I hereby give notice that a meeting of the Strategy and Policy Committee will be held on:

Date: **Tuesday, 10 March 2020**
Time: **10.00am**
Venue: **Tararua Room**
Horizons Regional Council
11-15 Victoria Avenue, Palmerston North

STRATEGY AND POLICY COMMITTEE

AGENDA

MEMBERSHIP

Chair	Cr RJ Keedwell
Deputy Chair	Cr JM Naylor
Councillors	Cr AL Benbow
	Cr EM Clarke
	Cr DB Cotton
	Cr SD Ferguson
	Cr EB Gordon
	Cr FJT Gordon
	Cr WM Kirton
	Cr NJ Patrick
	Cr WK Te Awe Awe
	Cr GJ Turkington

Michael McCartney
Chief Executive

Contact Telephone: 0508 800 800
Email: help@horizons.govt.nz
Postal Address: Private Bag 11025,
Palmerston North 4442

Full Agendas are available on Horizons Regional Council website
www.horizons.govt.nz

Note: The reports contained within this agenda are for consideration and should not be construed as Council policy unless and until adopted. Items in the agenda may be subject to amendment or withdrawal at the meeting.

for further information regarding this agenda, please contact:
Julie Kennedy, 06 9522 800

CONTACTS	**24 hr Freephone : 0508 800 800**	**help@horizons.govt.nz**		**www.horizons.govt.nz**
SERVICE CENTRES	**Kairanga** Cnr Rongotea & Kairanga-Bunnythorpe Rds, Palmerston North	**Marton** 19-21 Hammond Street	**Taumarunui** 34 Maata Street	**Woodville** Cnr Vogel (SH2) & Tay Sts
REGIONAL HOUSES	**Palmerston North** 11-15 Victoria Avenue	**Whanganui** 181 Guyton Street		
DEPOTS	**Levin** 120-122 Hokio Beach Rd	**Taihape** 243 Wairanu Rd		
POSTAL ADDRESS	Horizons Regional Council, Private Bag 11025, Manawatu Mail Centre, Palmerston North 4442			
FAX	06 9522 929			

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AGENDA

1 Welcome / Karakia

2 Apologies and Leave of Absence

At the close of the Agenda no apologies had been received.

3 **Public Forums:** Are designed to enable members of the public to bring matters, not on that meeting's agenda, to the attention of the local authority.

Deputations: Are designed to enable a person, group or organisation to speak to an item on the agenda of a particular meeting.

Requests for Public Forums / Deputations must be made to the meeting secretary by 12 noon on the working day before the meeting. The person applying for a Public Forum or a Deputation must provide a clear explanation for the request which is subsequently approved by the Chairperson.

Petitions: Can be presented to the local authority or any of its committees, so long as the subject matter falls within the terms of reference of the council or committee meeting being presented to.

Written notice to the Chief Executive is required at least 5 working days before the date of the meeting. Petitions must contain at least 20 signatures and consist of fewer than 150 words (not including signatories).

Further information is available by phoning 0508 800 800.

4 Supplementary Items

To consider, and if thought fit, to pass a resolution to permit the Committee/Council to consider any further items relating to items following below which do not appear on the Order Paper of this meeting and/or the meeting to be held with the public excluded.

Such resolution is required to be made pursuant to Section 46A(7) of the Local Government Official Information and Meetings Act 1987 (as amended), and the Chairperson must advise:

(i) The reason why the item was not on the Order Paper, and

(ii) The reason why the discussion of this item cannot be delayed until a subsequent meeting.

5 Members' Conflict of Interest

Members are reminded of their obligation to declare any conflicts of interest they might have in respect of the items on this Agenda.

Minutes of the third meeting of the eleventh triennium of the Strategy and Policy Committee (Live streamed) held at 10.00am on Tuesday 11 February 2020, in the Tararua Room, Horizons Regional Council, 11-15 Victoria Avenue, Palmerston North.

PRESENT	Crs RJ Keedwell (Chair), AL Benbow, EM Clarke, DB Cotton, SD Ferguson, EB Gordon, FJT Gordon, WM Kirton, JM Naylor, NJPatrick, WK Te Awe Awe, and GJ Turkington.	
IN ATTENDANCE	Chief Executive	Mr MJ McCartney
	Group Manager Corporate and Governance	Mr C Grant
	Committee Secretary	Mrs JA Kennedy
ALSO PRESENT	At various times during the meeting:	
	Mr R Strong (Group Manager River Management), Dr N Peet (Group Manager Strategy & Regulation), Mr G Shirley (Group Manager Regional Services & Information), Dr J Roygard (Group Manager Natural Resources & Partnerships), Mr R Smillie (Environmental Manager), Mr T Bowen (Principal Advisor), Mr J Twomey (Senior Policy Analyst Iwi), Mrs R Tayler (Manager Policy & Strategy), Ms A Matthews (Science & Innovation Manager), Dr E Daly (Senior Scientist Ecology), Ms C Morrison (Media & Communications Manager), and a member of the press.	

The Chair welcomed everyone to the meeting and invited Cr Te Awe Awe to say a Karakia.

APOLOGIES
There were no apologies.

PUBLIC FORUMS / DEPUTATIONS / PETITIONS
There were no requests for public speaking rights.

SUPPLEMENTARY ITEMS
There were no supplementary items to be considered.

MEMBERS' CONFLICTS OF INTEREST
There were no conflicts of interest declared.

CONFIRMATION OF MINUTES

SP 20-12 ***Moved*** ***Patrick/Naylor***

That the Committee:

confirms *the minutes of the Strategy and Policy Committee meeting held on 10 December 2019 as a correct record, and notes that the recommendations were adopted by the Council on 17 December 2019.*

CARRIED

DRAFT NATIONAL POLICY STATEMENT FOR INDIGENOUS BIODIVERSITY: CONSULTATION DOCUMENT
Report No 20-04

Dr Roygard (Group Manager Natural Resources & Partnerships) introduced the report which summarised the key issues identified in the draft National Policy Statement for Indigenous Biodiversity (NPSIB), and discussed the potential implications for the management of biodiversity in the Horizons Region and the work that may be required from the region's territorial authorities. The report sought council agreement to key themes for Horizons' submission on the NPSIB and the process for councillor input into finalising the submission. Dr Daly (Senior Scientist Ecology) summarised the aims, purpose, and implementation of the NPSIB policies. She highlighted the concerns amongst regional councils around the current timeframes associated with its implementation, commented on the strong focus within the NPSIB around the promotion of restoration, and the shift of responsibilities from Horizons Regional Council to territorial authorities. Members expressed their views around the draft NPSIB, sought clarification, noted their concerns, and outlined their thoughts around issues to be included in the submission.

Ultimately the recommendations were moved with several suggested additions:

- c.ii – include 'potential' before 'trade-offs'; and include 'in the absence of additional funding and resourcing' after 'may need to be made'.
- An additional iv. and v. were included.

Before the amended recommendations were put by the Chair, Cr F Gordon had the opportunity to clarify her suggested amendments.

SP 20-13 ***Moved*** ***F Gordon/Kirton***

That the Committee recommends that Council:

a. receives the information contained in Report No. 20-04; and

b. notes that the draft National Policy Statement for Indigenous Biodiversity (NPSIB) could have a significant impact on how the council manages and regulates indigenous biodiversity in the Manawatū-Whanganui region;

c. agrees to the following key themes to be progressed in the development of the submission for the council on the draft:

i. sets out the approach to indigenous biodiversity regulation and management in the Horizons Region and discusses the efficiency gains that can be realised when taking an adaptive management planning approach;

ii. demonstrates the estimated financial impact for councils within the region to implement the draft NPSIB and the potential trade-offs that may need to be made in the absence of additional funding and resourcing

1.

iii. demonstrates the importance of non-regulatory interventions and partnerships in realising biodiversity gain;

2.

iv. sets out Horizons Regional Council progress on priority sites biodiversity programme to date, as per the State of Environment report and including the number of sites currently under active management (L4-6);

3.

v. sets out the likely barriers to increasing the number of priority sites under active management (L4-6) into the future, including any science needs, funding or resource issues.

d. directs the Chief Executive to circulate the submission to council for comment via email and to finalise the submission with the Chair.

CARRIED

HORIZONS BIODIVERSITY MANAGEMENT UPDATE
Report No 20-05

Dr Roygard (Group Manager Natural Resources & Partnerships) presented the report which introduced Horizons current approach to biodiversity management with a focus on the non-regulatory biodiversity activities. The paper also overviewed a review of non-regulatory biodiversity activity that had been underway for some time and sought council's decision on one part of the review in relation to Horizons' Biodiversity Partnerships Programme. The programme included the range of collaborative projects with other agencies and community groups to enhance biodiversity within the Region. Dr Daly (Senior Scientist Ecology) then took Members through the detail of the biodiversity programme, commented on the One Plan's strategy of a two tiered approach, and clarified Members' questions.

SP 20-14 ***Moved*** ***Ferguson/Cotton***

That the Committee recommends that Council:

a. receives the information contained in Report No. 20-05 and Annex.

b. Holds a council workshop to scope:

i. the strategic overarching goal for the non-regulatory biodiversity programme;

ii. the goal/s for the community biodiversity programme;

iii. the process and criteria for allocating funds to the biodiversity partnerships projects with other agencies and community groups;

iv. options for a broader programme of community engagement around biodiversity projects; and

v. options for the allocation of funding between projects that engage with community groups; initiatives that mobilise community members at an individual or household level; and ensuring budget is available to capitalise on opportunities that bring additional funding to projects.

c. directs the Group Manager of Natural Resources and Partnerships to report back on work of the Councillor workshop to Council for final decisions around the matters identified in (b).

CARRIED

IWI QUARTERLY REPORT
Report No 20-06

Mr Twomey (Senior Policy Analyst Iwi) introduced the report which provided Council with an update on iwi matters in the region including progress in Treaty settlement negotiations, and ongoing iwi engagement. The quarter also provided information on some of the economic opportunities that iwi were advancing within the region. Members' questions were responded to by Mr Twomey and the Chief Executive, and discussion was had around a process and approach for consultation and engagement for the management of freshwater.

SP 20-15 ***Moved*** ***Clarke/Patrick***

That the Committee recommends that Council:

a. receives the information contained in Report No. 20.06;

b. notes that Te Arawhiti is due to distribute the Ngāti Maniapoto draft Deed of Settlement for discussion and an indication of support from Council;

c. notes the economic opportunities that iwi are pursuing for the benefit of their people;

d. notes that Horizons staff are developing a relationship agreement in partnership with Te Rūnanga o Tūpoho;

e. notes that Horizons staff are in the initial stages of planning for an iwi regional hui.

CARRIED

Cr Te Awe Awe closed the meeting with a Karakia.

The meeting closed at 11.19am.

Confirmed

CHIEF EXECUTIVE CHAIR

Report No.	20-30
Decision Required	

LAKE HOROWHENUA UPDATE

1. PURPOSE

1.1. This item is to update Council on progress in regard to the Lake Horowhenua Accord to restore Lake Horowhenua. The item focuses primarily on the establishment and operation of a weed harvesting operation on Lake Horowhenua and seeks the new Councils decision on the pathway forward for this.

2. EXECUTIVE SUMMARY

2.1. Lake Horowhenua is the largest lake within the Horizons Region and the largest dune lake within New Zealand. Monitoring data shows that the lake experiences poor water quality and many of the parameters monitored are below the One Plan targets and the national bottom line for a number of the attributes that are contained in the National Policy Statement for Freshwater Management (2014). The Lake has had a long complicated history of management and this continues to be a matter that is considered as part of the ongoing Treaty Settlement processes.

2.2. The Lake Horowhenua Accord is a collaboration led by the Lake Trust (that are elected to represent the Beneficial Owners of the lake). Other partners include the Horowhenua Lake Domain Board (Domain Board), Horizons Regional Council, Horowhenua District Council, and the Department of Conservation. Horowhenua District Council led the formation of the Lake Horowhenua Accord with the Accord celebrating its sixth anniversary on the 4th of August 2019. The Lake Horowhenua Accord aligns a range of organisations who have various, and in some cases overlapping, responsibilities for Lake Horowhenua.

2.3. The regulatory and non-regulatory activity for Horizons was identified in the One Plan including Lake Horowhenua being a catchment included in the nutrient management rules and two non-regulatory methods (see Annex A), Method 5-6 Lake Horowhenua and other coastal lakes and Method 5-7 lake quality research, monitoring and reporting. The Lake Horowhenua Accord was formed following the completion of lake restoration option reports commissioned by Horizons and completed by National Institute of Water and Atmospheric Research (NIWA).

2.4. This collaborative approach through the Lake Accord has delivered an Action Plan and significant works to implement the actions within it. The collaboration has been extended to involve Central Government, horticulture growers and the dairy industry across three large work programmes comprising of the Lake Horowhenua Freshwater Clean-up Fund, Te Mana o Te Wai Fund and Freshwater Improvement Fund (FIF) projects. Horizons, the Accord Partners, Universities, NIWA and others have collaborated to undertake science and monitoring to inform restoration options and to measure progress.

2.5. Through the Lake Accord, progress has been made in the restoration of Lake Horowhenua. There has however been opposition to some of the monitoring and restoration activity that has slowed progress. The opposition to monitoring and restoration work around Lake Horowhenua predates the Lake Horowhenua Accord and has continued following its formation with court action opposing a range of activities including:

- the establishment of a fish pass to restore fish to access the lake from the sea that was blocked by installation of a weir on the lake outlet;

- a sediment trap to reduce the amount of sediment and nutrient reaching the lake; and
- the lake weed harvesting project that aims to address in-lake process caused by introduced lake weeds that lead to toxic conditions in the lake for aquatic life and close the lake for recreational use.

2.6. Legal processes in various courts have included cases around the regulatory consents for undertaking restoration programmes, the legality of Horizons being able to access the lake, and related to these matters, governance arrangements of the Lake Horowhenua Trust, including trustee elections. Many of the decisions relating to the obtaining of resource consents and implementation have been appealed to higher courts. These legal challenges have significantly increased costs (including diverting funds from restoration projects) and delayed actions to restore the lake, either on the ground or in the lake.

2.7. This item provides an update on the progress and activities involved to enable the establishment and operation of the weed harvester on Lake Horowhenua. Weed harvesting was identified as one of the key in-lake interventions to improve water quality and aquatic health. In addition, it seeks a Council decision for the next steps for the weed harvesting project.

3. RECOMMENDATION

That the Committee recommends that Council:

a. receives the information contained in Report No. 20-30 and Annexes.

b. directs the Chief Executive to:

i. proceed with the establishment of the boat ramp to enable lake weed harvesting at Lake Horowhenua and associated works to complete harvesting in spring 2020, including approving the associated additional capex expenditure for the project,

or

ii. delay weed harvesting until spring 2021 and complete the construction of the associated infrastructure in **2020** or **2021 [choose 1]**, including approving the associated additional capex expenditure for the project and any action necessary to maintain permissions relating to the works,

or

iii. to cease pursuing weed harvesting as a mechanism for water quality improvement in Lake Horowhenua; including selling the lake weed harvesting equipment.

and

c. directs the Chief Executive to notify the Lake Accord Partners, the Ministry for the Environment and the community of this decision.

4. FINANCIAL IMPACT

4.1. This item does have financial impact. The recommendations relate to budget items previously approved by Council, some of which sit outside of Annual Plan processes.

4.2. If Council chooses to continue to pursue lake weed harvesting as a mechanism for water quality improvement in Lake Horowhenua there will be costs for the construction of a boat ramp and associated infrastructure. Further, there will be additional costs associated with

enabling the lake weed harvesting activity to occur and the costs for the weed harvesting operation.

4.3. If Council chooses not to continue to pursue lake weed harvesting as a mechanism for water quality improvement in Lake Horowhenua there will not be additional costs associated with enabling the weed harvesting activity to occur, including the construction of a boat ramp and operation of the weed harvester. There may be some costs associated with paying back the Ministry for the Environment their share of contribution to the purchase of the weed harvester. There is likely to be some return to Council for the sale of the weed harvester.

4.4. Regardless of the decision to continue or not there will be ongoing costs associated with the depreciation of the capital costs to date associated with obtaining regulatory permissions and the purchase of assets to enable weed harvesting including the road access way to the proposed boat ramp.

4.5. The costs to date for the lake restoration programme have been reported to Council in a range of items over the last five years including via public excluded items. The budgets for Lake Horowhenua have been part of Long-term Plan and Annual Plan processes and have also been contributed to by multi-agency restoration projects that have included Central Government funding. An overview of these costs is provided in Annex C.

5. COMMUNITY ENGAGEMENT

5.1. The Lake Horowhenua Accord has been subject to considerable community engagement. The activities have been reported by various means including via media, public reporting to Council through the Environment Committee Agenda, through publicly notified resource consent hearings, the Lake Horowhenua Domain Board meetings and through various other reporting by the Lake Accord partners. Horizons' involvement in Lake Horowhenua restoration and the funding of this has also been a part of Long-term Plan and Annual Plan processes that have provided for the community to submit to Council.

6. SIGNIFICANT BUSINESS RISK IMPACT

6.1. This item is considered a significant business risk impact. The item seeks approval to continue with or withdraw from an activity that has been pursued by Council since 2013.

6.2. Horizons and the other Lake Accord Partners signed the Lake Accord in 2013. The Lake Accord and the restoration reports that preceded the Accord identified lake weed harvesting as one of the Management Actions.

6.3. Horizons Regional Council originally applied to the Ministry for the Environment Freshwater Clean-up Fund in 2013 and in that application committed funding toward lake weed harvesting as one of the key projects to contribute to restoration of Lake Horowhenua. Over time the costs for this activity have grown, particularly through challenges to Horizons obtaining regulatory permissions to undertake the activity and for the capital and operational costs to undertake the activity. Councils have overtime considered the funding and path forward for the activity in at least six council items over the period from 2013 to 2019 and also in Long-term Plan and Annual Plan processes.

6.4. Alongside the direct investment in lake weed harvesting activity there has been other investment in the restoration of Lake Horowhenua. This includes monitoring, science and other restoration activities including work with the Lake Horowhenua Trust, Central Government, the Tararua Growers Association and horticultural growers, DairyNZ and dairy farmers, and Horowhenua District Council. Two of the larger projects have been the installation of the sediment trap and a fish pass.

6.5. The lake weed harvesting activity is considered a key activity to improve water quality of the lake to be above national bottom lines for some water quality indicators. The lake

report card included with Annex C overviews the likely improvements from lake restoration work including the weed harvesting and sediment trap as predicted by NIWA Research Scientist Dr Max Gibbs. This includes improvements which move four out of five water quality indicators out of the category of being below national bottom lines in the National Policy Statement – Freshwater Management 2014.

6.6. The significant business risk impacts if the work is further funded include likely feedback from the community around the increasing cost of this activity and uncertainty around it progressing. Further, there are risks in progressing this activity in the field. These risks include the risk of the project not progressing due to weather type delays or delays caused via protest type action, including potential physical harm to staff or contractors. There is always a risk of the planned intervention not delivering the outcome it is forecast to do or the activity not being perceived to have had produced the outcome it is seeking to do. Note, the outcome sought is for the lake to have reduced toxicity. The lake will likely continue to turn green with algae in the summer, however, the difference is there will be fewer instances of the algae being toxic to aquatic life or closing the lake for recreation.

6.7. The significant business risk impacts of not proceeding with the lake weed harvesting include reputational damage with Lake Horowhenua Accord Partners, the community, funding partners (e.g. the Ministry for the Environment) and others due to the inability to progress what is viewed as a key intervention (identified by NIWA) that Horizons has actively pursued and invested in. Horizons would also not be implementing (at least through this activity) work to achieve legislative requirements for water quality in the Lake. There is also risk that not progressing this work will result in the Lake Accord partnerships no longer functioning.

6.8. There is also a risk of not meeting Horizons legislative requirements through the **National Policy Statement for Freshwater (NPSFW)** to restore water quality that is below the national environmental bottom lines to be above national bottom lines.

7. BACKGROUND

7.1. Lake Horowhenua is the largest lake within the Horizons Region and the largest dune lake within New Zealand. The lake is shallow at maximum of approximately two meters deep and has a sole outlet through the Hōkio Stream which enters the Tasman Sea at Hōkio township. The lake has had a long and complicated history of management. The last in-depth update on Lake Horowhenua to Council was provided in September 2018. The Council resolutions from that item are included as Annex B and the item is provided as Annex C.

7.2. Under the Regional Council administration and prior to the One Plan Lake Horowhenua was managed under the Lake Horowhenua and Hōkio Stream Catchment Strategy (1997). During the development of the One Plan Lake Horowhenua was identified as a catchment for the management of nutrients through the management of activities which are defined as intensive land use. Additionally, the non-regulatory methods of the One Plan included Methods 5-6 and 5-7,(Annex A) which directed that Lake Horowhenua and coastal lakes were identified for further effort around science monitoring and restoration efforts.

7.3. In 2011 and 2012 Horizons commissioned NIWA to produce a report establishing the current state of the lake, and considering potential restoration options (Gibbs 2011, Gibbs and Quinn, 2012). These reports identified that restoration of the lake was possible and these reports along with a number of other factors led to Horowhenua District Council taking the lead on the formation of the Lake Horowhenua Accord. These reports were the basis for many of the actions that were identified in the Lake Horowhenua Accord and Action Plan and the subsequent work programmes.

7.4. The Lake Horowhenua Accord, the associated Action Plan and the collaborative approach that the Accord has taken has resulted in three successful bids to Central Government

Funds to enable works to be completed. The Lake Horowhenua Clean-Up Fund project was led by Horizons, Te Kakapa Manawa o Muaūpoko (Te Mana o te Wai) was led by the Lake Horowhenua Trust, and the Lake Horowhenua Freshwater Improvement Fund project also led by the Lake Horowhenua Trust. All of these projects have or will deliver on the ground works to improve the health of the lake (including cultural health and connections). These projects and progress on them are overviewed in Annex C.

7.5. With the establishment of the Accord and the successful bid to the Freshwater Clean-Up Fund project, a targeted rate was established for Lake Horowhenua to allow for the completion of the works. This targeted rate was used to contribute to Horizons share of the co-funding requirements of the Deeds of Funding with the Ministry for the Environment, and the continuation of the work under the Lake Horowhenua Accord. Originally labelled the Lake Horowhenua Weed Harvesting Rate, it was later changed to the Lake Horowhenua Restoration Rate to provide the ability to utilise the funds on a wider range of Lake Horowhenua restoration projects.

7.6. As a package of work for the Freshwater Clean-Up Fund projects Horizons was required to obtain resource consents from Horizons and Horowhenua District Council to enable the construction of the sediment trap, fish pass, the infrastructure to enable the operation of the weed harvester (access road and boat ramp), and also for the operation of the weed harvester. These consents were granted by an independent commissioner following a joint hearing for the Regional and District Councils, with those decisions (and the consents) subsequently confirmed on appeal by the Environment and High Courts. A broad timeline of regulatory and court processes is provided in the Table below. Many of the challenges to the works have related to some parties concerns around the effects of the proposal, including cultural effects. There has been a range of evidence provided to the Court about the cultural effects, with the Lake Horowhenua Trust and Muaūpoko Tribal Authority providing evidence in support of the projects proceeding. The Environment Court and High Court appeal decisions found in favour of the activities proceeding. There has also been objection to Horizons accessing the Lake Trust land to complete certain works, with proceedings issued in the Maori Land Court. The Maori Land Court, and then the Appellate Court (on appeal), refused to issue an injunction preventing access. Copies of these Court decisions have been made available to Councillors via the Hub.

