| | | |
|---|---|---|
| *Carduelis carduelis* | European Goldfinch | Introduced and Naturalised |
| *Spatula rhynchotis* | Australasian Shoveler | Not Threatened |
| *Vanellus miles* | Spur-winged Plover | Not Threatened |
| *Egretta novahollandiae* | White-faced Heron | Not Threatened |
| *Todiramphus sanctus* | Sacred Kingfisher | Not Threatened |
| *Gymnorhina tibicen* | Australian Magpie | Introduced and Naturalised |
| *Turdus philomelos* | Song Thrush | Introduced and Naturalised |
| *Friginilla coelebs* | Common Chaffinch | Introduced and Naturalised |
| *Platycercus eximius* | Eastern Rosella | Introduced and Naturalised |
| *Larus novaehollandiae* | Red-billed Gull | At Risk, Declining |
| *Phalacrocrax sulcirostris* | Little Black Cormorant | Naturally Uncommon |
| *Phalacrocorax varius* | Pied Cormorant | Recovering |
| *Branta canadensis* | Canada Goose | Introduced and Naturalised |
| *Cygnus olor* | Mute Swan | Introduced and Naturalised |
| *Phasianus colchicus* | Common Pheasant | Introduced and Naturalised |
| *Phalacrocorax melanoleucos* | Little Pied Cormorant | Not Threatened |
| *Alauda arvensis* | Eurasian Skylark | Introduced and Naturalised |
| *Acridotheres tristis* | Common Myna | Introduced and Naturalised |
| *Prunella modularis* | Dunnock | Introduced and Naturalised |
| *Columba livia* | Rock Dove | Introduced and Naturalised |
| *Anas superciliosa* | Grey Duck | Nationally Critical |
| *Anas chlorotis* | Brown Teal | Recovering |
| *Poliocephalus rufopectus* | New Zealand Grebe | Recovering |
| *Cyanoramphus novaezelandiae* | Red-Crowned Parakeet | Relict |
| *Emberiza citronella* | Yellowhammer | Introduced and Naturalised |
| *Nestor meridionalis* | New Zealand Kaka | Recovering |
| *Chrysococcyx lucidus* | Shining Bronze- Cuckoo | Not Threatened |
| *Corvus frugilegus* | Rook | Introduced and Naturalised |

## 3.6 Lizards

A review of the Bioweb Herpetofauna Database showed mostly old records prior to the year 2000 (Table 21). Four native species were found within a 5km radius of the site, these are: Barking gecko, Northern grass skink, Ornate skink and Ngahere gecko. Of these both the Barking gecko and

Ngahere gecko are At Risk Declining species and therefore of High ecological value. Suitable lizard habitat was found to be present on site.

Note that all indigenous lizards are absolutely protected from killing and injury under the Wildlife Act 1953. A lizard survey will confirm species presence and absence at this site.

*Table 21: 2021 Bioweb Herpetofauna records within 5km of the project site.*

| Common name | Scientific name | Threat Classification |
|---|---|---|
| Southern Bell Frog | *Ranoidea raniformis* | Introduced and Naturalised |
| Brown tree frog | *Litoria ewingii* | Introduced and Naturalised |
| Barking Gecko | *Naultinus punctatus* | At Risk - Declining |
| Northern grass skink | *Oligosoma polychroma* | Not Threatened |
| Ornate skink | *Oligosoma ornatum longirostrum* n. spp. | Data Deficient |
| Ngahere gecko | *Mokopirirakau* "southern North Island" | At Risk - Declining |

# 4 Assessment of Ecological Values

This section of the report assesses the ecological values of impacted vegetation, habitats and species in the following categories:

- Vegetation and habitats;
- Presence of At Risk, Threatened or locally uncommon - plant, and terrestrial and aquatic fauna species.

*Table 22: Assignment of values to vegetation, habitats and species in the development area (adapted from EIANZ, 2018).*

| Vegetation/Habitat/ Species | Value | Comments |
|---|---|---|
| Pasture Vegetation | Negligible | The majority of the site is dominated by exotic pasture. These areas contain no indigenous vegetation and provides limited habitat for indigenous fauna. |
| Kanuka Shrubland | Low | This area is dominated by Kanuka. This area is identified as a threatened indigenous environment in the GWRC mapping system. |
| Kanuka Regeneration | Low | This area is dominated by Kanuka regeneration adjacent to the existing mature forest block. If possible, this area should be included within the shrubland area of the kanuka shrubland. |
| Wetlands | High | There are 5 wetlands on site. Natural Wetlands are considered significant under the GWRC proposed natural resources plan. They also meet the rarity components of Policy 25. |

| | | |
|---|---|---|
| | | It I important to note that these wetlands are dominated in a common rush species.<br><br>Wetlands as a whole are protected under the NPS-FM (2020), due to their rarity within NZ & the Wellington Region.<br><br>The wetlands themselves contained no rare or threatened species. |
| Waimeha Stream habitat | Low | The Waimeha Stream within the property boundaries is heavily degraded and this is reflected in the RHA scores. There is little riparian vegetation, no fencing from previous stock access and culverts located along the stream appear to be a barrier to fish passage. Further, the Waimeha Stream is soft-bottomed and culverts appear to be blocked by sediment and weeds. In its current state the value of the Waimeha Stream habitat is considered Low. |
| Unnamed Stream 1, 2, 3 and 4 habitats | Low | The Unnamed Streams within the property boundary are all heavily modified. There is little in the way of riparian vegetation, no fencing and there is evidence of stock accessing the streams in recent times. Culverts found in some of the Unnamed streams appear to be a barrier to fish passage. Further, Unnamed Streams in the property are largely soft-bottomed and culverts appear to be blocked by sediment and weeds. In their current state the Unnamed Stream habitat is considered of low ecological value. |
| Ephemeral Flow Path | Negligible | Ephemeral flow paths do not fall under the definition of a river in the RMA (1991). Provides minimal value for aquatic life therefore ecological value of the ephemeral flow paths is considered Negligible. |
| Drain | Low | Artificial watercourses do not fall under the definition of a river in the RMA (1991). Ecological value of the drain is considered low. |
| Aquatic Fauna in the Waimeha Stream and Unnamed Streams 1, 2, 3 and 4 | High | The Waimeha Stream and all of its tributaries have Schedule F1 value and are recognised as habitat for indigenous threatened/ at risk fish and as habitat for six or more migratory indigenous fish species. The streams contain suitable fish habitat and have been valued as high accordingly.<br><br>Due to the presence of several 'At-Risk Declining' species in the Waimeha Stream the ecological value of freshwater fauna is considered High. |
| Bats | Very High | Long-tailed bats have been recorded within 11km of the project site. They classified as 'Threatened-Nationally Critical'. The Very High value rating only applies if bats are proven to be using the site on a regular basis. This requires further survey to confirm. |

| | | |
|---|---|---|
| Birds | Low | No 'At Risk' or 'Threatened' bird species were recorded. The site supports bird fauna are common species typical of a modified landscape in a residential/semi-rural setting. |
| Lizards | High | 'At Risk' species or lizard have been recorded within 5 km of the project site.<br><br>The High value rating only applies if Threatened lizard species are proved to be using the site. If only non-threatened species are present this would trigger a Low value rating. |

# 5 Assessment of Effects

The assessment of effects will consider the following:

- Effects on existing vegetation
- Effects on wetlands
- Effects on freshwater ecology
- Effects on bats
- Effects on birds
- Effects on lizards

## 5.1 Vegetation

The vegetation that will be impacted across the majority of the site comprises of grazed pasture and exotic plant communities of low intrinsic ecological value. Little native vegetation will be lost as a result of the proposed development. The current proposal will result in no vegetation clearance within the kanuka shrubland habitat.

