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ECOLOGICAL ASSESSMENT & REPORTING SERVICES

Memo

To:	Mark Lile; Landmark Lile Ltd	Project:	Maitahi Village Development — Stream Mitigation Assessment
From:	Ben Robertson; Robertson Enviro Ltd	Date:	10 July 2025
cc:	Neil Donaldson; CCKV (Maitahi Project Manager)		
Subject:	Maitahi Village — Stream Mitigation Assessment		

Maitahi Village — Stream Mitigation Assessment

1 Purpose and Scope

The Maitahi Village proposal includes (Figure A.1, **Attachment A**):

- Realignment of intermittent reaches—Lower Kākā Hill Tributary (KHT1) and the eastern and western hillslope tributaries (KHT3 and KHT4);
- Restoration and enhancement of the remaining main stem sections of Kākā Hill Tributary and KHT3 and KHT4; and
- Reclamation of KHT2.

The Project EcIA (REL, Feb 2025) has implemented the mitigation hierarchy to avoid, remedy or mitigate any the adverse effects on the environment (Roper-Lindsay et al., 2018) and is generally consistent with the Guidance on Good Practice Biodiversity Offsetting in New Zealand (2014). The Project EcIA identified the above stream reaches that will be impacted by the Project and that cannot be mitigated (at the point of impact), and as such residual effects remain.

The Project EcIA mitigation package is designed to achieve no net loss of stream ecological value and function. This memo tests that objective by calculating Environmental Compensation Ratios (ECRs) using the method of Storey et al. (2011) and comparing the required offsets with those proposed.

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2 Aquatic Offsetting

2.1 Freshwater habitat loss

Based on the current Project design, stream realignment and enhancement works will lead to the temporary loss of 990 m of highly degraded riparian and in-stream habitat along the Lower Kākā Hill Tributary (KHT1) and intermittent reaches associated with KHT3 and KHT4. The Project will have a **Moderate** level of effect on the habitat values of this stream even after measures to avoid, remedy or mitigate have been considered.

The Unnamed Tributary on Eastern Hillslope (KHT2) reach will be reclaimed leading to the complete loss of 300 m of highly modified riparian and in-stream stream habitat. The Project will have a **Moderate** level of effect on the habitat values of this stream even after measures to avoid, remedy or mitigate have been considered.

Figure A.2 provides an overview map of existing watercourses, while detailed data and ecological values for each reach are outlined in the Project EcIA[1]. This information informed the ECR calculations and is not repeated in this report, which should be read in conjunction with the Project EcIA.

2.2 Principles of stream offsetting

As acknowledged in the Project EcIA, the permanent and intermittent flowing reaches of KHT1, KHT2, KHT3 and KHT4 meet the NPS-FM definition of a river and therefore the constraints on complying activities outlined within the NES-F[2] apply to the streams and surrounding area. Because potential impacts on the streams are inconsistent with the NPS-FM[3], it will be necessary to conduct further assessment and carry out biodiversity offsetting to compensate for the loss of river extent and values[4].

Guidance on, and the Principles for, good practice aquatic biodiversity offsetting is provided in Appendix 6 of the NPS-FM. In summary the offsetting restoration and enhancement guidance recommend:

a) The site be located as close as possible to the subject site;

b) Be ‘like-for-like’;

c) Achieve no net loss (preferably net gain) in ecological values and extent; and

d) Consideration of the use of biodiversity offsetting.

2.3 Environmental Compensation Ratio (ECR) Method

The ECR utilises the Stream Ecological Valuation (SEV) score to calculate a ratio for the minimum stream area (stream bank width x stream length) to be restored as mitigation for stream loss (Storey et al., 2011). The aim of the ECR is to ensure no net loss of ecological functioning (loss of function at impact site, gain of function at offset site).The SEV score used in the ECR calculation does not include two biotic functions relating to fish and mac-

[1] Refer Section 3.1.2 Aquatic Ecology, pages 22-33.

[2] Reclamation of the bed of any river is a discretionary activity, per Section 57 of the NES-F.

[3] Policy 3.24 outlines that the loss of river extent and values is avoided.

[4] In accordance with the effects management hierarchy as defined in Policy 3.21 of the NPS-FM.

roinvertebrates due to the difficulty of predicting changes to these communities (Storey et al., 2011).

The ECR equation is calculated as follows:

$$ECR = [(SEVi\text{-}P – SEVi\text{-}I) / (SEVm\text{-}P – SEVm\text{-}C)] \times 1.5$$

Where:

• SEVi-P and SEVi-I are the potential SEV value and SEV value after impact, respectively, for the site to be impacted.

• SEVm-C and SEVm-P are the current and potential SEV values, respectively, for the site where the environmental compensation (mitigation) works are to be applied.

• 1.5 is a multiplier that allows for the delay in achieving compensation benefits.

Once the ECR is calculated then the ratio (stream loss: stream offset) can be used to calculate the required area (or length) of stream offset.

The ECR methodology recognises that there are values associated with edge habitat and the proximity to banks and requires that the minimum replacement length must at least be equal to stream length lost.

SEV scores presented in this report (see detailed SEV results in **Attachment B**) have been derived using relevant information either presented in, or collected to inform, the Project EcIA. Further SEV assessments may be required to confirm current baseline stream conditions, particularly if site conditions have changed since the original surveys were undertaken.