7.7. Since the development of the One Plan, Central Government has released and implemented the National Policy Statement for Freshwater Management (NPSFM). The NPSFM (both 2014 and 2017) contain a number of attribute states that relate specifically to lakes. Monitoring and comparison of these monitoring results against these attributes shows that Lake Horowhenua falls below the national bottom line (Band D) for total phosphorus, total nitrogen, ammonia (annual maximum), chlorophyll a (annual maximum), and cyanobacteria (80th percentile). The NPSFM requires action to be taken to move those waterbodies that fall into a Band D attribute state out of that state.

7.8. Analysis by Dr Max Gibbs from NIWA based on the lake restoration activity including the lake weed harvesting and sediment trap predicts four out of five of the attributes currently below national bottom lines in the National Policy Statement for Freshwater Management 2014, improve to above national bottom lines. The attribute that will not lift above national bottom lines is Total Nitrogen. This is further overviewed in the Lake Horowhenua Report Card which is included in Annex C.

Table 1: Indicative timeline for the Lake Horowhenua Accord activity with a focus on the regulatory processes. Please note the timeline is not intended to be a complete record of activity.

Date	Description
2010	Lake Horowhenua ranked 7th worst out of 112 monitored lakes in New Zealand for Tropic Lake Index (TLI).
2011	Lake Horowhenua Restoration Options report completed for Horizons by NIWA (Gibbs 2011) with input from the Lake Trust.
2012	Lake Horowhenua Restoration Plan report completed for Horizons by NIWA (Gibbs & Quinn 2012).
August 2013	Lake Horowhenua Accord signed.
February 2014	The Fresh Start for Freshwater Clean-up Fund project was announced with the Government's Freshwater Clean-up Fund contributing $540,000. The balance of the funding is from local government (Horizons, Horowhenua District Council) and . support from industry (Tararua Growers Association and DairyNZ). The project was project managed by . Horizons Regional Council.
August 2014	Lake Horowhenua Accord Action Plan launched. The Action Plan contains a series of key management actions to restore the lake. These included: • Completion of a sediment trap to remove sediment inputs into the lake; • Lake weed harvesting; and • Installation of a fish pass at the Hōkio Stream/Lake weir (these were collectively known as the 'restoration activities' for the consenting process).
2015	Resource consent applications for the restoration activities lodged with Horizons and District Council regulatory teams, with the support of the Accord, including the Lake Trust.
Nov. 2015	Government announces $980,000 of funding towards the Lake Horowhenua Te Mana o Te Wai Fund project with cofounding contributions from Horizons Regional Council, Horowhenua District Council and the Lake Horowhenua Trust. The project was project managed by the Lake Trust.
9 Dec. 2015	Independent Commissioners grant consents for restoration activities.
19 Jan. 2016	Hōkio Trust file Notice of Appeal against grant of all consents.
22 Sep. 2016	Decision of Environment Court - [2016] NZEnvC 185. Appeal of Hōkio Trusts denied and consents confirmed (subject to conditions).
18 Oct. 2016	Hōkio Trust files Notice of Appeal against Environment Court decision.
21 Apr. 2017	Environment Court confirms amended conditions lodged by MWRC.
21 June 2017	Decision of the High Court – [2017] NZHC 1355, dismissing Hōkio Trust appeal of the Environment Court decision.
August 2017	Government Announces $842,750 of funding toward the Lake Horowhenua Freshwater Improvement Fund project with co-funding to be provided by Horowhenua District Council, Horizons Regional Council and the Lake Horowhenua Trust. The project is to be project managed by the Lake Trust.
29 Aug. 2017	Award of costs by the High Court against Hōkio Trust, Hōkio A Trust, Hōkio Part A Trust and Hōkio Maori Township Trust: MWRC (as applicant) the sum of $10,157.16; and MWRC (as respondent) the sum of $13,065.50 – [2017] NZHC 2076
27 Sep. 2017	Award of costs by the Environment Court against Hōkio Trust, Hōkio A Trust, Hōkio Part A Trust and Hōkio Maori Township Trust: MWRC (as applicant) the sum of $75,500; and MWRC (as respondent) the sum of $36,500 – [2017] NZEnvC 159.
2017/2018	Fish pass and sediment trap restoration activities undertaken.
April 2018	Construction of an access road started across Horizons land (which contains the sediment trap) towards the lake. Once fully constructed the access road will traverse Horizons and Lake Trust land. This road is intended to provide access to the boat ramp to be constructed at the lake edge (for the weed harvester), with a turn-around bay.
24 Apr. 18	Application for Interlocutory Injunction filed by Vivienne Taueki - to prohibit the construction of the boat ramp and access way forming part of the weed harvesting consent.
April 2018	Discovery of Midden. Heritage New Zealand Accidental Discovery procedure initiated.
17 May 2018	Maori Land Court dismissed injunction application due to the statutory rights of access afforded to MWRC under the Reserves and Other Lands Disposal Act 1956 (ROLD).
16 July 2018	Notice of Appeal against the decision of the Maori Land Court filed by Vivienne Taueki.

Date	Description
12 Sep. 2018	Maori Appellate Court issue a judgment quashing the order to appoint trustees on 19 May 2016. Mr Hemana appointed as Responsible Trustee in absence of any trustees officially in office, with former trustees acting as advisory trustees. These issues have resulted in several adjournments of the appeal and created delays with HeritageNZ process.
24 June 2019	Maori Appellate Court dismisses appeal of the Maori Land Court decision in favour of Horizons on the basis that the Appellant does not have standing to seek an injunction under s 19(1)(a); and upholds the Maori Land Court decision.
8 July 2019	MWRC application for costs filed.
17 July 2019	Maori Appellate Court award $15,000.00 in costs against Vivienne Taueki.
23 July 2019	Application for recall of Maori Appellate Court costs decision filed by Vivienne Taueki.
26 July 2019	Memorandum of MWRC filed in response to recall of judgment.
29 Oct. 2019	Maori Appellate Court award $10,000.00 in costs against Vivienne Taueki after the rehearing on papers.
Dec. 2019	Completion of the access track to the boat ramp location.

7.9. As covered in the Table above, the sediment trap and fish pass have both been constructed and are operational. The access road to where the boat ramp is proposed to be constructed and the engineering drawings for the boat ramp were completed last calendar year.

7.10. To enable the establishment of the weed harvesting operation on Lake Horowhenua a boat ramp needs to be constructed to be able to launch the harvester and unload the harvested weed. Two sites were original selected (and consented) as potential locations for boat ramps with the preferred location being near the confluence of the Arawhata Stream with Lake Horowhenua. This site is preferred over the Lake Horowhenua Domain due to site security and being able to manage the public entering a working site. In addition, to the establishment of the boat ramp a number of work streams need to start as a requirement of resource consent conditions and will require boat access to the lake. The construction of the boat ramp is also to provide an alternative location for staff to access the lake by boat. Staff have ceased using the Lake Domain boat access site due to security concerns.

8. DISCUSSION

Interventions:

8.1. Changes in land management practices were also identified as part of the Lake Horowhenua Accord and the Acord has taken an integrated approach to management of the lake. A large component of the Freshwater Clean-Up Fund project was working with the horticulture growers and the associated changes to farming practices through this engagement. The aim of this being to reduce the sediment that left properties combined with the establishment of the sediment trap at the base of the Arawhata Catchment. In addition, an understanding of the drainage network throughout the Arawhata Catchment was developed to identify bottlenecks to water flow and identify areas were the network has never been fully developed. This work, being undertaken by Tonkin and Taylor for Horizons, is ongoing with a current project underway working to identify options to improve the drainage network and options to further reduce sediment and nutrient inputs to the lake. A Sustainable Farming Fund project and Massey PhD project (both supported in-part by Horizons) are also underway in the catchment looking at options to reduce nutrient inputs from Horticultural operations into the lake.

8.2. The Freshwater Clean-up Fund project also worked with all dairy farms within the catchment and these have now obtained nutrient management consents through the One Plan framework. These catchment wide interventions continue to progress and can be considered more medium to long-term interventions. Regulatory processes are also

ongoing in relation to reducing inputs to the lake such as nutrient management consents for dairy and horticulture farms and stormwater consenting for Horowhenua District Council. Further research work on the groundwater inputs to the lake are also underway as a part of the work planned via the Freshwater Improvement Fund project.

In-lake processes:

8.3. The lake weed harvesting project is viewed as a key in-lake intervention for the health of the lake and for improving the suitability of the lake for recreation. This in-lake activity seeks to address the in-lake processes that lead to toxic conditions in the lake including elevated pH, ammonia toxicity and the cyanobacteria blooms that occur in the lake.

8.4. These processes are driven by the presence of the introduced macrophytes (lake weeds) including *Potamogeton crispus*. During spring the macrophytes start to grow and undergo a rapid growth phase resulting in the pH of the water column being raised above 9.2. The pH levels reached in-lake are high enough for Dissolved Reactive Phosphorus (DRP) to be released from sediment. Further, the pH change results in ammonium becoming ammonia and this can result in toxic ammonia concentrations in the water column. The macrophytes continue their fast growth cycle, depleting the water column of all soluble inorganic nitrogen and depending on the climatic conditions, the macrophytes reach their peak in late October through to December. During this growth phase they are reproducing turions (seed equivalents) which are dropped to the lakebed. Once they reach their peak the macrophytes start to collapse as a part of their life cycle. The depositing of the plant material on the lake bed creates low dissolved oxygen (anoxic) conditions on the lake bed. These conditions are suitable for the release of DRP from the lakebed sediments into the water column. The high DRP concentrations in the water column and the low nitrogen levels (due to the uptake by the macrophytes) provides cyanobacteria blooms a competitive advantage over other algal species and cyanobacteria blooms begin to become dominant in the lake causing impacts on aquatic life and closing the lake for contact recreation.

8.5. Regardless of catchment wide interventions, without some form of in-lake interventions the lake would continue to experience these conditions due to the presence of the introduced macrophyte. Internationally and nationally alum (or alum based agents) have been used to bind DRP on lake beds and make it unavailable for uptake by cyanobacteria. This is effective for the removal of DRP and essentially locks it up. This was considered as a tool for Lake Horowhenua however, was discounted due to cultural concerns around the discharge of alum to the lake. In Lake Horowhenua, although alum dosing could effectively deal with the DRP concentrations in the lake and the associated cyanobacteria blooms, it would not prevent the pH changes and the associated ammonia toxicity that the lake can experience. Further information on lake weed harvesting is provided in Annex C.

8.6. The sediment trap, fish pass, and weed harvesting were all identified as interventions which could be completed in a short time frame and make a meaningful difference to the health of Lake Horowhenua. These interventions have always been considered as a part of a wider long-term restoration programme. The weed harvesting activity is targeting the aspects of lake health that cause toxic effects (ammonia toxicity and cyanobacteria), it is not an intervention that will address the presence of other algae in the lake i.e. the lake will likely continue to have a strong presence of green algae in the lake if weed harvesting is undertaken. The weed harvesting activity aims to eliminate or significantly reduce the toxic form of the algae that impacts on aquatic life and recreational use of the lake.

9. OPTIONS

9.1. There are three main options that are considered as part of this item. These options are:

1. Proceed with the weed harvesting in the spring of 2020 and the construction of the associated infrastructure (boat ramp) to allow this to occur; or
2. Delay weed harvesting until spring 2021 and complete the construction of the associated infrastructure (boat ramp) in **2020** or **2021 [Choose 1]**; or
3. Cease pursuing weed harvesting as a mechanism for water quality improvement in Lake Horowhenua.

10. ASSESSMENT OF OPTIONS

10.1. Each of these options has a range of advantages and disadvantages and brief overview of these is provided below. It is noted here that the Lake Trust have expressed concern to Horizons around the ongoing delay with progressing the harvesting activity and the regular revisiting of the intent to complete the lake weed harvesting. Further the issue of staff and contractor safety in the field are matters for consideration (see Annex C for more information).

10.2. Option 1 is to proceed with the weed harvesting in the spring of 2020 and the construction of the associated infrastructure (boat ramp) to allow this to occur. This option enables Horizons to continue to seek to implement works to achieve regulatory requirements around maintaining and improving water quality and raising water quality parameters to be above national bottom lines and continues the work that has been progressed over many years as a part of the Lake Accord. Disadvantages include the additional costs and workload associated with this option due to the need to procure contractors to undertake construction of the boat ramp and the weed harvesting activity. Further there are costs associated with the regulatory requirements to implement the consents and any additional security measures or potential legal challenges that might still be taken by some parties.

10.3. Option 2 is to delay weed harvesting until spring 2021 and complete the construction of the associated infrastructure (boat ramp) in either 2020 or 2021. A disadvantage of this option is that year one of the weed harvesting involves a trial year and this option would effectively delay the benefits to the lake for at least another 12 months compared to option one. There may be further work to ensure various permissions remain in place.

10.4. Option 3 is to cease pursuing weed harvesting as a mechanism for water quality improvement in Lake Horowhenua. An advantage of this approach is lower costs and the ability to redirect staff and funding resources to other activities. Disadvantages include that lake would be forecast to continue to stay below national bottom lines for water quality with there being ongoing impacts to the aquatic life (fish, kakahi etc) and recreational suitability of the lake. Further investigation would be required to identify other in-lake interventions to meet Horizons requirements under the NPS-FM. Other disadvantages include the potential harm to the relationships with the Lake Accord Partners, and the perceptions around change of direction in the context of significant expenditure that has occurred to date. In addition, Horizons would need to discuss with the Ministry for the Environment the potential reimbursement of their monetary contribution to the lake weed harvester.

11. TIMELINE / NEXT STEPS

11.1. Depending on the resolutions from Council will depend on the next steps for the weed harvesting programme on Lake Horowhenua.

12. SIGNIFICANCE

12.1. This is not a significant decision according to the Council's Policy on Significance and Engagement.

Logan Brown

FRESHWATER AND PARTNERSHIPS MANAGER

Jon Roygard
GROUP MANAGER NATURAL RESOURCES & PARTNERSHIPS

ANNEXES

A One Plan Methods

B Resolutions of 25 September 2018 Council Item

C September 2018 Council Item

Method 5-6	Lake Horowhenua and Other Coastal Lakes
Description	The Regional Council and other agencies will work with all agencies to protect and enhance Lake Horowhenua and other coastal lakes. Landowners and other agencies will be provided with advice and project management assistance to carry out enhancement and protection measures including fencing, planting, sediment control, wastewater/stormwater management and fertiliser application management. The Regional Council will seek funding from third parties to assist with this method. The effectiveness of the protection and enhancement works in achieving improved water quality within Lake Horowhenua and other Coastal Lakes will be monitored. The method will include publicity to increase public awareness about the importance of the lakes. The method will include utilising industry codes of practice as a means of enhancing and protecting water quality eg., the Code of Practice for Commercial Vegetable Growing in the Horizons Region.
Who	Regional Council, Territorial Authorities, Fish & Game New Zealand, Department of Conservation, iwi, Horticulture NZ, landowners and other agencies.
Links to Policy	This method implements Policy 5-7.
Target	The Lake is actively managed, including protection and enhancement measures, within 5 years of this Plan becoming operative.
Method 5-7	**Lake Quality Research, Monitoring and Reporting**
Description	The aim of this method is to develop an integrated research, monitoring and reporting programme. The focus will be to define the current state of the quality of the Region's lakes, particularly the Region's coastal lakes. The method will seek to assess the state and quality of the lakes to better understand the influences on water quality in those lakes. The outcomes will link into work to refine existing policies, objectives and methods in terms of the need to add rural land uses and *Water Management Sub-zones** in managing nutrient management and effects on water quality. The outcomes will also guide implementation planning and allow implementation effectiveness is to be assessed.
Who	Regional Council, Department of Conservation, Fish & Game New Zealand, Horticulture New Zealand, DairyLink, research institutes, universities, non-Government agencies, community groups and iwi authorities as required.
Links to Policy	This method implements Policies 5-3, 5-4, 5-7 and 5-8.
Targets	A research, monitoring and reporting programme that defines the current state of water quality of the Region's lakes (particularly coastal lakes) and measure changes in water quality.

Annex B

Recommendations - Lake Horowhenua Update, Report 18-157 – Council Meeting 25 September, 2018

18-363 ***Moved*** ***Patrick/Burnell***

It is recommended that Council:

a. receives the information contained in Report No. 18-157 and Annexes.

b. endorses the continuation of Horizons work programmes as a part of the Lake Trust led Lake Horowhenua Accord in collaboration with the Lake Trust and other Lake Accord partners.

c. endorses the continuation of the following works that occur outside of the Lake Domain and Lake Trust administered area.

1. Water quality and flow monitoring of the tributaries that enter the lake. Noting that one monitoring site that was in the Lake Domain will need to be moved to a location outside of the Lake Domain;

2. Installation of two continuous flow sites on tributaries that flow into Lake Horowhenua to contribute to Horizons requirements to the Freshwater Improvement Fund (FIF) project;

3. Continuation of the groundwater monitoring within the catchment, including an increase in the groundwater monitoring as part of Horizons contribution to the FIF project around groundwater;

4. Continuation of animal and plant pest control in the catchment (including possum and some purple loosestrife control);

5. Continuation of Horizons presence on Governance Groups as both Governance and advisor roles;

6. Continuation of work with the horticulture growers, including the Sustainable Farming Fund project;

7. Completion of the processes with HeritageNZ to provide for the completion of the access road, boat ramp and associated dredging;

8. Participation in the Maori Appellate Court process, specifically around the Maori Land Court injunction decision that was appealed by Ms Taueki;

9. Monitoring and maintenance of the sediment trap including actions required by consent conditions and additional efficiency monitoring; and

d. endorses the continuation of the following works that occur within the area of Lake Domain and Lake Trust administered area (including the lake).

1. Continuing monitoring of the lake both through the collection of water quality samples and servicing of the water quality monitoring buoy using helicopters. Noting the preference is to do this work by boat and the use of helicopters is ideally an interim measure until the boat ramp location near the sediment trap (or another location other than in the Lake Domain) is operational;

2. Returning to monitoring of the lake outlet and Hōkio Stream both through the collection of water quality samples and servicing of the lake water level and Hōkio Stream water level and flow site. Noting the continuous monitoring at these locations has not been ceased over recent months, however the servicing of these sites has;

3. *Undertaking ongoing science and monitoring to inform the lake restoration programme and other programmes where it is assessed as safe to do so;*

4. *Assessing options for purple loosestrife management within the Lake Domain and Lake Trust land areas and where assessed as feasible, including budgetary considerations, undertaking purple loosestrife control.*

CARRIED

18-364 ***Moved*** ***Patrick/Burnell***

It is recommended that Council:

d. endorses the continuation of the following works that occur within the area of Lake Domain and Lake Trust administered area (including the lake):

5. *Completion of the construction of the access road to the boat ramp for the weed harvester on Horizons and Lake Trust land under the current contract for this work, which includes establishment of a docking bay and some limited dredging of the lake. Noting this includes working through the HeritageNZ and Maori Appellate Court processes, with the latter involving a challenge to installation of the access road and boat ramp;*

6. *Finalising design and completing construction of the boat ramp for the weed harvester at the alternate location near the sediment trap;*

7. *Undertaking monitoring as required by consent conditions to enable the harvesting of weed in Spring 2019 and completing work on other lake weed harvesting related consent conditions;*

8. *Enabling lake weed harvesting in 2019. Noting this requires some preparatory work on the harvester including obtaining spare parts and equipment for monitoring the activity on the lake. Further it requires procurement for a contractor to undertake the works.*

Against: Crs Cotton, Keedwell, McKellar, Rollinson

CARRIED

18-365 ***Moved*** ***Patrick/Burnell***

It is recommended that Council:

d. endorses the continuation of the following works that occur within the area of Lake Domain and Lake Trust administered area (including the lake):

9. *Re-establishing the ability to launch boats and undertake monitoring etc from the Lake Domain if the assessment of risk changes.*

CARRIED

Regional Council
25 September 2018

Report No.	18-157
Decision Required	

LAKE HOROWHENUA UPDATE

1. PURPOSE

1.1. This item is to update Council on progress with the restoration of Lake Horowhenua through the **Lake Horowhenua Accord (Lake Accord)** and seeks Councils endorsement around the next steps for **Horizons Regional Council (Horizons)** in this work.

2. EXECUTIVE SUMMARY

2.1. The fifth anniversary of the signing of the Lake Accord was celebrated on the 4th of August 2018. Through the Lake Accord, considerable progress has been made in the restoration of Lake Horowhenua.

2.2. The Lake Accord is a collaboration led by the Lake Trust (that are elected to represent the Beneficial Owners of lake). Other partners include the **Horowhenua Lake Domain Board (Domain Board)**, the Regional and District Councils and the Department of Conservation.

2.3. The Lake Accord was formed following the completion of lake restoration option reports commissioned by Horizons and completed by **National Institute of Water and Atmospheric Research (NIWA)**. Horowhenua District Council led the formation of the Lake Accord.

2.4. The collaboration has delivered the Lake Accord, an Action Plan and significant works to implement these. The collaboration has been extended to involve Central Government, horticulture growers and the dairy industry across three large work programmes comprising of the Lake Horowhenua Freshwater Clean-up Fund, Te Mana o Te Wai and **Freshwater Improvement Fund (FIF)** projects. Horizons, the Accord Partners, Universities, NIWA and others have collaborated to undertake science and monitoring to inform restoration options and to measure progress. This work is ongoing and in recent months new reports on pest fish populations and the sediment in the lake have been advanced.

2.5. Some Beneficial Owners of the lake and community members have actively challenged the work to restore the lake and this has considerably slowed progress on the restoration of Lake Horowhenua. Regulatory processes in various courts have included cases around the Lake Horowhenua Trust, its elections and its management, the regulatory consents for undertaking restoration programmes and the legality of Horizons being able to access the lake. Beyond the legal processes, work on the ground has been hampered by physical intervention, aggressive behaviour and threats toward the Lake Accord partners, usually Horizons staff and Lake Trustees, undertaking work or participating in activities relating to the lake. The paper provides and updates on a number of legal proceedings.

2.6. The individuals challenging the work to restore the lake have actively advocated for less work being done to restore the lake. This has included court processes seeking to block the completion of restoration works including the installation of a fish pass to enhance native fish populations (Photo 1) and the construction of a sediment trap to reduce sediment and phosphorus inputs into the lake. Without the actions of these individuals, restoration of the lake would have been much further advanced. In particular, the weed harvesting activities to reduce the seasonal algal blooms and toxic conditions that close the lake for recreation and impact on fish and other aquatic life in the lake. Further, the opposition to the restoration of the lake has significantly increased costs and diverted funds from action to restore the lake, either on the ground or in the lake.

2.7. Recent aggressive behaviour to staff during monitoring, verbal and physical threats to Horizons staff, and a confrontational presentation to Council that included giving Councillors and one staff member a "trespass notice", have resulted in Horizons ceasing a some activity in and around Lake Horowhenua. Some activity away from the lake has been able to continue. Monitoring has largely ceased, although limited monitoring is being done by accessing the lake though the use of helicopters with permission from the Domain Board and Lake Trust. Science work has continued using information gathered through the significant amount of field work completed earlier this year and prior to that.

