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## Ecological Mitigation Monitoring Report

Gleeson Huntly Quarry  
Gleeson & Cox Ltd

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## Documentation

**envoco**

Specialists in Ecological, Horticultural, Environmental & Civil work

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## Introduction

Gleeson Quarries Huntly Ltd and Gleasons Managed Fill Ltd have been granted resource consent for the disposal of quarry overburden material within a 2.5ha gully ('Fill Area 5') located at Gleeson Huntly Quarry, 300 River-view Road, Huntly. Resource consent applications for three other proposed fill areas, also for the purpose of disposal of quarry overburden material and imported cleanfill, are still in progress. The ecological compensation package proposed to mitigate for the loss of terrestrial and aquatic habitat of the four fill areas involves the restoration of a 4ha Significant Natural Area (SNA\_16743) located on farmland owned by Gleeson Quarries Huntly Ltd to the west of the quarry. The SNA includes wetland, gully and treeland habitats that are heavily impacted by land use activities, mainly damage from livestock and aerial herbicide application.

An Ecological Management Plan (Wildlands, 2020) for the compensation site (SNA) has been followed to ensure restoration goals and resource consent conditions are met. Envoco was engaged by Gleeson Quarries Huntly Ltd in February 2021 to implement the plan, which has included stock exclusion, pest plant and animal control, and indigenous replanting to achieve the goal of improving the ecological values of the site, particularly the restoration of degraded wetland habitats and riparian margins.

Resource consent LUC0176/20 (Waikato District Council) and resource consent AUTH141283.06.01 (Waikato Regional Council) permit works for Fill Area 5, which commenced around April 2021. To mitigate for 50m of stream loss in Fill Area 5, an area approximately 2,644m<sup>2</sup> including approximately 120 metres of spring-fed headwaters of the western tributary of the SNA is being restored through stock-proof fencing, weed control and indigenous planting. Although resource consent for the remaining fill areas is yet to be granted, Gleeson & Cox have encouraged ecological restoration works to be undertaken for the whole SNA as per the Ecological Management Plan.

This Ecological Mitigation Monitoring Report is required as a general condition under the operative resource consents, and details works completed in the preceding 12 months associated with the Ecological Management Plan.

## Summary of works

- Fish salvage and relocation in Fill Area 5 prior to earthworks
- Establishment of pest control and monitoring operations in SNA
- Control of pest plants in SNA - removing infestations, preparing planting areas
- Stock-proof fencing around periphery of SNA
- Restoration planting in SNA - 14,200 plants, approximately half complete
- Macroinvertebrate sampling in Fill Area 2,3,4 receiving environments
- Fish passage - recommendations to rectify fish barrier





Gleeson Huntly Quarry showing proposed fill areas and SNA's, including the compensation area.



## Fish management in Fill Area 5

The construction of Fill Area 5 and associated sediment pond will result in the loss of approximately 60 metres of ephemeral watercourse and potential habitat for native freshwater fauna. A Fish Management Plan (Wildlands, 2021) that outlines measures remove fish and koura (*Paranephrops planifrons*) from the watercourse was followed to ensure they are not injured or killed due to fill works.

A stop net was constructed on the 17th May at the downstream end of the watercourse to prevent fish returning or migrating into the affected area. A total of 150 koura (*Paranephrops planifrons*) were captured and relocated over a three day period (17th - 20th May) using bait traps and hand searching, with the majority captured on the second day. Electrofishing was carried out in the upper section of watercourse but yielded no results. All koura (*Paranephrops planifrons*) were relocated downstream of the impact area in similar suitable habitat.



Figure 1: Several koura captured in a bait trap in the Fill Area 5 watercourse.



Figure 2: Ecologists hand-searching for fish and koura.



Figure 3: Ecologists electric fishing in a pool in the upper part of the watercourse.

