Natural Inland Wetland and Buffer Management Plan

Taharoa Ironsands Central and Southern Block Mining Project

Taharoa Ironsands Limited

Prepared by:

SLR Consulting New Zealand

SLR Project No.: **850.V15262.00001**

8 September 2026

Revision: 5.0

Making Sustainability Happen

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
5.0	27 June 2025	Hamish Dean	Keren Bennett	
2.0	22 August 2025	Hamish Dean	Keren Bennett	
3.0	13 October 2025	Hamish Dean	Keren Bennett	Keren Bennett
4.0	22 June 2026	Hamish Dean		
5.5	8 September 2026	Hamish Dean	Nicola Pyper	Nicola Pyper

Basis of Report

This report has been prepared by SLR Consulting New Zealand (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Taharoa Ironsands Limited (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

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1.0 Introduction

Taharoa Ironsands Ltd (TIL) operates an ironsand mining operation at Taharoa on the west coast of the North Island, south of Kawhia Harbour. TIL is seeking new resource consents to continue the existing ironsand mining operation, concentration, and processing facilities and enable the export of titanomagnetite from the Port of Taharoa.

The Taharoa mine site includes several induced and modified Natural Inland Wetlands which will be directly impacted by the ongoing operation of the mine. The mine is also adjacent to several high-quality wetlands associated with the Taharoa Lake complex. The Ecological Impact Assessment for wetlands and terrestrial vegetation (the EcIA) (SLR 2025) included an assessment of the direct and indirect effects on wetlands and proposed a series of management actions to avoid, minimise, remedy, offset or compensate for those effects.

The Assessment recommended that the following management measures and plans be specified:

(a) A plan to monitor and manage water levels in all wetlands in the proposed groundwater drawdown areas.

(b) A plan to monitor lake margin wetlands near the Taharoa C Block, including baseline monitoring, ongoing 5-yearly monitoring, and monitoring triggered by extended periods of low lake levels.

(c) A plan including measures to fence and/or maintain vegetated buffers around retained natural wetlands, a planting and weed control programme for wetlands and buffers, and pest control.

(d) Offset for loss of natural inland wetlands as a result of mining within the Taharoa C Southern Block.

This management plan includes:

1. Methods for monitoring, minimising and managing potential adverse effects on lake margin wetlands.
2. Methods for minimising and managing drawdown effects and monitoring and managing effects on retained natural inland wetlands.
3. An indicative plan to offset the loss of 4.25 ha of wetland habitat in the mine footprint and specifications for planting, weed control and maintenance of the offset to demonstrate the feasibility of these works.
4. Specifications for planting and/or fencing of stream and wetland buffers.
5. Measures for pest animal control within the offset site and stream and wetland buffers to protect vegetation and fauna.

The offset in this plan is a proof of concept only. The final wetland offset site will be determined after the consents have been granted, at which time this plan will be updated and the hydrology and engineering work required to support it will be completed.

2.0 Minimising Significant Adverse Effects on Lake Margin Wetlands

2.1 Potential adverse effects on Lake margin wetlands

Modelling indicates that lake levels naturally fluctuate by approximately 700 mm annually, driven mainly by climate and rainfall. The proposed increase in ship loading events will slightly amplify these fluctuations and extend low-water periods in summer. This will alter the hydrological regime of lake margin wetlands, potentially affecting their extent, vegetation composition, and health. Dominant species like raupō are likely to adapt due to their tolerance and growth flexibility, though some reduction in vigour is possible, while other plant communities may shift location rather than disappear. Under normal conditions, effects are expected to be minor and reversible each winter, but during severe drought, accelerated drawdown could stress wetlands and associated species, posing a low-likelihood but high-consequence risk.

2.2 Lake Shore Monitoring

~~2.1.1~~2.2.1 ~~Goals~~ Purpose of the Monitoring

The goals of wetland monitoring are to:

- determine whether the extent and health of the wetlands on the margins of Lake Taharoa adversely change over time as a result of lake fluctuations (other than those caused by natural seasonal conditions).
- provide data to inform management responses in the event that adverse effects on the lake margin wetlands are detected.

~~2.2 Timing of and triggers for monitoring~~

~~Table 1 outlines the timing of and triggers for monitoring.~~

~~Table 1: Lake margin wetland monitoring programme~~

~~Wetland Monitoring~~	~~Timing / trigger~~
~~Baseline~~	~~Within the months of February and March in the first year following the commencement of the consents.~~
~~Repeat monitoring~~	~~Within the months of February and March, every 5 years following baseline monitoring.~~
~~Lake level trigger monitoring~~	~~Water level in Lake Taharoa is less than *9.6 metres RL as measured by the Local Datum Survey Marker*, for a continuous period of 30 days.~~

~~2.2.1~~2.2.2 Monitoring ~~S~~sites

A minimum of 12 monitoring sites/plots will be established across the 'Lake Shore' and 'Wetland 22' areas (Figure 1; Table 1~~Table 1Table 2~~).

Table 1~~12~~: Wetlands subject to monitoring.

Wetland identifier	Vegetation structure and composition	Description
Wetland 22	*Carex virgata* - sharp spike	This wetland is directly connected to Lake Taharoa and occupies a shallow gully. Raupō is common around the margins and scattered elsewhere and *Carex virgata* is common throughout. Sharp spike sedge is abundant and dominates the groundcover in places. Swamp

Wetland identifier	Vegetation structure and composition	Description
	sedge sedgeland	kiokio is scattered throughout. Raupō becomes more dominant towards the lake edge where the water is deeper, and in the northeast part *Isolepis prolifera* is common. A few scrubby grey willows are present in one patch, along with a few hukihuki. This wetland has been heavily grazed but was in the process of being fenced in late 2021 as part of the fencing of the Lake Taharoa shoreline. This site is identified as a Significant Natural Area by Waitomo District Council (DC).[1]
Lake Shore	Raupō reedland, *Juncus* rushland	Marginal lacustrine wetlands occur on all three of the larger lakes. These comprise raupō reedland with scattered harakeke where there is standing water, grading into low stature rush- and sedgeland with species such as *Isolepis prolifera*, *Juncus prismatocarpus, J. tenuis,* and *J. articulatus,* as well as a range of exotic grass species such as narrow-leaved carpet grass and Yorkshire fog. These wetlands have all been grazed although they are now being fenced off. Stock grazing has influenced the vegetation, and low turf occurs where they have easy access. At Lake Taharoa these wetlands are contiguous with those along the margins of the Wainui Stream. Most of the lake shore wetlands are outside the Taharoa land parcels. This site includes parts of Significant Natural Areas R16UP014.01 and R16UP002.

~~2.2.2~~2.2.3 ~~Wetland~~ Monitoring Methodology

The extent and health of the raupō and flax wetlands on the margins of Lake Taharoa adjoining Taharoa C Block will be monitored.

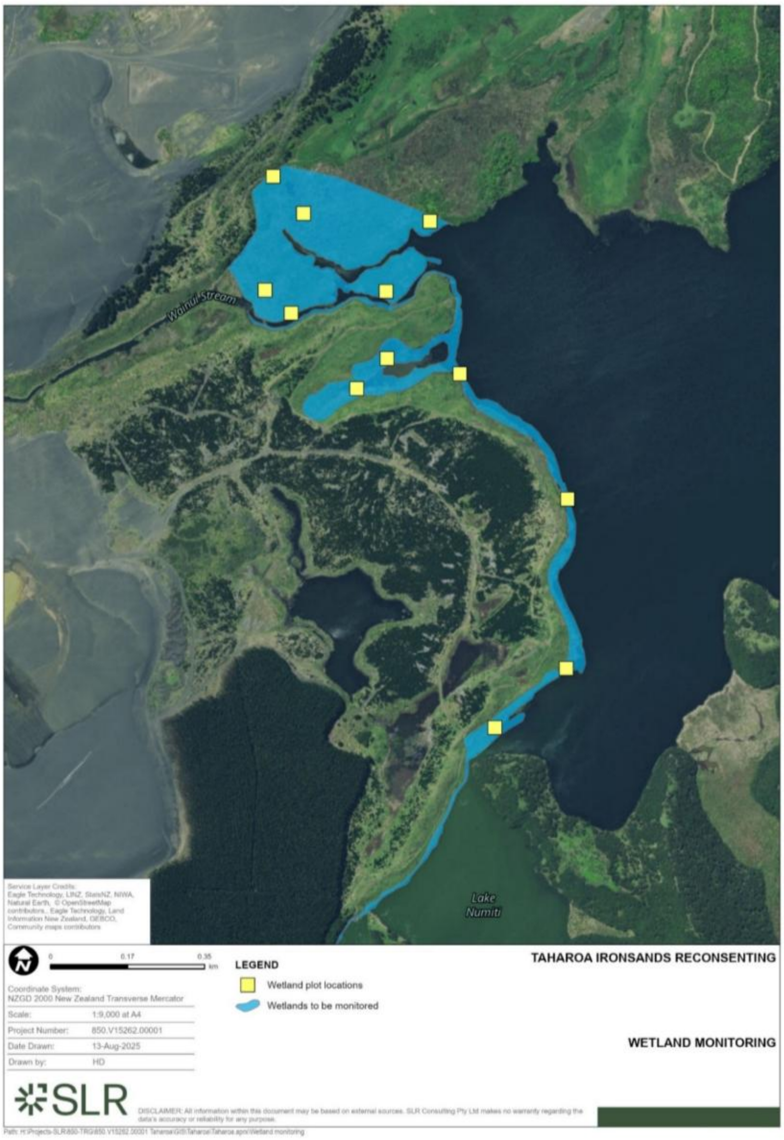
~~2.2.2.1~~2.2.3.1 Wetland Extent

The baseline extent of wetland vegetation should be mapped in GIS using the most up-to-date aerial imagery. This may involve capturing drone imagery. This mapping should be done at a scale no greater than 1:2,000 and should be repeated ~~every 5 years~~on the same schedule as the vegetation monitoring (Table 2). Any differences in wetland extent should be quantified and assessed. In addition, wetland extent in a control site such as Lake Harihari should be monitored to control for natural variation caused by climate conditions.

Photopoint monitoring should be established ~~in at least five locations~~ at viewpoints overlooking ~~the~~ each wetland to show general wetland health and extent. Photo points should be permanently marked so that they are repeatable, and the photos can be compared across monitoring events.

[1] Data obtained from Waikato Regional Council geospatial portal. https://maps.waikatoregion.govt.nz/arcgis/rest/services/OurMaps/Environmental_Assessment_ICM/MapServer

Figure 1: Wetlands to be monitored on the margins of Lake Taharoa adjoining Taharoa C Block.

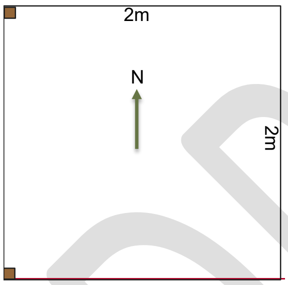


~~2.2.2.2~~2.2.3.2 Wetland Condition

Monitoring of wetland condition~~s~~ will utilise the methodology developed by Clarkson *et. al.* (2014) for the Bay of Plenty which is an adaptation of the ~~comprise completion of a Wetland Record Sheet as described in the~~ Handbook for Monitoring Wetland Condition (Clark~~e~~son *et al.* 2003~~[2]~~). This method includes use of the Prevalence Index which uses wetland plant indicator status to give an indication of how wet a site is. ~~-~~The Wetland Record Sheet is used to score wetland condition indicators and pressures, while the Wetland Plot Sheet provides finer detail to inform an overall calculation of the Wetland Condition Index. ~~.~~Wetland condition should be monitored for the potentially impacted wetlands ~~(Lake Shore Wetlands & Wetland 22)~~ as well as for an appropriate control site, such as Lake Harihari to the south. This will ensure that any change in wetland condition at Taharoa is not due to natural change, such as weather patterns.