2.8. This item overviews the various projects and activities of the lake restoration programme including providing updates on a number of legal proceedings and seeks Council's endorsement around the next steps for a range of activities/projects in and around the lake.

Photo 1. Lake Trust representatives and Horizons Councillors and Staff at the newly installed fish pass at the weir on the Hōkio stream.

3. RECOMMENDATION

It is recommended that Council:

a. receives the information contained in Report No. 18-157 and Annexes.

b. endorse the continuation of Horizons work programmes as a part of the Lake Trust led Lake Horowhenua Accord in collaboration with the Lake Trust and other Lake Accord partners.

c. endorse the continuation of the following works that occur outside of the Lake Domain and Lake Trust land area.

1. Water quality and flow monitoring of the tributaries that enter the lake. Noting that one monitoring site that was in the Lake Domain will need to be moved to a location outside of the Lake Domain;
2. Installation of two continuous flow sites on tributaries that flow into Lake Horowhenua to contribute to Horizons requirements to the Freshwater Improvement Fund (FIF) project;
3. Continuation of the groundwater monitoring within the catchment, including an increase in the groundwater monitoring as part of Horizons contribution to the FIF project around groundwater;
4. Continuation of animal and plant pest control in the catchment (including possum and some purple loosestrife control);
5. Continuation of Horizons presence on Governance Groups as both Governance and advisor roles;
6. Continuation of work with the horticulture growers, including the Sustainable Farming Fund project;
7. Completion of the processes with HeritageNZ to provide for the completion of the access road, boat ramp and associated dredging;
8. Participation in the Maori Appellate Court process, specifically around the Maori Land Court injunction decision that was appealed by Ms. Taueki;
9. Monitoring and maintenance of the sediment trap including actions required by consent conditions and additional efficiency monitoring; and

d. endorses the continuation of the following works that occur within the area of Lake Domain and Lake Trust Land area (including the lake).

1. Continuing monitoring of the lake both through the collection of water quality samples and servicing of the water quality monitoring buoy using helicopters. Noting the preference is to do this work by boat and the use of helicopters is ideally an interim measure until the boat ramp location near the sediment trap (or another location other than in the Lake Domain) is operational;
2. Returning to monitoring of the lake outlet and Hōkio Stream both through the collection of water quality samples and servicing of the lake water level and Hōkio Stream water level and flow site. Noting the continuous monitoring at these locations has not been ceased over recent months, however the servicing of these sites has;
3. Undertaking ongoing science and monitoring to inform the lake restoration programme and other programmes where it is assessed as safe to do so;
4. Assessing options for purple loosestrife management within the Lake Domain and Lake Trust land areas and where assessed as feasible, including budgetary considerations, undertaking purple loosestrife control;
5. Completion of the construction of the access road to the boat ramp for the weed harvester on Horizons and Lake Trust land under the current contract for this work, which includes establishment of a docking bay and some limited dredging of the lake. Noting this includes working through the HeritageNZ and Maori Appellate Court processes, with the latter involving a challenge to installation of the access road and boat ramp;

6. Finalising design and completing construction of the boat ramp for the weed harvester at the alternate location near the sediment trap;
7. Undertaking monitoring as required by consent conditions to enable the harvesting of weed in Spring 2019 and completing work on other lake weed harvesting related consent conditions;
8. Enabling lake weed harvesting in 2019. Noting this requires some preparatory work on the harvester including obtaining spare parts and equipment for monitoring the activity on the lake. Further it requires procurement for a contractor to undertake the works; and
9. Reestablishing the ability to launch boats and undertake monitoring etc from the Lake Domain if the assessment of risk changes.

4. FINANCIAL IMPACT

4.1. This item does have financial impact. The recommendations relate to budget items previously approved by Council noting the removal of funding from year 1 (2018-19, this year) of the **Long Term Plan (LTP)** for lake weed harvesting has reduced the ability to complete some preparatory work in advance of the LTP signalled weed harvesting activity in 2019-2020.

4.2. If Council decide to not proceed with finishing the access road, docking bay and dredging associated with the boat ramp for the lake weed harvesting project, there will be additional costs as a result of breaking the contract. If works proceed as currently contracted (noting, as above, that these works are presently the subject of litigation) then works will be completed as per the approved budget (and procurement process that has already been completed). Additional costs associated with responding to the regulatory permissions will also be incurred.

4.3. Proceeding with some activities in a modified way may result in additional costs for some activities. For example, the use of helicopter sampling of the lake compared to sampling by boat. Additional involvement of Tangita Tiaki from the Lake Trust in the monitoring will also likely increase the costs of the monitoring. Modifying the way of working to implement some projects with additional health and safety measures in place may also increase costs, for example additional security costs.

5. COMMUNITY ENGAGEMENT

5.1. The Lake Horowhenua Accord has been subject to considerable community engagement. The activities have been reported by various means including via media, public reporting to Council through the Environment Committee Agenda, through publicly notified resource consent hearings, the Lake Horowhenua Domain Board meetings and through various other reporting by the Lake Accord partners.

6. SIGNIFICANT BUSINESS RISK IMPACT

6.1. Possible risk impacts include potential further community concern around the increasing cost of this activity and uncertainty around it progressing. Further, there are risks in progressing this activity in the field. These risks include the risk of the project not progressing due to weather type delays or delays caused via protest type action, including potential harm to staff or contractors. The health and safety implications of completing this work have led to the reduction in work currently being carried out. If Horizons is to resume these functions health and safety obligations exist for Horizons, both for staff and governance. This is discussed further within the item and its annexes.

6.2. The significant risk impacts of not proceeding with the activity include reputational damage with Lake Accord Partners, the community, funding partners (e.g. the Ministry for the Environment) and others due to the inability to progress what is viewed as key interventions identified by NIWA, that Horizons have actively pursued and invested in. There is also risk

that not progressing this work will result in the Lake Accord partnerships no longer functioning.

7. BACKGROUND

7.1. Lake Horowhenua has had a long complicated history of management. This has been traversed and is still a matter of discussion as a part of ongoing treaty settlement processes. This paper focuses on the more recent management in the lead up to the Lake Horowhenua Accord signing and beyond. The management is complicated by multiple agencies and organisations having statutory roles. These responsibilities are discussed in the Lake Accord Action Plan and are not repeated here for the sake of brevity. The Lake Accord Action Plan can be located at http://www.horizons.govt.nz/HRC/media/Media/Reserves%20and%20Projects/Action-Plan-for-Lake-Horowhenua.pdf?ext=.pdf

7.2. There is also a level of challenge within iwi around who should manage the lake and how this should be done. The Lake Horowhenua Trust is the body who administers the lake on behalf of the Beneficial Owners of the lake. Trustees are appointed by way of election. The Trust has been challenged legally a number of times over recent years and there are still some matters before the court. A recent Maori Appellate Court decision (12 September 2018) concluded:

- "…that Judge Doogan should have recused himself from sitting on 19 May 2016. It follows that his decision to appoint trustees at 354 Aotea MB 54-88 (354 AOT 54-88), should be quashed."; and
- "We direct a rehearing before the Māori Land Court pursuant to s 56(1)(e). The purpose of the rehearing is to (1) consider the results of the 9 April 2016 election; (2) enquire into any objections to trustee candidates; and (3) appoint trustees. The Lake Horowhenua Trust will be without trustees in the meantime, so the re-hearing should occur soon."

7.3. This decision was released recently and there has not been sufficient time to assess what, if any, implications this may have for Horizons activity at the Lake. Staff will endeavour to have a further update for Council around this at the time of presentation of this item.

7.4. A range of other iwi/hapu organisations and individuals have been involved and expressed views in the lake restoration programme through a range of processes such as the consent process and through the Long Term Plan and Annual Plan processes. These individuals and groups have included some who have supported the Lake Accord work and some who have opposed it.

8. POLICY CONTEXT

8.1. Lake Horowhenua was previously managed under the Lake Horowhenua and Hōkio Stream Catchment Management Strategy (1997). The policy process of the One Plan (notified in 2007), identified Lake Horowhenua as a priority for regulatory effort including being a target catchment for the nutrient management rules for intensive farming. Further Lake Horowhenua was identified in the One Plan for non-regulatory effort around monitoring and restoration.

8.2. Horizons in collaboration with the Lake Trust commissioned work around restoration options that was completed by NIWA scientists in 2011 & 2012 (Gibbs 2011, Gibbs and Quinn 2012). These reports compiled the available monitoring and science information for the lake and identified a suite of options to restore the lake. The monitoring information clearly showed the lake had poor water quality and also showed water quality had declined for a key measure of lake health, the Trophic Lake Index (TLI). The restoration options information determined that restoration of the lake was possible. These and a range of other factors led to the Horowhenua District Council taking the lead to form the Lake Accord.

has enabled the reestablishment of monitoring at the lake, the subsequent Action Plan and associated projects including the Freshwater Clean-up Fund project, Te Mana o te Wai project and the new Freshwater Improvement Fund project.

8.3. The work of the Lake Accord is consistent with the statutory requirements of Horizons to maintain and improve water quality through the Resource Management Act and requirements through the **National Policy Statement for Freshwater Management (NPS-FM)** to improve water bodies that are below national bottom lines. The monitoring and research has clearly shown Lake Horowhenua has poor water quality that is below national bottom lines for a range of water quality indicators (Annex A). The Lake Horowhenua report card (Annex A) overviews the likely improvements from the key lake intervention projects (including lake weed harvesting) as predicted by Dr Gibbs of NIWA. These improvements include moving four out of five key water quality indicators out of the category of being below national bottom lines. The predicted improvements are for parameters that include toxicity measures of ammonia and cyanobacteria that can impact on aquatic life, and in the case of cyanobacteria also close the lake for recreational use.

8.4. The proposed non-regulatory lake restoration projects are intended to advance the restoration of the water quality in Lake Horowhenua. The projects are considered interim steps toward a broader longer term programme to restore Lake Horowhenua. These actions alone will not fully restore the lake. This has been made clear through a range of court processes and Council papers. As an example the lake weed harvesting activity seeks to reduce the toxicity issues of cyanobacteria and ammonia in the lake, however will not likely address the production of green algae in the lake. The key difference being the weed harvesting will reduce the frequency the green algae is in a toxic form (cyanobacteria). A further example is the sediment trap on the Arawhata, which is one method to reduce sediment and phosphorus entering the lake. Other sediment reduction methods including addressing the sediment at source, drainage improvements and sediment traps on other streams would be complementary and build on the improvements provided by the sediment trap on the Arawhata.

9. LEVEL OF INVESTMENT

9.1. Lake Horowhenua is the largest of over 220 lakes in the Manawatū-Whanganui Region that are greater than a hectare in size. Through the Lake Accord, Lake Horowhenua has received significantly more restoration investment than any other lake in the Region over recent years.

9.2. Overall, the three core projects with Central Government and local investment total when announced of around $4.117 million, with approximately $2.354 million (57%) from Central Government. Other funding partners include Horizons, Horowhenua District Council, the Lake Trust, DairyNZ, and the Tararua Growers Association. Over and above these projects Horizons has contributed more than $580,000 in regulatory costs to obtain resource consents for lake weed harvesting, a sediment trap and a fish pass. Horizons has also invested significantly in monitoring and science for the lake. This cost is broadly estimated to be over $600,000 over the life of the Accord, with some further funding obtained from external sources i.e. not from rates.

9.3. Other costs for Horizons ratepayers have included purchase of a monitoring boat specifically for Lake Horowhenua, costs for other court processes, staff costs, additional costs for the weed harvesting project including equipment costs and establishing the access track etc. Overall, the non-regulatory work of the Accord is estimated to be in excess of $4 million over the past five years across a range of funding organisations.

9.4. Horizons Long Term Plan commits approximately $2.156 million of further funding to restoration of the lake over ten years (2018-28) via the Lake Horowhenua Restoration Rate and further funding for staff time, monitoring, science etc in the order of $1 million in total over 10 years. This comprises approximately $100,000 per year for monitoring of the lake health using the monitoring buoy, lake sampling, lake level, monthly monitoring of

inflow/outflow flows and water quality, as well as measurements of water level and flow on the Arawhata inflow and the Hōkio Stream outflow. A **Sustainable Farming Fund (SFF)** project with the horticulture growers and industry is budgeted to spend approximately $400,000 over 3 years including $120,000 from Horizons. Horizons has budgeted $700,000 over the next 10 years ($70,000 per annum) for work with the horticulture growers, including the support of the SFF project. The projected spend for the next five years including the total FIF project budget is estimated to be greater than $3 million.

9.5. Broadly the investment in the lake is estimated to total over $7 million over the first decade of the Lake Accord to restore the lake. This excludes some of the costs from other agencies, landowners and the regulatory processes around policy development and consents for nutrient management, water takes etc. Included within this investment has been a significant amount from the Regions ratepayers. The regional rate contribution has been a mixture of general rate for monitoring/research and some implementation work as well as the targeted rate of the Lake Horowhenua Restoration that is funded 80% from Horowhenua District Ratepayers and 20% from general rates (i.e. across the Region, including the Horowhenua District).

9.6. This level of investment in water quality improvement is not isolated, with many large water quality restoration programmes underway through the country and Region. Iconic lakes such as Lake Taupō and the Rotorua lakes have investments in the order of hundreds of millions of dollars over recent decades. Other lakes like Te Waihora (Lake Ellesmere) near Christchurch, and Lake Wairarapa have had more modest budgets, with Te Waihora estimated to have received more than the budgets going into Lake Horowhenua (with approximately $9 million secured from the Freshwater Clean-up Fund). Lake Wairarapa is estimated to have received lower investment than Lake Horowhenua, having received some funding through the Freshwater Clean-up Fund. The only other lake in the Horizons Region with significant planned investment is Lake Waipu. The Lake Waipu Freshwater Improvement Fund (FIF) project, has approximately $1.9 million programmed to be spent over 5 years with funding from central government, Horizons and Rangitīkei District Council. Other lakes have received some investment, with riparian planting and fencing typically dominating the work to restore lakes. Horizons has recently upgraded the lakes monitoring programme and the results show a large proportion of the monitored lakes are below national bottom lines for several measures of water quality in the National Policy Statement for Freshwater Management. Restoration options for these lakes has been assessed through Horizons science programme and two reports on this are nearly complete (one for deep lakes and the other for shallow lakes).

9.7. Other water quality restoration measures in the Region have spent large budgets including $72 million for the Sustainable Land Use Initiative over about 10 years, the Manawatū River Leaders' Accord spending $46 million over approximately four years through the Freshwater Clean-up Fund. The Horowhenua District Council has undertaken significant recent investments in water quality including in the order of $8 million for Shannon wastewater to be land applied (with support from the Freshwater Clean-up Fund) and a current project to land apply Tokomaru wastewater to land (with support from the FIF).

10. ACHIEVEMENTS

10.1. While progress has been slow in some aspects of the restoration, a range of work has been completed or advanced. Some of the first achievements of the Accord include the Accord itself, the Action Plan and re-establishing a monitoring and science programme.

10.2. The sections below provide updates on the achievements and current progress on the three key projects that have involved Central Government and local investment i.e. the Freshwater Clean-up Fund, Te Mana o te Wai project and the Freshwater Improvement Fund projects.

11. THE FRESHWATER CLEAN-UP FUND

11.1. The Freshwater Clean-up Fund project for Lake Horowhenua was led by Horizons Regional Council, with Horowhenua District Council managing the boat wash project. The overall programme completed the following:

1. Purchase of a lake weed harvester for lake weed harvesting to address toxic conditions in the lake (Annex B overviews the rationale for lake weed harvesting);
2. Establishment of a boat wash facility near the lake to assist with biosecurity management in the lake;
3. 4.397 kilometres of stream fencing and 7,100 riparian plants established in the catchment and a fish pass on the Patiki Stream;
4. Establishment of a sediment trap on the Arawahata Stream that Dr Max Gibbs of NIWA estimated would reduce the annual load of sediment input to Lake Horowhenua from the Arawhata Stream by more than 50%, equivalent to reducing the yearly sediment inputs from all of the inflowing streams by approximately 25% and the annual load of phosphorus from these by 30%. The sediment trap is a part of a wider programme to reduce sediment entry into the lake with the design of this trap focussed on coarse sediment removal during large storm events. This design focus means the sediment trap does not always operate during rainfall events and may not visually change the colour of the water between entering the sediment trap and exiting the sediment trap, which can be more of a reflection of the fine sediment content. The measure of success over time will be the amount of sediment accumulated in the trap, and subsequently removed from the sediment trap, rather than deposited into the lake;
5. Drainage and Erosion Management Plans (DEMPs) have been completed for eight horticultural growers within the Lake Horowhenua Catchment. Twenty (DEMPs) were produced covering 82% or 368 ha of the total area assessed (446 ha). In the Arawhata area, 15 plans covered 81% of the estimated 404 hectares cropped in the sub-catchment. The blocks without specific DEMPs were very similar to nearby properties operated by the same grower. Planning for a phased upgrade of the drainage infrastructure in the catchment was completed to complement this work. The phased upgrade was funded separately via Horizons last Long Term Plan over three years and there is already more work that could be done to improve the management of water in the Arawhata Catchment during storm events.
6. Sustainable Milk Plans were prepared for all 10 dairy farms in the Lake Horowhenua Catchment. The plans cover a total of 1,765 ha of land used for dairy farming and associated runoff blocks; and
7. A fish pass on the weir in the Hōkio Stream, a restoration measure recommended via the fish population monitoring in 2013 to enable fish to have improved access to the lake. Observations indicate the fish pass is working, with schools of inanga viewed on multiple occasions in the Arawhata Stream in 2018. In the 2013 fish survey over several days, only a few inanga were detected.

12. TE MANA O TE WAI

12.1. The Te Mana o Te Wai work programme "Te Kakapa Manawa o Muaūpoko" contains thirteen projects and is led by the Lake Horowhenua Trust. Horizons assisted with the application for this funding. The Lake Trust has appointed a Governance Group that includes Councillor Sheldon, a Horizons staff member is also listed as a non-voting advisor to the group. The project has been underway for about 2 years and is ongoing and on track to be completed by December. Horizons has a role in assisting with the delivery of some projects that are managed via a contract between the Lake Trust and Horizons. The status of the component projects is outlined below.

12.2. **Community engagement** – The work of the Accord including Te Mana o te Wai project have been on display at Te Takere (the Levin Library/community hub). Several community planting days have been held, including a recent one to celebrate the 5th anniversary of the Accord. Horizons have assisted with the community planting days.

12.3. **Manawhenua engagement** – Two versions of a magazine have been produced, one for the beneficial owners and one for a wider public audience. These have been circulated through various mechanisms. The second and third magazines are being produced in an online video type format. Six wananga have been programmed with some of these now complete.

12.4. **Lake report card, website and lake signage.** A lake report card has been developed (Annex A). A website has also been developed. The signage work has included establishing a pou (Figure 1) that is located on Horizons land (at the sediment trap location). Horizons assisted with the production of the lake report card and an update is currently being progressed.

Figure 1: Image of the pou established and unveiled on the 4th August 2018 during the Lake Horowhenua Accord anniversary celebrations.

12.5. **Sediment legacy study and options report** – This project sought to answers questions around the rate at which the lake is infilling (sediment accumulation rate) and also the source of that sediment from within the catchment. This involved work by NIWA, Massey University, the Lake Trust, and Horizons and involved the collection of sediment cores from the lake and analysis of these. Key points from the study include that sediment rates have increased over recent decades and that predominate sources of sediment to the lake have changed over time (Annex C). The results show that over the last 5 years the Arawhata Stream Catchment has been contributing between 48% and 75% of the sediment, and the Mangaroa Stream catchment, has been contributing between 20% and 45% over the same period. This result reinforces the importance of the work to address sediment in the Arawhata sub-catchment.

12.6. **Cultural monitoring programme** – The cultural monitoring programme has been completed in several stages with a computer mapping (GIS) tool to map cultural information and scientific data, and a cultural monitoring programme being developed and presented to the Lake Trust. Kakahi monitoring was a component of this programme (Annex D). This was a joint project by the Lake Trust, Niwa and Horizons. The monitoring concluded that although

adult kakahi are producing larvae in Lake Horowhenua recruitment failure is probably occurring with poor or no survival of either larvae and/or juveniles. A likely cause of recruitment failure is poor water quality, specifically elevated pH and ammonia concentrations during the summer larval release period. Other factors may be contributing including reduced populations of host fish and/or sedimentation in juvenile habitat. In addition, the presence of many dead adult mussels *in situ* in the sediment suggests that adult survival is also decreasing in recent years. The adult mussels may simply be aging and reaching the end of their life span or they may be affected by multiple stressors in Lake Horowhenua, particularly degraded water quality and sedimentation. The results indicate that without in-lake interventions such as the lake weed harvesting, the kakahi populations in Lake Horowhenua will eventually become extinct.

12.7. **Nursery** – The Lake Horowhenua Trust have established a new nursery to provide plants for the restoration of the lake and elsewhere. Approximately 36,000 plants are in production.

12.8. **In-lake planting** – This trial sought to implement one of the recommendations made in the Gibbs (2012) report for the restoration of Lake Horowhenua. The trial involved the planting of approximately 2,500 plants on the lake edge extending into the lake up to a depth of 60 cm's. Although exact numbers aren't known, after numerous visits to the site following the planting it is estimated that the plant survival rate was around 5%. Factors influencing the survival rate were birds, pest plants, and wave action. During the planting it was noted that vegetation was beginning to naturally extend out from the lake edge into the lake and this appeared far more stable than the plants that were planted as part of the trial. On-site observation was that as the plants grow out from the lakes edge they provide a mat and stability which prevents the wave action from eroding the plants. Although this natural succession may be slow it is likely to be more successful.

12.9. **Removal of rubbish from the lake** – This project is targeting the locating and removing rubbish such as steel standards and wire from the lake and also mapping the location of significant structures in the lake. Procurement for this work has been completed and the work is underway.

12.10. **Lake weed cordon** – This project to enhance biosecurity protection aimed to establish a weed cordon at the launching location in the Domain. Weed cordons are established in some Rotorua lakes and provide a mechanism to reduce the potential for weeds coming into the lake from boats, waka etc. The project was ceased and the funding redirected within the Te Mana o Te Wai project.

12.11. **Stormwater upgrades** – Originally this project targeted stormwater upgrades to be led by Horowhenua District Council at Makomako Road, Patiki Stream and Mangaroa Stream). Late in the project this changed to works on the Queen Street drain. Horizons governance and officers were not a part of the decision to change the location of the works or any decisions in relation to completion of the works.

12.12. **Stream fencing and riparian planting** – There have been issues with establishing fencing and planting on some leased land particularly in the Patiki Catchment. Some blocks with multiple owners have been difficult to source permissions for work to proceed. In some cases, while the people leasing the land have signaled interest, Horizons have not been able to secure permissions to undertake the work. This leaves further gaps in the level of stock exclusion on some streams. By the end of the project approximately 5.7 km's of stream fencing and 15,000 riparian plants planted.

