Appendix DD Draft Natural Inland Wetland and Buffer Management Plan

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**

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Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
3.0	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
	Click to enter a date.			

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.

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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.

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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 Goals of monitoring

The goals of wetland monitoring are to:

- 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.

2.3 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.

2.4 Monitoring sites

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

Table 2: Wetlands subject to monitoring.

Wetland identifier	Vegetation structure and composition	Description
Wetland 22	*Carex virgata* - sharp spike sedge sedgeland	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 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.

2.5 Wetland Monitoring

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

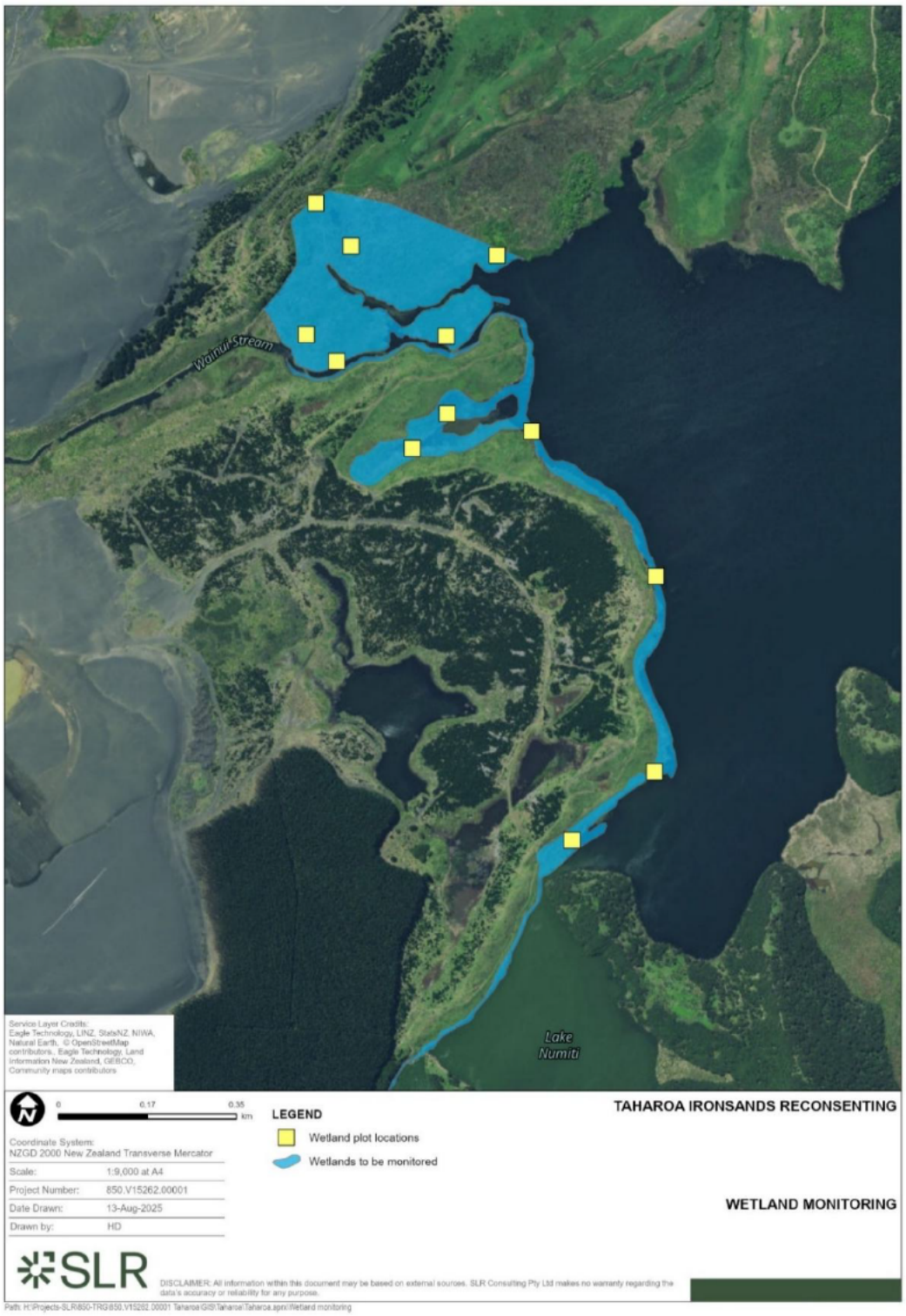
2.5.1 Wetland extent

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. 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 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.