~~**Vegetation change**~~

~~Formal vegetation monitoring should be established in the wetlands so that any changes in vegetation composition can be tracked over time. Permanently marked 2 m × 2 m vegetation monitoring plots will be established in each wetland.~~ At least 12 quadrats should be established in the ~~raupō v~~vegetation of the Lake Margin wetlands and Wetland 22. ~~Quadrats should be permanently marked using wooden pegs as in the illustration below, and the plot number clearly marked on the peg.~~



~~For each plot, a brief vegetation description should be written following the system developed by Atkinson (1985). Maximum and average vegetation heights are recorded.~~

~~Percent foliar cover of each species of vascular plant should be estimated in three height classes: < 30 cm, 30 – 100 cm, and 100 – 200 cm. Cover of woody stems and the culms of rushes are not recorded as foliar cover so that if a plant has its natural spread of foliar cover in the 30 – 100cm height class, for example, percent cover is recorded in that class but the cover of the vertical stems through the < 30cm class are not recorded. Cover of bare ground, leaf litter, and woody debris should also be recorded.~~

~~Photos should be taken of the plot and of the surrounding vegetation in such a way that they will be repeatable for each monitoring event with the intent of showing change in vegetation composition and health.~~

~~[2] Clarkson B.R., Sorrell B.K., Reeves P.N., Champion P.D., Partridge T.R., and Clarkson B.D. 2003. Handbook For Monitoring Wetland Condition. Coordinated Monitoring of New Zealand Wetlands. Revised October 2004. A Ministry for the Environment Sustainable Management Fund Project.~~

~~Quadrats should be measured every five years during February and March, or when triggered by persistent low lake levels, for the period of consent.~~

~~2.2.2.3~~2.2.3.3 Data Interpretation

Wetland values, based on wetland extent, condition scores and vegetation, will be compared against recorded baseline values, and the offsite control site, to identify changes to overall wetland condition for the course of the consent period. Deterioration in condition scores, negative changes in wetland extent and changes in vegetation type, including species dominance or an influx in terrestrial or weed species will trigger detailed review of results against lake water level fluctuations.

The extent of emergent macrophytes such as raupō can vary year to year due to weather conditions and natural fluctuations in water level so care is required when interpreting changes in extent between monitoring events. A reduction in extent of at least 10% would be required before any action is taken.

Similarly, changes in relative cover and species diversity derived from plot data, and wetland condition index, need to be interpreted with caution.

A brief report summarising the data, providing comparisons between survey results and recommending any necessary lake level management changes will be produced after each monitoring event and submitted to WRC as part of an annual monitoring report.

Management actions required in response to monitoring results are detailed in consent conditions AUTH142035.05.01 which require the Consent Holder to review and update the Lake Level & Water Management Plan to identify measures that can be implemented to address the identified adverse effects.

~~2.2.3~~2.2.4 Timing of and Triggers for Monitoring

Table 2~~Table 2~~ outlines the timing of and triggers for monitoring.

Table 2~~21~~: Lake margin wetland monitoring programme

Wetland Monitoring	Timing / trigger
Baseline	Within the months of February and March in the first year following the commencement of the consents.
Repeat monitoring	Within the months of February and March: • Annually for the first three years following baseline monitoring; then • Every two years for the next six years; then • If adverse effects have not been detected, every five years for the duration of the consent.
Lake level trigger monitoring	Water level in Lake Taharoa is less than *9.6 metres RL as measured by the Local Datum Survey Marker*, for a cumulative period of 30 days over any 60 day period.

3.0 Minimising Drawdown Effects on Retained Wetlands

3.1 Potential Drawdown Effects

The groundwater modelling report (WWLA, 2025) indicates that during the mining of the pits on the Southern Block, groundwater levels beneath nearby wetlands ~~will~~ may drop by up to 4 m and a groundwater gradient from east to west will be created. ~~The~~ WWLA have identified that nine of the Natural Inland Wetlands that are being retained, as well as the Offset & Compensation Site (Site 27), are at least partially groundwater-fed and within the area where drawdown is expected at some point during the mining sequence. These are listed in Table 3 and shown in Figure 2. ~~groundwater report has identified a number of wetlands that are groundwater influenced (, but notes that surface water inputs, from lake or stream water, and surface inputs from rainfall also contribute to maintaining these wetlands). F~~For these groundwater-influenced wetlands, ~~this~~ drawdown could result in a change in wetland hydrology, loss of wetland extent, and the proposed offset site (explained below) could be compromised.

To mitigate these effects, ~~several~~ contingency supplementation of water has been proposed (Section 1.1.1) ~~measures are proposed including ceasing pit dewatering in close proximity to wetlands during dry periods, and supplementation of water levels~~.

Table 3: Wetlands that are at least partially fed by groundwater and may be subject to drawdown effects.

SLR Wetland ID	WWLA Wetland ID
Wetland 12	62
Wetland 16	66
Wetland 9	67
Wetland 10	69
Wetland 11	70
Site 27 (Offset site)	72
Wetland 21	73 & 75
Wetland 8	74
Wetland 15	80

Once mining in the southern pits is complete, the groundwater levels are expected to return to normal and supplementary water will no longer be required. No further restoration steps are required.

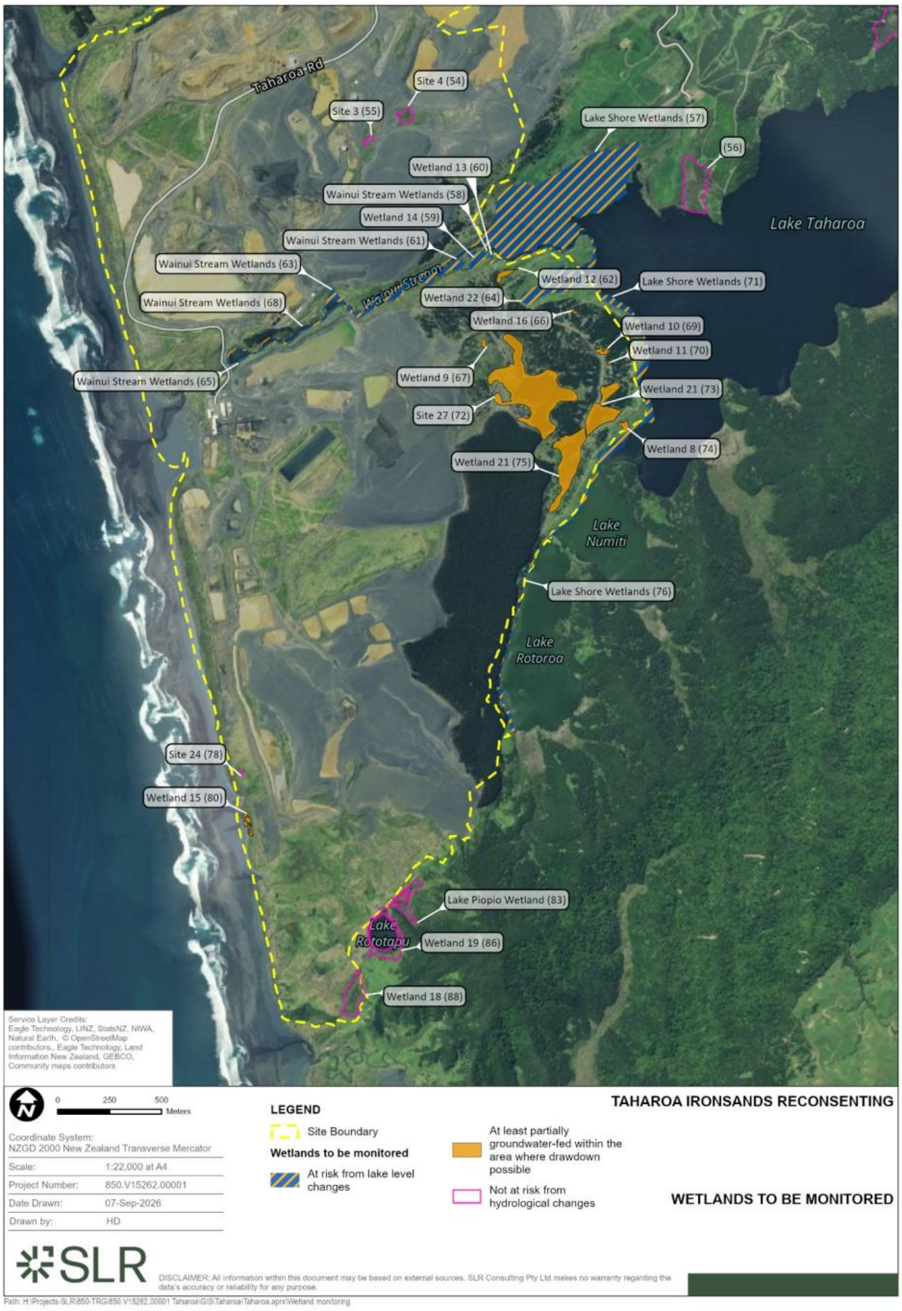


Figure 2: Wetlands to be monitored

3.2 Monitoring of Retained Wetlands

3.2.1 Water Level Monitoring

To ensure effective mitigation, the WWLA groundwater report has recommended a 12-month baseline monitoring period, commencing during the first 12 months of exercising of the consent. They recommend monitoring using the following approach which is based on the modelling that all wetlands within a particular group are linked:

- Wetland Group 1, comprised of Wetland 42 only (north of the site), is monitored by the existing piezometer C103.
- Wetland Group 2 is group of wetlands that are riparian features and will be supported via flow conditions in the Wainui Stream which are controlled by the dam as described in Section 6.2.2 (of the WWLA groundwater report).
- For each of Wetland Groups 3 and 4, the most vulnerable wetland (in terms of risk of groundwater drawdown) was identified based on its proximity to mining and potential drawdown, with Wetland 72 being identified for Group 3 and Wetland 80 being identified for Group 4. These wetlands both have monitoring piezometers that were installed on 30/10/2025 and 6/11/2025, respectively.
- ~~*Wetland Group 3 is a group of wetlands near the edge of Lake Taharoa with Wetland 72* (SLR Site 27) *being both the largest and closest to the excavation. It is recommended to establish a new monitoring site within Wetland 72.*~~
- ~~*Wetland Group 4 is a group of wetlands to the south of the proposed Southern Pit mining area. The wetlands to the southeast of the Taharoa C Block are predominantly surface water fed from the adjacent hills, with a pair of nested piezometers (S103) confirming the hydraulic separation of the wetlands from regional groundwater. Wetland 80* (SLR Wetland 15)*, to the west of the mining area, may have a degree of connection groundwater.*~~

~~The baseline wetland water level monitoring would form the basis of water level long-term simulation modelling to define trigger levels for the setting of contingency measures.~~

~~Monitoring and modelling should determine the lowest and mean natural water level in each wetland in the periods of December – February, March – May, June – August and September – November (summer, autumn, winter, spring).~~

~~Ongoing daily monitoring of wetland levels will be required until dewatering of adjacent pits has been completed, and groundwater levels have returned to background conditions.~~

3.2.2 Trigger Levels

Triggers ~~should~~ will be based on 12 months of baseline water level data collected at each site. These data will then be used to calibrate a water balance model, that includes historic wet and dry periods, to project a longer-term data set of at least 20 years in duration. The resulting simulation can be used to inform the setting of trigger levels and responses as per Table 4.

Table 4: Table of methodology for the setting of trigger levels and management responses.

Trigger Level	Metric	Purpose	Management Response
TL1	5th percentile lowest of natural baseline water level.	Raise awareness of potential issue approaching if decline continues. To enable TIL to closely monitor wetland water levels and make preparations to augment the wetlands in the affected wetland group, if declines continue.	TIL to alert WRC that levels are approaching the low end of the anticipated range. No other action required.
TL2	1st percentile lowest of natural baseline water level.	Acknowledgment that groundwater levels are at the limit of their historical range. Initiates a review of likelihood of the continuance of low groundwater levels.	TIL to commission a review of the cause of the water level decline, considering: • Seasonal climate (natural vs affected by mining) • Rate of decline • Timing with regard to the mining progression The review must be completed within one month.
TL3	Outcome of TL2 review is that the effect is likely induced by mining and likely to continue	Enact measures to mitigate effect	Initiate augmentation of all wetlands in the affected group that are potentially connected to groundwater. Augmentation in the monitored wetland must 1. meet water quality standards for augmentation water; and 2. sustain water level above the 5th percentile, as determined by baseline monitoring. Other wetlands in the group that are potentially connected to groundwater shall be augmented at an equal depth to the monitored wetland, adjusted for area (i.e. if 50 mm/day is added to Wetland 72, other groundwater connected wetlands in Group 3 shall also receive 50 mm/day of augmentation). Once the monitored wetland can sustain the TL1 depth without augmentation, all augmentation in that wetland group can cease.

~~the lowest natural level during any given season. If water levels in any of the groundwater connected wetlands drop below the seasonal low for more than 14 days, contingency measures should be implemented and levels maintained within the natural seasonal range.~~

~~3.2.3 Contingency Measures~~

~~Contingency measures comprise:~~

~~**Cessation of dewatering** in pits in proximity to the wetlands during dry times until wetland water levels recover to within the natural seasonal range; and/or~~

~~**Supplementation of wetland water levels** with (fresh) water from the mine reservoir or storage ponds. Supplementary water additions are to be either directly (if clean) or indirectly via ground soakage through sand beds (if silty).~~

- ~~Water input and ground soakage locations will be determined by the project hydrologist.~~
- ~~The volume and timing of supplementation will be guided by:~~
  - ~~Wetland water level monitoring (section 3.2.13.2);~~
  - ~~A dynamic wetland water balance model;~~
  - ~~The progression of mining in the southern mining pits.~~
- ~~Wetland water levels will be maintained at or above the lowest natural water level for the given season, and within the natural seasonal range.~~

~~3.2.4~~3.2.3 Wetland Health Monitoring

The condition and extent ~~of a representative sample~~ of all nine of the remaining wetlands identified in Table 3 should be monitored to ensure that the groundwater trigger levels and contingency measures are sufficient to maintain wetland health. Monitoring should be consistent with that described in Section ~~2.5~~ 2.2.3 for the lake margin wetlands, except that at least one wetland plot should be established in each vegetation type of each wetland.

