APPENDIX TEN

ECOLOGY ASSESSMENT - FRESHWATER

Memorandum

Bioresearches
A Babbage Company

To:	[redacted] **Limited**	**Date:**	9 July 2021
Attention:	[redacted]	**Ref:**	64496
Subject:	**Freshwater Ecological Assessment – Shelly Bay culvert inlet**		

Background Information

Bioresearches was engaged by [redacted] Limited, on behalf of their client, to undertake an ecological values and impact assessment of the modification of a culvert inlet at a site in Shelly Bay, Wellington.

The culvert inlet provides for flow, mainly rainfall flow, from a small intermittent stream that drains the upper bush catchment.

The application for the culvert inlet works is subject to a RMA Section 92 request for further information (File No: WGN210336 [37582] [37583] [37584], dated 04 June 2021).

Request 9. stated
Please assess the inlet structure and the associated reclamation (ie. loss of extent) against this provision as follows:

a) whether there is a loss of stream extent of values;
b) whether there is a functional need for any loss of extent; and if so
c) how the effects of the activity are managed by applying the effects management hierarchy

This memorandum provides an assessment of stream values and effects of the 3m of reclamation of the stream.

The site was visited by an experienced freshwater ecologist on 23 June 2021, after 32mm of rain in the preceding 48 hours (refer Appendix 1).

Methodologies

A detailed assessment of the watercourse was undertaken in general accordance with the criteria from the Stream Ecological Valuation (SEV) methodology (Storey *et al*., 2011). The methodology enables the overall function of a stream to be assessed and involves the collection of habitat data (e.g. stream depth, substrate type, riparian cover), and sampling of fish communities (where appropriate) and macroinvertebrates (e.g. insect larvae, snails), the latter being recognised indicators of habitat quality. Ten stream cross-sections were assessed from the culvert inlet to 6m upstream, and a visual assessment was undertaken of the stream above the final cross-section to the fence line approximately 20m upstream of the inlet.

Macroinvertebrate sampling was carried out in the stream accordance with the Ministry for the Environment's current "Protocols for Sampling Macroinvertebrates in Wadeable Streams" (Stark *et al.*, 2001). Five biotic indices were calculated, namely the number of taxa, the number and percentage of Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) recorded in a sample

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(%EPT), the Macroinvertebrate Community Index (MCI) and the Semi-Quantitative Macroinvertebrate Community Index (SQMCI). EPT are three orders of insects that are generally sensitive to organic or nutrient enrichment. The MCI and SQMCI are based on the average sensitivity score for individual taxa recorded, although the SQMCI is calculated using coded abundances instead of actual scores.

Guidelines for undertaking Ecological Impact Assessments have been published by the Environment Institute of Australia and New Zealand (EIANZ; Roper-Lindsay *et al*. 2018). The Guidelines provide criteria for assigning value to habitats for assessment purposes. Ecological values have been assigned based on Table 1 (adapted from Tables 5 and 6 of EIANZ 2018), with criteria for describing the magnitude of effects presented as Table 2 (Chapter 6 of the EIANZ Guidelines).

The level of effect can be determined through combining the value of the ecological feature/attribute with the magnitude of effect to create a criterion for describing level of effects (Table 3). The cells in italics in Table 3 represent a 'significant' effect under the EIANZ 2018 guidelines. Cells with low or very low levels of effect represent low risk to ecological values rather than low ecological values *per se*. A moderate level of effect requires careful assessment and analysis of the individual case. For moderate levels of effects or above, measures need to be introduced to avoid through design, or appropriate mitigation needs to be addressed (Roper-Lindsay *et al*. 2018).

Table 1. Criteria for assigning value to habitat/species for assessment.

