;

Objectives	Related Conditions/ Standards	Minimum Content
		<ul style="list-style-type: none"> l) procedures for pre-construction survey capture and relocation to identified closest similar habitats of 'At Risk' or 'Threatened' indigenous invertebrate species as defined by the Department of Conservation New Zealand Threat Classification System, including the following 'Not Threatened' invertebrate species: <ul style="list-style-type: none"> i. Wainuia (<i>Wainuia urnula</i>); ii. Peripatus (<i>Peripatoides novaezealandiae</i>); iii. Auckland tree wētā (<i>Hemideina thoracica</i>) iv. Wellington tree wētā (<i>Hemideina crassidens</i>) v. Cave wētā (<i>Pleioplectron hudsoni</i>) vi. Stick insects (<i>Clitarchus</i> spp.). m) A summary of offset and compensation actions to inform Ecology Offset Site Layout Plans, including specific monitoring and reporting requirements and incident reporting; n) the identification of areas, methods, targets and duration for pest plant and animal management; o) the Lizard Relocation Area Management Plan; p) the Freshwater Ecology Management Plan; and q) monitoring and reporting requirements.

Attachment 2: Memorandum from Dr Jack McConchie to Mike Thompson which provides further context in respect of the effect of proposed abstraction of construction water from the Waitohu Stream, dated 26 January 2023

To: Mike Thompson
Copy: Greg Lee & Caitlin Kelly
From: Dr John (Jack) McConchie
Date: 26 January 2023
Subject: Effect of proposed abstraction of construction water from Waitohu Stream

At: Greater Wellington Regional Council
At: Ō2NL Project Team, Waka Kotahi
At: SLR Consulting NZ Limited
Ref: 720.30017.00000 O2NL Waitohu Abstraction FINAL.docx

Background

To support the construction of the Ō2NL Project, a resource consent has been lodged with Greater Wellington Regional Council to abstract water from Waitohu Stream. To avoid having any effects that are 'more than minor', and to be consistent with the requirements of the relevant Regional Plan and policies, the following has been proposed:

- Abstraction of up to a maximum of 2,160m³ a day from the existing core allocation. This will leave at least 1,080m³ a day available for any other users throughout the duration of the consent;
- Water would be abstracted only when flow in the Waitohu River is above the current minimum flow (140L/s);
- Water would be abstracted at a rate of no more than 14L/s at the minimum flow (i.e., 10%); and
- Abstraction would be increased *pro rata* above the minimum flow to a maximum of 50L/s.

In addition to the above, and to further mitigate any potential 'less than minor' adverse environmental effects, abstraction would also be constrained by:

- Only abstracting for the duration of construction of the Ō2NL Project i.e., estimated at five years;
- Total abstraction across several sites used to support construction of the Ō2NL Project cannot exceed a maximum of 3,950m³ a day;
- Total abstraction across sites used to support construction of the Ō2NL Project cannot exceed an average of 2,160m³ a day; and
- Wherever possible, water abstracted from the Waitohu catchment would be used to support construction of the Ō2NL Project within that catchment. That is, as far as practicable there will be no inter-basin transfer of water. This will reduce the duration, and volume of water, that may need to be abstracted from Waitohu Stream.

Following lodgement of the resource consent application for the Ō2NL Project, and because of the distinctive character of Waitohu Stream i.e., it contains both influent (losing water to groundwater) and effluent (gaining water from groundwater) reaches, GWRC requested further information on the natural low flow regime of

Waitohu Stream. A response to the further information request was provided on 23 December 2023 confirming and clarifying the effects of the resource consent applications lodged. Additional gauging data was also supplied subsequently by GWRC. This memorandum provides a detailed assessment of that data with specific focus on the low flow regime and conditions when surface flow might cease downstream of Taylors Road. This memorandum therefore provides context to the lodged RMA applications.

Background

Flow in Waitohu Stream has been measured by GWRC since October 1994, now providing almost 30-years data for characterising the flow regime (Figure 1). While the Waitohu at Water Supply Intake recorder is the only flow gauge in the catchment, it is suitable for assessing the impact of any potential abstraction of construction water from this catchment. The gauge is approximately 4.5km east of Ōtaki and located where Waitohu Stream exits the foothills of the Tararua Ranges. Steep forested land borders the stream to the north of the gauge, with flatter pastoral land to the south.

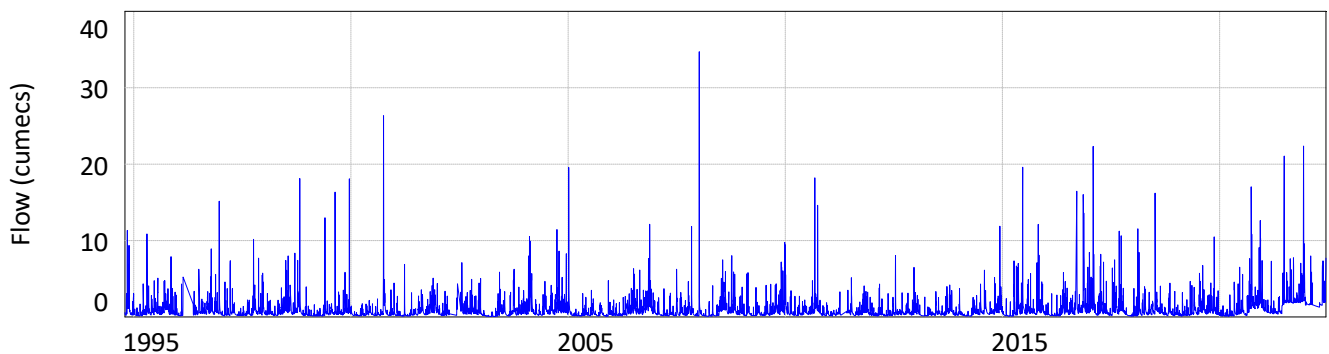


Figure 1: Waitohu at Water Supply Intake mean daily flow series (1994-2022).