3 Impact Sites

3.1 Impact Site - KHT1

To accomodate the Project design stream realignment and enhancement works of will lead to the temporary loss of 630 m of highly degraded riparian and in-stream habitat along the Lower Kākā Hill Tributary (KHT1). This will lead to loss of all residual stream functions with a baseline SEV score of 0.301 current / potential to 0.00 predicted impacted score. It was assumed that current and potential scores for KHT1 would remain the same, as KHT1 is currently constrained by surrounding development and landuse, there is limited scope to improve scores at this location and it is likely that this score would remain similar if no impact occurred. Justification for these scores are set out in Table 3.1.

Table 3.1 Current / Potential SEV scores for KHT1 and predicted change following impact.

SEV Function	KHT1 - Current (SEVi-C) / Potential SEVi	KHT1 - Impacted– SEVi-I	Justification for predicted scores following stream removal
Hydraulic function mean score	0.53	0.00	Stream will be lost, will not exist and subsequently all SEV metrics scores zero
Biogeochemical function mean score	0.18	0.00	
Habitat provision function mean score	0.28	0.00	
Biodiversity function mean score	0.06	0.00	

Overall mean SEV score	0.301	0.00	**The SEV score will decrease by 0.301 to 0.00**

3.2 Impact Site - KHT2

To accomodate the Project design the entire 300 m of KHT2 will be lost and reclaimed. This will lead to loss of all residual stream functions with a baseline SEV score of 0.173 current / potential to 0.00 predicted impacted score. It was assumed that current and potential scores for KHT3 would remain the same, as KHT3 is currently constrained by surrounding development and landuse, there is limited scope to improve scores at this location and it is likely that this score would remain similar if no impact occurred. Justification for these scores are set out in Table 3.2.

Table 3.2 Current / Potential SEV scores for KHT2 and predicted change following impact.

SEV Function	KHT2 - Current (SEVi-C)	KHT2 - Impacted (SEVi-I)	Justification for predicted scores following stream removal
Hydraulic function mean score	0.30	0.00	Stream will be lost, will not exist and subsequently all SEV metrics scores zero
Biogeochemical function mean score	0.11	0.00	
Habitat provision function mean score	0.17	0.00	
Biodiversity function mean score	0.00	0.00	
Overall mean SEV score	0.173	0.00	**The SEV score will decrease by 0.173 to 0.00**

3.3 Impact Site - KHT3 / KHT4

To accomodate the Project design stream realignment and enhancement works of will lead to the temporary loss of 360 m of highly degraded riparian and in-stream habitat along the KHT3 / KHT4 reaches. This will lead to loss of all residual stream functions with a baseline SEV score of 0.294 current / potential to 0.00 predicted impacted score. It was assumed that current and potential scores for KHT3 / KHT4 would remain the same, as KHT3 / KHT4 is currently constrained by surrounding development and landuse, there is limited scope to improve scores at this location and it is likely that this score would remain similar if no impact occurred. Justification for these scores are set out in Table 3.3.

Table 3.3 Current / Potential SEV scores for KHT3 / KHT4 and predicted change following impact.

SEV Function	KHT3/KHT4 - Current (SEVi-C)	KHT3/KHT4 - Impacted (SEVi-I)	Justification for predicted scores following stream removal

Hydraulic function mean score	0.44	0.00	Stream will be lost, will not exist and subsequently all SEV metrics scores zero
Biogeochemical function mean score	0.28	0.00	
Habitat provision function mean score	0.18	0.00	
Biodiversity function mean score	0.01	0.00	
Overall mean SEV score	0.294	0.00	**The SEV score will decrease by 0.294 to 0.00**

4 Offset Site

4.1 Offset Site Justification

Based on concept stream design and the provision of unimpacted stream corridors within the Project Area, the following stream offsetting opportunities have been identified within the Kākā Hill Tributary (Figure A.1):

- Approximately 460 m of new stream created as part of the KHT1 realignment along the lower Kākā Hill Tributary;
- Approximatey 585 m of new stream created as part of the KHT3 / KHT4 realignment;
- Approximatey 380 m of riparian enhancement along the remaining KHT3 / KHT4 reaches; and
- Approximatey 2,380 m of riparian enhancement along the remaining Kākā Hill Tributary (upstream of the Lower Kākā Hill Tributary Realignment).

The proposed offset streams will be located within the wider Project Area and reflect 'like for like' (being the same watercourse).

As highlighted in the Project EcIA there is significant opportunity to naturalise channel and streambed heterogeneity via channel reshaping and substrata addition using natural materials and 'alternatives' that provide further ecological benefit (e.g. improve bank stability through planting; increased quantity and quality of in-stream and riparian habitat available to aquatic (and riparian) flora and fauna; enhanced riparian margins with no animal stock access to improve and maintain connectivity and provide stream shade, with improved biodiversity; limit water flow velocities for protection against erosion and habitat flushing; and improve fish passage along the Kākā Hill Tributary stream length.

The proposed KHT1 realignment offset comprises newly created stream and riparian enhancement along the remaining Kākā Hill Tributary (upstream of the Lower Kākā Hill Tributary Realignment).

The proposed offset for the intermittent KHT2, KHT3 and KHT4 reaches comprises the new stream created as part of the KHT3 / KHT4 realignment and further and riparian enhancement along the remaining KHT3 / KHT4 reach and Kākā Hill Tributary main stem.

Overall, Kākā Hill Tributary main stem and associated tributaries is a suitable location for stream offset and would accommodate the proposed offset required for the KHT1, KHT3 and KHT4 realignment and KHT2 reclamation. It is considered that no like for like function value will be lost, and that the wider improvement that can be achieved within Kākā Hill Tributary is an opportunity to provide high ecological restoration in an area with significant historical modification.