3.2.3.1 Purpose of the Monitoring

The purpose of this monitoring is to determine whether the extent and health of the retained wetlands are adversely affected by groundwater drawdown and to provide data to inform management responses in the event that adverse effects are detected.

3.2.4 Timing of and Triggers for Monitoring

Table 5 outlines the timing of and triggers for monitoring~~and is required to be done prior to disturbance of wetlands and at least every five years thereafter. It is recommended that this monitoring be done alongside the lake shore monitoring~~.

Table 5: Retained wetland monitoring timing and triggers

Wetland Monitoring	Timing / trigger
Baseline	Within the months of February and March in the first year following the commencement of the consents.
Repeat monitoring	Within the months of February and March: • Annually for the first three years following baseline monitoring; then • Every two years for the next six years; then

Wetland Monitoring	Timing / trigger
	• If adverse effects have not been detected every five years for the duration of the consent.
Lake level trigger monitoring	Water level in the representative wetland remains below mean seasonal level for a cumulative period of 30 days over any 60 day period.

Proposed conditions require that should monitoring show a decline in wetland health due to mining activities, trigger levels and contingency measures will be re-assessed.

4.0 Offsetting Wetland Loss

~~4.0~~

Commented [HD1]: This section has been completely revised since Version 4 which was submitted as part of the response to comments in Jul 2026. Sections 4.1 - 4.6 replace Sections 4.1 - 4.2 in the previous version.

4.1 Characterisation of the loss

Seven wetlands, ranging from 0.03 ha (300 m^2) to 2.18 ha in size, ~~will~~ are proposed to be lost during mining. These were referred to as Wetlands 5, 6, 7, 17, 20, 23 and 25 in the ~~EcIA~~Terrestrial Ecology – Wetlands and Vegetation Assessment (Appendix K to the Substantive Application), and are all located in the southern part of the Southern Block (refer Figure 3~~Figure 2~~). Table 6~~Table 5Table 3~~ provides a classification for each wetland according to the system described by Johnson & Gerbeaux[3], along with a description and the area each wetland occupies. In total, 4.25 ha of wetland habitat will be lost. Of this, 3.81 ha is seepage wetland.

4.1.1 Seepage wetlands

Seepages are wetlands that occur on sloping land, often at the toe of a slope or on a hillside, where a groundwater layer intersects the surface. Accordingly, these wetlands are primarily fed by groundwater and they feature saturated soils and very shallow surface water and runnels. Seepages can be diverse because of the unique growing conditions and generally higher nutrient status of the groundwater that feeds them compared with the surrounding land. Seepages have been classified as Endangered[4], but this is based primarily on their physical features, rather than their biotic ones. Recreating seepages would be very difficult because of their unique hydrology and therefore any wetland creation to mitigate loss of seepages would not meet the like for like requirement of the Offsetting Principles[5]. Loss of seepage wetlands therefore cannot be offset and must be compensated for.

[3] Johnson P, Gerbeaux P 2004. Wetland Types in New Zealand. Department of Conservation Wellington. ISBN: 0-478-22604-7.

[4] Holdaway RJ, Wiser SK, Williams PA 2012. Status Assessment of New Zealand's Naturally Uncommon Ecosystems. Conservation Biology 26: 619-629.

[5] Ministry for the Environment 2020. National Policy Statement for Freshwater management 2020. New Zealand Government, December 2025. 72p.

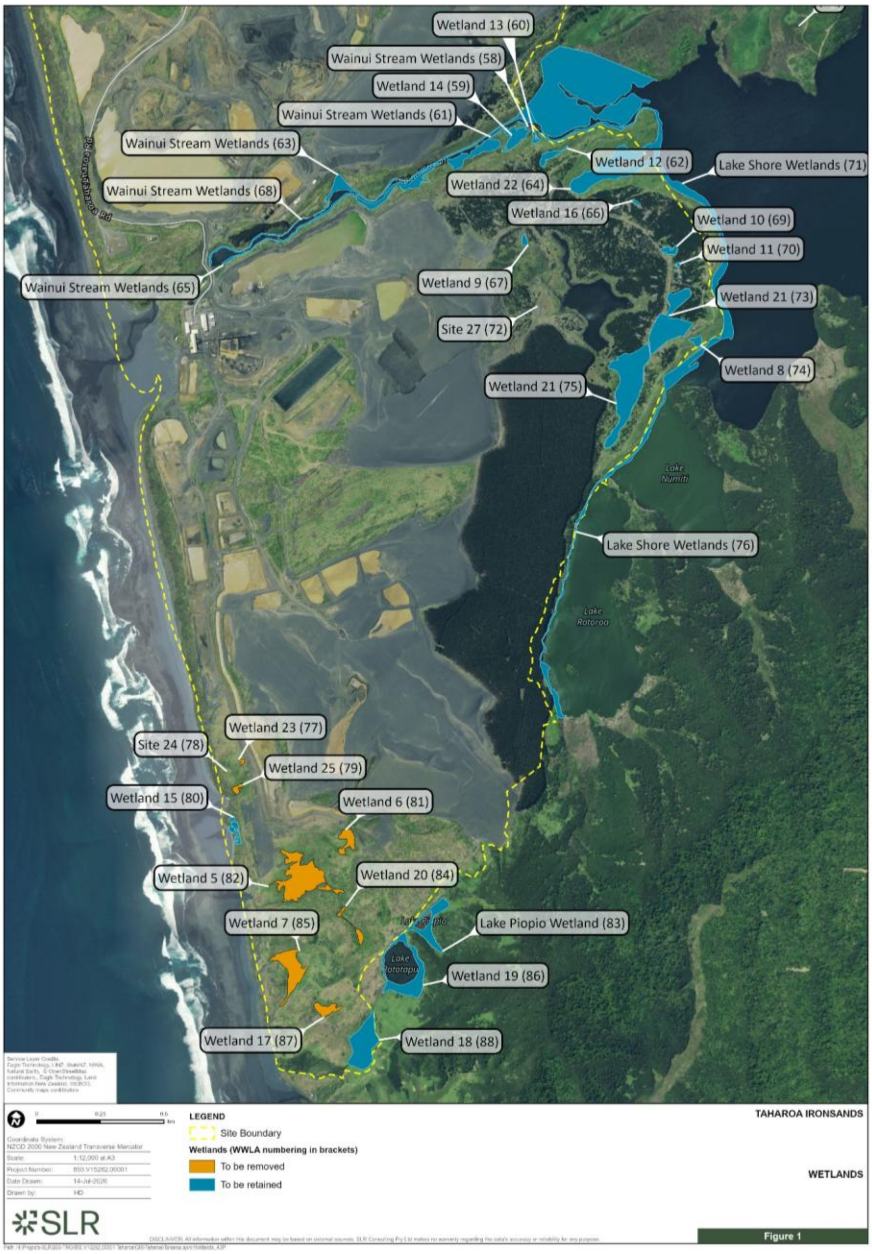


Figure 3~~32~~: Wetlands proposed to be lost

Table 6~~53~~: Classification and descriptions of wetlands being lost

Wetland identifier	Hydrosystem	Class	Form	Vegetation structure and composition	Description	% Indigenous cover	Area (ha)
Wetland 5	Palustrine	Seepage	Flat	Jointed rush rushland	A flat area approximately 150m inland from the beach. This is a seepage wetland which discharges via a small stream to the beach. The vegetation is a low, reasonably diverse turf dominated by *Juncus articulatus* but with a range of other species including swamp plantain, lotus, *Cyperus congestus, Myriophyllum votschii,* water purslane, and narrow-leaved carpet grass. The landform is unnaturally undulating which has resulted in a wetland of irregular shape whose boundaries were difficult to delineate. A large tailings disposal area is located upslope of this wetland to the northeast which receives large quantities of water as part of the sand slurry. The hydrology of this wetland and the one immediately to the northeast may be artificially enhanced by this.	3	2.18
Wetland 6	Palustrine	Seepage	Basin	Jointed rush rushland	This is a seepage area adjacent to Wetland 5 and very similar in vegetation composition and structure. This site is also fed by groundwater seepage and is likely to be affected by the discharge of slurry water upslope.	3	0.37
Wetland 7	Palustrine	Seepage	Basin	(Oioi) - [knobby club rush] / jointed rush rushland	A gully floor wetland within 75m of the beach. At the time of survey there was standing water in the northern part of this wetland in an area dominated by *Isolepis prolifer*. The remaining part of the wetland includes patches of oioi and knobby clubrush over a turf dominated by jointed rush with pasture grasses. The wetland is heavily grazed by cattle and horses. It drains to the south through a narrow channel.	40	0.92
	Palustrine	Shallow water	Basin	(Isolepis prolifer) - [jointed rush] / Myriophyllum propinquum waterfield		72	0.16
Wetland 17	Palustrine	Shallow water	Basin	jointed rush - common water milfoil waterfield	This wetland occupies a shallow basin southwest of Lake Rototapu. The vegetation comprises jointed rush and floating sweetgrass over *Myriophyllum propinquum,* starwort, and Centella, with giant umbrella sedge around the margins. This site is likely to be subject to seasonal inundation.	95	0.33
Wetland 20	Palustrine	Swamp	Basin	(knobby clubrush) - (giant umbrella sedge / jointed rush rushland	A small wetland in a gully to the west of lake Rototapu and draining to the northwest. This wetland was not closely inspected. Vegetation includes knobby	32	0.17

Wetland identifier	Hydrosystem	Class	Form	Vegetation structure and composition	Description	% Indigenous cover	Area (ha)
					clubrush and occasional giant umbrella sedge over jointed rush and pasture grasses.		
Wetland 23	Palustrine	Ephemeral or marsh	Basin	Raupo reedland	This small wetland appears to have formed in a shallow basin left after mining operations. The vegetation is dominated by raupō with ferny azolla and *Lemna minor* floating on the wetland surface. Mercer grass was common along with jointed rush and a range of pasture species.	75	0.03
Wetland 25	Palustrine	Seepage	Flat	Jointed rush - water purslane rushland	This seepage wetland occupies the coastal terrace above the beach. A few giant umbrella sedge and knobby clubrush are emergent over a groundcover dominated by Jointed rush and water purslane. This wetland was heavily grazed at the time of visit.	32	0.09
							4.25

4.2 Offset and Compensation Proposal

The proposal is to construct a new 8.3 ha wetland adjacent to Site 27 at the eastern edge of the Taharoa C block close to Lake Taharoa (