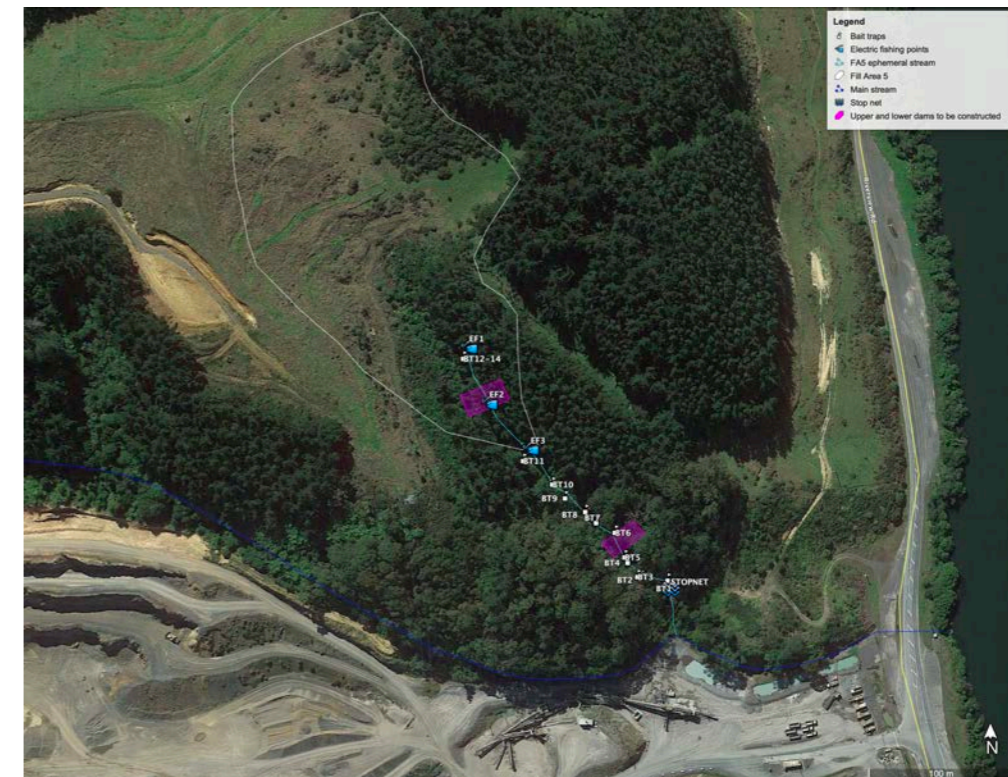


Figure 4: Map of Fill Area 5 and fish sampling points.



## Pest animal control

### Monitoring

Pest animal monitoring is done to monitor the presence or absence of pest animal species at a given time and location in order to track changes over time. A monitoring event was done prior to pest animal traps being set to gauge baseline presence of pest animals. Monitoring involves placing ink tracking cards within 18 permanently placed tracking tunnels and placing 16 peanut butter filled chew cards on trees throughout the site. Tracking tunnels and chew cards are set for 2 nights during fine weather. Monitoring events will be done three times per year with the aim of tracking the presence of pest animals as a response to trapping and baiting operations. Further monitoring of possums will be done using wax tags and leg hold traps in order to obtain a residual trap catch index (RTCI), giving a more accurate relative population density of possums within the site.

Preliminary monitoring of pest animals was conducted during May 2021, with subsequent monitoring events during September 2021 and February 2022. Monitoring data indicates that the presence of mice and possums has increased since May, and the presence of rats has decreased (Table 1). This may be attributed to seasonal variations in pest animal behaviour and abundance; more data is required to obtain significant long term results. Increased trapping effort since September 2021 and a recent bait pulse will hopefully see a decrease in the abundance of pest animals detected during monitoring.

Table 1: Pest monitoring data for three monitoring events in the SNA restoration site.

Species	May 2021		September 2021		February 2022	
	Proportion of tracking tunnels containing prints	Proportion chew cards containing bite marks	Proportion of tracking tunnels containing prints	Proportion chew cards containing bite marks	Proportion of tracking tunnels containing prints	Proportion chew cards containing bite marks
Mouse ( <i>Mus musculus</i> )	33%	0%	22%	0%	50%	26%
Rat ( <i>Rattus</i> spp.)	39%	0%	39%	0%	11%	0%
Possum ( <i>Trichosurus vulpecula</i> )	0%	46%	22%	53%	61%	58%



Figure 5: Tracking tunnel and chew card set in the south-western gully area of the SNA.

