/ terms with the exception of compliance with Rule 14-27(c)(ii) [compliance with 14-27 except subclause (a) is a condition of 14-28] because the discharge is located within the bed of a river; 14-28(c) because it may not be 600mm above the seasonally highest water table; and (d)(ii) because it is not located at least 20 metres from the nearest surface water body. It therefore falls to be considered as a **discretionary activity under Rule 14-30**.

Discharge permit for the intermittent discharge of stored water from the reservoir via spillway to the Ōhau River if overtopping occurs or if maintenance draw down is required

The permitted activity rule for this activity is Rule 14-12 and the discharge of stored reservoir water is very likely able to meet all the conditions/standards/terms. For the avoidance of doubt and to ensure long term certainty for the Applicant, consent is however sought under the 'default' **discretionary** rule for discharges of water to water, being **Rule 14-30.**

8.1 Permitted Activities Included in this Application

The taking of water from the reservoir does not require consent, as per the rule guide within section 16 of the Regional Plan at page 16-12 which states:

> *"Takes or uses of water from water storage facilities that are not within a water body do not require resource consent"*

'Water body' is defined in the RMA as:

> *"Water body means fresh water or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area".*

It is considered that the reservoir is not a 'water body' under the RMA, and hence the taking of water from it is a permitted activity.

9 ASSESSMENT OF ACTUAL AND POTENTIAL EFFECTS OF THE PROPOSED ACTIVITIES ON THE ENVIRONMENT

9.1 Cultural Effects

[This section to be completed upon receipt of CIA / CVAs].

9.2 Construction Effects

The construction of the reservoir intake and the associated riparian vegetation removal, earthworks and infrastructure construction has the potential to have a significant effect on the river during the construction period. The nature of the proposed activity requires disturbance of the riverbed for construction which has the potential to cause sedimentation at and downstream of the site, introduce contaminants, affect habitat and impact fish passage.

Appendix C details the proposed construction methodology from the Preliminary Design Report and assesses this against national best practice guidance for undertaking infrastructure construction works in waterbodies. The key guidance document in this regard is the National Works in Waterways Guideline- Best Practice Guide for Civil Infrastructure Works and Maintenance, published by the Ministry for the Environment, July 2021. That document "forms part of the National Works in Waterways toolbox, and sets out the legislative framework, environmental risks, management objectives and principles, and current best practice" and "provides a framework of best practice to support decision-making and management of activities in and adjacent to waterways."

The best practice measures proposed are detailed in Appendix C, and repeated in Table 9.1 below.

Table 9.1: Best Practice Methods to be Used to Minimise Effects of Construction in Accordance with the National Works in Waterways Guideline Best Practice Guide for Civil Infrastructure Works and Maintenance

Best practice principles for works in waterways	How this principle may be implemented on-site following best practice methodology.
Avoid in-stream works as a first principle	Due to the nature of the proposed activity, in-stream works must occur. Best practice principles will be implemented to reduce the effects of the proposed works. Following best practice, the construction works will be undertaken in the dry to minimise sediment discharges to the river. This will be carried out by installing a temporary diversion of the active channel within the river bed river following best practice principles specified in the National Works in Waterways Guideline and regionally specific Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Wellington Region with particular regard for section G4.0. The temporary diversion channel will be constructed as per G4.2.3 of the regional guidance and will minimise sediment generation and discharge from works within the watercourse. The length of the watercourse to be diverted will be kept to the minimum necessary to enable safe and efficient construction. This also reduces the affected riverbed area which is required for the diversion.
Critically assess the operational methodology	As the works are undertaken, the operational methodology will continue to be critically assessed to ensure that the activity is completed in a way which minimises environmental effects. Qualified and competent contractors will be engaged for the duration of the project and this will be a matter that is taken into account in the procurement process for the contract.
Maintain the streambed profile	The proposed construction works will ensure that any riverbank zones not required for permanent access will be reinstated to their previous contours and revegetated, or rip-rap river protection will be installed. The streambed profile will be maintained after the construction of the intake. Survey will be undertaken prior to the works commencing to confirm the current profile. Once works commence, the existing streambed material will be removed and stockpiled for later use. Following the completion of the works, the stockpiled material will be re-laid generally in accordance with the same bed profile as prior to the works commencing in order to restore the run-riffle-pool sequence of the river bed. Overall, the proposed works will not reduce habitat quality and create ongoing erosion issues post-construction.
Retain vegetation on the bank	Vegetation on the bank will be retained wherever possible, and as per the above, riverbank zones not required for permanent access will be revegetated. This includes affected areas as part of the river diversion. Where riparian vegetation must be cleared, disturbance to the river will be minimised by felling vegetation away from the river. Felled vegetation is to be left in-place on the ground for 2-3 days to allow for passive dispersal of terrestrial fauna from the felled vegetation.
Stabilise exposed areas as soon as possible	The banks will be stabilised to avoid erosion and sediment discharge into water as soon as reasonably practicable. Immediate stabilisation methods such as using geotextile products will be utilised.
Avoid using synthetic materials for in-stream and riparian applications	Biodegradable stabilisation and plant protection options (e.g., entirely biodegradable hessian matting, Combi plant guards) will be utilised for bank stabilisation. This will ensure plastic remnants from synthetic materials cannot enter the environment.