Value	Determining Factors
Very High	Nationally Threatened species found in the 'zone of influence' (ZOI) either permanently or seasonally. Area rates 'High' for at least three of the assessment matters of Representativeness, Rarity/distinctiveness, Diversity and Pattern, and Ecological Context. Likely to be nationally important and recognised as such.
High	Species listed as At Risk – Declining found in the ZOI either permanently or seasonally. Area rates 'High' for two of the assessment matters, and 'Moderate' and 'Low' for the remainder OR area rates 'High' for one of the assessment matters and 'Moderate' for the remainder. Likely to be regionally significant and recognised as such.
Moderate	Species listed as At Risk – Relict, Naturally Uncommon, Recovering found in the ZOI either permanently or seasonally. Locally uncommon or distinctive species. Area rates 'High' for one of the assessment matters, 'Moderate' or 'Low' for the remainder OR area rates as 'Moderate' for at least two of the assessment matters and 'Low' or 'Very Low' for the remainder. Likely to be important at the level of the Ecological District.
Low	Nationally and locally common indigenous species. Area rates 'Low' or 'Very Low' for majority of assessment matters, and 'Moderate' for one. Limited ecological value other than as local habitat for tolerant native species.

Negligible	Exotic species including pests, species having recreational value. Area rates 'Very Low' for three assessment matters and 'Moderate', 'Low' or 'Very Low' for the remainder.

Table 2. Criteria for describing the magnitude of effects (EIANZ 2018)

Magnitude	Description
Very High	Total loss of, or a very major alteration to, key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature.
High	Major loss of major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature.
Moderate	Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature.
Low	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances and patterns; AND/OR Having minor effect on the known population or range of the element/feature.
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR Having negligible effect on the known population or range of the element/feature.

Table 3. Criteria for describing the level of effects (EIANZ 2018). Where text is italicised it indicates 'significant effects' where mitigation is required.

Magnitude of Effect	Ecological Value				
	Very High	High	Moderate	Low	Negligible
Very High	*Very High*	*Very High*	*High*	*Moderate*	Low
High	*Very High*	*Very High*	*Moderate*	Low	Very Low
Moderate	*High*	*High*	*Moderate*	Low	Very Low
Low	*Moderate*	Low	Low	Very Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low	Very Low
Positive	Net Gain	Net Gain	Net Gain	Net Gain	Net Gain

Stream Habitat and Values

The water flow entering the culvert was a narrow shallow intermittent stream. The average width of the lower stream near the culvert was 0.35m (n=10), with an average depth of 0.02m (n=50). There were no significant pools present with the deepest water, 0.08m, recorded within the inlet pool at the partially blocked culvert mouth (Figure 1 and Figure 2). The substrate was a mix of medium to large gravels, cobbles and bedrock, although the upper sections of the stream, more than 10m above the inlet structure, were softer with a higher component of silt and small gravels (Figure 3).

The stream showed moderate hydrologic variation forming a run in the upper reaches but with some small drops and shoots down to the outlet.

Although the quantity of aquatic habitat was very limited and intermittent, the quality of the habitat when water was present was high for macroinvertebrates with good shading, hard substrate, roots and woody debris creating a variety of firm spaces and food sources. There was insufficient habitat to support resident native freshwater fish, with no deep pools, undercuts or cover even during the winter period after 32mm of rain. The juveniles of strong climbing fish such as shortfin eel and koaro could attempt the pipe to the stream but would not be able to sustain their position because of the limited and intermittent habitat.

Figure 1. Culvert inlet (partially blocked) with wingwalls

Figure 2. Stream inlet pool (note part of headstone on photo left)

Figure 3. Intermittent stream channel upstream of proposed works area.

Figure 4. Upper section of intermittent stream, view towards inlet.

Macroinvertebrates were sampled in the steam, targeting the inlet pool, rocky habitats and root wads. Although the total numbers and diversity were both very low (26 individuals and five taxa), indicative of poor quantity of habitat, all the taxa were EPT taxa, with high and very high MCI values, resulting in MCI and SQMCI ≥120 and ≥6.0 successively (refer Appendix 2), indicative of excellent habitat quality (Stark and Maxted, 2007a,b).

The stream banks to about 4m upstream of the inlet structure were steep and vertical (1.5m), forming a bowl above the current inlet with the concrete apron and wing walls. Upstream of the inlet, the stream formed a shallow run within a shallow channel.

The riparian vegetation was showing the effects of land use changes, comprised of a mix of early regenerating native shrubs, dominated by kawakawa, rangiora and māhoe, and exotic weed species, broom, gorse, and Montbretia (refer to Appendix 3 for the species list), and surrounded by pine. The ground was a mix of bare ground and leaf litter and pine needles. (Figure 3 and Figure 4).

A combination of steep banks and riparian canopy gave high shading to the stream.