The flow regime of Waitohu Streams is typical of a waterway draining pastoral hill-country at the foothills of the Tararua Range. Generally low flows are interspersed with occasional but random large floods. This creates a highly variable flow regime where the maximum flow recorded is two orders of magnitude greater than the median.

Flow in Waitohu Stream has ranged from a minimum of 0.065m³/s, to a maximum of 34.7m³/s (Table 1). Waitohu Stream experienced this minimum flow in April 2003, while the maximum flow occurred in January 2008 (Figure 1).

Table 1: Summary statistics of flows recorded in Waitohu Stream (m³/s).

Site	Min	Max	Mean	Std Dev	L.Q.*	Median	U.Q.**
Waitohu at Water Supply Intake	0.065	34.7	0.98	1.39	0.30	0.54	1.12

* L.Q. is the Lower Quartile flow i.e., the flow that is exceeded 75% of the time
 ** U.Q. is the Upper Quartile flow i.e., the flow that is exceeded 25% of the time

Because Waitohu Stream contains both influent and effluent reaches, the flow measured at the Water Supply Intake recorder may not represent the flow at other locations accurately. It is possible that flow increases with catchment area over some reaches but decreases over other reaches despite an increase in catchment area. Losses through the bed of Waitohu Stream downstream of SH1 are sufficient, during occasional extended

periods of extremely low flow, that surface flow ceases in the vicinity of Taylors Road until effluent flow then restores, and even augments, flow downstream at the Golf Course. This behaviour makes any assessment of the flow regime at specific locations problematic.

Identifying and quantifying the potential impact of these changes to inflow and outflow from a stream requires concurrent stream gauging i.e., measurements of flow at different locations at essentially the same time. Concurrent gaugings are generally undertaken during periods of low flow when any losses or gains of water from the stream are a greater percentage of the total flow and can be quantified more easily.

Concurrent gaugings

GWRC, as the water resource manager for Waitohu Stream, has undertaken several series of concurrent gaugings (13) of Waitohu Stream (Table 2). Most of these gaugings were undertaken from 1995-2001 (10) and the last gauging was in 2008.

Table 2: Concurrent gaugings available for Waitohu Stream.

Date of gauging	Forest Park	Butterfly Creek	Water Supply Intake	Below Water Supply Intake	Ringawhatai Road Bridge	Waitohu Valley Rd Bridge	State Highway One	Taylors Road Bridge	Above Ngatotara Ditch	Below Ngatotara Ditch	Golf Club	Norfolk Crescent	Mouth
Distance (m)	0	1217	1372	1467	3704	5735	6883	8038	9173	9313	10786	13160	14527
16-01-1995			178				228		93	0	133		
25-03-1998			209	203	239		170				97		219
27-01-1999			162	180	165		166				61		224
10-02-1999			162	119	124		110				52		216
29-02-2000			192	138	153		150				66		299
28-03-2000			146	113	126		120				47		
19-04-2000			216	232	253		205				139		852
10-01-2001			244	202	224		190				110		173
08-02-2001			230	192	171		158				63		351
28-02-2001			153	123	126		95				29		304
26-04-2004			241		220		202	116			146		
15-03-2005								62			72		
28-03-2008	71		90		98		76	0	0		16	94	118

The concurrent gaugings were undertaken at various locations along Waitohu Stream, however, the locations varied between the different gauging runs (Figure 2). While 13 different locations have been gauged at some stage, most of the gauging runs only measured flow at six sites, although in 2008 the flow at nine sites was apparently gauged.

The data from the various concurrent gaugings is shown in Figure 3 & Figure 4. Note that the only difference in these figures is the exclusion of the ‘extreme’ flow measured at the river mouth on 19 April 2000 to enhance the resolution of Figure 4.

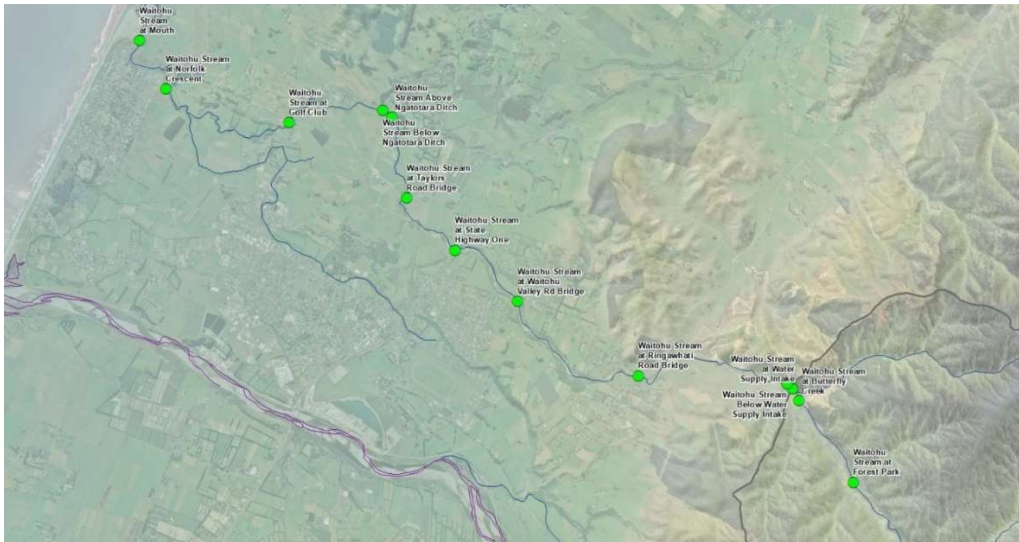


Figure 2: Locations of the various concurrent gaugings undertaken on Waitohu Stream.

