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Diversion of the Mangakotukutuku Stream through an Open-Pit Mine:

Post Diversion Update

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Rotowaro Opencast Mine

- Rotowaro Coal Mine is located 10km West of Huntly in the Rotowaro coal field
- Sub-bituminous, domestic use thermal coal
- First mined in 1915, current opencast mine opened in 1958 at the former Township pit
- Current opencast mining activities at Rotowaro are limited to the Waipuna West and Waipuna West Extension areas

Mangakotukutuku Stream Diversion

- A key component of the Waipuna West Extension was the diversion of the Mangakotukutuku Stream
- The diversion spans approximately 1.4 km and includes two culvert crossings designed for large mine haul trucks
- The design of the diverted stream channel was developed in 2021, construction completed in September 2023, and the diversion channel opened in December 2023.

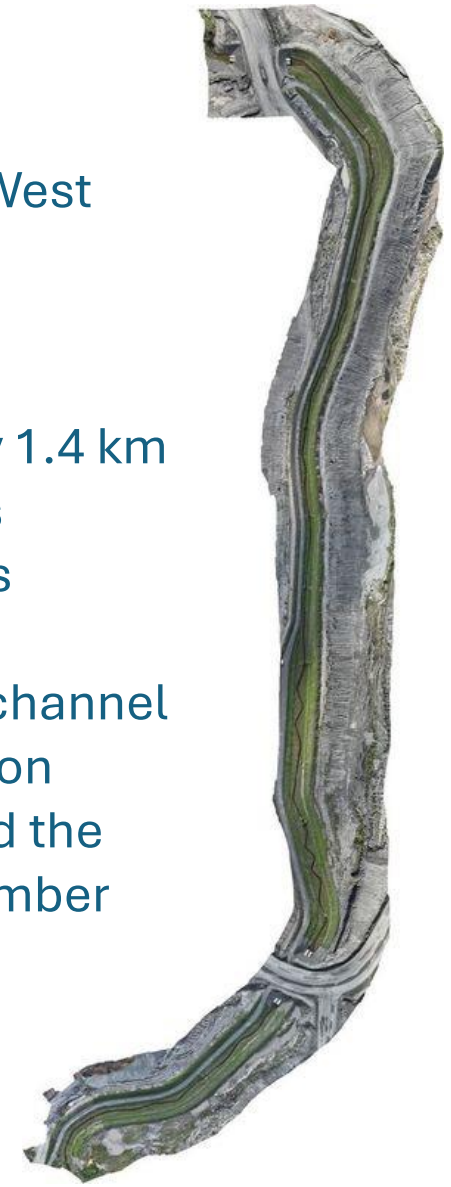

Figure One: *(top left) June 2022,* **Figure Two:** *(bottom left) August 2023,* **Figure Three:** *(right) May 2025*

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Mangakotukutuku Stream Diversion Design

- In-stream features
  - Hydrology
- Habitats for indigenous fish
  - Long- and short-finned eel, Inanga, Banded Kōkopu, and more