While there will be permanent vegetation loss, this is mainly grazed pasture species. Riparian planting is also recommended for all open waterways.

The development of the surrounding areas will result in urban density housing surrounding the Kanuka Shrubland/regen areas. This will result in greater edge effects and an increased likelihood of pest plant and animal incursions into this block. As such a pest management plan and improved fencing is recommended to minimise these adverse effects.

The magnitude of effects on the vegetation present at the site has been assessed as Low.

## 5.2 Wetlands

The 5 natural wetlands on the site support a variety of plant species. They may also provide some limited habitat function for wetland fauna. Any vegetation clearance or earthworks within these wetlands is prohibited under the NES-F, a hydrological assessment is required to determine the water source for these wetlands and to ensure that the proposed works will not have an adverse hydrological effect on these wetlands (ie: will the proposed works result in drainage or partial drainage of these areas).

The proposed recommendations include a minimum 10m buffer around each of these wetlands and fencing to protect these sites from introduced animals as a result of the subdivision.

Overall, the magnitude of effects on the wetland have been assessed as Low (assuming the recommendations are undertaken).

There is also potential to increase the ecological values of some of the wetland areas by implementation of a restoration plan, including pest management and planting indigenous species, this would allow the project to result in a biodiversity net gain.

## 5.3 Freshwater Habitat

There are five perennial streams on site, the Waimeha Stream and four Unnamed streams. All of the Unnamed streams within the site boundary are highly modified, unfenced and have very little in the way of vegetated margins. There was evidence of stock having had access to the streams in recent times. All RHA scored below 50 out of a possible 100 in relation to habitat quality.

The proposed development has the potential to increase contaminants to the Waimeha Stream and its tributaries. Both through sediment and contaminants as a result of the construction processes, and on-going contaminants from the addition of increased housing within the catchment.

Recommendations to improve waterways within the property boundary include fencing of all waterways on site and riparian planting to enhance stream margins and improve habitat for freshwater fauna.

Fish surveys in all stream sites within the property boundary are recommended to determine presence and absence of fish species within the site, particularly those classified as 'At-Risk Declining'. Throughout the site visit a number of undersized culverts were observed, a further recommendation is to replace these culverts with culverts that comply with the NES-F (2020) requirements for fish passage. As the Waimeha and its tributaries are valued habitat for threatened species under the PNRP, and the current culverts are acting as a barrier to fish passage.

Overall, the magnitude of mitigated effects on the freshwater stream habitat within the site is considered Low (if recommendations are implemented). The magnitude of mitigated effects on the freshwater fauna of the Waimeha Stream and its tributaries is considered Low, assuming best practice stormwater and contaminant management plans (including a site-specific erosion and sediment control plan) are implemented. Further, presence and absence monitoring could be conducted to confirm if there are currently fish species within the streams on site and to inform culvert replacement options.

Overall, the magnitude of effects on freshwater streams within the property boundary is considered likely to be Low.

## 5.4 Bats

The site supports mature trees which are potential bat roost locations (as well as the mature trees in neighbouring properties) and there are also many suitable foraging areas, therefore it is likely that bats use this site.

To address the risk that bats do use the site for roosting/foraging it is recommended that an acoustic bat survey is undertaken to determine presence/absence of bats and best practice tree roost removal protocols implemented, if bats are detected. This assumes that mature potential roost trees cannot be retained, which is the preferred option.

Without survey data we have no way of establishing the risk level of effects on bats.

## 5.5 Birds

Since the site is primarily habitat for common introduced or native bird species, it is not expected that the proposed development will have any discernible adverse impact on the current bird population of the area. The effects on native bird populations have been assessed as Negligible. However, most native bird species are protected from killing or injury under the Wildlife Act 1953. It is therefore recommended that vegetation clearance (if required) occurs outside of the main bird

breeding season (September to December, inclusive). Alternatively, if this is not practicable, a preclearance nesting native bird survey conducted by an experienced ecologist is recommended.

## 5.6 Lizards

A lizard survey is required to determine the potential effects of the development on the herpetofauna present at the site. Note that most of the site (i.e., grazed farmland) that does not provide good habitat for lizards. However, locally there are habitats could provide habitat for lizards. It is likely based on the current project footprint and the availability of suitable lizard habitat that the magnitude of effects on lizards will be Low, but a lizard survey will be needed to confirm this. If lizards are found management mitigation options are available to ensure that effects on lizards are minimal.

## 5.7 Summary of Magnitude of effects ratings

Table 23 summarises the likely magnitude of effects on the key ecological features of the site and assigns a magnitude of effects rating to effects on vegetation, habitats and species. .

*Table 23: Magnitude of effects on the ecological features of the site.*

| Vegetation/Habitat/ Species | Magnitude of mitigated effects | Comments |
|---|---|---|
| Pasture vegetation | Very Low | The proposal will result in a total loss of this rural habitat; however this is a habitat type that is abundant in the wider landscape. |
| Kanuka Shrubland | Low | Based on the implementation of a pest management plan (both plants and animals) and upgraded fencing.<br><br>This is assuming that there will be no works within the site or marginal vegetation clearance. |
| Kanuka Regen | Very Low | Assuming loss of the area, it is small in nature and likely grown due to a reduction in grazing pressure at the site. |
| Wetlands | Low | Assuming implementation of a 10m setback from these wetlands and the implementation of a wetland restoration plan for each of these areas.<br><br>Any proposed earthworks in the vicinity of these sites is likely to result in partial/complete drainage of these wetlands a hydrological study is required to confirm the extent of these proposed effects, should the wetland areas be retained. |
| Waimeha Stream habitat | Low | Assuming that the stream will be fenced and planted (with appropriate species). |
| Unnamed Streams 1, 2, 3 and 4 habitat | Low | Assuming that the stream will be fenced and planted (with appropriate species). |
| Ephemeral flow path | Negligible | Ephemeral flow paths do not fall under the definition of a river in the RMA (1991). Therefore, ephemeral streams are not subject to the same |

| | | |
|---|---|---|
| | | loss of extent requirements as intermittent and perennial streams in the RMA. |
| Drain | Negligible | Artificial watercourses do not fall under the definition of a river in the RMA (1991). Therefore, artificial waterways are not subject to the same loss of extent requirements as intermittent and perineal streams in the RMA. |
| Aquatic Fauna | Low | There is an increased risk of contamination to the streams with the construction of residential housing. Current culverts are acting as a barrier to fish passage. Replacement of these with culverts that comply with the NES-F (2020) would improve habitat for aquatic fauna.<br><br>It is assumed that best practice stormwater design will be used on site to minimise any impact to freshwater fauna long-term. |
| Bats | Not possible to assess without survey data. | |
| Birds | Negligible | The proposed development will have minimal impact on populations of common native and introduced bird species likely to inhabit the site. Note provisions of the Wildlife Act 1953 which prohibits killing or injuring most native bird species. |
| Lizards | Low | Based on only common non-threatened species being present on site and the implementation of a lizard management plan. |

## 5.8 Overall level of effects based on EIANZ guidelines

Table 24 provides an overall level of effects rating based on the EIANZ matrix shown in Table 3, noting the limitations of this high-level assessment. Ecological values have been taken from Table 22 and the magnitude of effects from Table 23. This assumes that the effects minimisation measures discussed below are implemented.