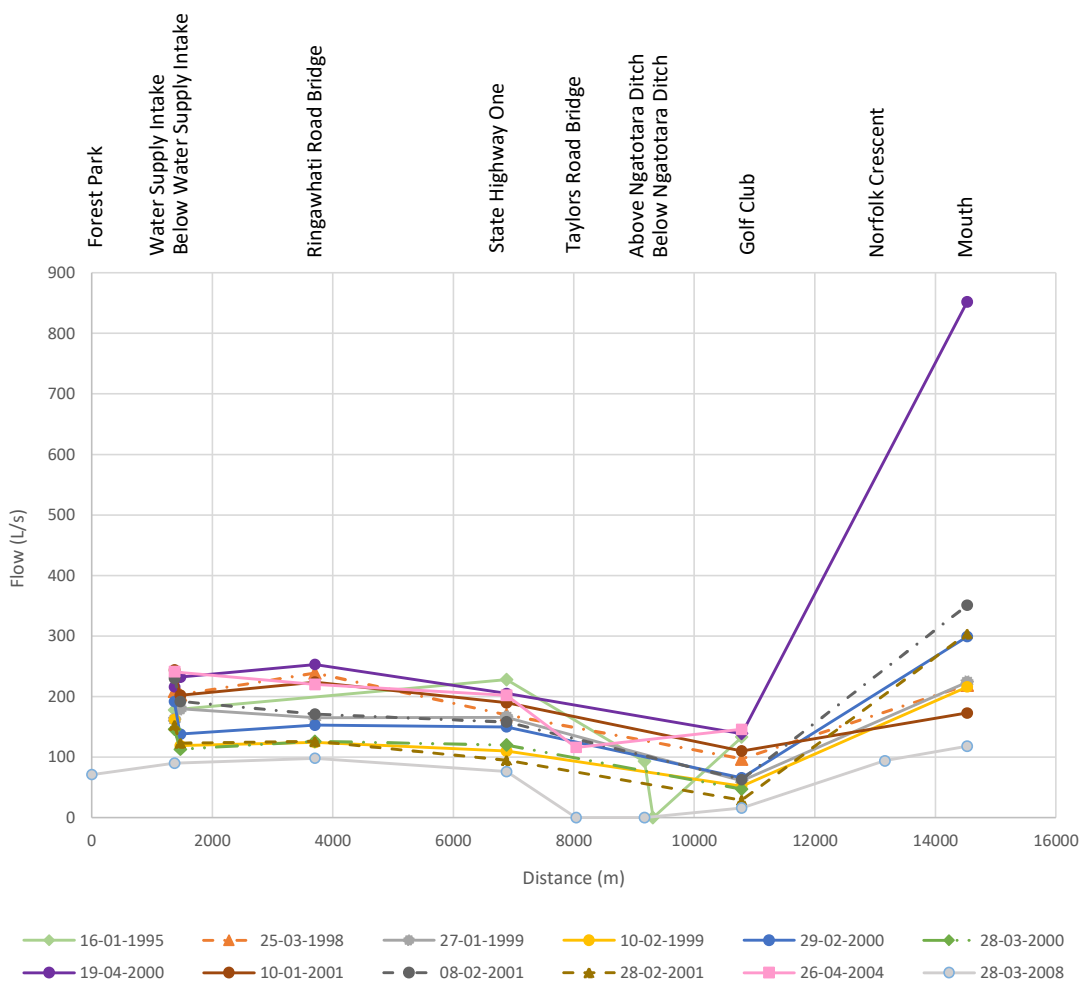


Figure 3: Data from all the series of concurrent gaugings.