4.2 Offset Plan

The following conceptual design aspects are considered within the offset plan for wider Kākā Hill Tributary. Conceptual stream design plans for the realignment and enhancement of tributaries (KHT1, KHT3 and KHT4) are presented in RMM Maitahi Village - Landscape Design Plans[5]. Channel dimensions referenced in this report have been updated to reflect those concept plans. The considerations outlined below informed the potential SEV calculations for the stream-specific offset design in Section 4.3:

(a) Realignment and enhancement of intermittent tributaries (KHT3 and KHT4)

- The new alignments will be armoured with a variety of rock sizes will be used to line the channels, providing a more natural appearance and better erosion protection.
- Low-angle benches (slope 1:3 to 1:4) will flank the rock bed and be planted in light-permeable sedges and flax, maintaining solar input for periphyton growth and providing periodic inundation habitat.
- Above the benches will support a mixed shrub–tree canopy that delivers summer shade, leaf litter, and long-term woody debris while still allowing light to reach the streambed through the lower bench vegetation.
- Occasional embedded boulders and coarse woody cover will be placed at bends and outfalls to break up flows, create refugia, and add roughness without compromising channel stability.

(b) Realignment and enhancement of KHT1 realignment

- Two-stage channel profiling for flow permanence – a narrow, inset low-flow channel (thalweg) is nested within broader flood benches. This is intended to concentrate base-flow year-round, maintaining pool depth and preventing the new channel from dewatering during dry spells, while still providing capacity for larger events.
- Sinuous alignment with alternating habitat units – the reconstructed planform alternates pools, riffles, runs, and shoals, maximising hydraulic and substrate diversity for native fish and macroinvertebrates.
    - Pool – deep scour pockets on outer bends offer cool refugia and organic-matter retention.
    - Shoal – shallow depositional bars on inner bends supply spawning and foraging gravel.
    - Riffle – coarse cobbles and boulders create high turbulence and oxygenation.
    - Run – glide sections with uniform velocity ensure unobstructed fish passage between units.
- Terraces/flood benches – low vegetated benches inundate during high flows, extending wetted habitat, trapping sediment, and providing wetland colonisation sites.
- In-stream structure – embedded root-wads, key boulders, and coarse woody debris add cover, promote local scour, and sustain pool depth.
- Riparian planting – lower benches are planted in light-permeable sedges and flax, main-

[5] Part 2(A) pages 16-24; Part 2(B) pages 33-35.

taining solar input for primary productivity; steeper banks support a taller shrub–tree canopy for summer temperature moderation, leaf-litter input, and future woody debris recruitment. The riparian margin will include a minimum 40 m wide buffer. This will provide a self-sustaining indigenous vegetation corridor, wide enough to maintain long-term benefits for both aquatic and terrestrial biota.

- Selective armouring – graded rock protects the thalweg and outer bends from erosion while preserving habitat heterogeneity elsewhere.
- Integrated offline stormwater-treatment wetlands[6] – development runoff is diverted to a chain of lateral offline wetlands on the flood benches. Inlets are set above the thalweg to bypass natural baseflow. The wetlands attenuate peaks, settle sediments and contaminants, then release treated water via a defined spillway weir outlets back to the main channel. This design is intended to preserve or modestly augment baseflow while protecting the thalweg from erosive pulses.

(c) Restoration of the remaining Kākā Hill Tributary riparian corridor

- Riparian planting within the KHT1 realignment will continue upstream where the stream ecological values are currently compromised by a degraded riparian habitat. No instream works are proposed.
- Eco-sourced natives will be installed across stream edge, flood-bench, mid-slope, and upper-terrace tiers.
- Within the wider Kākā Hill Tributary corridor, non-pest exotics or remnant natives offering ecological value will be kept and under-planted.
- All listed pest species (e.g. Salix spp.) and intrusive poplars will be eradicated and replaced with appropriate native trees and shrubs.

(d) Restoration of the remaining KHT3 / KHT4 reach

- Riparian planting will occur within the remaining KHT3 / KHT4 reach where the stream ecological values are currently compromised by a degraded riparian habitat. No instream works are proposed.
- Eco-sourced natives will be installed across stream edge, flood-bench and mid-slope.
- Within the wider Kākā Hill Tributary corridor, non-pest exotics or remnant natives offering ecological value will be kept and under-planted.
- All listed pest species (e.g. Salix spp.) and intrusive poplars will be eradicated and replaced with appropriate native trees and shrubs.

Offset works will be maintained for five years, with performance standards for instream and riparian values.

All native planting species palettes will follow appropriate planting guidelines for the Bryant Ecological District (e.g. Courtney et al. 2003).

At the concept stage all designs accept the no-net-loss objective and are sized to meet or exceed ECR requirements set out in Section 5. All stream design and therefore ECR re-

[6] Refer to Water sensitive design report - Morphum (Section 2.3, page 6); Appendix C of T+T Maitahi Village Stormwater Assessment Report.

quirements are subject to detailed design.

4.3 Offset Site - KHT1 realignment

Approximately 920 m^2 (460 m length x 2 m width) of new stream created as part of the KHT1 realignment is available for offset. Potential SEV could increase scores from 0.00 (current) to 0.50. Justification for these scores is set out in Table 4.1.

Table 4.1 Current scores for KHT1 realignment and predicted change following creation of the new stream. Different SEV metrics are indicated in the justification column by bold text.