Best practice principles for works in waterways	How this principle may be implemented on-site following best practice methodology.
Avoid discharge of sediment into water	The proposed work will be carried out using best practice for works within a watercourse outlined in the National Works in Waterways Guideline and regionally specific Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Wellington Region with particular regard for section G4.0. An Erosion and Sediment Control Plan will be developed prior to construction taking place and provided to the Regional Council for technical certification.
Avoid sediment release downstream	The construction of the stream diversion and required bank works is an area that has the highest potential for sediment release downstream. These works will be carried out using best practice principles and operating under a robust erosion and sediment control plan to avoid sediment release. As part of this, all construction activities will be closely monitoring during construction, before and after every rainfall event, to ensure devices are operating as anticipated, and to ensure sediment release downstream is avoided.
Implement robust erosion and sediment control measures	Appropriate erosion and sediment control measures will be in place to avoid fine sediment entering waterways during works in or adjacent to waterways. This includes non-structural approaches to managing erosion and sediment controls such as; construction works taking place on a dry riverbed such that sediment discharge from this avoided, minimising the disturbed area, protecting steep slopes and the watercourse, and stabilising exposed areas rapidly, routine monitoring and maintenance of sediment devices. Types of structural sediment controls to be installed onsite may include; Installing silt fences adjacent to the watercourse as a final barrier of protection, cut off drains upstream of the site area, designated stockpile areas with appropriate controls around them and sediment retention ponds.
Avoid discharge of contaminants onto riverbeds or into waterways	A spill response plan will be developed prior to construction works taking place. This will address the potential impacts of the construction of the proposed works, which will ensure the following is procedures are in place: • All refuelling of machinery will occur outside of the waterway and in a place where no fuel can enter the waterway if it is spilled. • Ensuring fuels and other chemicals are stored safely away from waterways, and spill kits are available for immediate use for any chemical fuel or other spill. • Store all machinery and equipment above the anticipated flood level at the end of each working day and/or when the site is unattended.
Avoid impediments to free passage	As part of the construction works, fish passage will be maintained or only temporarily disrupted during activities (eg during the creation of the diversion channel and fish relocation process). The diversion channel will be constructed to allow for fish passage.

Best practice principles for works in waterways	How this principle may be implemented on-site following best practice methodology.
Avoid disturbance and mortality of freshwater fauna	Due to the proposed works, the excavation of the riverbed will result in some short term disturbance to freshwater fauna. This area will be minimised as far as reasonably practicable. The Wildlands Ecological Assessment for the proposed intake works dated January 2023 notes that once the diversion channel is decommissioned and flow resumes within the main river channel, it is expected that the river will return to its natural form due to the bed movement during flood events. Fish relocation will be undertaken prior to the works commencing with a Fish Management Plan prepared in consultation with mana whenua and all necessary approvals obtained prior to commencing. Any water take pumps which may be necessary (eg for dewatering) will be screened with appropriately 2–3-millimetre mesh to avoid fish mortality due to being drawn into the pumps. The Guideline outlines best practice protocols for fauna relocation and salvage protocol which will be included in a Fish Management Plan prior to construction.
Avoid in-stream works during critical spawning and migration periods	The works will be undertaken at a time to avoid critical spawning and migration periods. The area of the proposed works is not identified as being valued for trout or inanga spawning under the One Plan, nor is it identified as a site of significance - riparian and therefore the exclusion periods specified in Table 17.1 of the One Plan do not apply.
Avoid the spread of freshwater plant and animal pests	All appropriate biosecurity measures including requirement of the Biosecurity Act and most recent guidance from Ministry of Primary Industries will be followed for any machinery working in the river. In accordance with approved method statements, machinery will be sprayed down and washed prior to river entry in a suitable bunded location, to minimise and avoid the spread of freshwater plant and animal pests, and discharge of contaminants.
Avoid archaeological or wāhi tapu (sacred) sites	The proposed site location does not include any known archaeological or wāhi tapu (sacred) sites. Conditions of consent and contract will be imposed requiring an accidental discovery protocol to be followed. If any artefacts, taonga or similar are identified, works will cease immediately and the relevant hapu, Regional Council and Heritage New Zealand Pouhere Taonga will be informed.

The construction period for the intake works is expected to take up to two months subject to good weather conditions. A key part of minimising disturbance during river works is to minimise the amount of time that the works are undertaken and the bed and natural flow of the river is disturbed. The physical works contract will include, along with all of the consent requirements for these works, a requirement that the contractor confirm all available plant, machinery and equipment is in place to complete the works prior to the works commencing (except for some equipment such as pumps, controls etc can be installed at a later date as they will be able to be installed once the civil works are completed and without further riverbed or riparian disturbance).

Wildland Consultants Ltd were engaged to undertake an assessment of the effects of the proposed works on the instream and riparian ecology. This is included in Appendix D. This work involved a site visit which was attended by Damwatch as consultants responsible for the preliminary design. The proposed river diversion to enable the construction and construction methodology was discussed in detail at that site visit to inform the ecological assessment.

The ecological assessment recommended a series of standard construction effects management plans including sediment control plan, spill response plan, fish management plan and riparian planting. The Applicant has agreed to implement these recommendations and the content of these Plans is

discussed in Appendix C. A consent condition is offered requiring these plans to be prepared prior to construction commencing.

In terms of the existing riparian vegetation, the assessment found that removal of the riparian vegetation will have minimal ecological effects due to the vegetation being composed of common plant species and extensive amounts of similar habitat being present within the immediate area. This notwithstanding, a riparian planting programme to replace some of the vegetation removed with suitable indigenous species was recommended. The applicant has accepted this recommendation and proposes to undertake such planting upon completion of the civil construction works.

The assessment found that:

> *"While extensive earthworks and a large amount of riverbed excavation will be required to construct the proposed intake structure and its accompanying infrastructure, the ecological effects of this work can be managed effectively through careful planning, particularly in relation to sediment control and the capture and relocation of fish from within the impact reach.*
>
> *Once constructed, the ongoing operation of the intake structure is expected to have minimal ecological effects due to the infiltration gallery being designed to be located below the level of the existing riverbed. Excavation of the riverbed to install the intake structure will result in some short-term disturbance to aquatic fauna in the area and will require extensive recontouring of the riverbed. However, once the diversion channel is decommissioned and flow resumes within the main river channel it is expected that the riverbed will return to its natural form due to bed movement during flood events.*
>
> *Overall, construction and operation of the proposed intake structure will have relatively minor ecological impacts on the Ōhau River and its surrounding environment subject to appropriate mitigation measures being implemented."*

The construction of the pipe bridge has the potential to have temporary effects, given that it is to be installed within and nearby to the bed of the river. The scale of these effects is significantly lesser than those of the construction of the intake structure and these are able to be managed appropriately by way of construction methodology and management plan that follows the best practice principles for works in and near waterways as set out in detail above, and particularly avoiding works in the bed where possible and avoiding any unnecessary discharge of sediment during construction.