*Table 24: Overall level of effects rating based on the EIANZ matrix.*

| Vegetation/Habitat/Species | Ecological Value | Magnitude of Mitigated Effect | Level of Effect |
|---|---|---|---|
| Vegetation | Negligible | Very Low | Very Low |
| Kanuka Shrubland | Low | Low | Very Low |
| Kanuka Regen | Low | Very Low | Very Low |
| Wetlands | High | Low | Low |
| Waimeha Stream habitat | Low | Low | Very Low |

| | | | |
|---|---|---|---|
| Unnamed Streams 1, 2, 3 and 4 habitat | Low | Low | Very Low |
| Ephemeral flow paths | Negligible | Negligible | Very Low |
| Drain | Low | Negligible | Very Low |
| Aquatic Fauna in all streams | High | Low | Low |
| Bats | Very High | Undetermined. | Undetermined. |
| Birds | Low | Negligible | Very Low |
| Lizards | High | Low | Low |

# 6 Recommendations

A summary of the recommended measures proposed to minimise the effects of the project are given below. These measures address disturbance to wildlife during the construction period, likely effects of earthworks activities, effects of works near streams, and mitigation for the mobilisation of sediment, and measures to reduce the mortality of birds, bats and herpetofauna.

## 6.1 General

- Any areas of exposed earth (as a result of construction) will be revegetated to minimise sediment loss as soon as is practicable.
- Preparation and implementation of a site-specific erosion and sediment control plan should be a condition of consent.

## 6.2 Vegetation Management

To ensure that effects on the Kanuka-Shrubland vegetation is minimised the following are recommended:

- The Kanuka Regen area (Figure 3) is included (if possible) within the fenced extent of the Kanuka Shrubland habitat, and the fence is upgraded to reduce pest incursions as a result of the development.
- A pest management plan (including pest animals and pest plants) is developed and implemented to ensure protection and to minimise edge effects on the area of Kanuka Shrubland.

## 6.3 Wetland Management

It is important to note that the NPS-FM and NES-F 2020 are currently under review and the above wetland delineation is subject to change when the legislation is changed.

To ensure compliance with the NES it is recommended that:

- No works occur within a minimum 10m setback from all 5 delineated wetlands.
- There is no discharge of any kind to any of the wetlands.
- A hydrological assessment is undertaken to ensure that the proposed works will not result in drainage (or partial drainage) of these wetlands. Drainage of natural wetlands is a non-complying activity under the NES-F (2020).
- A wetland restoration plan is to be prepared to enhance the values of the site, including planting of the 10m buffer to aid in the reduction of edge effects on the site.

## 6.4 Freshwater Habitat Management

It is recommended that all waterways on site are fenced and riparian planting to enhance stream margins and improve habitat throughout the site.

## 6.5 Aquatic Fauna Management

Fish surveys at all stream sites within the property boundary are recommended to further determine presence and absence of fish species, particularly those classified as 'At-Risk Declining'. Throughout the site visit a number of undersized and weed choked culverts, were observed, and it is recommended that these culverts are replaced with culverts that comply with the NES-F (2020) requirements for fish passage. As the Waimeha and its tributaries are valued habitat for threatened species under the NRPRP, and the current culverts are acting as a barrier to fish passage.

## 6.6 Bat Management

It is recommended that acoustic bat surveys are undertaken to assess if bats a present within the site and the level of activity. Based on this the magnitude of effects can be assessed and any necessary mitigation or offset requirements. Note that surveys for bats can only be reliably undertaken during warmer months, between 1 October and 30 April (inclusive).

## 6.7 Bird Management

To ensure compliance with the provisions of the Wildlife Act 1953 it is recommended that:

- Should vegetation clearance be required for the proposal (other than that of pasture species) it should be undertaken outside of the main bird breeding season (September-December inclusive).
- Alternatively, if this is not practicable a preclearance nesting native bird survey conducted by an experienced ecologist is recommended.

## 6.8 Lizard Management

A lizard survey is recommended to determine the species that will be affected by the development. Various methods exist to manage effects on lizards depended upon the species present and the type of habitat affected.

# 7 Conclusions

This assessment for due diligence has determined that the project site (and its receiving environments) provides high value habitat for aquatic fauna, vegetation, bats and lizards and contains five natural wetlands (threatened ecosystem). Where possible the effects of the proposed development have been assessed and range from negligible to low.

Measures to mitigate and offset the residual effects have been recommended above. Further surveys have ben recommended and a full impact assessment will be required once the extent and scope of works has been finalised.

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# Appendix A – Wetland Delineation

## Wetland Vegetation Assessment

Vegetation has been assessed against the Dominance Test and Prevalence Index, following Clarkson et al. (2013).

Vegetation assessments using the Dominance Test and Prevalence Index. Wetland plant indicator status ratings are the following:

- Obligate (OBL): occurs almost always in wetlands (estimated probability >99% in wetlands)
- Facultative Wetland (FACW): occurs usually in wetlands (67-99%)
- Facultative (FAC): equally likely to occur in wetlands or non-wetlands (34-66%)
- Facultative Upland (FACU): occurs occasionally in wetlands (1-33%)
- Upland (UPL): rarely occurs in wetlands (<1%), almost always in 'uplands' (non-wetlands).

## Wetland 1 – Plot 1

| Stratum (and plot size) | Common Name | Scientific Name | Percent Cover | Dominant Species (Y/N) | Classification (OBL, FACW, FAC, FACU, UPL) |
|---|---|---|---|---|---|
| Herb | | | | | |
| | Broom rush | *Juncus sarophorus* | 80 | Y | FACW |
| | willow weed | *persicaria maculosa* | 5 | N | FACW |
| | Rye Grass | *Lolium perenne* | 2 | N | FACU |
| | Buttercup | *Ranunculus repens* | 2 | N | FAC |
| Total Cover (%) | | | 89 | | |
| 50% of total cover | | | 44.5 | | |
| 20% of total cover | | | 17.8 | | |

| Dominance Test | |
|---|---|
| (A) Number of dominant species (OBL, FACW, FAC) | 1 |
| (B) Total number of dominant species | 1 |
| Percent of dominant species (A/B) | 1 |

| Prevalence Index | | | |
|---|---|---|---|
| Classification | (A) Percent Cover | Multiplier | (B) Result |
| OBL | 0 | 1 | 0 |
| FACW | 85 | 2 | 170 |
| FAC | 2 | 3 | 6 |
| FACU | 2 | 4 | 8 |
| UPL | 0 | 5 | 0 |
| Total (A and B) | 89 | | 184 |
| Index Value (B/A) | 2.06741573 | | |