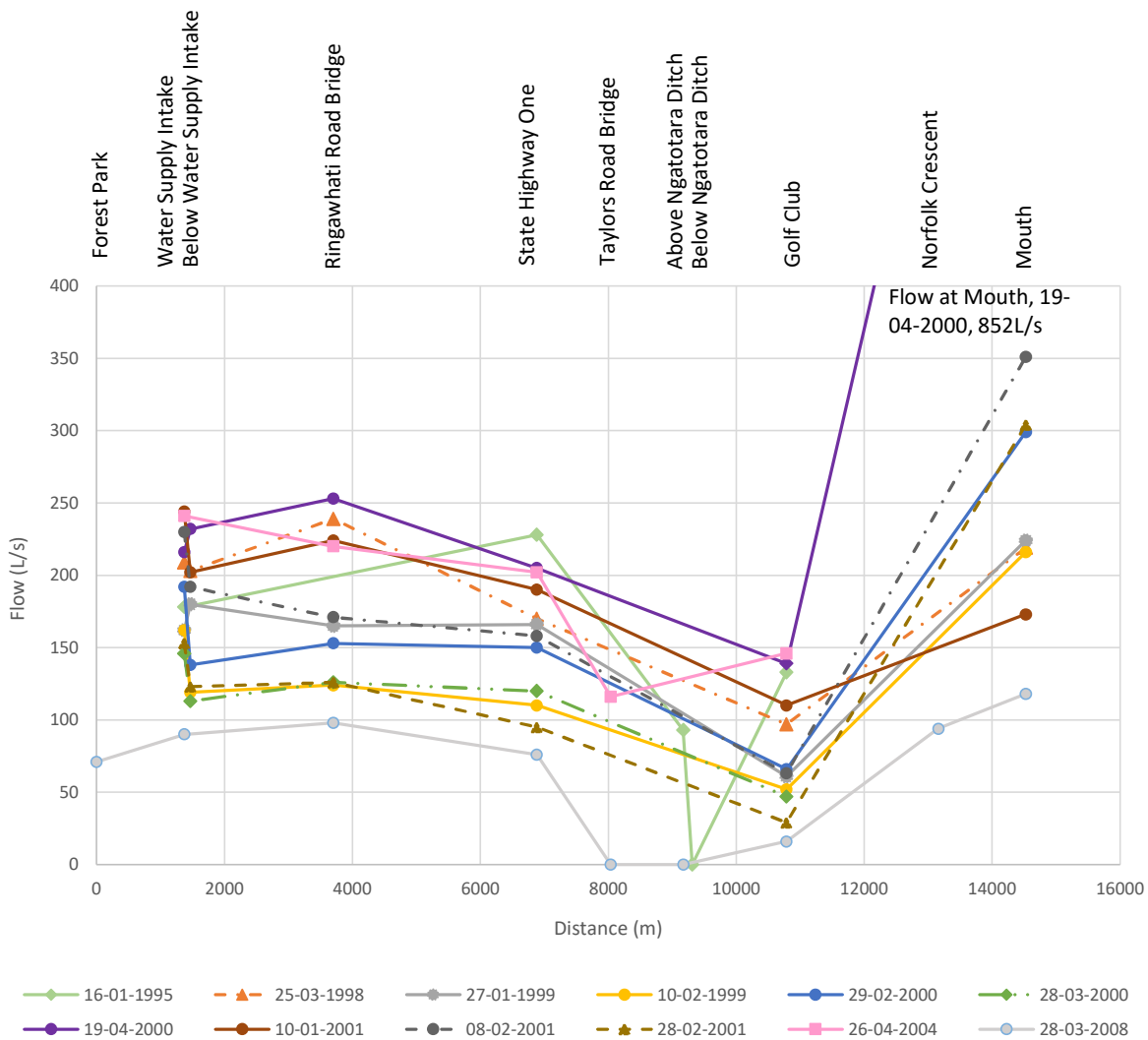


Figure 4: Data from the series of concurrent gaugings, excluding the ‘extreme’ value recorded at ‘The Mouth’ on 19 April 2000 to improve resolution at lower flows.

It should be noted that these figures differ from those provided in an internal GWRC report produced by Laura Keenan *Mean annual low flow statistics for rivers and streams in the Wellington region* in two respects:

- The data are plotted relative to their actual distance downstream of the most upstream site. Keenan (nd) plotted the data as if it was ‘categorical’ and therefore the rates of actual gains and losses in flow are misrepresented; and
- Some of the data available currently from GWRC’s hydrometric archive is different to that used by Keenan (nd). It is assumed that the current data are the more accurate.

Notwithstanding the above, it is apparent that:

- There are significant differences in both the location and volume of losses and gains in flow down Waitohu Stream. Each gauging run indicates a different pattern of behaviour;

- Flow between the Waitohu at Water Supply Intake and SH1, however, is essentially constant, at least within the generally accepted accuracy of open channel flow measurements i.e., $\pm 8\%$. Consequently, flows measured upstream at the Water Supply Intake are likely to be indicative of those at SH1 and therefore the likely point of abstraction of any water used to support the construction of the Ō2NL Project;
- The minimum flow (140L/s) is sufficient to sustain channel flow downstream of SH1 i.e., at the minimum flow continuity of flow is maintained throughout the entire length of Waitohu Stream. It should be noted that the data from the concurrent gaugings of 16 January 1995 have been excluded when identifying conditions when Waitohu Stream ‘goes dry’. This is because the relative flows upstream and downstream of Ngatotara Ditch appear anomalous. Given the distance between the gaugings is probably only a few 10s of metres, it is unlikely that the river loses 93L/s over this reach. This is the only occasion when this apparent behaviour was observed. The increase in flow to 133L/s at the Golf Club suggests that zero flow downstream of Ngatotara Ditch is an error in the data in the hydrological archive (Table 2);
- Although there are limited data, it appears that flow in Waitohu Stream at the Water Supply Intake must drop to at least 100L/s for a sustained period before flow in the river downstream of Taylors Road ceases, before commencing again further downstream;
- Since the Ō2NL Project proposes to stop abstracting at the current minimum flow (140L/s) and flow downstream does not cease until a flow of less than 100L/s persists, the proposed abstraction will have no effect on periods of no flow, their occurrence, frequency, or duration. These will remain controlled by natural climatic and fluvial processes;
- A flow of 140L/s at the Water Supply Intake would appear to ensure continuity of flow and a flow at the Golf Course of 60-70L/s. Assuming the entire 14L/s sought by the Ō2NL Project at the minimum flow reduced this flow, which is considered unlikely given the interaction between surface water and groundwater over this reach, this would reduce flow at the Golf Course by between 20-23%. Any potential effects of this are suggested to be extremely small. Since flows have reduced to significantly less than this naturally in the past, stream biota would have adjusted to these conditions.
- Consequently, any effects of the abstraction proposed by the Ō2NL Project will be ‘*less than minor*’ as argued in the resource consent application.

Periods of low flow

As discussed, the key hydrological metrics for abstraction from Waitohu Stream are the minimum flow (140L/s) and the flow threshold that, when sustained for a period, is associated with surface flow ceasing in a reach downstream of Taylors Road (100L/s). It should be noted that while the abstraction of water can affect flows above 140L/s, since all abstractions must cease when the flow drops below this level, the dynamics of flow between 140L/s and 100L/s (and below this threshold) are entirely natural. They are controlled by climate and fluvial processes.

Figure 5 shows the periods when flow in Waitohu Stream dropped below these two thresholds since 1994 and these are summarised in Table 3. It is apparent that the mean daily flow drops below 140L/s most years, although how often and for how long is highly variable. As expected, the mean daily flow drops below 100L/s

considerably less often and only three times since 1995. During the ‘driest year on record’ (2003) flow was below 100L/s for 43 days. Most recently, in 2020, flow was below this threshold for five days.