9.3 Hydrology Assessment & Associated Effects

The hydrology assessment considers the effects of the proposed abstraction on the river hydrology and, by extension, on its life supporting capacity. The abstraction scenarios which are required to be assessed are:

- The effect of the core allocation abstraction including the proposed distribution of the core allocation across the intake sites. This assessment is undertaken within the context of the core allocation framework of the One Plan including the determination via the One Plan process that the core allocation volume can be allocated without having significant adverse effects on the life supporting capacity of the river. Further, it takes into account that the core allocation sought under this consent is already allocated to the Council with the significant majority of that allocation being available until 2042.
- The effect of the new supplementary allocation sought on the hydrology and life supporting capacity of the river.
- The effect of abstractions at times when the river is at or below minimum flow.

It is noted that the above allocations cannot be easily separated into these three components and therefore an overall assessment is provided to consider the effects of the overall abstraction regime on the river and its life supporting capacity.

The following assessment draws from the hydrology assessment undertaken by Keane Associated Ltd, included in Appendix E.

Horizons Regional Council's technical report[18] to support the One Plan sets out the hydrology and ecological assessment underpinning the establishment of the minimum flow and core allocation framework in general, and for the Ōhau River specifically. In Volume 1 of that report, it describes the theoretical framework of establishing minimum flows and core allocation and states that:

> *In this way water is allocated "in a way, or at a rate, which enables people and communities to provide for their social and cultural well being" while the definition of the minimum flow will safeguard "the life-supporting capacity of air, water, soil and ecosystems" as required by the Resource Management Act 1991.*

With respect to the Ōhau River, the report references an IFIM (Instream Flow Incremental Methodology)[19] study carried out by NIWA and Horizons on the Ōhau River which found that flows of between 700 L/s and 800 L/s provides approximately 80% of optimal habitat for trout rearing and spawning. The minimum flow which has been set in the One Plan is above these estimates (820 L/s). The report also noted that maintaining flow variability is an important consideration in determining the core allocation for the Ōhau River and that the number of days between significant freshes was a key factor. It found that allocating more than 280 L/s (as core allocation) from the river would increase the period between freshes to more than 50 days which could affect the ecological balance and water quality of the stream. The core allocation which has been set for the river is 24,192 m^3/day which equates to the 280 L/s quoted.

The core allocation sought is 15,409 m^3/day which is the same as the core allocation already provided to the District Council via its existing consents. No increase in core allocation is sought.

What is sought in this application is a redistribution as to where this allocation is to be abstracted within the river, and an extension (by way of the new consent sought) of the timeframe of the existing allocation. The majority of the existing allocation (15,000 m^3/day or 97% of HDC's allocation) is consented through to July 2042. HDC seeks a 35-year consent term in this application, which would essentially extend this allocation timeframe a further 16 years.

In terms of the One Plan policies and rules, there is no distinction as to where, within the overall management zone, the core allocation can be taken. However, this is not necessarily the case with the actual effects on the river. Of note, this application seeks to 'move' some of the existing allocation further upstream than the existing point of take which may have an effect given that the abstraction will now be from a smaller watercourse (ie prior to the Makakahi and Makaretu tributaries joining the Ōhau River).

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[18] *Horizons Regional Council, May 2007, Regional Water Allocation Framework: Technical Report to Support Policy Development - Volume 1.*

[19] *"Instream Flow Incremental Methodology (IFIM) is a habitat assessment method used where the instream management objective is the protection of particular aquatic species, making retention of appropriate habitat a key consideration. It uses models of the hydraulic and morphological characteristics of a stream to determine the amount of habitat available for various species at a range of flows. IFIM is well suited to the physical and ecological characteristics of New Zealand rivers (Ministry for the Environment, 1998).", as per Horizons, May 2007 - Regional Water Allocation Framework: Technical Report to Support Policy Development – Volume 1.*

Hydrology Assessment Effects Model

The hydrology assessment included in Appendix E details the derivation, for modelling and assessment purposes, of a naturalised flow record for the Ōhau River at Rongomatane and understanding of the relationship between the flow in the upper Ōhau and Makahika Rivers in order to be able to estimate the naturalised flow regime at the proposed reservoir intake site.

The hydrology effects assessment was then undertaken by modelling the proposed abstraction regime under a worst-case effects scenario. That is, the maximum 15,409 m^3/day is abstracted, with as much of that water taken at the furthest upstream intake (the reservoir intake) as would be provided for in the consent (7,500 m^3/day)[20].

The hydrology water balance model also provided for abstraction of up to 10% of the estimated flow in the Ōhau River at the proposed reservoir intake site in order to model the effects of the requested supplementary allocation.

Assessment of Effects of Modelled Abstraction Regime

The hydrology assessment has found that:

- The effect of abstracting up to 7,500 m^3/day of core allocation from the reservoir intake site is a less than 10% reduction in minimum flow, mean flow, upper and lower quartile flows, median flow and FRE3 (FRE3 represents the annual frequency of flushing flow events being flow events greater than three times the median flow).
- The change in FRE3 due to the core allocation abstraction is <1% and the cumulative effect including the supplementary allocation is 7%.
- The confluence with the Makahika Stream is about 800 m downstream from the reservoir intake site and contributes approximately 25% of the natural flow at Rongomatane compared with 45% from the upper Ōhau River. The addition of natural flow from the Makahika reduces the effect of abstraction at the reservoir intake on Ōhau River flow from this point downstream.
- Downstream from the existing intake, the effect on flow change below median flow is the same as under the current consent conditions. Above median flow, including the effect of the supplementary allocation, the abstraction affect's the flow by up to 8%.

