



Pohangina and Ōroua Natural Character Index Assessment

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Table of contents

1	Introduction	1
1.1	Site context	2
1.1.1	Pohangina River	2
1.1.2	Ōroua River	5
2	Data sources for assessment	10
3	Design epochs	11
4	NCI Methodology	12
4.1	NCI Characteristics	13
5	NCI results	15
6	Discussion	34
6.1	Pohangina	34
6.2	Ōroua River	34
7	References	35
8	Applicability	36
Appendix A	NCI Results	
Appendix B	Data provided by Horizons	
Appendix C	Pohangina NCI Maps	
Appendix D	Ōroua NCI Maps	

1 Introduction

The Pohangina and Ōroua Rivers are two major river systems within the Manawatū Catchment that drain into the Manawatū River. Over time, these systems have adjusted in response to both natural and anthropogenic disturbance and direct river management intervention. However, no formal assessment has been conducted to understand the magnitude of these changes over time.

Tonkin & Taylor Ltd (T+T) have been engaged¹ by Horizons Regional Council (HRC) to provide a Natural Character Index (NCI) Assessment for sections of the Pohangina and Ōroua Rivers. The Natural Character Index assessment is valuable because it compares the pre-intervention state of these rivers with its current, post-intervention state (accounting for any changes as a result of recent extreme flood events such as the 2023 ex-Tropical Cyclone Gabrielle).

The NCI is a simple, objective means of identifying the change in a particular characteristic or parameter of the river's geomorphology. This can be built upon through a discussion of the potential drivers of this change, and by applying this index method to coherent reaches of the river with similar character.

This report covers the NCI assessment methodology, results and high-level interpretation for three separate epochs spanning a total of ~80 years.

¹ Letter of Engagement dated 9th April 2025. HRC PO#15376

1.1 Site context

1.1.1 Pohangina River

The Pohangina River is situated in the southwest of the North Island and is a tributary of the Manawatū River. The river has a length of approximately 71 kilometres, and a catchment area of approximately 551.5 km². The headwaters of the river are located in the western and southern Ruahine Ranges and eventually joins the Manawatū River at Ashhurst. The study reach of the Pohangina River is approximately 50 km long and extends from Piripiri Stream (within the Ruahine Ranges) towards the confluence of the Manawatū River. The Pohangina catchment is characterised by steep relief, with the Ruahine Ranges rising to 1568 m above sea level in the catchment (Figure 1.1). The lower terrain to the west of the Ruahines comprises dissected soft-rock hill country.

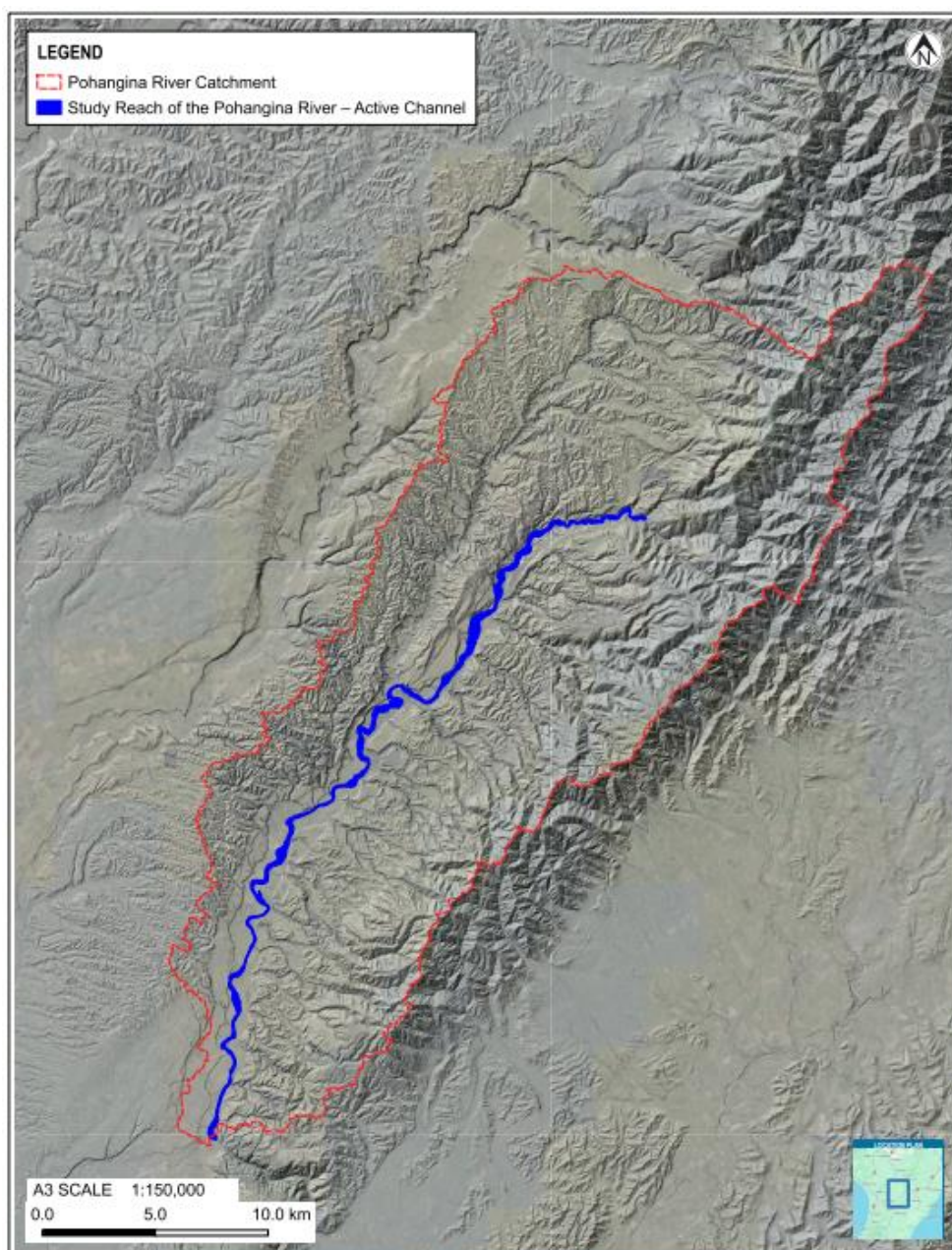


Figure 1.1: Topography of the Pohangina Catchment and surrounding area (Land Information New Zealand, 2025)

Within the study area, geological units primarily consist of sand and gravel alluvium (contemporary floodplain, Holocene and Late Pleistocene river terraces), as well as weak sedimentary sandstone (Eastern province sedimentary rock and Neogene sedimentary rock of the Whanganui Basin). Comprehensive description of lithology experienced within the study reach is outlined in Figure 1.2 below. The Ruahine Ranges border the east of the catchment and consist primarily of hard, fractured greywacke rock, which is prone to physical weathering and landslides, especially during heavy rainfall events. This process delivers the large volumes of coarse material which contributes to the river's dynamic sediment load and geomorphic character. These conditions predispose the Pohangina River to a dynamic behaviour as the river channel adjusts to variable flows (floods) and pulsed sediment (gravel) inputs.

The land use of the catchment generally consists of grassland, scrub/scrubland and indigenous forest with an urban area (Ashhurst town) at the lower portion of the catchment (Figure 1.3).

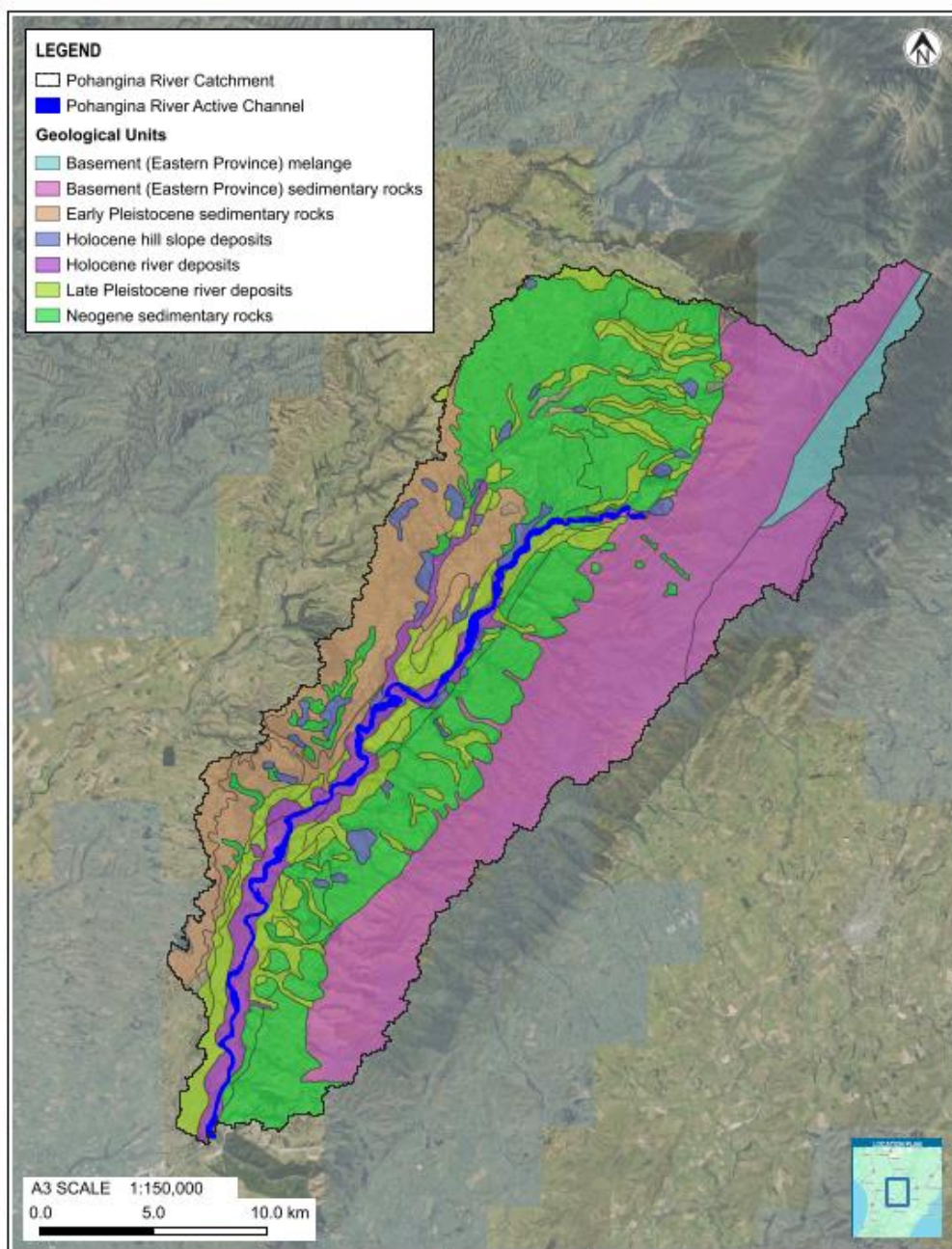


Figure 1.2: Geological Units within the Pohangina River Catchment (Heron, 2023)

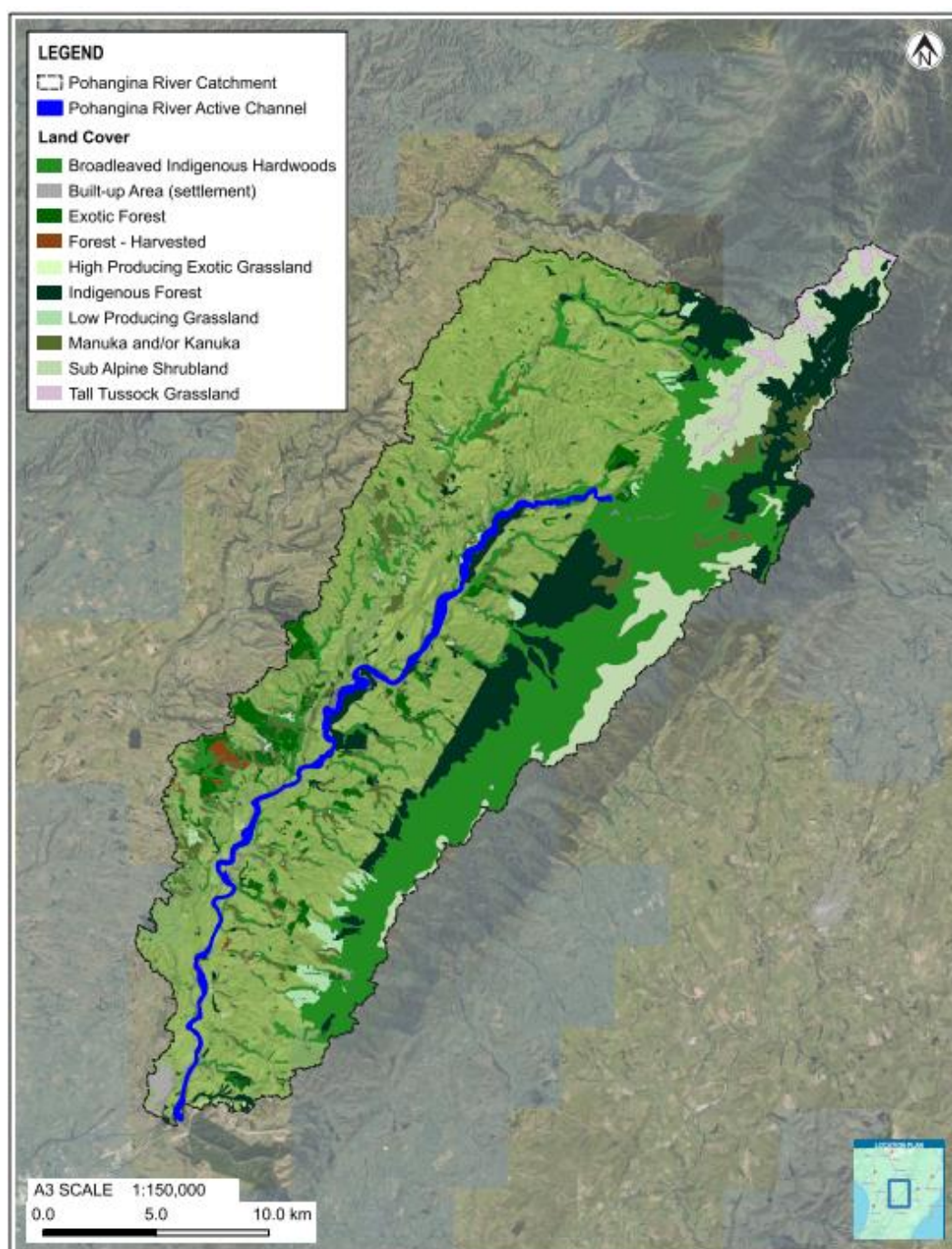


Figure 1.3: Land Cover of the Pohangina River Catchment (Landcare Research, 2024).

For the purpose of this NCI assessment, the Pohangina River has been classified into eleven discrete coherent geomorphic reaches, based on spatial consistency of their geomorphology, to improve the sensitivity of NCI assessment and ensure key changes to river character are highlighted when present. Reaches were partitioned using the earliest aerial imagery available, and the same reaches were used throughout the assessment. Reach locations and descriptions are outlined in (Figure 1.4).

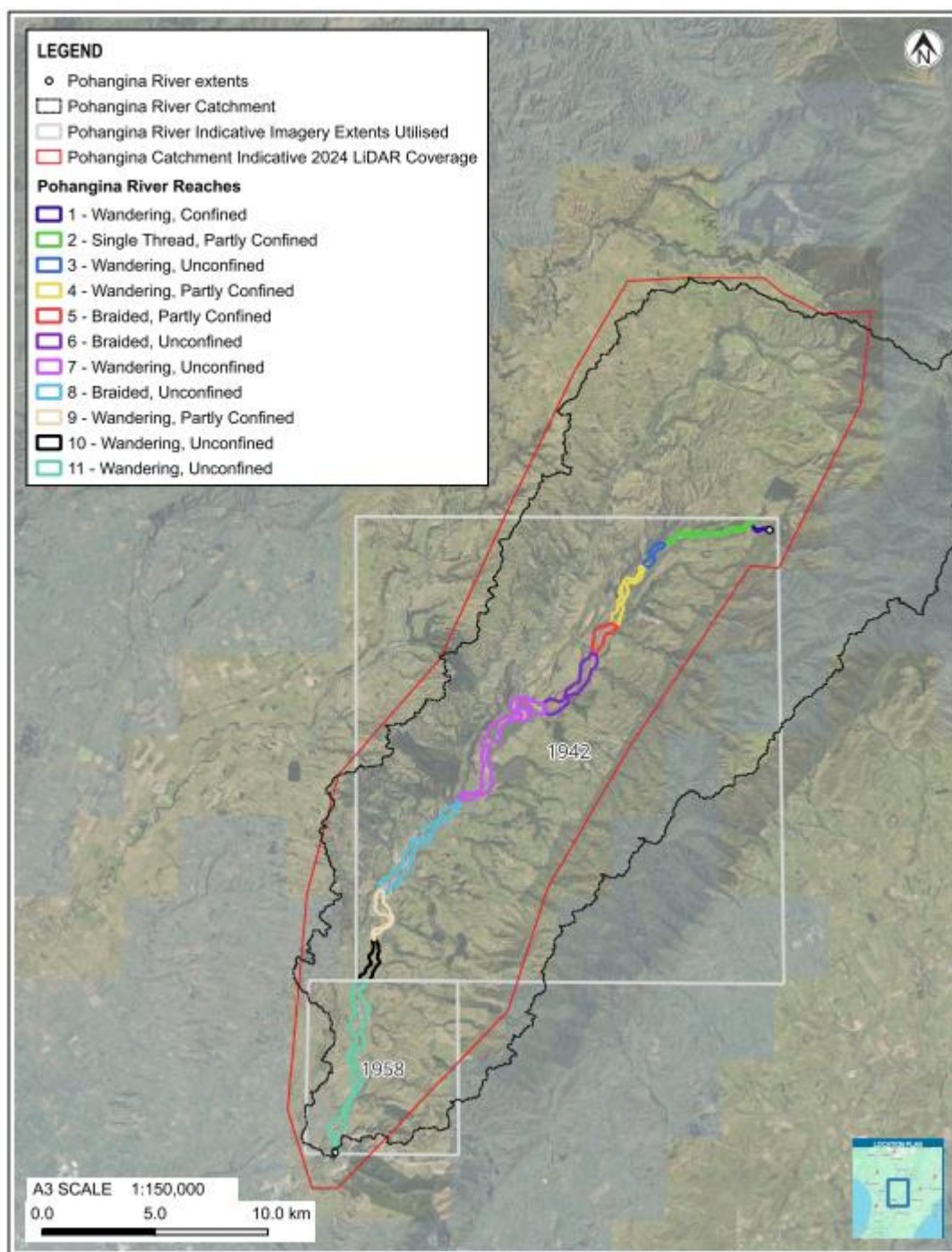


Figure 1.4: Reaches of the Pohangina River and extent of historical aerial imagery and 2024 LiDAR coverage.

1.1.2 Ōroua River

The Ōroua River is also situated in the southwest of the North Island and is also a tributary to the Manawatū River. The river has a length of approximately 141 kilometres, and a catchment area of approximately 903 km². The headwaters of the river are located in the western Ruahine Ranges, from here the river flows southwest through Feilding and eventually joins the Manawatū River at Rangiotu between Palmerston North and Shannon. The study reach of the Ōroua River is approximately 115 km long and extends from Umutoi Creek (within the Ruahine Ranges), towards the confluence of the Manawatū River. The upper Ōroua catchment is characterised by steep relief, with the Ruahine Ranges rising to 1695 m above sea level in the catchment (Figure 1.5). Beyond the

Ruahines, mid-catchment the Ōroua drains dissected soft-rock hill country. The lower catchment is characterised by low relief of the Taonui basin.

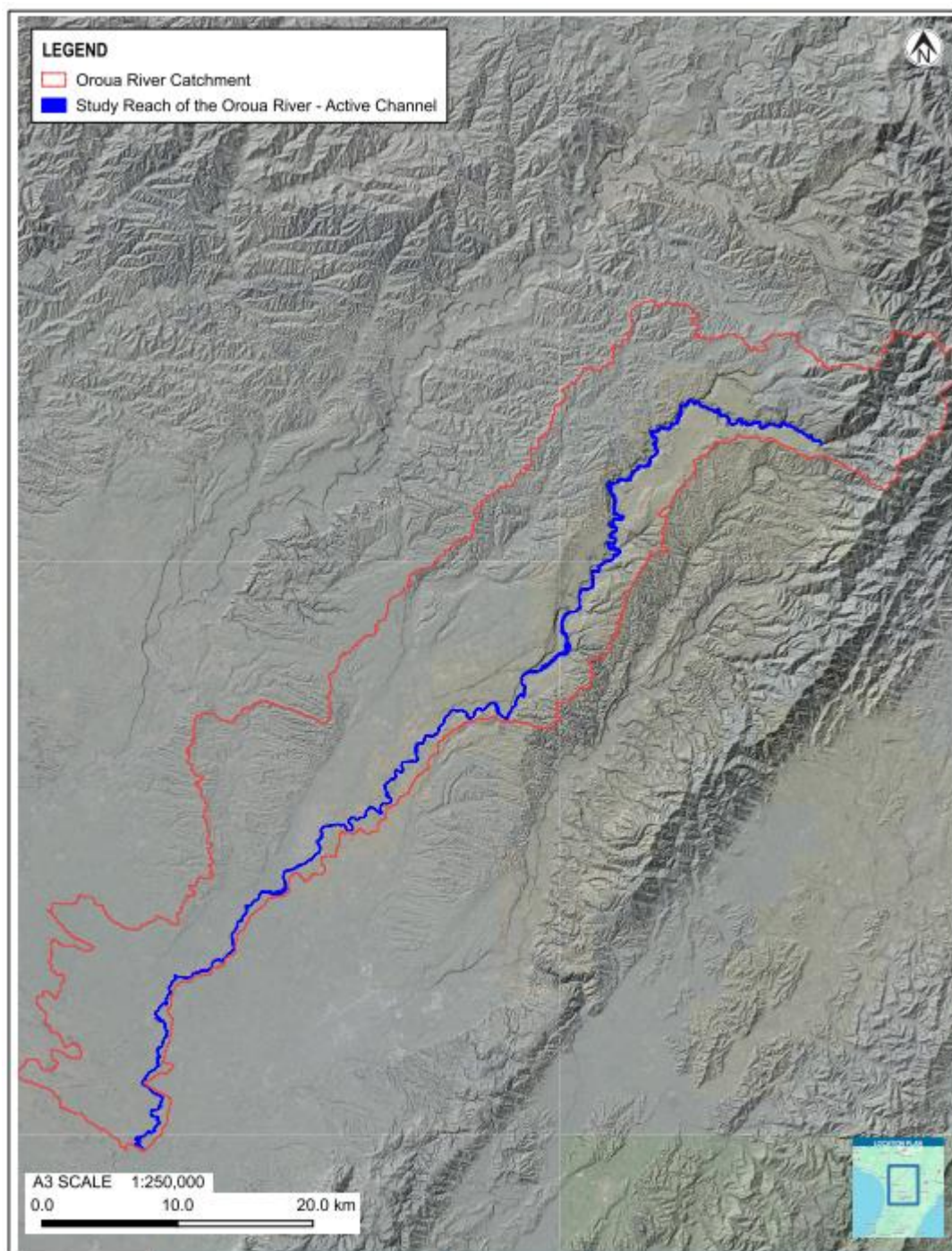


Figure 1.5: Topography of the Ōroua Catchment and surrounding area (Land Information New Zealand, 2025).

Geological units within the study reach primarily consist of sand and gravel alluvium (contemporary floodplain, Holocene and Late Pleistocene river terraces), as well as weak sedimentary sandstone (Eastern province sedimentary rock and Neogene sedimentary rock of the Whanganui Basin). The Taonui basin is a drained swamp, comprising peats and sands, and the south-western catchment drains coastal dune field (sand country). Comprehensive description of lithology experienced within the study reach is outlined in Figure 1.6 below. A significant portion of Ōroua sediment originates from the river's headwaters in the greywacke-dominated Ruahine Ranges. These ranges consist

primarily of hard, fractured greywacke rock, which is prone to physical weathering and landslides, especially during heavy rainfall events. This process delivers large volumes of coarse material—ranging from gravel to boulders—into the upper reaches of the river, where it is transported downstream and contributes to the river’s dynamic sediment load and geomorphic character. These conditions predispose the Ōroua River to a dynamic behaviour as the river channel adjusts to variable flows (floods) and pulsed sediment (gravel) inputs. A gravel-sand transition is noted to occur within the lower reaches (see Figure 1.6).