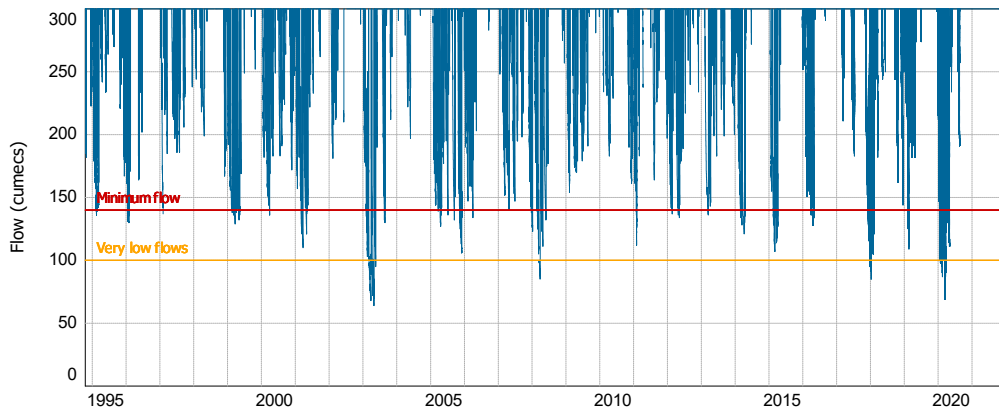


Figure 5: Waitohu Stream at Water Supply Intake flow record below 300L/s with minimum flow threshold of 140L/s (red line) and very low flow threshold of 100 L/s (orange line).

Table 3: Number of days per year that the mean daily flow dropped below 140L/s and 100L/s in Waitohu Stream at the Water Supply Intake.

Year	Flow below min flow (140 L/s)	Flow below 100 L/s
1995	1	-
1996	-	-
1997	-	-
1998	-	-
1999	16	-
2000	1	-
2001	21	-
2002	-	-
2003	80	43
2004	-	-
2005	34	-
2006	3	-
2007	1	-
2008	47	11
2009	-	-
2010	-	-
2011	3	-
2012	4	-
2013	6	-
2014	27	-
2015	31	-
2016	4	-
2017	11	-
2018	9	-
2019	8	-
2020	28	5

Details of the changes in flow that occurred naturally, solely from climate and fluvial processes, over these three periods of sustained low flow are shown in Figure 6 through Figure 8.

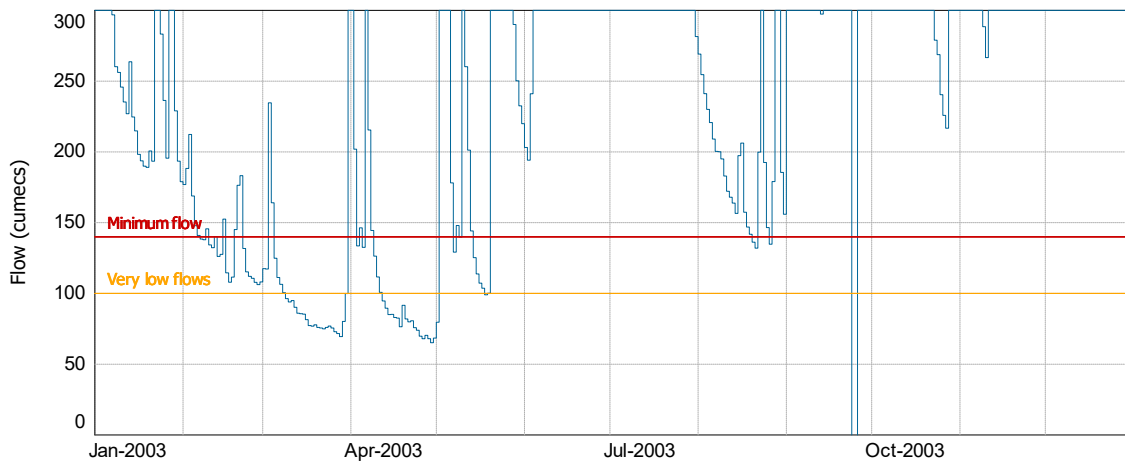


Figure 6: Flow in Waitohu Stream at the Water Supply Intake below 300L/s over 2003 with minimum flow threshold of 140L/s (red line) and very low flow threshold of 100L/s (orange line).

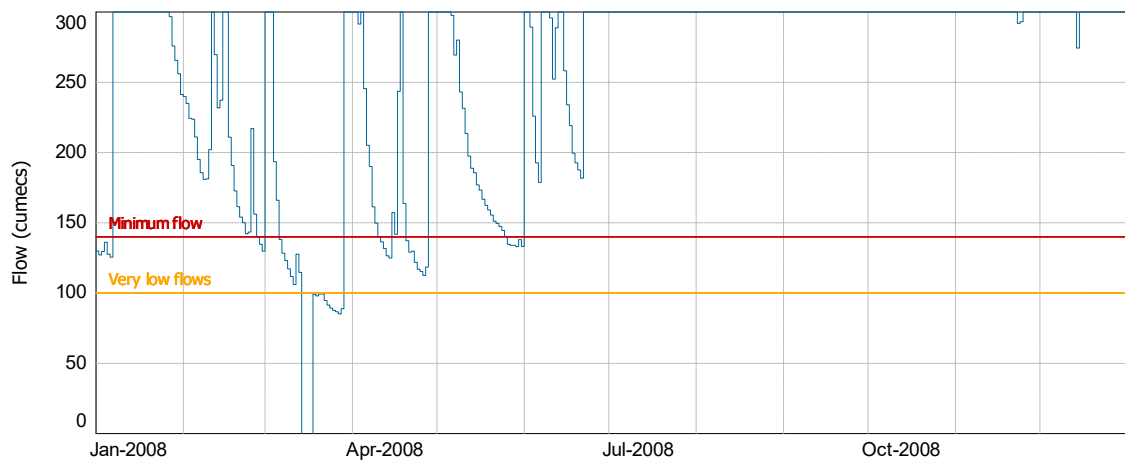


Figure 7: Waitohu Stream at Water Supply Intake flow record below 300L/s over 2008 with minimum flow threshold of 140L/s (red line) and very low flow threshold of 100L/s (orange line).