In terms of the core allocation component, the amount sought is within the overall core allocation of the River and provided for under the One Plan. The key effect for consideration is the impact of shifting some of this allocation upstream such that the abstraction is a greater percentage of the river flow at the point of take. The hydrology assessment has found that the effect of the 7,500 m^3/day core allocation abstraction from the reservoir site less than 10% change in flow statistics and the scale of these changes is consistent with the flow regime change at the existing intake under the current consent. It is considered that the effects of this abstraction are provided for, and anticipated in, the One Plan allocation framework.

The effect of the core allocation abstraction at the reservoir site is reduced approximately 800 m downstream of the intake with the addition of flows from the Makahika Stream. The stretch of river which is affected is also not subject to the Site of Significance - Aquatic value in the One Plan. The proposal does not seek any abstraction below minimum flow at the reservoir intake site and therefore there is no change to the minimum flow in the river at or downstream of the reservoir intake site.

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[20] *Note: For simplicity, these figures have been rounded up in the hydrology assessment. The water balance model has actually modelled a total of 15,500 m^3/day being abstracted, of which 7,500 m^3/day is abstracted at the reservoir intake and the remaining 8,000 m^3/day abstracted at the existing intake. This means that effects will be overstated, albeit by a small margin.*

The effect of the supplementary allocation abstraction, in combination with the core allocation abstraction, results in approximately 7% change in FRE3.

Regional Policy Statement Policy 5-17 directs the matters that need to be considered in terms of a supplementary allocation. These are:

- The supplementary allocation cannot increase the frequency or duration of minimum flows. The supplementary allocation will only be taken when the river is above median flow and does not have any effect on either the frequency or duration of minimum flows.
- The supplementary allocation cannot lead to a significant departure from the natural flow regime, including the magnitude of the median flow and the frequency of flushing flows. The proposed abstraction does not lead to a significant departure from the natural flow regime as evidenced in the hydrology assessment and summarised in Figure 9.1 below. That shows the combined effect of the reservoir intake abstraction (which, except as per the O2NL construction discussed below, is the only location where supplementary allocation is to be taken) on the Ōhau River at the point of the abstraction. This has been derived from applying the abstraction to the derived naturalised flow regime at the point of abstraction. It shows that, below the median flow the abstraction (being the core allocation component) does not cause significant change in the natural flow regime. Between the median and 25th percentile, the abstraction affects the natural flow regime by 10% in accordance with the supplementary allocation policy. Above the 25th percentile, the amount of water abstracted as a percentage of the natural flow reduces (as it is not possible with the proposed pump capacity to abstract the full 10% of the supplementary allocation).

  In terms of flushing flows, the FRE3 (being 3 times the median flow) is normally used to assess flushing flows. The proposed abstraction influences the flushing flow at the intake site by less than 5% and does not impact on its frequency.
- The supplementary allocation shall not cause any adverse effects that are more than minor on the Schedule B values of the water body or its bed. The effect of the abstraction on Schedule B values is assessed in Section 9.7 below and is found to be no more than minor.
- The supplementary allocation shall not limit the ability of anyone to take water under a core allocation. The supplementary allocation regime is separate from the core allocation regime and the proposed abstraction does not impact on any other persons ability to take water under the core allocation regime.
- The supplementary allocation shall not derogate from water allocation to hydroelectricity generation. There is no such water use on the Ōhau River and therefore the supplementary allocation does not impact on water allocation to hydroelectricity generation.

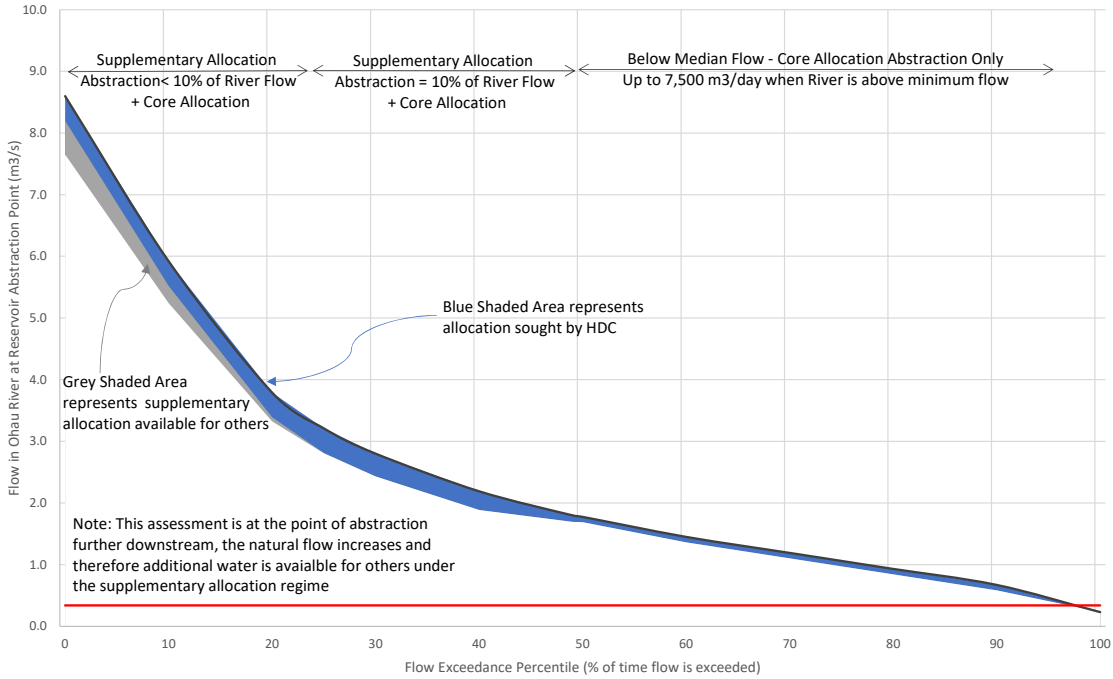

Figure 9.1: Effect of Reservoir Abstraction (supplementary allocation) on naturalised flow regime of the Ōhau River at the Reservoir Intake Site

The above demonstrates that, in terms of the effects determined relevant in the Regional Policy Statement for grant of supplementary allocation, the effects of the proposed abstraction are less than minor.