12.13. **Pest Fish Survey** – As a requirement of the consent conditions for the fish pass on the Hōkio Stream, Horizons was required to monitor pest fish in the lake before and after the installation of the fish pass. Monitoring indicated that populations of the main pest fish species recorded in Lake Horowhenua (perch, goldfish and koi carp) had not increased since the installation of the fish pass (Annex E). Although koi carp are a difficult species to capture and all fishing methods will underestimate their abundance, the continued difficulty in

capturing koi carp within Lake Horowhenua since 2013 suggests this species remains at densities below those known to cause adverse ecological impacts.

12.14. **Glass eels** – The glass eels project involved capturing glass eels, growing them in a establish facility to increase survival rates and releasing them into Lake Horowhenua. Approximately 1,000 eels were released as a part of the 5th anniversary celebrations on the 4th August 2018.

13. FRESHWATER IMPROVEMENT FUND

13.1. A further achievement of the Lake Accord is the establishment of the Freshwater Improvement Fund project for Lake Horowhenua, led by the Lake Trust. The project has been underway from 1 July 2018 and is programming delivery over a three year period. The Lake Trust has appointed a governance group that includes Councillor Sheldon. A Horizons staff member is also listed as a non-voting advisor to the group. Horizons is involved as a co-funding partner and will lead the groundwater research component of the project. The component projects and some of their linkages with Horizons work programmes are outlined below.

13.2. **Stormwater upgrades** – This project is led by the Horowhenua District Council and includes a range of stormwater upgrades. This links to Horizons regulatory programmes where Horowhenua District Council are completing monitoring and compiling a resource consent application for the discharge of stormwater to Lake Horowhenua.

13.3. **Cultural monitoring** – This programme is being led by the Lake Trust and builds on work in the Te Mana o Te Wai project. The programme has linkages with Horizons monitoring of the lake and the reporting of lake health through the lake report card, state of environment report, LAWA etc.

13.4. **Groundwater research** – This project is being led by Horizons and seeks to refine the knowledge of groundwater inputs to Lake Horowhenua. The lakes water balance has been studied and reported on several times over the last decade or so and this work seeks to reduce the uncertainty around the groundwater inputs. The new study will have the benefit of new information from the lake level monitoring and inflow/out flow monitoring completed recently as a part of the monitoring programme (see below). Groundwater and hydrology information is important to inform lake restoration efforts and resource consent processes around water allocation in the catchment. In the past resource consents to take water have been declined based on potential effects on the lake e.g. Levin Meats and some applications by horticulture growers. Further, some horticulture growers have water take consents that have short terms and this work will likely inform the decisions around any new applications to take beyond the expiry of the existing consents.

14. MONITORING AND SCIENCE

14.1. The monitoring and science programme has evolved over the last decade or so. Horizons was actively doing work in the catchment in 2008, however ceased activity due to health and safety concerns for staff. Monitoring restarted in 2013 following the signing of an intent to form an Accord. The monitoring and science programme are briefly outlined below including updating on work that has recently ceased due to health and safety concerns.

14.2. A summary of the state and trends of water quality in the Lake Horowhenua Catchment is provided in Annex F. This is based on a recent analysis of the regions water quality information for state and trends that is programmed to be presented to Council as a part of the next Environment Committee meeting. The report shows that the ability to calculate trend information has been impacted by the disruptions to water quality information collection that have resulted in sampling not being undertaken consistently due to health and safety concerns. Only trend information for the macroinvertebrate community index is able to be presented. This does not show any definitive trends that there is strong statistical confidence

in, however the information indicates a general degradation over the ten year period 2007 to 2017. The state information compared to the One Plan targets show E. coli targets are met in the lake and outflow stream, but not in the inflowing tributaries where monitored, nutrient targets are almost uniformly not meet in the lake and tributaries and the lake does not meet chlorophyll a targets. Compared to the National Policy Statement categories of water quality state as outlined in the National Objectives Framework (NOF), the lake is below national bottom lines (band D for phytoplankton and nutrient measures, nitrogen and phosphorus). Inflowing tributaries are band E for E. coli, with the outflow stream being band B). Nitrate as assessed for toxicity to aquatic life as a part of the NOF is band B or C in most tributaries, however band D (below the national bottom line) in the Arawhata stream.

14.3. The monitoring and science at the lake is done as a part of the Lake Accord and the Lake Trust provide Tangata Tiaki to assist with some of the monitoring as a standard practice. Permissions are obtained for the work from the Lake Trust and the Lake Domain Board. Various components of the monitoring programme are overviewed below.

14.4. **Lake monitoring buoy** to monitor changes in a range of parameters over time.

- This has provided critical information to inform the restoration programme including data on the pH changes in the lake and frequency and duration of deoxygenation of the base of the lake (that leads to phosphorus release).
- Recently Horizons moved to servicing this via helicopter following ongoing access issues for boats at the lake over many years. Launching and retrieving boats from the lake now includes notifying police as a standard practice and arrests have been made during this type of activity on multiple occasions. The opposition to Horizons (or its contractors) using boats is often cited around biosecurity concerns. Horizons have put in place measures to manage the biosecurity risk including use of a dedicated monitoring boat that is only used in Lake Horowhenua.
- The potential longer term solution for this is Horizons accessing the lake, from the alternative boat ramp near the sediment trap that has been proposed to enable lake weed harvesting.
- This is the only lake monitoring buoy Horizons currently has deployed permanently in the Region.
- Previously completed by the dedicated monitoring boat, this work is now delivered via the helicopter sampling. When the monitoring was completed by boat Tangata Tiaki were assisting with this monitoring when they were available. However, with the change to helicopter sampling they are no longer assisting with this work.

14.5. **Monthly Lake Monitoring** to measure lake health.

- This monitoring involves collection of samples and measurement from the lake in multiple locations.
- This monitoring provides for calculation of compliance with One Plan targets, National Policy Statement requirements and links to a target of the Lake Accord to improve the Trophic Lake Index (TLI). The TLI is the measure that was determined to be statistically declining by the Niwa report and is the measure that is used to compare lakes on a national level through the LAWA website. In 2010, Lake Horowhenua was ranked as the 7th worst lake out of 112 monitored for TLI nationally.
- This information also allows calculation of trend information over time to assess the effectiveness of interventions including regulatory and non-regulatory measures.
- The sampling also measures a range of other parameters that enables comparison to measures specified in One Plan Targets and the National Policy Statement for Freshwater Management.
- The lakes monitored for water quality in the region are mostly monitored via helicopter on a quarterly basis. Lake Horowhenua is the only lake monitored monthly by Horizons.

- Previously completed by the dedicated monitoring boat, this work is now delivered via the helicopter sampling. When the monitoring was completed by boat Tangata Tiaki were assisting with this monitoring when they were available. However, with the change to helicopter sampling they are no longer assisting with this work.

14.6. Continuous flow and lake level monitoring

- This currently consists of monitoring of the Arawhata Stream level and flow, the Hōkio Stream level and the lake level.
- These recording sites provide critical information about groundwater and hydrology of the streams and lake.
- The Arawhata site also informs the management of the sediment trap.
- The servicing of these monitoring sites ceased in June due to health and safety concerns.
- Two further similar sites are proposed and budgeted for this year as a part of the Freshwater Improvement Fund. These have been on-hold and are now proposed to be installed.
- The Hōkio Stream recorder and the lake level recorder are located on Lake Trust land.

14.7. Monthly inflow and outflow monitoring

- This comprises of measuring flow and collecting water quality on the inflows and outflow of the lake once a month.
- The measurement of flows, via flow gaugings is a technical exercise involving specialist training and equipment.
- This has provided key information on enabling the calculation of the relative contributions to nutrient and sediment loads in the lake from various catchments to help inform lake restoration options.
- The data also allows calculation trend information over time to assess the effectiveness of interventions including regulatory and non-regulatory measures. This monitoring programme is relatively new and the records are nearing the length of time where trend information can be generated. Water quality trend analysis such as those used in national state of environment reporting or the LAWA website typically use 10 years of record to generate trend information. It is noted that gaps in the record can influence the ability to complete trend analysis. This is currently an issue for trend analysis of information from the Lake Horowhenua monitoring programme.
- This monitoring ceased in June 2018 and has been sporadic at times prior to this due to health and safety concerns.
- The majority of this monitoring is not on Lake Trust land, however the outflow monitoring of the Hōkio Stream is.
- Tangata Tiaki have not regularly been involved in this monitoring, however the Lake Trust has recently requested that Tangata Tiaki become involved in this work on a regular basis.

14.8. Other targeted investigations

- These have included fish surveys, lake weed mapping, and other monitoring work linked to the restoration programme and/or national research work.
- Outputs from this include improved understanding of the fish populations and lake weed in the lake. This includes the development of a lake weed harvesting strategy that was submitted as a part of the consenting process.
- At the present time there is no programmed monitoring in this space in 2018. Mapping of lake weed over this spring/summer would be helpful, however at this stage is not progressing due to funding requirements and the health and safety issues of having to launch a boat on the lake.

15. MANAGEMENT OF PURPLE LOOSESTRIFE

15.1. Purple loosestrife is a highly invasive weed of wetland areas, stream and lake margins, and drains. It is present across much of the Region in relatively low and reducing populations, except the Lake Horowhenua infestation. Horizons has been managing the infestation at Lake Horowhenua over many years. This has met resistance in the field by some individuals and has at times required Police involvement to provide safe access to areas around the lake for control work. Over recent years, Horizons staff have not been able to complete the full level of weed control due to health and safety issues. This year staff undertook some control work, however were unable to complete the work following a directive from management that no further work in and around the lake take place.

15.2. The interruption to the programme over several years, has meant a considerable loss of the gains previously made against this weed. It is noted that this year, no budget has been allocated to purple loosestrife control at the lake. Without ongoing control this weed is approaching, if not at, a point where current management methods are insufficient to regain control of the weed in this area.

16. CURRENT WORK PROGRAMME

16.1. Horizons has involvement in a range projects within the Lake Horowhenua catchment, some of these are currently on hold or only being completed in part. This section overviews the current status and work remaining on a range of the non-regulatory projects underway in the catchment. The monitoring and science programmes covered above are not repeated in this section but do form part of the current work programme.

Lake weed harvesting

16.2. The lake weed harvesting project is viewed as a key intervention for the health of the aquatic life in the lake and for improving the suitability of the lake for recreation. This in-lake activity seeks to address the in-lake processes that lead to toxic conditions in the lake including elevated pH, ammonia toxicity and the cyanobacteria blooms that occur in the lake.

16.3. The project has been delayed by regulatory processes and including a publicly notified consent hearing, Environment Court and the High Court. The project was delayed by a further year through the Long Term Plan process following delays in establishing the infrastructure for the 2018 harvesting season. Council included the target of lake weed harvesting in 2019 and beyond in the Long Term Plan.

16.4. The delays were in part due to an injunction in the Maori Land Court about the establishment of the access track and boat ramp on Lake Trust land to enable weed harvesting. This application was dismissed by the Maori Land Court, however has recently been appealed to the Maori Appellate Court. The outcome of this process will be a factor in determining if and how the lake weed harvesting programme is to proceed in 2019.

16.5. Prior to the injunction, the construction of the access track was underway on Horizons land. This work located some middens that triggered a requirement to cease work and to work with HeritageNZ regarding this and the process to undertake further work. Horizons has previously worked with HeritageNZ to obtain archaeological authorities for a range of lake restoration activities including the sediment trap on the same site. HeritageNZ had previously advised that an authority was not required for the work on the access road and boat ramp, however locating the middens triggered some further process requirements. These processes require completion if the work on the access road and boat ramp is to proceed.

16.6. The completion of the access road, a docking bay and some limited dredging of the lake is currently contracted to be completed. This contract is on hold. There is the ability to restart the contract. If the contract is ceased there will be some further costs.

16.7. There is some boat ramp design work to be completed and a contract for the construction of boat ramp itself to be established. There is the ability to complete this work in close alignment with the timing of the completion of the current contract for the access road etc.

16.8. A further task related to the lake weed harvesting (and the sediment trap and fish pass) is the cost recovery for the resource consent process from both the Environment and High Courts. This equates to approximately $135,000 needing to be recovered through processes in both the District and High Courts. This recovery process is underway.

Sediment trap

16.9. The sediment trap is operational. Further work on the sediment trap includes completing some consent condition requirements that relate to monitoring for potential fish entrapment. Ongoing maintenance of the sediment trap is budgeted via the Drainage Scheme and is a further task.

16.10. There is further optional work around measuring the efficacy of the sediment trap and potentially modifying it, as is permitted by the resource consent conditions, to make it more effective. This work has not been prioritised for completion this year.

Work with the horticulture growers

16.11. The Long Term Plan provides funding for work with the horticulture growers to implement the Drainage and Erosion Management Plans and to complete the new Sustainable Farming Fund project "future proofing vegetable production". There is an associated PhD project being formulated to support this project with funding from Massey University and Horizons. A further project related to this is the management of and continual improvement of the drainage network in the Arawhata Catchment by the River Management Team.

Te Mana o Te Wai Fund

16.12. Horizons remaining work on the Te Mana o Te Wai fund includes:

- Ongoing governance of the project (Councillor Sheldon) and staff support of the governance project.
- Coordinating the finalisation of the legacy sediment and pest fish reports with NIWA and the Lake Trust.
- Finalising the stream fencing and planting work.
- Provision of information for an update to the Lake Report Card.
- Final invoicing and reporting on the project.

Freshwater Improvement Fund

16.13. Horizons remaining work on the Freshwater Improvement Fund includes:

- Ongoing governance of the project (Councillor Sheldon) and staff support of the governance project.
- Finalising the scope and activity for the groundwater component of the project.
- Commissioning the science work and undertaking the field work required for the groundwater project, including installing two additional flow sites on tributary streams that flow into the lake. This work has been budgeted for.
- Administration including invoicing and reporting on the project.

17. NEXT STEPS

17.1. There are range of potential options for Horizons ongoing work programme around Lake Horowhenua, all of which have an element of complexity to them.

17.2. As outlined above there are significant challenges for continuing work on the ground in the catchment following staff experiencing aggressive and confrontational behaviour when

undertaking some work, threats to staff, a "trespass notice" being given to Councillors (and one staff member) and further legal and regulatory work to complete (associated with the Maori Appellate Court proceedings and with HeritageNZ).

17.3. In relation to the confrontational behaviour, charges have recently being laid against Phillip Taueki regarding alleged intimidation of a Horizons staff member. This has placed some limitations on Mr Taueki's interactions with the staff member, some Lake Trustees and other witnesses (including another Horizons staff member) until the court process is completed.

17.4. There are legislative requirements around health and safety to manage given the significant history of threats and aggressive behaviour experienced during some types of work. In simple terms, the advice Horizons has received indicates that if Horizons is initiating projects and contributing funding to projects, then Health and Safety requirements remain if Horizons:

- Undertakes the work itself via its own staff or with its own staff, including when delivered in collaboration with the Lake Trust (noting Tangata Tiaki receive remuneration from Horizons for their involvement);
- Engages contractors to complete the work (including if someone else manages the contracts for Horizons).
- Provides a grant to enable some other agency to undertake the work (themselves or via contractors).

17.5. It is noted that if Horizons initiating and setting out the work, as well as funding the work, provides the ability to 'influence and control the work'. This places requirements on Horizons to be a part of managing the risk of the work. More information on Health and Safety requirements is provided in Annex G.

17.6. For the purposes of forming options for the next steps, Horizons work programme is considered in two parts. This has been done to separate the area where the most frequent increased health and safety risk has been experienced to date. The two areas being:

1. Works that occur within the Lake Domain and within the Lake Trust land (including on the lake); and
2. Works that occur outside this area within the catchment and in various public places, courts, meetings etc.

17.7. The areas of Lake Domain and Lake Trust land have additional complexities related to the legislative roles and rights of organisations, including the Lake Domain Board, the Lake Trust and beneficial owners of the lake, within these locations. These areas are where staff have primarily encountered the aggressive behaviour and threats, noting other threats, confrontational and aggressive behaviour have been encountered in and around various regulatory processes and other meetings. Some of the more typical threats to staff refer to what will happen when staff are next located in the areas around the lake. That said, physical threats and aggressive behaviour have also occurred in relation to lake restoration in areas outside of the Domain and Lake Trust Land e.g. in and around court proceedings.

17.8. The Lake Domain area and the Lake Trust land are considered the highest risk locations and working in these areas has been temporarily ceased based on health and safety considerations.

17.9. To date, restoration work on the ground completed within the catchment but outside of the Lake Horowhenua Trust land and the Domain area has not encountered the strong opposition that has occurred within the Domain and Lake Trust Land area. Please note this refers to on-the ground type works, fencing, planting, community planting days etc and excludes the activities around court processes and other meetings about lake restoration.

17.10. The work to be done outside of the Lake Trust land and the Domain area for the non-regulatory lake restoration programme includes programmes outlined below, which is

referred to as List 1. It noted that some modifications to the way these are to be delivered are included in the list to lessen the health and safety risk. These programmes are:

1. Water quality and flow monitoring of the tributaries that enter the lake. Noting that one monitoring site that was in the Lake Domain will need to be moved to a location outside of the Lake Domain;
2. Installation of two continuous flow sites on tributaries that flow into Lake Horowhenua to contribute to Horizons requirements to the Freshwater Improvement Fund (FIF) project;
3. Continuation of the groundwater monitoring within the catchment, including an increase in the groundwater monitoring as part of Horizons contribution to the FIF project around groundwater;
4. Continuation of animal and plant pest control in the catchment (including possum and some purple loosestrife control);
5. Continuation of Horizons presence on Governance Groups in both Governance and advisor roles;
6. Continuation of work with the horticulture growers, including the Sustainable Farming Fund project;
7. Completion of the processes with HeritageNZ to provide for the completion of the access road, boat ramp and associated dredging;
8. Participation in the Maori Appellate Court process, specifically around the Maori Land Court injunction decision that was appealed by Ms. Taueki; and
9. Monitoring and maintenance of the sediment trap as required by consent conditions for fish entrapment and additional efficiency monitoring;

17.11. There are also a number of work streams to be done that involve needing access to the lake and its margin and therefore to be present on the Lake Trust land and/or the Domain area (referred to as List 2). These work programmes are:

1. Continuing monitoring of the lake both through the collection of water quality samples and servicing of the water quality monitoring buoy using helicopters. Noting the preference is to do this work by boat and the use of helicopters is ideally an interim measure until the boat ramp location near the sediment trap (or another location other than in the Lake Domain) is operational;
2. Returning to monitoring of the lake outlet and Hōkio Stream both through the collection of water quality samples and servicing of the lake water level and Hōkio Stream water level and flow site. Noting the continuous monitoring at these locations has not been ceased over recent months, however the servicing of these sites has;
3. Undertaking ongoing science and monitoring to inform the lake restoration programme and other programmes where it is assessed as safe to do so;
4. Assessing options for purple loosestrife management within the Lake Domain and Lake Trust land areas and where assessed as feasible, including budgetary considerations, undertaking purple loosestrife control;
5. Completion of the construction of the access road to the boat ramp for the weed harvester on Horizons and Lake Trust land under the current contract for this work, which includes establishment of a docking bay and some limited dredging of the lake. Noting this includes working through the HeritageNZ and Maori Appellate Court processes, with the latter involving a challenge to installation of the access road and boat ramp;
6. Finalising design and completing construction of the boat ramp for the weed harvester at the alternate location near the sediment trap;
7. Undertaking monitoring as required by consent conditions to enable the harvesting of weed in Spring 2019 and completing work on other lake weed harvesting related consent conditions;
8. Enabling lake weed harvesting in 2019. Noting this requires some preparatory work on the harvester, including obtaining spare parts and equipment for monitoring the activity on the lake. Further, it requires procurement for a contractor to undertake the works; and
9. Reestablishing the ability to launch boats and undertake monitoring etc from the Lake Domain if the assessment of risk changes.

18. OPTIONS

18.1. There are a range of options that could potentially be considered as a part of this item. One option that is not presented is to continue as Horizons had previously operated through accessing the lake for monitoring and other activity via the Domain. This has been ruled out in the interim based on the health and safety risk. The options could be presented in terms of individual decisions on various projects but have been considered as three packages for the non-regulatory lake restoration programme being:

1. Proceeding with all of the work, with some modifications to how this is delivered i.e. complete the projects on both List 1 and List 2.
2. Proceeding with all of the work outside of the Lake Domain and Lake Trust land area (List 1), and cease all work inside the Lake Domain and Lake Trust area (List 2).
3. Ceasing all of the work in the catchment i.e. cease all of the work in Lists 1 and 2.

18.2. As a further consideration in the options is to retain an ability to return to using the Lake Domain should the assessment of risk change.

19. ASSESSMENT OF OPTIONS

19.1. Option 1 is to proceed with all works via a modified programme. Advantages of this include progressing the work with modifications to the way the programme is delivered in consideration of the current assessment of the health and safety risk. This option enables Horizons to continue to seek to implement works to achieve regulatory requirements around maintaining and improving water quality and raising water quality parameters to be above national bottom lines. A disadvantage is the additional workload associated with this option due to increased activity around regulatory permissions etc, and potential further exposure of staff and Councillors to the types of confrontational behaviour that has been experienced during some work around Lake Horowhenua. Fiscally, Option 1 involves further expenditure than the other options including in relation to enhancing security/health and safety management, regulatory processes and increased level of physical works.

19.2. Option 2 includes cessation of work in the Lake Domain area and Lake Trust land (including the lake). Advantages of this option include removing the need for staff to operate in these areas reducing health and safety risk and exposure of staff to the types of confrontational behaviour that can occur when working around Lake Horowhenua. Option 2 also has lower expenditure than Option 1. A disadvantage is that some of the work to restore the lake will not occur and the forecast improvement of the lake will not likely occur. With this option the lake would be forecast to continue to stay below national bottom lines for water quality with there being ongoing impacts to the aquatic life (fish, kakahi etc). A range of monitoring work would also cease removing the ability to track changes in water quality and aquatic health.

19.3. Option 3 is cessation of all non-regulatory lake restoration work (including some monitoring) in the Lake Horowhenua Catchment. An advantage of this is lower costs. Disadvantages include having to cease involvement in a range of collaborative programmes such as the Freshwater Improvement Fund with Accord Partners and Sustainable Farming Fund work with the horticulture growers and industry. A range of work that would inform regulatory processes (including monitoring of water quality outcomes) would also be ceased. The same disadvantages as outlined in Option 2 would also apply to Option 3.

19.4. The paper is presented with resolutions based on option 1, which seeks to reduce the health and safety risk through a modified work programme and enable Horizons to continue to undertake lake restoration activity.

20. SIGNIFICANCE

20.1. This is not a significant decision according to the Council's Policy on Significance and Engagement.

Logan Brown
FRESHWATER AND PARNTERSHIPS MANAGER

Jon Roygard
GROUP MANAGER NATURAL RESOURCES AND PARTNERSHIPS

ANNEXES

A	Lake Horowhenua report card
B	Rationale for weed harvesting
C	Sediment legacy project results
D	Kakahi monitoring project results
E	Pest fish survey results
F	Water quality state and trends
G	Health and safety considerations

ECOSYSTEM HEALTH

The National Policy Statement for Freshwater Management 2014 (Freshwater NPS) sets out the objectives and policies for freshwater management under the Resource Management Act 1991. The National Objectives Framework of the Freshwater NPS contains a list of attributes that must be managed. These attributes are graded into four different categories of which Band D falls below the national bottom line. Unless certain criteria are met an Authority must develop plans to move systems out of Band D.