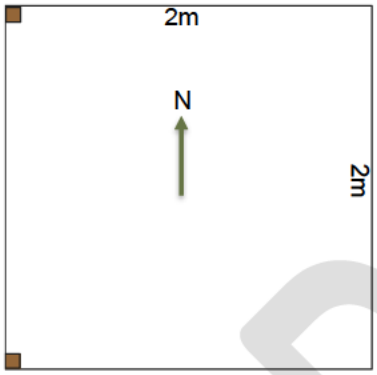


2.5.2 Wetland condition

Monitoring of wetland conditions will comprise completion of a Wetland Record Sheet as described in the Handbook for Monitoring Wetland Condition (Clarke *et al.* 2003[2]). The Wetland Record Sheet is used to score wetland condition indicators and pressures. Wetland condition should be monitored for the potentially impacted wetlands (Lake Shore Wetlands & Wetland 22) as well as an appropriate control site such as Lake Harihari to the south. This will ensure that any change in wetland condition is not due to natural change such as weather patterns.

2.5.3 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 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.

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] 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.

2.5.4 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.

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 drop by up to 4 m and a groundwater gradient from east to west will be created. The WWLA 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). For groundwater-influenced wetlands, this 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 measures are proposed including ceasing pit dewatering in close proximity to wetlands during dry periods, and supplementation of water levels.

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.

3.2 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).
- *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.

3.3 Trigger Levels

Triggers should be based on 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.

3.4 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);
        - 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.

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4.0 Offsetting Wetland Loss

The Biodiversity Compensation Model (Baber *et. al.* 2021) was used to confirm an appropriate quantum for offsetting. The details of how this model was applied and the values used for each of the parameters in the model is included in Section 6.6 of the EcIA (SLR, 2025). A summary of the model inputs and outputs is included in Figure 2 below. The results of the model demonstrate that an area of 8.3 ha of moderate – high value wetland is required to be created to offset the loss of 4.25 ha of wetland within the mine footprint.

The offset in this plan is a proof of concept only. The final wetland offset site and area required 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.

Figure 2: Compensation model output.

Model Inputs	
Input descriptors	**Input data**
Project/reference name	Taharoa Ironsands
Biodiversity type	Wetlands
Technical expert(s) input	Hamish Dean, Keren Bennett
Benchmark	5
How many habitat types OR sites are impacted	1
Number of proposed compensation actions	1
Net gain target	10%
Habitat/Site Impact(s)	
Impact risk contingency:	2
Impact uncertainty contingency:	1
Areal extent of impact (ha):	4.25
Value score prior to impact:	2.5
Value score after impact:	0.001
Compensation Action(s)	**Restoration of indigenous shallow water and rush-sedgland habitats**
Discount rate:	3.0%
Finite end point (years):	2
Compensation confidence contingency:	2
Areal extent (ha) of compensation type:	8.3
Value score prior to compensation:	1
Value score after compensation:	3

Model outputs		
	Total impact score	**0**
Impact score	**-2.34188**	**-2.34188**
	Total compensation score	**Restoration of indigenous**
Compensation score	**2.58177**	**2.58177**
Net gain outcome	**10.2%**	

4.1 Potential offset site

The location currently considered best suited to the creation of a new wetland intended to offset wetland loss is an area adjacent to Site 27 at the eastern edge of the Taharoa C block close to Lake Taharoa (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 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.