9.3.1 Effects of the Abstraction Below Minimum Flow

The effects of the proposal will be a reduction from the existing consented effects of the abstraction below minimum flow. As described throughout this AEE, the Council is currently authorised to abstract up to 13,000 m^3/day when the river is below minimum flow. The only criteria that needs to be satisfied for Council to exercise this abstraction is for the trigger level 4 water restrictions to be imposed. With the current infrastructure, Council must abstract from the river at all times when it is below minimum flow in order to maintain supply to the community.

The reservoir, including the ability to fill the reservoir by way of the supplementary allocation sought, enables the Council to avoid abstraction from the river below minimum flow in all but exceptional circumstances or extended drought. Further, it enables the Council to significantly reduce the amount of water abstracted below minimum flow.

For the flow record available, the maximum number of days per year that the river has been below minimum flow is 50 days. This occurred in the 2003/2004 summer. This summer period also had the maximum number of consecutive days below minimum flow, being 25 days. A statistical analysis[21] also found that 26 consecutive days below minimum flow would be considered a 100-year return period event.

Rather than abstract consistently at 13,000 m^3/day in this event as is currently required, the proposed reservoir enables supply to be maintained during such periods via a mixture of supply from the reservoir and supply from the river. The analysis in section 4.1 shows that this could be met by a mixture of days with no abstraction from the river and a mixture of days with a combined river-

[21] *As reported in section 2.5.1 of the Options Report, Appendix A.*

reservoir supply. The amount of water which would need to be abstracted from the reservoir is highly dependent on the reservoir levels leading into the drought period, community demand and the extent to which there are freshes during the summer period to enable the reservoir to be refilled.

The overarching principle will be to avoid or minimise abstractions from the river below minimum flow as far as possible, in order to minimise effects on the river and to give effect to the first priority objective of Te Mana o te Wai. Section 4.1 has proposed a series of criteria that are required to be met in order to exercise the abstraction below minimum flow. These criteria reduce the potential for the minimum flow abstraction to be exercised unnecessarily following the construction of the reservoir.

It is acknowledged that abstractions below minimum flow will have an effect on the river. The proposal to reduce and avoid such abstractions as far as possible and to provide a consent condition framework that requires engagement with mana whenua and post-event reviews and improvements to be undertaken is considered appropriate to minimise these effects as far as practicable whilst also providing for the second-tier priority of Te Mana o te Wai being the needs of people.

9.3.2 Effects of Climate Change on Hydrology and Projected Abstraction Effects

To ensure the robustness of the proposed water harvesting scheme, the effects of climate change on the flow regime in the river have been assessed. HDC, via its design consultants, engaged Williamson Water & Land Advisory to develop a catchment model to assess the impacts of nine climate change scenarios on the flow regime of the Ōhau River catchment upstream of Rongomatane (refer Appendix H).

That assessment found that by 2030 – 2050, climate change effects are predicted to have little impact on key flow statistics. By 2081 – 2100, climate change effects are predicted to result in a small reduction in low flow statistics for the higher order RCP climate scenarios.

In the medium term, flow in the Ōhau River is most likely to be controlled by the weather patterns experienced and not gradual climate change. Risks associated with drought are expected to be similar risks to the existing situation through until about 2050 (this has been assessed as "high" risk in the regional risk assessment discussed in Section 5.1. After 2050, risks associated with drought are considered to increase to extreme by 2100 on a regional scale.

Therefore, within the term of consent sought, there is not expected to be a significant change in the Ōhau River flow regime on which the allocation framework and effects assessment has been based. The proposal is consistent with the recommended approach in the Regional Climate Change Risk Assessment for managing risks to water supply in the short to long term, being the addition and enhancement of storage, combined with an improved water demand management approach, in order to enhance the adaptive capacity of the water supply system.

It is therefore considered that the effects of climate change do not materially affect the assessment of effects included in this application and the proposal is consistent with the recommended regional approach for managing drought risks associated with climate change in the longer term.

9.4 Water Quality Effects

In addition to the construction effects discussed above, the proposed activities have the potential to affect the water quality of the Ōhau River through the routine maintenance of the infiltration gallery (in particular the activation of the air backwash system), and through the discharges from the groundwater drainage underneath the reservoir and from the reservoir spillway.

9.4.1 Effects of Infiltration Gallery Air Backwash System

This system has been discussed in Section 4.2 and will include intermittent backwash of an air /water mix (water sourced directly from the river via the infiltration gallery abstraction) through the gabion basket array beneath the river bed in order to remove silts or sediment build up in the gallery.

The ecological assessment in Appendix D assessed this activity and noted that this activity could potentially release sediment into the Ōhau River and cause localised disturbance of the resident fish population during periods when it is in operation. However, the assessment found that:

> *"Operation of the air backwash system for routine maintenance is unlikely to have anything other than a minor effect on the aquatic environment. Any disturbance to aquatic fauna will be temporary, and the discharge of sediment is likely to be similar to that which occurs during natural events."*

9.4.2 Effects of Groundwater Diversion and Discharge

The proposed reservoir includes a groundwater diversion and discharge system which will collect groundwater from below the reservoir and discharge it to ground on the river terrace. This system is critical for the integrity of the reservoir liner as it avoids groundwater pressure building up below the reservoir if groundwater levels were to naturally be above the base of the reservoir.