## Wetland 1 plot 2

| Stratum (and plot size) | Common Name | Scientific Name | Percent Cover | Dominant Species (Y/N) | Classification (OBL, FACW, FAC, FACU, UPL) | Dominance Test | |
|---|---|---|---|---|---|---|---|
| Herb | | | | | | (A) Number of dominant species (OBL, FACW, FAC) | 2 |
| | Broom rush | *Juncus sarophorus* | 30 | Y | FACW | (B) Total number of dominant species | 2 |
| | Buttercup | *Ranunculus repens* | 10 | N | FAC | Percent of dominant species (A/B) | 1 |
| | Rye Grass | *Lolium perenne* | 15 | N | FACU | | |
| | Plantain | *Plantago lanceolata* | 1 | N | FACU | | |
| | Budding club-rush | *Isolepis prolifera* | 15 | N | OBL | | |

| Prevalence Index | | | |
|---|---|---|---|
| Classification | (A) Percent Cover | Multiplier | (B) Result |
| OBL | 15 | 1 | 15 |
| FACW | 30 | 2 | 60 |
| FAC | 10 | 3 | 30 |
| FACU | 16 | 4 | 64 |
| UPL | 0 | 5 | 0 |
| Total (A and B) | 71 | | 169 |
| Index Value (B/A) | 2.38028169 | | |

## Wetland 2

| Stratum (and plot size) | Common Name | Scientific Name | Percent Cover | Dominant Species (Y/N) | Classification (OBL, FACW, FAC, FACU, UPL) |
|---|---|---|---|---|---|
| **Herb** | | | | | |
| | Buttercup | *Ranunculus repens* | 30 | N | FAC |
| | Broom rush | *Juncus sarophorus* | 80 | Y | FACW |
| | willow weed | *persicaria maculosa* | 15 | N | FACW |
| | Plantain | *Plantago lanceolata* | 10 | N | FACU |
| **Total Cover (%)** | | | 135 | | |
| **50% of total cover** | | | 67.5 | | |
| **20% of total cover** | | | 27 | | |

| Dominance Test | |
|---|---|
| (A) Number of dominant species (OBL, FACW, FAC) | 1 |
| (B) Total number of dominant species | 1 |
| Percent of dominant species (A/B) | 1 |

| Prevalence Index | | | |
|---|---|---|---|
| **Classification** | **(A) Percent Cover** | **Multiplier** | **(B) Result** |
| OBL | 0 | 1 | 0 |
| FACW | 95 | 2 | 190 |
| FAC | 0 | 3 | 0 |
| FACU | 10 | 4 | 40 |
| UPL | 0 | 5 | 0 |
| Total (A and B) | 105 | | 230 |
| **Index Value (B/A)** | 2.19047619 | | |

Wetland 3

| Stratum (and plot size) | Common Name | Scientific Name | Percent Cover | Dominant Species (Y/N) | Classification (OBL, FACW, FAC, FACU, UPL) |
|---|---|---|---|---|---|
| Herb | | | | | |
| | willow weed | *persicaria maculosa* | 25 | Y | FACW |
| | Broom rush | *Juncus sarophorus* | 45 | Y | FACW |
| | Buttercup | *Ranunculus repens* | 10 | N | FAC |
| | Marsh bedstraw | *Galium palustre* | 15 | N | OBL |
| Total Cover (%) | | | 95 | | |
| 50% of total cover | | | 47.5 | | |
| 20% of total cover | | | 19 | | |

| Dominance Test | |
|---|---|
| (A) Number of dominant species (OBL, FACW, FAC) | 2 |
| (B) Total number of dominant species | 2 |
| Percent of dominant species (A/B) | 1 |

| Prevalence Index | | | |
|---|---|---|---|
| Classification | (A) Percent Cover | Multiplier | (B) Result |
| OBL | 15 | 1 | 15 |
| FACW | 70 | 2 | 140 |
| FAC | 10 | 3 | 30 |
| FACU | 0 | 4 | 0 |
| UPL | 0 | 5 | 0 |
| Total (A and B) | 95 | | 185 |
| Index Value (B/A) | 1.947368421 | | |

Wetland 4

| Stratum (and plot size) | Common Name | Scientific Name | Percent Cover | Dominant Species (Y/N) | Classification (OBL, FACW, FAC, FACU, UPL) |
|---|---|---|---|---|---|
| **Herb** | | | | | |
| | willow weed | *persicaria maculosa* | 90 | Y | FACW |
| | Marsh bedstraw | *Galium palustre* | 10 | N | OBL |
| | Broom rush | *Juncus sarophorus* | 5 | N | FACW |
| | | | | | #N/A |
| **Total Cover (%)** | | | 105 | | |
| **50% of total cover** | | | 52.5 | | |
| **20% of total cover** | | | 21 | | |

| Dominance Test | |
|---|---|
| (A) Number of dominant species (OBL, FACW, FAC) | 1 |
| (B) Total number of dominant species | 1 |
| Percent of dominant species (A/B) | 1 |

| Prevalence Index | | | |
|---|---|---|---|
| **Classification** | **(A) Percent Cover** | **Multiplier** | **(B) Result** |
| OBL | 10 | 1 | 10 |
| FACW | 95 | 2 | 190 |
| FAC | 0 | 3 | 0 |
| FACU | 0 | 4 | 0 |
| UPL | 0 | 5 | 0 |
| Total (A and B) | 105 | | 200 |
| **Index Value (B/A)** | 1.904761905 | | |

## Wetland 5

| Stratum (and plot size) | Common Name | Scientific Name | Percent Cover | Dominant Species (Y/N) | Classification (OBL, FACW, FAC, FACU, UPL) |
|---|---|---|---|---|---|
| **Herb** | | | | | |
| | Broom rush | *Juncus sarophorus* | 90 | Y | FACW |
| | Rye Grass | *Lolium perenne* | 5 | N | FACU |
| | Buttercup | *Ranunculus repens* | 5 | N | FAC |
| | Budding club-rush | *Isolepis prolifera* | 2 | N | OBL |
| **Total Cover (%)** | | | 102 | | |
| **50% of total cover** | | | 51 | | |
| **20% of total cover** | | | 20.4 | | |

| Dominance Test | |
|---|---|
| (A) Number of dominant species (OBL, FACW, FAC) | 1 |
| (B) Total number of dominant species | 1 |
| Percent of dominant species (A/B) | 1 |

| Prevalence Index | | | |
|---|---|---|---|
| **Classification** | **(A) Percent Cover** | **Multiplier** | **(B) Result** |
| OBL | 2 | 1 | 2 |
| FACW | 90 | 2 | 180 |
| FAC | 5 | 3 | 15 |
| FACU | 5 | 4 | 20 |
| UPL | 0 | 5 | 0 |
| Total (A and B) | 102 | | 217 |
| **Index Value (B/A)** | 2.12745098 | | |

## Hydric Soil Assessment

Source: Fraser et al. (2018).