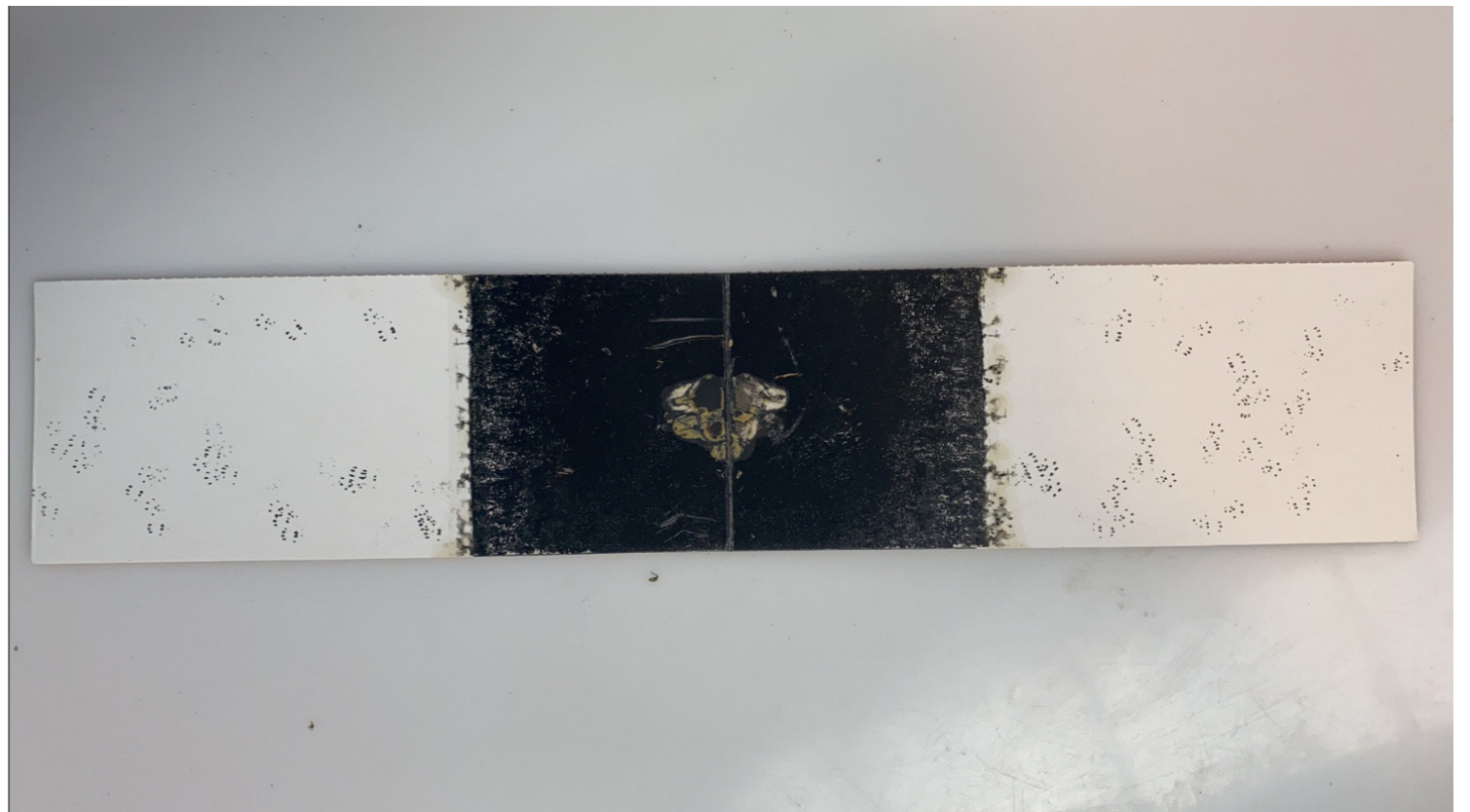


Figure 6: Mouse prints on a tracking card.



## Trapping

23 DOC 200 traps (targeting rats, mice, mustelids and hedgehogs) and 5 Trapinator traps (targeting possums) were set up across the site during September and October 2021. Initially the traps were left empty and unset for a period of 2 weeks to allow the animals to get used to having them in the environment. The traps were baited with peanut butter but left unset for a further 2 weeks to encourage interaction with the traps. Trapping has occurred one a week with results detailed in the Table 2 (below). Trapping breaks occur approximately three times per year when catch rates decline, during this time traps are de-set and shifted to new locations with a pre-feed period of two weeks prior to being baited and set again.



Figure 7: DOC200 baited with peanut butter within the gully forest.