The monitoring data to date shows the attribute state that Lake Horowhenua falls into Band D for several measures:

PRESENT BAND	TP	TN	TAN	Chl a	CYANOBACTERIA
	Annual median (mg/m3)	Annual median (mg/m3)	Annual maximum (mg/m3)	Annual maximum (mg/m3)	80th percentile (mm3/L)
A	< 10	< 300	< 0.05	< 10	< 0.5
B	> 10 AND < 20	> 300 and < 500	> 0.05 and < 0.4	> 10 and < 25	N/A
C	> 20 and < 50	500 and < 800	**0.4 and < 2.20**	> 25 and < 60	> 0.5 and < 10
D	**> 50 (250)**	**> 800 (1910)**	**> 2.20**	**> 60**	**> 10**

< less than | > greater than

As part of the integrated approach that is being undertaken for the restoration of Lake Horowhenua predications have been made by Dr Max Gibbs (NIWA) that a range of parameters will move from Band D (or below national bottom lines) to:

PREDICTED FUTURE BAND	TOTAL PHOSPHOROUS	TOTAL NITROGEN	AMMONIA	Chlorophyll a	CYANOBACTERIA
	Annual median (mg/m3)	Annual median (mg/m3)	Annual maximum (mg/m3)	Annual maximum (mg/m3)	80th percentile (mm3/L)
A	< 10	< 300	**< 0.05**	< 10	< 0.5
B	**> 10 AND < 20**	> 300 and < 500	**> 0.05 and < 0.4**	**> 10 and < 25**	N/A
C	**> 20 and < 50**	500 and < 800	0.4 and < 2.20	**> 25 and < 60**	> 0.5 and < 10
D	> 50 (250)	**> 800**	> 2.20	> 60	> 10

< less than | > greater than

These predictions show that the restoration work, including the sediment trap and weed harvesting activities, will provide immediate and positive effects on water quality through the reduction of cyanobacterial blooms.

WHAT IS THE TLI?

Lake Horowhenua has very poor water quality and is classified as supertrophic on the trophic level index (TLI). The TLI measures four parameters: water clarity, chlorophyll content, total phosphorus and total nitrogen, and is used to give an overall picture of the health of New Zealand lakes. Each lake is assigned a number typically between 1 and 7, the lower the number, the better the water quality in the lake.

TLI HISTORY FOR LAKE HOROWHENUA DATA TABLE							
Year	2006	2007	2008	2009	2014	2015	2016
TLI Score	6.5	6.1	6.7	7.1	6.1	6.3	6.7

*2010-2013 Lake not monitored.

HUMAN HEALTH

Currently swimming is actively discouraged at Lake Horowhenua. Other recreational activities, such as boating, rowing and sailing, are discouraged during the summer months when toxic algal blooms may be present. A key goal of the lake weed harvesting activity, planned for 2018-19, is to reduce the frequency of toxic cyanobacteria blooms. Over the 2016-17 summer period (November to April) Lake Horowhenua's water quality was sampled 22 times for *E. coli*.

CATEGORY	RANGE	% SAMPLES IN EACH CATEGORY
Avoid swimming	>550 *E.coli* MPN/100 ml	55%
Could be a health risk	260-550 *E.coli* MPN/100ml	14%
Should be safe to swim	<260 *E.coli* MPN/100ml	32%

* All samples were taken from the Lake edge rather than the centre of the Lake, and represent the risk to human health from contact with the Lake at the Domain.

< less than | > greater than

E.coli monitoring in the middle of the lake shows that between July 2013 and June 2017 it was always safe to swim from an *E. coli* infection risk perspective. This is likely due to the UV radiation killing the *E. coli* that will be entering the lake from various sources.

Compiled by Horizons Regional Council, November 2017. Document 2017/710

He Hokioi Rerenga Tahi
Te Kawenata o te Roto o Horowhenua

LAKE HOROWHENUA

CATCHMENT REPORT CARD

HE MIHI

Ko tēnei te moemoeā
O te iwi nei, arā ko Ngāi Tara te Muaūpoko o te Ika
Kia rongoā te taiao nei, te whenua me ngā wai tapū o te rohe nei
E kōrero ana tātou ki ngā Iwi katoa, kei a tātou kotahi te rongoa
Ti hea Mauria Ora!

This is the wish of our iwi Ngāi Tara te Muaūpoko o te Ika
To restore nature, our sacred lands, and waters to their former glory
We are speaking to all people, as we are all part of the solution
The breath of life!

LakeHorowhenuaTrust · horizons regional council · Horowhenua District Council · Department of Conservation Te Papa Atawbai · HorowhenuaLakeDomainBoard

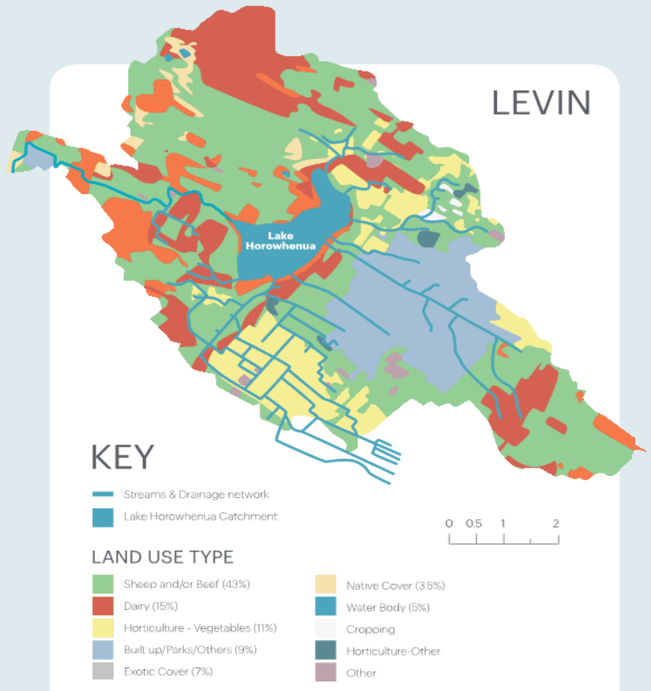
LAKE HOROWHENUA CATCHMENT

BACKGROUND

In pre- European times, Lake Horowhenua was a cleanwater supply and valued fishery for the Muaūpoko iwi who lived in the coastal forest that surrounded the Lake.

Clearance of coastal forest, draining of swamps, intensification of land use, urban expansion, and the disposal of treated effluent in the Lake between 1962 and 1987 has lead to significant degradation of Lake Horowhenua. After the input of treated sewage stopped in 1987, water quality within the Lake started to improve. However, a decade later water quality began to decline again and in 2010 Lake Horowhenua was ranked as the 7th worst out of 112 monitored lakes in New Zealand.

Lake Horowhenua is regularly closed for recreation in summer due to the presence of toxic cyanobacteria. This is related to the large amounts of nutrients and sediment entering the Lake combined with large amounts of sediment and nutrients already present in the Lake.



LAKE HOROWHENUA RESTORATION

Since the signing of the Lake Horowhenua Accord in 2013, 15 key actions outlined in the 2014-2016 action plan, have significantly progressed.

LAKE HOROWHENUA ACCORD

In 2013, five parties representing Muaūpoko owners, community interests and statutory bodies agreed to work together to provide leadership, halt degredation and put in place remedial measures on Lake Horowhenua and Hokio Stream that will ensure these taonga (treasures) hold pride of place in the Horowhenua community. The five parties that form the Lake Horowhenua Accord are: Lake Horowhenua Trust, Lake Horowhenua Domain Board, Horowhenua District Council, Horizons Regional Council, and the Department of Conservation.

FUNDING

Lake restoration initiatives have been greatly enhanced with funding and inkind resource from all Lake Horowhenua Accord parties. The $1.28 million Fresh Start for Freshwater Clean-up Fund project received $730,500 from Horizons Regional Council, Horowhenua District Council and industry, as well as $540,000 from the Ministry for the Environment.

The Clean-up Fund project included the installation of a fish pass over the weir to enable fish to travel between the sea and the lake, the construction of a sediment trap which is predicted to reduce sediment phosphorus loads from streams into the lake by more than 25%, and lake weed harvesting to reduce cyanobacteria blooms. Less blooms will increase the lake's frequency of suitability for swimming over summer and the weed harvesting will also enhance the fishery by reducing the toxicity effects of the lake weed in spring.

Sub-projects through the Clean-Up Fund project included the completion of environmental management plans for all 10 dairy farms in the catchment, sediment and erosion control plans for growers

covering 80 per cent of the horticultural land in the catchment, and the building of a boat wash facility to reduce the risk of further lake weed species being introduced to and contaminating the Lake.

MfE have also contributed a further $980,000 as part of the Te Mana o Te Wai fund (Te Kakapa Manawa o Muaūpoko) towards a $1.2 million project that will involve a scientific assessment of the lakebed sedimentation and native fish populations, community planting days, an education programme, development of a plant nursery, completion of storm water treatment upgrades and the repairing of fish barriers.

Most recently a $1.6 million Freshwater Improvement Fund project has been awarded to the Accord Partners. This project, lead by the Horowhenua Lake Trust, has co-funding from Horizons, Horowhenua District Council and the Lake Trust, as well as $842,750 from MfE. The work programme will include assessment and flushing of the stormwater system, establishment of a silt interceptor, shallow groundwater monitoring and implementation of two cultural monitoring programme activities.

Monitoring in 2015 and 2016 found five species of macrophytes within the lake of which two species are exotic. There are currently 12 species of native fish and three introduced species of fish which have been sighted in the Lake Horowhenua catchment. Koura and freshwater mussels are also present.

Annex B: Overview of the rationale for the weed harvesting activity.

Lake weed harvesting was one of the many recommendations of the Horizons & NIWA reports on restoration options for Lake Horowhenua that were incorporated into the Lake Horowhenua Accord, the Lake Accord Action Plan and the Fresh Start for Freshwater Clean-up Fund project for Lake Horowhenua.

Lake Horowhenua is a hypertrophic lake that had a mean trophic level index (TLI) of 6.4 for the 2013-14 year. The lake develops high ammonia concentrations in spring/summer and cyanobacteria blooms in summer.

The lake has two main species of aquatic macrophytes (weeds) – *Potamogeton crispus* (curly-leaf pondweed) and *Elodea canadensis* (Canadian pond weed). Although both weeds are exotic invasive species, they have very different life/growth cycles. *Elodea* is a perennial plant with a clumping growth form. It develops a dense weed bed that eventually reaches the surface. Although the plants flower they do set seed and propagation is entirely from small fragments broken off the surface reaching stems. In contrast, *Potamogeton* is an annual plant that grows from propagules (turions) shed by the mature plants before they die in summer. The propagules germinate in autumn (April –May) and overwinter as low growing plants. In spring these plantlets grow rapidly to reach the water surface. In summer, they flower and produce turions which fall to the lake bed to produce the next year's plants. In mid-summer the mature plants die and collapse onto the lake bed where their decomposition causes anoxia and the release of phosphorus (P) from the sediment beneath the decomposing plant matter.

The weed harvesting operation is viewed as the key project within the overall restoration programme for Lake Horowhenua. Weed harvesting is to be undertaken in the lake to directly break a cycle that is occurring where the introduced lake weed is altering the chemistry of the lake by increasing the pH of the water, lowering the nitrogen concentration and enabling the chemistry to become favourable for phosphorus release from the sediment into the lake. Increased phosphorus and low nitrogen conditions favour the growth of the cyanobacteria in the lake. Cyanobacteria in the lake can be toxic to humans and animals restricting the use of the lake for recreation. Cyanobacteria also impacts on aquatic life. The die off of some of the lake weed in summer also leads to low oxygen levels at the bed of the lake which makes conditions suitable for further release of phosphorus contributing to the cyanobacteria blooms.

The lake weeds influence on pH can also drive a further change in the chemistry of the lake leading to toxic levels of ammonia that can and do kill fish. In 2013/14, ammonia toxicity persisted for a period of several months in summer; however, ammonia toxicity was not observed in the 2014/15 season (according to monthly monitoring data up to January 2015). Figure 1 shows a schematic of the *Potamogeton* growth cycle including the impacts on the lake and how the weed harvesting programme aims to reduce these.

Harvesting the weed aims to reduce the weeds ability to change the pH of the lake as much as it currently does (i.e., less weed equals less photosynthesis) thereby creating conditions in the lake that are more favourable for fish and other aquatic life, including the native lake weeds. Harvesting the weed and managing the removal of the cut weed will reduce or eliminate the development of the high pH that can lead to phosphorus release from the sediment and ammonia toxicity. It will also reduce or eliminate the development of cyanobacteria blooms. Further it will remove part of the nutrient load from the lake. An overview of the weed extent in Lake Horowhenua at various times of the year is shown in Figure 2.

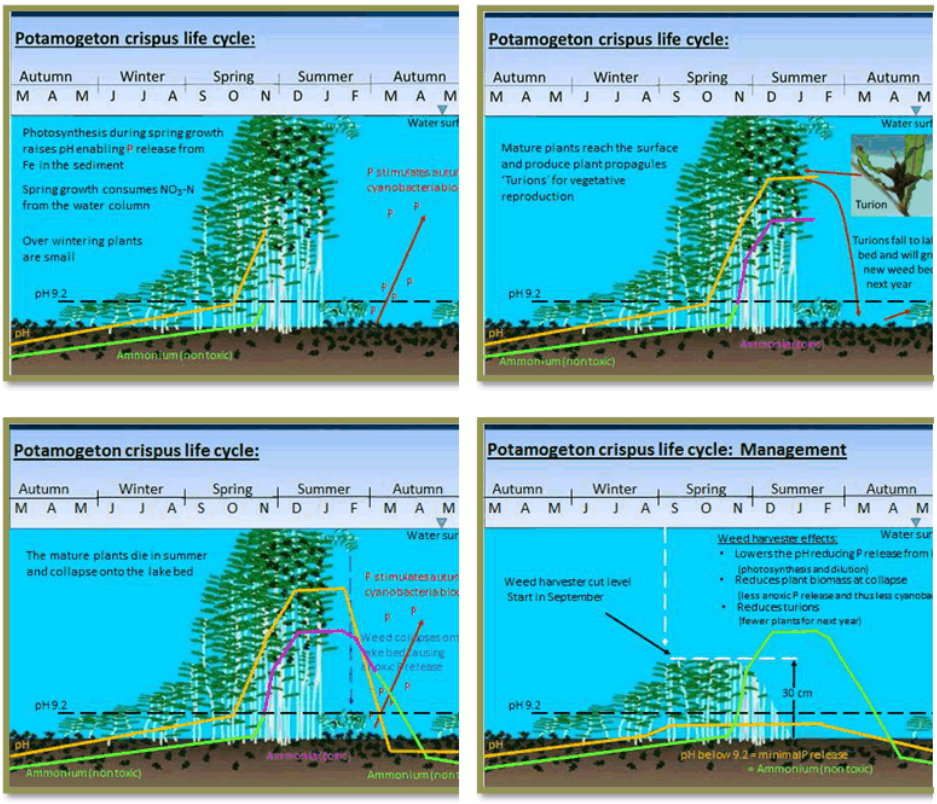


Figure 1: Schematic diagram showing the key parts of the *Potamogeton* life cycle (A) to (C) and the effect of mowing the tops off the weed beds (D).

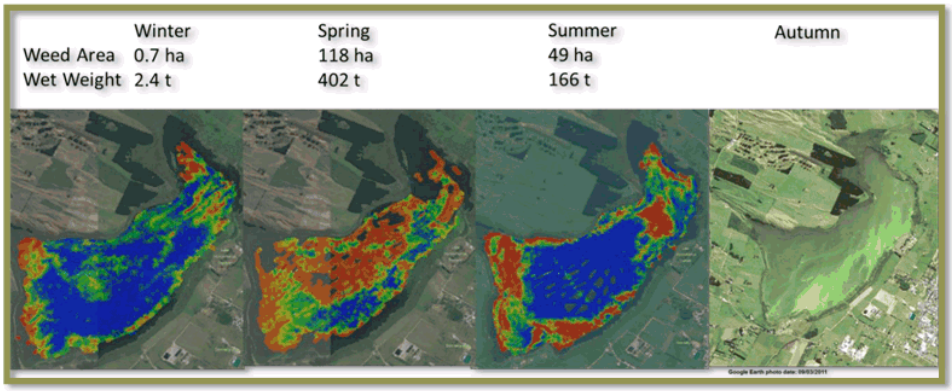


Figure 2: Compilation of three weed mapping surveys arranged to indicate the natural sequence of expansion and decline of the weed beds each year. Surveys are not in chronological order. Red represents 100 % weed cover per unit area and blue represents 0 %. Intermediate colours on a rainbow colour scale represent different percentage cover at those locations.

Annex C: Key results of the sediment legacy project

The Te Mana o te Wai work programme included a project to complete a sediment legacy project to inform the restoration programme. The project was a collaboration between the Lake Trust, Horizons, Massey University and Niwa. The report was completed by NIWA. The sediment legacy project reported that:

- In 1922 the sediment came from the southern inflows (Arawhata Stream and Sand Road drain) and the Queen Street drain;
- In 1942 the sediment originated from the Arawhata Stream and Patiki Stream Catchments;
- In 1962 the sediment originated from the Arawhata Stream and Mangaroa Stream Catchments.
- During the period that sewage effluent was being discharged into the lake, this may have been the source of some of the additional sediment, but it is unlikely to have been the major source. The CSSI isotopic proportions indicate that, in 1972, the sediment originated from the Mangaroa Stream at the northern end of the lake and the Sand Road drain at the southern end of the lake.
- In 1980 the sediment was coming from the Queen Street Drain which is consistent with observations by Gibbs and White (1991; 1994) of very high flows of turbid water in the Queen Street drain and the Arawhata Stream. At that time, the Queen Street drain flow was augmented with water from the Ohau River and also received water from hydroponics (M. Gibbs, NIWA, personal observations).
- Over the last 5 years the sediment results show the Arawhata Stream catchment has been contributing between 48% and 75% of the sediment, and the Mangaroa Stream catchment has been contributing between 20% and 45% over the same period (Figure A). In addition the sediment accumulation rates have increased in recent times as shown in the table below (Table A).

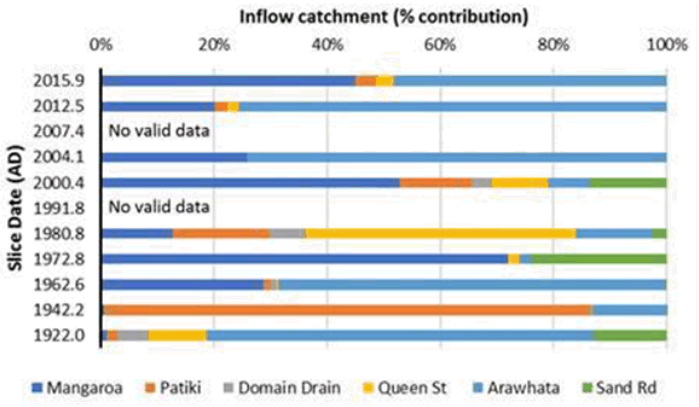


Figure 1 Bar graph of soil proportions showing the relative proportion changes in soil sources contributing to the sediment at site 1. Data from 2007 and 1991 have been omitted as they were not interpretable.

Table 1 Sediment accumulation rates in Lake Horowhenua as determined by the sediment legacy study.

Sediment accumulation rates (SAR) for selected depth / date ranges in the sediment core from Site 1.

Depth range (cm)	Time range (year)	SAR (mm y^{-1})
0-1.5	2015-2018	6.2
1.5-3.5	2012-2015	5.9
3.5-10	2000-2012	5.8
10-15	1991-2000	5.2
15-30	1962-1991	5.0
30-40	1942-1962	4.9

Annex C

Annex D: Key findings of the Kakahi monitoring project.

Kakahi Monitoring in Lake Horowhenua was undertaken as a part of the Te Mana o te Wai Cultural monitoring project.

Kakahi (freshwater mussel) monitoring was completed as a part of the cultural monitoring project of the Te Mana o Te Wai Project. The monitoring was undertaken by NIWA in November 2017 as a joint project between the Lake Trust, NIWA, and Horizons. This monitoring involved divers scuba diving within the lake along transect lines and recovering live kakahi (Photo 1) that they encountered. These were then counted, measured, visually inspected and then replaced in the Lake.

Preliminary evaluation of brood pouch status indicated that 43% were females brooding ripe larvae (glochidia). It was concluded that although adult kakahi are producing larvae in Lake Horowhenua recruitment failure is probably occurring with poor or no survival of either larvae and/or juveniles. A likely cause of recruitment failure is poor water quality, specifically elevated pH and ammonia concentrations during the summer larval release period. Other factors may be contributing including reduced populations of host fish and/or sedimentation in juvenile habitat.

In addition, the presence of many dead adult mussels *in situ* in the sediment suggests that adult survival is also decreasing in recent years. The adult mussels may simply be aging and reaching the end of their life span or they may be affected by multiple stressors in Lake Horowhenua, particularly degraded water quality and sedimentation. The results indicate that without in-lake interventions such as lake weed harvesting, the kakahi populations in Lake Horowhenua will eventually become extinct.

The Lake Accords interventions have targeted these potential causes of low recruitment including:

- The lake weed harvesting aiming to address the elevated pH and ammonia concentrations;
- Work to improve fish populations and diversity in the lake including the fish pass work and lake weed harvesting to address toxicity impacts on fish populations; and
- Work to target sediment reduction including installation of the sediment trap, work with Horticulture growers and the recent sediment study to inform sediment management.

Photo 1: Kakahi encountered from Lake Horowhenua during November 2017. Kakahi were returned to the water after measurement.

Annex E: Pest Fish Survey results

The pest fish survey was undertaken as a requirement of the consent conditions for the fish pass on the Hōkio Weir (Photo 1). Horizons was required to identify changes in the abundance, composition and size structure of pest fish species present in Lake Horowhenua as a result of the fish pass installation. This project also formed part of the work programme for the Te Mana o Te Wai project and was a collaboration between the Lake Trust, Horizons Regional Council and Niwa.

Gill net surveys were carried out in April 2017, prior to the installation of the fish pass, and during April and May 2018, a year post-completion of the fish pass.

Across 2017 and 2018, the main fish species captured in the gill nets were perch (2,420) and goldfish (266), with lower numbers of mullet (30) and rainbow trout (2) recorded. The perch were predominately large adult fish ranging between 350 and 500 mm and the goldfish population were predominately between 150 and 200 mm.

Monitoring indicated that populations of the main pest fish species recorded in Lake Horowhenua (perch, goldfish and koi carp) are all below the threshold density of 50 kg per hectare specified by consent conditions. Based on the current population structure and biomass of perch and goldfish there is no evidence to suggest that the abundance of these species within Lake Horowhenua has increased since 2017 as a direct result of the fish pass installed at Hokio weir.

Although koi carp are a difficult species to capture and all fishing methods will underestimate their abundance, the continued difficulty in capturing koi carp within Lake Horowhenua since 2013 suggests this species remains at densities below those known to cause adverse ecological impacts. It should also be noted that once resident in a lake, perch, goldfish and koi carp will readily breed and form self-sustaining populations. In this regard, changes in abundance and size structure can naturally occur independent of immigration into the system via the fish pass at Hokio weir.