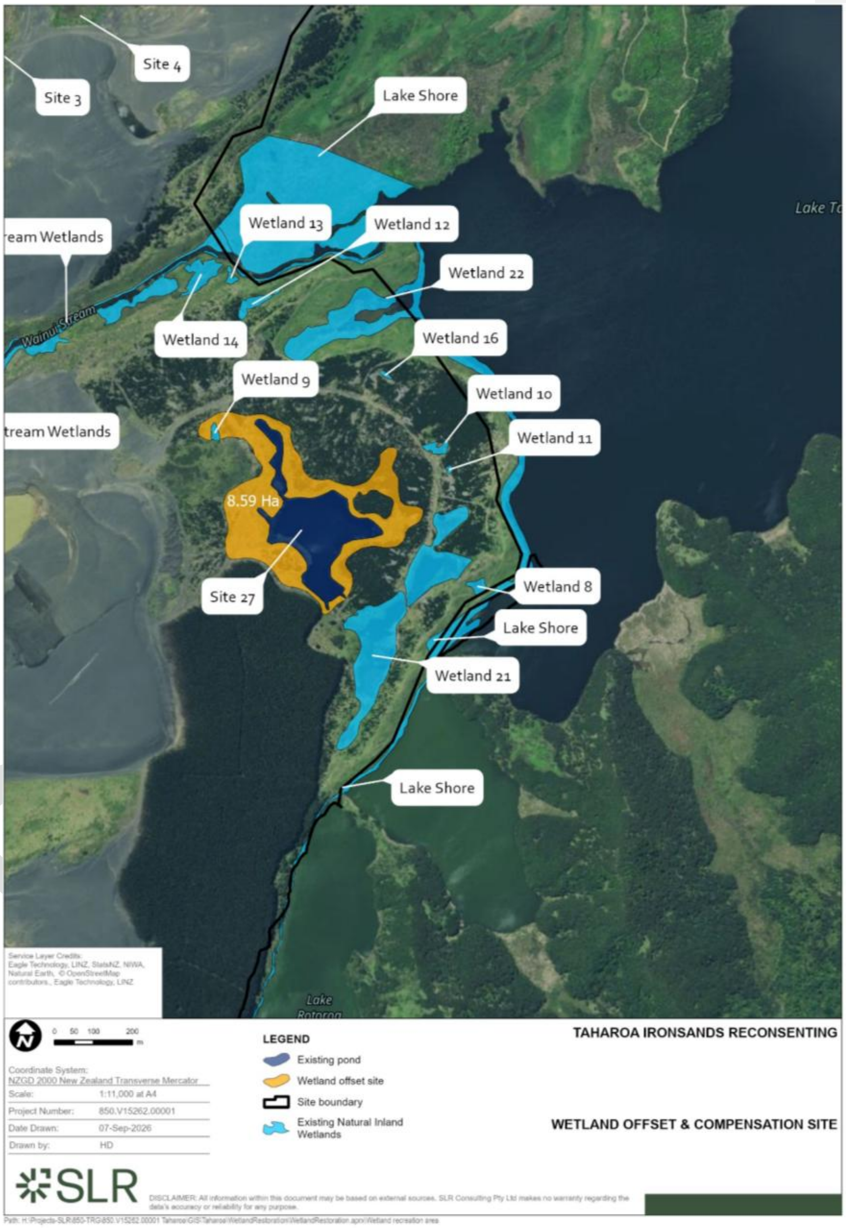

Site 4
Site 3
Lake Shore
Lake To
eam Wetlands
Wetland 13
Wetland 12
Wetland 22
Wainui Stream
Wetland 14
Wetland 16
Wetland 9
Wetland 10
tream Wetlands
Wetland 11
8.59 Ha
Site 27
Wetland 8
Lake Shore
Wetland 21
Lake Shore
Service Layer Credits:
Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, LINZ
Lake Rotoroa
0 50 100 200 m
Coordinate System:
NZGD 2000 New Zealand Transverse Mercator
Scale: 1:11,000 at A4
Project Number: 850.V15262.00001
Date Drawn: 07-Sep-2026
Drawn by: HD
LEGEND
Existing pond
Wetland offset site
Site boundary
Existing Natural Inland Wetlands
TAHAROA IRONSANDS RECONSENTING
WETLAND OFFSET & COMPENSATION SITE
SLR
DISCLAIMER: All information within this document may be based on external sources. SLR Consulting Pty Ltd makes no warranty regarding the data's accuracy or reliability for any purpose.

Figure 4: Potential wetland offset location and nearby natural wetlands.~~Figure 3~~). The concept is to lower the land surrounding the constructed pond to create a variety of wetland habitats including shallow water, saturated soils, and periodically inundated areas. The site is currently vegetated in regenerating radiata pine with a groundcover of predominantly exotic grasses and herbs (Photo 1~~Photo 1~~, Photo 2~~Photo 2~~). The landform has been modified by previous mining efforts which left the current pond. The margins of the pond are relatively low lying in some areas which will reduce the amount of earthworks required to achieve the target landform. The loss of raupō reedland and shallow water wetlands will be offset, while the loss of seepage wetlands will be compensated for. Specifically:

- To offset the loss of 0.49 ha of shallow water wetland (Wetlands 7 & 17), a minimum of 2 ha of shallow water habitat will be created. This will have an average water depth of less than 50 cm to match what is being lost. This area is to be planted with both emergent and submerged macrophytes, including those species in the lost wetlands, and it is expected that more submerged macrophytes will establish naturally over time.
- To offset the loss of 0.03 ha of raupō (*Typha orientalis*) reedland (Wetland 23), a minimum of 0.5 ha of raupo wetland will be established. Raupo can be difficult to establish but propagules from elsewhere in the site will be used as a starting point.
- To compensate for the loss of 3.72 ha of seepage wetland (Wetlands 5, 6, 7, 20 & 25), an additional 5.8 ha of wetland habitat and 7.31 ha of terrestrial buffer planting will be established at the offset ~~&~~and compensation site. To replicate as close as possible the conditions found in the seepage wetlands, the new wetland habitat will as much as possible feature saturated soils (i.e. not standing water).

Details of how the offset and compensation proposal will be achieved are included in Section 4.6~~4.6~~~~4.4~~ below.

4.3 Biodiversity Offset Accounting Model

The Biodiversity Offset Accounting Model (BOAM)[6] was used to verify that the proposed offset and compensation area would achieve the desired outcomes for those wetlands being offset.

Indigenous vegetation cover was used as the primary input to the offset model. Quantitative data on vegetation cover was not collected for all the wetlands being lost but a vegetation plot was established in Wetland 5 as part of the wetland delineation process which provides cover data relevant to both Wetland 5 and 6. Atkinson vegetation descriptions[7] were written for all wetlands which include all dominant species and their relative cover in cover classes. These two sources of plant cover data, along with site photographs and general descriptions, have been used to estimate indigenous cover at each of the wetlands being lost.

[6] Maseyk, F, Maron M, Seaton R, and Dutson G. 2015. A Biodiversity Offsets Accounting System for New Zealand. Contract report prepared for the Department of Conservation, Hamilton Service Centre, Hamilton New Zealand.

[7] Atkinson IAE 1985. Derivation of vegetation mapping units for an ecological survey of Tongariro National Park, North Island, New Zealand. New Zealand Journal of Botany 23: 361-378.

The BOAM calculations to support the offset are included in Appendix A~~Appendix B~~ Aand are summarised in Table 7~~Table 6Table 4~~ below. The justifications for the values and parameters used in the model are included in Table 8~~Table 7Table 5~~.

For the shallow water and raupō wetland types the offset proposal complies with the good practice definition of No Net Loss, that '*no high value indigenous components and no indigenous types should be substituted for other components or types'*[8]. No known high value indigenous components are being lost from seepage wetlands either as these are currently vegetated primarily in exotic species and have no threatened or at-risk species present. The physical attributes of a seepage (specifically the hydrology) cannot be replicated however, so compensation is required.

Photo 1: The western side of the potential restoration site including the artificial pond area. September 2021.

[8] New Zealand Government (2014) Guidance on Good Practice Biodiversity Offsetting, http://www.doc.govt.nz/Documents/our-work/biodiversity offsets/the-guidance.pdf

Photo 2: An area on the southwestern side of the artificial pond which will be excavated and turned into wetland habitat. September 2021.

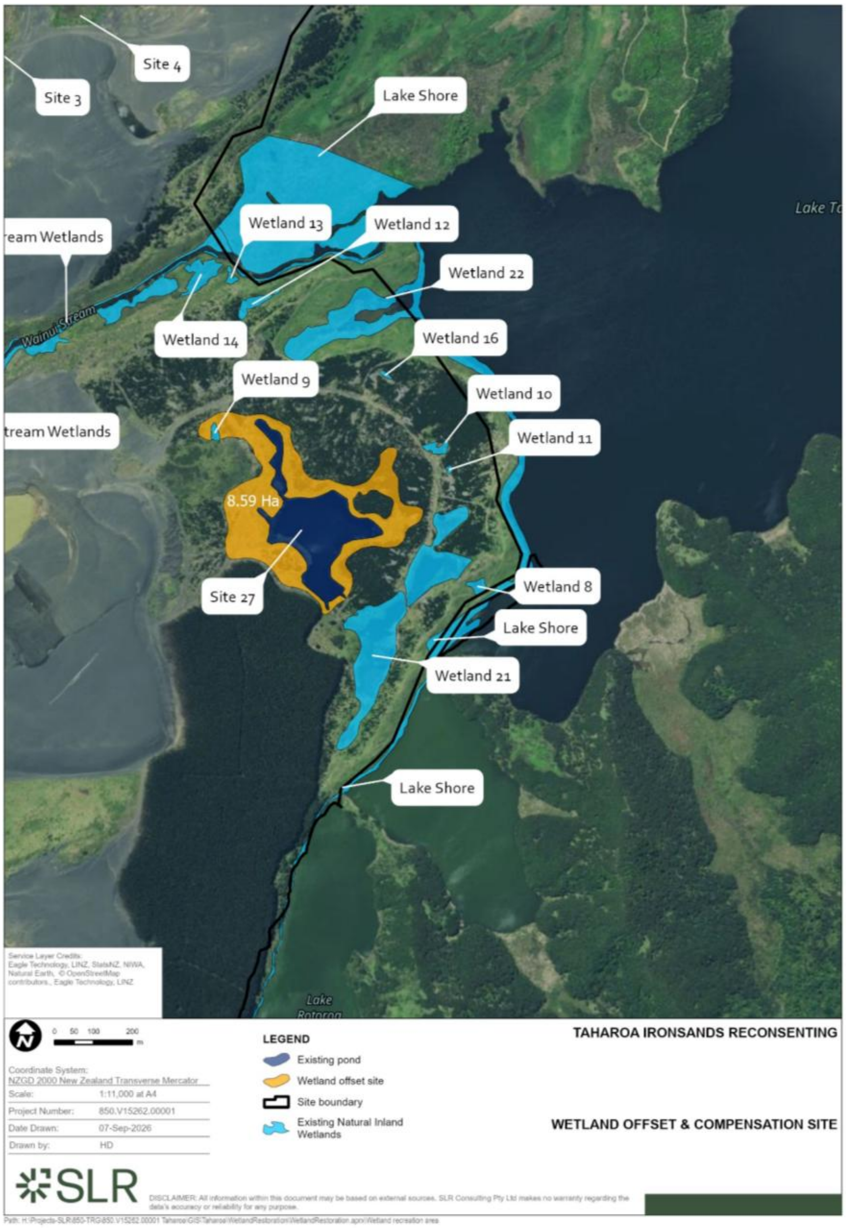

Site 4
Site 3
Lake Shore
Wetland 13
Wetland 12
Wetland 22
Wetland 14
Wetland 16
Wetland 9
Wetland 10
Wetland 11
8.59 Ha
Site 27
Wetland 8
Lake Shore
Wetland 21
Lake Shore
Service Layer Credits: Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, LINZ
Coordinate System: NZGD 2000 New Zealand Transverse Mercator
Scale: 1:11,000 at A4
Project Number: 850.V15262.00001
Date Drawn: 07-Sep-2026
Drawn by: HD
LEGEND
Existing pond
Wetland offset site
Site boundary
Existing Natural Inland Wetlands
TAHAROA IRONSANDS RECONSENTING
WETLAND OFFSET & COMPENSATION SITE
SLR

Figure 4: Potential wetland offset location and nearby natural wetlands.~~**Figure 3: Potential wetland offset location and nearby natural wetlands.**~~