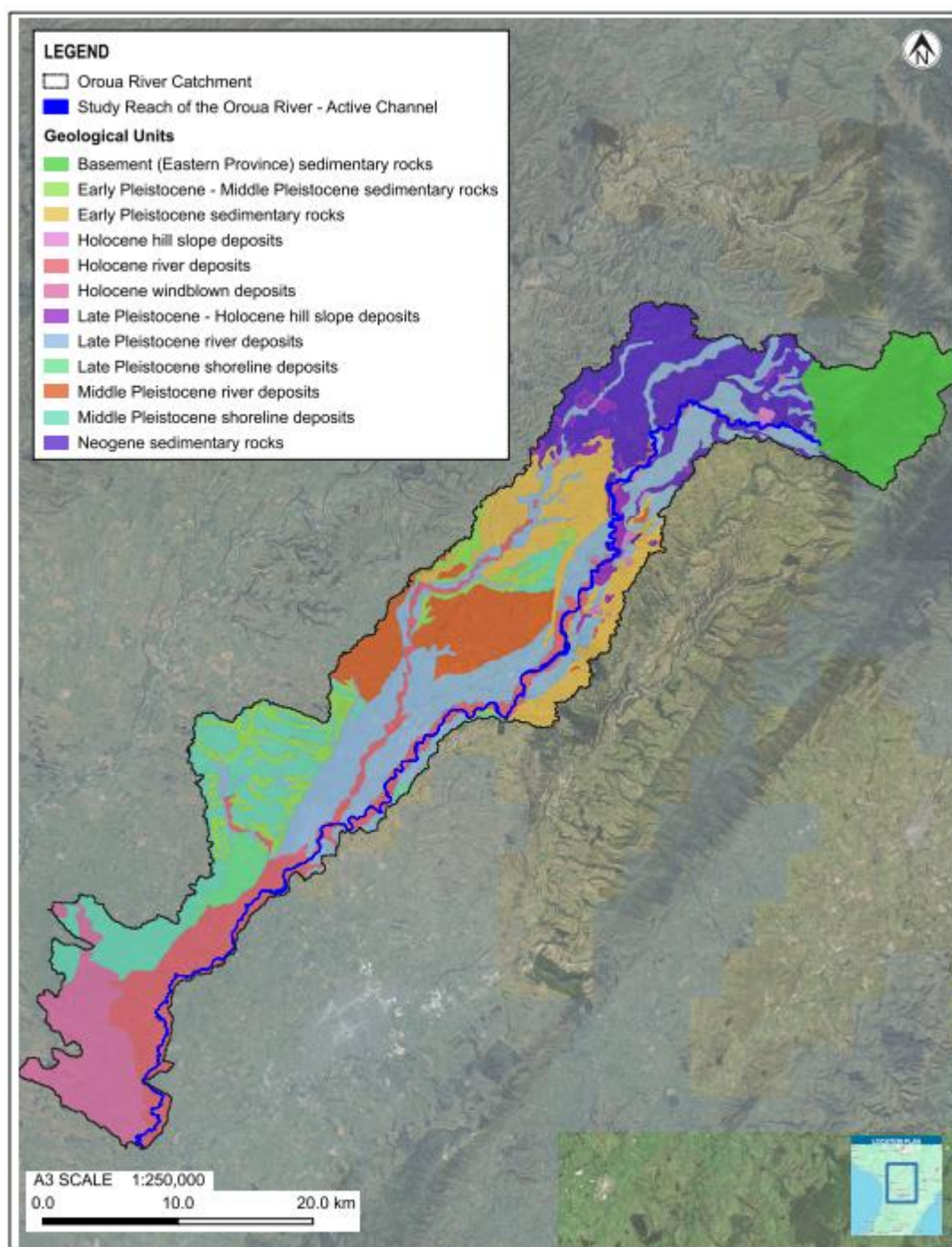


Figure 1.6: Geological Units within the Ōroua River Catchment (Heron, 2023).

The land use of the catchment is similar to the Pohangina and generally consists of high producing exotic grassland, some short-rotation cropland, and indigenous forest within the Ruahine Ranges, with an urban area (Feilding town) at the mid to lower reach of the Ōroua (Figure 1.7).

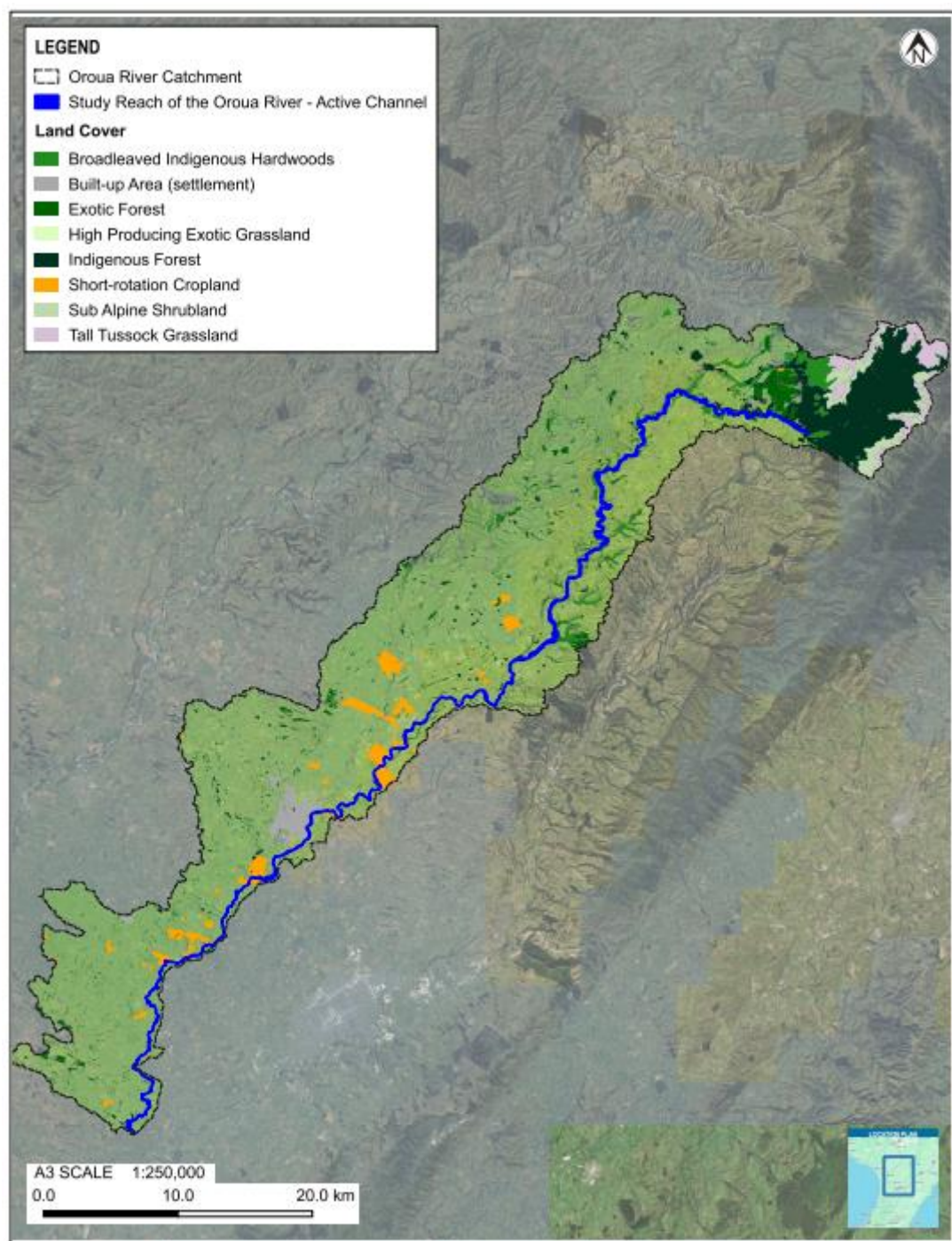


Figure 1.7: Land Cover of the Ōroua River Catchment (Landcare Research, 2024)

For the purpose of this assessment, the Ōroua River has been classified into eight coherent geomorphic reaches (Figure 1.8). Reaches were partitioned from the earliest aerial imagery available, and the same reaches were used throughout the assessment. Reaches were further divided when different aerial imagery sets informed the NCI digitising. The form and confinement of the resulting classified historic reaches are illustrated in Figure 1.8.

Flood stop bank systems have been installed on either side of the Ōroua River, downstream of Feilding town (reaches 5-8). Given these structures have been installed to artificially confine the floodplain and not the channel itself, we considered the river at these locations to be naturally unconfined.

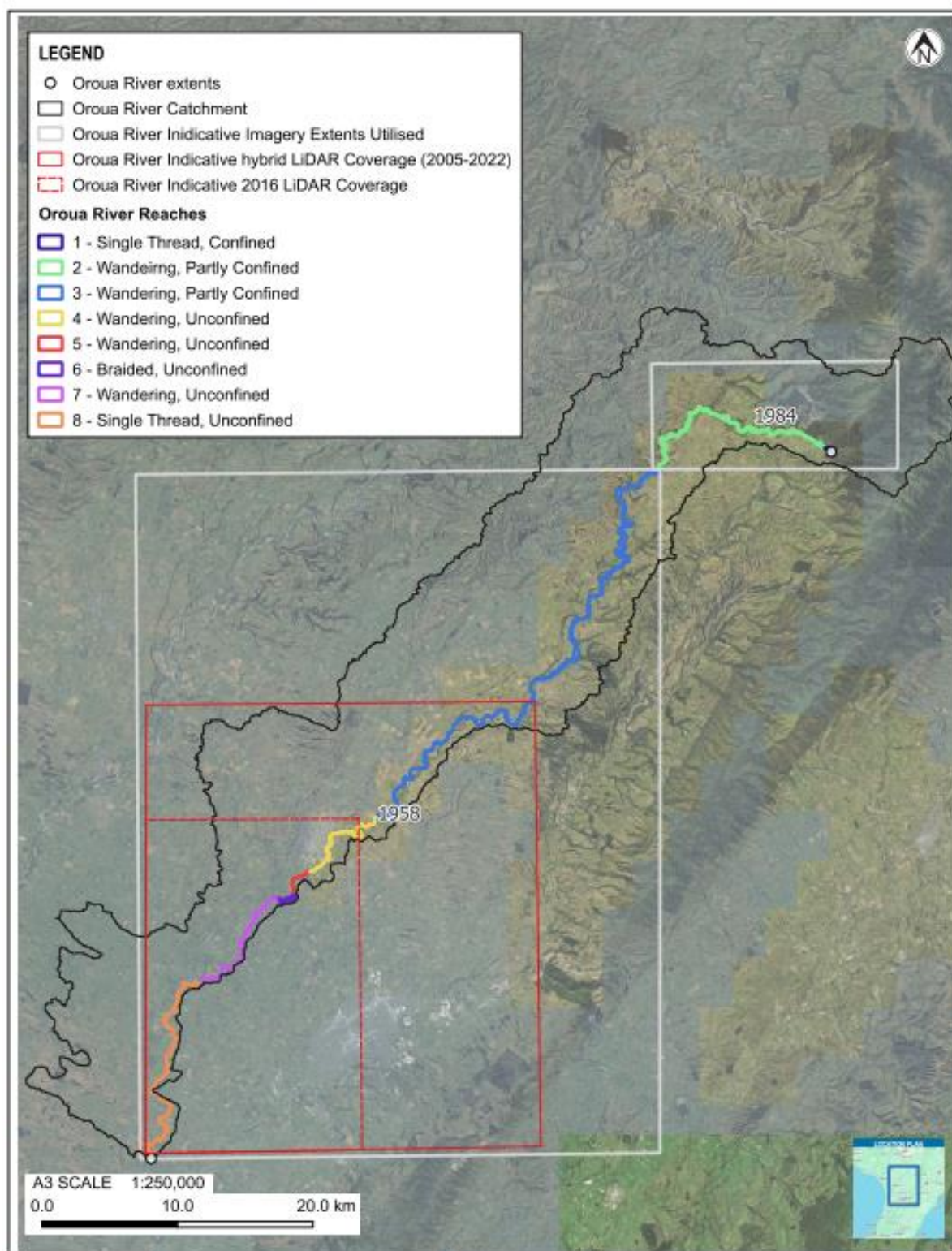


Figure 1.8: Reaches of the Ōroua River and extents of historical aerial imagery and LiDAR coverage.

2 Data sources for assessment

The following data were requested and provided by HRC to complete the NCI assessment (Table 2.1).

The extent of historic aerial surveys provided were noted to vary over the study reaches, with the majority of older aerial surveys only partially covering the required area and more recent surveys providing a fuller coverage. To ensure continuity in application of characteristics, historical and recent aerial imagery surveys with the most extensive coverage were utilised for the assessment. The extents of all surveyed imagery and elevation models are included in Appendix B.

Table 2.1: Data provided to T+T by HRC, May 2025

Pohangina	Ōroua
Aerial imagery • 1942 (middle extent) • 1958 (lower and middle extent) • 1961 (upper extent) • 1974 (upper and middle extent) • 1979 (lower extent) • 1983 (Majority extent) • 1999 (full extent) • 2001 (Lower extent) • 2005 (full extent) • 2011 (full extent) • 2016 (full extent) • 2021 (full extent) • 2024 (full extent) Elevation models • Pohangina 2024 (collected Jan - May 2024)	Aerial imagery • 1937 (lower extent) • 1942 (middle extent) • 1958 (majority extent) • 1961 (upper extent) • 1974 (Full extent) • 1979 (lower extent) • 1980 (middle extent) • 1982 (middle extent) • 1983 (middle extent) • 1984 (upper extent) • 1999 (upper and middle extent) • 2001 (Lower extent) • 2005 (full extent) • 2011(full extent) • 2016 (full extent) • 2021 (full extent) • 2024 (Upper and middle extent) Elevation models • Ōroua Corridor 2016 DEM (collected July 2016) • Ōroua Hybrid DEM (Collected 2005-2022) • Imagery-derived DSM (collected March 2016-April 2017. Not LiDAR based.)

3 Design Epochs

NCI characteristics would normally only assess coherent geomorphic reaches as outlined in sections 1.1.1 and 1.1.2 above, which have similar features and are identified to reflect diversity in dominant bed features and anthropogenic modification. However, because the availability of continuous historic aerial imagery is incomplete, this NCI assessment has also been guided by the historic aerial imagery Epochs (timelines) in addition to reach geomorphology.

Three design Epochs were defined and assessed as part of the NCI assessment. These relate to:

- 1 Earliest complete aerial imagery (varies) up to 2021 – The intention of this Epoch is to detect any changes to river characteristics between the earliest and most contemporary state.
- 2 2021 up to 2024 – The intention of this Epoch is to detect discrete impacts on river characteristics within both the Ōroua and Pohangina from ex-Tropical Cyclone Gabrielle.
- 3 Earliest complete aerial imagery (varies) up to 2024 – The intention of this Epoch is to detect any changes to river characteristics between the pre intervention state (“natural”) and post intervention state following Cyclone Gabrielle to understand whether a large event such as Cyclone Gabrielle moved the river towards pre-management form.

For the Pohangina River, historical aerial survey was found to be patchy with no single survey providing full coverage of the study reach. As such, historical analysis of the pre-intervention state within the Pohangina was split into two distinct temporal segments, relating to aerial imagery from 1942 and 1958.

The imagery from 1942 was used for the NCI assessment for the upper and middle portion of the Pohangina from the Ruahine Forest Park to the south of Raumai Reserve downstream. The imagery from 1958 was used for the NCI assessment of the lower Pohangina from the same position below Raumai Reserve to the confluence of the Manawatū River (see Figure 1.4). Aerial imagery covering the full study reach was available in 2021 and subsequently 2024 .

It should be noted that during the fifteen years from 1942 to 1958, the Pohangina River experienced several severe flood events (NIWA, 2024) that may have had the potential to change river characteristics within the NCI assessment. Completing the historical NCI assessment in two segments avoids complications arising from these differences in dates.

For the Ōroua River, historical aerial survey was also noted to be patchy with no single survey providing full coverage of the study reach. As such, historical analysis of the pre-intervention state within the Ōroua has been split into two distinct temporal segments, relating to aerial imagery from 1958 and 1984.

The imagery from 1958 was used for the NCI assessment for lower, middle and most of the upper portion of the Ōroua from the confluence with the Manawatū to the township of Āpiti, with 1984 imagery used for the remainder (see Figure 1.8). There is a small section of overlap between the 1958 and 1984 imagery. An NCI calculation was completed within the overlapped segment of these two data sets to identify any significant changes in river character, with results showing minor to no difference in active channel width. The earlier imagery from 1958 was therefore used within this overlap section.

Historic aerial imagery from 1974 was provided for this catchment and was considered as an option to substitute imagery required for the missing upper portion of the Ōroua (approx. 25 km). However, imagery contained patches of high cloud cover, hindering the digitisation of active channel required for the NCI assessment. The imagery from 1984 was therefore selected and used for the NCI

assessment for this remaining upper portion. Aerial imagery covering the full study reach was available in 2021 and subsequently 2024².

It should be noted that the upper portion of the Ōroua River may also have changed in the twenty-six years from 1958 to 1984. Ōroua River has experienced several severe flood events such as the August 1965 flood events (NIWA, 2024) that may have had the potential to change river characteristics. Completing the historical NCI assessment in separate segments corresponding to the different years of aerial imagery avoids potential complications arising from these differences in dates. Table 3.1 outlines the Epochs that have been assessed for the Pohangina and Ōroua River.

Table 3.1: Design Epoch for Pohangina Ōroua River NCI assessment

Epoch	Pohangina	Ōroua
1	1942/1958 - 2021	1958/1984 - 2021
2	2021-2024	2021-2024
3	1942/1958 -2024	1958/1984 -2024

4 NCI Methodology

Assessment of the river character and its change over time (e.g. 1958 to 2024) were completed using a Natural Character Index (NCI) approach. This approach provides an assessment of long-term changes of key river characteristics. The NCI was introduced as a tool for preliminary assessment of the extent of change in river character by Fuller, et al. (2021). The NCI is produced by calculating areas of mapped characteristics from earliest available, geo-rectified, aerial imagery. These characteristics are compared to those mapped using the most recent aerial imagery. The same approach was used for the Rangitikei River in a report to HRC by Fuller & Conley (2023), the Lower Manawatū by T+T (2024) and the Mangatainoka by T+T (2024). The following method has been replicated from the aforementioned T+T reports and adapted where required.

Quantifying changes in river character using the NCI typically involves generating a ratio of 'observed' i.e., contemporary geomorphic units, over 'expected', i.e., the nature of corresponding geomorphic units in the earliest imagery (Fuller et al., 2021). Considering the resolution of aerial imagery, the NCI approach is best suited to assessing changes in larger sub-aerial geomorphic features e.g., gravel bars, as opposed to more nuanced changes in subaqueous features such as pools and riffles (Fuller, et al., 2021). Following mapping, areas of these river characteristics are assessed using the NCI ratio. If no change has occurred, the ratio will be 1.00. If a reduction in the parameter has occurred, then the ratio will be less than 1.00. Conversely, if there has been an increase in the parameter, i.e., the area has increased, the ratio will exceed 1.00.

An example of generating an NCI ratio can be demonstrated for the Kawhatau active channel reported by Fuller and Conley (2023):

$$NCI \text{ active channel area} = \frac{\text{Area in 2021}}{\text{Area in 1952}} = \frac{208 \text{ ha}}{247 \text{ ha}} = 0.84$$

This result indicates a 16% reduction in active channel area along the Kawhatau between 1952 and 2021 (Fuller and Conley, 2023).

² High resolution (0.2m) imagery was only available for upper and middle portion of the Ōroua River. Lower resolution imagery was used for the lower reaches in areas where high resolution imagery was unavailable

It should be noted that the extent of wetted channels in a reach is flow dependent. Parameters that are affected by flow conditions (e.g., area or length of wetted channels, and area of bare gravel surfaces (bars)) will be dependent on river flow at the time of aerial imagery acquisition, resulting in some fluctuation in the NCI for these parameters. Thus, the NCI results are only an approximation and provide a first-cut overview of any larger-scale changes in channel characteristics (Fuller, et al., 2021).

For the imagery used, the wetted channel, unvegetated bar area, lightly vegetated bar area, and densely vegetated bar area were all digitised to polygonal areas, allowing for a calculation of total area covered by each mapped parameter. The NCI was calculated by dividing the mapped area of a channel component in the most recent imagery, by the area in the earliest imagery. This index is calculated for each of the four channel components, and for the active channel (the sum of the four components). An index was also calculated for sinuosity and active floodplain width, using the same approach.

Accuracy of the NCI results was further refined by cross-checking with the most recent high-resolution LiDAR Digital Elevation Model (DEM), where available. In reaches beyond the LiDAR coverage, the coarser topographical visualisation available through Google Earth was used to identify more significant areas of elevation difference to help define the extent of the river corridor.

LiDAR DEM for the entire study reach of the Pohangina was captured in 2024 and therefore was particularly useful for the contemporary channel mapping to indicate differences in elevation along the river corridor that delineate the active channel (including changes as a result of Cyclone Gabrielle). Earlier LiDAR DEM for the Pohangina was not available and therefore were not used to cross-reference earlier time periods.

LiDAR for the lower and middle part of the Ōroua study reach were captured by Horizons over a period of 2005 to 2022 and compiled to create a single DEM. This was then used to cross-reference contemporary channel mapping within the lower and middle parts. A subsequent imagery derived digital surface model (DSM) was created by Horizons using photogrammetry of 2016 aerial imagery and extended the full length of Ōroua study reach. This was once again used to provide a high-level check on channel mapping where available. Earlier LiDAR DEM for the area was not available.

4.1 NCI Characteristics

For the NCI assessment, several characteristics were mapped for the lengths of both the Pohangina and Ōroua Rivers. These were mapped from 1942, 1958, 1984, 2021 and 2024 aerial imagery using QGIS, from which two sets of shapefile polygons were generated to calculate the NCI values. These shapefiles will be provided to HRC as part of this package of work.

There is some uncertainty in the NCI, introduced by natural variances in flow, vegetation density, geo-rectification, and colour rectification in the imagery. Within the 1942-1984 black-and-white imagery, some features were difficult to distinguish from each other, notably the margins of the river corridor where LiDAR coverage was lacking. More accuracy of the NCI assessment has been enabled by the colour imagery of 2021 and 2024, further refined where LiDAR was available.

The following characteristics, listed below, were mapped:

- **Active channel area:** the zone of the current river floodplain interpreted as being actively or recently reworked by the river channel. This is the sum of the wetted channel and all bar areas, but excludes any cultivated land, mature forest, or developed land that would otherwise have been within the river corridor.
- **Wetted channel area:** area of active channel which was wet at the time of the aerial imagery. This parameter depends on an assumption that flow is approximately equivalent across both sets of imagery. It includes any side-channels, back-waters, braids, or high-flow secondary

channels that were wetted at the time of imagery. Large-scale aerial imagery as used in this work was captured at the end of the summer season during low flows, providing some consistency and allowing a reasonable comparison of wetted channel to be made. Flows were not obviously high in available imagery.

- **Total wetted channel length:** The combined length of all channel centrelines classified as wetted at the time of aerial imagery capture. This includes main channels, side channels, backwaters, and braids where surface water was visible.
- **Exposed bar area:** the area of the active channel that is exposed, with no vegetation. This is the most recently active portion of the active channel that is not wetted, where vegetation has not colonised due to repeated flooding in higher flows. These bars are depositional features, and their growth indicates active bedload accretion. However, flood flows can erode and lower sections of bars.
- **Lightly vegetated bar area:** area within the active channel with patchy or young vegetation, indicating initial colonisation or sparse growth. From aerial imagery, this was interpreted as areas with vegetation present, while exposed bed material remained visible. These areas indicate either a lack of recent high flows crossing bars, allowing vegetation colonisation, or that this part of the river corridor is becoming less active. Light vegetation growth does not prevent remobilisation of sediments during larger floods; however, it does facilitate finer sediment accretion as these sediments get trapped by the vegetation.
- **Heavily vegetated bar area:** area within the active channel where bars have become completely vegetated by grass, shrubs, or small tree growth. This does not include areas of cultivation, development, or forest. From the aerial imagery, this was interpreted as vegetated areas without visible exposed bed material, without large trees, and without signs of human cultivation or development. This also includes riparian margins, where there is a strip of vegetated land that runs alongside the river channel that was assessed as being at an equivalent level to the channel, as opposed to a steep slope adjacent to the river corridor. These bar areas are the least active part of the channel and are receive less frequent inundation. They are not yet floodplain, as they have the potential to be reworked in a particularly large flood event.
- **Active channel width:** the active channel width is defined as the active channel area divided by the length of the river centreline. This parameter accounts for changes in the river length between years.
- **River centreline length:** The length of the main or widest channel of the river, traced along its centreline. This measure excludes any side channels, backwaters, or braids, representing only the primary flow path.
- **Braid channel ratio:** A measure of channel complexity, calculated by dividing the total wetted channel length by the river centreline length. It reflects the degree of braiding within a reach, with higher values indicating more secondary channels and flow paths.
- **Sinuosity:** sinuosity is defined as the ratio between the valley length (which is taken as a constant) and the river centreline length. This helps to quantify the extent of meandering, and when compared between successive years, indicates whether the active channel has become straighter or more sinuous.

5 NCI results

A full series of NCI maps is included in Appendix C and Appendix D for the Pohangina and Ōroua Rivers, respectively. These show the areas delineated for each characteristic, comparing both historical (1942-1984) and contemporary areas (2021-2024). Figure 5.1 to Figure 5.6 and Figure 5.10 to Figure 5.15 summarise the NCI results for the identified reaches for the Pohangina and Ōroua respectively. A few NCI values significantly exceeded 2, however for simplicity, we have set 2 as the upper limiting value in the figures. Active channel composition by reach and Epoch is shown in Figure 5.7 to Figure 5.9 for the Pohangina and Figure 5.16 to Figure 5.18 for the Ōroua. Summary calculations and changes in mapped area for each NCI characteristic and Epoch are summarised in Appendix A.