SEV Function	KHT1 Realignment - Current (SEVm-C)	KHT1 Realignment - Potential (SEVm-P)	Justification for predicted scores following stream creation
Hydraulic function mean score	0.00	0.76	**Vchann**: Two-stage, sinuous channel widens corridor and restores natural hydraulic diversity. **Vlining**: No artificial lining; local rock armour only where needed; natural material used and retained. **Vpipe**: One overflow from offline wetlands, perched above baseflow. **Vbank**: Flood benches reconnect channel to floodplain along full length. **Vrough**: 40 m indigenous riparian and floodplain vegetation along full length. **Vbarr**: Bed set flush; no culverts or fish passage barriers.
Biogeochemical function mean score	0.00	0.42	**Vshade**: Exotics removed; 40 m indigenous riparian and floodplain vegetation along full length. The score was conservatively adjusted as effective shading may take several years to establish as the planted vegetation matures. **Vdod**: While point source SW treatment wetland inputs may improve water quality locally, the diffuse upstream quality may not change considerably in the short term. Effective shading may take several years to impact macrophyte growth. **Vripar**: Planting of native early stage riparian and floodplain vegetation will improve the intactness of riparian zone. **Vdecid**: Non-deciduous native riparian planting will increase the proportion of non-deciduous cover. **Vmacro**: In stream habitat improvement will improve particle retention. Riparian planting will also improve the source of leaf fall. **Vsurf**: Natural gravel/cobble bed; organic cover will build as planting matures. **Vripfilt**: Early stage restoration planting will improve filtering activity along the full length.
Habitat provision function mean score	0.00	0.37	**Vgalspwn, Vgalqual, Vgobspwn**: Stream sculpting / recontouring expected to support Galaxiidae spawning habitat. Flood bench habitat with moderate riparian cover and gently sloping banks (1° – 10° slope). **Vphyshab**: New two-stage, sinuous bed adds alternating pools, riffles, runs and embedded wood. Early native planting on riparian and floodbank. **Vwatqual**: Assumes no change to catchment-wide water quality. **Vimperv**: Catchment-wide proportion of impervious surfaces 10-20% with moderate runoff controls.

Biodiversity function mean score	0.00	0.24	**Vfish**: Removed from ECR. **Vmci**: Removed from ECR. **Vept**: Removed from ECR. **Vinvert**: Removed from ECR. **Vripconn**: Assumed full connectivity to riparian zone will be achieved through realignment contouring. Riparian and floodplain planting along full length.
Overall mean SEV score	0.00	0.50	**The SEV score will increase by 0.50 to 0.50**

4.4 Offset Site - KHT3 / KHT4 realignment

Approximately 878 m^2 (585 m length x 1.5 m width) of new intermittent stream created as part of the KHT3/KHT4 realignment is available for offset. Potential SEV could increase scores from 0.00 (current) to 0.40. Justification for these scores is set out in Table 4.2.

Table 4.2 Current scores for KHT3 / KHT4 realignment and predicted change following creation of the new stream. Different SEV metrics are indicated in the justification column by bold text.

SEV Function	KHT1 Realignment - Current (SEVm-C)	KHT1 Realignment - Potential (SEVm-P)	Justification for predicted scores following stream creation
Hydraulic function mean score	0.00	0.61	**Vchann**: Channel with low-angle (1:3–1:4) benches restores floodplain interaction. **Vlining**: Bed armoured with graded rock of varied size for natural appearance and scour resistance; embedded boulders add structure. **Vpipe**: No through-piped sections within the reach. **Vbank**: Benches on both banks reconnect channel to floodplain along entire length, accommodating periodic inundation. **Vrough**: Sedges/flax on benches plus mixed native shrub–tree canopy along full length. **Vbarr**: Bed set flush; no culverts or fish passage barriers.
Biogeochemical function mean score	0.00	0.40	**Vshade**: Sedges / flax give immediate dappled light; the developing shrub–tree canopy will add further shade along full length. The score was conservatively adjusted as effective shading may take several years to establish as the planted vegetation matures. **Vdod**: Future shading will enhance water quality; upstream diffuse inputs unchanged. **Vripar**: Continuous native planting on benches and banks. **Vdecid**: Non-deciduous native riparian planting will increase the proportion of non-deciduous cover. **Vmacro**: In stream habitat improvement will improve particle retention. Riparian planting will also improve the source of leaf fall. **Vsurf**: Graded rock blended with gravel / cobble provides a natural bed; organic coating will accrue as vegetation matures. **Vripfilt**: Dense sedge / flax benches and understory shrubs enhance sediment and nutrient filtration along the reach.

Habitat provision function mean score	0.00	0.18	**Vgalspwn, Vgalqual, Vgobspwn**: Assumes no native fish spawing habitat. **Vphyshab**: Limited habitat and hydrologic heterogeneity. Early native planting on riparian and floodbank enhance shade. **Vwatqual**: Assumes no change to catchment-wide water quality. **Vimperv**: Catchment-wide proportion of impervious surfaces 10-20% with moderate runoff controls.
Biodiversity function mean score	0.00	0.01	**Vfish**: Removed from ECR. **Vmci**: Removed from ECR. **Vept**: Removed from ECR. **Vinvert**: Removed from ECR. **Vripconn**: Assumed partial connectivity to riparian zone will be achieved through realignment contouring. Riparian and floodplain planting along majority of length.
Overall mean SEV score	0.00	0.40	**The SEV score will increase by 0.40 to 0.40**

4.4 Offset Site - Remaining Kākā Hill Tributary riparian corridor

Approximately 4,760 m^2 (2,380 m length x 2.0 m width) of the remaining Kākā Hill Tributary and riparian corridor is available for offset. Potential SEV could increase scores from 0.46 (current) to 0.57. Justification for these scores is set out in Table 4.3.

Table 4.3 Current scores for remaining Kākā Hill Tributary and predicted change following riparian restoration. Different SEV metrics are indicated in the justification column by bold text.