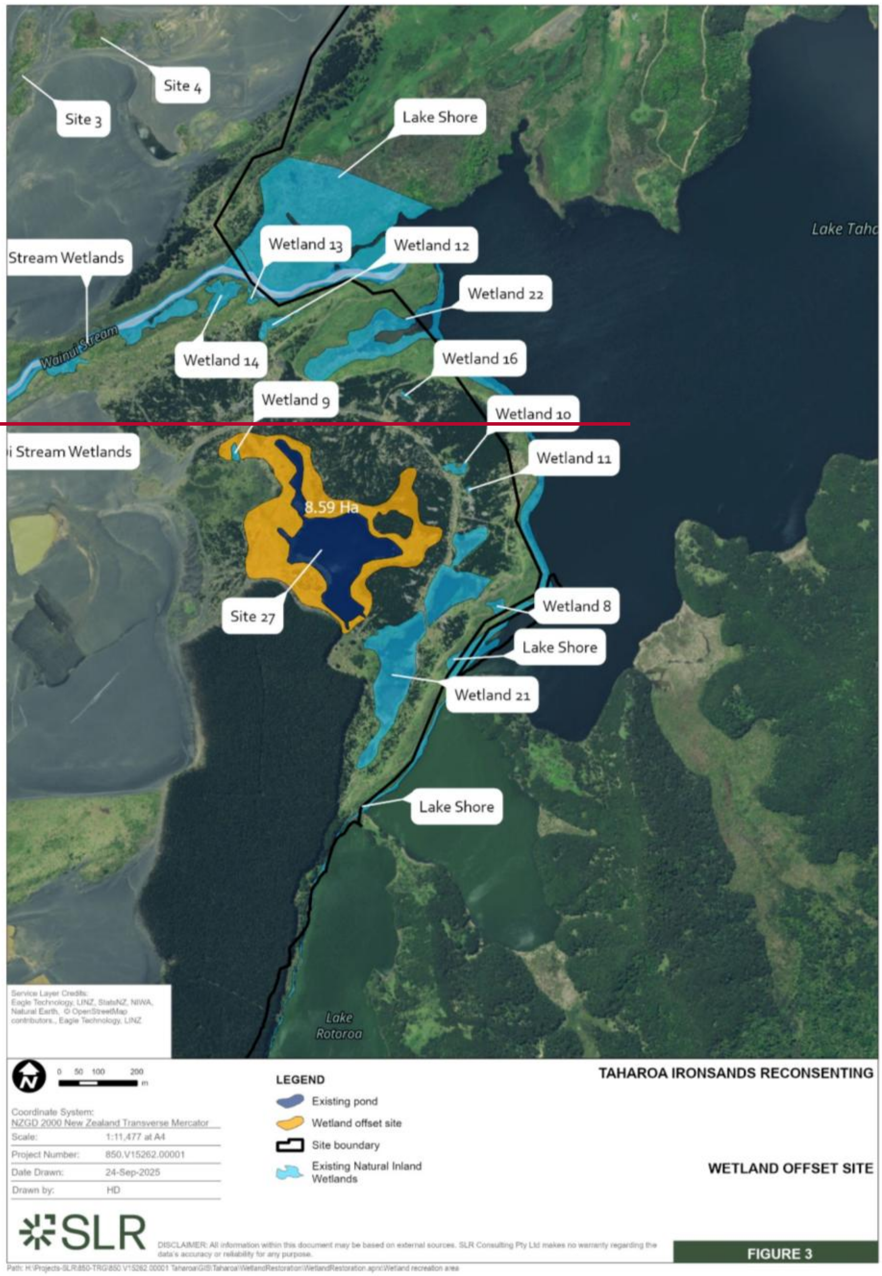

Site 4
Site 3
Lake Shore
Lake Taho
Stream Wetlands
Wetland 13
Wetland 12
Wetland 22
Waimai Stream
Wetland 14
Wetland 16
Wetland 9
Wetland 10
i Stream Wetlands
Wetland 11
8.59 Ha
Site 27
Wetland 8
Lake Shore
Wetland 21
Lake Shore
Lake Rotoroa
Service Layer Credits: Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, LINZ
0 50 100 200 m
Coordinate System: NZGD 2000 New Zealand Transverse Mercator
Scale: 1:11,477 at A4
Project Number: 850.V15262.00001
Date Drawn: 24-Sep-2025
Drawn by: HD
LEGEND
Existing pond
Wetland offset site
Site boundary
Existing Natural Inland Wetlands
TAHAROA IRONSANDS RECONSENTING
WETLAND OFFSET SITE
SLR
DISCLAIMER: All information within this document may be based on external sources. SLR Consulting Pty Ltd makes no warranty regarding the data's accuracy or reliability for any purpose.
FIGURE 3

Table 7~~64~~: Summary of offset calculations

Biodiversity Type	Component	Attribute (unit)	Offset action	Area lost (Ha)	Offset area (Ha)	Confidence in offset	Offset site			Biodiversity Value			
							Measure before offset	Measure after offset	Time to end point (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	NPBV
Shallow water wetland (7 + 17)	(Isolepis prolifer) - [jointed rush] / Myriophyllum propinquum waterfield (Wetland 7) & jointed rush - common water milfoil waterfield (Wetland 17)	Native species cover (%)	Restoration of shallow open water habitat including submerged and emergent macrophytes	0.49	2	Low confidence >50% <75%	0	75	10	0.77	-0.49	0.28	0.28
	Depth of water	Depth of water (cm)	Restoration of shallow open water habitat including submerged and emergent macrophytes	0.49		Confident 75-90%	0	30	2	1.56	-0.49	1.07	1.07
Raupo reedland	Raupo reedland	Native species cover (%)	Restoration of raupo reedland	0.03	0.5	Low confidence >50% <75%	0	50	10	0.12	-0.02	0.09	0.09

Table 8~~75~~: Justification for values used in the BOAM

Parameter	Raupo reedland		Shallow water wetland			
	Indigenous vegetation cover		Indigenous vegetation cover		Water depth	
	Value used	Justification	Value used	Justification	Value used	Justification
Discount rate	3%		3%		3%	
Benchmark	100%	Raupo reedlands in nearby wetlands (e.g. taharoa lake margins) have very dense canopies often reaching 100 % native vegetation cover.	90%	Indigenous vegetation cover in the impacted wetlands was in a relatively natural state and had an indigenous cover of approximately 90%.	30 cm	This type of wetland features shallow standing water with depths between 10 and 50 cm. 30 cm has been used as it is the mid-point of this range.
Confidence in offset actions	Low confidence >50% <75%	Raupo reedlands can be difficult to establish despite naturally spreading rapidly. Low confidence acknowledges that reed beds may be slow to get going.	Low confidence >50% <75%	Sourcing appropriate species in the required volumes could be difficult and submerged aquatics could be slow to establish.	Confident 75-90%	Achieving enough area with suitable water depth should be relatively simple with available machinery and resources.
Measure before offset	0	The offset site is currently not wetland	0	The offset site is currently not wetland	0	The offset site is currently not wetland
Measure after offset	50%	50% cover in the available area is a reasonable, achievable target, given potential challenges to establishment when compared to planting container-grown plants.	75%	Slow establishment and potential difficulties managing aquatic weeds could impact the expected indigenous vegetation cover target	30 cm	Achieving enough area with an average water depth between 10 - 50 cm should be relatively simple with available machinery and resources.
Time till endpoint (years)	10	Although the offset measure should be achievable earlier, 10 years provides enough time to be	10	This timeframe allows plenty of time to achieve	2	Assuming that the offset site work can begin prior to wetland destruction, this allows enough time

Parameter	Raupo reedland		Shallow water wetland			
	Indigenous vegetation cover		Indigenous vegetation cover		Water depth	
	Value used	Justification	Value used	Justification	Value used	Justification
		sure that targets can be met. Growth rates of raupo are rapid, but establishment (i.e. getting the reed beds going) could be slow.		targets in potentially challenging conditions		to do earthworks, monitor hydrology, and make any resulting changes to landform.

4.4 Compensation for loss of seepages

Four seepage wetlands, comprising 3.81 ha of exotic-dominated wetland vegetation, will be lost and as this cannot be offset, it is proposed that this will be compensated for by creating 5.8 ha of new wetland, characterised by saturated soils (rather than standing water) and appropriate indigenous vegetation communities. The proposed compensation is ~~technically~~ trading one ~~biodiversity~~ wetland type for another, but it will have the saturated soils of the seepages being lost and will include indigenous vegetation that may have been in the seepages had they been restored. The key component missing is the sloping landform with groundwater emergence.

The offset and compensation site is very well situated in terms of landscape context. It is within a few hundred metres of Lake Taharoa, immediately adjacent to the high quality Wetland 21, and the areas to the southeast and north are reserved for cultural purposes and will provide a buffer over and above the proposed 30 m. Matuku hūrepo (Australasian bittern, *Botaurus poiciloptilus*) and pūweto (spotless crake, *Zapornia tabuensis tabuensis*) utilise Wetland 21 and the wetlands on the margins of the lakes and the addition of 5.8 ha of well-buffered wetland, over and above the offset requirements, will provide additional good quality feeding and possibly nesting habitat for these species. Despite the loss of the seepage wetlands, the proposed actions will provide adequate compensation for biodiversity loss.

4.5 Offset and compensation targets

The following should be included in consent conditions to ensure that the offset and compensation is executed, and should form the basis of measuring success.

4.5.1.1 Final Targets

1. To offset the loss of 0.49 ha of shallow water wetland, establish a minimum of 2 ha of shallow water habitat (average water depth <50 cm) to achieve 75% indigenous cover, including at least 25% cover of submerged macrophytes, within 10 years of destruction of Wetlands 7 and 17.
2. To offset the loss of 0.03 ha of raupō (*Typha orientalis*) reedland, establish a minimum of 0.5 ha of wetland with a minimum of 50% indigenous cover within 10 years of destruction of Wetland 23.
3. To compensate for the loss of 3.72 ha of seepage wetland, establish at least 5.8 ha of wetland. Wetland habitat must be saturated soils (i.e. not standing water) and reach 90% indigenous cover within 5 years of destruction of Wetlands 5, 6, 7, 20 & 25.
4. To ensure the sustainability of the offset and compensation actions, and to buffer the site from external impacts, a minimum of a 30 m-wide terrestrial buffer planting will be established. Terrestrial planting must form a buffer around the offset & compensation site and must achieve 90% indigenous cover within 5 years of the destruction of the wetlands.

4.5.1.2 Progress Targets

1. Within 5 years of destruction of Wetlands 7 and 17, indigenous cover in the 2 ha of shallow water habitat must be at least 30% and average water depth must be between 10 cm and 50 cm.

2 Within 5 years of destruction of Wetland 23, raupō cover in the 0.5 ha of raupō offset wetland must be at least 20%.

3 Within 2 years of the destruction of the seepage wetlands listed in 4.5.1.1~~4.5.1.14.2.2.1~~ (3) above, indigenous vegetation cover must be at least 40% in both wetland and buffer habitat.

If progress targets are not met, response actions must be implemented. Response actions are outlines in Section 4.8.

4.6 Restoration Plan

4.6.1 Hydrology and Landform

The existing hydrology of the site will be utilised to create and maintain appropriate wetland habitat. Currently, the pond level is at approximately 11.2m RL and Lake Taharoa sits at approximately 9 m RL. The WWLA groundwater assessment (WWLA, 2025) shows that the pond is likely groundwater connected and that the groundwater flow is broadly from southwest to northwest towards Lake Taharoa.

The proposed wetland would be created by lowering the land surrounding the existing pond so that it is at or about the pond level, with parts being below groundwater level to create shallow water habitat and parts being slightly above groundwater level to create habitat with saturated soils in the root zone.

Establishing the appropriate level to make the wetland surface would first require establishing the hydrology of the pond and how it relates to the surrounding groundwater. Water level monitoring of this ponded area for a minimum of a one-year period is proposed as a component of the monitoring of groundwater drawdown effects on wetlands (see Section 3.2.1~~3.2.13.2~~). Monitoring will establish the relationship between pond level and groundwater level, and the natural fluctuation of the pond over a year will account for seasonality. As water is currently periodically taken from Site 27 (WWLA site 72), all artificial manipulation of the pond level and mining of hydrologically connected areas will need to cease before any water level monitoring is done.

The current landform in the area proposed for wetland creation ranges from around 11.2 m RL at the pond edge to a maximum of 25 m RL on the western side. The new landform should generally follow the existing landform to reduce the total amount of earth that needs to be moved and to reduce batter slopes. Figure 5~~Figure 4Figure 5~~ shows an indicative design, but TIL mine engineers should produce the final design and construction plan and an experienced wetland ecologist should be onsite during earthworks to ensure that the desired landforms and wetland typologies are achieved.

Access tracks should be included in the design to ensure that planting and maintenance activities are as easy as possible.

4.6.2 Earthworks and site stabilisation

Earthworks should be carried out in the summer months during periods of reduced groundwater levels to reduce potential erosion and sedimentation of the pond and to get the site ready for planting. Earthworks should be carried out in such a way as to minimise sediment input to the pond and appropriate erosion and sediment control measures should be implemented following good practice guidelines. Stabilisation after earthwork is not necessary unless the site is to remain bare for many months as the natural state of the area is bare, mobile sand dunes. The site will be stabilised as it is planted.