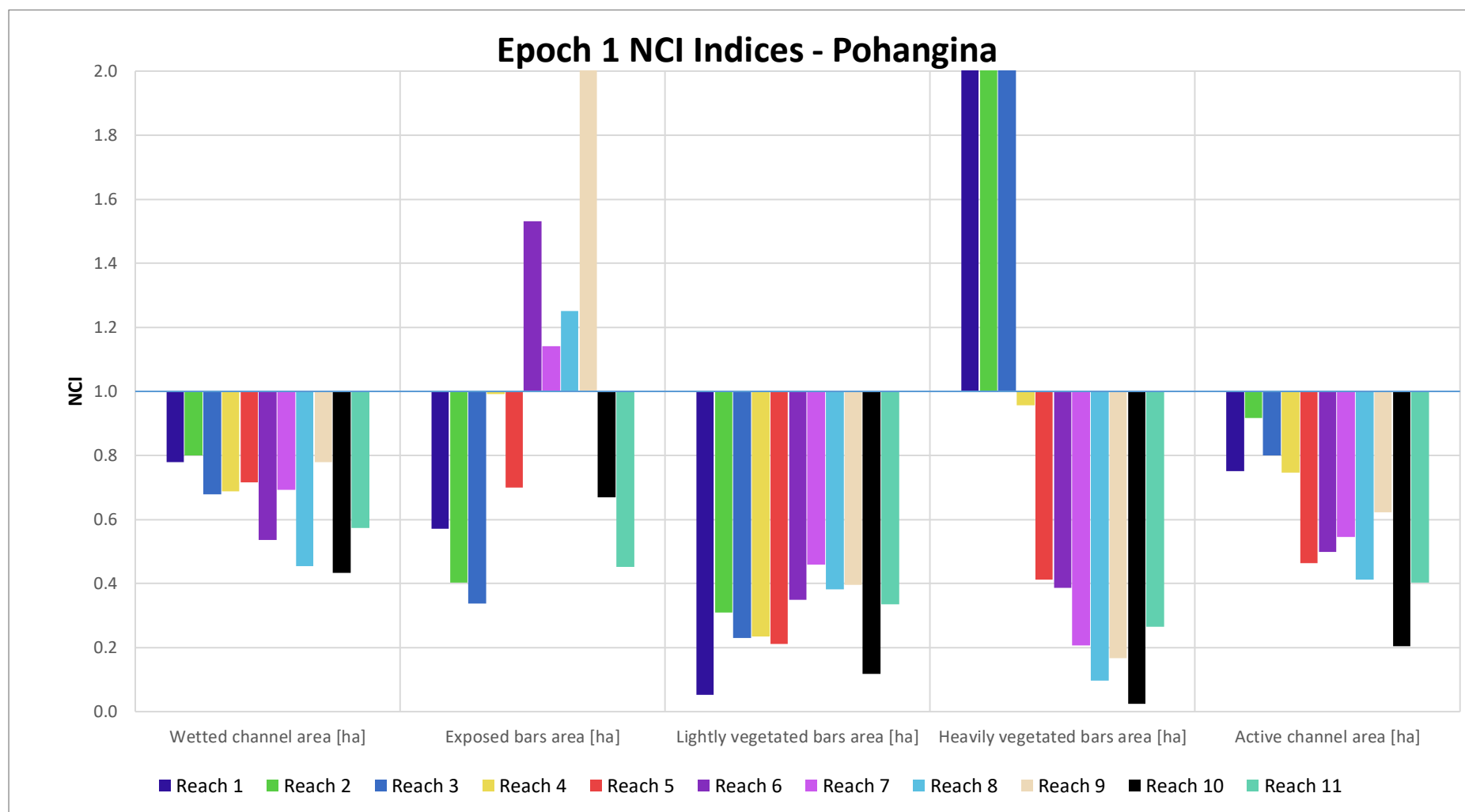


Figure 5.1: Comparison of NCI Indices for each characteristics, with 1 (no change) as the horizontal axis for Pohangina – Part One of Epoch 1

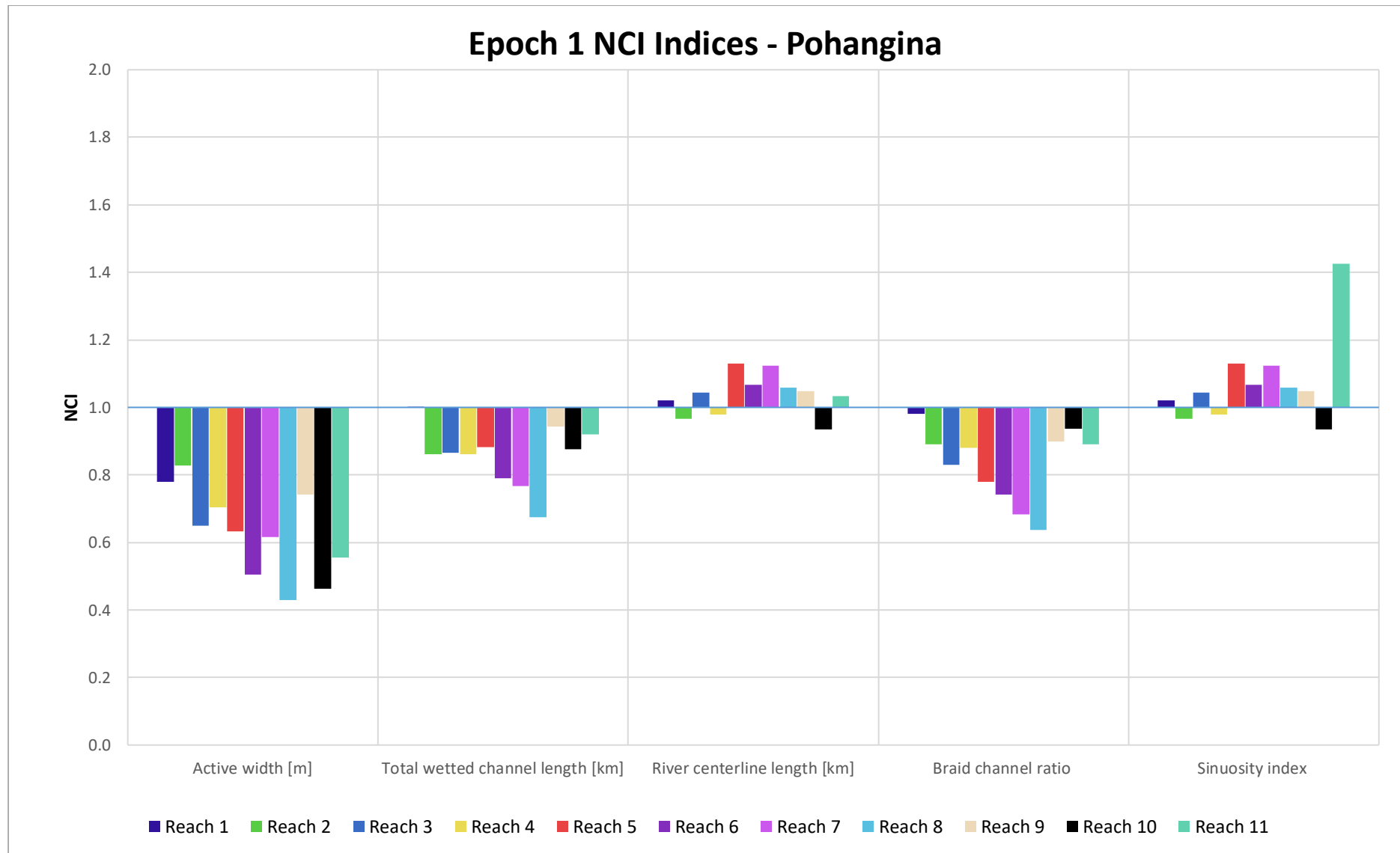


Figure 5.2: Comparison of NCI Indices for each characteristic, with 1 (no change) as the horizontal axis for Pohangina – Part Two of Epoch 1

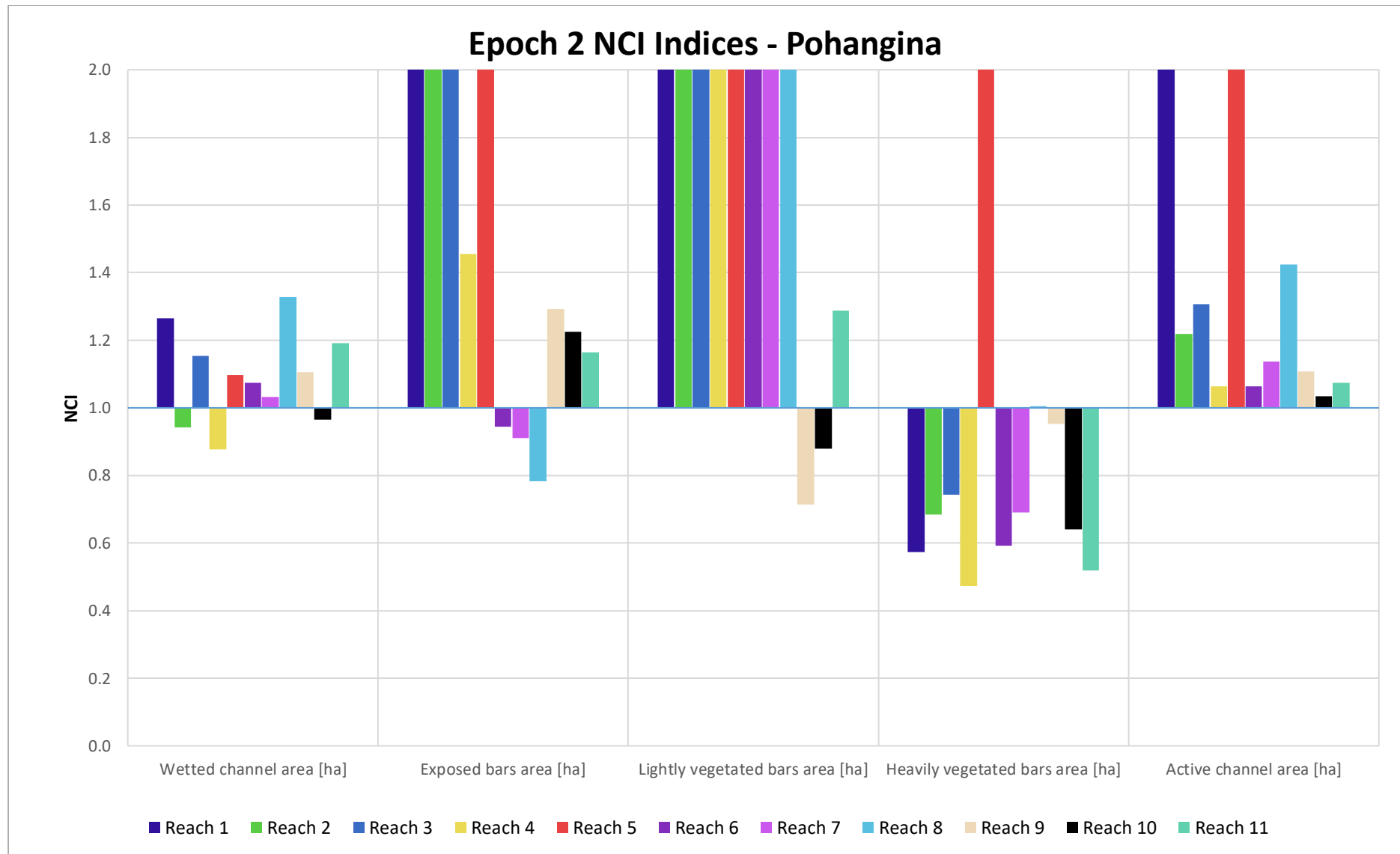


Figure 5.3: Comparison of NCI Indices for each characteristic, with 1 (no change) as the horizontal axis for Pohangina – Part One of Epoch 2

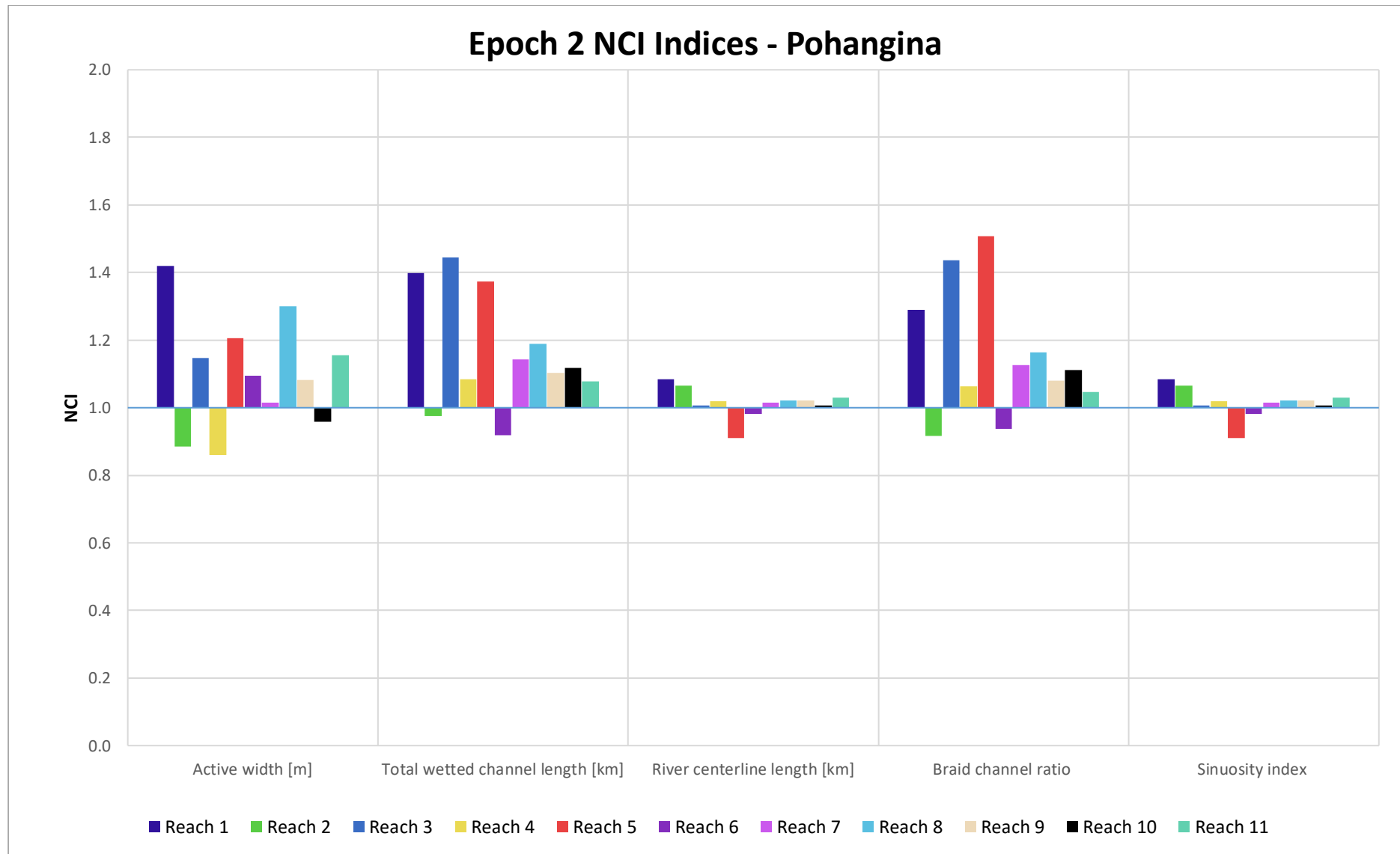


Figure 5.4: Comparison of NCI Indices for each characteristic, with 1 (no change) as the horizontal axis for Pohangina – Part Two of Epoch 2

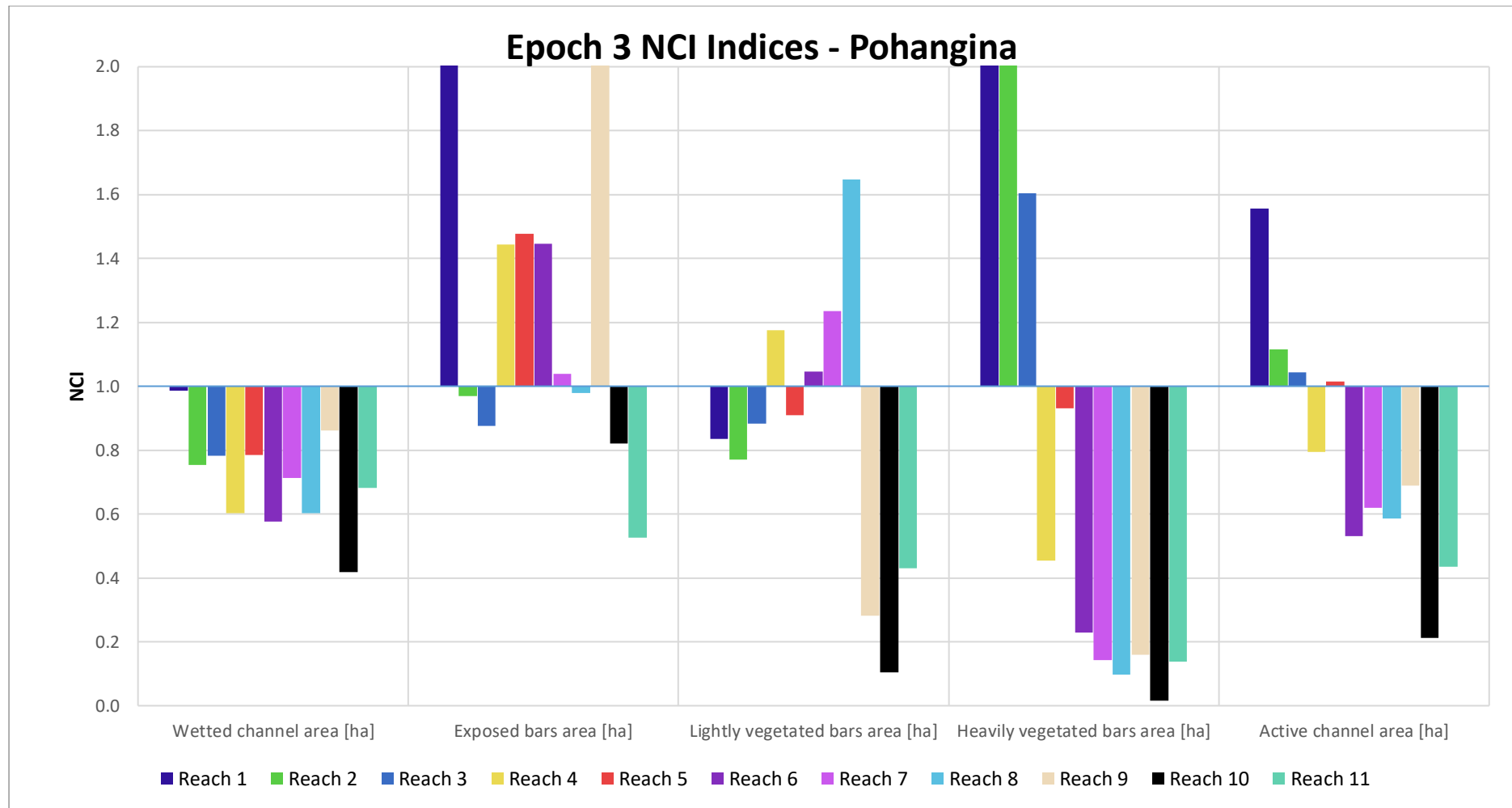


Figure 5.5: Comparison of NCI Indices for each characteristic, with 1 (no change) as the horizontal axis for Pohangina – Part One of Epoch 3

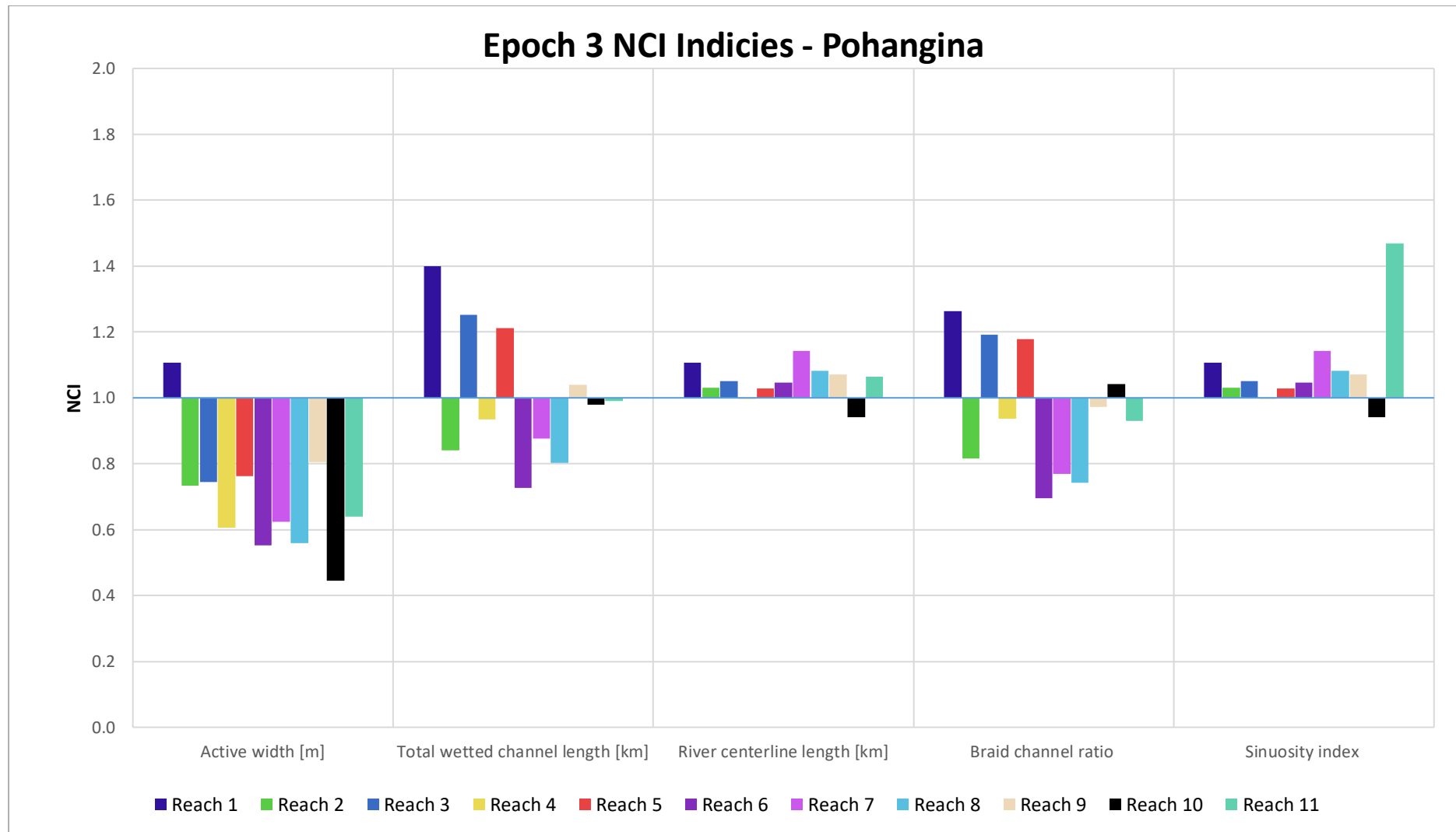


Figure 5.6: Comparison of NCI Indices for each characteristic, with 1 (no change) as the horizontal axis for Pohangina – Part Two of Epoch 3

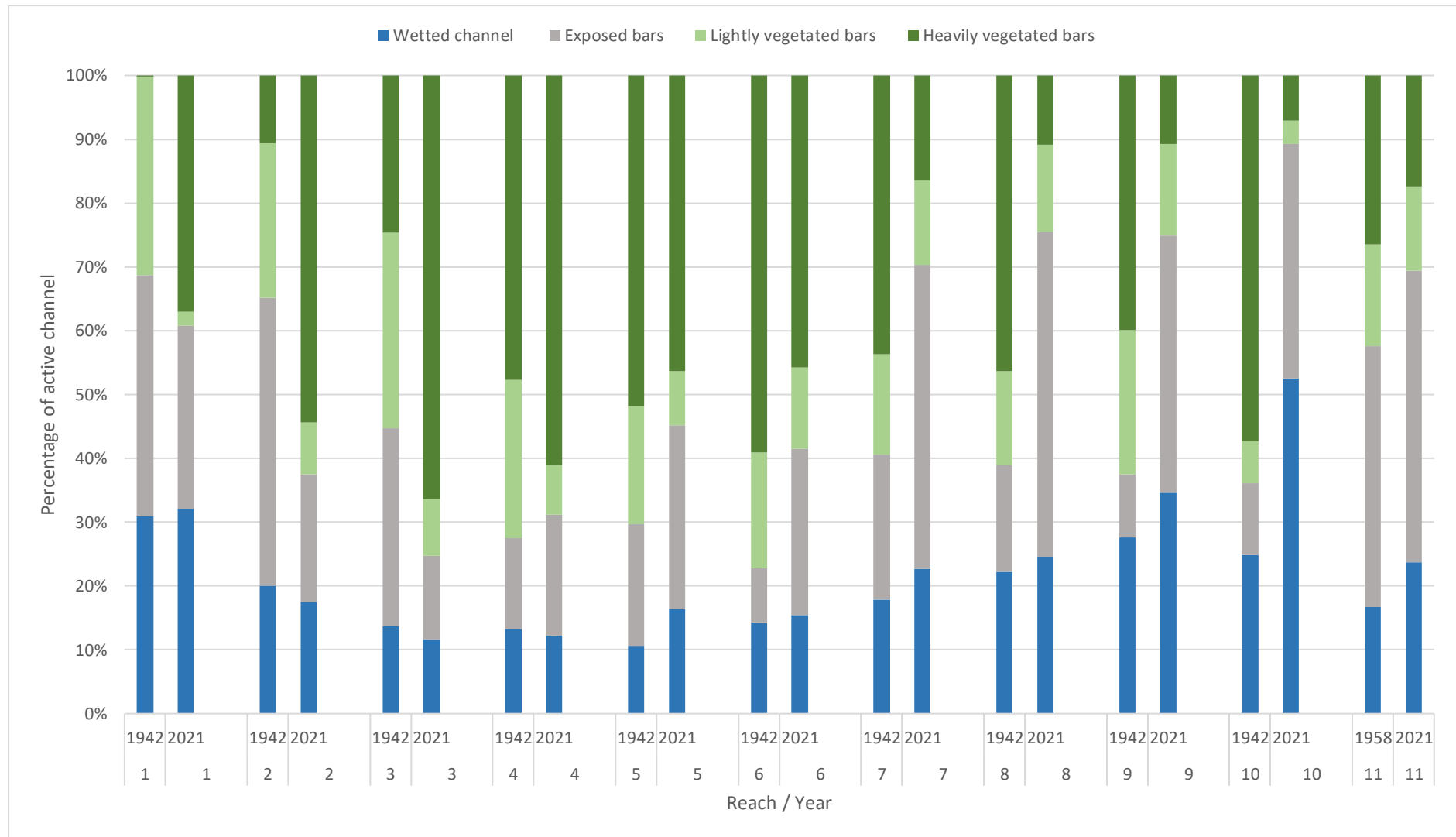


Figure 5.7: Active Channel Composition for the Pohangina River Reaches – Epoch 1.