SEV Function	Remaining Kākā Hill Tributary - Current (SEVm-C)	Remaining Kākā Hill Tributary - Potential (SEVm-P)	Justification for predicted scores following riparian restoration
Hydraulic function mean score	0.53	0.76	**Vchann**: Assumes no change. **Vlining**: Assumes no change. **Vpipe**: Assumes no change. **Vbank**: Assumes no change. **Vrough**: 10-20 m indigenous riparian and floodplain vegetation along full length. **Vbarr**: Assumes no change.

Biogeochemical function mean score	0.46	0.54	**Vshade**: 10-20 m indigenous riparian and floodplain vegetation along full lengthh. The score was conservatively adjusted as effective shading may take several years to establish as the planted vegetation matures. **Vdod**: Assumes no change. **Vripar**: Planting of native early stage riparian and floodplain vegetation will improve the intactness of riparian zone. **Vdecid**: Non-deciduous native riparian planting will increase the proportion of non-deciduous cover. **Vmacro**: Riparian planting will also improve the source of leaf fall. **Vsurf**: Assumes no change. **Vripfilt**: Early stage restoration planting will improve filtering activity along the full length.
Habitat provision function mean score	0.45	0.45	**Vgalspwn, Vgalqual, Vgobspwn**: Assumes no change. **Vphyshab**: Early native planting on riparian and floodbank. **Vwatqual**: Assumes no change to catchment-wide water quality. **Vimperv**: Catchment-wide proportion of impervious surfaces <10% with low runoff controls.
Biodiversity function mean score	0.11	0.24	**Vfish**: Removed from ECR. **Vmci**: Removed from ECR. **Vept**: Removed from ECR. **Vinvert**: Removed from ECR. **Vripconn**: Riparian and floodplain planting along full length.
Overall mean SEV score	0.46	0.57	**The SEV score will increase by 0.11 to 0.57**

4.5 Offset Site - Remaining KHT3 / KHT4 reach

Approximately 570 m^2 (380 m length x 1.5 m width) of the remaining KHT3 / KHT4 reach is available for offset. Potential SEV could increase scores from 0.30 (current) to 0.40. Justification for these scores is set out in Table 4.4.

Table 4.4 Current scores for remaining KHT3 / KHT4 reach and predicted change following riparian restoration. Different SEV metrics are indicated in the justification column by bold text.

SEV Function	Remaining KHT3 / KHT4 - Current (SEVm-C)	Remaining KHT3 / KHT4 - Potential (SEVm-P)	Justification for predicted scores following riparian restoration
Hydraulic function mean score	0.44	0.61	**Vchann**: Assumes no change. **Vlining**: Assumes no change. **Vpipe**: Assumes no change. **Vbank**: Assumes no change. **Vrough**: 5-10 m indigenous riparian and floodplain vegetation along full length. **Vbarr**: Assumes no change.

Biogeochemical function mean score	0.28	0.40	**Vshade**: 5-10 m indigenous riparian and floodplain vegetation along full lengthh. The score was conservatively adjusted as effective shading may take several years to establish as the planted vegetation matures. **Vdod**: Assumes no change. **Vripar**: Planting of native early stage riparian and floodplain vegetation will improve the intactness of riparian zone. **Vdecid**: Non-deciduous native riparian planting will increase the proportion of non-deciduous cover. **Vmacro**: Riparian planting will also improve the source of leaf fall. **Vsurf**: Assumes no change. **Vripfilt**: Early stage restoration planting will improve filtering activity along the full length.
Habitat provision function mean score	0.18	0.18	**Vgalspwn, Vgalqual, Vgobspwn**: Assumes no change. **Vphyshab**: Early native planting on riparian and floodbank. **Vwatqual**: Assumes no change to catchment-wide water quality. **Vimperv**: Catchment-wide proportion of impervious surfaces <10% with moderate runoff controls.
Biodiversity function mean score	0.01	0.01	**Vfish**: Removed from ECR. **Vmci**: Removed from ECR. **Vept**: Removed from ECR. **Vinvert**: Removed from ECR. **Vripconn**: Assumes no change.
Overall mean SEV score	0.30	0.40	**The SEV score will increase by 0.10 to 0.40**

5 Environmental Compensation Ratios

A summary of SEV data used to derive ECR values is summarised in Table 5.1. ECR values were calculated for each 'impact / offset' reach combination as required.

Table 5.1 Predicted and current SEV scores used to derive ECR values.

Impact stream	Impact scores		Offset Stream	Offset scores		ECR value[a]
	SEVi-P	SEVi-I		SEVm-P	SEVm-C	
KHT1	0.30	0.00	KHT1 (Lower Kākā Hill Tributary) Realignment	0.50	0.00	1.00
KHT1	0.30	0.00	Upper Kākā Hill Tributary (Remaining permanent stream with degraded riparian margin)	0.57	0.47	4.80
KHT2	0.17	0.00	KHT3 / KHT4 Realignment	0.40	0.00	1.00
KHT2	0.29	0.00	KHT3 / KHT4 Realignment (remaining after KHT2 offset)	0.40	0.00	1.13
KHT2	0.29	0.00	KHT3 / KHT4 (Remaining intermittent stream with highly degraded riparian margin)	0.40	0.29	4.50

KHT2	0.29	0.00	Upper Kākā Hill Tributary (Remaining after KHT1 Offset)	0.57	0.47	4.50

[a] ECR values <1.00 default to 1.00 to ensure no net loss.