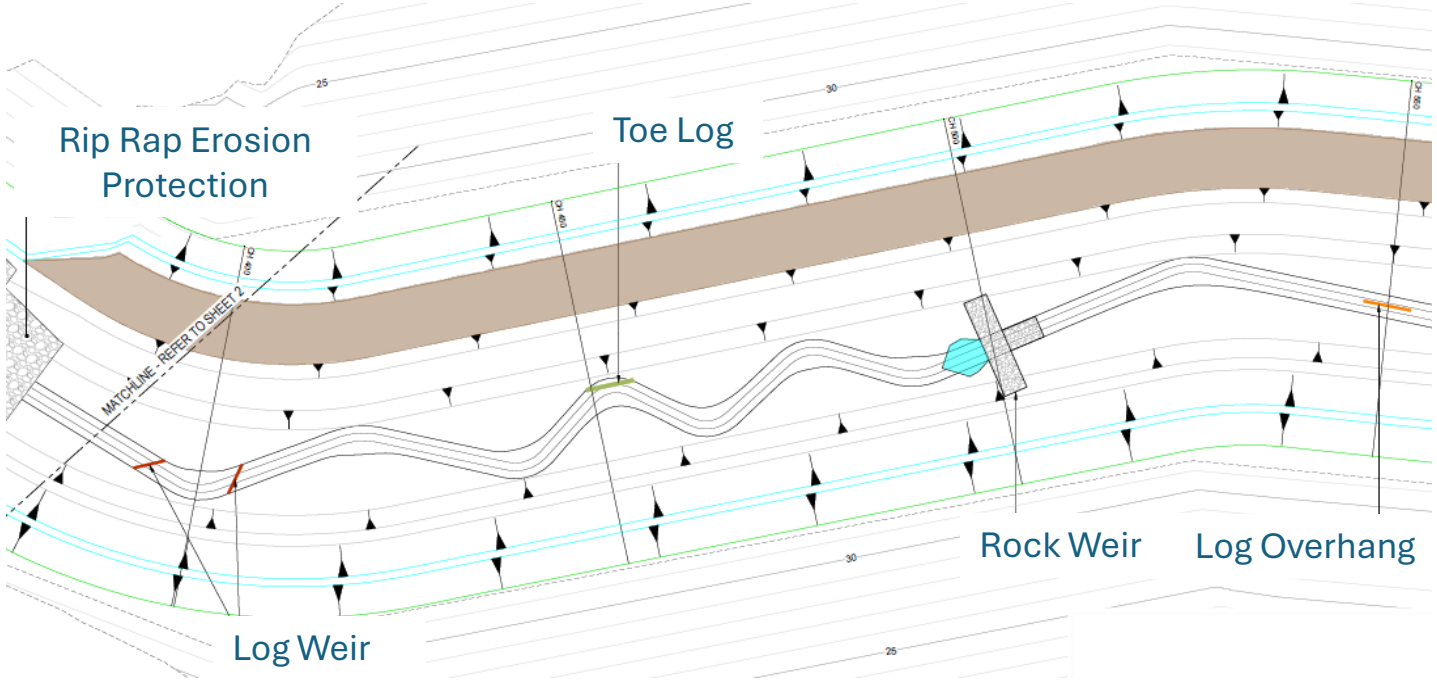

Figure Four: *(left) Design Philosophy,* **Figure Five:** *(right)* Mangakotukutuku Stream
August 2023

Ecological and Fish Management Plan

Objective and Implementation of the Mangakotukutuku Stream Diversion Fish Management Plan

- The primary objective of the Mangakotukutuku Stream Diversion Fish Management Plan was to capture and relocate all resident indigenous fish from the section of the stream designated for diversion.
- All fish collected were relocated downstream of the capture area.

Ecological Management Plan Objectives and Mitigation Measures

- The Ecological Management Plan aimed to offset the loss of stream channel and riparian habitat resulting from the diversion, with the goal of achieving a net ecological gain.
- In total, approximately 3.1 hectares of riparian planting

Figure Six: *(top) Juvenile banded kōkopu (left and juvenile giant kōkopu (right),* **Figure Seven:** *(bottom) Kōura*

Cultural and Ecological Collaboration

Collaboration was key to project success

- Strong partnerships with local iwi throughout all phases

Flora and fauna relocation

- Conducted with iwi guidance and support

Establishment of Maatauranga Maaori Plan

- To allow for the recognition of cultural knowledge, cultural practices cultural induction, kaitiakitanga (guardianship) physical involvement and innovation to ensure the restoration, enhancement and protection of land and water quality, habitat.