Discharge volumes from the groundwater system will vary depending on natural groundwater levels and seasonal variations. It is estimated that the discharge volumes will be in the order of 14-42 m^3/day. This will be discharged to ground on the river terrace in a way which will seep into the ground and / or may flow overland to reach the Ōhau River. The quality of this discharge will be groundwater with no contaminants introduced.

At its maximum anticipated discharge rate of 42 m^3/day, the discharge - if it were to all reach the Ōhau River - represents only 0.06% of the minimum flow for the River (820 L/s). Given the extremely low contribution of the discharge to the river flow; that this scenario of maximum groundwater discharge coinciding with minimum river flow is highly unlikely to occur but is a worst case estimate; and that the discharge is clean groundwater with no contaminants, it is considered that any effects from the discharge of groundwater will be less than minor.

During construction, sediment controls will be put in place to avoid sediment discharges. This aspect of the discharge is to be managed under the Large Scale Land Disturbance Earthworks consent to be sought at a later date. This is a Controlled Activity which means that the Regional Plan anticipates this activity, conditions are able to be imposed to manage any potential effects and consent must be granted.

9.4.3 Effects of Spillway Discharge

The spillway discharge will also occur under vary rare circumstances. The primary mechanism for a spillway discharge is when the reservoir is at its fullest level and there is heavy rainfall at the reservoir site. This may cause the reservoir level to rise above its maximum operating level and flows to be discharged via the spillway. This is a design feature required to prevent overtopping of the embankments and subsequent potential failure of the reservoir.

In this event, the discharge will be a mixture of stored reservoir water (being water previously abstracted from the Ōhau River) and rainwater being discharged back to the Ōhau River. The quality of the discharge water and the receiving environment is therefore considered to be the same. The river is also expected to be well above its minimum flow levels in this scenario and therefore less vulnerable to any discharge effects. The effects of the spillway discharge in this event are considered to be less than minor.

The other scenario for spillway discharge is a failure of the abstraction control system which results in the abstraction pumps continuing to operate when the reservoir level is full. In this case, the discharge would essentially be the return of water to the river immediately after its abstraction. The effects of this discharge are considered de minimus as it is return of river water to the river. Any such discharge would also be temporary as the control system will include a series of back up alarms to advise the operator of the malfunction and, failing that, would be detected upon routine operational visits.

The final discharge scenario is in the event that the reservoir needs to be drawdown quickly for operational reasons. Routine operations and maintenance activities would not require this to be activated as the maintenance would be programmed at times when the reservoir level was low and /or the reservoir levels would be manipulated to be drawn down by preferential use of stored water to supply the community, and reduction in river abstraction. However, there may be times when the reservoir level would need to be dropped quickly, for example for inspection purposes following an earthquake to check on the structural integrity of the reservoir or to undertake repairs. In this event the discharge would be of stored water of similar quality to the River. The discharge rate would be limited by pump capacity to pump from the reservoir into the spillway and any such pump rate would not be sufficient to cause downstream flooding or similar effects.

The effects of the spillway discharge, under all of the scenarios where such a discharge may occur, are considered to be less than minor.

9.5 Ecological Effects

The potential ecological effects of the proposed activities that need to be considered include the potential disturbance and loss of habitat during the construction phase of the new intake, and the potential effects on the life supporting capacity and habitat for freshwater species arising from the water abstraction.

In terms of the construction phase, the potential effects include loss of habitat due to the riparian vegetation clearance, earthworks and intake infrastructure as well as disturbance and realignment of the riverbed to construct the infiltration gallery. These construction effects have been separately assessed in section 9.2 above. The ecological assessment (Appendix D) found that the riparian vegetation in this area was composed of tutu, toetoe and exotic pampas grass, with the understorey being a mixture of indigenous species including coprosma, mahoe and wheki. It states that “no rare or threatened indigenous vegetation was observed during the site visit, with all indigenous species being widespread and common”. The vegetation and habitat that will be disturbed therefore is not considered a rare, threatened or at-risk habitat in terms of Schedule F of the One Plan. It is noted that Schedule F states that any riparian margin not classified elsewhere in Schedule F as a rare or threatened habitat which is within 20 m landwards from a river with Schedule B value of Site of Significance – Aquatic must be considered to be at-risk whether it is indigenous or exotic. In this instance, the area where vegetation disturbance will occur is not a stretch of the river which has Schedule B value of Site of Significance – Aquatic and therefore the riparian habitat is not considered “at risk”. The ecological assessment states that the removal of riparian vegetation “will have minimal ecological effects”. This notwithstanding, it also recommended a riparian planting programme to replace some of the vegetation removed with suitable indigenous species. This recommendation has been accepted by the Applicant and a condition is proposed to require the recommended riparian planting programme be developed and implemented thereby ensuring no net loss of riparian habitat quality. The effect of the proposed works on the riparian habitat and its ecological value is therefore considered to be less than minor.

The impact of the construction phase on the in-river habitat and fish species has also been assessed in section 9.2. This includes a series of mitigation measures including diversion of the flowing channel within the river bed to enable the works to be undertaken in the dry and prevent downstream sedimentation of the water and also to prevent effects on in-stream species from construction machinery in the active channel. A Fish Management Plan will be prepared to capture and relocate

fish within the affected area prior to the works being undertaken. Further, the methodology involves temporary removal and stockpiling of the river bed material and then reinstatement of the same at the same grade as the existing river bed after completion. This will ensure that the river bed strata and the riffle, run, pool environment is maintained post construction. Following construction, the river bed habitat will be the same as prior to construction. The effects of the intake construction on the in-river habitat and fish species is therefore considered to be less than minor.