### Simple key to identify hydric soil features

**For the top 30 cm of soil**

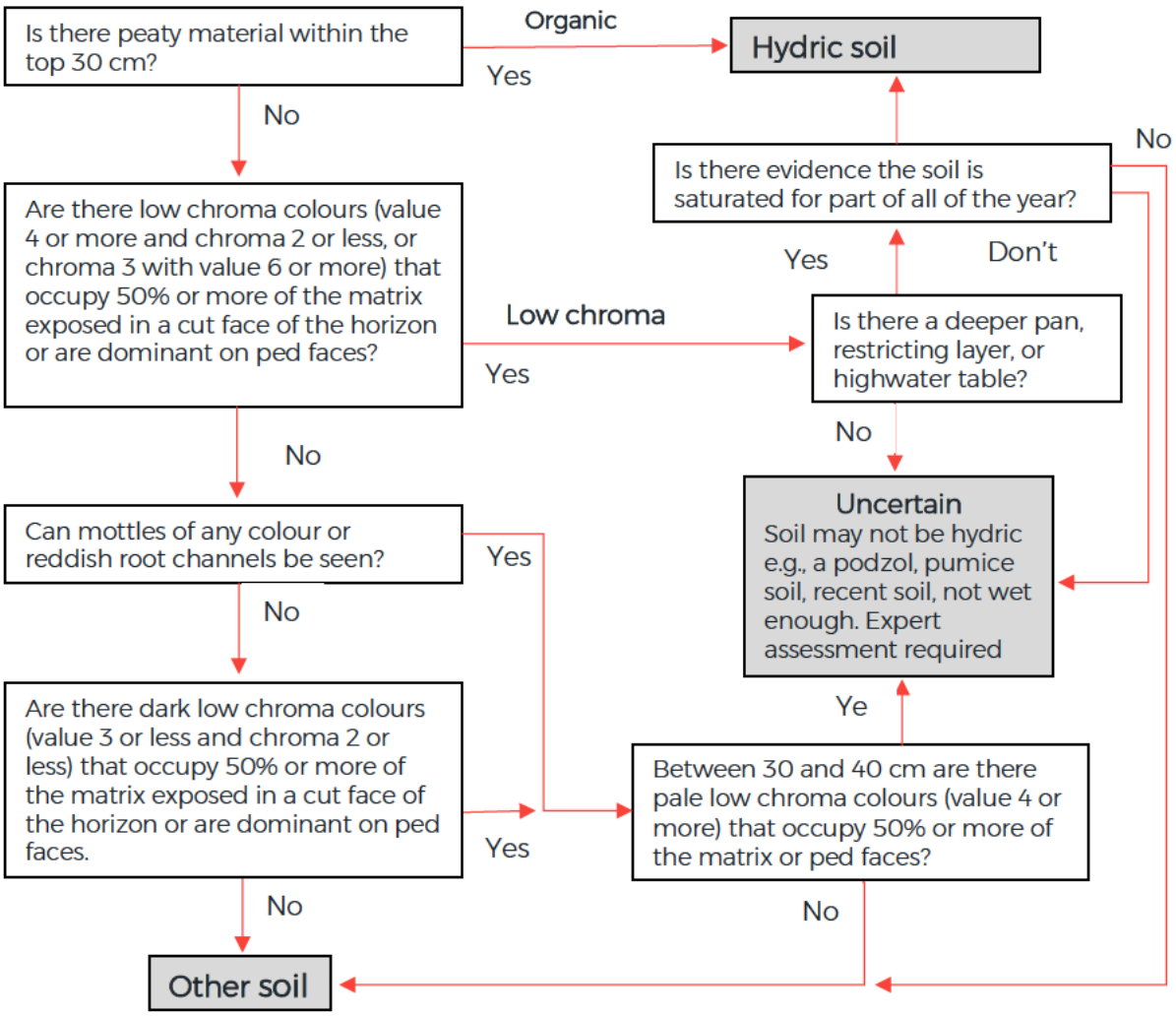



*Table C 1: Hydric soil assessment results based on the above key.*

| Wetland | Hydric soil (yes/no) |
|---|---|
| Wetland 1 | No |
| Wetland 2 | No |
| Wetland 3 | No |
| Wetland 4 | No |
| Wetland 5 | No |

**Comment:** The soils found on site were organic, digging 30cm deep no water table was found.

## Wetland Hydrology Assessment

Source: MfE (2021)

To confirm the presence of wetland hydrology, the following are required:

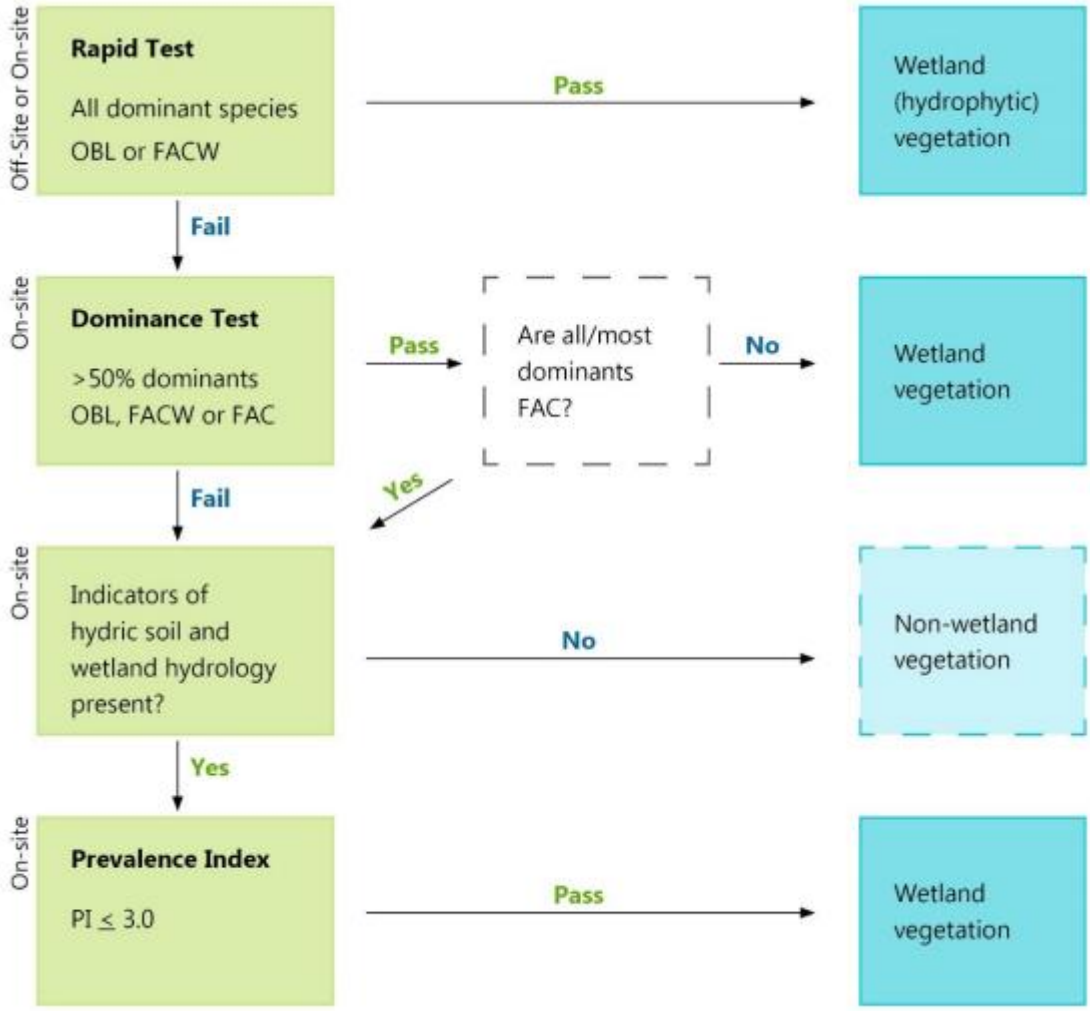
- one primary indicator, or
- two secondary indicators.