Figure Eight: *(Top), Cultural Blessing from Mana-Whenua,* **Figure Nine:** *(Bottom), Diversion Opening*

Riparian Enhancement Planting

- Planting designs were split into four zones; the near channel zone, the channel bank zone, a marginal planting zone and a stop bank planting zone.
- Achieving 95% vegetation cover in the marginal zone is considered critical for channel stability, while achieving 80% cover in other zones.
- A maintenance and monitoring period of up to five years post-diversion is planned, with replacement planting occurring during the first and second years.

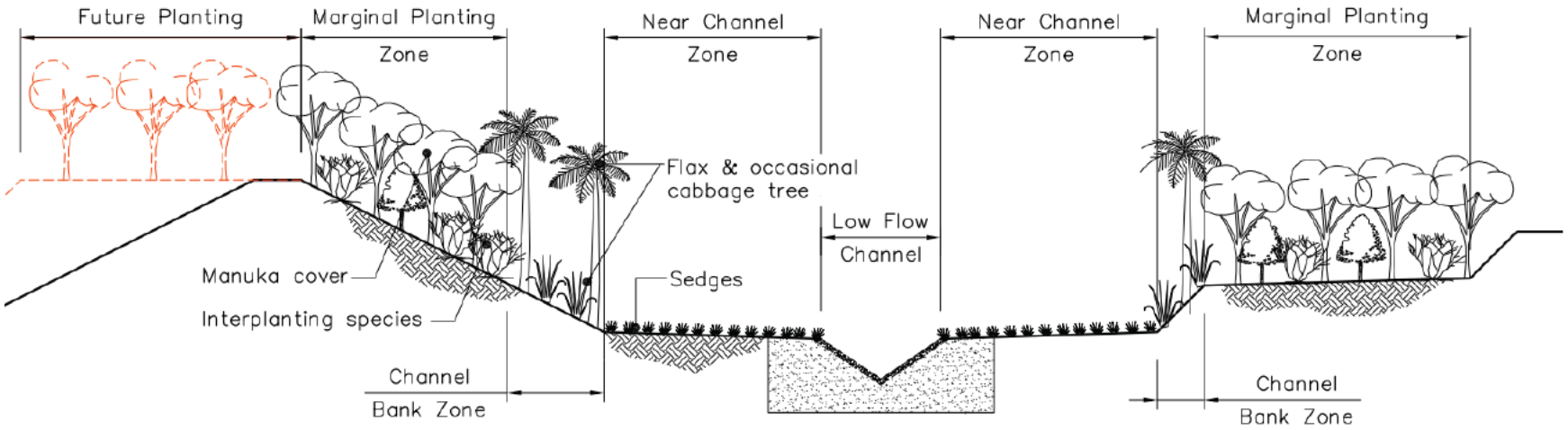

Figure Ten: *Riparian planting enhancement design*

Riparian Enhancement Planting

- In August 2023, planting works were initiated ahead of the stream diversion project to establish vegetation along the floodplain and near-channel areas
- At the end of November 2023, a targeted application of liquid fertilizer was carried out to provide nutrients and support the establishment of the newly planted vegetation
- In December 2023, as part of the ongoing ecological enhancement efforts, Nasturtium officinale (Wātakirihi) was introduced into the waterway along the length of the diversion project
- Soil sampling was conducted throughout April to prepare for the upcoming planting season in August 2025.

Figure Eleven: *(top) Installation of first plants (August 2023),* **Figure Tweleve:** *(bottom) Wātakirihi in Mangakotukuku Stream weirs (April 2025)*

Post Diversion Monitoring

- Monitoring of the Mangakotukutuku Stream diversion sites and the control site occurs annually post construction, for 5 years aligning with the goal of creating stream habitat values that are better than what is present

- 2025 post diversion monitoring results showed:
  I. Stream pH remained within the Waikato Regional Council's ‘excellent’ category
  II. Notably, giant kōkopu—an ‘At Risk – Declining’ species—were detected via trapping and eDNA, marking a positive change from 2024
  III. Longfin eel and īnanga, also classified as ‘At Risk – Declining’, were recorded across both sites.