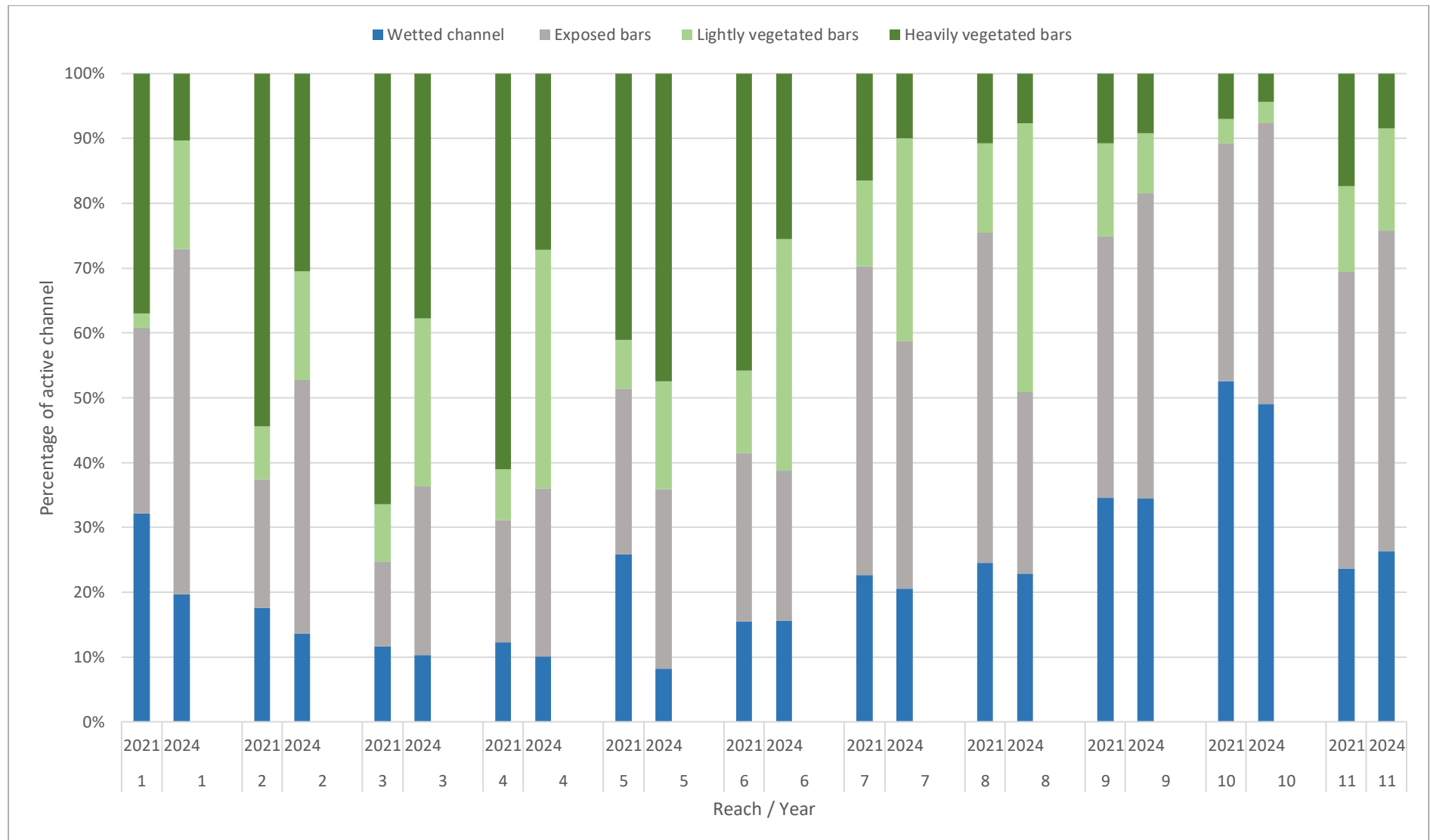


Figure 5.8: Active Channel Composition for the Pohangina River Reaches – Epoch 2.

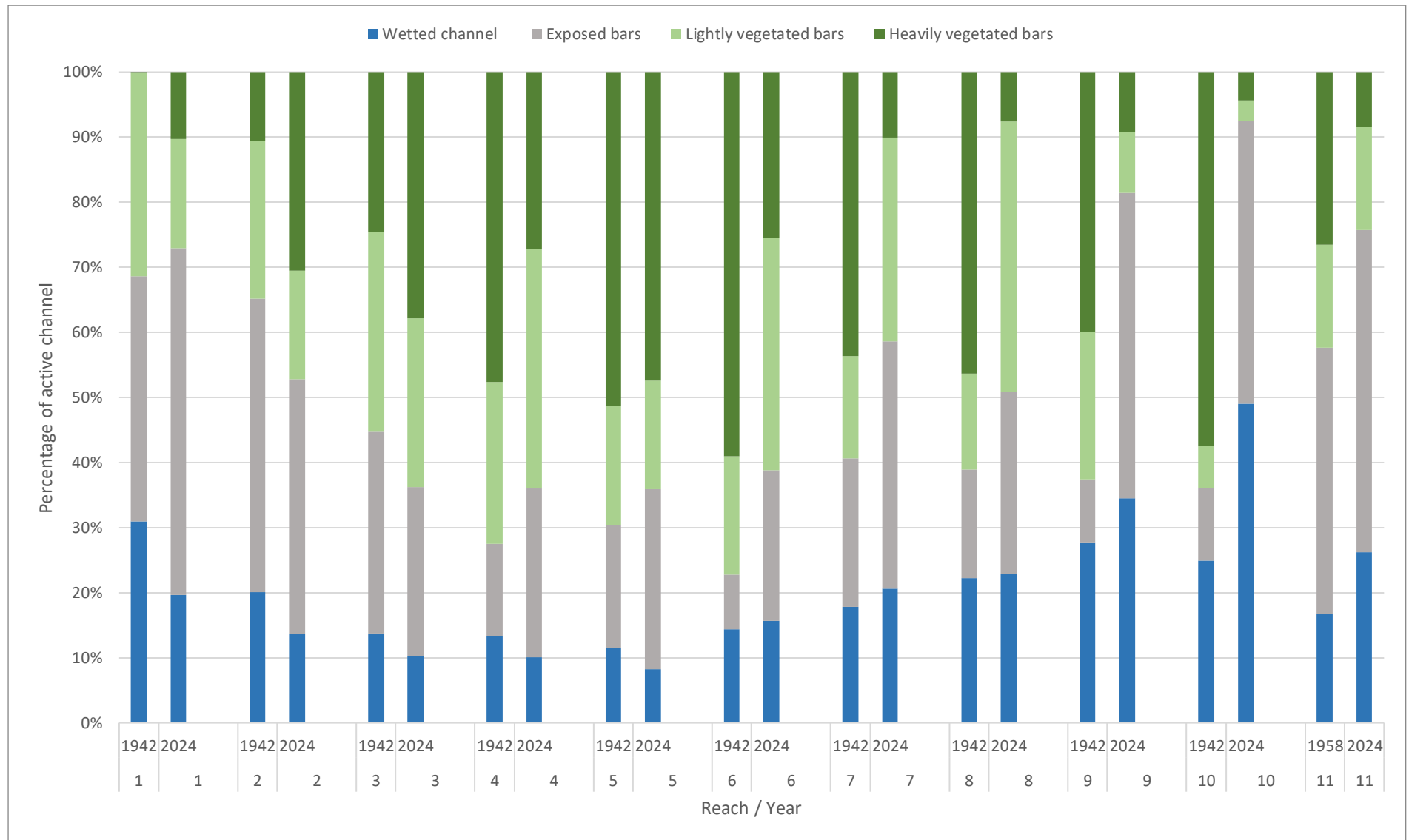


Figure 5.9: Active Channel Composition for the Pohangina River Reaches – Epoch 3

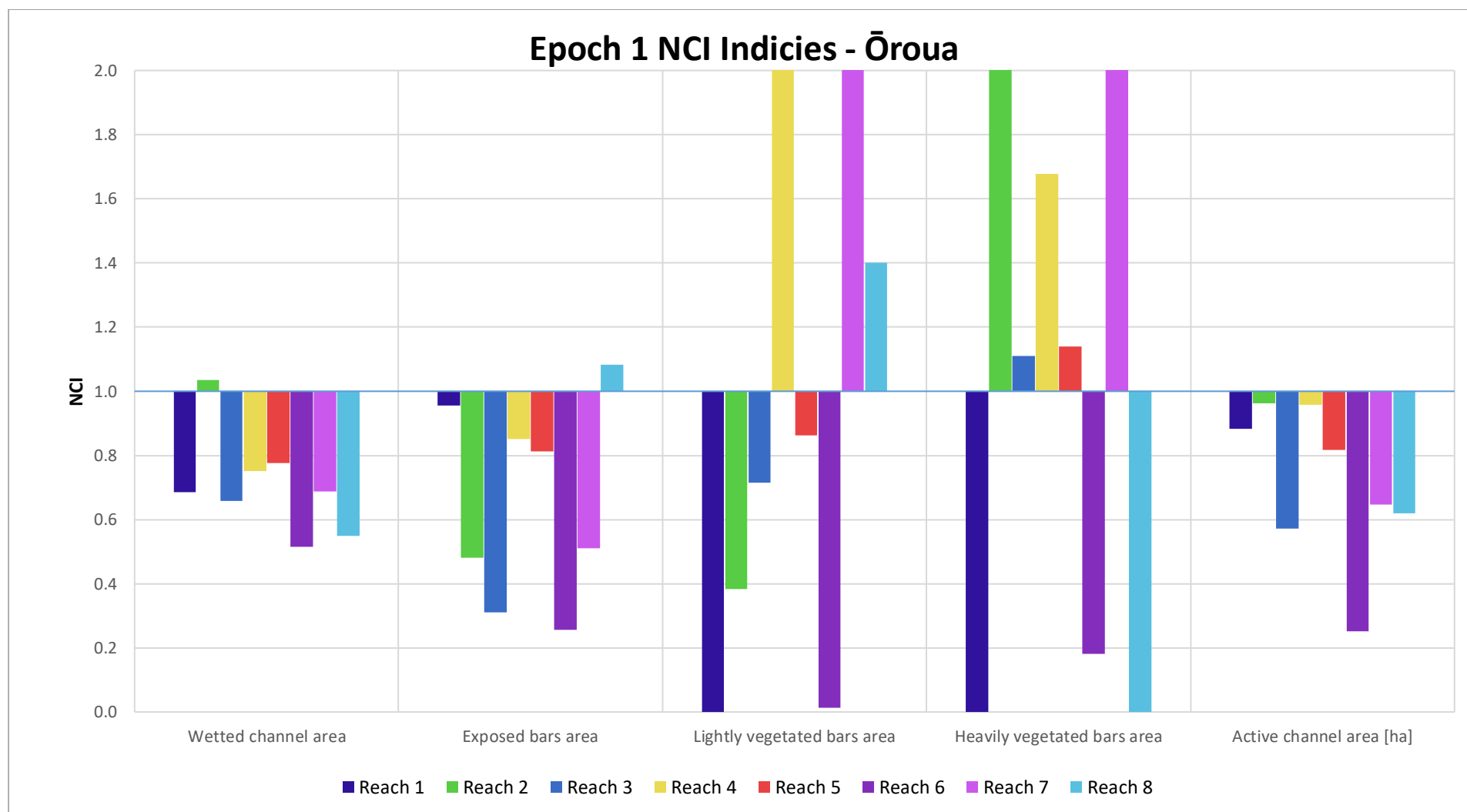


Figure 5.10: Comparison of NCI Indices for each characteristic, with 1 (no change) as the horizontal axis for Ōroua – Part One of Epoch 1.

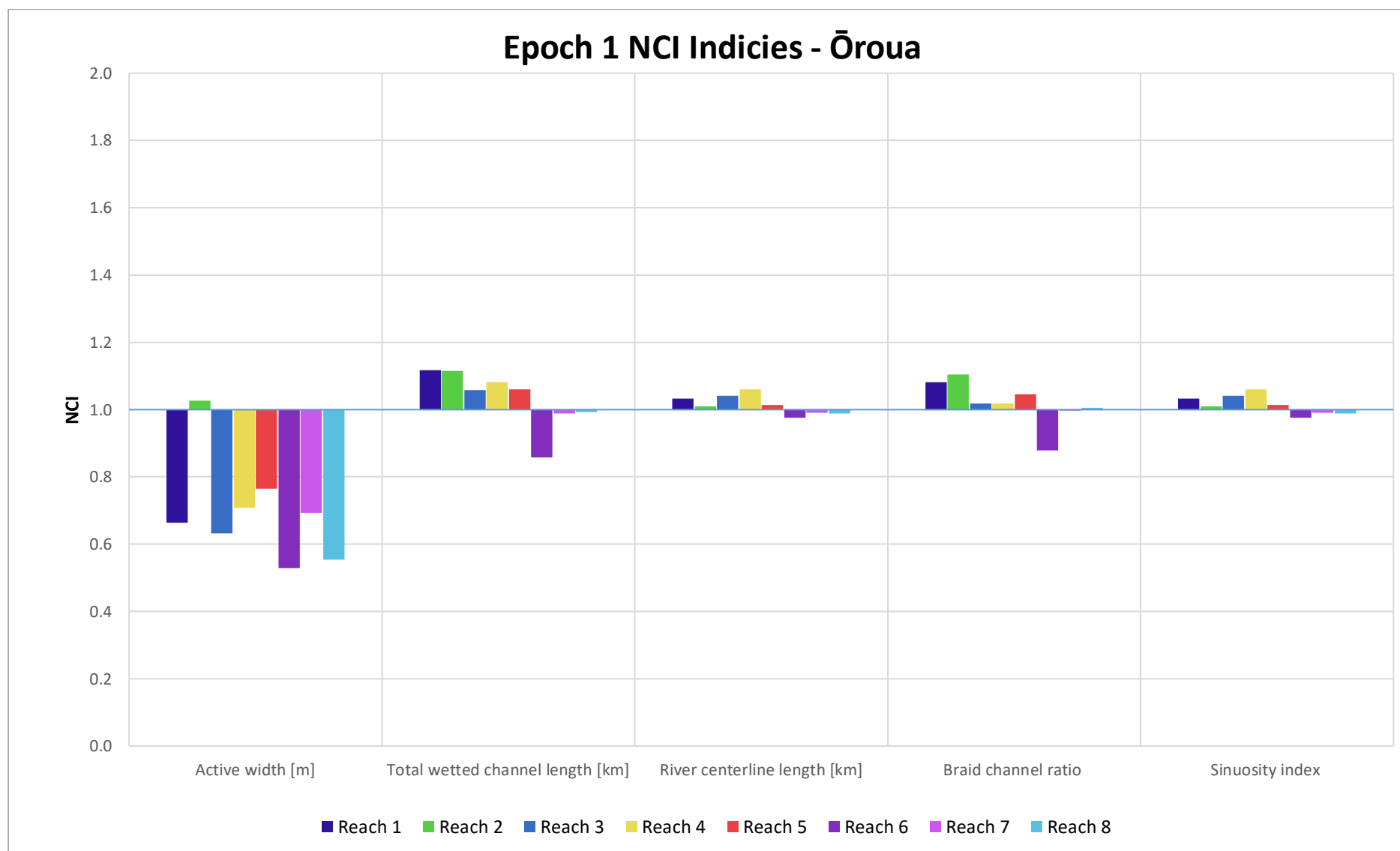


Figure 5.11: Comparison of NCI Indices for each characteristic, with 1 (no change) as the horizontal axis for Ōroua – Part Two of Epoch 1.

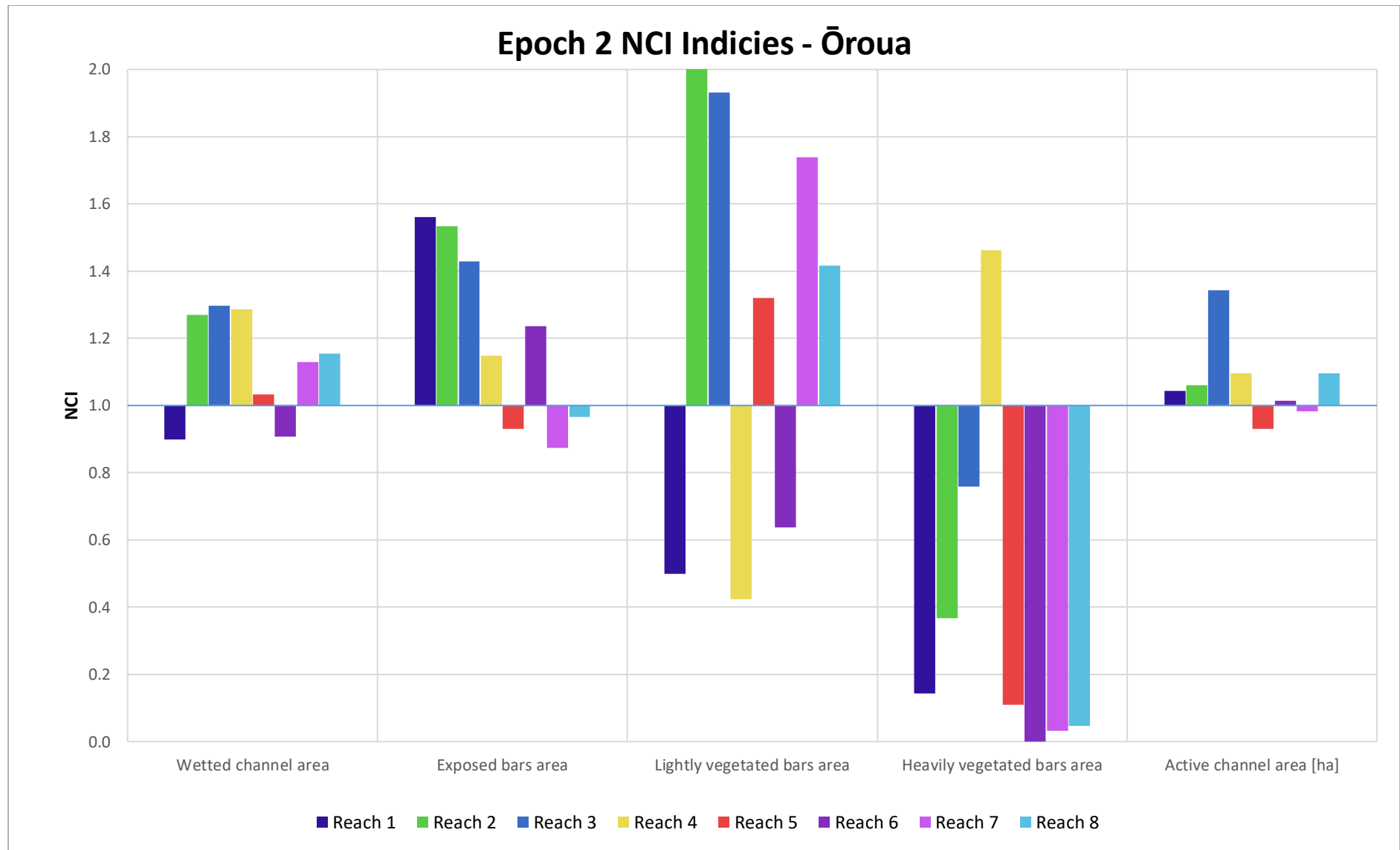


Figure 5.12: Comparison of NCI Indices for each characteristic, with 1 (no change) as the horizontal axis for Ōroua – Part One of Epoch 2

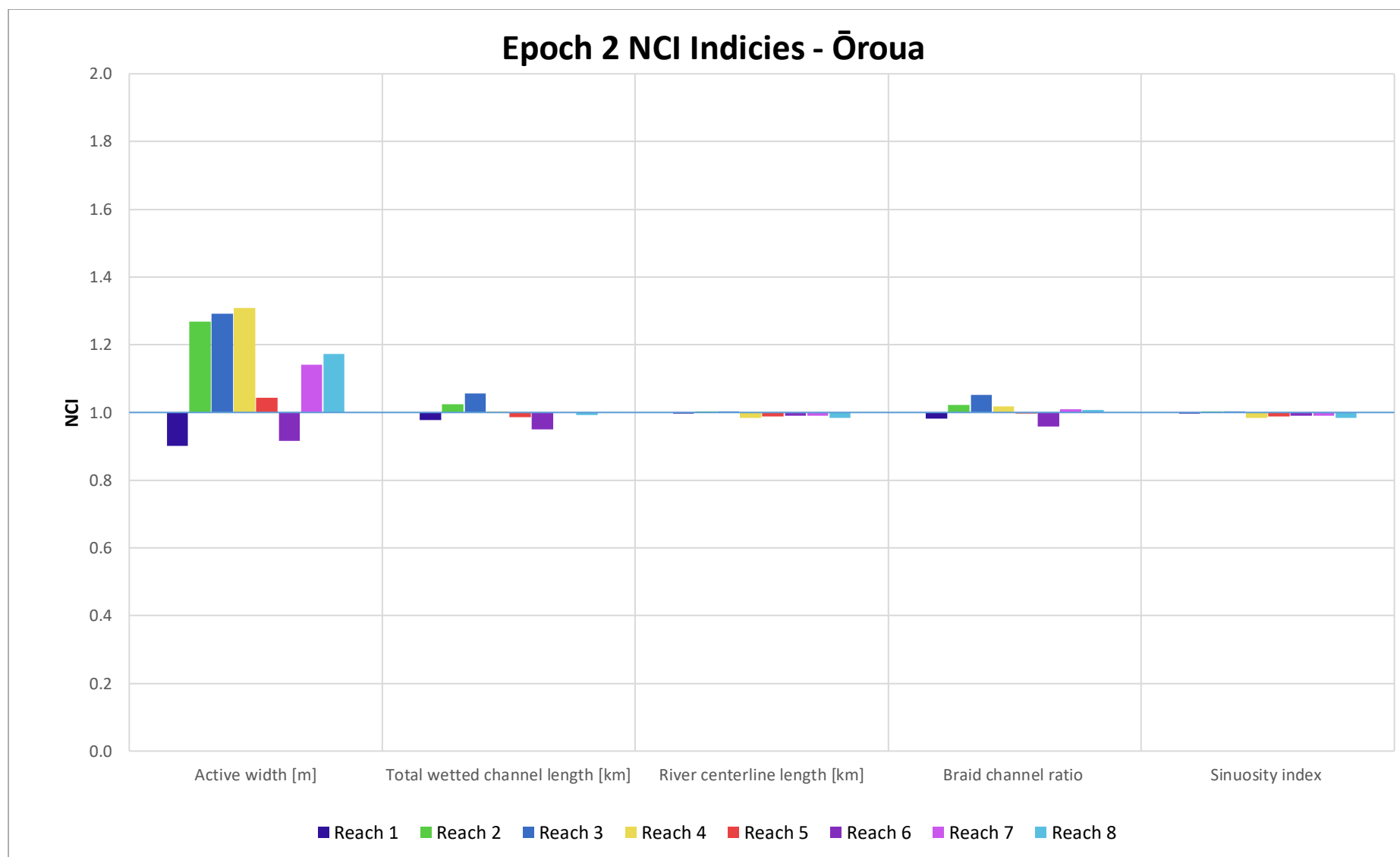


Figure 5.13: Comparison of NCI Indices for each characteristics, with 1 (no change) as the horizontal axis for Ōroua – Part Two of Epoch 2

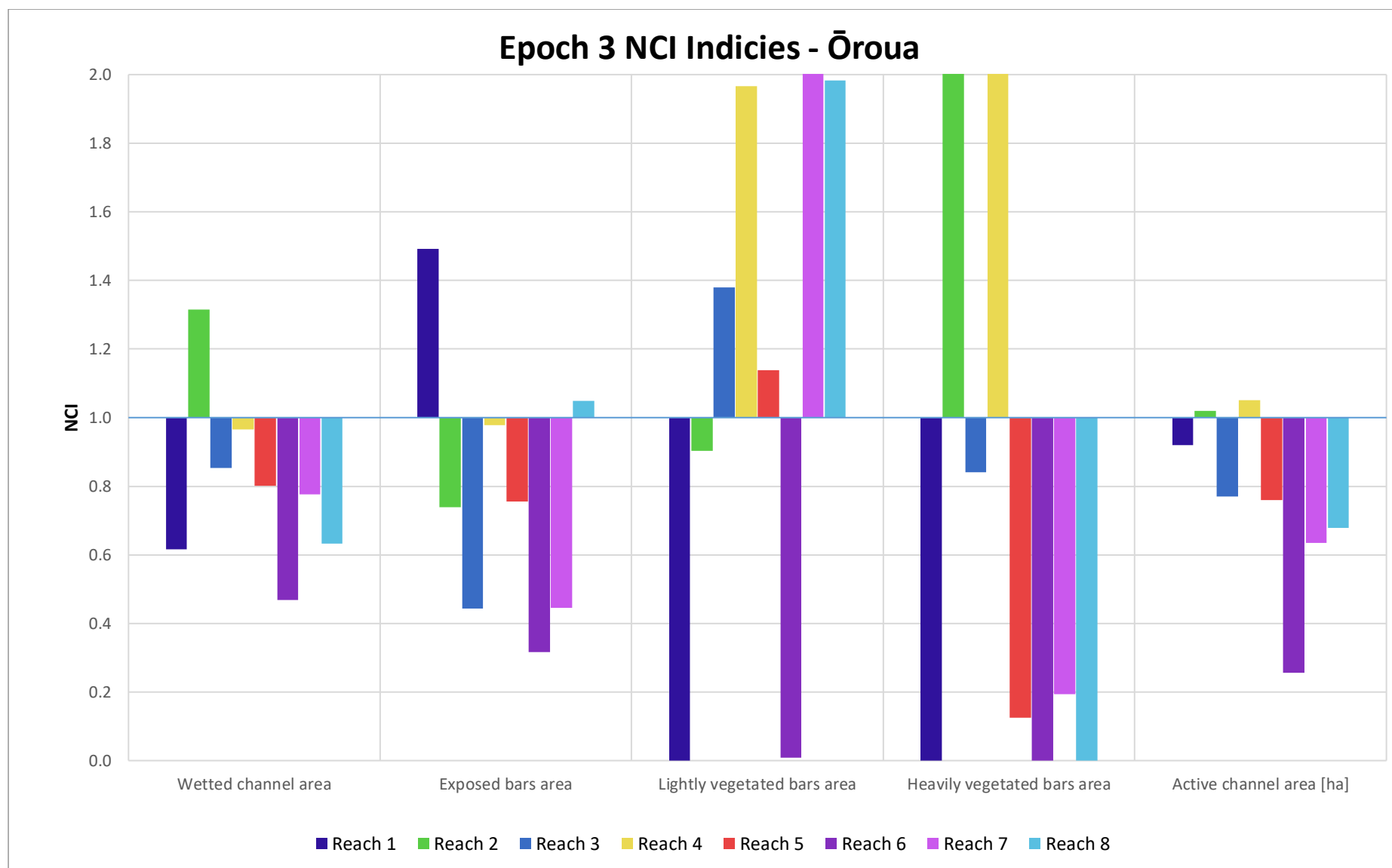


Figure 5.14: Comparison of NCI Indices for each characteristics, with 1 (no change) as the horizontal axis for Ōroua – Part One of Epoch 3.