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

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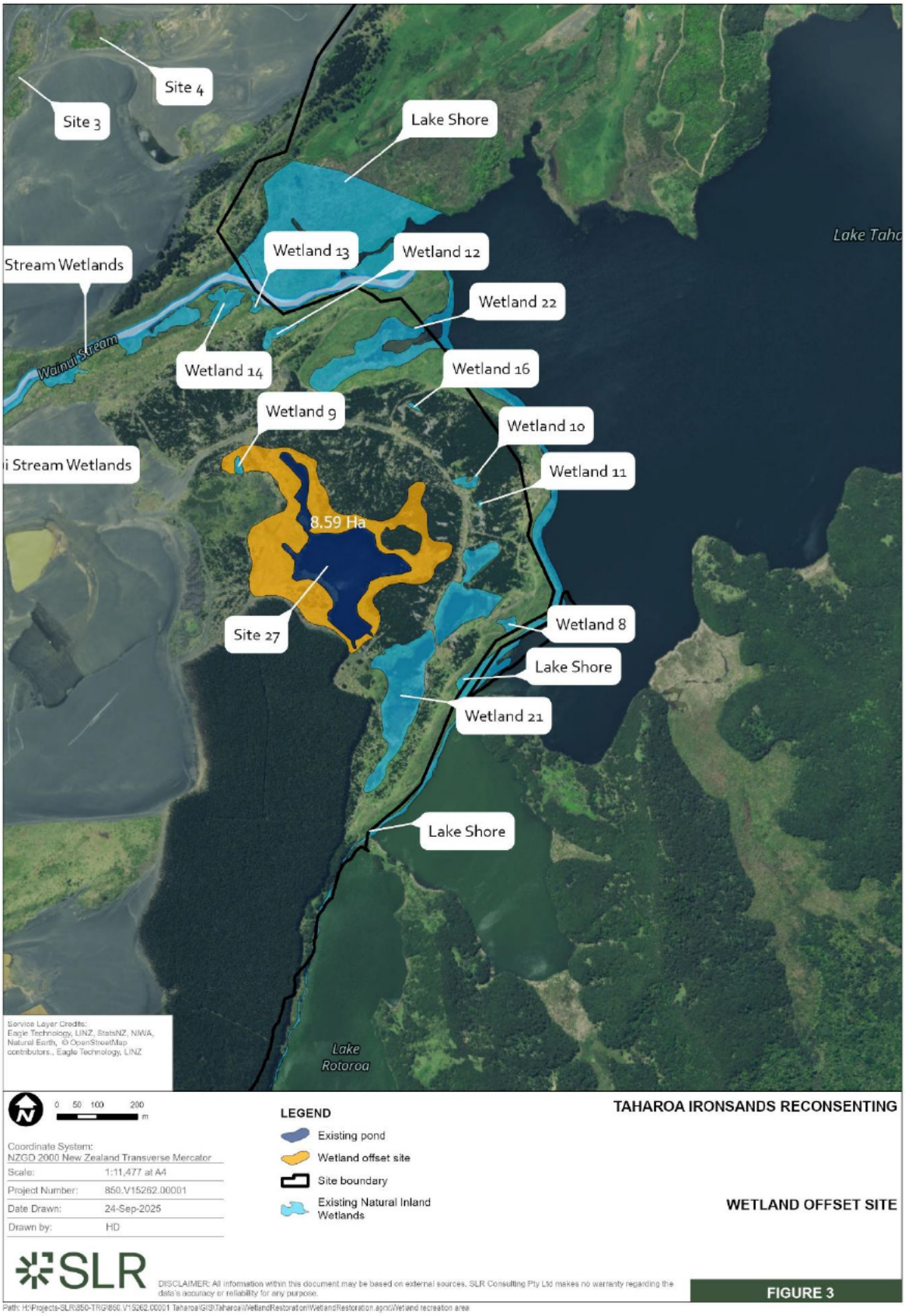
Site 4
Site 3
Lake Shore
Lake Taha
Stream Wetlands
Wetland 13
Wetland 12
Wetland 22
Wetland 14
Wetland 16
Wetland 9
Wetland 10
i Stream Wetlands
Wetland 11
8.59 Ha
Site 27
Wetland 8
Lake Shore
Wetland 21
Lake Shore
Service Layer Credits:
Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, LINZ
Lake Rotoroa
0 50 100 200 m
Coordinate System:
NZGD 2000 New Zealand Transverse Mercator
Scale: 1:11,477 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
Path: H:\Projects-SLR\850-TRG\850.V15262.00001 Taharoa\GIS\Taharoa\WetlandRestoration\WetlandRestoration.aprx\Wetland recreation area