Figure Thirteen: *Kākahi Upstream (January 2025)*

Ecotox Testing

- BT Mining Limited commissioned NIWA to conduct an ecotoxicity study to evaluate the environmental impacts of the mine discharge on local freshwater ecosystems
- The study presented findings of toxicity tests conducted on five native freshwater species - *primary endpoints measured were survival, growth, and reproduction*

Figure Fourteen: *(top) Juvenile kōura, tested over 21 days,* **Figure Fifteen:** *(bottom) NIWA ecotox trials*

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Ecotox Testing

- The primary contaminant of concern in the discharge was boron, which becomes elevated in mine water when waste rock containing tourmaline minerals is disturbed.
- No progressive concentration-response for growth and no statistically significant effect on *inanga, koura and Daphnia* growth and survival at the highest tested mine discharge concentration (100%)
- The *kākahi* test showed no progressive concentration-response for survival until concentrations greater than 25% mine discharge.
- The larval stage of the freshwater mussel, were the most sensitive to boron exposure, with a threshold concentration of 1.6mg/l.
- A 3-fold dilution in receiving waters is expected to **protect all tested species**, supporting sustainable and environmentally responsible discharge management.

Species	*Boron (mg/l) Threshold Effects Concentration*
Inanga	3.9
Kooura	4.5
Kaaeo larvae	**1.6**
Ngaarara wai (Daphnia)	4.5
Alga Kaakaaariki (Rhizoclonium sp)	4.5