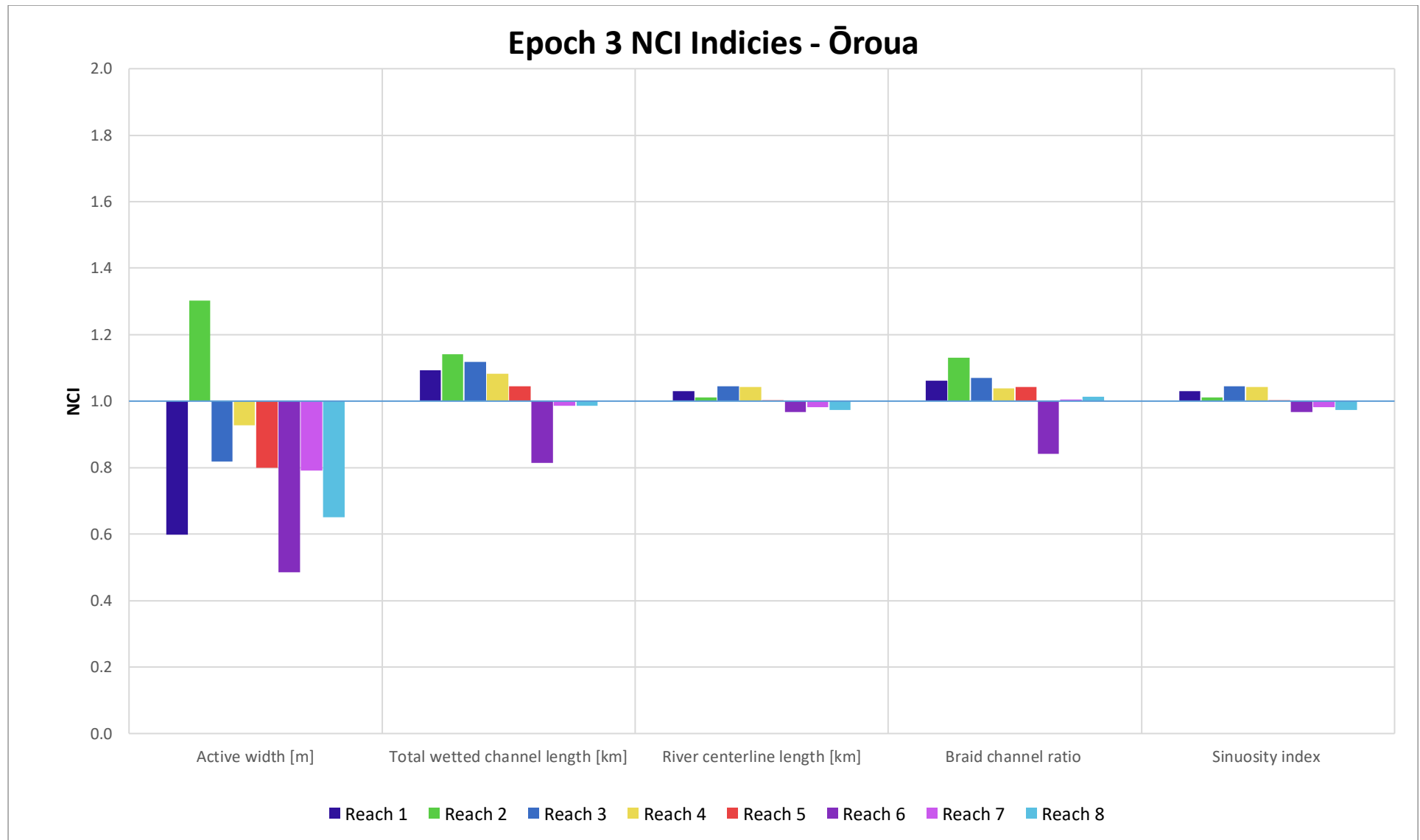


Figure 5.15: Comparison of NCI Indices for each characteristics, with 1 (no change) as the horizontal axis for Ōroua – Part Two of Epoch 3.

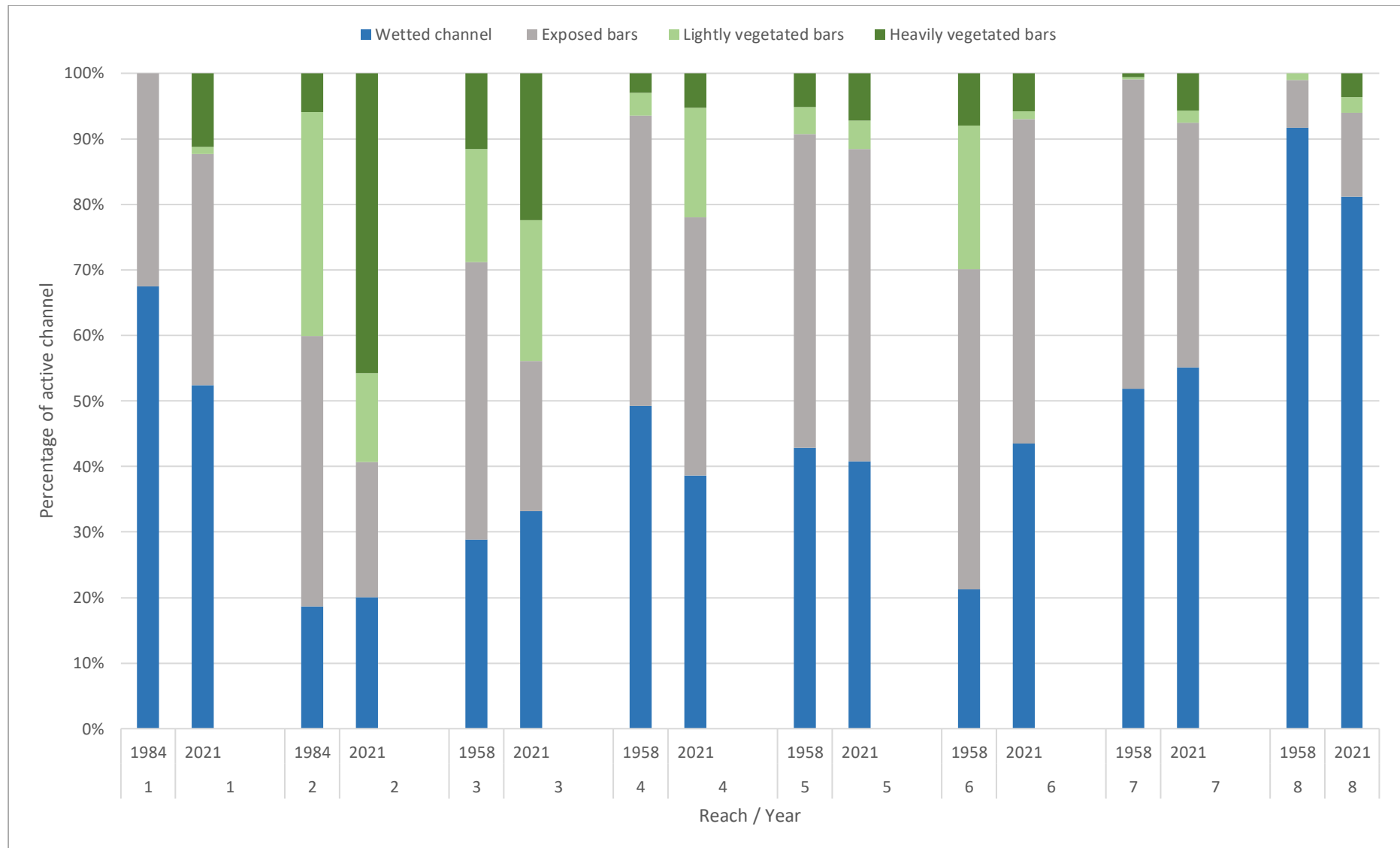


Figure 5.16: Active channel composition across the Oroua River reaches – Epoch 1.

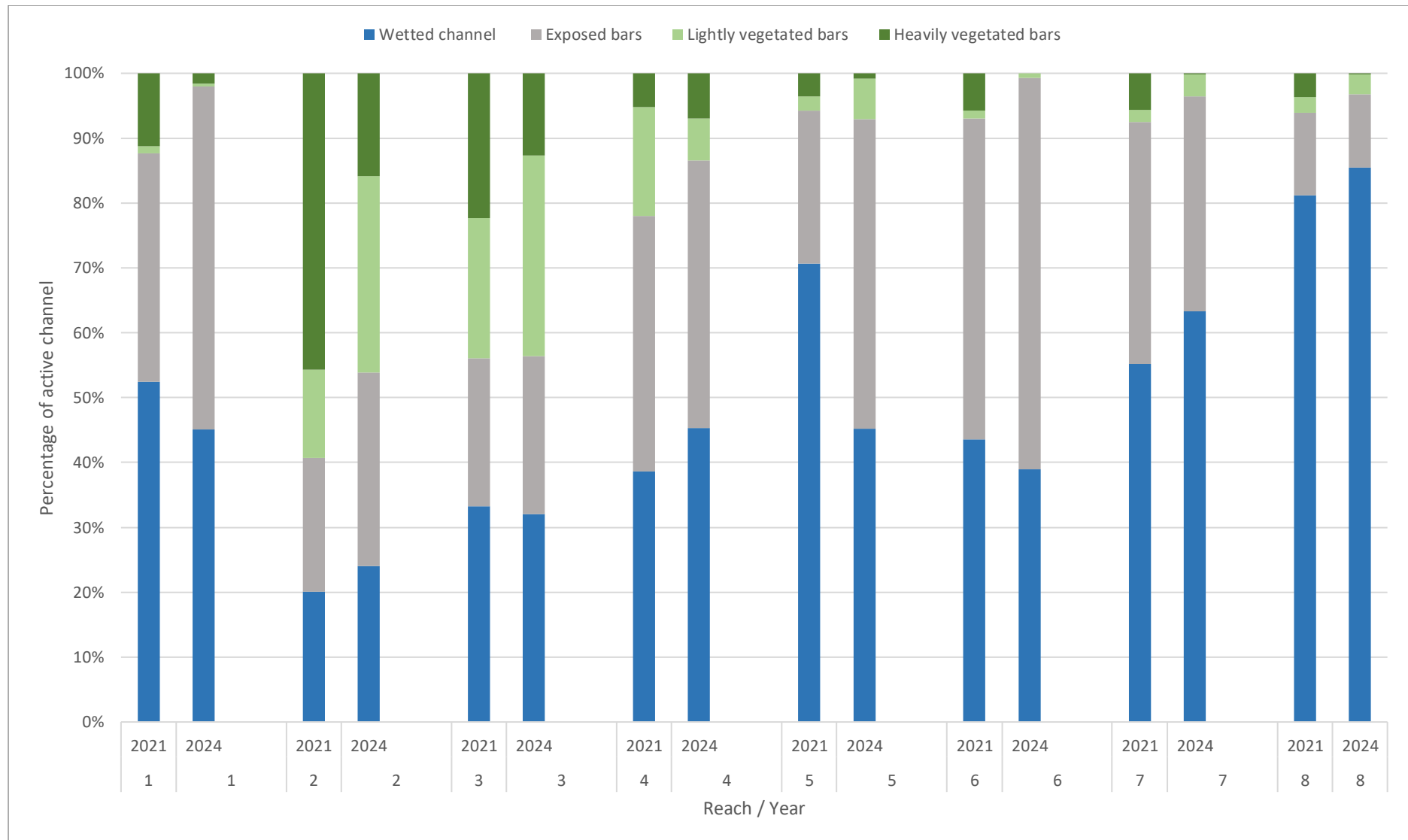


Figure 5.17: Active channel composition across the Oroua River reaches – Epoch 2.

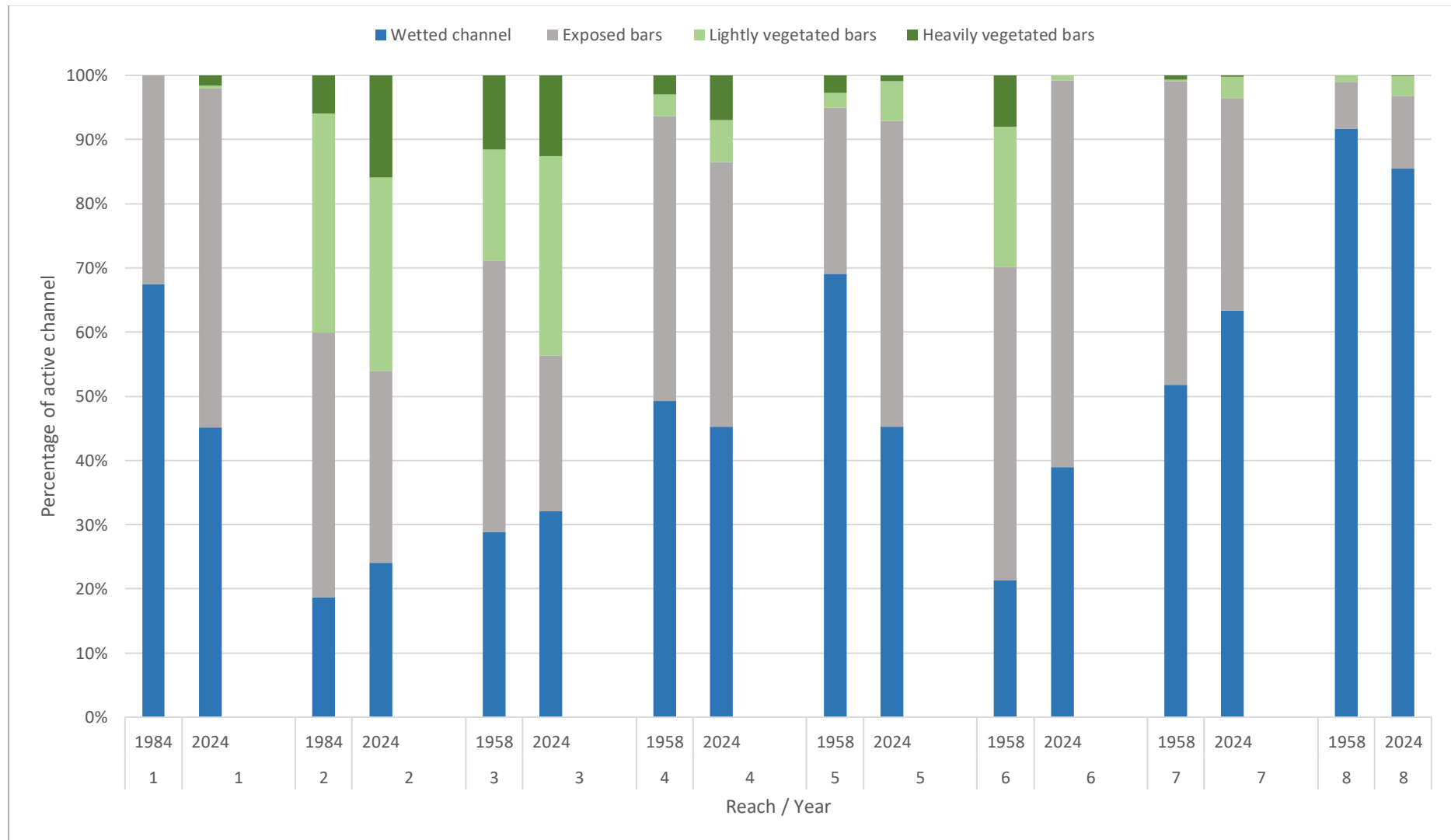


Figure 5.18: Active channel composition across the Oroua River reaches – Epoch 3.

6 Discussion

Overall, the NCI assessment has shown the Pohangina River and Ōroua River have gone through substantial change over the past 85 years and 65 years respectively. Change in active channel area (i.e. zone of current river floodplain interpreted as being actively or recently reworked by the river channel) can be taken as a proxy for change in river condition and was noted to some extent in all reaches within all Epochs. It is important to understand that NCI indices should be interpreted in light of total area of parameters. In cases where there is a small total reach area, a relatively minor adjustment in composition of reach can present itself as a large change in parameter. Changes in characteristics as a result of total area shown in Figure Appendix A.1 to Figure Appendix A.19.

6.1 Pohangina

Within Epoch 1, the Pohangina River has shown a general decrease in active channel area (up to a 79% reduction in reach 10). This change generally indicates a narrowing of the river corridor, and therefore a reduction in the room available for these rivers to naturally adjust laterally. Reduction in active channel area was greatest within the lower unconfined reaches of the Pohangina, where a reduction in sinuosity and therefore straightening of the river could also be seen. This may be attributed to anthropogenic changes to the floodplain and implementation of river management practices along the banks over time, to limit the area of the valley floor reworked by the river.

Within Epoch 2, there was generally an increase in active channel area following Cyclone Gabrielle as impact of the flood associated with this event substantially enlarged the active river corridor. This was particularly prominent in the upper to middle reaches where an increase in braided channel ratio and sinuosity were noted, highlighting both the dynamic nature of the Pohangina River and its ability to modify the river corridor following a sufficiently large flood.

Reaches 1 and 5 show the largest increases in active channel area, with increases of 107% and 120% respectively. However, both reaches 1 and 5 have a relatively small active channel area compared to other reaches, meaning even minor absolute changes within the reach can result in disproportionately high percentage increases and NCI values, which may be misleading. The reader should take total reach area into account when considering effects.

Within Epoch 3, the upper (confined) reaches show an increase in active channel area, with the river area expanding to levels somewhat similar to historic state following Cyclone Gabrielle. The remainder of the Pohangina showed a reduction (albeit lower than Epoch 1) in active channel area. It can be concluded that modification back to pre-intervention/natural state as a result of natural events is possible but likely to be limited, with these active channel changes being relatively minor when compared with the overall change experienced within the Pohangina River corridor over the last 85 years.

6.2 Ōroua River

Within Epoch 1, the Ōroua River has shown a general decrease in active channel area (up to a 75% reduction in reach 6). This change generally indicates a narrowing of the river corridor since earliest assessments, and therefore a reduction in the room available for these rivers to naturally adjust laterally. Reductions in active channel area were more prominent within the middle to lower unconfined reaches of the Ōroua River. This may be attributed to anthropogenic changes to the floodplain and implementation of river management practices along the banks over time. An increase in sinuosity (up to 6 %) was noted for the upper to middle reaches which typically relates to reaches where artificial stopbanks were not present. It is noted that reach 6 shows a large reduction in active area (75%) and reduction in wetted channel area, which is due to both having significant changes within a relatively small area, and represents a change from braided to wandering channel planform.

Within Epoch 2, there was an increase in active channel area following Cyclone Gabrielle as the impact of this flood substantially enlarged the river area. This was particularly prominent within reach 3 (longest reach assessed) where a 34% increase in active channel area, and a 5% increase in the braid channel ratio was noted, highlighting both the dynamic nature of the Ōroua River and the ability to modify the river corridor following a sufficiently large flood. Sinuosity within the middle to lower reaches showed minor reductions which could once again be linked to implementation of edge protection and stop banks limiting movement of the river channel.

Epoch 3 shows a reduction (albeit lower than Epoch 1) active channel area. It can be concluded that modification back to pre-intervention/natural state as a result of natural events possible but limited, with active channel changes being minor compared to the overall change experienced within the Ōroua River systems over the last 65 years.

7 References

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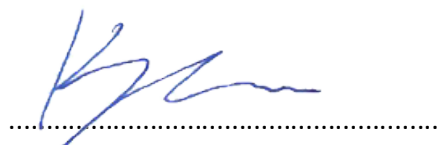
8 Applicability

This report has been prepared for the exclusive use of our client Horizons Regional Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

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Appendix A NCI Results

Table Appendix A.1: Tabulated NCI results and values for each parameter and reach for the Pohangina.

Reach	Characteristic	Value			NCI		
		1942/1958	2021	2024	Epoch 1 (1942/1958 – 2021)	Epoch 2 (2021-2024)	Epoch 3 (1942/1958 – 2024)
Reach 1 (1942)	Wetted channel area [ha]	1.75	1.37	1.73	0.78	1.27	0.99
	Exposed bars area [ha]	2.14	1.22	4.69	0.57	3.84	2.20
	Lightly vegetated bars area [ha]	1.77	0.09	1.48	0.05	16.13	0.84
	Heavily vegetated bars area [ha]	0.01 ³	1.58	0.90	242.24	0.57	138.99
	Active channel area [ha]	5.66	4.26	8.81	0.75	2.07	1.56
	<i>Active width [m]</i>	14.54	11.33	16.09	0.78	1.42	1.11
	<i>Total wetted channel length [km]</i>	1.21	1.21	1.69	1.00	1.40	1.40
	<i>River centreline length [km]</i>	0.97	0.99	1.07	1.02	1.09	1.11
	<i>Braid channel ratio</i>	1.24	1.22	1.57	0.98	1.29	1.26
	<i>Sinuosity index</i>	1.06	1.09	1.18	1.02	1.09	1.11
Reach 2 (1942)	Wetted channel area [ha]	10.48	8.39	7.91	0.80	0.94	0.75
	Exposed bars area [ha]	23.55	9.51	22.83	0.40	2.40	0.97
	Lightly vegetated bars area [ha]	12.61	3.90	9.72	0.31	2.49	0.77
	Heavily vegetated bars area [ha]	5.55	26.00	17.78	4.69	0.68	3.20
	Active channel area [ha]	52.19	47.79	58.24	0.92	1.22	1.12
	<i>Active width [m]</i>	20.21	16.73	14.80	0.83	0.88	0.73
	<i>Total wetted channel length [km]</i>	8.75	7.53	7.35	0.86	0.98	0.84

³ Reach 1 has a relatively low total area. It is also noted that there was essentially no densely vegetated surface in that reach in the earliest imagery, but this had become extensive in 2021. For this reason, a large NCI value for Epoch 1 and Epoch 3 is shown.