*Table D 1: Wetland hydrology indicator results*

| Indicator | Category | | Indicator is present (yes/no/unsure) |
|---|---|---|---|
| | Primary | Secondary | |
| **Group 1: Observations of flooding or groundwater** | | | |
| 1A: Surface water | x | | No |
| 1B: Groundwater | x | | No |
| 1C: Soil saturation | x | | No |
| **Group 2: Evidence of flooding or ponding** | | | |
| 2A: Water marks | x | | No |
| 2B: Sediment deposits | x | | No |
| 2C: Drift deposits | x | | No |
| 2D: Algal mats or crust | x | | No |
| 2E: Iron deposits | x | | No |
| 2F: Surface soil cracks | x | | No |
| 2G: Inundation visible on aerial imagery | x | | No, depressions visible |
| 2H: Sparsely vegetated concave surface | x | | Yes |
| 2I: Salt crust | x | | No |
| 2J: Aquatic invertebrates | x | | Not Assessed |
| 2K: Water-stained leaves | x | x | No |
| 2L: Drainage patterns | | x | No |
| **Group 3: Evidence of current or recent soil saturation** | | | |
| 3A: Hydrogen sulphide odour | x | | No |
| 3B: Oxidised rhizospheres along living roots | x | | Unsure |
| 3C: Reduced iron | x | | Unsure |
| 3D: Recent iron reduction in tilled soils | x | | Unsure |
| 3E: Dry season water table | | x | Unsure |
| 3F: Saturation visible on aerial imagery | | x | No |
| **Group 4: Evidence from other site conditions or data** | | | |
| 4A: Stunted or stressed plants | x | | No |
| 4B: Geomorphic position | | x | Unsure |
| 4C: Shallow aquitard | | x | Unsure |
| 4D: Facultative-neutral test | | x | Unsure |
| 4E: Frost-heave hummocks | | x | No |

## Wetland Delineation Procedure

Source: Wetland Delineation Protocols (MfE, 2020)




*Flow chart of steps for hydrophytic (wetland) vegetation determination. Wetland indicator status abbreviations: FAC= facultative; FACW = facultative wetland; OBL = obligate wetland.*

# Appendix B - Freshwater Values Assessment Criteria

Sources: Roper-Lindsay et al., 2018; Clapcott, 2015

## EIANZ Guidelines for Assigning Freshwater Values

Table B 1 shows the matters to be considered when assigning ecological value to a freshwater site or area. The Rapid Habitat Assessment is used to help inform some of the assessed attributes. Matters are then scored against Table B 2 which then provides an ecological value.

*Table B 1: Matters that may be considered when assigning ecological value to a freshwater site or area.*

| Matters | Attributes to be Assessed |
|---|---|
| Representativeness | • Extent to which site/catchment is typical characteristic<br>• Stream order<br>• Permanent, intermittent or ephemeral waterway<br>• Catchment size<br>• Standing water characteristics |
| Rarity / distinctiveness | • Supporting nationally or locally Threatened, At Risk or uncommon species<br>• National distribution limits<br>• Endemism<br>• Distinctive ecological features<br>• Type of lake/pond/wetland/spring |
| Diversity and pattern | • Level of natural diversity<br>• Diversity metrics<br>• Complexity of community<br>• Biogeographical considerations – pattern, complexity, size, shape |
| Ecological context | • Stream order<br>• Instream habitat<br>• Riparian habitat<br>• Local environmental conditions and influences, site history and development<br>• Intactness, health and resilience of populations and communities<br>• Contribution to ecological networks, linkages, pathways<br>• Role in ecosystem functioning – high level, proxies |

*Table B 2: Scoring for site or areas combing values for four matters in Table B 1.*

| Value | Description |
|---|---|
| Very High | Area rates High for three or all of the four assessment matters listed in Table B1. Likely to be nationally important and recognised as such. |
| High | Area rates High for two of the assessment matters, Moderate and Low for the remainder, or Area rates High for one of the assessment maters, Moderate for the remainder. Likely to be regionally important and recognised as such. |
| Moderate | Area rates High for one matter, Moderate and Low for the remainder, or Area rates Moderate for two or more assessment matters Low or Very Low for the remainder. Likely to be important at the level of the Ecological District. |
| Low | 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 | Area rates Very Low for 3 matters and Moderate, Low or Very Low for remainder. |

## Rapid Habitat Assessment Protocol

The National Rapid Habitat Assessment Protocol provides a habitat quality score (HQS) for freshwater streams and rivers. The habitat quality score is informed by the following 10 parameters scored 1–10. The total maximum score is 100. However, the total score could be scaled to a reference score to provide a % HQS for reporting.

- Deposited sediment
- Invertebrate habitat diversity
- Invertebrate habitat abundance
- Fish cover diversity
- Fish cover abundance
- Hydraulic heterogeneity
- Bank erosion
- Bank vegetation
- Riparian width
- Riparian shade

# Appendix C – Rapid Habitat Assessment

Eight rapid habitat assessments were undertaken along five streams. Mean assessment scores are displayed in the tables below.

*Table C-1: Mean Rapid Habitat Assessment (1) scores for the Unnamed Stream 4 at the project site.*

| HABITAT PARAMETER | CONDITION CATEGORY | | | | | | | | | | MEAN SCORE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Deposited sediment** | *The percentage of the stream bed covered by fine sediment.* | | | | | | | | | | 3 |
| | 0 | 5 | 10 | 15 | 20 | 30 | 40 | 50 | 60 | ≥75 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat diversity** | *The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.* | | | | | | | | | | 2 |
| | ≥5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat abundance** | *The percentage of substrate favorable for EPT colonization, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.* | | | | | | | | | | 1 |
| | 95 | 75 | 70 | 60 | 50 | 40 | 30 | 25 | 15 | 5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover diversity** | *The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.* | | | | | | | | | | 2 |
| | >5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover abundance** | *The percentage of fish cover available.* | | | | | | | | | | 2 |
| | 95 | 75 | 60 | 50 | 40 | 30 | 20 | 10 | 5 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Hydraulic heterogeneity** | *The number of hydraulic components such as pools, riffle, fast run, slow run, rapid, cascade/waterfall, turbulence, backwater, Presence of deep pools score higher.* | | | | | | | | | | 2 |
| | ≥5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bank erosion** | *The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank or stock pugging.* | | | | | | | | | | 7 |
| Left bank | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |
| Right bank | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Bank vegetation** | *The maturity, diversity, and naturalness of bank vegetation.* | | | | | | | | | | 3 |
| Left bank | Mature native trees with diverse and intact understory | | Regenerating native or flaxes/sedges/tussock > dense exotic | | | Mature shrubs, sparse tree cover > young exotic, long grass | | | Heavily grazed or mown grass > bare/impervious ground | | |
| Right bank | | | | | | | | | | | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian width** | *The width (m) of the riparian buffer constrained by vegetation, fence, or other structure(s).* | | | | | | | | | | 1 |
| Left bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Right bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian shade** | *The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).* | | | | | | | | | | 1 |
| | ≥90 | 80 | 70 | 60 | 50 | 40 | 25 | 15 | 10 | ≤5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Total** | (sum of parameters 1-10) | | | | | | | | | | **24** |

Table C-1: Mean Rapid Habitat Assessment (2) scores for the Unnamed Stream 4 at the project site.