Table 2: Pest trapping data for November 2021 - May 2022.	
Species	Number caught
Hedgehog ( <i>Erinaceus europaeus</i> )	3
Mouse ( <i>Mus musculus</i> )	16
Norway rat ( <i>Rattus norvegicus</i> )	7
Ship rat ( <i>Rattus rattus</i> )	40
Stoat ( <i>Mustela erminea</i> )	3
Weasel ( <i>Mustela nivalis</i> )	2
<b>Total</b>	<b>71</b>

## Baiting

11 bait stations (targeting hares, rabbits, rats and possums) were set up across the site during May 2021. The bait stations were initially left empty to allow animals to become familiar with them, as hares and rabbits are particularly neophobic. Carrots were used as a pre-feed bait for 2 weeks after this period to encourage interaction with the bait stations prior to poison bait being added. Four 'bait pulses' are scheduled each year, which involves a 2 week period of pre-feeding and a 4 week period of poisoning. 200g of bait is added to each bait station and amount taken is recorded on a weekly basis. Pindone is used in the hare and rabbit bait stations and brodifacoum used in the possum and rabbit bait stations. Two bait pulses have occurred so far, with a total of 4.4kg bait taken during December 2021 and a total of 8.8kg taken in April-May 2022.



Figure 8: Pre-feeding bait station with carrots to encourage interaction.



Figure 9: Trapinator trap set in a totara near the stream.



## Pest plant control

Control of pest plants must be undertaken to ensure the success of restoration activities within the SNA. Pest plant species present at the site that are listed in the Waikato Regional Pest Management Plan include *Berberis darwinii* (barberry), *Jacobaea vulgaris* (ragwort), *Ligustrum sinense* (Chinese privet), *Salix cinerea* (grey willow), *Solanum mauritianum* (woolly nightshade) and *Ulex europaeus* (gorse). These species have been controlled with a range of methods, including hand-pulling small seedlings, cutting with hand saws or chainsaws and pasting the stumps with glyphosate gel, and drilling and poisoning. Pest plant control was prioritised in planting areas but now much of the infestations have been removed across the whole site.

An area of wetland approximately 1400m<sup>2</sup> at the northern end of the gully is dominated by mature *Salix cinerea* (grey willow). During September and October 2021 these willows were targeted using the drill and poison method (active ingredient: 540 g/L glyphosate). There has been an estimated 80% kill rate, with follow-up poisoning on remaining willows scheduled for the coming spring.

*Ligustrum sinense* (Chinese privet) and *Ulex europaeus* (gorse) are the most prevalent pest plants on site, and have been targeted across the whole site with planting areas as a priority. Dead pest plants on the eastern boundary of the SNA as a result of aerial herbicide spraying in 2020 have been cut and piled to create room for planting. Where pest plants were not impacted by the herbicide application, they were removed using chainsaws and hand saws and the cut stumps pasted with glyphosate gel to prevent regrowth.

The exotic grass species *Paspalum distichum* (Mercer grass) was present within the wetland channel and formed a thick mat, hindering the establishment of native wetland species. This grass was targeted using herbicide application with a quick-reel and spray gun using 100 g/litre haloxyfop-P present as haloxyfop-P-methyl. This herbicide was also used to target small *Cordarteria selloana* (pampas) infestations at the top of the gully.



Figure 10: Sprayed gorse on the eastern edge of the SNA (March 2022).



Figure 11: Gorse after being cut and piled (April 2022).





Figure 12: Chinese privet removed with chainsaws on the western side of the stream to prepare the area for planting.



Figure 13: Gorse removed with chainsaws on the eastern side of the stream to prepare the area for planting.



Figure 14: Gorse removed with a hand saw and grazon herbicide applied to cut stumps.