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

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

4.2 Target Ecosystem

The target ecosystem should be wetland types as close as possible to those being lost. These are seepages, swamps and shallow water wetlands. Table 3 details the area of each of these types being lost, the proportion of the total area of similar wetland type within the mine site being lost, and a calculated area to be created, based on that proportion. Wetland 23 was classed as ephemeral, but this had formed in an artificial excavation so has been included in the swamp group. Seepage wetlands require very specific hydrological conditions to form and are generally on slopes. These conditions will be impossible to recreate so instead, similar conditions will be targeted through the inclusion of areas of saturated soils to provide habitat for plants which occur in local seepages.

Table 3: Proportion of each wetland type being lost and to be created.

Wetland type	Wetland ID	Area being lost (ha)	Proportion of total area being lost	Area to be created (ha)
Palustrine seepage	Wetland 5, 6, part of 7, 25	3.47	81%	6.72
Palustrine shallow water	Part wetland 7*, wetland 17	0.58	14%	1.16
Palustrine swamp	Wetland 20, 23	0.2	5%	0.42

*The shallow water area in Wetland 7 was estimated.

4.3 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). 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 11.2m 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. The layout in Figure 4 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.

4.4 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 the following winter. 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.

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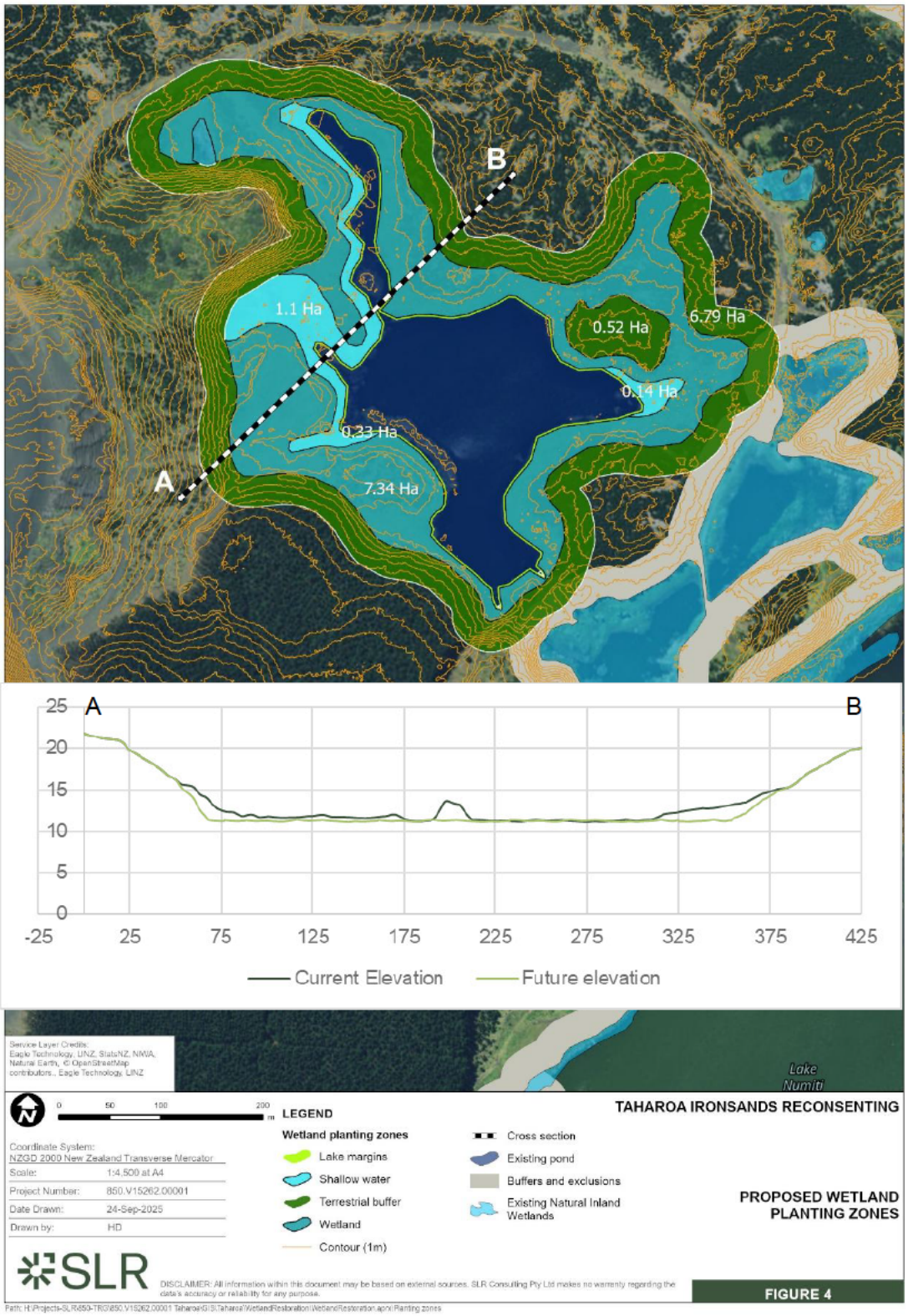
Figure 4: Planting zones and current and future land elevation across an indicative cross section (A-B).