Broken pieces of a marble headstone and domestic rubbish, comprised of beer bottles, polystyrene, plastic, a washing line, a tyre and mussel shells were all present within the stream and embedded within the banks within 4m of the outlet (Figure 1, Figure 2 and Figure 5). Beer bottles were also common (and in greater numbers) in and immediately adjacent to the stream in the upper reaches.

Figure 5. Rubbish in stream embankment within proposed works area

When measured against the EIANZ criteria for assigning value to a habitat, the stream measured moderate for macroinvertebrate habitat (low in two indices and high in two indices); negligible for native fish habitat; negligible to low for rarity / distinctiveness with habitat values and ecological features common throughout the catchment and region, and no 'at risk' or uncommon species; low for continuity of habitat, with shallow, short duration intermittent aquatic habitat; low for ecological context as the site has been modified (existing apron, wing walls and rip-rap) and through historic and existing land use (including land clearance and rubbish disposal); and the impact area is not important at the level of the Ecological District.

The ecological value of the inlet area and proposed reclamation area, is therefore assessed as **low**.

Table 4. Summary of freshwater characteristics from the watercourse upstream of the inlet.

Stream Ecological Valuation	Watercourse Features
Physical Characteristics	
Average Width (m)	0.35
Average Depth (m)	0.02
Macrophyte cover	No cover
Shading	High (due to bank incision and canopy)
Dominant substrate	Bedrock and cobble
Riparian vegetation type	Mixed early regenerating scrub dominated by kawakawa
Fish IBI score	Insufficient habitat for native fish
Macroinvertebrates MCI	168 'excellent'
Consistency of flow	Low
Modification	High
Freshwater Ecological Value	**Low**

Assessment of Ecological Effect

Modifying the inlet structure will result in the loss of 3 linear metres of intermittent stream bed. A third to half of this area includes the current apron and rip-rap, and the remainder cobble and bedrock substrate. This will result in a minor alteration to the baseline conditions so that the attributes of the stream on the site will be partially changed, with the loss of a very low proportion of the stream bed of the intermittent stream. This is assessed as a **low** magnitude of effect within the context of the site.

With the **low** ecological value of the 3m of intermittent stream and **low** magnitude of effect, the level of effect is assessed as **Very low** (refer to EIANZ matrix, Table 3).

This very low level of effect has been achieved through the effects hierarchy by design, to minimise the extent of stream loss, and mitigation of potential adverse ecological effects with the provision of fish passage.

Yours sincerely
BIORESEARCHES

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Bioresearches, a subsidiary of Babbage Consultants Limited
[redacted]

References

Roper-Lindsay, J., Fuller S.A., Hooson, S., Sanders, M.D., Ussher, G.T. (2018)
Ecological Impact Assessment (EcIA) guidelines for use in New Zealand terrestrial and freshwater ecosystems. 2nd edition. Environment Institute of Australia and New Zealand Inc.133pp.