Annex C

Annex F: State and Trends of Water Quality in the Lake Horowhenua Catchment

Prepared by Maree Patterson, September 2018
Senior Scientist – Water Quality
Horizons Regional Council

Introduction

The state and trends of water quality for the Lake Horowhenua Catchment has recently been assessed by Land, Water, People Ltd. as part of the Regional State and Trends of Water Quality Report. This Annex presents the current State and Trends of water quality in the catchment utilising Horizons state of the environment water quality data to 30 June 2017 for the Lake, the inflowing tributaries and the Hōkio Stream at the outlet of the Lake.

Trends

Gaps in the data as a result of health and safety issues and sampling access hinder the ability to assess trends in water quality for the Lake and tributaries. As such only trends in MCI are able to be reported. Over the 10 year period 2007 – 2017 All sites monitored for Macroinvertebrates (Lake Outlet, Patiki and Arawhata Streams) have too much noise in the data to determine a trend with confidence. However, both the Hōkio at Lake Outlet and Patiki Stream are indicating a general degradation in the Macroinvertebrate Community Index (MCI) over the period.

State

The state of water quality for the 5 year period (1 July 2012 – 30 June 2017) has been assessed against both the water quality targets identified in the One Plan (as a pass/fail) and against the attribute state bands in the National Objectives Framework (NOF) (NPS-FM, 2017).

The assessment against the One Plan targets are presented in Table 1 and Table 2.

- Ammoniacal nitrogen targets are met in both the Lake and the tributary streams.
- *E. coli* targets are met in the Lake but not in the tributaries with the exception of the Hōkio Stream at Lake Outlet during the bathing season.
- Nutrient targets are almost uniformly not met in the Lake and tributaries
- Where monitored the tributary stream fail to meet MCI targets.
- Clarity is uniformly not met in the tributaries.
- The Lake does not meet targets for chlorophyll *a*.

The assessment against the NoF is presented in Table 3 and Table 4.

- The Lake is below the national bottom line for all trophic status (nutrient and algae) attributes assessed.
- The tributaries are band E for *E. coli* with the exception of the Hōkio at Lake Horowhenua which is band B.
- Nitrate in the tributaries is band B or C with the exception of the Arawhata which is band D.
- Ammoniacal Nitrogen in the tributaries is spread across bands A-C.
- MCI compared to the Stark bands is poor (<80) at the Arawhata Stream and Hōkio at Lake Horowhenua sites and fair (<81 – 100) at the Patiki Stream site.

Table 1: Assessment of the water quality data for Lake Horowhenua against the One Plan Targets. Green means the site meets the specific target and red means the target is not met at the site.

Site Name	Chlorophyll *a* (average)	Chlorophyll *a* (maximum)	Total Nitrogen	Total Phosphorus	Ammoniacal Nitrogen	*E. coli* bathing	*E. coli* Year round
Lake Horowhenua	Fail	Fail	Fail	Fail	Pass	Pass	Pass

Table 2: Assessment of the water quality data for the Lake Horowhenua tributaries against the One Plan Targets. Green means the site meets the specific target and red means the target is not met at the site.

Site Name	Clarity	SIN	DRP	MCI	Ammoniacal-N (Max)	Ammoniacal-N (Mean)	*E. coli* (Bathing)	*E. coli* (year round)	Dissolved Oxygen Saturation
L Horowhenua Inflow at Lindsay Road	Fail	Fail	Fail	Not assessed	Pass	Pass	Fail	Fail	Fail
Patiki Stream at Kawiu Road	Fail	Fail	Fail	Fail	Pass	Pass	Fail	Fail	Fail
L Horowhenua Inflow at culv d/s Queen St	Not assessed	Fail	Pass	Not assessed	Pass	Pass	Fail	Fail	Fail
Queen Street Drain at L Horowhenua	Fail	Fail	Fail	Not assessed	Pass	Pass	Fail	Fail	Fail
Makomako Road Drain at L Horowhenua	Fail	Fail	Fail	Not assessed	Pass	Pass	Fail	Fail	Pass
Arawhata Drain at Hōkio Beach Road	Fail	Fail	Fail	Fail	Pass	Pass	Fail	Fail	Fail
L Horowhenua Inflow at Hōkio Sand Rd	Fail	Fail	Fail		Pass	Pass	Fail	Fail	Fail
Hōkio at Lake Horowhenua	Fail	Fail	Fail	Fail	Pass	Pass	Pass	Fail	Fail

Table 3: Assessment of the water quality data for Lake Horowhenua against the NoF Targets. Green = Band A, Yellow = Band B, Orange = Band C, Red = Band D (below national bottom line) and Dark Red = Band E (for E. coli only).

Site Name	NOF: Lake Phytoplankton (Median)	NOF: Lake Phytoplankton (Max)	NOF: Lake Total Nitrogen	NOF: Lake Total Phosphorus	NOF: Ammoniacal Nitrogen
Lake Horowhenua	D	D	D	D	Not assessed

Table 4: Assessment of the water quality data for the Lake Horowhenua tributaries against the NoF Targets. Green = Band A, Yellow = Band B, Orange = Band C, Red = Band D (below national bottom line) and Dark Red = Band E (for E. coli only)..

Site Name	*E. coli* combined	Nitrate combined	Ammoniacal- N combined
L Horowhenua Inflow at Lindsay Road	E	B	C
Patiki Stream at Kawiu Road	E	C	A
L Horowhenua Inflow at culv d/s Queen St	E	C	B
Queen Street Drain at L Horowhenua	E	C	A
Makomako Road Drain at L Horowhenua	E	C	A
Arawhata Drain at Hokio Beach Road	E	D	B
L Horowhenua Inflow at Hōkio Sand Rd	E	B	B
Hōkio at Lake Horowhenua	B	B	C

Annex G: Health and Safety Risk Management Considerations for the Lake Horowhenua Accord Work.

Prepared by Dave Griffith, HR Development. August 2018

Introduction

This document relates to the health and safety implications for the ongoing work done as part of the Lake Horowhenua Accord and Action Plan. This advice is from the viewpoint of Horizons Regional Council and its health and safety obligations towards is workers, other stakeholders' workers and the public.
Work carried out under the Accord includes – fish pass construction; sediment traps; weed harvesting on the lake; agricultural impact reduction initiatives; water quality monitoring, lake bed analysis and plant nurseries.

Operational Challenges

Since the implementation of the Action Plan there has been increasing opposition to the work from some members of the community. Horizons workers have been subjected to actual physical violence, threats and intimidation. The work being carried for the improvement of the lake and its surrounds is a statutory obligation, reducing the ability to simply cease to do the work. While some the initiatives have been halted in the interests of the health and safety of workers, this has been considered a temporary measure. For the full work programme to commence again there would need to be additional risk management solutions put in place to protect workers and others from further violence and intimidation.

Governance – Health and Safety Perspective

Horizons Regional Council is a Person Conducting a Business or Undertaking (PCBU) under the *Health and Safety at Work Act 2015* (HSWA). As a PCBU, Horizons Regional Council has a primary duty of care to 'ensure so far as reasonably practicable, the health and safety of workers who work for the PCBU' and also 'that the health and safety of other persons is not put at risk from work carried out as part of the conduct of the business or undertaking'. Under the HSWA, workers are identified as employees, contractors, sub-contractors and some volunteers (where a volunteer is an integral part of the organisation).

The HSWA appoints Officers of the PCBU to take on the responsibility for achieving the primary duty of care. For Horizons, the Officers of the PCBU are the elected members and the Chief Executive. The Officers of the PCBU are given six due diligence obligations that demonstrate that they are meeting the requirements of the HSWA. In relation to the Lake Horowhenua Accord work, the most relevant due diligence obligation is 'to ensure that the PCBU has available for use, and uses, appropriate resources and processes to eliminate or minimise risks to health and safety from work carried out as part of the conduct of the business or undertaking'.

It is important to note that under the HSWA 'Health means physical and mental health'. Physical and mental health has equal standing when it comes to meeting our health and safety obligations and managing risk.

Operational Risk Management

The HSWA requires that 'a PCBU who manages or controls a workplace must ensure, so far as is reasonably practicable, that the workplace, the means of entering and exiting the workplace, and

anything arising from the workplace are without risks to the health and safety of any person'. From an operational perspective, given the level of potential mental and physical harm that Horizons workers have been subjected to, there needs to be additional consideration given to the controls in place for minimising risk when the work is carried out. The current controls, although extensive have failed to mitigate the potential for mental and physical harm to occur. If work is to be recommenced in some of the areas where it has been temporarily halted, then management must be confident that 'all reasonably practicable steps' have been put in place to prevent further harm.

Working with other PCBU's

Horizons has other options at its disposal for the delivery of the required services as part of the Lake Horowhenua Accord Work. They could directly engage contractors to carry out the work, or take a further step back and provide grant funding for other stakeholders to facilitate the work. In both cases Horizons cannot extract itself completely from its obligations under the HSWA. PCBU's working together on a piece of work or a work programme need to 'so far as is reasonably practicable, consult, co-operate with, and co-ordinate activities with all other PCBUs who have a duty in relation to the same matter'. This means all the PCBU's involved have a stake in meeting the primary duty of care for the health and safety of workers and other persons.

If Horizons is engaging others to complete the work on their behalf in place of Horizons employees, there will still be a requirement for them to consult, cooperate and coordinate with the PCBU's they are partnering with. This includes sharing information on the risks involved in the work and the agreeing the control measures that will prevent harm. Regardless of who carries out the work, Horizons will not be able to remove itself completely from its duty of care under the HSWA.

Report No.	20-31
Information Only - No Decision Required	

QUARTERLY UPDATE: CLIMATE CHANGE POLICY PROGRAMME

1. PURPOSE

1.1. The purpose of this paper is to provide Council with an overview of activities being undertaken on Climate Change across Government. This quarter the focus is largely on the implications for Council of the promulgation of the **Climate Change Response (Zero Carbon) Amendment Act 2019 (the Zero Carbon Act)**.

2. EXECUTIVE SUMMARY

2.1. The Government has an ambitious programme of work to address climate change. Some of this work is delivered through legislation, such as the Zero Carbon Act, along with the establishment of initiatives and targeted funds to deliver environmental improvements, build community resilience and ensure a just transition that provides for social and economic wellbeing.

2.2. While the Act only directly requires Councils to undertake an information collection and response role, considerable work remains in understanding how the Act will work in practice to deliver on the Zero Carbon aspirations that are now set out in legislation. It is not yet clear how local issues will be accommodated in national plans, nor what will be expected of local government. In the meantime, Horizons is continuing to develop our advice in response to climate change. This encompasses a draft strategy and an initial set of actions (including a regional vulnerability assessment).

3. RECOMMENDATION

That the Committee recommends that Council:

a. receives the information contained in Report No. 20-31.

b. notes that Horizons staff will continue to seek clarity from the Ministry for the Environment on the role of regional councils under the Climate Change Response (Zero Carbon) Amendment Act 2019.

4. FINANCIAL IMPACT

4.1. There is no financial impact arising from this item.

5. COMMUNITY ENGAGEMENT

5.1. Community engagement on the national policy discussed in this report is the responsibility of central Government. Council will have an opportunity to consider community engagement in the context of its own approach to climate change in the coming months.

6. SIGNIFICANT BUSINESS RISK IMPACT

6.1. There is no significant business risk associated with this item.

7. BACKGROUND

7.1. Government has an ambitious programme of work to address climate change effects, and to make tangible progress in meeting the international commitments arising from the Paris agreement and the United Nations Framework Convention on Climate Change.

7.2. Two legislative amendments have been made to the Climate Change Response Act 2002; New Zealand's principal piece of climate change legislation. The first was the Zero Carbon Act, which provides a framework for climate change mitigation and adaptation, and came in to force in November 2019. The second amendment, the **Emissions Trading Scheme (ETS) Bill** is currently before the House. Horizons submitted on both amendments to Select Committee.

7.3. The Zero Carbon Act supports New Zealand's contribution to the global effort under the Paris Agreement to limit the global temperature to 1.5 degrees Celsius above pre-industrial levels. The Zero Carbon Act also lays out an approach for New Zealand to adapt to the impacts of climate change. The Act commits Government to:

- Assess the climate associated risk and opportunities by producing a **National Climate Change Risk Assessment (Risk Assessment)** every six years;
- Produce a **National Adaptation Plan (NAP)** in response to each Risk Assessment; and
- Set emissions reduction targets to reach net zero carbon emissions by 2050.

7.4. The Ministry for the Environment maintains a number of data sets relating to climate change, particularly **greenhouse gas emissions (GHGs)**. The Ministry recently released New Zealand's fourth biennial report under the United Nations Framework Convention on Climate Change, which reports on New Zealand's progress towards GHGs and the policies that support climate change efforts: https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/4th-biennial-report-2019.pdf

7.5. In addition to these legislative changes, the Ministry for Business, Innovation and Employment (MBIE) houses the Just Transitions unit. This unit was set up in recognition that the need to mitigate and adapt to the impacts of climate change requires active planning. With planning, the Government aims to ensure that the transition to new technologies, new work (and opportunities) and globalisation is fair, equitable and inclusive. The current focus of this unit is on the Taranaki Region, as they look to reduce their economic dependence on offshore oil and gas exploration.

7.6. The Ministry for Primary Industries houses Te Uru Rakau, the Forestry branch which has embarked on the "Billion Trees" planting programme. This programme is a 10-year afforestation programme to replant 500,000 production trees due to be harvested, and grow the overall forestry estate by a further 500,000 trees. Currently, tree planting is New Zealand's most significant initiative to contribute to carbon sequestration, and generate carbon credits under the ETS.

8. IMPLICATIONS OF THE ZERO CARBON ACT

8.1. Adaptation Planning

8.1.1. The first National Climate Change Risk Assessment (Risk Assessment) is underway and due to be published in mid-2020. Due to timing, there are limited opportunities for meaningful input from local government and other relevant stakeholders. Horizons staff have attended workshops where possible: the Risk Assessment looks likely to generate a useful list of generic issues; we do not anticipate that it will include significant local risks.

8.1.2. In response to each Risk Assessment, the Minister must prepare a National Action Plan (NAP) setting out Government's objectives for adapting to the effects of climate change;

strategies, policies and proposals for meeting objectives; and, timeframes for implementing these. The first NAP is scheduled to be published by mid-2022.

8.1.3. Over the course of the past year, Horizons staff have been working with colleagues from district councils in the region to scope a proposal to conduct a regional vulnerability assessment. The intent of this project is to identify key, local issues within the region – an important step for us to develop a robust regional action plan. To the extent that any issues we identify within the region are nationally significant, the Minister could take these into account alongside the Risk Assessment in preparing the NAP.

8.2. Reporting Requirements

8.2.1. The Zero Carbon Act's only specific requirement of local government is to respond to requests for information. The Minister or the Climate Change Commission may request:

- a description of the organisation's governance in relation to the risks of, and opportunities arising from, climate change;
- a description of the actual and potential effects of the risks and opportunities on the organisation's business, strategy, and financial planning;
- a description of the processes that the organisation uses to identify, assess, and manage the risks;
- a description of the metrics and targets used to assess and manage the risks and opportunities, including, if relevant, timeframes and progress;
- any matters specified in regulations.

8.2.2. While the Act does not explicitly require councils to take any particular action in relation to climate change, these reporting requirements suggest an expectation that we be doing so on our own account. National direction to local government may well develop over time (for example, following preparation of the first NAP).

8.2.3. In anticipation of the requests for information, the climate strategy (and vulnerability assessment) will likely provide many of the answers. However, Horizons staff will also consider what information may be need to be collected that is complementary to data that we already hold. This may have cost implications for the Council over time.

8.3. Emissions Targets

8.3.1. Local government does not, at this point, have any specific role in achieving emissions targets or carbon neutrality under the Zero Carbon Act. Members will be aware that the Local Government Act 2002 is similarly silent: a proactive response to climate change (including emissions reductions) can be read into 'providing for the future wellbeing of communities' (s10) but is not explicitly required. While the **Resource Management Act 1991 (RMA)** requires us to 'have particular regard' to the effects of climate change (s7), it also precludes planning rules from having regard to the effects of greenhouse gas discharges on climate change (s70A).

8.3.2. As has been noted above, the Government's primary tool in achieving emissions reductions is the ETS. However, the Government also acknowledges that the ETS alone will not be sufficient to meet our climate change targets. Supporting policies will be necessary to achieve the scale of economic and behavioural change 'zero carbon' implies. These include measures to produce more renewable energy, decarbonise transport, improve agricultural productivity and sustainability, and encourage forestry. These 'complementary policy measures' will all require close engagement between central and local government.

9. CONSULTATION

9.1. No consultation was required in the preparation of this report.

10. TIMELINE / NEXT STEPS

10.1. Submissions to the Ministry for the Environment on the proposed ETS settings closed on 28 February, and we will monitor the outcomes from this consultation, as this policy work is complementary to the submission points the Council made on the ETS Bill. There is unlikely to be significant implementation work arising from these changes for the Council.

10.2. We are continuing to develop our advice on Horizons' response to climate change. This encompasses a draft strategy and an initial set of actions (including a regional vulnerability assessment) that Council may wish to consider in the context of its Annual Plan and the Long-Term Plan.

10.3. In parallel, staff will proactively engage with central government officials and other councils to develop consistent methodologies across regions and integrate local considerations into the national frameworks being developed.

11. SIGNIFICANCE

11.1. This is not a significant decision according to the Council's Policy on Significance and Engagement.

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POLICY ANALYST – CLIMATE CHANGE

Tom Bowen
PRINCIPAL ADVISOR

Rebecca Tayler
MANAGER POLICY & STRATEGY

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ANNEXES

There are no attachments to this report.

Report No.	20-32
Information Only - No Decision Required	

OLD MAN'S BEARD MANAGEMENT IN THE HORIZONS REGION

1. PURPOSE

1.1. This paper reviews the current programme on old man's beard (OMB) control, provides an assessment of options for its future management within Horizons' Region and seeks Councillors guidance on next steps for this programme.

2. EXECUTIVE SUMMARY

2.1. Old man's beard is our region's worst terrestrial weed and accounts for the Council's single biggest annual spend against a pest plant species. Old man's beard colonises disturbed or open forests, shrub lands, riversides, cliffs, bush tracks, roadsides and hedgerows, and is also in urban areas. Horizons has managed OMB via rules or active management programmes since Regional Councils were established in 1991 and currently spends approximately $650,000, either directly or by supporting community initiatives and site protection. Communities support the reduction of OMB and generally desire more control in places valued for recreation or aesthetic values. Many of our significant biodiversity sites are threatened by OMB with others already lost to smothering, leading to species reduction.

2.2. Horizons has championed biological control of OMB with a goal of reducing vigour and spread, to reduce the dominance it exhibits currently. Multiple insect and disease agents have been trialed but we have not yet achieved any significant impact. The OMB gallmite is currently a focus. Other new-to-New Zealand agents are being investigated and are worth pursuing, however future known options are limited.

2.3. Control typically requires re-visiting historic sites and regular surveillance by ground and/or air of valued sites and large areas of potential habitat to find new plants, which are invariably adult. Control is usually achieved chemically at a cost of up to $1,500/ha. Chemical control can pose a risk to the local ecosystem being protected. Many sites are within One Plan Schedule F rare biodiversity habitat and widespread chemical application is generally unsuitable in these locations.

2.4. Horizons' current approaches of control within sites of high value and areas where OMB is sparse is sound. Horizons' Regional Pest Management Plan includes areas where OMB is actively controlled, the **Active Management Zone** (AMZ) and an area that is not controlled, the **Good Neighbour Process Zone** (GNPZ). Pressure on the AMZ increases as the non-controlled area 'fills-up' and spreads. The current biosecurity programme is 'holding the line' within the AMZ, with 75% of the 2,000 or more sites we manage at Zero levels. However, new sites are being found every year. Horizons' Biodiversity programme, which works across the AMZ and GNPZ is similarly impacted by a large and increasing burden of OMB that compromises the long-term integrity of sites and incurs considerable costs.

2.5. Assessment of the current approach concludes that the Regional Pest Management Plan and biodiversity goals will not be met. Suppression, not eradication of OMB in the AMZ will become more likely. Further, there will be limited biodiversity protection in the priority habitats that Horizons manages, due to control being focused within sites, without buffer control around sites to reduce reinvasion.

3. RECOMMENDATION

That the Committee recommends that Council:

a. receives the information contained in Report No. 20-32.

b. notes the projected outcomes from the current control programme in relation to regional pest management plan and biodiversity protection.

4. FINANCIAL IMPACT

4.1. There is no financial impact of this paper.

5. COMMUNITY ENGAGEMENT

5.1. This item is presented to Council to transparently report the review of OMB control that has recently been completed. Old man's beard control is delivered in partnership with some community groups and is a topic that has been submitted on via the Regional Pest Management Plan process and Long-term Plan/Annual Plan budget process. This item is presented in a public forum.

6. SIGNIFICANT BUSINESS RISK IMPACT

6.1. OMB does not have a significant business impact, but there is a risk that the Regional Pest Management Plan goal of zero level goals within the AMZ will not be met by the goal date of 2037; there is also a risk to our biodiversity site integrity from OMB infestations. This review is to provide an overview of the risk and options in relation to this and seeks Councils guidance on next steps for the programme. There is also a risk Horizons faces via the perception of non-action in the area OMB is not controlled (GNPZ).

7. BACKGROUND

7.1. Old man's beard is known to have been in the Horizons Region from around the 1930s and local lore has it that the Taihape mayor's wife imported it for her floral arrangements. Then it was more likely known by its European nickname, Travellers' Joy, a plant desired for its flowers and fluffy seed heads that were useful in floral art. Since then, terrestrial habitats across New Zealand have undergone widespread transformation and the invasive OMB gained widespread public attention during the late 1980s (Figure 1). This galvanised ongoing action by catchment boards and government organisations to control this pest plant, which has been declared an unwanted organism under the Biosecurity Act 1993, prohibiting its sale, distribution and propagation. OMB's ability to spread freely on the wind, grow quickly, and smother all but the largest trees has seen permanent loss of many indigenous habitats as well as the creation of weed problems in amenity plantings, forestry and river management vegetation.

Figure 1 Bring back Bellamy. The face of old man's beard in the 1980s was TV presenter, botanist and environmental campaigner David Bellamy.

7.2. National spread continues and although some councils have ceased work and many areas managed by others have been left to let nature take its course, there remains a strong desire to keep OMB in check. Management approaches around New Zealand include:

- Exclusion – keep it out of a region;
- Eradication – completely remove it from a region;
- Progressive Containment – remove all plants from large areas where the current population is beatable and push back towards the entrenched infestation;
- Site-led control, where high value biodiversity sites are kept free of OMB and ingress is prevented by control work within a buffer area.

7.3. Alongside direct intervention by chemical or physical control, there has been a long-term search for biological control agents to minimise the effect of OMB in areas too costly or sensitive for usual control methodology to be effective. Horizons has been a lead agency in the search for biological control options, including a current DNA analysis of the New Zealand OMB population to compare to the plant's northern hemisphere home range in hopes of locating any future biological control options.