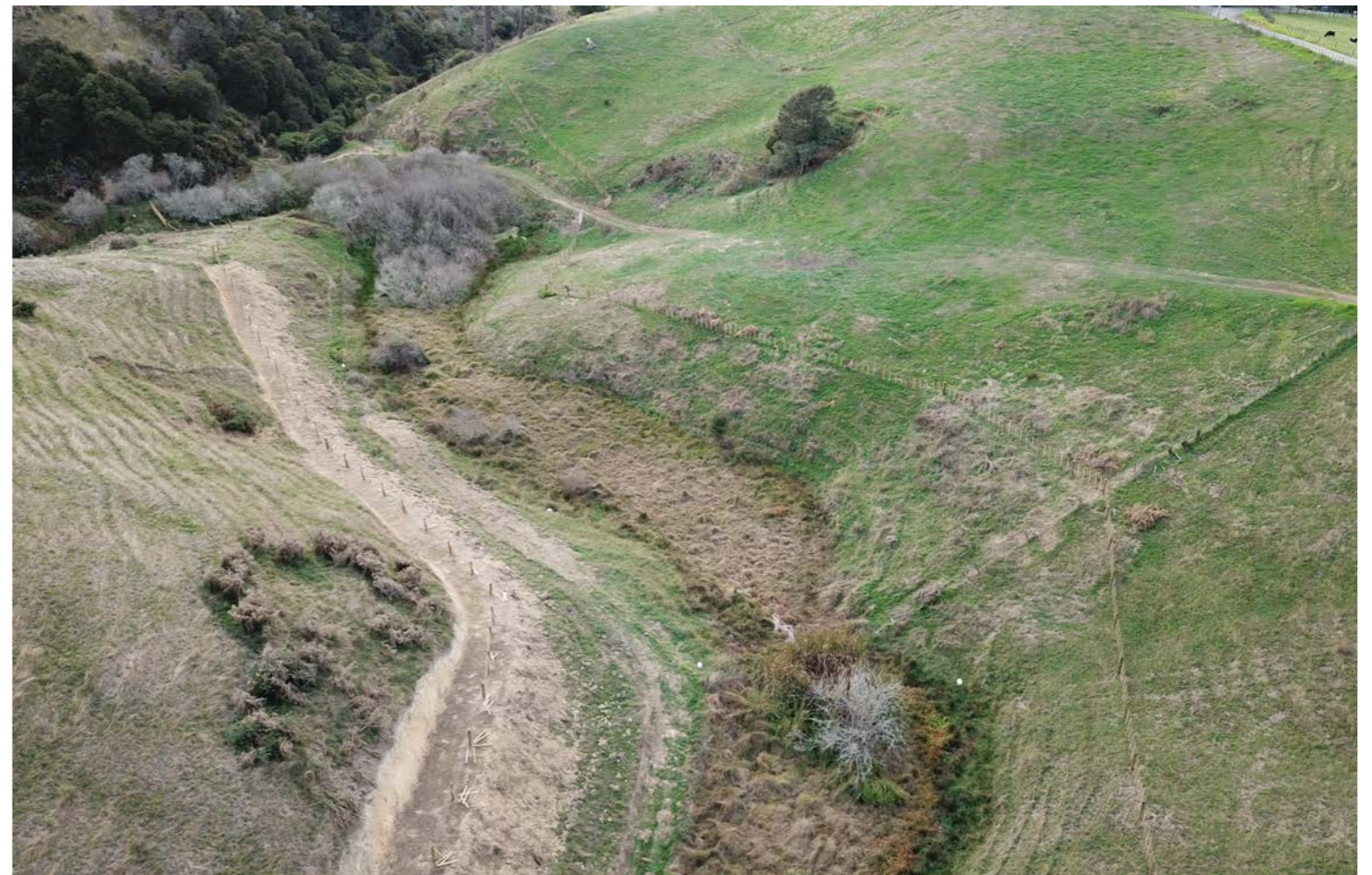


Figure 15: Results of willow poisoning and spraying of Mercer grass in the wetland.



## Bird monitoring

Bird monitoring has been conducted to distinguish changes in populations of birds caused by management actions (ie. pest animal control, restoration planting). Bird monitoring was conducted on the 2nd May 2022 at three sites approximately 200m apart within the SNA using 5-minute bird counts (5MBC). A range of exotic and native species were observed, detailed in Table 3 below. Of interest is the changes in population of native seed dispersing and pollinating birds, such as kereru, tui and silvereye. Birds observed throughout the site outside of monitoring include kereru, tui, pukeko, harrier and a resident morepork who lives in the *Dysoxylum spectabile* (kohekohe) fragment in the western tributary. Bird counts will be conducted seasonally (every 3 months) to monitor changes in existing bird populations and to see if new species colonise the area as a result of restoration activities.

Table 3: Results of bird monitoring in the SNA using 5MBC. Counts were taken on 02/05/22 in fine calm conditions.

Species	Site 1 (wetland next to willows)		Site 2 (middle area of gully)		Site 3 (upper gully, main tributary)	
	Seen	Heard	Seen	Heard	Seen	Heard
Blackbird		1		1		1
Chaffinch		1				
Fantail	1	1				
Goldfinch		3		3		
Greenfinch			2	1		
Grey warbler				2		1
Kingfisher				1	1	
Magpie				1		
Myna		3				1
Sparrow		4				2
Silvereye		4		1		



Figure 16: Kohekohe flowers are an important food source for nectar-feeding native birds.