4.6.3 Fencing

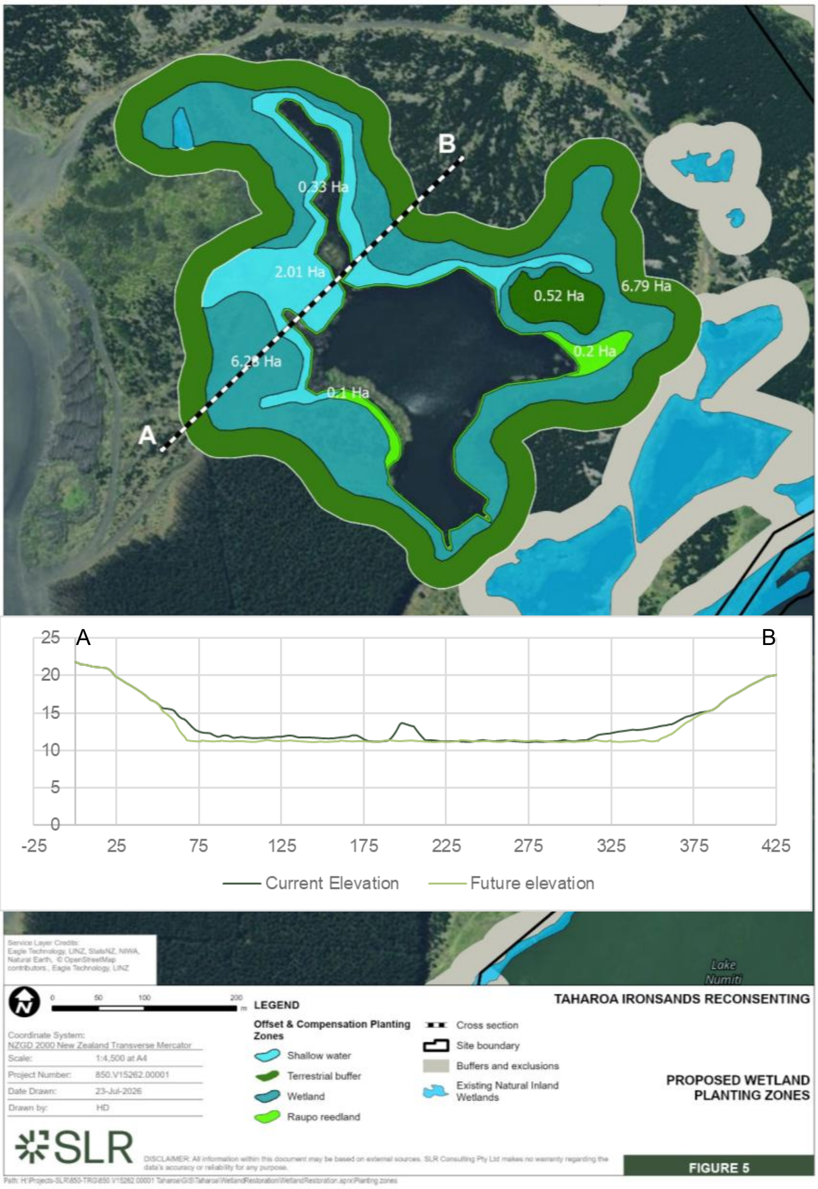
The wetland offset and compensation site should be fenced as securely as is practicable (refer to section 5.2 below), preferably with an 8 or 9-wire post and batten fence to ensure it excludes livestock and feral animals, such as pigs, cannot access the site. Fences should have gates installed at access tracks to allow vehicular access for planting and maintenance and to provide a way to remove livestock should they get into the fenced areas.

4.6.4 Planting Zones

Four planting zones have been identified:

1. The **Raupō Reedland Zone** is the shallow water on the edge of the existing pond which would be planted to tie the new wetland into the existing pond and the sparse emergent vegetation around the edges. This zone would be planted in raupō and other emergent macrophyte species and where appropriate some submerged macrophytes. This zone will offset the loss of Wetland 23.
2. The **Shallow Water Zone** is the zone which would have water of between 10 – 50 cm deep and would be intended to provide suitable habitat for submerged and emergent species like those currently found in Wetlands 7 and 17.
3. The **Wetland Zone** would be an area of saturated soils and shallow surface water intended to compensate for the loss of seepage wetlands.
4. The **Terrestrial Buffer Zone** would be a 30 m wide elevated area that would be planted in trees and shrubs typical of the Taharoa area and would be intended to provide a physical buffer around the entire wetland, like the planted wetland buffers around the retained wetlands on the Site.

Figure 5~~55~~: Planting zones and current and future land elevation across an indicative cross section (A-B).



4.6.5 Plant Mixes

Plant species appropriate for each zone are included in Table 9~~Table 8Table 6~~. These species are all native to the local area and are generally hardy and easy to establish. The aim is to establish appropriate wetland species as quickly as possible across the whole site so that they have the maximum amount of time possible to establish before the wetlands in the southern block are destroyed. Given the proximity of a large area of natural wetland it is expected that less common species will establish in the new wetland naturally over time.

Table 9~~86~~: Plant mixes

Botanical name	Common Name	Lake margins	Shallow water	Wetland	Terrestrial buffer
Bolboschoenus fluviatilis	Kukuraho, pūrua grass			2%	
Carex lessoniana	Rautahi			5%	
Carex secta	Pūrei			10%	
Carex virgata	Pukio			2%	
Carpodetus serratus	Putaputaweta				5%
Centella uniflora	Centella		5%		
Coprosma lucida	Shining karamu				5%
Coprosma propinqua var. propinqua	Mingimingi			2%	
Coprosma rhamnoides	Mingimingi				2%
Coprosma robusta	Karamu				5%
Coprosma tenuicaulis	Hukihuki			2%	
Cordyline australis	Tī kōuka / cabbage tree			5%	
Cyperus ustulatus	Cyperus, coastal cutty grass		10%	2%	
Dacrycarpus dacrydioides	Kahikatea			2%	10%
Eleocharis acuta	Sharp spike sedge	10%	20%	15%	
Eleocharis gracilis	Slender spike sedge	5%		2%	
Eleocharis sphacelata	Kutakuta	15%	5%		
Isachne globosa	Swamp millet			5%	
Isolepis prolifera		20%	20%	10%	
Kunzea robusta	Kānuka				40%
Leptospermum scoparium	Mānuka			3%	10%
Machaerina articulata	Jointed twig rush	20%	10%		
Machaerina rubiginosa	Baumea		5%	10%	

Botanical name	Common Name	Lake margins	Shallow water	Wetland	Terrestrial buffer
Melicytus ramiflorus	Māhoe				10%
Myriophyllum propinquum	Common water milfoil		5%		
Myriophyllum votschii				2%	
Myrsine australis	Māpou				10%
Ozothamnus leptophyllus	Tauhinu				3%
Phormium tenax	Harakeke	10%		11%	
Potamogeton cheesemanii	Red pondweed	10%	10%		
Typha orientalis	Raupō	10%	10%	10%	
		100%	**100%**	**100%**	**100%**

4.7 Monitoring of the Offset Site

4.7.1 Purpose of the Monitoring

The purpose of the water level monitoring is to ensure that suitable wetland hydrology is in place prior to planting and that it is maintained over the life of the consent.

The purpose of the vegetation monitoring is to track progress against the vegetation cover targets detailed in Section 4.5.

~~4.6.6~~4.7.2 Wetland Water Level

Maintaining a suitable wetland hydrology in the wetland offset site is critical to successfully offsetting the loss of the wetlands in the southern block.

After the wetland is built but before planting takes place, water level should be recorded within the wetland on an hourly or two-hourly basis for at least one full year to demonstrate that wetland hydrological conditions are present and being maintained. Should water levels be too low or too high, additional earthworks will be required. Ongoing monitoring of wetland water level is to be undertaken as part of wider groundwater monitoring.

~~4.6.7~~4.7.3 Vegetation

~~4.6.8 Baseline assessment~~

~~An assessment of vegetation composition and structure in the retained wetlands that could be affected by groundwater drawdown should be undertaken as soon as possible and prior to works moving into the wetland locations to establish the vegetation present during the typical operating water level of all retained wetlands. This would involve a one-off measurement of vegetation plots in each wetland following the method described in 2.5.3 above. Data collected should be used to compare with vegetation data collected in the new, created wetland.~~

~~4.6.8.1~~4.7.3.1 Photographic Record

To illustrate the works undertaken and inform review and reporting purposes, photopoints should be established in the wetland offset site, and in the wetland and stream buffer sites prior to works, following fence construction, following planting, ~~and~~ and then annually until restoration targets (Section 4.5)~~,~~ have been met. ~~at a minimum, following fence construction, following planting, and at 1- and 2-years following planting.~~ Photos should be spaced a maximum of 500 m apart and should be geo-located and taken at the same locations each time so a visual comparison can be made.

~~4.6.8.2~~4.7.3.2 ~~Wetland offset site~~Quantitative Monitoring

Formal vegetation monitoring should be established in the wetland offset site to track progress of the wetland restoration. Methodology should be as described for lake margin and retained wetland monitoring in Section 2.2.3, i.e. following Clarkson *et. al.* (2014).

~~Data to be collected includes % cover of each species within each target type, species richness and diversity, and vegetation structure. A methodology for monitoring is outlined below.~~

Quadrats should be measured annually at the same time of year (preferably summer) until ~~a 95% cover of indigenous wetland plants~~the final targets detailed in Section 4.5 have been achieved. Once targets have been achieved, monitoring should reduce to 5-yearly for the duration of the consent.

A brief report summarising the data should be produced after each monitoring event and submitted to WRC as part of an annual monitoring report.

~~4.6.9 Visual Inspection~~

~~Visual inspections of all plantings should be made annually and an estimate of canopy cover made and included in the report described in section 5.2.3.~~

~~4.7~~4.8 Management Responses

If vegetation in the offset and compensation site is not meeting the indigenous vegetation cover targets listed in Section ~~4.2.2~~4.5 the following actions will be taken:

- Additional plants will be planted to fill gaps. This will be at a higher density than the original planting and using species specified in the planting mix or appropriate substitutes.
- An assessment of weed and exotic plant cover will be made, and appropriate weed control undertaken to achieve weed control targets.
- An assessment of pest animal impacts will be made, and appropriate pest control undertaken.
- Additional watering will be initiated during dry months (for terrestrial plantings), if it is deemed that water stress is an issue.
- An assessment of whether additional offset or compensation is required will be undertaken and, if so, a plan to achieve it will be prepared.

If during ~~visual, quadrat or photo~~ monitoring plants are found to have died, these will be replaced as soon as practical.

5.0 Wetland and Stream Buffers

Buffers around each of the remaining wetlands and along each of the streams are to be established and planted. These will be a minimum of 30 m wide and should achieve 90% indigenous plant cover within five years of planting (as set out in section 4.5 above).~~.~~

5.1 Buffer Plant Mixes

The buffers around wetlands and the Wainui and Mitiwai streams should be planted in general revegetation species appropriate to the area (Table 10~~Table 9Table 7~~). Regenerating kānuka forest is common around Lake Taharoa and so the mix detailed below has a high proportion of kānuka which is clearly well suited to the local conditions. The buffer around Wetland 15, which is just above the beach, should be planted in hardy coastal species specified in the 'Coastal Buffer' column of Table 10~~Table 9Table 7~~. Enhancement species listed in Table 10~~Table 9Table 7~~ are to be planted once the revegetation species are well established.

Table 10~~97~~: Wetland and stream buffer plant mix

Botanical name	Common Name	Terrestrial buffer	Coastal Buffer
Carpodetus serratus	Putaputawētā	5%	
Coprosma lucida	Shining karamū	5%	
Coprosma rhamnoides	Mingimingi	2%	
Coprosma robusta	Karamū	5%	
Dacrydium cupressinum	Rimu	5%	
Ficinia nodosa	Wīwī		30%
Kunzea robusta	Kānuka	40%	
Leptospermum scoparium	Mānuka	10%	
Melicytus ramiflorus	Māhoe	10%	
Muehlenbeckia complexa	Pōhuehue		50%
Myrsine australis	Māpou	10%	
Ozothamnus leptophyllus	Tauhinu	3%	20%
Podocarpus totara	Tōtara	5%	
		100%	**100%**
Enhancement species			
Didymocheton spectabilis	Kohekohe	✓	
Litsea calicaris	Mangeao	✓	
Prumnopitys ferruginea	Miro	✓	
Vitex lucens	Pūriri	✓	

5.2 Fencing

Although fencing is strongly recommended, there are practical and economic issues with effectively installing and maintaining fencing on the site and provided livestock are excluded some other way (i.e. the entire property is stock-free), fencing is not essential. Plantings and natural wetlands cannot thrive in the presence of grazing animals.

5.3 Lizard Release Site

The Lizard Management Plan specifies that an area be set aside and prepared for relocation of any lizards salvaged from impacted areas.

Suitable habitat exists within the permanent buffer areas around perennial water bodies, where a release pen should be established for any relocated lizards. The exact location should be selected by a herpetologist to determine the most suitable site at the time of establishment of the release pen prior to salvage activities. See TIL's lizard management plan.

This site should be planted with patches of native vegetation, leaving open areas suitable for lizard sun basking.

5.4 Site Preparation

Before each area is planted all weeds and competing vegetation should be removed or supressed. The most effective way to do this is by using a broad-spectrum herbicide such as glyphosate which is also safe to use in and around wetlands. Since the planting areas in the offset site would have been worked with machines it is unlikely that any woody weeds will be present, but for other sites an assessment of the site should be undertaken at least three months prior to planting and any woody weeds controlled using appropriate methods.

5.5 Plant Stock and Eco-sourcing

Plants should be propagated from seed or cutting material collected in the Kawhia Ecological District or nearby parts of the Herangi Ecological District. This will maintain local genetic characteristics and assist plant establishment and performance. Plant cultivars (e.g., variegated varieties) should not be used. Any plants that cannot be grown in the onsite nursery should be contract-grown by a reputable grower who keeps records of their eco-sourcing practices. Some plants such as the aquatic *Myriophyllum* species may be best grown from cuttings or fragments taken from onsite wetlands.