7.4. This paper provides a review of the current programme and an assessment of options for future management of OMB within Horizons' Region and is part of a staff review of progress on the Regional Pest Management Plan in 2020 to be presented to Council in April-May 2020. Given the significance of the spend on OMB, this item has been completed as a separate piece of work. Information is sourced from, and reference given to, two of the previous management reviews Horizons has recently conducted to ensure the approach and goals of management are best suited to controlling OMB in a regional context. These documents are available for reference: Review of Horizons Regional Council Old Man's Beard (*Clematis vitabla*) Management Strategy, Cam Speedy and Peter Williams, October 2010; Can we keep the lid on old man's beard? Consideration of management options for old man's beard in Horizons' Region, Diederik Meeneken, 2013.

Figure 2 Old man's beard has invaded this stand of kowhai at Moawhango near Whanganui (M.Matthewson).

Why control old man's beard?

7.5. Old man's beard is the worst terrestrial weed in our region. It is named for the attractive mass of fluffy seeds that persist on the plant over winter. It was introduced into New Zealand and we believe into Taihape, as an ornamental before 1922 and was well naturalised by 1935. It is native to Europe, where it achieves minor pest status in forests and vineyards (Mihajlovic *et al*., 1998). However, in Europe it does not form the vigorous thickets with massive stems that damage lowland forest fragments in many parts of New Zealand. It is also regarded as invasive in the Pacific Northwest region of the United States and Canada, and in Maine and Ontario (ISSG 2017).

7.6. Old man's beard colonises disturbed or open forests and forest margins, shrub lands, riversides, cliffs, bush tracks, roadsides, hedgerows and vacant land (Gourlay *et al*., 2000) and is also a troublesome urban weed. It is adventive, i.e. introduced but not fully naturalised, throughout much of NZ, predominantly south of Auckland. Without a national weeds database the best distribution map available is the **Department of Conservation** (DOC) database (Figure 3). The most heavily infested areas in Horizons' Region are the wider Taihape and Turakina Valley high country, the middle and lower stretches of the Rangitīkei and Turakina River corridors, Whanganui urban area, Pahiatua and much of the Tararua District including the Manawatū River corridor. An example of OMB impact on a site in the region is provided in Figure 2. Many other regions are heavily impacted by OMB spreading significantly into and over vulnerable habitat, to the extent that control is deemed not to be feasible and OMB is now ubiquitous in the landscape.

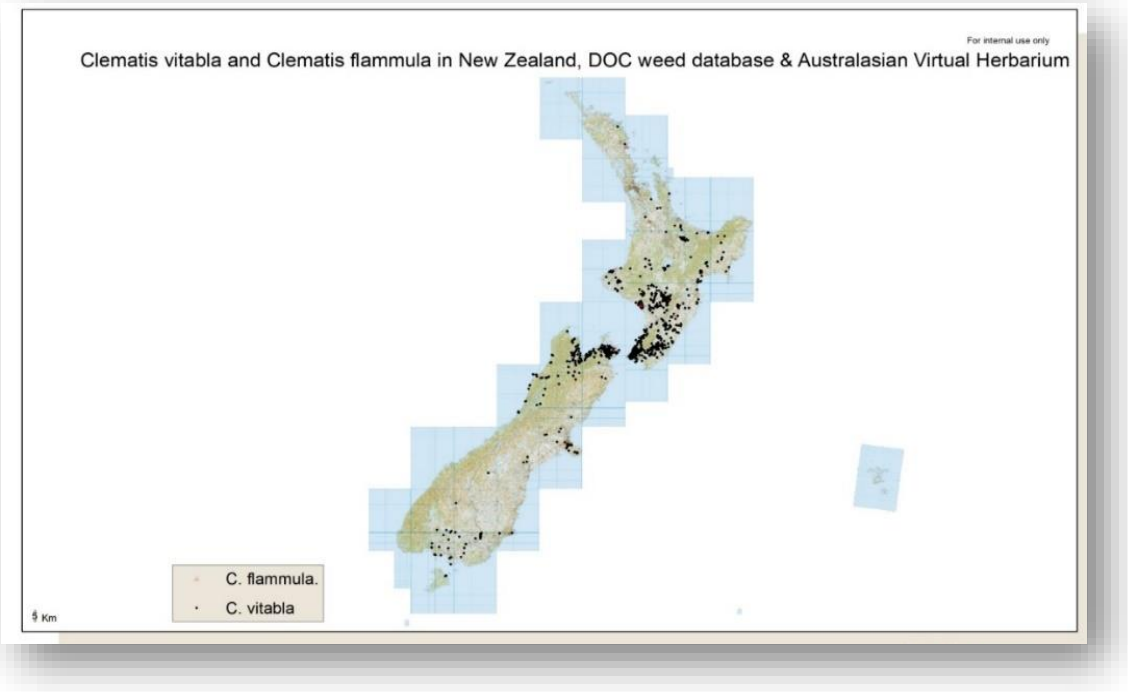

Figure 3 Distribution of old man's beard, 2018.

7.7. Old man's beard can attain a density of 7,000 stems per hectare and a fresh weight increment of 6.3 kilograms per square metre per year. Stems can grow an average of 2.3 metres in one year, producing 20 new nodes. Plants spread both by seed and adventitious roots. West (1992) recorded an average seed fall at one site of 65 seeds per square metre per year, and estimated the life of seed in the soil to be 8-10 years. Seeds are borne on wind or water, but OMB can also spread by stem layering and can establish where garden refuse is dumped.

Old man's beard's impact on biodiversity

7.8. OMB invades forests from the edges or from canopy gaps. The vines can grow more than 20 metres, scrambling over low-growing vegetation or climbing into undergrowth. Vines ascend into the canopy and can climb large-diameter trees if shrubs and smaller trees provide 'stepping stones' to the crown. Vines can smother and collapse the forest canopy, leaving only tall emergent trees. Curtains of OMB create dense shade, killing plants growing beneath and stopping regeneration from seedlings.

7.9. Ogle *et al*. (2000) found there is little regeneration of remnant species, even where the vine has been cleared, likely due to control methodology at the study site and the ingress of other weed species. The study, highlighted graphically in figure 3, showed the number and variety of understorey trees and shrubs at a Central North Island site near Taihape had been severely reduced following infestation with *C. vitalba*, and the authors concluded that already-vulnerable species had been disproportionately affected by OMB. They concluded the presence of OMB had resulted in local extinction of uncommon species. Based on the evidence that *C. vitalba* can significantly degrade tall mixed podocarp forest, it has one of the highest weed rankings in the DOC weed database.

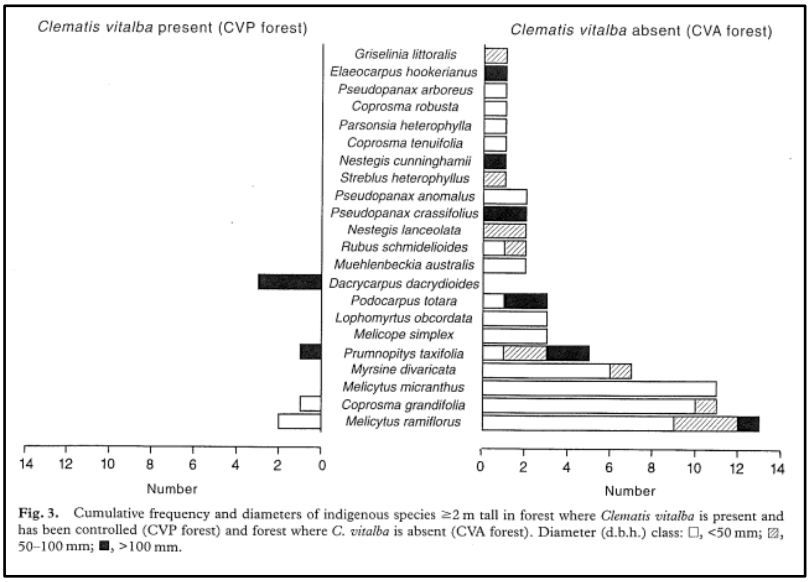

Fig. 3. Cumulative frequency and diameters of indigenous species ≥2 m tall in forest where *Clematis vitalba* is present and has been controlled (CVP forest) and forest where *C. vitalba* is absent (CVA forest). Diameter (d.b.h.) class: □, <50 mm; ▨, 50–100 mm; ■, >100 mm.

Figure 4 Impact of OMB on native species variety, abundance and age class in comparative reserves near Taihape, one with *C. viatalba* present (CVP), one where it is absent (CVA).

7.10. One of the worst examples of its impact on native biodiversity and transformational change to landscapes is the middle reaches of the Rangitīkei River corridor. Downstream from Mokai, OMB is too dense and growing in too difficult terrain to effectively manage, retain successful control and allow a return to a sustainable native vegetation mix. This is evident in Figure 5, where old man's beard can be seen completely smothering vegetation, likely the locally endemic kowhai (*Sophora godleyi* aka Godley's kowhai, papa kowhai or Rangitīkei kowhai), and turning a once dynamic and diverse mixed-height canopy into blanketed stems and a monoculture of OMB.

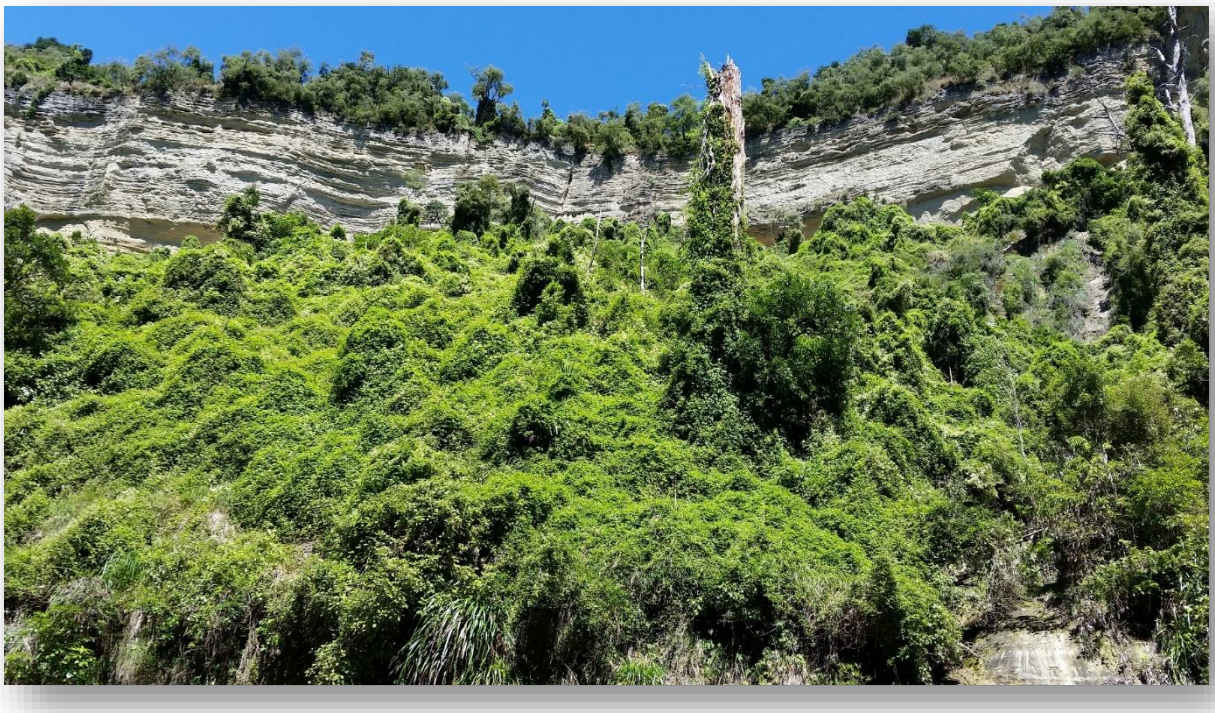

Figure 5 Old man's beard, Rangitīkei River. Old man's beard is in the middle below the cliff, dominating all but the tallest emergent trees (D.Havell, DOC).

Old man's beard's impact on forestry and farm land

7.11. Private landowners incur costs for shelter belt management on farms and orchards, and when restoration work is implemented to restore native habitats.

7.12. Old man's beard vines impede both productivity and operations in production forests (Figure 6) and in areas set aside for retirement or riparian planting. It is controlled in the farmed landscape by a competitive pasture sward and by sheep and cattle browsing. Withdrawal of grazing in areas where OMB is present can result in almost immediate invasion. Livestock are normally excluded during the establishment of new forests, allowing OMB to establish. Following harvest, bare ground and slash provide an ideal nursery environment for OMB seedlings. Forest compartments are occasionally subject to respraying and replanting of a second rotation due to OMB. One Taihape-based farm forester would not replant because OMB affected tree quality.

7.13. Old man's beard also appears to have a tolerance to terbuthylazine, a herbicide used to provide long-term suppression of competing weeds in forests. This allows OMB to establish adjacent to forest seedlings which it can climb and smother, reducing yields. OMB also impedes access for silvicultural work, and the risk to workers felling trees bound up with OMB poses health and safety-related costs at harvest. There is no exotic forest species currently growing in New Zealand that can outgrow OMB, so without effective control forest estate can be significantly impacted with many forests unable to re-establish without chemical control strategies targeting OMB.

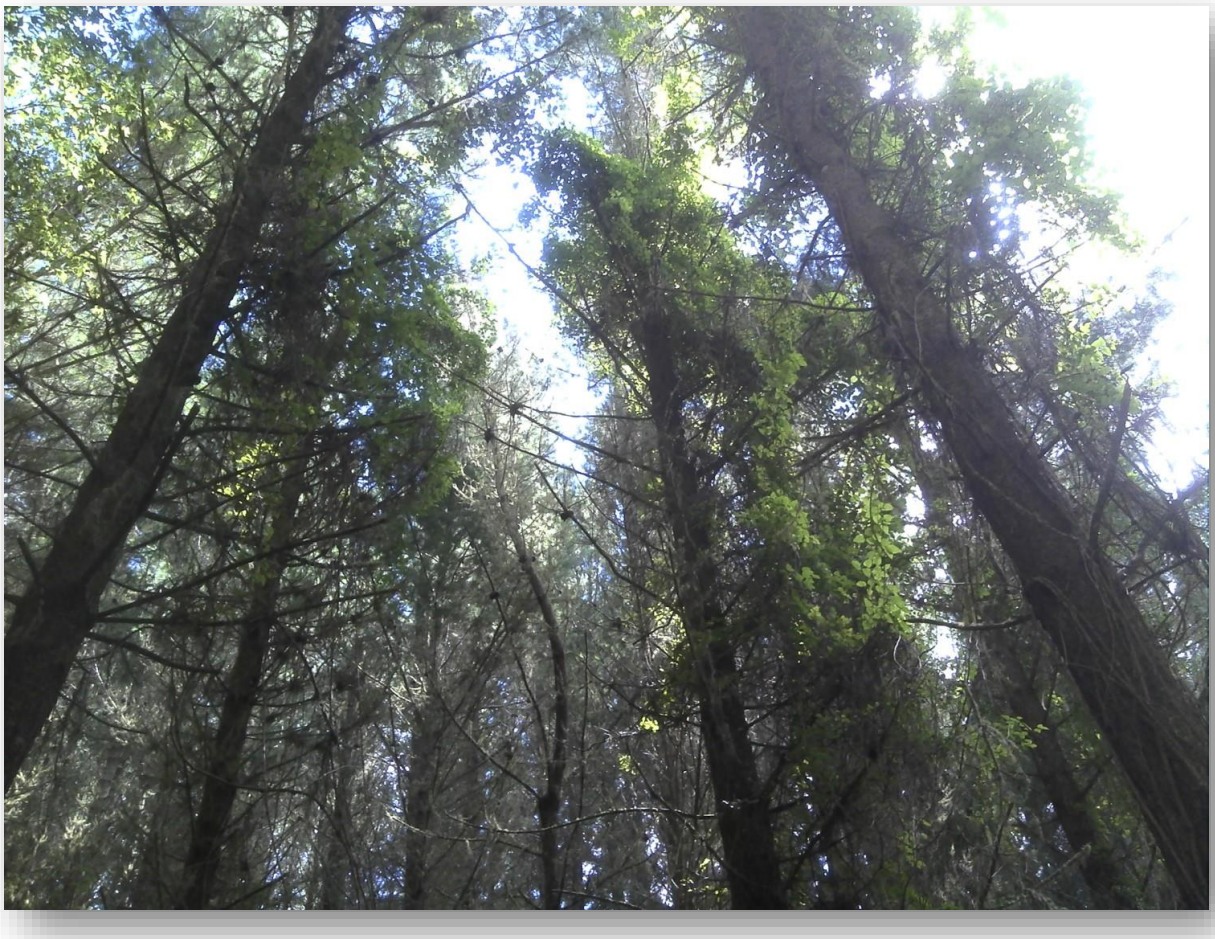

Figure 6 Old man's beard reaching to the crowns of production forestry trees (D. Alker).

Old man's beard control in Horizons' Region

7.14. Horizons has chosen to manage OMB, given the large impact large populations can have on native biodiversity, amenity plantings, forestry and other natural assets. A number of community groups receive either funding or advice when working on infestations not managed by Horizons staff. Since 1996 Horizons has managed OMB via the Biosecurity Act and has included it within Regional Pest Management Strategies (now Plans). Horizons started by placing responsibility on occupiers and this includes regulatory rules. The current Regional Pest Management Plan (the Plan) requires that Horizons manages control programmes within a mapped (Figure 7) Active Management Zone (AMZ, 828,000 ha), and boundary control is enforced via a good neighbour rule within the GNPZ covering all of the region outside the AMZ. Staff currently manage live and historic infestations which cover a total of 3,314 ha. Approximately 16 ha (a measure of the area of occupancy (AOO) or plant cover) of plants (Figure 8), across approximately 2,000 sites of which 75% are at zero-levels (Figure 9). 'Zero levels' is the state where a site is either clear or only presenting seedlings with no risk of spreading.

7.15. Horizons also controls OMB within and around high value biodiversity sites under the Biodiversity programme across the entire region. OMB is a constant threat to the integrity of many of our pristine sites and can be the main determinant of whether a location is added to the programme, in view of the cost and long-term nature of any control, potential collateral damage due to the control operations and the likelihood of reinvasion from nearby seed sources. A typical annual cost of $50,000 is needed to maintain the current level of control but this is well short of the actual sum required to effectively protect our top biodiversity locations.

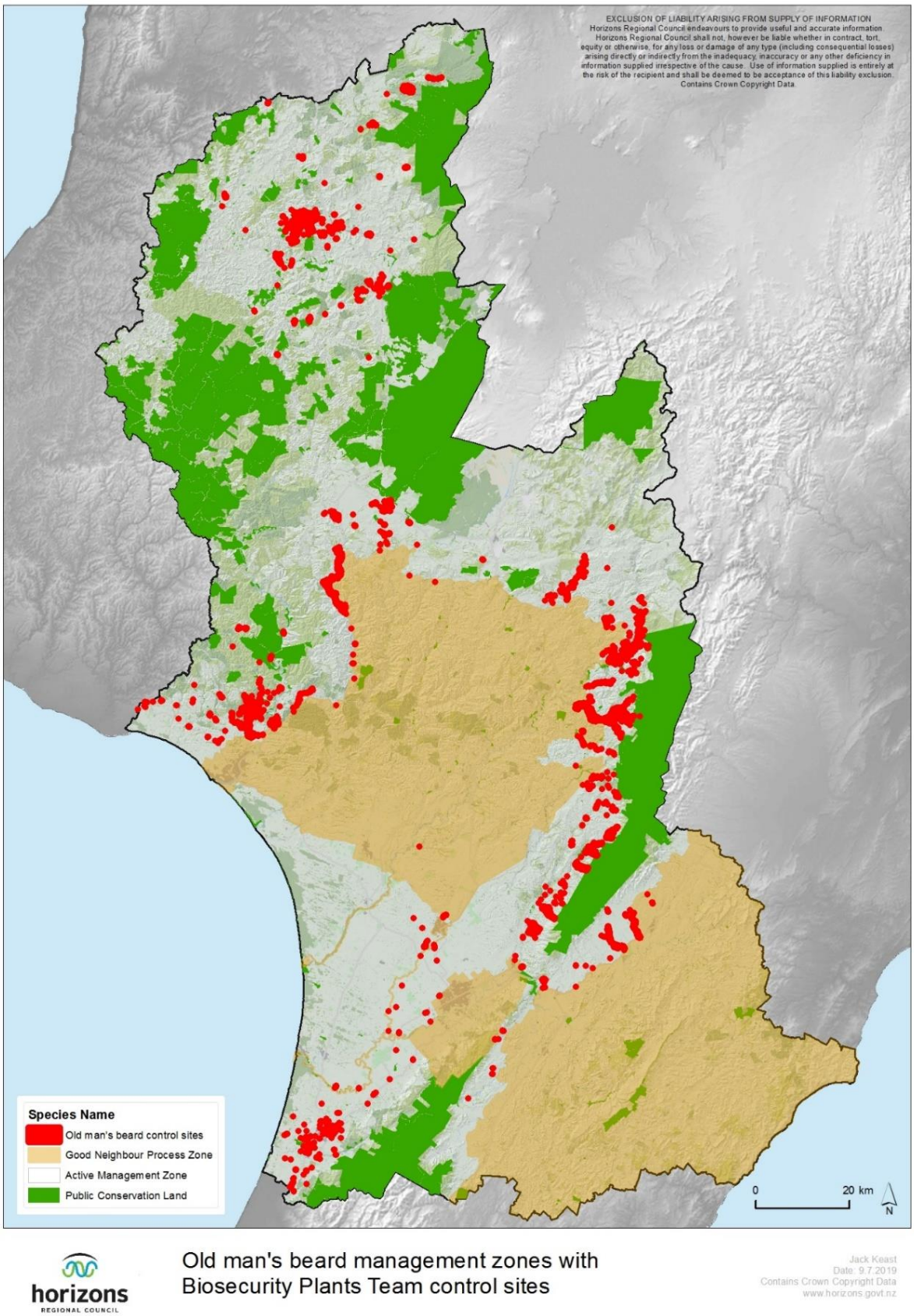

Figure 7 Old man's beard management zones and Biosecurity plant control site distribution. Please note this excludes the work by the biodiversity team.