## Fencing

A seven-wire post and batten fence was completed around the entire perimeter of the SNA to prevent stock access. A bench was cut around much of the perimeter in order for the fence to be constructed and for ease of access for small mobile machinery. The benches were hay mulched to prevent erosion and encourage grass growth on the exposed soil.



Figure 17: Fencing progress at the top of the gully, looking south. March 2022.



Figure 18: Fencing progress in the middle of the gully, looking north. March 2022.



Figure 19: Hay applied to recently cut bench. March 2022.



Figure 20: Fencing progress around the wetland, looking north-west. March 2022.



## Planting

The planting schedule involves approximately 14,200 plants across 12 areas situated around the SNA. The goal of the planting is to fill in bare areas that would otherwise be colonised by pest plants with the aim of creating contiguous canopy cover with existing remnant vegetation. A range of fast-growing pioneer species suited to the site were chosen, with slower-growing tree species characteristic of the local forest type to be added in once sufficient canopy cover has been achieved within the pioneer planting. Approximately half of the planting is complete. Measures of success for the planting will be estimated with the establishment of 5x5m plots within planting areas of each different habitat type. Growth of plants and establishment of new species will be monitored over time to ensure restoration goals are being met. A rain gauge has been set up on site to monitor monthly rainfall.



Figure 21: Range of riparian pioneer species to be planted on the wetland margins.



Figure 22: Native sedges and grasses planted in the wetland.



Figure 23: Planting the wetland area underneath dead willows.



Figure 24: Map of fence line (green) and planting areas (white).



## Macroinvertebrate monitoring

Macroinvertebrate communities in the watercourses downstream of the discharge points of Fill Areas 2, 3 and 4 were sampled on the 11th April 2022 to obtain baseline water quality data prior to any works within the fill areas. It is of interest to monitor macroinvertebrate communities in these receiving environments (impact sites) and elsewhere in the catchment that will not be affected by fill discharge (reference sites) to gauge long term trends in water quality and assess the effects of localised impacts (ie. fill and extraction works).

Two reference sites and two impact sites were sampled to obtain MCI (Macroinvertebrate Community Index) values in order to gauge the baseline condition of watercourses that may potentially be impacted by three proposed fill areas. It is proposed that these sites will be monitored over time to track any changes in water quality, which will be evidenced by changes in the macroinvertebrate community. Both reference sites had MCI scores reflective of high water quality and a diverse assemblage of macroinvertebrates with a range of tolerances to pollution/nutrient enrichment. In contrast, both impact sites had MCI scores reflective of average to poor water quality and macroinvertebrate habitat, which is also indicative of moderate to severe pollution/nutrient enrichment. This may be attributed to the modified environment within the catchment, lack of suitable sampling areas (low flow conditions, lack of riffle habitat) and pollution/sedimentation from runoff from the surrounding land.

To continue monitoring macroinvertebrate communities at these sites, it is suggested that one summer and one winter sampling be done, as this will be adequate to assess species richness and may pick up changes in the community relating to climatic changes or land use activities.



Figure 25: Map of macroinvertebrate sampling sites in relation to the quarry and fill areas.



Figure 26: Koura/freshwater crayfish found at reference site 1 during macroinvertebrate sampling.



## Fish passage

Two barriers to fish passage have been identified within the SNA that will need to be rectified to ensure native migratory fish are able to travel up and down the waterways. The barriers are perched culverts that are located at the outlet of the wetland at the northern end of the SNA and at the outlet of the pond by the pump shed (Figure 27). Under the Waikato Regional Plan (permitted activity rule 4.2.9.2), culverts are permitted as long as they provide for safe passage of fish both upstream and downstream. It is recommended that a fish ladder be installed at both culverts to allow for the migration of native fish up through the watercourse. A constructed ramp with a rough surface and V-shaped cross section would maintain a continuous low velocity flow between the culvert and the stream below, allowing easier access for migrating fish to travel up and down the stream.



Figure 27: Perched culvert by pump shed in March 2022 (left) and May 2022 (right).



Figure 28: Map of northern end of SNA showing locations of fish barriers (perched culverts).



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