Reach	Characteristic	Value			NCI		
		1942/1958	2021	2024	Epoch 1 (1942/1958 – 2021)	Epoch 2 (2021-2024)	Epoch 3 (1942/1958 – 2024)
	<i>River centreline length [km]</i>	5.19	5.01	5.34	0.97	1.07	1.03
	<i>Braid channel ratio</i>	1.69	1.50	1.38	0.89	0.92	0.82
	<i>Sinuosity index</i>	1.27	1.23	1.31	0.97	1.07	1.03
Reach 3 (1942)	Wetted channel area [ha]	4.36	2.95	3.41	0.68	1.15	0.78
	Exposed bars area [ha]	9.82	3.33	8.59	0.34	2.58	0.87
	Lightly vegetated bars area [ha]	9.72	2.22	8.58	0.23	3.86	0.88
	Heavily vegetated bars area [ha]	7.80	16.83	12.51	2.16	0.74	1.60
	Active channel area [ha]	31.70	25.33	33.09	0.80	1.31	1.04
	<i>Active width [m]</i>	27.63	17.93	20.57	0.65	1.15	0.74
	<i>Total wetted channel length [km]</i>	1.95	1.69	2.44	0.87	1.45	1.25
	<i>River centreline length [km]</i>	1.58	1.65	1.66	1.04	1.01	1.05
	<i>Braid channel ratio</i>	1.23	1.02	1.47	0.83	1.44	1.19
	<i>Sinuosity index</i>	1.11	1.16	1.17	1.04	1.01	1.05
Reach 4 (1942)	Wetted channel area [ha]	8.31	5.72	5.02	0.69	0.88	0.60
	Exposed bars area [ha]	8.94	8.87	12.91	0.99	1.46	1.44
	Lightly vegetated bars area [ha]	15.56	3.65	18.30	0.23	5.02	1.18
	Heavily vegetated bars area [ha]	29.90	28.60	13.55	0.96	0.47	0.45
	Active channel area [ha]	62.71	46.83	49.77	0.75	1.06	0.79
	<i>Active width [m]</i>	23.60	16.61	14.28	0.70	0.86	0.60
	<i>Total wetted channel length [km]</i>	4.30	3.71	4.02	0.86	1.08	0.93
	<i>River centreline length [km]</i>	3.52	3.45	3.51	0.98	1.02	1.00

Reach	Characteristic	Value			NCI		
		1942/1958	2021	2024	Epoch 1 (1942/1958 – 2021)	Epoch 2 (2021-2024)	Epoch 3 (1942/1958 – 2024)
	<i>Braid channel ratio</i>	1.22	1.08	1.14	0.88	1.06	0.94
	<i>Sinuosity index</i>	1.19	1.17	1.19	0.98	1.02	1.00
Reach 5 (1942)	Wetted channel area [ha]	6.05	4.33	4.75	0.72	1.10	0.79
	Exposed bars area [ha]	10.88	7.61	16.07	0.70	2.11	1.48
	Lightly vegetated bars area [ha]	10.59	2.24	9.63	0.21	4.30	0.91
	Heavily vegetated bars area [ha]	29.56	12.22	27.50	0.41	2.25	0.93
	Active channel area [ha]	57.07	26.40	57.94	0.46	2.20	1.02
	<i>Active width [m]</i>	32.01	20.26	24.43	0.63	1.21	0.76
	<i>Total wetted channel length [km]</i>	3.24	2.86	3.93	0.88	1.37	1.21
	<i>River centreline length [km]</i>	1.89	2.14	1.94	1.13	0.91	1.03
	<i>Braid channel ratio</i>	1.72	1.34	2.02	0.78	1.51	1.18
	<i>Sinuosity index</i>	1.07	1.21	1.10	1.13	0.91	1.03
Reach 6 (1942)	Wetted channel area [ha]	17.53	9.42	10.12	0.54	1.07	0.58
	Exposed bars area [ha]	10.36	15.85	14.97	1.53	0.94	1.45
	Lightly vegetated bars area [ha]	22.13	7.73	23.13	0.35	2.99	1.05
	Heavily vegetated bars area [ha]	72.16	27.89	16.50	0.39	0.59	0.23
	Active channel area [ha]	122.19	60.89	64.72	0.50	1.06	0.53
	<i>Active width [m]</i>	43.28	21.81	23.89	0.50	1.10	0.55
	<i>Total wetted channel length [km]</i>	7.42	5.86	5.39	0.79	0.92	0.73
	<i>River centreline length [km]</i>	4.05	4.32	4.24	1.07	0.98	1.05
	<i>Braid channel ratio</i>	1.83	1.36	1.27	0.74	0.94	0.70

Reach	Characteristic	Value			NCI		
		1942/1958	2021	2024	Epoch 1 (1942/1958 – 2021)	Epoch 2 (2021-2024)	Epoch 3 (1942/1958 – 2024)
	<i>Sinuosity index</i>	1.20	1.28	1.25	1.07	0.98	1.05
Reach 7 (1942)	Wetted channel area [ha]	37.44	25.90	26.72	0.69	1.03	0.71
	Exposed bars area [ha]	47.65	54.34	49.48	1.14	0.91	1.04
	Lightly vegetated bars area [ha]	32.94	15.11	40.70	0.46	2.69	1.24
	Heavily vegetated bars area [ha]	91.53	18.82	13.00	0.21	0.69	0.14
	Active channel area [ha]	209.56	114.17	129.91	0.54	1.14	0.62
	<i>Active width [m]</i>	40.11	24.68	25.06	0.62	1.02	0.62
	<i>Total wetted channel length [km]</i>	14.31	10.98	12.56	0.77	1.14	0.88
	<i>River centreline length [km]</i>	9.34	10.50	10.66	1.12	1.02	1.14
	<i>Braid channel ratio</i>	1.53	1.05	1.18	0.68	1.13	0.77
	<i>Sinuosity index</i>	1.42	1.59	1.62	1.12	1.02	1.14
Reach 8 (1942)	Wetted channel area [ha]	33.40	15.19	20.15	0.45	1.33	0.60
	Exposed bars area [ha]	25.18	31.52	24.65	1.25	0.78	0.98
	Lightly vegetated bars area [ha]	22.18	8.49	36.53	0.38	4.31	1.65
	Heavily vegetated bars area [ha]	69.74	6.68	6.71	0.10	1.00	0.10
	Active channel area [ha]	150.50	61.87	88.04	0.41	1.42	0.58
	<i>Active width [m]</i>	55.26	23.72	30.83	0.43	1.30	0.56
	<i>Total wetted channel length [km]</i>	10.51	7.09	8.43	0.67	1.19	0.80
	<i>River centreline length [km]</i>	6.04	6.40	6.53	1.06	1.02	1.08
	<i>Braid channel ratio</i>	1.74	1.11	1.29	0.64	1.16	0.74
	<i>Sinuosity index</i>	1.17	1.24	1.27	1.06	1.02	1.08

Reach	Characteristic	Value			NCI		
		1942/1958	2021	2024	Epoch 1 (1942/1958 – 2021)	Epoch 2 (2021-2024)	Epoch 3 (1942/1958 – 2024)
Reach 9 (1942)	<i>Wetted channel area [ha]</i>	13.94	10.86	12.00	0.78	1.11	0.86
	Exposed bars area [ha]	4.94	12.65	16.34	2.56	1.29	3.31
	Lightly vegetated bars area [ha]	11.44	4.52	3.23	0.40	0.71	0.28
	Heavily vegetated bars area [ha]	20.12	3.37	3.21	0.17	0.95	0.16
	Active channel area [ha]	50.44	31.40	34.78	0.62	1.11	0.69
	Active width [m]	41.24	30.64	33.16	0.74	1.08	0.80
	<i>Total wetted channel length [km]</i>	4.60	4.34	4.79	0.94	1.10	1.04
	<i>River centreline length [km]</i>	3.38	3.54	3.62	1.05	1.02	1.07
	<i>Braid channel ratio</i>	1.36	1.23	1.32	0.90	1.08	0.97
	<i>Sinuosity index</i>	1.13	1.19	1.21	1.05	1.02	1.07
Reach 10 (1942)	<i>Wetted channel area [ha]</i>	14.10	6.12	5.90	0.43	0.96	0.42
	Exposed bars area [ha]	6.38	4.27	5.23	0.67	1.23	0.82
	Lightly vegetated bars area [ha]	3.69	0.43	0.38	0.12	0.88	0.10
	Heavily vegetated bars area [ha]	32.53	0.82	0.52	0.03	0.64	0.02
	Active channel area [ha]	56.70	11.64	12.04	0.21	1.03	0.21
	Active width [m]	63.66	29.53	28.33	0.46	0.96	0.44
	<i>Total wetted channel length [km]</i>	2.36	2.07	2.32	0.88	1.12	0.98
	<i>River centreline length [km]</i>	2.22	2.07	2.08	0.94	1.01	0.94
	<i>Braid channel ratio</i>	1.07	1.00	1.11	0.94	1.11	1.04
	<i>Sinuosity index</i>	1.12	1.05	1.05	0.94	1.01	0.94
	<i>Wetted channel area [ha]</i>	41.89	23.98	28.55	0.57	1.19	0.68

Reach	Characteristic	Value			NCI		
		1942/1958	2021	2024	Epoch 1 (1942/1958 – 2021)	Epoch 2 (2021-2024)	Epoch 3 (1942/1958 – 2024)
Reach 11 (1958)	Exposed bars area [ha]	102.68	46.36	53.93	0.45	1.16	0.53
	Lightly vegetated bars area [ha]	39.88	13.36	17.20	0.34	1.29	0.43
	Heavily vegetated bars area [ha]	66.45	17.65	9.17	0.27	0.52	0.14
	Active channel area [ha]	250.89	101.36	108.85	0.40	1.07	0.43
	Active width [m]	45.50	25.23	29.14	0.55	1.16	0.64
	<i>Total wetted channel length [km]</i>	11.85	10.90	11.74	0.92	1.08	0.99
	<i>River centreline length [km]</i>	9.20	9.51	9.80	1.03	1.03	1.06
	<i>Braid channel ratio</i>	1.29	1.15	1.20	0.89	1.05	0.93
	<i>Sinuosity index</i>	0.84	1.19	1.23	1.43	1.03	1.47

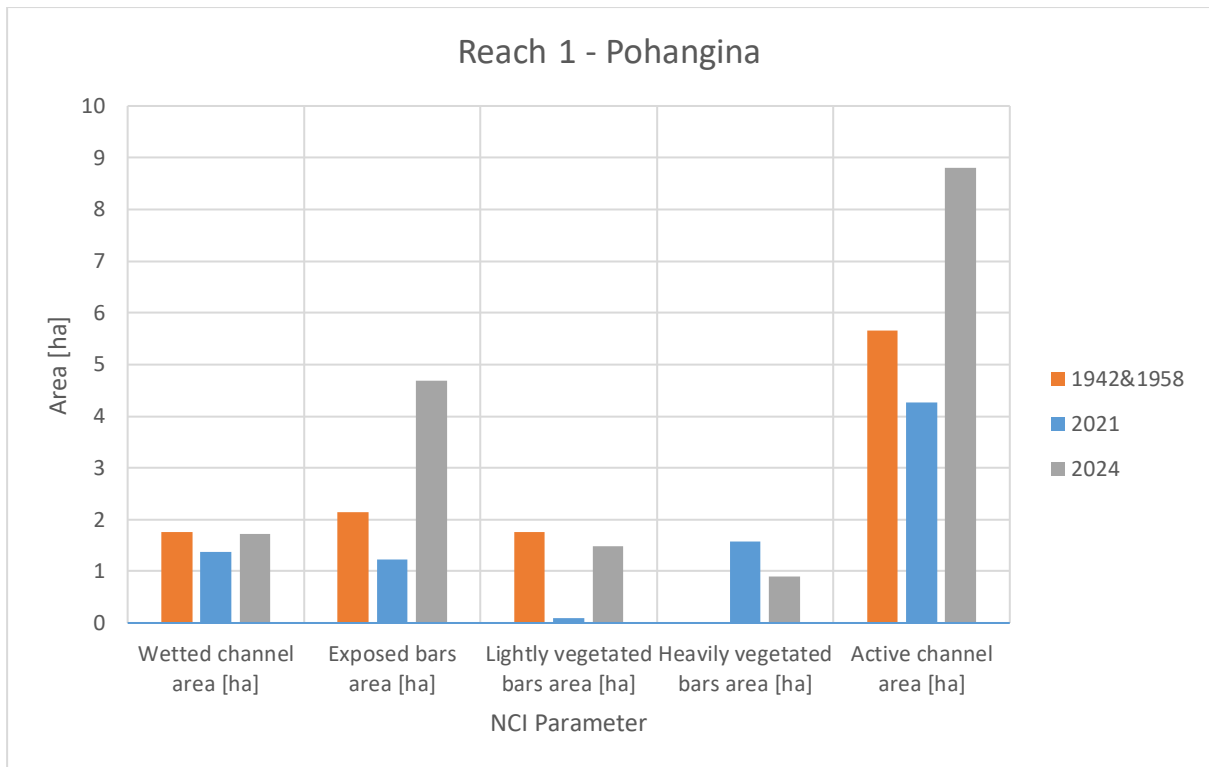


Figure Appendix A.1: Comparison of areas for each NCI parameter for reach one of Pohangina.

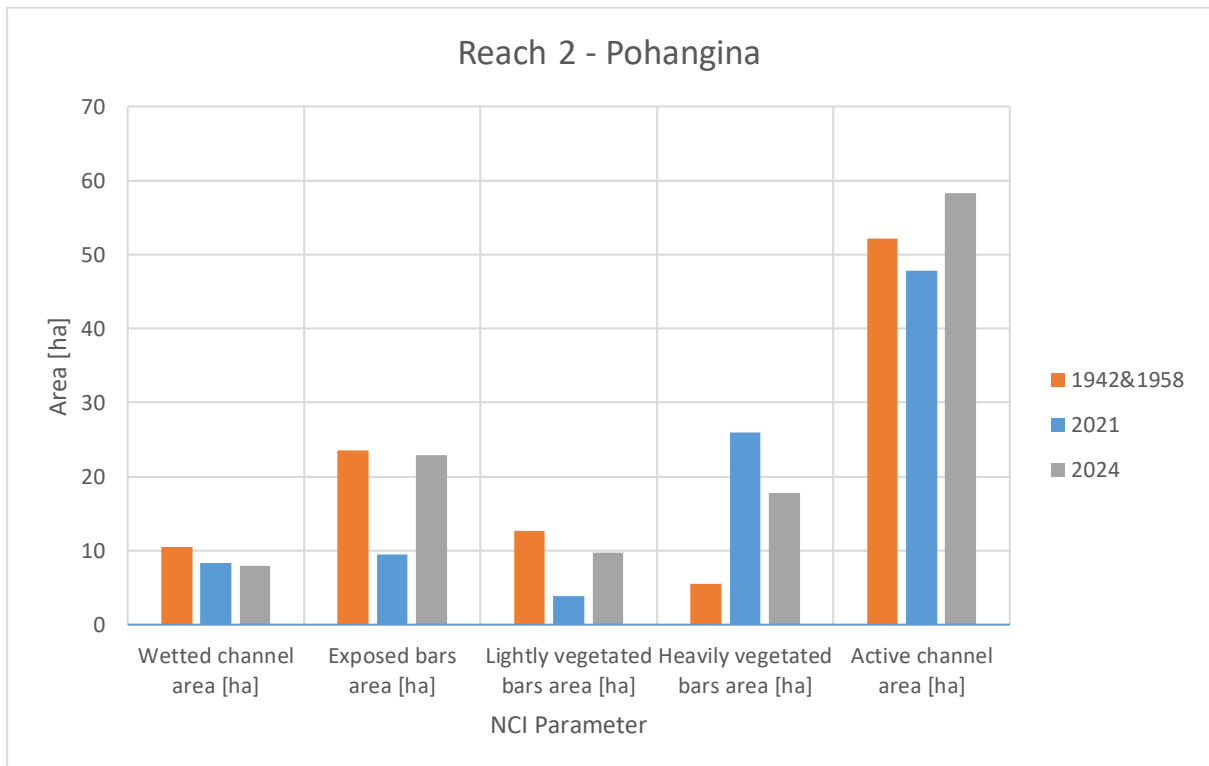


Figure Appendix A.2: Comparison of areas for each NCI parameter for reach two of Pohangina.

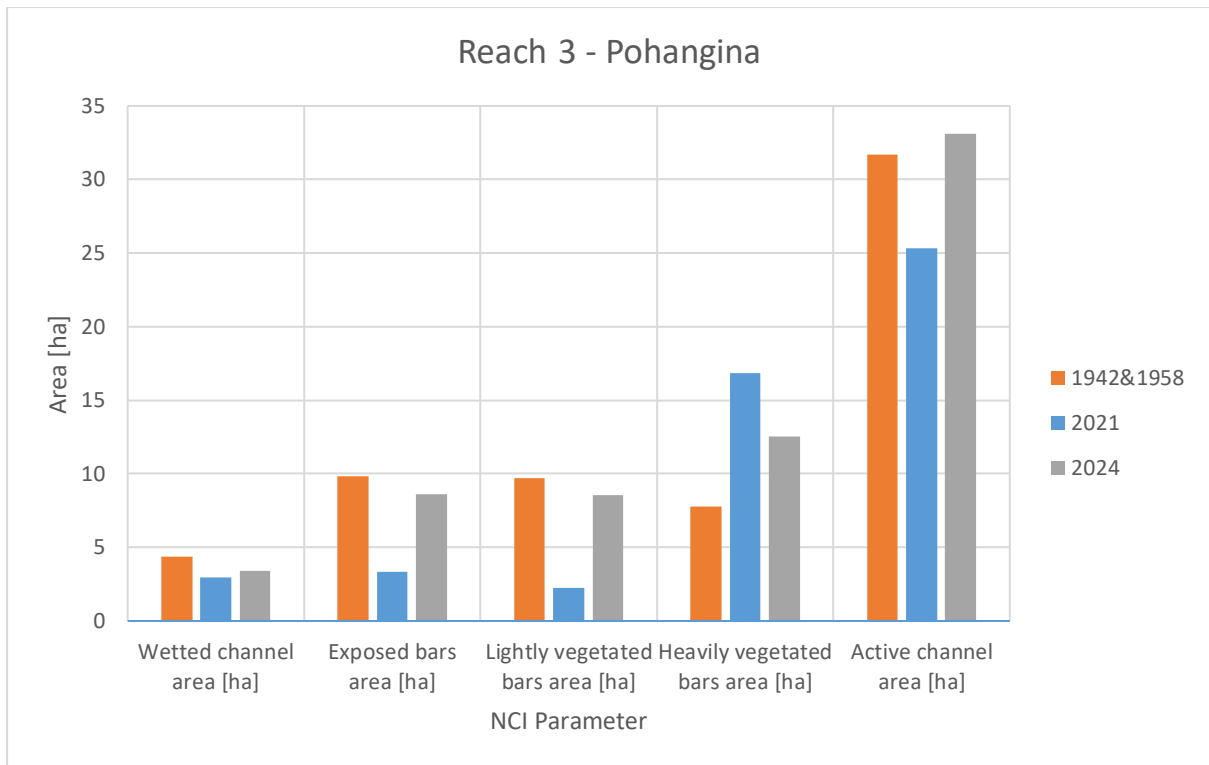


Figure Appendix A.3: Comparison of areas for each NCI parameter for reach three of Pohangina.

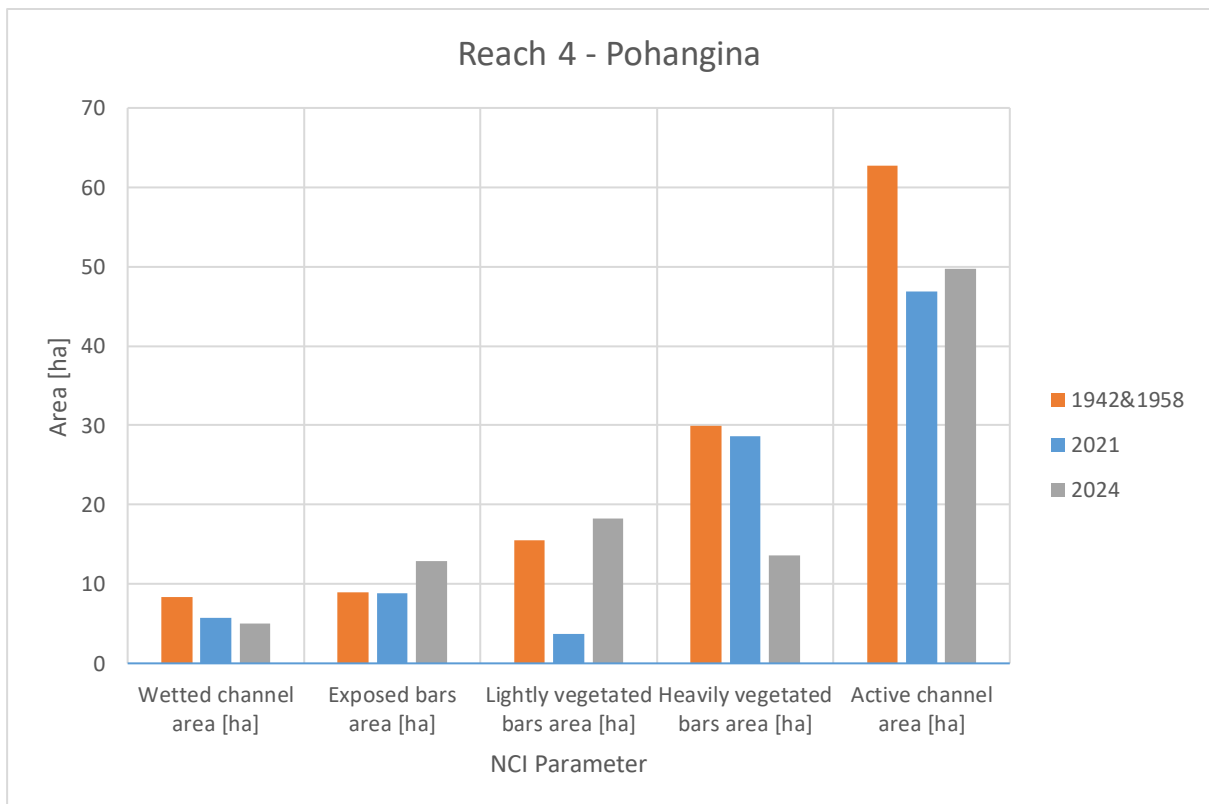


Figure Appendix A.4: Comparison of areas for each NCI parameter for reach four of Pohangina.

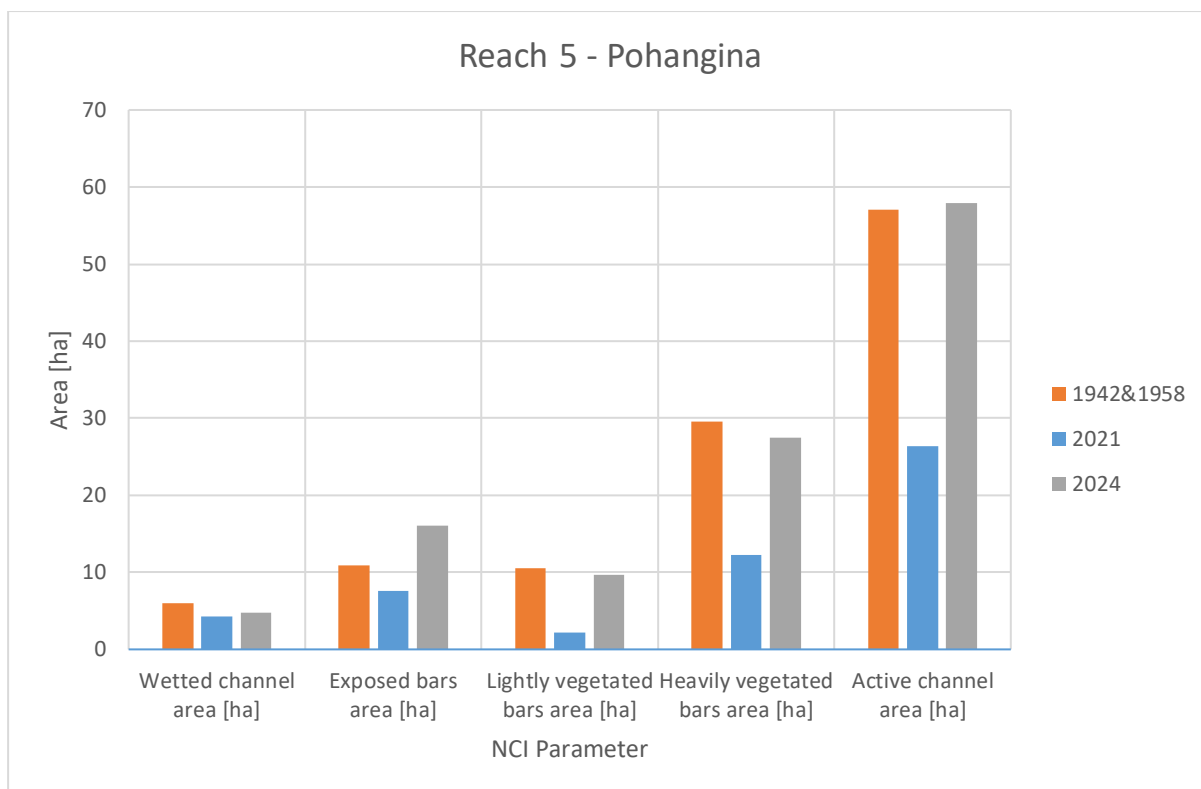


Figure Appendix A.5: Comparison of areas for each NCI parameter for reach five of Pohangina.

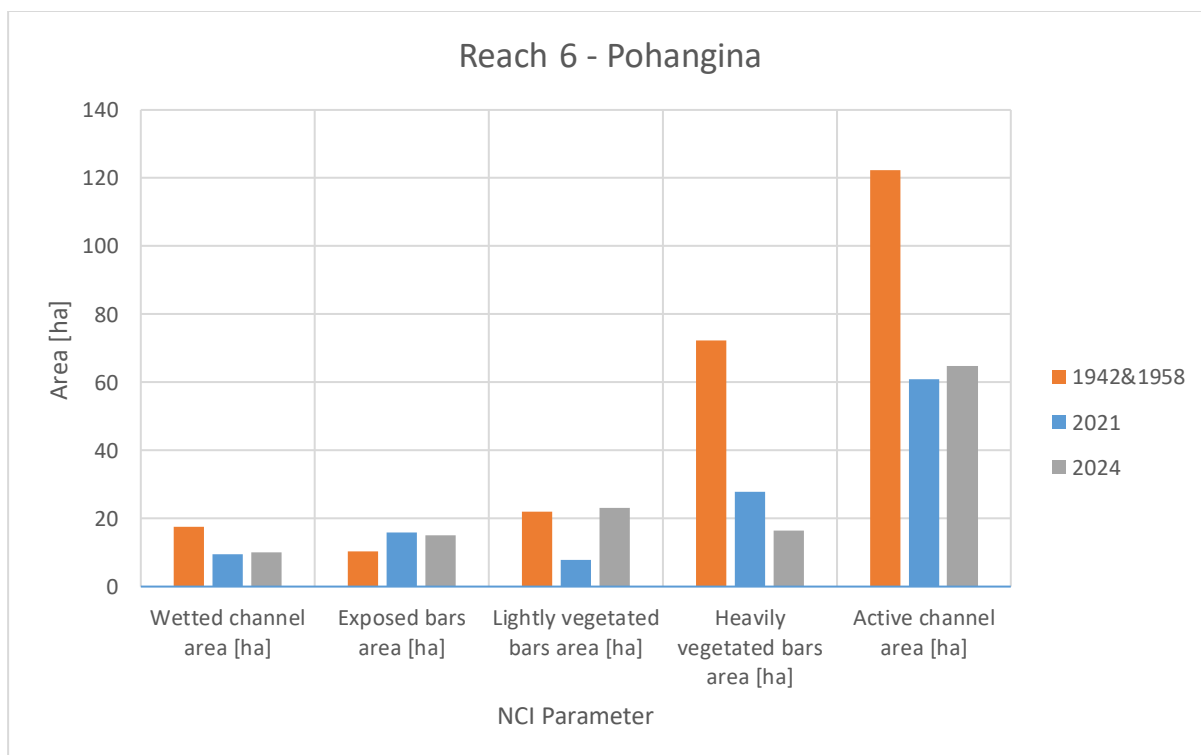


Figure Appendix A.6: Comparison of areas for each NCI parameter for reach six of Pohangina.