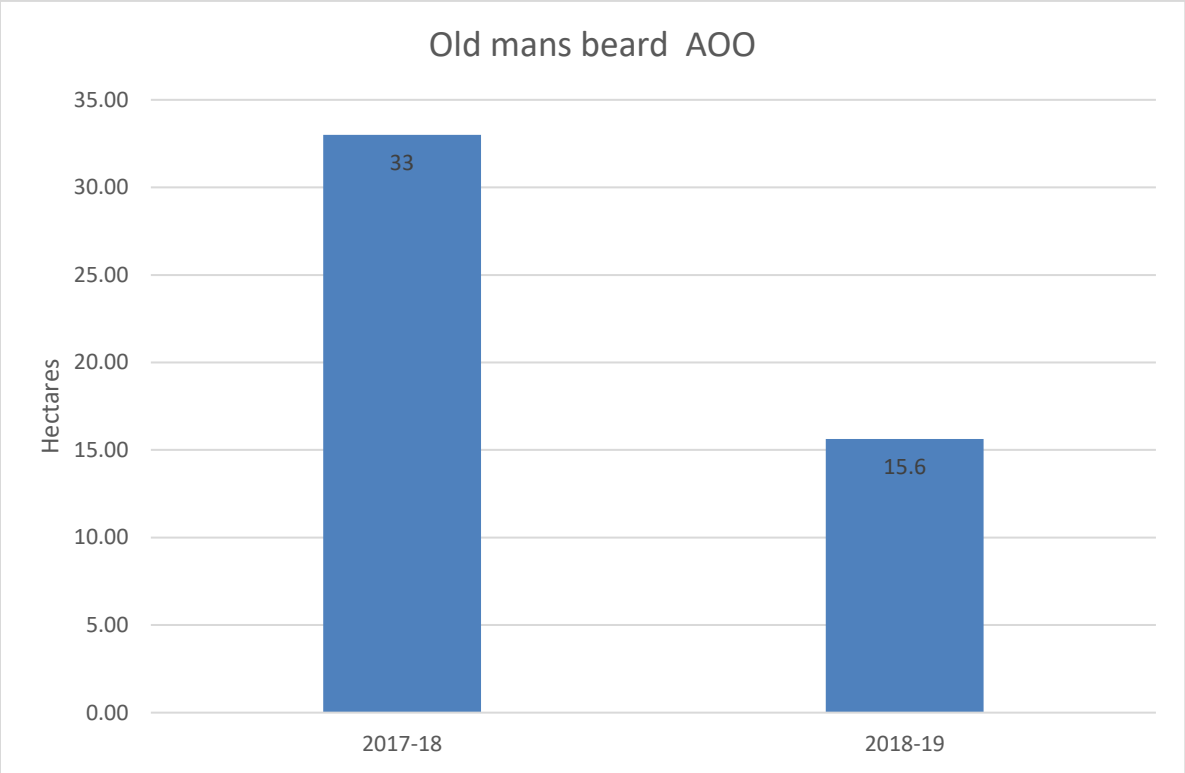

Figure 8 Old man's beard Area of Occupancy measure; accumulated plant cover within AMZ (known). (Data source: WEEDS2.0).

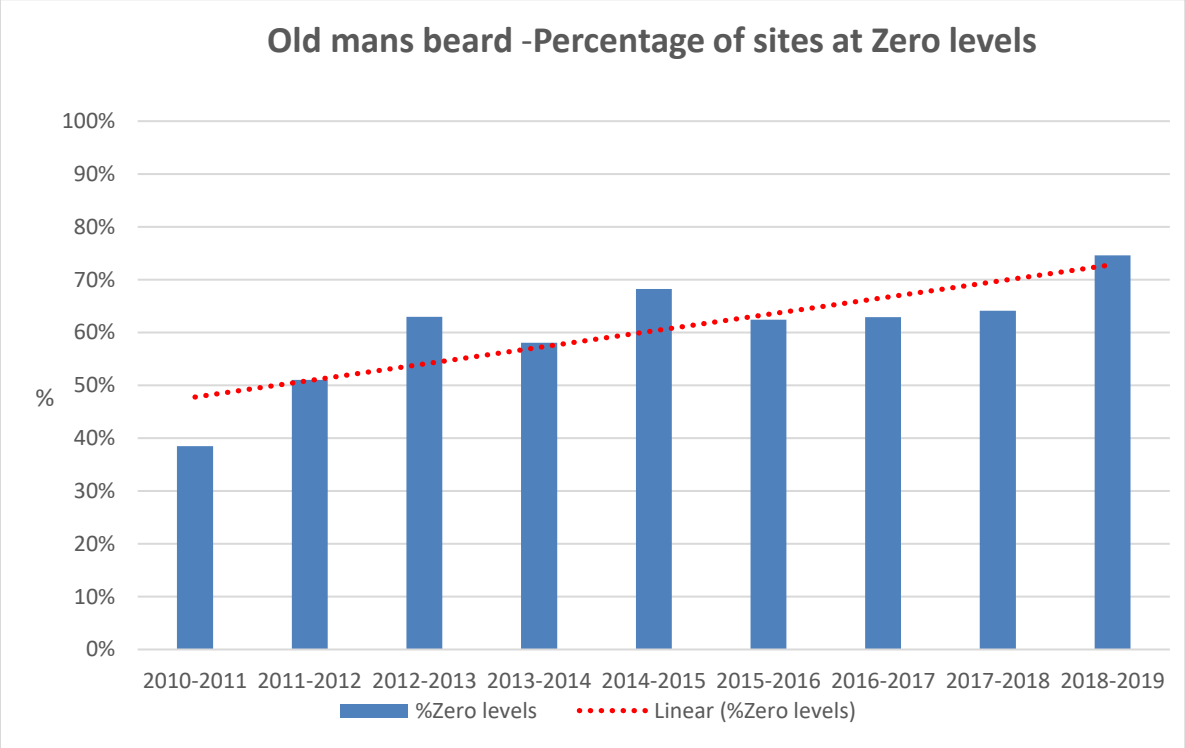

Figure 9 Old man's beard site status tracking. (Data source: WEEDS2.0)

7.16. The current Horizons expenditure against OMB is approximately $700,000 annually. The total spend within Horizons can be difficult to accurately sum as a number of teams undertake control operations against OMB as part of various control programmes. However, an approximate split of costs follows:

- External spend on contractors to undertake spraying and surveillance $330,000. Split across Biosecurity Plants, Biodiversity and River Management groups.
- Support of Rangitīkei Environment Group (REG) $110,000 through the biodiversity budget.
- Internal staff time on control (including project management) $230,000. Split across Biosecurity Plants, Biodiversity and River Management.
- Investment in biological control programmes – from DNA analysis of the national population to importing agents and purchasing populations to release $40,000, funded from Biosecurity Plants.

7.17. Control occurs across the Biosecurity Plants, Biodiversity and River Management teams. It is also a consideration and cost in the Freshwater team's riparian planting as well as retirement planting through the Land team's **Sustainable Land-use Initiative** (SLUI) programme.

7.18. Overall data from our WEEDS2.0 database (Figures 8-9) show that where we do manage sites, we are winning by reducing biomass and preventing seed dispersal, and that we are on track for eradication of these sites at some point in the future. The current 75 percent of sites at Zero levels includes historic and recent discoveries. Eighty-eight percent of sites with more than three years management are at Zero levels. The map in Figure 7 is skewed to the data collected by the Biosecurity pest plant team and misses the very heavy infestations within the GNPZ. It is noted that there are challenges in pooling all of the data for OMB control by the various teams within Horizons.

Partner organisations

7.19. **Territorial local authorities** (TLAs) such as Whanganui, Rangitīkei and Palmerston North councils also fund OMB control, as does the **Department of Conservation** (DOC), KiwiRail and many landowners.

7.20. Territorial local authorities focus control of OMB within local parks and reserves and may support public groups in these initiatives. Old man's beard within road corridors inside the AMZ is now TLAs' responsibility. Most of the TLAs' urban areas, except for Levin, Taumarunui and Ohakune, are within GNPZs. The TLAs are meeting their obligations under the Regional Pest Management Plan (RPMP) and Palmerston North City Council works in a collaborative cost-share initiative with the Horizons Weedbusters programme to control OMB in the city's green belts.

7.21. DOC is represented by a number of area offices within the region and has a substantial land area in the region. DOC and Horizons endeavour to align work programmes to achieve the results deemed best for the region but budget constraints and prioritisation differences have meant this ideal is not always achieved. DOC is under constant fiscal pressure for species-led weed programmes, as well as an expectation from the public and partner organisations to do more against OMB. The newly presented funding opportunity of the government's International Visitors Levy was the impetus for a recent assessment of expanded control scenarios and during 2019 DOC priced four scenarios for OMB management within the Rangitīkei and Manawatū districts:

Year one costs of the four scenarios are:

- Eradication across the Rangitīkei and Manawatū districts $4.4 million;
- Zero-density in all PCLs within Manawatū district $2.1 million;
- Retain the conservation values of DOC land (suppression of current infestation), and Zero density in high-value conservation areas, $518,000; and
- Seek removal of OMB from the Ruahine Forest Park and install a 1.5 km buffer, $463,000.

7.22. The costs were based on DOC and Horizons staff current distribution knowledge in 2019 and on actual current spend against the infestation types present in the target area. Given the current weed burden and the nature of many infestations, the areas for control were understandably large and also dependant on the ultimate goal sought. At the time of writing Horizons is not aware of any decision having been made on the success of this bid.

7.23. KiwiRail has the same requirements as TLAs to manage pest plants under the Regional Pest Management Plan. Old man's beard is not heavily infesting the rail corridor within the AMZ and given the access issues for working within the corridor, staff are reporting any sites discovered directly to the certified contractor for KiwiRail. KiwiRail has in the past undertaken work within the work area of the Rangitīkei Environment Group (REG) to support their local goals.

Non-governmental organisations

7.24. Old man's beard creates management problems and costs to gardeners as well as stewards of reserves and is a great disappointment to those who see what is happening within the GNPZ where a single species is altering the vista and ultimately the essence of once diverse and unique local habitat and landscapes. Community groups are well represented among those against OMB. The Rangitīkei Environment Group is a well-structured group supported by approximately $110,000 annually from Horizons via a Rangitīkei District resident targeted rate as well as assistance with planning by Horizons and Rangitīkei District Council. This group has long been an advocate and manager of OMB control operations across District Council and private land. Initially focussed on Taihape scenic reserves, the group tackles OMB infestations across a range of sites in the Rangitīkei District.

7.25. Forest & Bird is a well-informed and active group championing the control of OMB through the maintenance of many reserves along with QE2Trust registered owners of similar blocks. Groups at Mangaweka, Whanganui, Pongaroa and elsewhere have formed over the years to tackle OMB in parks or within wild areas. However, most disband without achieving their desired outcome generally due to pitching too big a vision and not having the support or funds to allow success and/or prevent the gains made from clearing the plant being lost due to spread from nearby infestations that have not been controlled.

Figure 10 Whanganui old man's beard warriors attacking vines in the suburb of Aramoho (N.Gallagher).

Current management of old man's beard by Horizons.

7.26. Management of OMB can take many forms, depending on the desired outcome and the outcome which is achievable given specific factors. A successful control outcome is dependent on factors such as the abundance of OMB, ability to find individuals prior to seeding/spread, tool availability to control an invaded habitat, control of re-invasion factors, the cost of control and impact of control operations on habitat.

7.27. Old man's beard is abundant and well distributed in the region (Figure 9), hence the current approach of working back towards the entrenched infestations from the scattered, less established areas. Finding OMB prior to flowering and the subsequent risk of seeding requires both ground and aerial surveillance due to a dispersal range from known parent sites of potentially many kilometres. Once it is found, successfully treating OMB typically requires ground access as what may be seen from the air is usually only a fraction of the individual plants at a site. This poses problems in dense bush with light-well invasion, such as along river cliffs, roadsides and other challenging access environments. Mature vines have been known to re-grow after herbicide application and herbicide use is not without potentially significant risk of collateral damage to desirable vegetation. The cost of aerial surveillance and the time resource for staff to ground-truth or de-limit infestations is currently a limiting factor in Horizons' distribution knowledge and influences a required prioritisation of treatment to certain zones within the AMZ on an annually modified rotation.

7.28. To support best practice control and management of OMB, Horizons is sponsoring ($25,000) 'Improving Management of Old Man's Beard' for a PhD study at the School of Agriculture and Environment, Massey University. The Doctoral student is looking at novel methodology of OMB control and broadly assessing best techniques in riparian areas along with targeted application of stem-absorbed herbicides.

7.29. Horizons' current management programmes:

a) Progressive containment via control to Zero levels and sustained control.

i. Rules - Used to enforce control of the isolated infestations below a threshold size (1,000 square metres) within the GNPZ (RPMP rule 5.14.5) and immediate impact of OMB on a landowner's valued habitat by addressing neighbouring boundary ingress (20 m boundary) via a Good Neighbour Rule (GNR), (RPMP rules 5.14.4 and 5.14.6).

ii. Satellite model – As mentioned in Meeneken (2013), the use of the biosecurity industry standard approach of managing small infestations before they increase and pushing back to the large or entrenched gnarly and expensive sites was the core criteria used when forming our AMZ. This programme is undertaken by the biosecurity plants team.

b) Site led – put forward by Speedy and Williams (2010) (Pg 5, 1a) as the likely best spend of limited resources is the identification and prioritisation of high-value sites and working within and nearby to 'weed' OMB from the habitat and aim to prevent most plants able to spread to the site from seeding. The Biodiversity site-led programme takes this approach at a local level at some sites and, given the regional distribution, our current AMZ is drawn to effect this type of approach around significant areas such as the DOC estate.

Another approach to site-led management is where other values in addition to the highest regional biodiversity prioritisation identifies areas with high community influence or use but are presently degraded by OMB. Our region has a number of sites with high profile and significant OMB burdens including Te Āpiti/Manawatū Gorge, Rangitīkei River cliffs at Mangaweka, Matipo Park at Whanganui, Pongaroa, Mowhango River and Makuri Gorge. These types of sites have yet to be explored as viable options for either Horizons managed programmes or fully supported community projects as the opportunity cost of the current funding model tends to favour working across thousands of hectares to prevent these very situations replicating elsewhere.

Horizons' largest site led programme is at Te Āpiti Manawatū Gorge which has a budget of $70,000 this year (including control of banana passionfruit).

c) Community group support – OMB is a plant despised by many people for all the reasons described above. The challenge with community group effort is multi layered. The selection of areas by community groups to focus on can create challenges, especially within the GNPZ where long-term reduction and then maintenance of the cleared asset comes at great cost – not only in herbicide and contractor time but also in volunteer hours. Working against a pest like OMB within an area with a large seed source nearby that can provide for reinfestation requires a long term control effort, albeit at a reduced input after the initial control. Long-term commitment is needed for groups to become successful and the REG is the longest-standing community group receiving funding via Horizons for OMB control.

d) Management of vectors is another industry standard and OMB is able to spread by both natural and human assisted means (vectors). By far the majority of spread is by wind and water; however, other spread can occur on a very low level but with far reaching consequence as survey and subsequent early discovery is not targeted for this type of pathway.

i. We have discovered OMB spread by contamination of potted plant media when shifted from an infested urban location to a holiday home location.

ii. Machinery and equipment may also be a vector, with OMB arriving in the middle of forests isolated by large distances from known OMB sites.

iii. Road and rail corridors appear to be dispersal pathways with sites spread by traffic either receiving seed or seed blowing along the roadside, or in seed contaminated road building materials.

e) Neighbouring councils' OMB programmes have the potential to impact on our success. Each regional council casts its rules or funds programmes depending on the regional priority OMB commands. There is a wide variance of OMB control on our boundaries, however, with a significant GNPZ within our region the level of regional boundary pressure is no worse than our internal infestations against our AMZ boundaries.

i. Greater Wellington Regional Council has in recent times stopped area-wide OMB control on our southern boundary and this is potentially the boundary where most pressure will come from as we have AMZ across the Tararua and Horowhenua district boundaries. An increase in OMB, particularly at Otaki, has been noted.

ii. Taranaki Regional Council has a rule requiring most landowners to remove all OMB from their properties so our western boundary has lower risk.

iii. Waikato Regional Council has active programmes against OMB and is also considered lower risk.

iv. Hawkes Bay Regional Council (HBRC) targets OMB control to a buffer zone along the DOC estate of the Ruahine and Kaweka range, and north of SH5. Below SH5 the southern area adjacent to our north-eastern boundary more or less lines up with our GNPZ, and the buffer zone more or less lines up with our own AMZ. The Hawkes Bay boundary is also considered lower risk.

f) To our knowledge biological control has long been supported by Horizons as there are many areas infested with OMB that are not suitable for conventional or current interventionist control techniques. Biocontrol would complement existing control methods used to mitigate the negative impacts of this weed because biocontrol agents will persist once established, offering the potential to:

i. suppress OMB plants in areas where control is not possible, reducing the accumulation of damaging biomass

ii. suppress regrowth after treatment, potentially reducing the frequency of chemical or mechanical weed control

iii. reduce seed and shoot production, in turn reducing the rate of spread and reinvasion.

7.30. Biological control of OMB has not been attempted elsewhere in the world and Horizons as Champion, along with the rest of the **New Zealand Biocontrol Collective** (NZBC), has funded host testing and introductions of all known and suitable bioagents. Horizons is part of the NZBC consortium of interested agencies which, over the past 14 years, has contracted Landcare Research to investigate, test and introduce a variety of agents to target the most troublesome pest plants in the country. The consortium meets annually to agree on target pest species and to prioritise expenditure. This collective approach means projects can be advanced at a faster rate than relying on a council 'to go it alone'.

7.31. Horizons is currently funding the last tranche of DNA sampling from a coordinated New Zealand-wide and northern hemisphere host range collection of OMB plant material to ascertain any as-yet-undiscovered pathogens from the most likely matching home range sources of the New Zealand OMB population cohort.

7.32. Two of the last un-tested OMB agents were recently re-introduced or planned for release shortly – gall mite (Horizons region, yet to be released) and a second attempt at the OMB sawfly (Canterbury, 12/2018). Both are from Serbia and field assessments will ascertain establishment and the hoped-for damage to effect suppression and ultimately balance

OMB with desirable vegetation. The sawfly establishment and inter-generational increase was discovered at the Canterbury introduction site in the summer of 2019.

Figure 11 Laboratory raised OMB seedling showing stunting after addition of gall-forming mites (Landcare Research).

Questions for future management of OMB

7.33. In this section we explore various options available for Horizons management of OMB and whether there are alternatives to remaining with the status quo or what increasing expenditure in these will deliver.

Is the current biosecurity work programme effective?

7.34. Both recent assessments of Horizons approach to OMB management (Speedy, C., Williams, P. (2010); and Meeneken, D. (2013)) have corroborated the control investment against OMB using the Progressive containment model. As we mature the approach adopted with the Regional Pest Plant Management Strategy 2007, and refine this with the Regional Pest Management Plan 2017, reporting from our site tracking database shows a reduction in plant population and a steady increase in the proportion of sites which are at our target of Zero levels. Site accumulation occurs due to historic spread from previously undiscovered AMZ sites and the GNPZ. This has implications of costs unlikely to reduce in the short to medium term as the need for regular surveillance, historic site visitation and seed bank expiration control remains for up to 15 years from the last seeding event. As more of the GNPZ area is infested, this will put increasing pressure on the maintained border of the AMZ. Speedy and Williams (2010) (pg 9 Recommendation 14) offered a nominal figure of $500,000 per annum as an increase to better enable the ‘line’ to be held. This recommendation was taken on board in part with incremental funding increases over the intervening years ($70,000 in Horizons 2019-20 Annual Plan) and by adjusting the AMZ from what it was when the report was written to one more aligned with areas more easily defendable and aligned to protecting the most vulnerable habitats – effectively a cost reduction and site-led model applied to the region.

7.35. Options for the future:

a) Status quo and continue through till RPMP expiration as planned, while acknowledging suppression rather than 100% Zero levels being the most likely outcome.

b) Reduce AMZ to large buffers around identified prioritised sites of significance.

c) Increase expenditure and staff numbers to enable full surveillance of current AMZ on a two-yearly basis, and enable de-limiting and control operations at all sites annually.

Does the community feel the current programme is delivering?

7.36. With any Progressive containment programme, large infestations unmanaged for good reasons are highly visible and unfortunately an apparent indicator to the general public of programme failure, as opposed to the large area (880,000 ha) of well controlled and protected land. Encouraging acceptance of Horizons' approach through interpretation information is a challenge and one that staff need to address continually. The nature of a Progressive Containment approach means someone's valued area may become infested due to the better spend across large hectares elsewhere. Feedback from the community is generally about wanting more done at specific sites of high local importance. People often agree with preventing spread into new areas but would dearly like more action in their 'special place'.

7.37. Options for the future:

a) Re-prioritise current Rangitīkei district community support to target discrete 'high-value' biodiversity locations under a site-led model, and include a full management plan for all threats to values.

b) Provide funding and support to more groups via community-led/owned groups from the same pool as OMB is currently funded from. The potential implication if this is reprioritised spending within the programme is a reduction of service in the current programme. Typically, OMB control costs approximately $2,000 per ha for a mature infestation, reducing to about $40 per hectare at year six with maintenance costs continuing for many years.

Is further expenditure in biological control justifiable?

7.38. The current investment in biological control is significant at approximately $40,000 per year and there has been no benefit delivered to date. Two new agents potentially able to deliver a reduction in plant biomass are yet to be fully realised and with no regional establishment we are a number of years away from a comfortable reliance on heavy OMB infestations being 'managed' by biocontrol agents. Horizons has prepared for the next generation of research by sponsoring ($78,000) the DNA analysis of New Zealand and northern hemisphere OMB populations to enable best efforts to locate any further agents if the last known agents prove to be sub-optimal. Typically, investment in even moderately successful biological control programmes have cost:benefit ratios of 1:14. Biological control offers the best long-term solution to reducing the impact of old man's beard.

7.39. Options for the future:

a) Expand the biological expenditure once agents have proven establishment, to encourage distribution to the full GNPZ as soon as practicable.

b) Press on with the search for novel agents in the northern hemisphere.

If the spend towards OMB is increased what can be delivered?

7.40. The Annual Plan for the 2019-20 financial year allocated $70,000 more towards investment in OMB management. This, with other adjustments within the budget, has increased the external spend against OMB since 2017-18 by approximately $100,000. Current external expenditure within the Pest Plant programme is in the order of $240,000.

a) Spending more within the current programme delivers a more robust earlier detection function and would allow for a more frequent return period at sites requiring control.

Outcome: The AMZ (excluding Crown land) is more than likely returned to an OMB-free state.

Cost: To be assessed. A current risk is contractor availability for the specialist work required in sensitive habitats. The approach would require an increase in aerial surveillance, ground surveillance and control resource necessitating at least one more staff member, with ~$200-350,000 estimated to cover a staff member and increased external contractor costs or development of in-house capacity to deliver control.

b) Spending more on biological control in the short term to expedite the assessment of any available options.

Outcome: Potential for enduring reduction of OMB impact.

Cost: Initial overseas assessment of most likely matching host locations for New Zealand's OMB cohort is estimated to be in the order of $100,000.

c) Spending more on OMB by increasing the support of biodiversity priority sites, by enhancing buffering required through more funds to the Biodiversity team.

Outcome: Overall better protection of regionally important significant habitat.

Cost: Yet to be fully estimated with Biodiversity team but estimated to be in the order of $150,000 for external contractor costs or development of internal capacity to deliver the work, both surveillance and control.

d) Spending more on OMB by increasing the support of community led/valued projects.

Outcome: The AMZ goal of Zero levels will likely not be achieved in all areas, with suppression containing most infestations and only a low level of population persisting. The community has the opportunity to tackle high visibility and valued areas to support community goals of OMB removal.

Cost: Increased spend at approximately $2,000 per ha plus staff time to either manage or process applications, sign off management approaches, and monitor and audit outworking of plans.

8. COMMENT

8.1. This item provides Council with an update on progress on OMB control in the region including current and forecast progress against the Regional Pest Plan goals. Overall it concludes that the current progamme is not on track to deliver on the Regional Pest Plan goals and provides limited biodiversity protection. Councillor guidance on next steps for this programme is sought.

9. SIGNIFICANCE

9.1. This is not a significant decision according to the Council's Policy on Significance and Engagement.

10. REFERENCES

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ANNEXES

There are no attachments for this report.