4.5 Planting Zones

Four planting zones have been identified:

1. **Lake margins** are 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 emergent wet tolerant species and where appropriate some submerged macrophyte species.
2. **Shallow water** 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 offset the loss of swamp and seepage wetlands.
4. The **terrestrial buffer** zone would be a 30m 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.

4.6 Plant mixes

Plant species appropriate for each zone are included in Table 4. 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 4: 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%	

Botanical name	Common Name	Lake margins	Shallow water	Wetland	Terrestrial buffer
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%	
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

4.7.1 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.

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4.7.2 Vegetation

4.7.2.1 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.

4.7.3 Photographic record

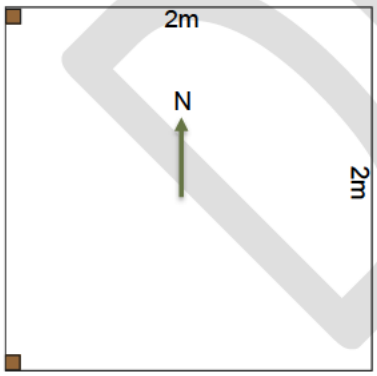
To illustrate the works undertaken and inform review and reporting purposes, photopoints should be established in the wetland offset site and in the wetland and stream buffer sites prior to works and then, at a minimum, following fence construction, following planting, and at 1- and 2-years following 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.

4.7.3.1 Wetland offset site

Formal vegetation monitoring should be established in the wetland offset site to track progress of the wetland restoration.

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

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 as Appendix A.

Quadrats should be measured annually at the same time of year (preferably summer) until a 95% cover of indigenous wetland plants is achieved across all quadrats.

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

4.7.4 Visual Inspection

Visual inspections of all buffer plantings should be made annually and an estimate of canopy cover made and included in the report described in section 4.7.3.1.

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 30 m wide.

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 5). 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 5. Enhancement species listed in Table 5 are to be planted once the revegetation species are well established.

Table 5: 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	✓	

Botanical name	Common Name	Terrestrial buffer	Coastal Buffer
Prumnopitys ferruginea	Miro	✓	
Vitex lucens	Pūriri	✓	

5.2 Fencing

Fencing in accordance with the conditions of TIL's consent, should be 8 or 9-wire post and batten to ensure they exclude livestock and feral animals such as pigs. 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 any fenced areas.

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.