Table One: *Boron Threshold Effects Concentration*

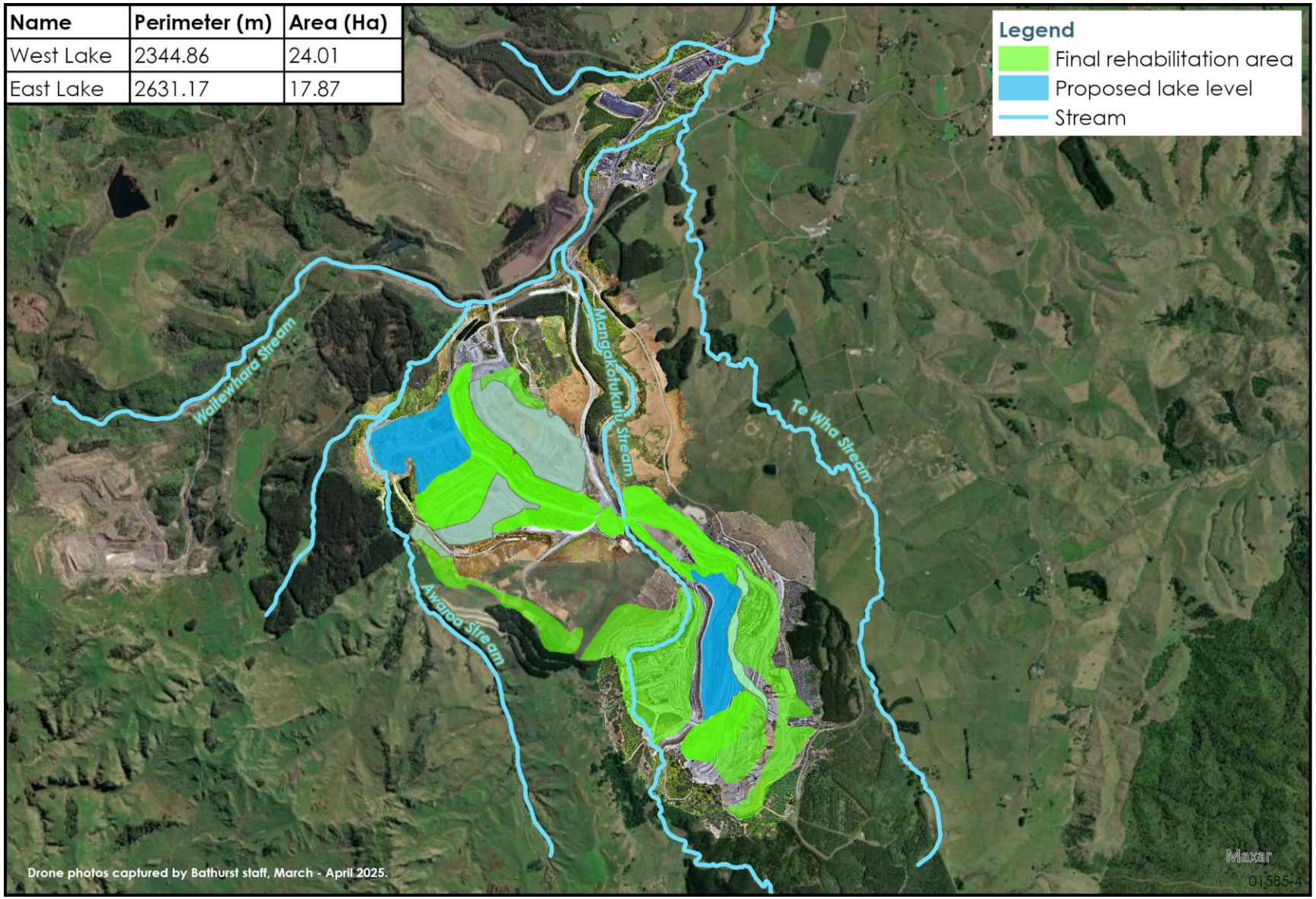
Organism	Endpoint	EC_{10}[a] (%) (±95% CI)	EC_{50}[a] (%) (±95% CI)	NOEC[b] (%)	LOEC[b] (%)	TEC[b] (%)	No Toxicity Dilution[c]
Fish - whitebait, inanga - *Galaxius maculatus*	Survival	>100[d]	>100	50	100	**71**	1.4
	Growth – Length [e]	>100	>100	100	>100	**>100**	1
	Growth - Biomass	>100	>100	100	>100	**>100**	1
Invertebrate - kākahi larvae - *Echyridella menziesii*	Survival	50 (45-55)	98 (91-104)	25	50	**35**	2.9
Invertebrate - kōura - *Paranephrops planifrons*	Survival	>100	>100	100	>100	**>100**	1
	Growth – OCL Length [e]	>100	>100	100	>100	**>100**	1
	Growth – Biomass	>100	>100	100	>100	**>100**	1
Invertebrate – water flea - *Daphnia thompsoni*	Survival	>100	>100	100	>100	**>100**	1
	Reproduction	>100	>100	100	>100	**>100**	1
Plant – filamentous green alga - *Rhizoclonium* sp.	Growth	>100	>100	100	>100	**>100**	1

[a] EC_x= dilution required to cause an X% effect on the test organisms; [b] NOEC = No observed effect concentration; LOEC = Lowest observed effect concentration; TEC = threshold effect concentration (Geometric mean of NOEC and LOEC); [c] No toxicity dilution calculated as follows: chronic test = (1/TEC)*100. [d] EC_{15} value as EC_{10} not available with the linear interpolation analysis used. [e] Low reliability results for this endpoint due to minimal observed growth (length) in test controls (Note: control growth for weight increase for both species met the quality control acceptability condition and can be used a reliable chronic growth measures).

Table Two: *Summary of toxicity test results for Rotowaro mine discharge sample. Bold indicates toxicity values used for calculating the no toxicity dilution.*

Mangakotukutuku Stream Post-Mining

Name	Perimeter (m)	Area (Ha)
West Lake	2344.86	24.01
East Lake	2631.17	17.87



- Overburden waste placed against part of the Mangakotukutuku Stream diversion embankment to create the final embankment land form
- Flooded to form a lakes up to ~RL 28m
- Both the West and East lakes will have discharge outlets that connect to the Mangakotukutuku Stream.

Figure Sixteen: *Rotowaro Conceptual Site Closure Plan*

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