Plants should be restoration planting grade (0.5L or larger) and hardened off. Plants should be in good condition at the time of planting and as this can be a challenging environment for seedlings, larger more robust plants that meet the following requirements are preferred:

- Minimum above ground seedling height of 30 cm.
- Minimum root collar diameter of 5 mm (for shrubs).
- Good root density such that plugs hold together during lifting, transport, and handling.

5.6 Planting Timing and Grade

Planting should take place between April and October, although the terrestrial buffer areas should only be planted in April – August so that they are well-established before the dry months over summer.

Wetland plants should be spaced 0.5m apart, although shrubs and harakeke can be planted 1m apart. The shrubs and trees in the Terrestrial Buffer zone and all of the stream and Natural Wetland buffers should be planted at 1.5m spacings.

It is recommended that each plant is marked with a biodegradable stake or plant sleeve so that they are easily relocatable for monitoring and maintenance purposes. Plant sleeves will also protect the plants from browsing and reduce the risk of overspray when using herbicide to release plantings from competing vegetation.

Plantings will need to be staged over two or three years because of the number of plants that will be required. However, the offset calculations are based on there being at least two years of growth on all plants before the southern block wetlands are destroyed so project managers will need to ensure all plants are in the ground within this timeframe.

5.7 Buffer Monitoring

5.7.1 Purpose of the Monitoring

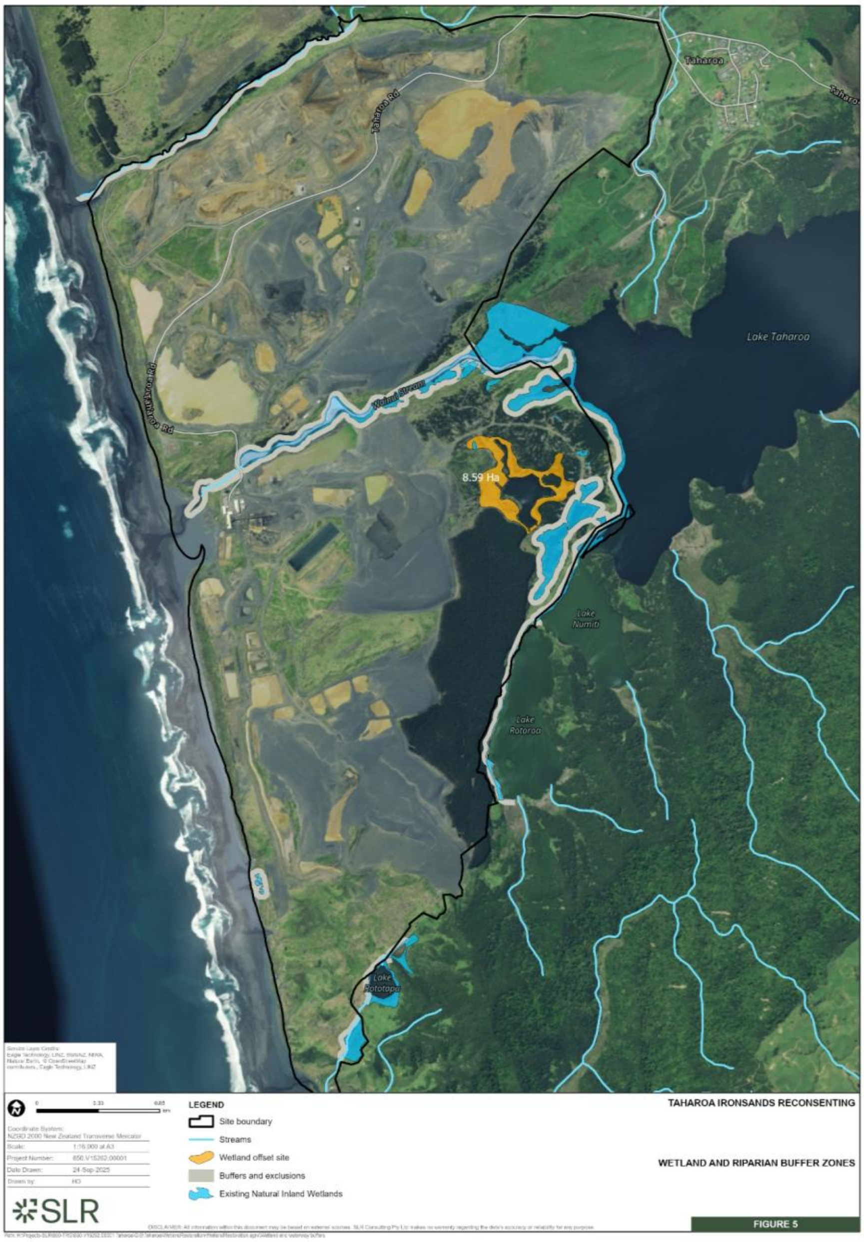
The purpose of the buffer monitoring is to track progress against the 90% indigenous cover target.

~~5.6.1~~5.7.2 Vegetation Monitoring

Monitoring of wetland and stream buffers should include photopoint monitoring as described in section 4.7.3.1, along with quadrat monitoring to measure vegetation cover. The purpose of this monitoring is to track progress against the 90% indigenous cover target.

Quadrat monitoring should follow the RECCE methodology (Hurst *et. al.* 2022), using a 10 m x 10 m fixed area plot or a modified version of the wetland plots recommended for lake shore and retained wetland monitoring. Either method can yield % indigenous cover and are suitable for monitoring progress against the 95% target.

Figure 6~~67~~: Wetland and riparian buffer zones



6.0 Maintenance and Weed Control within the buffers and offset area

Releasing of plantings from competing vegetation will be required in the first two to three years (minimum) of planting. This is most efficiently achieved through application of herbicide, although care must be taken not to spray plantings, especially if they are not protected by sleeves. Frequency will be determined by monitoring but will likely be three times in the first year following planting, and twice in the subsequent two years.

Maintenance should be continued until at least 95% canopy cover is achieved. Any plants that die should be replaced in the first year following planting.

All pest plants listed in the Waikato Regional Pest Management Plan (RPMP, Waikato Regional Council 2022) should be controlled within the wetland offset site and any problem plants such as wilding pine, blackberry, tree lupin, marram, gorse and willow should also be controlled. Pest plants should be reduced to zero density at least annually for the duration of the consent.

7.0 Pest Animal Control

Pest animal control will be carried out to relieve pressure on indigenous fauna and flora within the offset site and all buffer zones. The key target species are possums (*Trichosurus vulpecula*), rats (*Rattus rattus, R. norvegicus*), ferrets (*Mustela furo*), stoats (*Mustela erminea*), weasels (*Mustela nivalis*), and hedgehogs (*Erinaceus europaeus*). In addition, mice should be targeted within the lizard release area, the nearby parts of the buffer plantings, and in the riparian area of the lower Wainui Stream (below the dam) where īnanga spawn.

Pest control will be targeted to the offset site and riparian and wetland buffer zones, as the prevalence of pest animals across the remaining active mine sites is expected to be low.

7.1 Rats

Rats are voracious predators and will eat lizards, birds' eggs, chicks, and mice, along with seeds and fruits. The control methodology is the same for all species of rat and involves a palatable toxin contained within bait stations, followed by trapping if required.

The recommended approach to control rats is as follows:

- Establish a grid of tunnel-type rat bait stations at 50 m × 50 m spacing throughout the offset site and riparian and wetland buffer zones.
- Bait stations should be run-through types that give rodents an obvious escape route (). Rats have been shown to enter this type of bait station more readily, compared to a closed box type (Spurr *et al.* 2007).
- Use the second-generation anticoagulant brodifacoum as the primary toxin for rats.
- Initially pulse the application of toxin: Leave it in the bait stations for 12-14 days and during that period it should be checked regularly (at least every second day) to ensure a constant supply is available to the target animals. Brodifacoum will take up to five days to kill a rat so the total time the bait station is left full is important in case one or two dominant individuals are preventing others from reaching bait. Those individuals will be dead after a week or so, allowing another week for others to feed.

- After the first pulse, toxin can be removed for three to four weeks before re-filling the bait stations and leaving bait there continuously. This allows all of the rats who have fed in the stations to die, before re-introducing toxin which will then be available to mice and any remaining rats.
- It is recommended that brodifacoum is left in the stations permanently and checked and topped up every few months after the initial concentrated control effort.

~~**Figure 8: Dead rat café by Pestoff® - a 'run-through' type bait station suitable for rat control.**~~

7.2 Possums

The primary food of possums is vegetation (leaves, fruit, bark), but they also raid birds' nests and take eggs and chicks. Possums live in a wide range of habitats in New Zealand and at Taharoa are likely to be utilising open areas for feeding and the pine forest, wetlands, and scattered scrubby vegetation for feeding and dens. Possums should be relatively easy to control using kill traps. There are several effective kill traps on the market such as the Flipping Timmy and the Trapinator and any of these can be used. Self-resetting traps are also available, and although they are more expensive, they require much less regular checking.

Possum control methodology is as follows:

- Establish traps at approximately 150 m - 200 m apart where there is an appropriate tree or shrub on which to attach them. Locate traps where there are obvious pad-runs, park biting, scratching, or scat.
- Traps should be placed about 1 m off the ground and firmly affixed to a tree or post.
- The trap can be baited with apple, but a commercial lure should always be used to lure the possum into the trap. These are generally aniseed or cinnamon flavoured and have a strong aroma which possums can smell from further away than they can a piece of fruit.
- Traps should be serviced, and the lure and bait replaced every few days to begin with to ensure that no trap is left unset for too long.

7.3 Hedgehogs

Hedgehogs are predominantly insectivores, but they will take other invertebrates such as snails, birds' eggs and chicks, and they will predate lizards in colder months when they can catch them. Hedgehogs are an underestimated predator and are known to take on prey as large as domestic hens.

Eradication methodology:

- Hedgehogs (and stoats) are best trapped using DOC200 or BT200 kill traps in a double-set tunnel spaced around 100 m apart.
- Traps should be baited with fresh rabbit meat, eggs, or a commercial lure such as Erayz which is dried rabbit meat. Bait should be replaced at least monthly in the cooler months, but fortnightly (if using fresh bait) when it is warmer.
- Although hedgehogs hibernate in winter, traps should be left out all year because they will also be used to target stoats and rats.

7.4 Mustelids

Ferrets, stoats and weasels are all wide-ranging, highly efficient predators who will take on prey animals often much larger than themselves. All three species will predate lizards, birds, invertebrates, rabbits and hares, and rodents. Mustelids are active year-round.

Eradication of weasels and stoats can be achieved with the trapping methodology described for hedgehogs in 7.3 above. Ferrets are significantly larger than stoats and the larger DOC250 trap is recommended for them, although the DOC200 traps may also get them. Mustelid traps should be left out and maintained year-round.

7.5 Mice

Mice are significant predators of lizards (Broome *et. al.* 2011) and have been known to attack lizards much larger than themselves (Grant Norbury, Mokomoko Dryland Sanctuary, *pers. comm.*). Mice are also known predators of īnanga eggs (Baker, 2006). Because of their small home ranges they can be difficult to effectively control.

Mice can be controlled in the lizard release site and in a 50m buffer around it using bait stations and brodifacoum. Mice control should also target the riparian areas of the lower Wainui Stream, below the dam, where īnanga spawning habitats occur. Establish a grid of tunnel-type mice bait stations at 25 m × 25 m spacing throughout the area. A 25 m × 25 m grid gives a trap for every 0.047 ha. Mouse home ranges vary considerably but New Zealand research has shown home ranges of between 0.15 and 0.48 ha (MacKay *et. al.* 2011). Other than bait station type, the toxin and timing are the same for mice as the method described in Section 7.1 for rats.

7.6 Ungulates

Feral pigs and deer are common in and around Taharoa and free-roaming cattle and horses from third party properties have been an issue in the site. Pigs, cattle and horses will be kept out of the plantings and offset area by new fencing or exclusion from the property, and deer are unlikely to be a significant issue. Regular checks of the protection areas should be conducted to ensure that any fences are sound and that no ungulates have accessed the areas.

7.7 Pest animal monitoring

Monitoring of pest animal numbers is not required because there will be a constant reinvasion from neighbouring areas and monitoring is unlikely to show clear results. Instead, a record of maintenance of the trap and bait station network should be maintained. This should include date serviced, amount of bait taken from bait stations, and records of any pests caught in the kill traps. This information should be included in the annual monitoring report to WRC.

8.0 Monitoring Summary

Table 11 provides a summary of all monitoring requirements.