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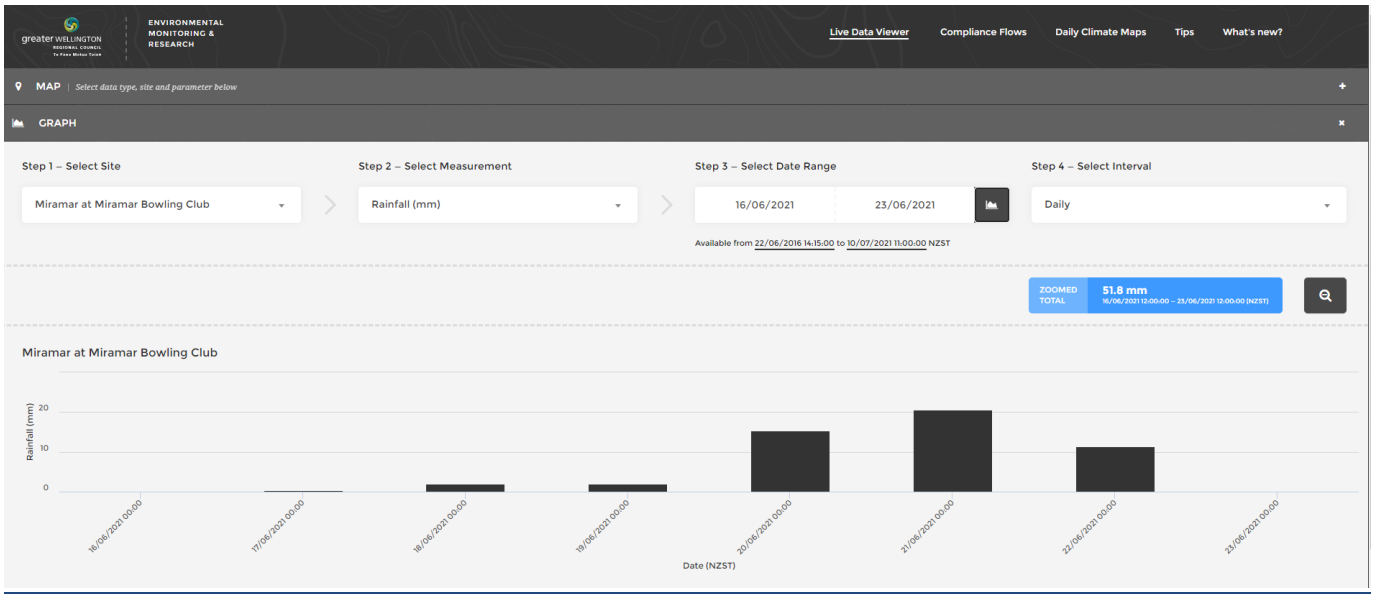
A biotic index for New Zealand's soft-bottomed streams.
New Zealand Journal of Marine and Freshwater Research, 41, 43-61.

Stark, J. D. and Maxted, J. R., (2007b).
A user guide for the Macroinvertebrate Community Index.
Cawthron Institute for the Ministry for the Environment, 58p.

Storey, R. G., Neale, M.W., Rowe, D.K., Collier, K.J., Hatton, C., Joy, M.K., Maxted, J.R., Moore, S., Parkyn, S.M., Phillips, N., Quinn, J.M., (2011)
Stream Ecological Valuation (SEV): a method for assessing the ecological function of Auckland streams. *Auckland Council Technical Report 2011/009*. 66p.

Appendix 1. GWRC Rainfall Data – Miramar (16 June to 23 June 2021)



Appendix 2. Macroinvertebrate Data

TABLE A: FRESHWATER INVERTEBRATES FROM SHELLY BAY INLET STREAM.

					HB
PHYLUM	**CLASS: Order**	**Family**	**Taxa**	**Taxa MCI hb**	**Site 1**
ARTHROPODA	**INSECTA: Ephemeroptera**	Leptophlebiidae	*Zephlebia* spp	7	7
	Trichoptera	Hydropsychidae	*Orthopsyche fimbriata*	9	15
		Philopotamidae	*Hydrobiosella mixta*	9	1
		Philorheithridae	*Philorheithrus agilis*	8	1
		Oeconesidae	*Oeconesus similis*	9	2
		TOTALS:	**NO. TAXA**		5
			NO. EPT TAXA		5
			NO. INDIVIDUALS		26

Appendix 3. Plant species list

Common name	Species name
broom	*Cytisus scoparius*
Carex / purei	*Carex secta*
coastal cutty grass	*Cyperus ustulatus*
coastal five finger / houpara	*Pseudopanax lessonii*
fivefinger	*Pseudopanax arboreus*
gorse	*Ulex europaeus*
hangehange	*Geniostoma ligustrifolium var. ligustrifolium*
hedge woundwort	*Stachys sylvatica*
hounds tongue	*Zealandia pustulata subsp. pustulata*
karamu	*Coprosma robusta*
Karol	*Pittosporum crassifolium*
kawakawa	*Piper excelsum*
koromiko	*Hebe stricta*
lancewood / horeka	*Pseudopanax crassifolius*
māhoe / whitey wood	*Melicytus ramiflorus*
Montbretia	*Crocosmia x crocosmiiflora*
pine	*Pinus radiata*
pohuehue	*Meuhlenbeckia complexa var triloba*
pōhutukawa	*Metrosideros excelsa*
rangiora	*Brachyglottis repanda*
shining spleenwort	*Asplenium oblongifolium*
taupata	*Coprosma repens*
wild ginger	*Hedychium gardnerianum*