6 Offset Mitigation Calculation

Channel dimensions, ECR values and the lengths of stream required to be created or restored as mitigation is summarised in Table 6.1. These are represented as follows:

- Reclamation of KHT1 requires an ECR of 1.00—equivalent to 630 m of new channel. The KHT1 (Lower Kākā Hill Tributary) realignment can supply 460 m of this length, leaving a 170 m shortfall. That residual can be offset by 816 m of riparian restoration along the Upper Kākā Hill Tributary (ECR 4.80). With 2,380 m of suitable stream available, all offset requirements for the KHT1 impact reach can be achieved within the Kākā Hill Tributary main stem.
- Reclamation of KHT2 requires an ECR of 1.00—equivalent to 300 m of new channel. The KHT3 / KHT4 Realignment can supply all 300 m of this length. All offset requirements for the KHT2 impact reach can be achieved within the wider Kākā Hill Tributary.
- Reclamation of KHT3/KHT4 requires an ECR of 1.13—equivalent to 407 m of new channel. The KHT3 / KHT4 Realignment realignment can supply 285 m of this length, leaving a 122 m shortfall. That residual can be offset by a combination of 548 m of riparian restoration along the remaining KHT3 / KHT4 reaches (ECR 4.5) and 756 m of riparian restoration along the Upper Kākā Hill Tributary (ECR 4.5). With a combined 1,944 m of suitable riparian margin available in the KHT3 / KHT4 and Upper Kākā Hill Tributary reaches, all offset requirements for the KHT3/KHT4 impact reaches can be achieved within the wider Kākā Hill Tributary.

It is acknowledged that stream offsetting is not strictly ‘like for like’; however, it is intended to deliver improved overall ecological function across the wider Kākā Hill Tributary. In this case, offset efforts prioritise long-term gains in habitat quality, hydrology, and connectivity, which are considered more ecologically meaningful than replicating the existing degraded conditions.

The predicted SEVm-P score has been based on the stream offset plan—including stream realignment, enhancement, and riparian margin planting—outlined in Section 4.2. Predicted SEV uplift has been applied conservatively at this preliminary concept design stage. If restoration measures or their associated functional outcomes differ at the detailed design stage from those assumed in this memo, the ECR calculation will need to be reassessed accordingly.

7 Conclusions

The wider Kākā Hill Tributary has been substantially degraded by historic channelisation, infilling, riparian habitat removal, and loss of flood-plain connection. The proposed offset and restoration package directly addresses those legacies and will:

- Re-establish natural hydrology and geomorphic form through flood-bench re-contouring, two-stage channel construction, and variable streambed form.

- Restore riparian integrity, supplemented by sedge–flax benches that allow solar penetration and periodic inundation.
- Enhance habitat heterogeneity by embedding woody material and boulders, creating alternating riffle–run–pool sequences, and providing bank cover for aquatic and terrestrial fauna.

Offset calculations (Section 6) confirm that all design scenarios achieve no net loss of stream length or ecological value; any works above the calculated minimums will deliver a clear net ecological gain.

The current ECR is based on the best information available at the time of assessment. A detailed Stream Restoration Plan (SRP)—to be secured by consent condition—will translate these principles into construction drawings, planting schedules, success criteria, and an adaptive-management framework, ensuring that:

- Performance targets (e.g. canopy closure, macroinvertebrate indices) are defined and time-bound.
- Monitoring and reporting occur at appropriate frequencies to demonstrate progress and initiate timely corrective actions.
- Adaptive measures (e.g. supplementary planting, additional in-stream features) can be deployed if targets are not met.

With these safeguards in place, the stream offsetting outlined herein is well positioned to remediate past impacts, future-proof habitat quality, and deliver enduring ecological benefits across the wider Kākā Hill Tributary catchment.

8 Applicability

Robertson Environmental's professional opinions are based on its professional judgement, experience, and training. These opinions are also based upon data derived from the existing information and analysis described in this document. Robertson Environmental Limited has relied upon information provided by the Client to inform parts of this document, some of which has not been fully verified by Robertson Environmental Limited.

This letter has been prepared for the exclusive use of CCKV Maitai Dev Co LP (Maitahi), with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

If you have any further queries or wish to discuss any aspect of the above, please do not hesitate to contact Ben Robertson via phone (027 823 8665) or email (ben.robertson@robertsonenviro.co.nz).

Robertson Environmental Limited

Report Prepared by:

Dr Ben Robertson

Principal Consultant Ecologist, Director

Table 6.1 Maitahi Village stream offset calculation[a]. The predicted (SEVm-P) has been based on the concept stream offset plan (stream realignment and enhancement and riparian margin planting) outlined in Section 4.2. If at detailed design stage restoration measures and associated functional outcomes differ than what has been included in this memo, then ECR calculation will need to be reassessed.