The effects of the water abstraction, including on the life supporting capacity of the river, have been assessed in Section 9.3. The proposed abstraction regime is entirely within the allocation framework provided within the One Plan. The development of that allocation framework by Horizons Regional Council was informed by IFIM studies (Instream Flow Incremental Methodology) which found that between 700 and 800 L/s needed to be maintained in the Ōhau River to provide for 80% of optimal habitat for most species. The minimum flow for the river has been set at 820 L/s (ie above the flow required to maintain 80% optimal trout habitat) and the proposal is not to abstract below minimum flow except in exceptional circumstances as described above. It therefore follows that the effects of the abstraction on trout rearing and spawning are within that anticipated in the setting of the allocation framework within the Regional Plan and are less than minor. Refer also to the discussion in Section 9.3.

9.6 Flood Hazards

There are two aspects to flood hazards which need to be considered. Firstly, the impact of the proposed activities on the flood carrying capacity of the Ōhau River in general and the Ōhau Flood Control and Drainage Scheme in particular. Secondly, potential effects arising from the extremely unlikely event of a failure of the reservoir structure and subsequent quick release of the stored water into the Ōhau River.

9.6.1 Effects on Flood Control and Drainage Scheme

In terms of flood carrying capacity of the river, the abstraction element of the proposal obviously does not have an adverse effect on flood carrying capacity.

The proposed reservoir intake is a sub-surface intake and there will be no structures within the riverbed after construction. Therefore after construction it has no effect on the river's flood carrying capacity. During construction, the main channel will be diverted to a temporary channel within the river corridor which will be designed to ensure it has sufficient capacity to manage expected diverted flows. However, if a large flood event occurs during the construction period, it is expected that this will be conveyed via the diversion channel and the area where construction is occurring. Construction does not require significant material and equipment to be located within the riverbed works area while the site is being actively worked on. A Flood Contingency Plan will be developed as part of the overall suite of construction management plans and will include provisions for monitoring long term weather forecasts and for exiting the construction area and removal of all machinery in the event of anticipated or forecast flood flows. This will include making use of the Horizons Regional Council River Alert System and regular communications with the Horizons River Management Team. The Flood Contingency Plan will ensure that materials which may be in the river bed which could pose a potential downstream risk can be removed from the river bed prior to the flood event. The construction period for the in-river works is relatively short being 1-2 months and therefore these measures will be able to be easily implemented and reflect standard best practice construction methodology.

The proposed pipe bridge presents a potential constraint in terms of flood carrying capacity. However, the effect of this is considered less than minor as the proposed bridge will not result in any structures within the flood channel (ie no piers or structures in the river) and will be at the same height as the existing road bridge. It therefore does not present any constraint or change the existing flood carrying capacity of the river.

The Ōhau River is valued for Flood Control and Drainage Values in respect of the Ohau Manakau Scheme under the One Plan. This value applies from approximately 250 m downstream of the proposed reservoir intake site to the coastal marine area. In preparing this application, HDC has engaged with Horizons Regional Council's Area Engineer responsible for this scheme who has advised that they do not consider that the proposal will impact on the scheme and that there are no flood protection assets in the vicinity of the proposed works. The Flood Control and Drainage Value has been applied in the upper Ōhau in order to be able to undertake catchment improvement measures that may contribute to flood protection. The proposed activities do not impact on the ability to undertake such measures and do not impact on the Flood Control and Drainage Value.

9.6.2 Potential Effects in Event of Reservoir Embankment Breach

The proposed reservoir, when full, will hold 740,000 – 855,000 m^3, the larger volume being at the embankment crest level and therefore assumes that the freeboard height in the reservoir is fill. Such a scenario cannot occur, given the spillway level to allow for controlled overflows back into the river has a level set at lower than the embankment crest height and the spillway discharge occurs via gravity and does not rely on operator intervention. Nonetheless, to assess the worst case effects scenario, the total reservoir volume of 855,000 m^3 has been used in the analysis of effects of a potential reservoir embankment breach. This assessment is described in Section 3 and Appendix B of the Preliminary Design Report in Appendix B.

The reservoir is considered a large dam under New Zealand's Dam Safety Guidelines (NZDSG) and a dam break assessment is required to be undertaken in accordance with the procedures set out in those guidelines and under the Building (Dam Safety) Regulations 2022. Part of this process is a Potential Impact Classification, or PIC, which assesses the potential embankment failure mechanisms, assumes a worst case (ie dam full) breach occurs and assesses the potential impact of that breach. It includes modelling the area that would be inundated in this event and assesses the likely number of persons, property and significant sites affected. This then informs the level of design, construction and ongoing monitoring required to prevent such a breach scenario occurring. That is, the dam breach analysis is not one which is used to assess likely effects that may or may not be acceptable but is used to inform the design requirements to avoid adverse effects occurring.

Given the proposed reservoir is off-river and no affected by potential flood flows, and because of the proposed reservoir spillway, an embankment breach due to overtopping is not a credible failure mechanism and therefore has not been assessed. The only credible failure mechanisms for the reservoir (refer Table 20 of the Preliminary Design Report) are a liner failure resulting in concentrated seepage through the embankment; or a seismic event which would also cause a concentrated seepage through the embankment. Identifying the credible failure mechanisms informs the design and monitoring requirements to avoid such failures.

In terms of infrastructure at risk, the embankment breach scenario represents a flow generally equivalent to the 1:100 year flood at the reservoir site and dissipates as it progresses further downstream. Assuming the existing Poads Road bridge over the Ōhau River is capable of conveying the 100 year flood flow, this will not be affected by a breach of the reservoir. By the time the breach flows have reached the State Highway 1 bridge, the peak has reduced to be less than the mean annual flood and does not present a risk to the State Highway or other infrastructure. As above, this is a theoretical breach event, and the assessment informs the design and monitoring required to prevent such a breach occurring.

Based on the assessed population at risk in a breach scenario of 15 persons, the reservoir has been assessed as Potential Impact Classification of "Medium". It is noted that even if the assumptions made in the assessment raised the population at risk significantly to any number up to 100, it would still be assessed as a Medium Potential Impact Classification under the Dam Safety Guidelines. Therefore, the reservoir will be designed, monitored and maintained to meet the design standard for a medium PIC dam.