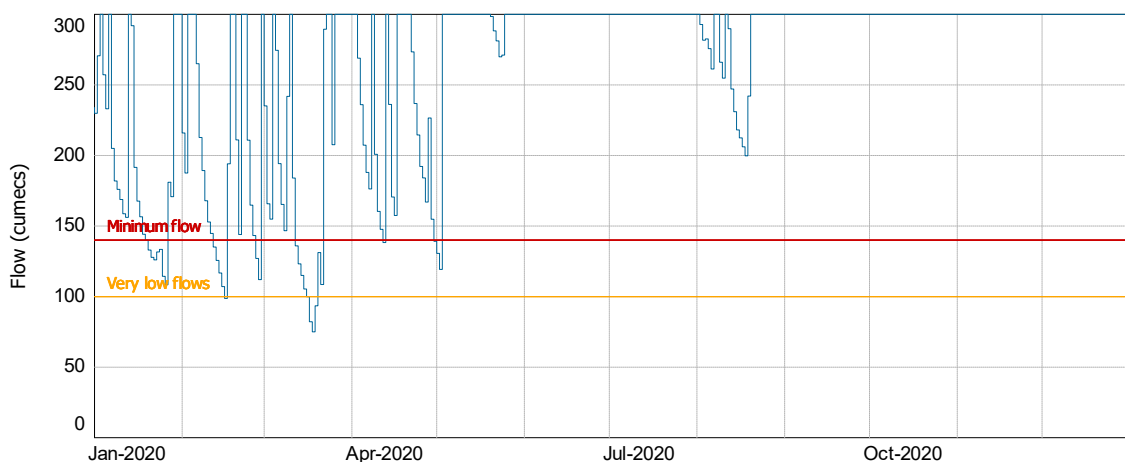


Figure 8: Waitohu Stream at Water Supply Intake flow record below 300L/s over 2020 with minimum flow threshold of 140L/s (red line) and very low flow threshold of 100L/s (orange line).

Conclusions

The above analysis allows the following conclusions:

- As discussed in the Resource Consent application, the proposed abstraction of construction water from Waitohu Stream is consistent with the requirements of the relevant Regional Plan and policies.
- The flow recorder for Waitohu Stream at the Water Supply Intake provides a reliable estimate of the flow in the vicinity of SH1 and therefore the location of the proposed abstraction. Any difference in flow between the two locations is within the margin of uncertainty ($\pm 8\%$) of open channel flow measurements, and likely significantly less than this.
- During prolonged periods of low flow, likely flow less than 100L/s at the Water Supply Intake, surface flow in Waitohu Stream can cease over the reach between Taylors Road and the Golf Course. Flow both upstream of Taylors Road and downstream of the Golf Course is continuous.
- The characteristics of any flow recession below the minimum flow are natural and affected solely by the climate, hydrology, and characteristics of the channel. Since periods of sustained low flow, and no flow, have occurred in the past, the instream biota will have adapted to these occasional but infrequent conditions.
- Since it is proposed to cease abstraction of construction water below the minimum flow (140L/s), the abstraction will have no effect on the frequency or duration of periods of low flow, and specifically periods when surface flow ceases in Waitohu Stream.
- Abstraction of 14L/s at the minimum flow has the potential to reduce flows downstream at the Golf Course by between 20-23%, however, flow will be sustained throughout the reach downstream of SH1.

This analysis therefore confirms the conclusion in the resource consent application that any effects of the proposed abstraction of construction water from Waitohu Stream will be '*less than minor*'.

I would be happy to discuss this memorandum and its conclusions if that would be useful in resolving any residual issues or concerns you may have regarding the proposed abstraction of water from Waitohu Stream to support the construction of the Ō2NL Project.

Attachment 3: Memorandum from Dr Jack McConchie to Michaela Stout which provides clarification of how the proposed abstraction from Koputaroa Stream could be managed, dated 31 January 2023

To: Michaela Stout, Scientist - Allocation **At:** Horizons Regional Council
Copy: Greg Lee & Caitlin Kelly **At:** Ō2NL Project Team, Waka Kotahi
From: Dr John (Jack) McConchie **At:** SLR Consulting NZ Limited
Date: 31 January 2023 **Ref:** 720.30017.00000 O2NL Koputaroa Water Abstraction FINAL.docx
Subject: Clarification of proposed abstraction of construction water

Background

To support the construction of the Ō2NL Project, a resource consent has been lodged with Horizons Regional Council to abstract water from several streams. The abstraction proposed is consistent with:

- The Core Allocation available;
- The minimum flow listed in the One Plan; and
- A Supplementary Allocation of up to 10% of the flow when it is above the median.

In addition to the above, and to further mitigate any potential 'less than minor' adverse environmental effects, abstraction would also be constrained by:

- Only abstracting for the duration of construction of the Ō2NL Project i.e., estimated at five years;
- Total abstraction across several sites used to support construction of the Ō2NL Project cannot exceed a maximum of 3,950m³ a day;
- Total abstraction across sites used to support construction of the Ō2NL Project cannot exceed an average of 2,160m³ a day; and
- Wherever possible, water abstracted from a particular stream would be used to support construction of the Ō2NL Project within that catchment. That is, as far as practicable there will be no inter-basin transfer of water. This will reduce the duration, and volume of water, that may need to be abstracted from a stream.

Following lodgement of the resource consent application for the Ō2NL Project, Horizons requested further information regarding some aspects of the proposed abstraction of water to support construction. A response to the further information request was provided on 23 December 2023 confirming and clarifying the effects of the resource consent applications lodged.