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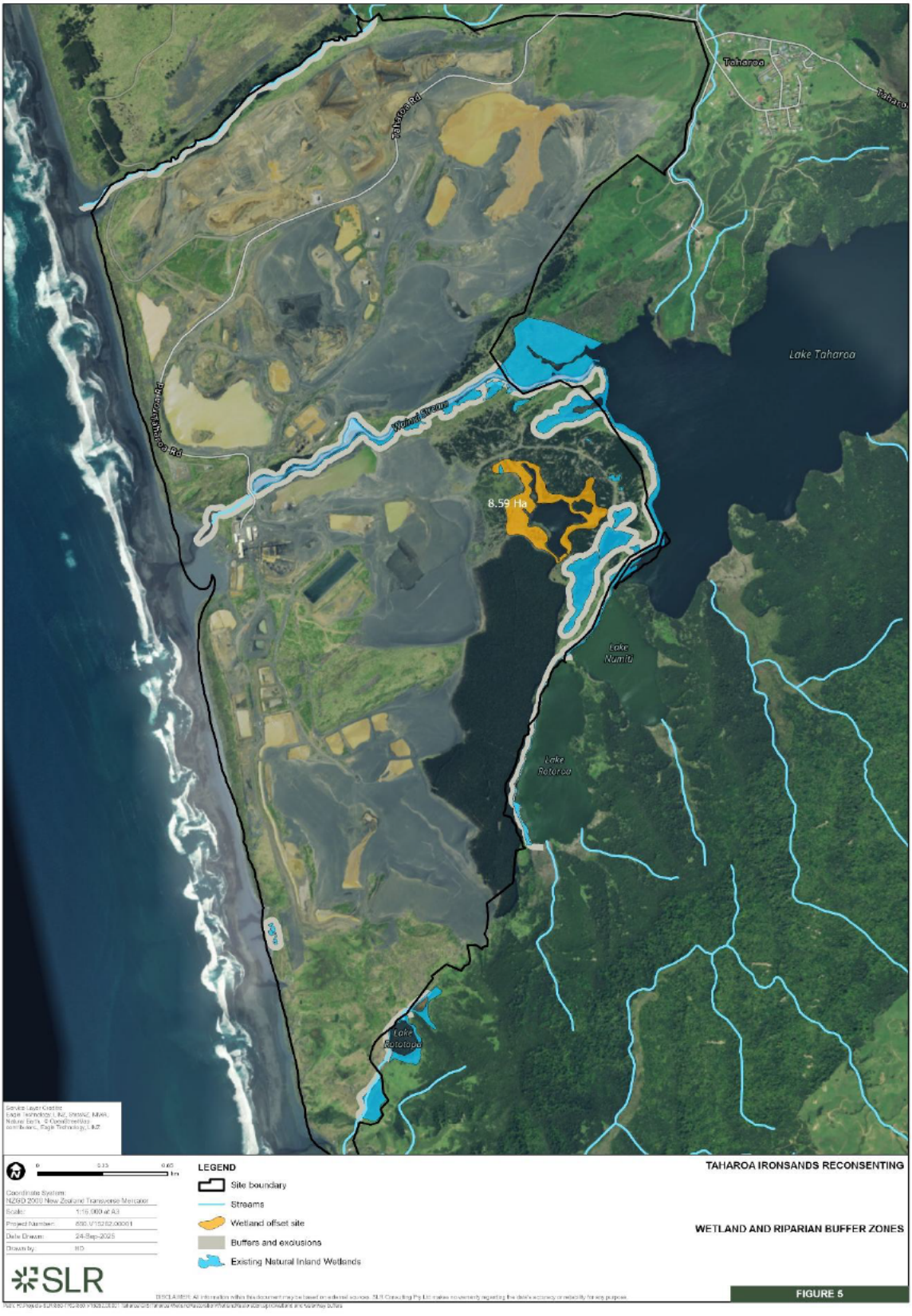
Figure 5: Wetland and riparian buffer zones



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 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 (Figure 6). 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 6: 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 the new fencing and deer are unlikely to be a significant issue. Regular checks of the protection areas should be conducted to ensure that fences are sound and that no ungulates have accessed the areas.