		Impact					Compensation / Offset							ECR			Compensated	Residual	
Stream ID	Impact type	SEVi-P	SEVi-I	Length (m)	Average width (m)	Stream bed area (m2)	Stream ID	Compensation method	SEVm-P	SEVm-C	Average width (m)	Length available (m)	Streambed area available (m2)	ECR	Streambed area compensartion required (m2)	Streambed length compensation required (m)	Proportion of impact reach compensated	Compensation stream bed area still available (m2)	Compensation stream length still available (m)
KHT1 (pre-dom. int)	Reclamation	0.301	0.00	630	1.3	819	KHT1 (Lower Kākā Hill Tributary) Realignment	Restoration (Creation)	0.50	0.00	2.0	460	920	1.00	819	630	0.73	101	-170
KHT1 (pre-dom. int)	Reclamation	0.301	0.00	170	1.3	221	Upper Kākā Hill Tributary (Remaining permanent stream with degraded riparian margin)	Enhancement (riparian)	0.57	0.47	2.0	2380	4760	4.80	1061	816	2.92	3699	1564
KHT2 (int)	Reclamation	0.173	0.00	300	0.3	90	KHT3 / KHT4 Realignment	Restoration (Creation)	0.40	0.00	1.5	585	878	1.00	90	300	1.95	788	285
KHT3 / KHT4 (int)	Reclamation	0.294	0.00	360	0.5	180	KHT3 / KHT4 Realignment (remaining after KHT2 offset)	Restoration (Creation)	0.40	0.00	1.5	285	428	1.13	203	407	0.70	224	-122
KHT3 / KHT4 (int)	Reclamation	0.294	0.00	122	0.5	61	KHT3 / KHT4 (Remaining intermittent stream with highly degraded riparian margin)	Enhancement (riparian)	0.40	0.294	1.5	380	570	4.50	274	548	0.69	296	-168
KHT3 / KHT4 (int)	Reclamation	0.294	0.00	168	0.5	84	Upper Kākā Hill Tributary (Remaining after KHT1 Offset)	Enhancement (riparian)	0.57	0.47	2.0	1564	3128	4.50	378	756	2.07	2750	808

[a] All proposed stream impact and offset areas have been estimated based on the Project concept plans and GIS analysis.

Attachment A:

Supporting Figures

Figure A.1. Proposed offset stream locations overlaid with the RMM concept landscape plan. Source: REL EcIA Report (Feb 2025).

PROJECT: MAITAHI VILLAGE, KĀKĀ VALLEY

Proposed Offset Streams

| Date: 29 Jan 2024 | Revision: A | Aerial: UAV May 24, LINZ 0.075m (22)
Plan map prepared for CCKV by Robertson Environmental Limited

Project Manager: Ben.Robertson@robertsonenviro.co.nz

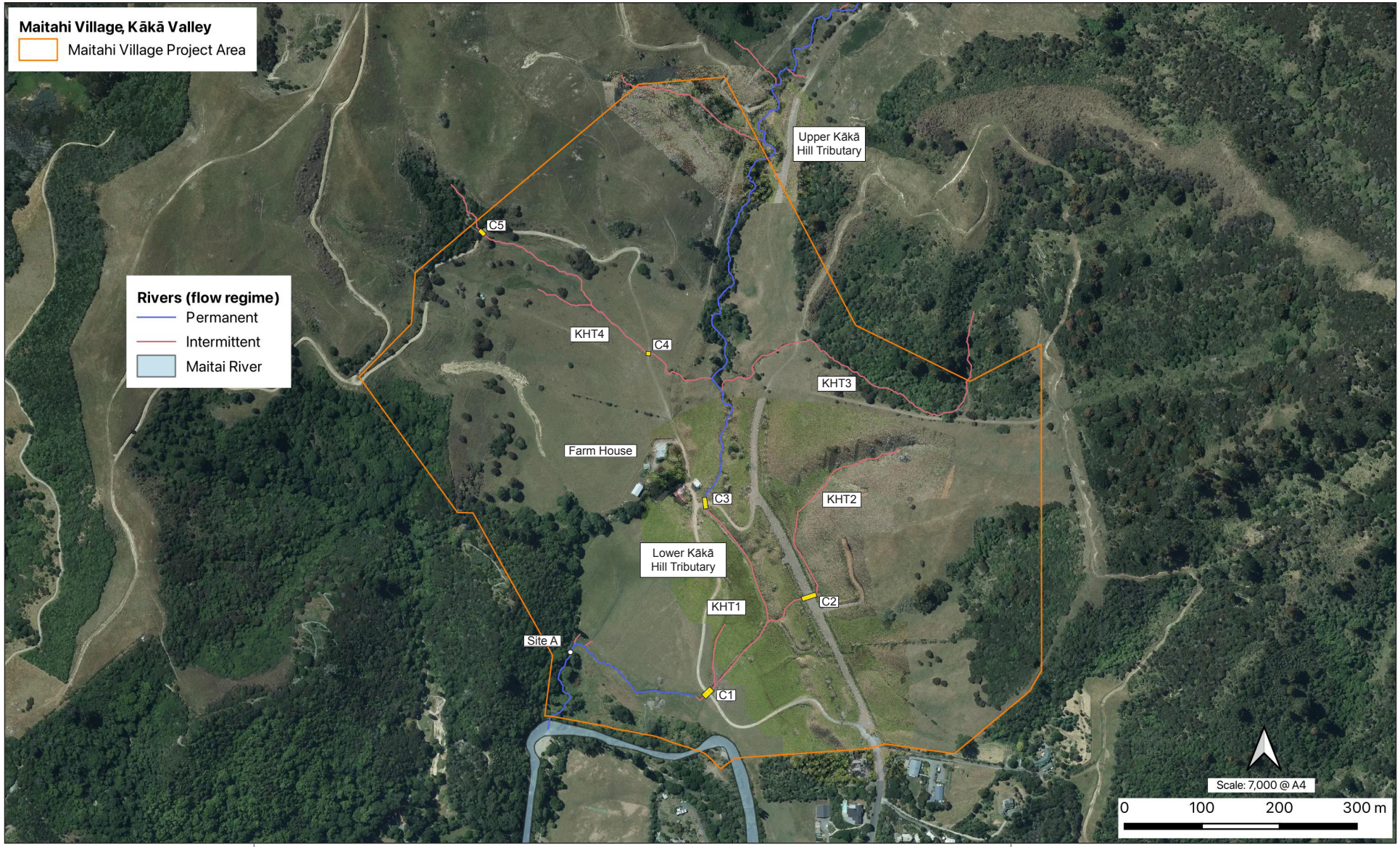

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Figure A.2. Existing watercourse survey locations, showing individual stream reaches and existing culverts C1-5 (▭) associated with Kākā Hill Tributary. General direction of in-stream water flow is from north to south across the property. Note mapped permanent and intermittent stream reaches meet the RMA (Part 1, Section 2) and NPS-FM/NES-F definition of a 'river'. Source: Adapted from REL EcIA Report (Feb 2025).