| HABITAT PARAMETER | CONDITION CATEGORY | | | | | | | | | | MEAN SCORE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Deposited sediment** | *The percentage of the stream bed covered by fine sediment.* | | | | | | | | | | 1 |
| | 0 | 5 | 10 | 15 | 20 | 30 | 40 | 50 | 60 | ≥75 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat diversity** | *The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.* | | | | | | | | | | 1 |
| | ≥5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat abundance** | *The percentage of substrate favorable for EPT colonization, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.* | | | | | | | | | | 1 |
| | 95 | 75 | 70 | 60 | 50 | 40 | 30 | 25 | 15 | 5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover diversity** | *The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.* | | | | | | | | | | 2 |
| | >5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover abundance** | *The percentage of fish cover available.* | | | | | | | | | | 1 |
| | 95 | 75 | 60 | 50 | 40 | 30 | 20 | 10 | 5 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Hydraulic heterogeneity** | *The number of hydraulic components such as pools, riffle, fast run, slow run, rapid, cascade/waterfall, turbulence, backwater, Presence of deep pools score higher.* | | | | | | | | | | 1 |
| | ≥5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Bank erosion** | *The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank or stock pugging.* | | | | | | | | | | 1 |
| Left bank | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |
| Right bank | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Bank vegetation** | *The maturity, diversity, and naturalness of bank vegetation.* | | | | | | | | | | 2.5 |
| Left bank | Mature native trees with diverse and intact understory | | Regenerating native or flaxes/sedges/tussock > dense exotic | | | Mature shrubs, sparse tree cover > young exotic, long grass | | | Heavily grazed or mown grass > bare/impervious ground | | |
| Right bank | | | | | | | | | | | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian width** | *The width (m) of the riparian buffer constrained by vegetation, fence, or other structure(s).* | | | | | | | | | | 1 |
| Left bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Right bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian shade** | *The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).* | | | | | | | | | | 1 |
| | ≥90 | 80 | 70 | 60 | 50 | 40 | 25 | 15 | 10 | ≤5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Total** | (sum of parameters 1-10) | | | | | | | | | | **12.5** |

Table C-1: Mean Rapid Habitat Assessment (3) scores for the Unnamed Stream 4 at the project site.

| HABITAT PARAMETER | CONDITION CATEGORY | | | | | | | | | | MEAN SCORE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Deposited sediment** | *The percentage of the stream bed covered by fine sediment.* | | | | | | | | | | 3 |
| | 0 | 5 | 10 | 15 | 20 | 30 | 40 | 50 | 60 | ≥75 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat diversity** | *The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.* | | | | | | | | | | 2 |
| | ≥5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat abundance** | *The percentage of substrate favorable for EPT colonization, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.* | | | | | | | | | | 1 |
| | 95 | 75 | 70 | 60 | 50 | 40 | 30 | 25 | 15 | 5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover diversity** | *The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.* | | | | | | | | | | 3 |
| | >5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover abundance** | *The percentage of fish cover available.* | | | | | | | | | | 2 |
| | 95 | 75 | 60 | 50 | 40 | 30 | 20 | 10 | 5 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Hydraulic heterogeneity** | *The number of hydraulic components such as pools, riffle, fast run, slow run, rapid, cascade/waterfall, turbulence, backwater, Presence of deep pools score higher.* | | | | | | | | | | 2 |
| | ≥5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Bank erosion** | *The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank or stock pugging.* | | | | | | | | | | 1 |
| Left bank | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |
| Right bank | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bank vegetation** | *The maturity, diversity, and naturalness of bank vegetation.* | | | | | | | | | | 1 |
| Left bank<br>Right bank | Mature native trees with diverse and intact understory | | Regenerating native or flaxes/sedges/tussock > dense exotic | | | Mature shrubs, sparse tree cover > young exotic, long grass | | | Heavily grazed or mown grass > bare/impervious ground | | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian width** | *The width (m) of the riparian buffer constrained by vegetation, fence, or other structure(s).* | | | | | | | | | | 1 |
| Left bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Right bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian shade** | *The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).* | | | | | | | | | | 1 |
| | ≥90 | 80 | 70 | 60 | 50 | 40 | 25 | 15 | 10 | ≤5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Total** | (sum of parameters 1-10) | | | | | | | | | | **17** |

Table C-1: Mean Rapid Habitat Assessment (4) scores for the Unnamed Stream 4 at the project site.

| HABITAT PARAMETER | CONDITION CATEGORY | | | | | | | | | | MEAN SCORE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Deposited sediment** | *The percentage of the stream bed covered by fine sediment.* | | | | | | | | | | 9 |
| | 0 | 5 | 10 | 15 | 20 | 30 | 40 | 50 | 60 | ≥75 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat diversity** | *The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.* | | | | | | | | | | 1 |
| | ≥5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat abundance** | *The percentage of substrate favorable for EPT colonization, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.* | | | | | | | | | | 1 |
| | 95 | 75 | 70 | 60 | 50 | 40 | 30 | 25 | 15 | 5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover diversity** | *The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.* | | | | | | | | | | 2 |
| | >5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover abundance** | *The percentage of fish cover available.* | | | | | | | | | | 1 |
| | 95 | 75 | 60 | 50 | 40 | 30 | 20 | 10 | 5 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Hydraulic heterogeneity** | *The number of hydraulic components such as pools, riffle, fast run, slow run, rapid, cascade/waterfall, turbulence, backwater, Presence of deep pools score higher.* | | | | | | | | | | 1 |
| | ≥5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Bank erosion** | *The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank or stock pugging.* | | | | | | | | | | 2 |
| **Left bank** | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |
| **Right bank** | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Bank vegetation** | *The maturity, diversity, and naturalness of bank vegetation.* | | | | | | | | | | 1 |
| Left bank | Mature native trees with diverse and intact understory | | Regenerating native or flaxes/sedges/tussock > dense exotic | | | Mature shrubs, sparse tree cover > young exotic, long grass | | | Heavily grazed or mown grass > bare/impervious ground | | |
| Right bank | | | | | | | | | | | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian width** | *The width (m) of the riparian buffer constrained by vegetation, fence, or other structure(s).* | | | | | | | | | | 1 |
| Left bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Right bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian shade** | *The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).* | | | | | | | | | | 1 |
| | ≥90 | 80 | 70 | 60 | 50 | 40 | 25 | 15 | 10 | ≤5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Total** | (sum of parameters 1-10) | | | | | | | | | | **20** |

Table C-1: Mean Rapid Habitat Assessment (5) scores for the Unnamed Stream 2 at the project site.

| HABITAT PARAMETER | CONDITION CATEGORY | | | | | | | | | | MEAN SCORE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Deposited sediment** | *The percentage of the stream bed covered by fine sediment.* | | | | | | | | | | 1 |
| | 0 | 5 | 10 | 15 | 20 | 30 | 40 | 50 | 60 | ≥75 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat diversity** | *The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.* | | | | | | | | | | 1 |
| | ≥5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat abundance** | *The percentage of substrate favorable for EPT colonization, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.* | | | | | | | | | | 1 |
| | 95 | 75 | 70 | 60 | 50 | 40 | 30 | 25 | 15 | 5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover diversity** | *The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.* | | | | | | | | | | 1 |
| | >5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover abundance** | *The percentage of fish cover available.* | | | | | | | | | | 1 |
| | 95 | 75 | 60 | 50 | 40 | 30 | 20 | 10 | 5 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Hydraulic heterogeneity** | *The number of hydraulic components such as pools, riffle, fast run, slow run, rapid, cascade/waterfall, turbulence, backwater, Presence of deep pools score higher.* | | | | | | | | | | 1 |
| | ≥5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Bank erosion** | *The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank or stock pugging.* | | | | | | | | | | 1 |
| Left bank | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |
| Right bank | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bank vegetation** | *The maturity, diversity, and naturalness of bank vegetation.* | | | | | | | | | | 1 |
| Left bank | Mature native trees with diverse and intact understory | | Regenerating native or flaxes/sedges/tussock > dense exotic | | | Mature shrubs, sparse tree cover > young exotic, long grass | | | Heavily grazed or mown grass > bare/impervious ground | | |
| Right bank | | | | | | | | | | | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian width** | *The width (m) of the riparian buffer constrained by vegetation, fence, or other structure(s).* | | | | | | | | | | 1 |
| Left bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Right bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian shade** | *The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).* | | | | | | | | | | 1 |
| | ≥90 | 80 | 70 | 60 | 50 | 40 | 25 | 15 | 10 | ≤5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Total** | (sum of parameters 1-10) | | | | | | | | | | 9 |