During a site visit, including members of the Project Team and Michaela Stout (Horizons), it appeared that further clarification of several matters would be useful. Michaela and I discussed these matters by telephone on 24 January 2023. This memorandum now summarises the results of our discussion and provides some clarification of what is proposed relating to how abstraction from Koputaroa Stream could be managed.

Ohau River – situation regarding the Core Allocation

Michaela provided some clarification regarding the Core Allocation available from the Ohau catchment.

Over the past year, Horizons have been evaluating the current allocation of water from the Ohau River and how this relates to the Core Allocation provided in the One Plan. A review of abstractions from the Ohau River is ongoing. Given the potential hydraulic interaction between surface water and groundwater, Horizons consider that the Core Allocation from the Ohau River is likely to be fully allocated. This needs to be formally confirmed. Furthermore, there are additional consents (for both surface water and groundwater) ahead of consideration of any application to support the Ō2NL Project.

Koputaroa Stream

Having inspected the potential site for the proposed abstraction of water to support the construction of the Ō2NL Project i.e., Koputaroa Stream at McDonald Road, there was some discussion as to how the abstraction would be managed. This memorandum therefore provides a suggested strategy for managing the abstraction so that any effects on the environment can be considered *‘less than minor’*.

The effects of abstraction from the Koputaroa Stream can be assessed by analysing the flow series from the Koputaroa at Tavistock Road recorder. This recorder is located approximately 5km north-east of Levin, and 6.5km upstream of Koputaroa Stream’s confluence with the Manawatū River. This site and flow record were maintained by Horizons from 1974-1996, after which the site was decommissioned (Figure 1). The gauging site and flow recorder have been subsequently reinstated to support the development of the Ō2NL Project, although the recent record is relatively short (Figure 2). The site is maintained by NIWA on behalf of the Ō2NL Project. Summary statistics and range of metrics derived from the full flow series now available is provided in Table 1.

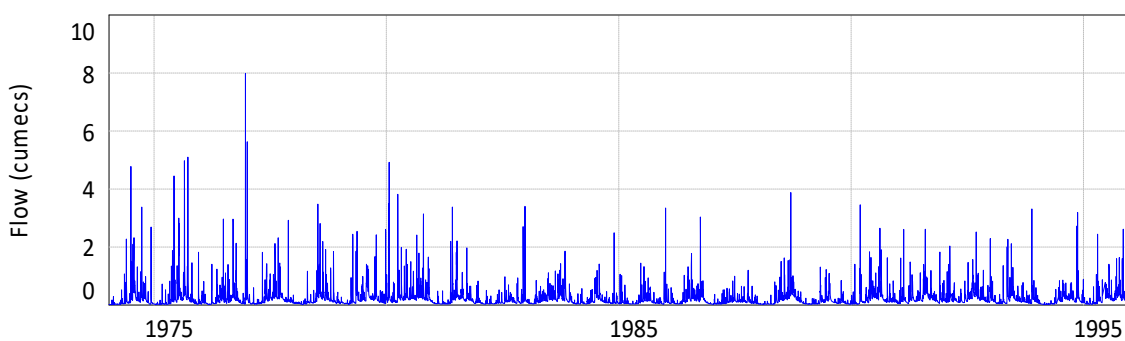


Figure 1: Koputaroa at Tavistock Road mean daily flow series (1974-1996).

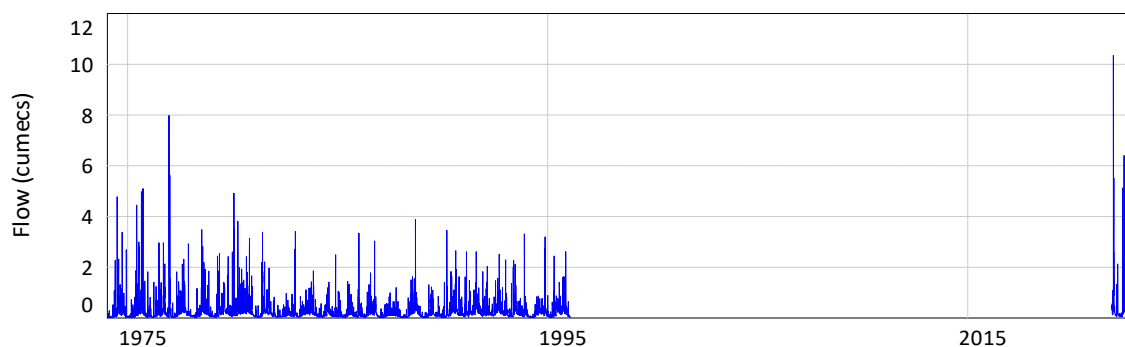


Figure 2: Koputaroa at Tavistock Road extended mean daily flow series.

Table 1: Summary statistics of flows recorded in Koputaroa Stream (m³/s to 2dp).

Site	Min	Max	Mean	Std Dev	L.Q.*	Median	U.Q.**	MALF
Koputaroa @ Tavistock Road	0.012	10.35	0.25	0.37	0.07	0.15	0.29	0.04

* L.Q. is the Lower Quartile flow i.e., the flow that is exceeded 75% of the time

** U.Q. is the Upper Quartile flow i.e., the flow that is exceeded 25% of the time

Likely because there was no flow recorder on the Koputaroa Stream at the time of the One Plan, abstraction of water in this catchment is managed currently with reference to the minimum flow in the Manawatū River, measured at Teachers' College.

Proposal

The resource consent application seeks to abstract:

- Up to 231m³ per day from the existing Core Allocation (351m³ per day) when flow is above the minimum flow; and
- A Supplementary Allocation of up to 10% of any flow above the median.