PROJECT: MAITAHI VILLAGE, KĀKĀ VALLEY

Existing Watercourses

| Date: 29 Jan 2025 | Revision: A | Aerial: UAV May 24, LINZ 0.075m (22)
Plan map prepared for CCKV by Robertson Environmental Limited

Project Manager: Ben.Robertson@robertsonenviro.co.nz

Attachment B:

Detailed SEV Results

Function	Worksheet #	Variable (code)	KHT1 Current	KHT2 Current	KHT3 Current	KHT4 Current	Upper Kākā Hill Tributary Potential	KHT1 Realignment Potential	KHT3/KHT4 Realignment Potential
		Vchann	0.11	0.10	0.46	0.46	0.57	0.54	0.46
		Vlining	0.76	0.68	0.76	0.76	0.97	0.97	0.76
		Vpipe	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NFR		**=**	**0.33**	**0.29**	**0.56**	**0.56**	**0.70**	**0.68**	**0.56**
		Vbank	0.97	0.40	0.97	0.97	0.99	0.99	0.97
		Vrough	0.20	0.12	0.20	0.20	0.48	0.48	0.15
FLE		**=**	**0.19**	**0.05**	**0.19**	**0.19**	**0.47**	**0.47**	**0.15**
		Vbarr	1.00	0.30	0.30	0.30	1.00	1.00	1.00
CSM		**=**	**1.00**	**0.30**	**0.30**	**0.30**	**1.00**	**1.00**	**1.00**
		Vchanshape	0.23	0.27	0.63	0.63	0.63	0.65	0.63
		Vlining	0.76	0.68	0.76	0.76	0.97	0.97	0.76
CGW		**=**	**0.58**	**0.54**	**0.72**	**0.72**	**0.86**	**0.86**	**0.72**
	Hydraulic function mean score		**0.53**	**0.30**	**0.44**	**0.44**	**0.76**	**0.76**	**0.61**
		Vshade	0.00	0.00	0.00	0.00	0.38	0.30	0.34
WTC		**=**	**0.00**	**0.00**	**0.00**	**0.00**	**0.38**	**0.30**	**0.34**
		Vdod	0.45	0.23	0.45	0.45	0.68	0.40	0.45
DOM		**=**	**0.45**	**0.23**	**0.45**	**0.45**	**0.68**	**0.40**	**0.45**
		Vripar	0.00	0.00	0.00	0.00	0.60	0.40	0.25
		Vdecid	1.00	1.00	1.00	1.00	0.63	0.63	0.05
OMI		**=**	**0.00**	**0.00**	**0.00**	**0.00**	**0.49**	**0.33**	**0.13**
		Vmacro	0.83	0.98	0.95	0.95	0.93	0.93	0.98
		Vretain	0.22	0.20	0.74	0.74	0.79	0.74	0.74
IPR		**=**	**0.22**	**0.20**	**0.74**	**0.74**	**0.79**	**0.74**	**0.74**
		Vsurf	0.23	0.15	0.20	0.20	0.43	0.43	0.20
		Vripfilt	0.20	0.12	0.20	0.20	0.26	0.24	0.50
DOP		**=**	**0.22**	**0.13**	**0.20**	**0.20**	**0.34**	**0.33**	**0.35**
	Biogeochemical function mean score		**0.18**	**0.11**	**0.28**	**0.28**	**0.54**	**0.42**	**0.40**
		Vgalspwn	0.57	0.45	0.00	0.00	0.00	0.00	0.00
		Vgalqual	0.25	0.00	0.00	0.00	0.00	0.00	0.00
		Vgobspwn	0.10	0.10	0.10	0.10	0.80	0.80	0.10
FSH		**=**	**0.12**	**0.05**	**0.05**	**0.05**	**0.40**	**0.40**	**0.05**
		Vphyshab	0.33	0.06	0.11	0.11	0.67	0.43	0.18
		Vwatqual	0.11	0.01	0.05	0.05	0.30	0.16	0.10
		Vimperv	1.00	1.00	1.00	1.00	0.40	0.30	0.80
HAF		**=**	**0.44**	**0.28**	**0.31**	**0.31**	**0.51**	**0.33**	**0.31**
	Habitat provision function mean score		**0.28**	**0.17**	**0.18**	**0.18**	**0.45**	**0.37**	**0.18**
		Vfish							
FFI		**=**							
		Vmci							
		Vept							
		Vinvert							
IFI		**=**							
		Vripcond	0.10	0.06	0.10	0.10	0.30	0.30	0.09
		Vripconn	0.60	0.05	0.05	0.05	0.80	0.80	0.05
RVI		**=**	**0.06**	**0.00**	**0.01**	**0.01**	**0.24**	**0.24**	**0.00**
	Biodiversity function mean score		**0.06**	**0.00**	**0.01**	**0.01**	**0.24**	**0.24**	**0.00**
		Overall Mean SEV score	**0.301**	**0.173**	**0.294**	**0.294**	**0.572**	**0.508**	**0.400**