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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 Closure

Sincerely,

SLR Consulting New Zealand

[redacted]

Hamish Dean, MSc, CEnvP
Principal Ecologist

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Appendix A Field Sheet

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

Taharoa Ironsands Limited

SLR Project No.: 850.V15262.00001

13 October 2025

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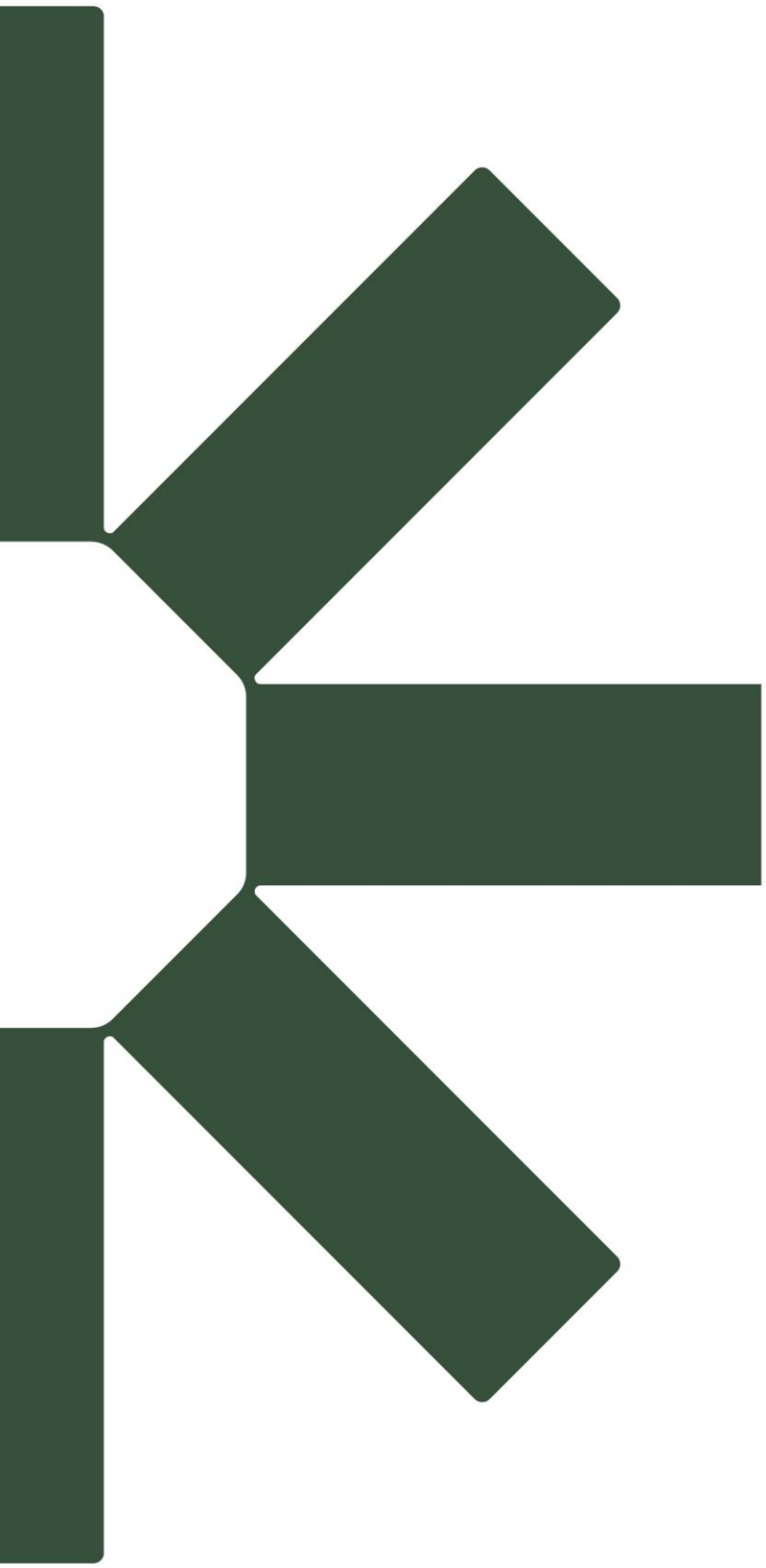
Transect		Quadrat		Date Established	
Tag Number		Coordinates		Date Surveyed	
Altitude		Recorders		Wetland/Dryland	
Vegetation description					
Maximum vegetation height			Average vegetation height		
Vegetation cover (%)			Proportion of vegetation cover that is indigenous (%)		
Ground species / other (<30 cm)	Cover %		Canopy Species / Other (30-100 cm)	Cover %	
			Canopy Species / Other (100 - 200 cm)	Cover %	



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