A PIC assessment has been undertaken in accordance with the Building (Dam Safety) Regulations 2022. This assessment considers the hypothetical event of dam failure and does not take into account the likelihood of that failure. However, modern water retaining structures, such as the Poads Road Water Storage Reservoir, have an extremely low likelihood of failure. As such, the likelihood of Potential Loss of Life from dam failure is also considered extremely low. This high level of dam safety is achieved by specification of appropriate performance criteria used in the design and construction of a dam (regulated by the Building Code 2004) and by close monitoring and management throughout the operational life of a dam by means of a comprehensive Dam Safety Management System, as regulated by the Building (Dam Safety) Regulations 2022 for Medium and High PIC structures.

9.7 Effects on Schedule B Values

The One Plan Schedule B values for which the Ōhau River is to be managed have been identified in Section 3.2.1. The values which have potential to be affected by the proposed activity have been assessed in detail above. For completeness, the following assesses the effects of the proposed activity on all of the Schedule B values relevant to this application and as identified in Section 3.2.1. Schedule B Values identified in Section 3.2.1 as not relevant to the proposed activity are not discussed.

- Life supporting capacity: As discussed above, the proposed activity will not affect the life supporting capacity of the river. The effects of the construction activities have been determined to be less than minor and the proposed abstraction is within the allocation framework determined as appropriate for supporting the life supporting capacity of the river during the development of the One Plan. The proposal will also significantly reduce the need for the Council to abstract when the river is at or below minimum flow.
- Aesthetics: The activities will not change the aesthetics of the river. The in-river works will be undertaken in the dry and will be undertaken in accordance with management plans and a construction methodology which is consistent with national best practice guidelines for such works. There are no discharges other than occasional discharges of water of the same quality as the source water and no chemicals or other contaminants will be discharged.
- Contact Recreation: The activities do not affect the ability for contact recreation activities to be undertaken and enjoyed. The abstraction is provided for within the allocation framework and will not affect the availability of water for contact recreation and the activities will not discharge any contaminants which may affect people's enjoyment of the river or its riparian areas for contact recreation purposes.
- Mauri: the applicant is engaging with mana whenua to understand the cultural values and impacts of the proposed activities. This assessment will be completed upon receipt of the CIAs currently being undertaken.
- Industrial Abstraction: There are no known industrial abstractions from the Ōhau River. The proposed abstraction is sought within the allocation framework provided for in the One Plan and does not adversely affect the rights or abilities of any other users.
- Irrigation: There are some abstractions in the lower Ōhau which are used for food production including likely irrigation activities. The proposed abstraction is within the allocation framework and does not prevent any other users from exercising any existing water permits. As discussed in Section 9.3, supplementary allocation above that sought by the Applicant, but within the One Plan allocation framework remains available for other users.
- Stockwater: As with other consumptive uses described above, the proposed abstraction does not affect any other users' ability to exercise existing legal rights to abstract water for this use.
- Existing Infrastructure: The proposal is enabled by consideration of this value, as it provides for the ongoing use and improved resilience of the Levin water supply infrastructure. The assessment in Section 9.6 has also demonstrated that the proposal does not impact on the existing flood

carrying capacity of the river and therefore does not impact on the roading or other infrastructure in, or in close proximity to, the river corridor.

- Site of Significance – Aquatic. This value does not apply to at the proposed reservoir intake site. As discussed in Section 9.3, the proposed abstraction does not adversely affect the hydrological or instream conditions and habitat and the effects on significant aquatic species is considered less than minor.
- Trout Fishery – Other. The allocation sought is within the allocation framework which includes establishment of a minimum flow to protect habitat for trout and other species. The effects of the proposal on trout fishery are therefore considered less than minor.
- Trout Spawning. The allocation sought is within the allocation framework which includes establishment of a minimum flow to protect habitat for trout spawning. The effects of the proposal on trout spawning are therefore considered less than minor.
- Water Supply. The proposed activities are consistent with and enabled by this value. The proposed activities enable a significant improvement to the management of the Levin water supply which is the only water supply which is provided for via the application of this value to the Ōhau River.
- Domestic Food Supply. There are some abstractions in the lower Ōhau which are used for food production. The proposed abstraction is within the allocation framework and does not prevent any other users from exercising any existing water permits. As discussed in Section 9.3, supplementary allocation above that sought by the Applicant, but within the One Plan allocation framework remains available for other users. The proposal does not include the discharge of any contaminants and therefore it does not affect the quality of water within the Ōhau river for this use.
- Flood Control and Drainage. As assessed in section 9.6, the proposal does not affect any of the Flood Control and Drainage assets on the Ōhau River nor does it impact on the flood carrying capacity of the River.

The proposal therefore provides for, and does not adversely affect, any of the values identified in the One Plan for which the Ōhau River and its tributaries are to be managed. The effects of the proposal on these values is considered to be less than minor.

10 PROPOSED CONDITIONS OF CONSENT

Throughout this AEE several measures have been identified as consent conditions being offered by the applicant in order to ensure that there are appropriate controls and oversight of the proposed activities and that measures offered to manage environmental effects are adhered to throughout the implementation of the project and the term of consent. These have not yet been developed into detailed consent conditions, as it is considered more appropriate to summarise and enable feedback on the intent of the proposed conditions prior to the detailed drafting of specific consent condition wording and because Horizons Regional Council, as consent authority, will wish to impose standard conditions where appropriate.

The following identifies the consent conditions offered by the applicant as have been discussed throughout this Assessment of Environmental Effects.

1. The activities are required to be undertaken **in general accordance** with the application documentation.
2. Conditions authorising the **water abstraction framework** as set out in Section 4.1.2 of this AEE, specifically:
    a. Up to 15,409 m^3/day may be abstracted when the river is above the minimum flow, being 820 L/s at the Rongomatane Gauging site. Subject to this daily limit not being exceeded