Table C-1: Mean Rapid Habitat Assessment (6) scores for the Waimeha Stream at the project site.

| HABITAT PARAMETER | CONDITION CATEGORY | | | | | | | | | | MEAN SCORE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Deposited sediment** | *The percentage of the stream bed covered by fine sediment.* | | | | | | | | | | 6 |
| | 0 | 5 | 10 | 15 | 20 | 30 | 40 | 50 | 60 | ≥75 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat diversity** | *The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.* | | | | | | | | | | 4 |
| | ≥5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat abundance** | *The percentage of substrate favorable for EPT colonization, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.* | | | | | | | | | | 3 |
| | 95 | 75 | 70 | 60 | 50 | 40 | 30 | 25 | 15 | 5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover diversity** | *The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.* | | | | | | | | | | 4 |
| | >5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover abundance** | *The percentage of fish cover available.* | | | | | | | | | | 4 |
| | 95 | 75 | 60 | 50 | 40 | 30 | 20 | 10 | 5 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Hydraulic heterogeneity** | *The number of hydraulic components such as pools, riffle, fast run, slow run, rapid, cascade/waterfall, turbulence, backwater, Presence of deep pools score higher.* | | | | | | | | | | 5 |
| | ≥5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Bank erosion** | *The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank or stock pugging.* | | | | | | | | | | 3 |
| Left bank | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |
| Right bank | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bank vegetation** | *The maturity, diversity, and naturalness of bank vegetation.* | | | | | | | | | | 2 |
| Left bank / Right bank | Mature native trees with diverse and intact understory | | Regenerating native or flaxes/sedges/tussock > dense exotic | | | Mature shrubs, sparse tree cover > young exotic, long grass | | | Heavily grazed or mown grass > bare/impervious ground | | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian width** | *The width (m) of the riparian buffer constrained by vegetation, fence, or other structure(s).* | | | | | | | | | | 1 |
| Left bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Right bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian shade** | *The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).* | | | | | | | | | | 1 |
| | ≥90 | 80 | 70 | 60 | 50 | 40 | 25 | 15 | 10 | ≤5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Total** | (sum of parameters 1-10) | | | | | | | | | | **33** |

Table C-1: Mean Rapid Habitat Assessment (7) scores for the Waimeha Stream at the project site.

| HABITAT PARAMETER | CONDITION CATEGORY | | | | | | | | | | MEAN SCORE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Deposited sediment** | *The percentage of the stream bed covered by fine sediment.* | | | | | | | | | | 7 |
| | 0 | 5 | 10 | 15 | 20 | 30 | 40 | 50 | 60 | ≥75 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat diversity** | *The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.* | | | | | | | | | | 2 |
| | ≥5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat abundance** | *The percentage of substrate favorable for EPT colonization, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.* | | | | | | | | | | 2 |
| | 95 | 75 | 70 | 60 | 50 | 40 | 30 | 25 | 15 | 5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover diversity** | *The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.* | | | | | | | | | | 4 |
| | >5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover abundance** | *The percentage of fish cover available.* | | | | | | | | | | 4 |
| | 95 | 75 | 60 | 50 | 40 | 30 | 20 | 10 | 5 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Hydraulic heterogeneity** | *The number of hydraulic components such as pools, riffle, fast run, slow run, rapid, cascade/waterfall, turbulence, backwater, Presence of deep pools score higher.* | | | | | | | | | | 2 |
| | ≥5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Bank erosion** | *The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank or stock pugging.* | | | | | | | | | | 2 |
| Left bank | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |
| Right bank | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bank vegetation** | *The maturity, diversity, and naturalness of bank vegetation.* | | | | | | | | | | 2 |
| Left bank / Right bank | Mature native trees with diverse and intact understory | | Regenerating native or flaxes/sedges/tussock > dense exotic | | | Mature shrubs, sparse tree cover > young exotic, long grass | | | Heavily grazed or mown grass > bare/impervious ground | | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian width** | *The width (m) of the riparian buffer constrained by vegetation, fence, or other structure(s).* | | | | | | | | | | 1 |
| Left bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Right bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian shade** | *The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).* | | | | | | | | | | 2 |
| | ≥90 | 80 | 70 | 60 | 50 | 40 | 25 | 15 | 10 | ≤5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Total** | (sum of parameters 1-10) | | | | | | | | | | **28** |

Table C-1: Mean Rapid Habitat Assessment (8) scores for the Unnamed Stream 1 at the project site.

| HABITAT PARAMETER | CONDITION CATEGORY | | | | | | | | | | MEAN SCORE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Deposited sediment** | *The percentage of the stream bed covered by fine sediment.* | | | | | | | | | | 7 |
| | 0 | 5 | 10 | 15 | 20 | 30 | 40 | 50 | 60 | ≥75 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat diversity** | *The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.* | | | | | | | | | | 4 |
| | ≥5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Invertebrate habitat abundance** | *The percentage of substrate favorable for EPT colonization, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.* | | | | | | | | | | 4 |
| | 95 | 75 | 70 | 60 | 50 | 40 | 30 | 25 | 15 | 5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover diversity** | *The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.* | | | | | | | | | | 6 |
| | >5 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Fish cover abundance** | *The percentage of fish cover available.* | | | | | | | | | | 6 |
| | 95 | 75 | 60 | 50 | 40 | 30 | 20 | 10 | 5 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Hydraulic heterogeneity** | *The number of hydraulic components such as pools, riffle, fast run, slow run, rapid, cascade/waterfall, turbulence, backwater, Presence of deep pools score higher.* | | | | | | | | | | 6 |
| | ≥5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Bank erosion** | *The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank or stock pugging.* | | | | | | | | | | 5 |
| Left bank | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |
| Right bank | 0 | ≤5 | 5 | 15 | 25 | 35 | 50 | 65 | 75 | >75 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bank vegetation** | *The maturity, diversity, and naturalness of bank vegetation.* | | | | | | | | | | 5 |
| Left bank / Right bank | Mature native trees with diverse and intact understory | | Regenerating native or flaxes/sedges/tussock > dense exotic | | | Mature shrubs, sparse tree cover > young exotic, long grass | | | Heavily grazed or mown grass > bare/impervious ground | | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian width** | *The width (m) of the riparian buffer constrained by vegetation, fence, or other structure(s).* | | | | | | | | | | 1 |
| Left bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Right bank | ≥30 | 15 | 10 | 7 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Riparian shade** | *The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).* | | | | | | | | | | 1 |
| | ≥90 | 80 | 70 | 60 | 50 | 40 | 25 | 15 | 10 | ≤5 | |
| Score | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| **Total** | (sum of parameters 1-10) | | | | | | | | | | **45** |

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