Table 11: Summary of monitoring requirements

Monitoring location	Purpose	Monitoring Type	Methodology	Timing / trigger
Lake margin wetlands identified as Wetland 22 & Lake Shore	• Determine whether the extent and health of the raupō and flax wetlands on the margins of Lake Taharoa adversely change over time as a result of lake fluctuations (other than those caused by natural seasonal conditions). • Provide data to inform management responses in the event that adverse effects on the lake margin wetlands are detected.	Wetland extent	• Map wetland extent on aerial photographs at a scale no greater than 1:2,000. • Establish at least one permanent photopoint overlooking each wetland.	Within the months of February and March • In the first year following the commencement of the consents; then • Annually for the first three years following baseline monitoring; then • Every two years for the next six years; then • If adverse effects have not been detected, every five years for the duration of the consent. **or** If the water level in Lake Taharoa is less than *9.6 metres RL as measured by the Local Datum Survey Marker*, for a cumulative period of 30 days over any 60 day period.
		Vegetation condition	• Methods outlined in Clarkson *et. al.* 2014. • At least one vegetation plot per vegetation type in each of the nine wetlands.	

Monitoring location	**Purpose**	**Monitoring Type**	**Methodology**	**Timing / trigger**
Retained Natural Inland Wetlands identified as Wetlands 8, 9, 10, 11, 12, 15, 16, 19 & 21.	To inform the long-term simulation model and determine mean seasonal water level in each wetland.	Water level monitoring	As per WWLA report.	• A 12-month baseline commencing during the first year after consent is issued. • Ongoing until dewatering of adjacent pits has been completed and groundwater levels have returned to background conditions.
	• Determine whether the extent and health of the retained wetlands are adversely affected by groundwater drawdown. • Provide data to inform management responses in the event that adverse effects are detected.	Wetland extent	• Map wetland extent on aerial photographs at a scale no greater than 1:2,000. • Establish at least one permanent photopoint overlooking each wetland.	Within the months of February and March • In the first year following the commencement of the consents; then • Annually for the first three years following baseline monitoring; then • Every two years for the next six years; then • If adverse effects have not been detected, every five years for the duration of the consent. **or** If the water level in the representative wetland remains below mean seasonal level for a cumulative period of 30 days over any 60 day period.
		Vegetation condition	• Methods outlined in Clarkson *et. al. 2014.* • At least one vegetation plot per vegetation type in each of the nine wetlands.	

Monitoring location	Purpose	Monitoring Type	Methodology	Timing / trigger
Offset & Compensation Site	To ensure that suitable wetland hydrology is in place prior to planting and that it is maintained over the life of the consent.	Water level	• Piezo or as recommended by the project hydrologist. • Hourly or two-hourly for a full year.	Beginning once new wetland landform has been created.
	To track progress against the vegetation cover targets detailed in Section 4.5.	Photographic record	• Establish permanently marked photopoints at a maximum spacing of 500 m. • Photopoints should be geo-located and taken from the same location each time.	• Prior to works; • Following fence construction; • Following planting; and • Thereafter annually until restoration targets (Section 4.5) have been achieved.
		Vegetation condition	• Methods outlined in Clarkson *et. al. 2014.* • A representative sample or at least one vegetation plot per vegetation type.	• Annually until targets have been achieved; and • Thereafter five-yearly.

Monitoring location	Purpose	Monitoring Type	Methodology	Timing / trigger
Wetland and Stream Buffers	To track progress against the 90% indigenous cover target.	Photographic record	• Establish permanently marked photopoints at a maximum spacing of 500 m. • Photopoints should be geo-located.	Thereafter annually until restoration targets (Section 4.5) have been met.
		Vegetation condition	• Methods outlined in Hurst *et. al* 2022 or Clarkson *et. al. 2014.* • At least two plots per wetland or stream buffer.	• Annually until targets have been achieved; and • Thereafter five-yearly.

~~8.0~~9.0 Closure

Sincerely,

SLR Consulting New Zealand

Hamish Dean, MSc, CEnvP
Principal Ecologist

~~9.0~~10.0 References

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Appendix A ~~Field Sheet~~Offset Calculations

Draft Natural Inland Wetland Management Plan Taharoa Ironsands Central and Southern Block Mining Project

Taharoa Ironsands Limited

SLR Project No.: 850.V15262.00001

8 September 2026

Table 12: Raupō reedland impact model

IMPACT MODEL

Key:

	User input
	Auto-filled

	BIODIVERSITY TYPE
1	Raupo reedland

READ ME:
Note 1: The Impact Model must be populated before data is entered into the Offset Model.
Note 2: Use a new workbook for each additional Biodiversity Type.
Steps 1 & 2: Input the Biodiversity Type to be accounted for into Cell C11 and corresponding number (e.g. 1 if it the first Biodiversity Type, 2, if it is the second etc.) into Cell B11..
Step 3: Input the first Biodiversity Component into Cell C15.
Steps 4–10: Work through the Impact Model for each Biodiversity Attribute (Columns E–L) entering values into all cells coloured light brown. Cells coloured light green will auto-populate.
Step 11: Repeat Steps 4–10 for as many Biodiversity Attributes as required.
Step 12: Repeat Steps 3–10 for as many Biodiversity Components as required (scrolling down the sheet).

	This section captures which elements of biodiversity, and over what area, will be impacted by the proposal					This section is where the change in measure of each Biodiversity Attribute due to the proposed Impact is quantified, and Attribute Biodiversity Value calculated. Inputs are derived from direct measures, existing data or models where available, or expert estimated predictions			
	Biodiversity Component		**Biodiversity Attribute**	**Measurement Unit**	**Area of Impact (ha)**	**Benchmark**	**Measure prior to Impact**	**Measure after Impact**	**Biodiversity Value**
1.1	Raupo reedland	1.1a	Native species cover	%	0.03	100	75	0	-0.02
		1.1b							Not calculated
		1.1c							Not calculated
		1.1d							Not calculated
		1.1e							Not calculated

Table 13: Raupō reedland offset model

	BIODIVERSITY TYPE	DISCOUNT RATE
1	Raupo reedland	0.03

Step 6: Work through accounting model for each Biodiversity Attribute entering values into light brown cells. At Column K choose method of accounting for time and follow instructions. If using a finite end point, continue on this sheet. If calculating the offset as accrued over time use the Offset Model_5yearly worksheet.
Step 7: Repeat for additional Biodiversity Components (scrolling down the sheet)

	This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model					These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
1.1	Raupo reedland	1.1a	Native species cover	%	100	Restoration of raupo reedland	0.5	Low confidence >50% <75%	Finite end point	Continue to Column M	0	50	10	0.12	-0.02	0.09	0.09
		1.1b						Low confidence >50% <75%	Choose option							Not calculated	
		1.1c						Low confidence >50% <75%	Choose option							Not calculated	
		1.1d						Low confidence >50% <75%	Choose option							Not calculated	
		1.1e						Low confidence >50% <75%	Choose option							Not calculated	

Table 14: Shallow water wetland impact model

brown. Cells coloured light green will auto-populate.
Step 11: Repeat Steps 4–10 for as many Biodiversity Attributes as required.
Step 12: Repeat Steps 3–10 for as many Biodiversity Components as required (scrolling down the sheet).

	BIODIVERSITY TYPE
1	Shallow water wetland (7 + 17)

	This section captures which elements of biodiversity, and over what area, will be impacted by the proposal				This section is where the change in measure of each Biodiversity Attribute due to the proposed Impact is quantified, and Attribute Biodiversity Value calculated. Inputs are derived from direct measures, existing data or models where available, or expert estimated predictions			
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Area of Impact (ha)	Benchmark	Measure prior to Impact	Measure after Impact	Biodiversity Value
1.1	(Isolepis prolifer) - [isolated rush] /	1.1a	Native species cover	%	0.49	90	90	0	-0.49
		1.1b							Not calculated
		1.1c							Not calculated
		1.1d							Not calculated
		1.1e							Not calculated

	This section captures which elements of biodiversity, and over what area, will be impacted by the proposal					This section is where the change in measure of each Biodiversity Attribute due to the proposed Impact is quantified, and Attribute Biodiversity Value calculated. Inputs are derived from direct measures, existing data or models where available, or expert estimated predictions			
	Biodiversity Component	**Biodiversity Attribute**		**Measurement Unit**	**Area of Impact (ha)**	**Benchmark**	**Measure prior to Impact**	**Measure after Impact**	**Biodiversity Value**
1.2	Water level	**1.2a**	Depth of water	cm	0.49	30	30	0	-0.49
		1.2b							Not calculated
		1.2c							Not calculated
		1.2d							Not calculated
		1.2e							Not calculated

Table 15: Shallow water wetland offset model

	BIODIVERSITY TYPE	DISCOUNT RATE
1	Shallow water wetland (7 + 17)	0.03

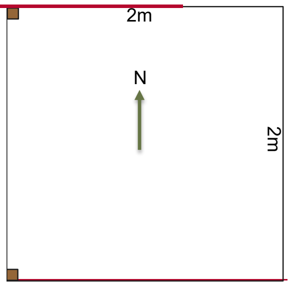
Step 6: Work through accounting model for each Biodiversity Attribute entering values into light brown cells. At Column K choose method of accounting for time and follow instructions. If using a finite end point, continue on this sheet. If calculating the offset as accrued over time use the Offset Model_5yearly worksheet.
Step 7: Repeat for additional Biodiversity Components (scrolling down the sheet)

	This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model					These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	**Biodiversity Attribute**		**Measurement Unit**	**Benchmark**	**Proposed Offset Actions**	**Offset area (ha)**	**Confidence in Offset Actions**			**Measure prior to Offset**	**Measure after Offset**	**Time till endpoint (years)**	**Biodiversity Value at Offset Site**	**Biodiversity Value at Impact Site**	**Attribute Net Present Biodiversity Value**	**Component Net Present Biodiversity Value**
1.1	(Isolepis prolifer) - [jointed rush] / Myriophyllum	1.1a	Native species cover	%	90	Restoration of shallow open water habitat including submerged and emergent	2	Low confidence >50% <75%	Finite end point	Continue to Column M	0	75	10	0.77	-0.49	0.28	0.28
		1.1b						Low confidence >50% <75%	Choose option							Not calculated	
		1.1c						Low confidence >50% <75%	Choose option							Not calculated	
		1.1d						Low confidence >50% <75%	Choose option							Not calculated	
		1.1e						Low confidence >50% <75%	Choose option							Not calculated	

	This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model					These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	**Biodiversity Attribute**		**Measurement Unit**	**Benchmark**	**Proposed Offset Actions**	**Offset area (ha)**	**Confidence in Offset Actions**			**Measure prior to Offset**	**Measure after Offset**	**Time till endpoint (years)**	**Biodiversity Value at Offset Site**	**Biodiversity Value at Impact Site**	**Attribute Net Present Biodiversity Value**	**Component Net Present Biodiversity Value**
1.2	Water level	1.2a	Depth of water	cm	30	Restoration of shallow open water habitat including submerged and emergent	2	Confident 75-90%	Finite end point	Continue to Column M	0	30	2	1.56	-0.49	1.07	1.07

~~A.1 Vegetation quadrat methodology~~

~~Several 2m x 2m quadrats should be established in each planting zone, excluding the terrestrial buffer. The number of quadrats will depend on the total area and layout of each zone. Quadrats should be permanently marked using wooden or metal pegs as in the illustration below, and the plot number clearly marked on the peg.~~



~~For each plot, a brief vegetation description should be written following the system developed by Atkinson (1985). Maximum and average vegetation heights are recorded.~~

~~Percent foliar cover of each species of vascular plant should be estimated in three height classes: < 30 cm, 30 – 100 cm, and 100 – 200 cm. Cover of woody stems and the culms of rushes are not recorded as foliar cover so that if a plant has its natural spread of foliar cover in the 30 – 100cm height class, for example, percent cover is recorded in that class but the cover of the vertical stems through the < 30cm class are not recorded. Cover of bare ground, leaf litter, and woody debris should also be recorded. An example field sheet is included below.~~

~~A.2 Example field sheet~~

~~Transect~~	-	~~Quadrat~~	-	~~Date Established~~	-
~~Tag Number~~	-	~~Coordinates~~	-	~~Date Surveyed~~	-
~~Altitude~~	-	~~Recorders~~	-	~~Wetland/Dryland~~	-
~~Vegetation description~~	-				

~~Maximum vegetation height~~	-	~~Average vegetation height~~	-
~~Vegetation cover (%)~~	-	~~Proportion of vegetation cover that is indigenous (%)~~	-
~~Ground species / other (<30 cm)~~	~~Cover %~~	~~Canopy Species / Other (30-100 cm)~~	~~Cover %~~
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	~~Canopy Species / Other (100 - 200 cm)~~	~~Cover %~~
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

-	-	-	-

~~Appendix B Offset Calculations~~

~~Draft Natural Inland Wetland Management Plan Taharoa Ironsands Central and Southern Block Mining Project~~

~~Taharoa Ironsands Limited~~

~~SLR Project No.: 850.V15262.00001~~

~~20 July 2026~~

Making Sustainability Happen

Making Sustainability Happen