Potential abstraction location

The Project corridor, and therefore any potential abstraction of construction water, is likely to be a significant distance upstream of the flow recorder. For example, the catchment area upstream of McDonald Road, a possible source of abstraction, is only about 40% of that upstream of Tavistock Road. Since flows, particularly low flows, in a stream are largely a function of catchment area, flows in Koputaroa Stream near McDonald Road are likely to be only about 40% of those recorded downstream at Tavistock Road. It is likely, however, that this approach is slightly conservative as the specific yield upstream of McDonald Road is likely to be higher than at Tavistock Road. This is because that portion of the catchment is closer to the hills, which receive greater rainfall because of orographic enhancement.

The reduced flows at McDonald Road, relative to those downstream at Tavistock Road, when combined with management based on the minimum flow in the Manawatū River is problematic when trying to minimise potential environmental effects. This is particularly the case during periods of low flow in Koputaroa Stream.

Management of abstraction

Since the rate of abstraction and its potential effects are directly related to flow in Koputaroa Stream, it is suggested that this should be the metric used in the management of any abstraction. This requires using a flow measured directly within the catchment and a 'catchment specific' minimum flow.

Using the same methodology as applied when developing the minimum flows in the One Plan (i.e., 80% of the 1-day MALF), the minimum flow for Koputaroa Stream at Tavistock Road would be ~32L/s. Abstracting a maximum of 10% of this would be 3.2L/s. However, when flow is scaled upstream to McDonald Road, the minimum flow would be only 13L/s. Therefore, the abstraction of 3.2L/s from this reach would be 25% of the flow and not only 10%.

To avoid the potential 'over-abstraction' of water at McDonald Road, the rate of abstraction at the minimum flow must also be reduced in the same proportion as total flow i.e., 40%. This would allow the abstraction of only 1.3L/s at McDonald Road at the minimum flow. At flows greater than the minimum, abstraction could increase *pro rata* i.e., up to 4% of the flow recorded at Tavistock Road.

The same scaling approach could be applied to locations other than McDonald Road if that was necessary.

I would be happy to discuss this further or provide any additional clarification that you might require.

Attachment 4: Email communication from Dr Jack McConchie to Michaela Stout, Horizons Regional Council on 27 February 2023

From: Jack McConchie <jmconchie@slrconsulting.com>
Sent: Monday, 27 February 2023 12:57 PM
To: Michaela Stout <Michaela.Stout@horizons.govt.nz>
Cc: Greg Lee <Greg.Lee2@nzta.govt.nz>; David Allen <David.Allen@buddlefindlay.com>; Avikesh Chandra <Avikesh.Chandra@buddlefindlay.com>
Subject: Clarification of matters relating to application for 'construction water'

CAUTION: The sender of this email is from outside Waka Kotahi. Do not click links, attachments, or reply unless you recognise the sender's email address and know the content is safe.

Dear Michaela,

Following our discussions on Thursday, I offered to provide clarification on several matters. This is provided below. Please get back to me if you have any further questions or need additional clarification.

- **Rate of abstraction from Manakau and Waiauti Streams**
We are proposing a total maximum daily abstraction 102m³/day from both streams, with the abstraction managed using the flow gauge on Manakau Stream at SH1 Bridge. The total abstraction is two-thirds of that available currently from the Core Allocation. We are proposing to take water from either Manakau OR Waiauti Stream as the designation for the Project passes through both catchments, however, the maximum combined daily abstraction will be capped at 102m³/day.
- The catchment areas of Waiauti and Manakau Streams are 8.013km² and 7.517km² respectively just upstream of the flow recorder at the SH1 Bridge. Consequently, each catchment contributes approximately 50% of the total flow at the recorder (52% and 48% respectively but certainly within the ±8% uncertainty of open channel flow measurements.
- While at low flows i.e., flows close to the minimum of 40L/s, the 102m³/day will likely have to come from both streams with half the abstraction coming from each stream. This will reduce any potential environmental effect on the streams. Since any potential increase in environmental stress is most likely during periods of low flow, and low flow is determined largely by those physical characteristics of the catchment that affect drainage, we believe that this is a reasonable approach. The approach has been confirmed by the Project Ecologist who has indicated that any effects will be 'less than minor'. However, at higher flows, likely in the order of 120L/s at the SH1 bridge, the Project wishes to abstract up to 6L/s from just one of the streams; still capped at 102m³/day. The rationale for this is that at 120L/s at the SH1 Bridge, there is likely to be at ~60L/s in each of the two streams and the abstraction of 10% of this would be 6L/s.
- A maximum rate of abstraction from Manakau and Waiauti Streams of 6L/s has been proposed. This recognizes the abstraction from the two streams while at the same time considering potential pump configuration. Discussion with the Project Ecologist (Alex James) has indicated that this rate would have effects that are 'less than minor'.
- The median flow for Koputaroa Stream in Table RWT-2 Median Flows (0.059m³/s) in the draft conditions is incorrect. That is the median flow if scaled from Tavistock Road upstream to MacDonald Road. The correct value for this table should be 0.150m³/s. We will update this in the revised conditions.
- After discussion with Jasmine (Horizons), who indicated that a Plan Change would be required to alter the minimum flow for Koputaroa Stream in the One Plan, we have decided to 'drop' our proposed condition which referenced a local minimum flow and revert to the use of the minimum flow in the Manawatu River at Teachers' College as required by the One Plan.

However, to meet the wishes of our iwi partners, we will manage our abstraction, when flow in the Manawatu River at Teachers' College is above its minimum flow, in the manner outlined in RWT1. That means, we will calculate a local minimum flow, abstract only when flow is above this (and above the minimum flow in the Manawatu River), abstract only up to 10% of this, and scale the abstraction rate as a function of catchment area upstream of the point of abstraction relative to that upstream of Tavistock Road.

- I have provided a copy of the latest flow data the Project has collected for Koputaroa Stream at Tavistock Road via a separate email.

Please get back to me if you have any other questions or need further clarification.

Email and attachment available on request

Cheers & kind regards

Jack



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