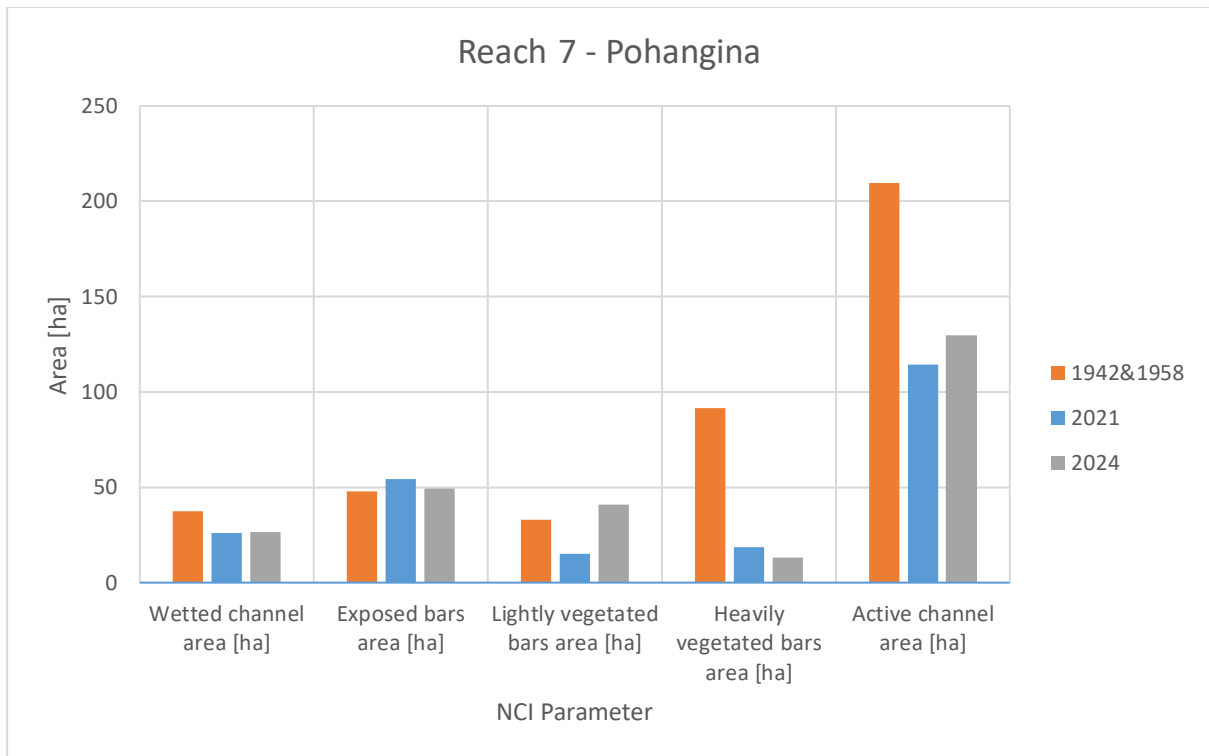


Figure Appendix A.7: Comparison of areas for each NCI parameter for reach nine of Pohangina.

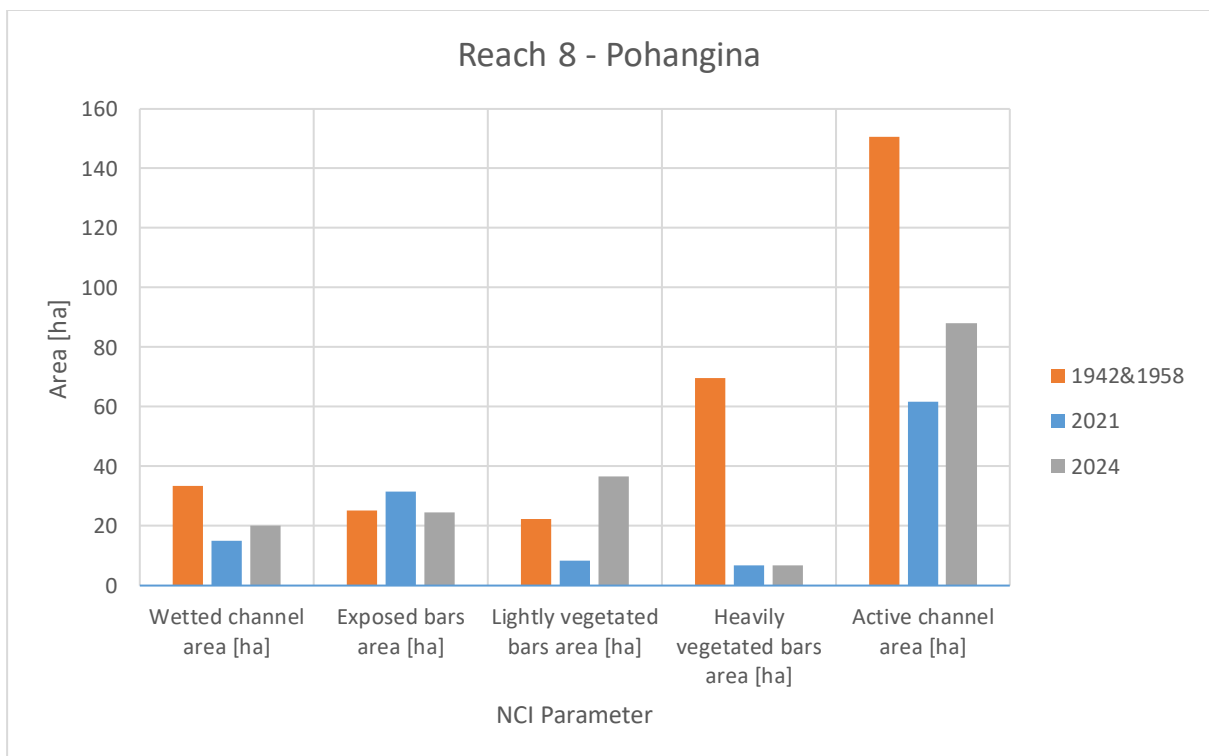


Figure Appendix A.8: Comparison of areas for each NCI parameter for reach eight of Pohangina.

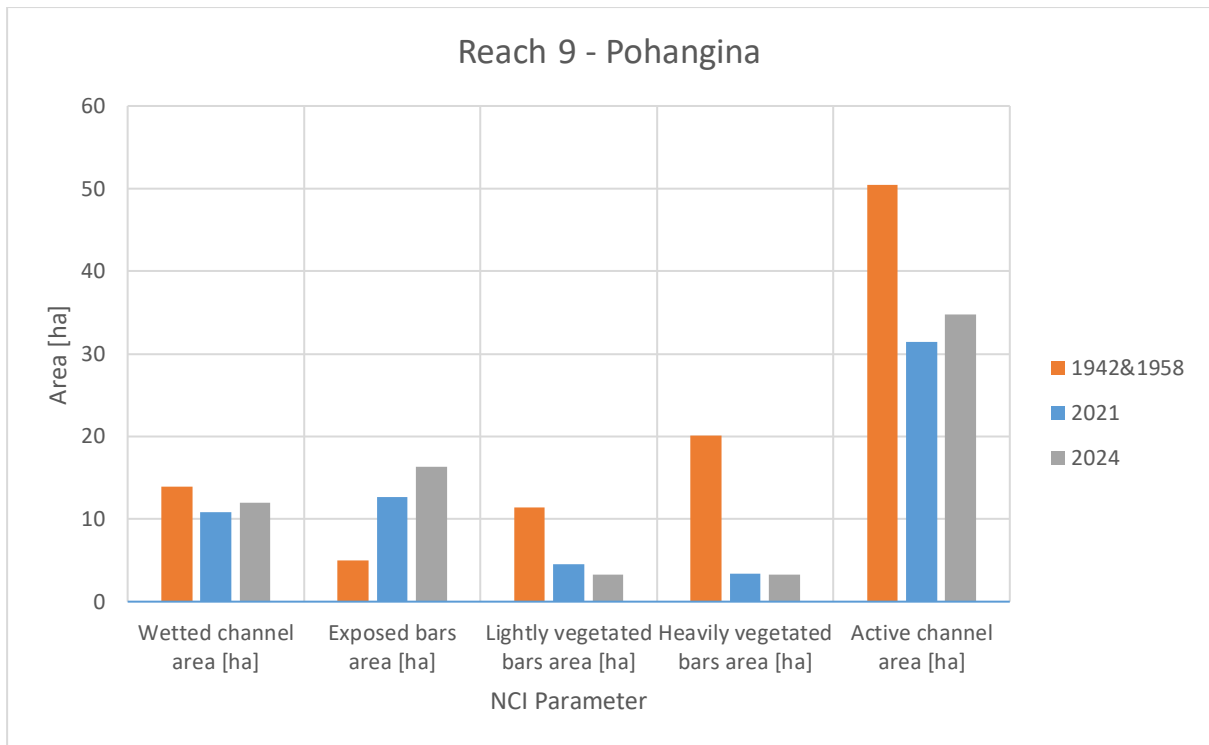


Figure Appendix A.9: Comparison of areas for each NCI parameter for reach nine of Pohangina.

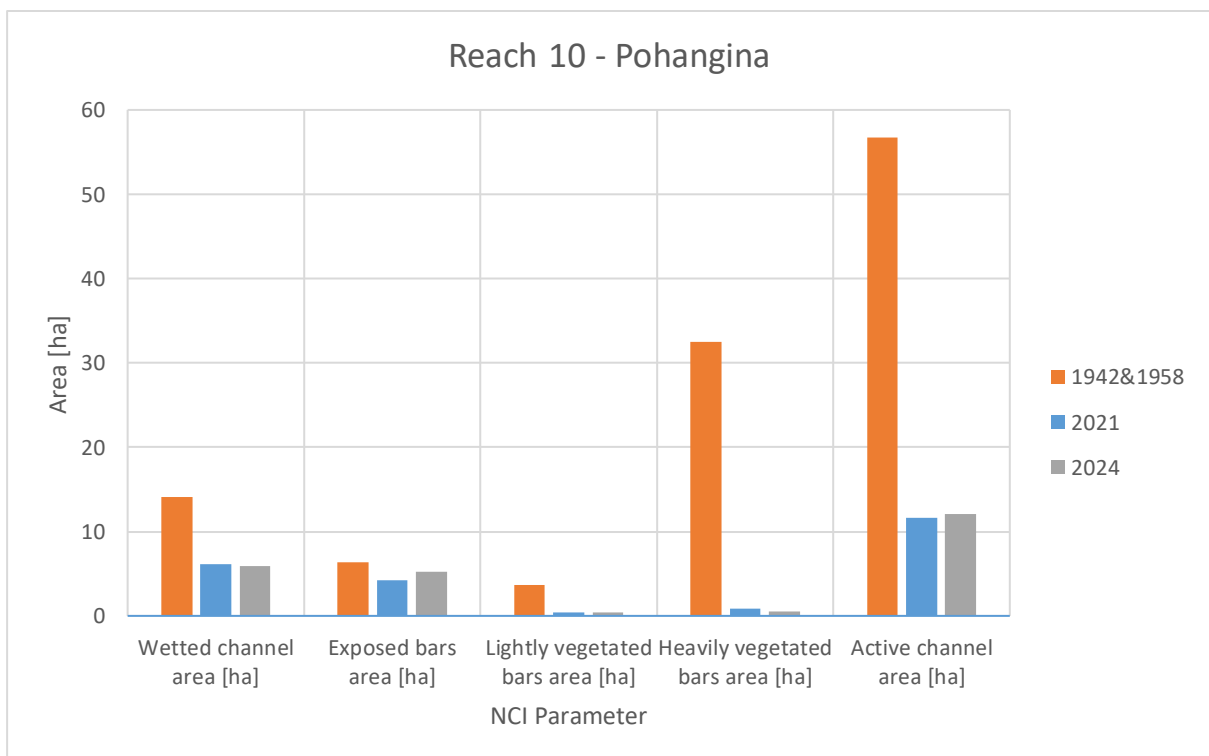


Figure Appendix A.10: Comparison of areas for each NCI parameter for reach ten of Pohangina.

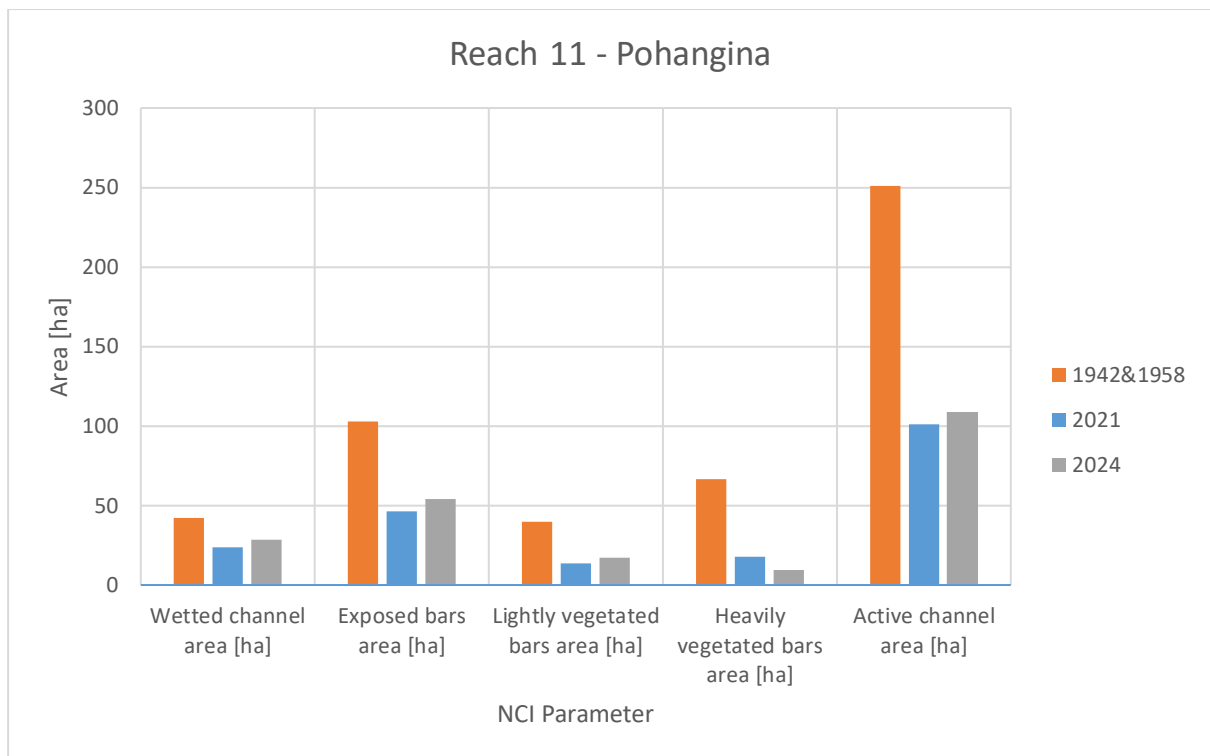


Figure Appendix A.11: Comparison of areas for each NCI parameter for reach eleven of Pohangina

Table Appendix A.2: Tabulated NCI results and values for each parameter and reach for the Ōroua.

Reach	Characteristic	Value			NCI		
		1958/1984	2021	2024	Epoch 1	Epoch 2	Epoch 3
Reach 1 (1984)	Wetted channel area [ha]	1.43	0.98	0.88	0.69	0.90	0.62
	Exposed bars area [ha]	0.69	0.66	1.03	0.96	1.56	1.49
	Lightly vegetated bars area [ha]	0.00	0.02	0.01	-	0.50	-
	Heavily vegetated bars area [ha]	0.00	0.21	0.03	-	0.14	-
	Active channel area [ha]	2.12	1.87	1.95	0.88	1.04	0.92
	<i>Active width [m]</i>	20.34	13.50	12.16	0.66	0.90	0.60
	<i>Total wetted channel length [km]</i>	0.70	0.78	0.77	1.12	0.98	1.09
	<i>River centreline length [km]</i>	0.70	0.73	0.72	1.03	1.00	1.03
	<i>Braid channel ratio</i>	1.00	1.08	1.06	1.08	0.98	1.06
	<i>Sinuosity index</i>	1.07	1.10	1.10	1.03	1.00	1.03
Reach 2 (1984)	Wetted channel area [ha]	38.72	40.10	50.93	1.04	1.27	1.32
	Exposed bars area [ha]	85.77	41.29	63.30	0.48	1.53	0.74
	Lightly vegetated bars area [ha]	70.86	27.17	64.00	0.38	2.36	0.90
	Heavily vegetated bars area [ha]	12.31	91.39	33.63	7.42	0.37	2.73
	Active channel area [ha]	207.66	199.95	211.86	0.96	1.06	1.02
	<i>Active width [m]</i>	16.09	16.52	20.96	1.03	1.27	1.30
	<i>Total wetted channel length [km]</i>	24.66	27.50	28.16	1.11	1.02	1.14
	<i>River centreline length [km]</i>	24.06	24.28	24.30	1.01	1.00	1.01
	<i>Braid channel ratio</i>	1.02	1.13	1.16	1.10	1.02	1.13
	<i>Sinuosity index</i>	1.49	1.50	1.50	1.01	1.00	1.01
Reach 3 (1958)	Wetted channel area [ha]	139.40	91.79	119.06	0.66	1.30	0.85
	Exposed bars area [ha]	204.09	63.32	90.45	0.31	1.43	0.44
	Lightly vegetated bars area [ha]	83.32	59.53	115.01	0.71	1.93	1.38
	Heavily vegetated bars area [ha]	55.77	61.87	46.91	1.11	0.76	0.84

Reach	Characteristic	Value			NCI		
		1958/1984	2021	2024	Epoch 1	Epoch 2	Epoch 3
	Active channel area [ha]	482.58	482.58	371.43	0.57	1.34	0.77
	<i>Active width [m]</i>	25.96	16.42	21.22	0.63	1.29	0.82
	<i>Total wetted channel length [km]</i>	54.20	57.40	60.60	1.06	1.06	1.12
	<i>River centreline length [km]</i>	53.70	55.91	56.11	1.04	1.00	1.04
	<i>Braid channel ratio</i>	1.01	1.03	1.08	1.02	1.05	1.07
	<i>Sinuosity index</i>	1.48	1.54	1.55	1.04	1.00	1.04
Reach 4 (1958)	Wetted channel area [ha]	20.53	15.43	19.84	0.75	1.29	0.97
	Exposed bars area [ha]	18.46	15.72	18.06	0.85	1.15	0.98
	Lightly vegetated bars area [ha]	1.45	6.72	2.85	4.63	0.42	1.97
	Heavily vegetated bars area [ha]	1.24	2.08	3.04	1.68	1.46	2.45
	Active channel area [ha]	41.68	39.95	43.79	0.96	1.10	1.05
	<i>Active width [m]</i>	21.35	15.13	19.78	0.71	1.31	0.93
	<i>Total wetted channel length [km]</i>	9.62	10.40	10.41	1.08	1.00	1.08
	<i>River centreline length [km]</i>	9.62	10.20	10.03	1.06	0.98	1.04
	<i>Braid channel ratio</i>	1.00	1.02	1.04	1.02	1.02	1.04
	<i>Sinuosity index</i>	1.36	1.44	1.41	1.06	0.98	1.04
Reach 5 (1958)	Wetted channel area [ha]	5.99	4.65	4.80	0.78	1.03	0.80
	Exposed bars area [ha]	6.69	5.44	5.06	0.81	0.93	0.76
	Lightly vegetated bars area [ha]	0.58	0.50	0.66	0.86	1.32	1.14
	Heavily vegetated bars area [ha]	0.72	0.82	0.09	1.14	0.11	0.13
	Active channel area [ha]	13.98	11.41	10.61	0.82	0.93	0.76
	<i>Active width [m]</i>	23.60	18.07	18.86	0.77	1.04	0.80
	<i>Total wetted channel length [km]</i>	2.54	2.69	2.65	1.06	0.99	1.05
	<i>River centreline length [km]</i>	2.54	2.57	2.54	1.01	0.99	1.00
	<i>Braid channel ratio</i>	1.00	1.05	1.04	1.05	1.00	1.04

Reach	Characteristic	Value			NCI		
		1958/1984	2021	2024	Epoch 1	Epoch 2	Epoch 3
	<i>Sinuosity index</i>	1.07	1.09	1.08	1.01	0.99	1.00
Reach 6 (1958)	Wetted channel area [ha]	7.73	3.99	3.62	0.52	0.91	0.47
	Exposed bars area [ha]	17.74	4.54	5.61	0.26	1.24	0.32
	Lightly vegetated bars area [ha]	7.97	0.11	0.07	0.01	0.64	0.01
	Heavily vegetated bars area [ha]	2.91	0.53	0.00	0.18	0.00	0.00
	Active channel area [ha]	36.35	9.17	9.30	0.25	1.01	0.26
	<i>Active width [m]</i>	38.78	20.51	18.79	0.53	0.92	0.48
	<i>Total wetted channel length [km]</i>	2.60	2.23	2.12	0.86	0.95	0.81
	<i>River centreline length [km]</i>	1.99	1.94	1.93	0.98	0.99	0.97
	<i>Braid channel ratio</i>	1.31	1.15	1.10	0.88	0.96	0.84
	<i>Sinuosity index</i>	1.10	1.07	1.06	0.98	0.99	0.97
Reach 7 (1958)	Wetted channel area [ha]	25.69	17.66	19.95	0.69	1.13	0.78
	Exposed bars area [ha]	23.43	11.95	10.44	0.51	0.87	0.45
	Lightly vegetated bars area [ha]	0.14	0.61	1.06	4.36	1.74	7.57
	Heavily vegetated bars area [ha]	0.31	1.81	0.06	5.84	0.03	0.19
	Active channel area [ha]	49.57	32.03	31.51	0.65	0.98	0.64
	<i>Active width [m]</i>	24.37	16.90	19.28	0.69	1.14	0.79
	<i>Total wetted channel length [km]</i>	10.69	10.56	10.54	0.99	1.00	0.99
	<i>River centreline length [km]</i>	10.54	10.45	10.35	0.99	0.99	0.98
	<i>Braid channel ratio</i>	1.01	1.01	1.02	1.00	1.01	1.00
	<i>Sinuosity index</i>	1.18	1.17	1.15	0.99	0.99	0.98
Reach 8 (1958)	Wetted channel area [ha]	52.51	28.78	33.22	0.55	1.15	0.63
	Exposed bars area [ha]	4.18	4.53	4.38	1.08	0.97	1.05
	Lightly vegetated bars area [ha]	0.60	0.84	1.19	1.40	1.42	1.98
	Heavily vegetated bars area [ha]	0.00	1.30	0.06	-	0.05	-

Reach	Characteristic	Value			NCI		
		1958/1984	2021	2024	Epoch 1	Epoch 2	Epoch 3
	Active channel area [ha]	57.29	35.45	38.85	0.62	1.10	0.68
	<i>Active width [m]</i>	22.39	12.42	14.56	0.55	1.17	0.65
	<i>Total wetted channel length [km]</i>	23.45	23.29	23.11	0.99	0.99	0.99
	<i>River centreline length [km]</i>	23.45	23.17	22.82	0.99	0.98	0.97
	<i>Braid channel ratio</i>	1.00	1.00	1.01	1.00	1.01	1.01
	<i>Sinuosity index</i>	1.27	1.26	1.24	0.99	0.98	0.97

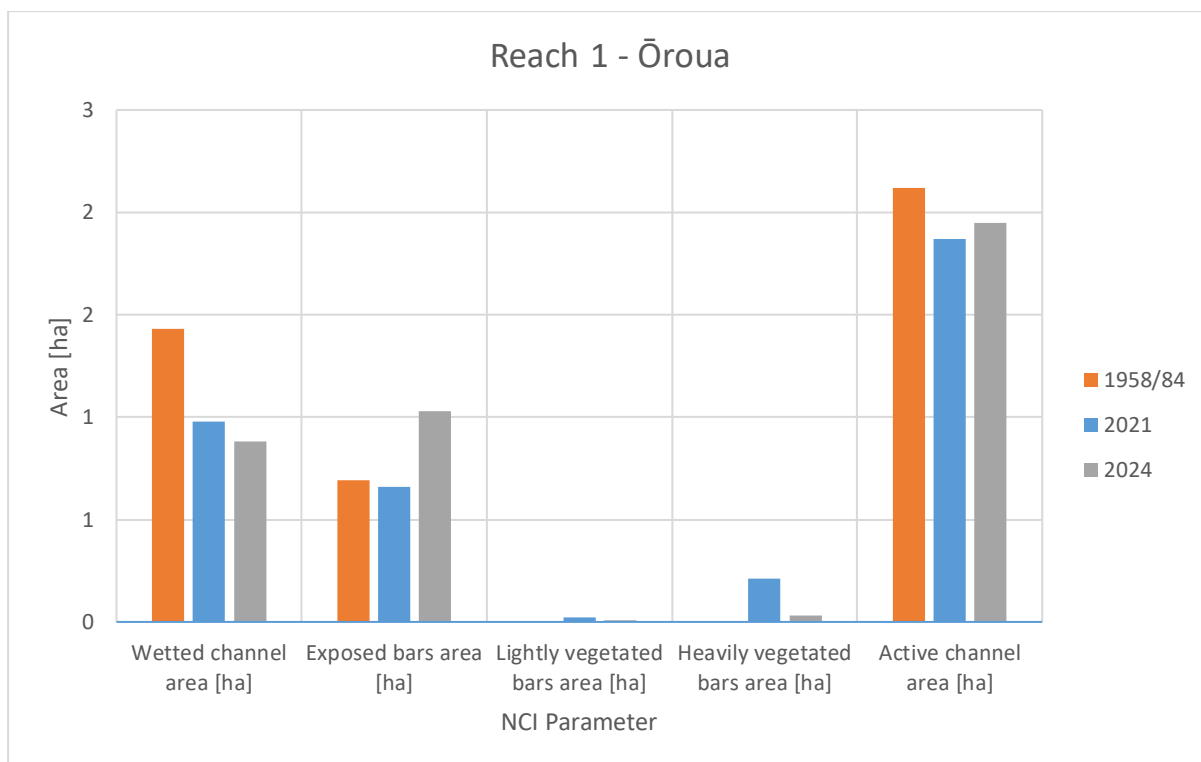


Figure Appendix A.12: Comparison of areas for each NCI parameter for reach one of Ōroua.

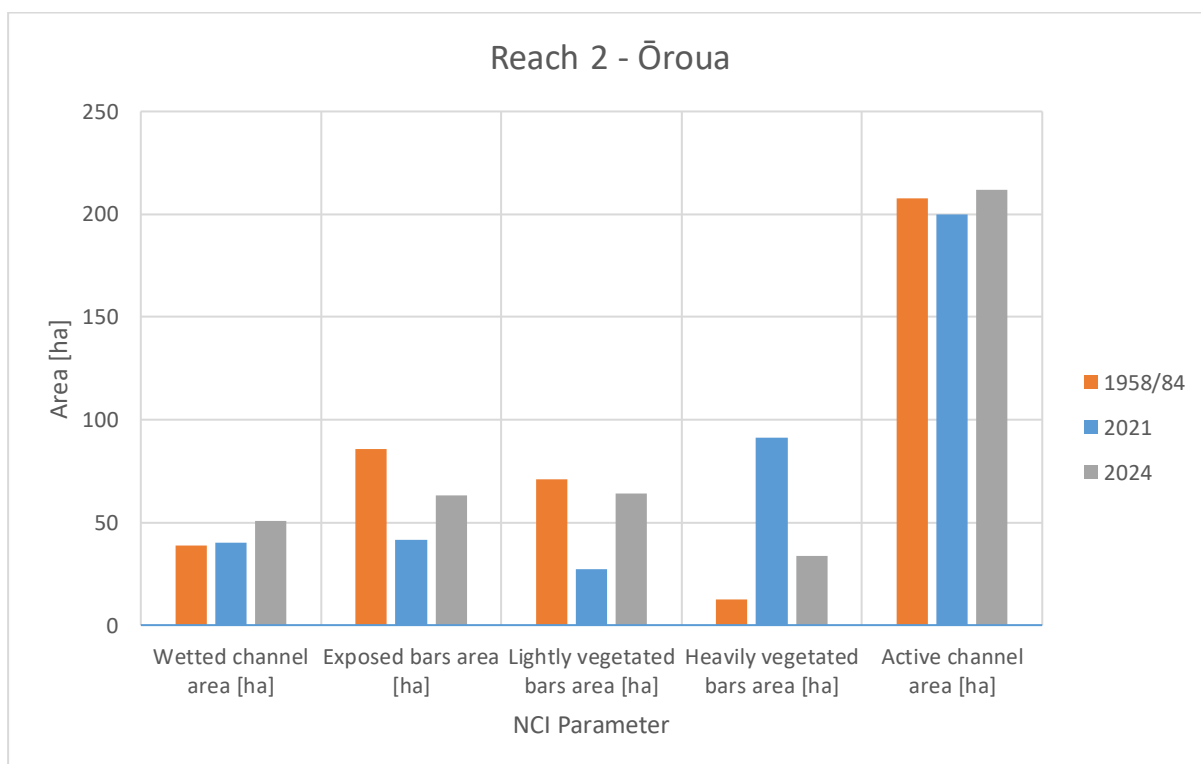


Figure Appendix A.13: Comparison of areas for each NCI parameter for reach two of Ōroua.

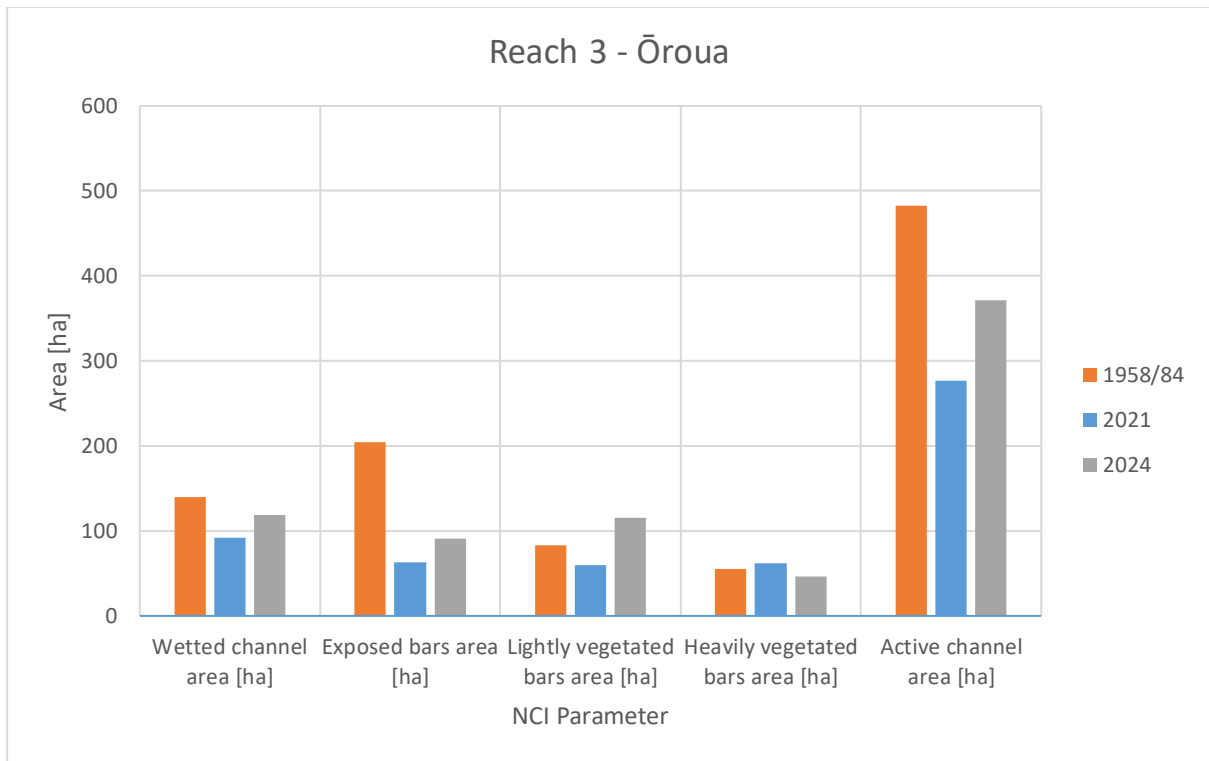


Figure Appendix A.14: Comparison of areas for each NCI parameter for reach three of Ōroua.

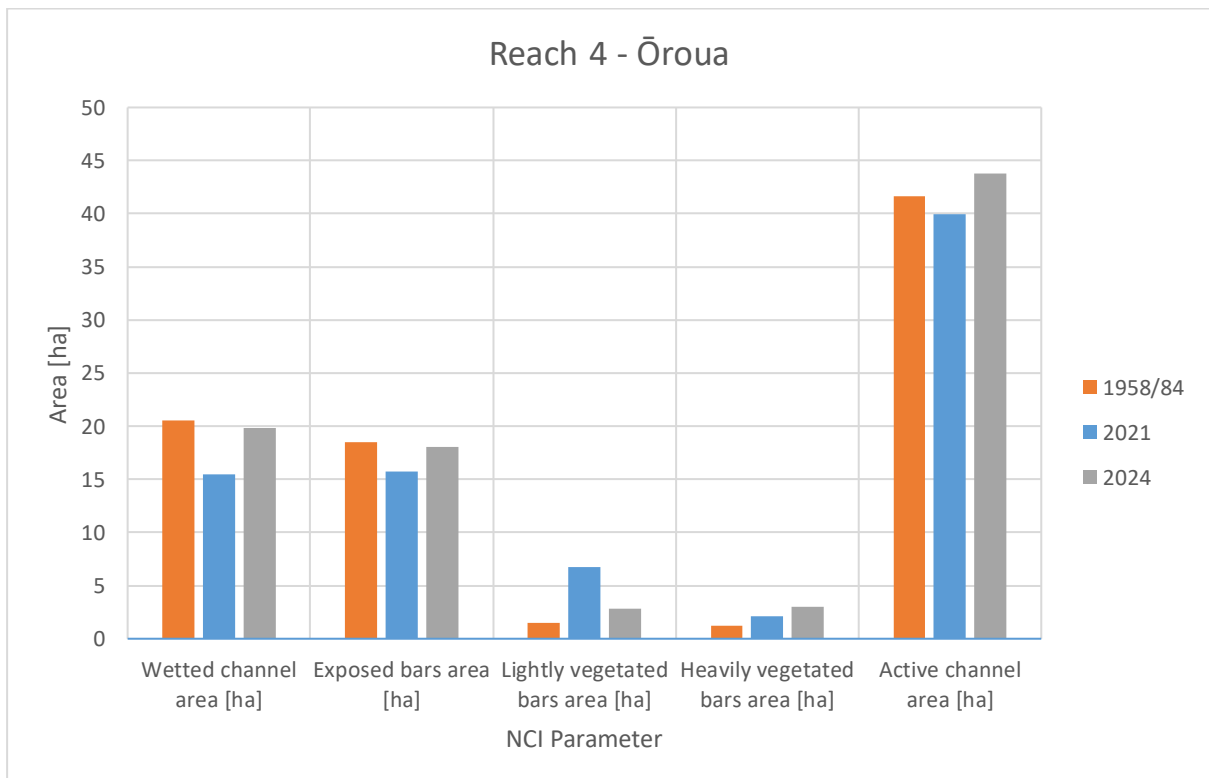


Figure Appendix A.15: Comparison of areas for each NCI parameter for reach four of Ōroua.

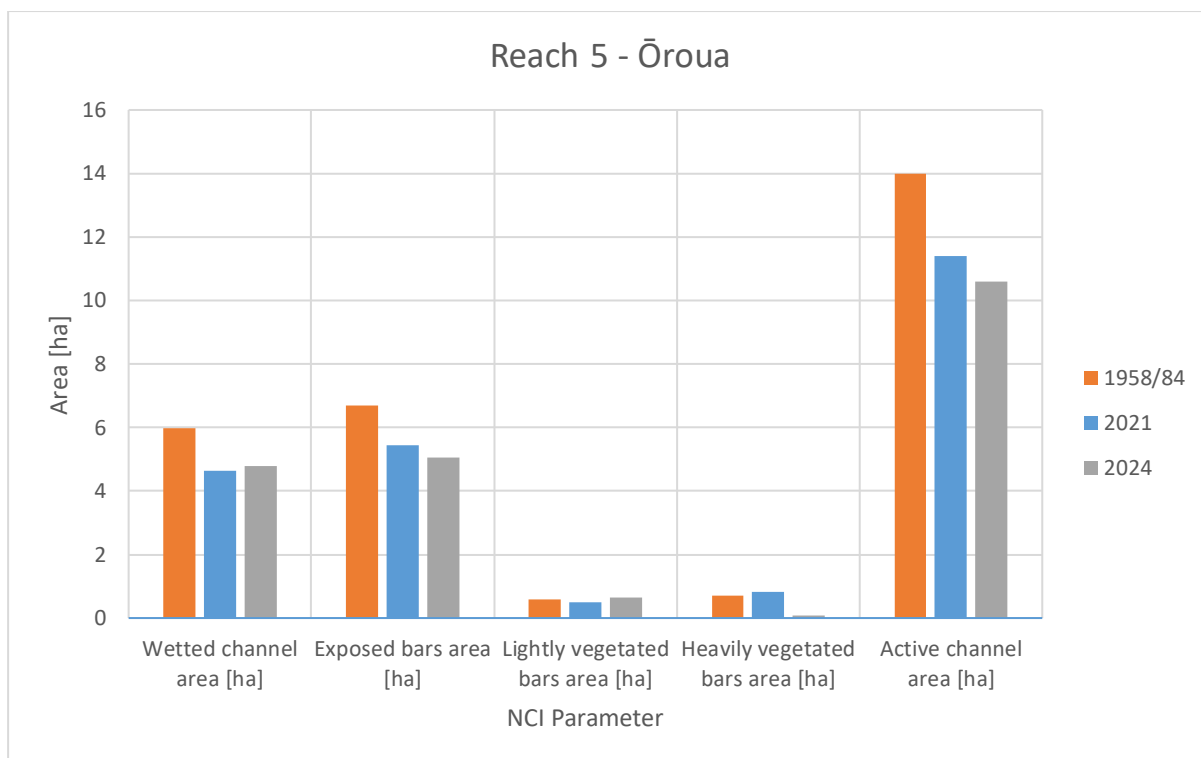


Figure Appendix A.16: Comparison of areas for each NCI parameter for reach five of Ōroua.

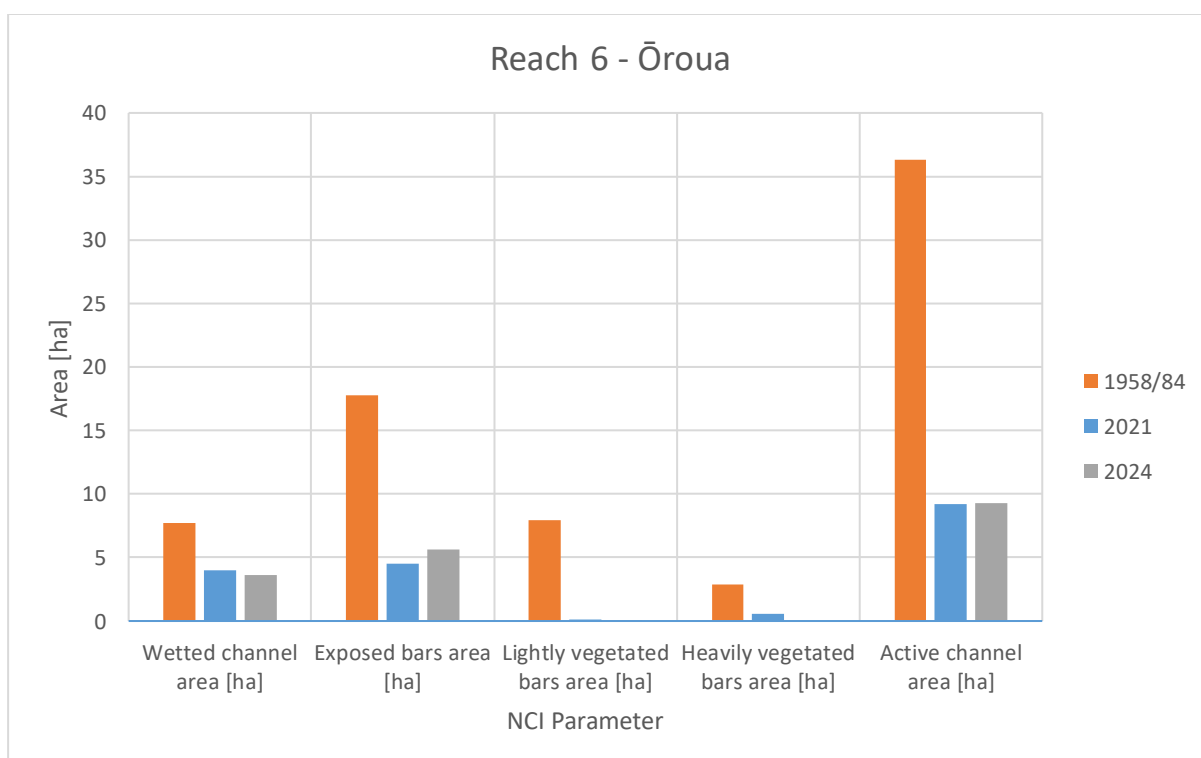


Figure Appendix A.17: Comparison of areas for each NCI parameter for reach six of Ōroua.

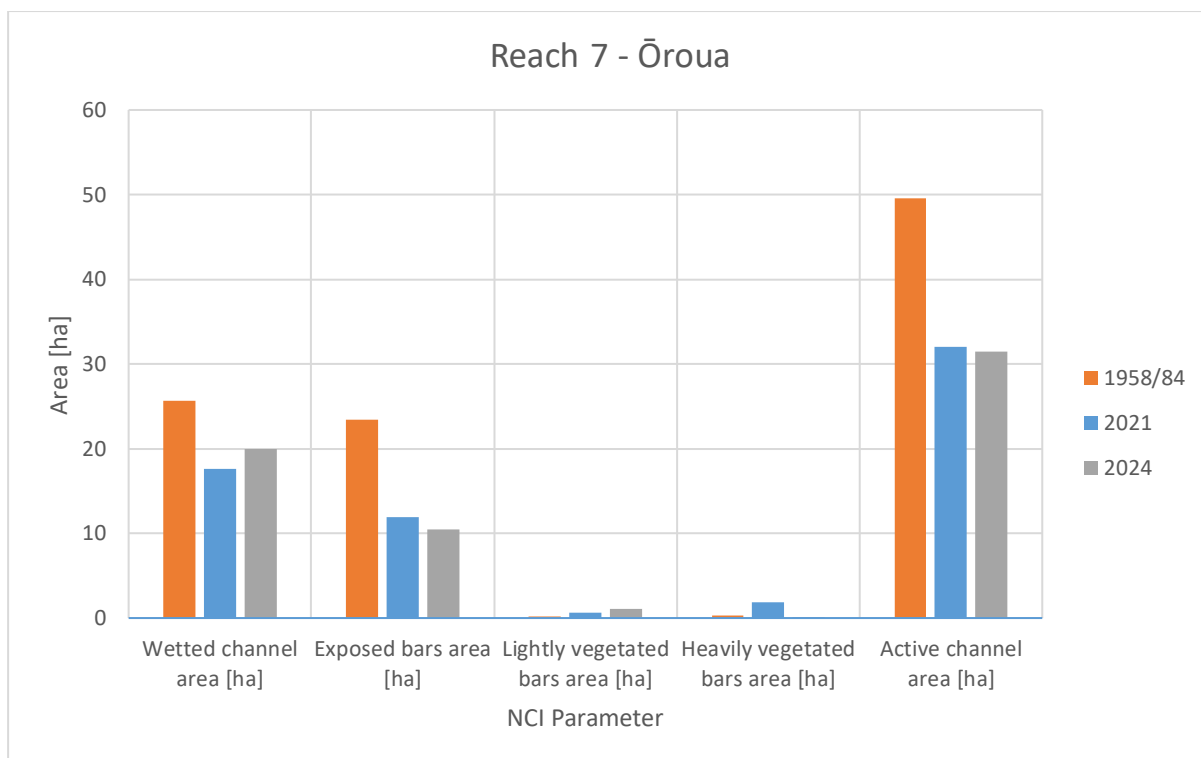


Figure Appendix A.18: Comparison of areas for each NCI parameter for reach seven of Ōroua.

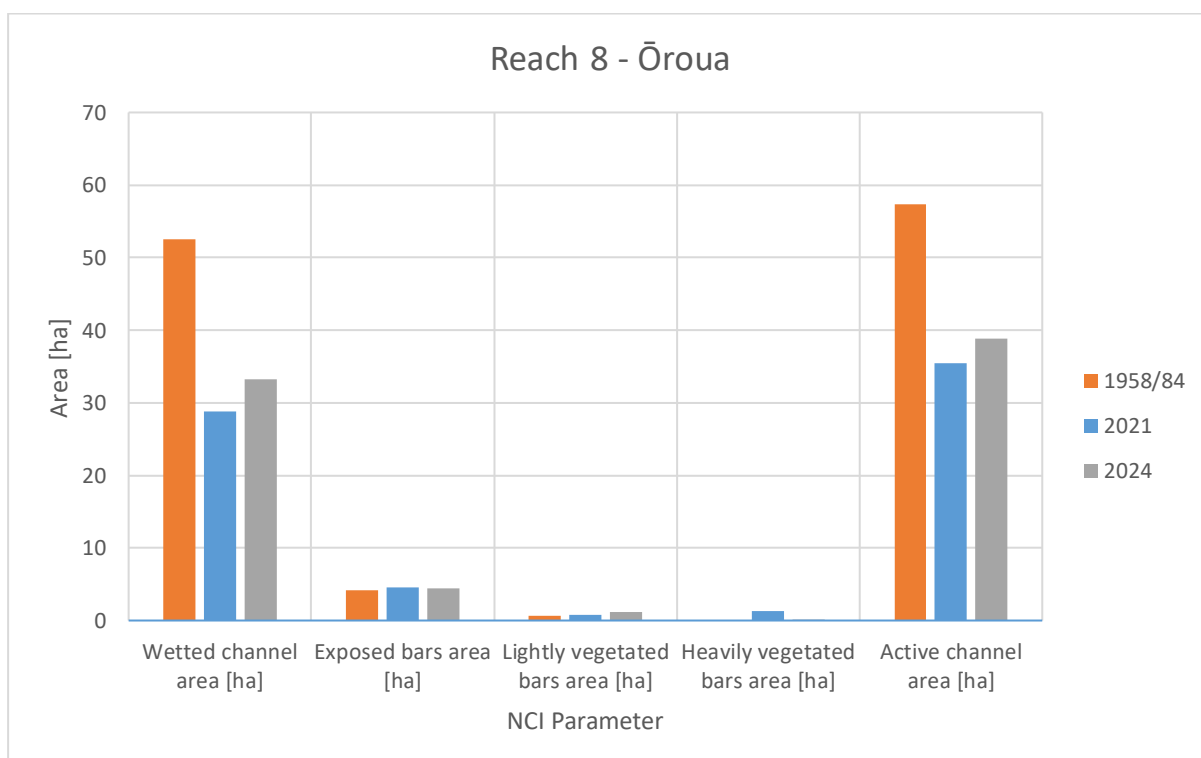


Figure Appendix A.19: Comparison of areas for each NCI parameter for reach eight of Ōroua.

Appendix B Data provided by Horizons

Natural Character Index Assessments

Ōroua and Pohangina Rivers: Data Sources

Nature-Based Solutions Investigation – Ōroua and Pohangina Rivers
Horizons and Tonkin + Taylor, 2025

Background	3
DATA USE STATEMENT 05 May 2025	3
Aerial Imagery	4
1937-1946	5
AerialImagery_1937_Oroua	5
AerialImagery_1942a_Oroua	6
AerialImagery_1942b_OrouaPohangina.....	7
1958-1961	8
AerialImagery_1958_OrouaPohangina.....	8
AerialImagery_1961_OrouaPohangina.....	9
1974-1980	10
AerialImagery_1974a_OrouaPohangina.....	10
AerialImagery_1974b_OrouaPohangina.....	11
AerialImagery_1974c_Oroua	12
AerialImagery_1974d_Oroua	13
AerialImagery_1979_OrouaPohangina.....	14
1980-1984	15
AerialImagery_1980_Oroua	15
AerialImagery_1982_Oroua	16
AerialImagery_1983_OrouaPohangina.....	17
AerialImagery_1984_Oroua	18
1999-2001	19
AerialImagery_1999_OrouaPohangina.....	19
AerialImagery_2001_OrouaPohangina.....	20
2005	21
AerialImagery_2005_OrouaPohangina.....	21
2011	22
AerialImagery_2011_OrouaPohangina.....	22
2016	23
AerialImagery_2016_OrouaPohangina.....	23
2021	24
AerialImagery_2021_OrouaPohangina.....	24
2024	25
Elevation Models.....	26
Ōroua Corridor 2016 DEM (Wel53)	26
Ōroua Hybrid DEM	27
Ōroua Imagery-Derived DSM	28
Pohangina 2024	29
Relative Elevation Models.....	30
Historic Channels	32

Background

Horizons have engaged Tonkin + Taylor to conduct Natural Character Index (NCI) assessments for the Ōroua and Pohangina Rivers as part of the Nature-Based Solutions Investigation – Ōroua and Pohangina Rivers. Horizons has provided data to Tonkin + Taylor for use during the development of the NCI reports. This document provides an overview of the data provided.

If you have any questions about this project, please contact the project team by emailing NatureBasedSolutions@horizons.govt.nz, or go to the project website:

Nature-Based Solutions Investigation - Ōroua And Pohangina Rivers

(<https://www.horizons.govt.nz/managing-natural-resources/nature-based-solutions-investigation-oroua-and-poh>)

DATA USE STATEMENT 05 May 2025

Supply of data to Tonkin + Taylor. This dataset provides spatial information solely to support the development of a Natural Character Index for the Ōroua and Pohangina Rivers, as part of the Nature-Based Solutions Investigation – Ōroua and Pohangina Rivers only. The provided information should be deleted from the clients' electronic systems at the completion of the clients' project. Horizons archives the provided information and can re-supply the requested information free of charge for additional related study / projects or peer review. The data provided is provisional as it has not been audited.

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DATA

Data supplied on 05 May 2025 by Ruby Stevens (Catchment Operations Group, Horizons)
Ruby.Stevens@horizons.govt.nz

Please contact us if we can help with any other data or information.

Data to be supplied:

- Grayscale and colour aerial imagery (.tif rasters) from 1937 to 2024.
- Elevation data (.tif rasters) including relative elevation models, point-cloud filtered digital surface models, and LiDAR-based digital elevation models.
- Area of interest (feature layers) vector data and supporting contextual data.

Aerial Imagery

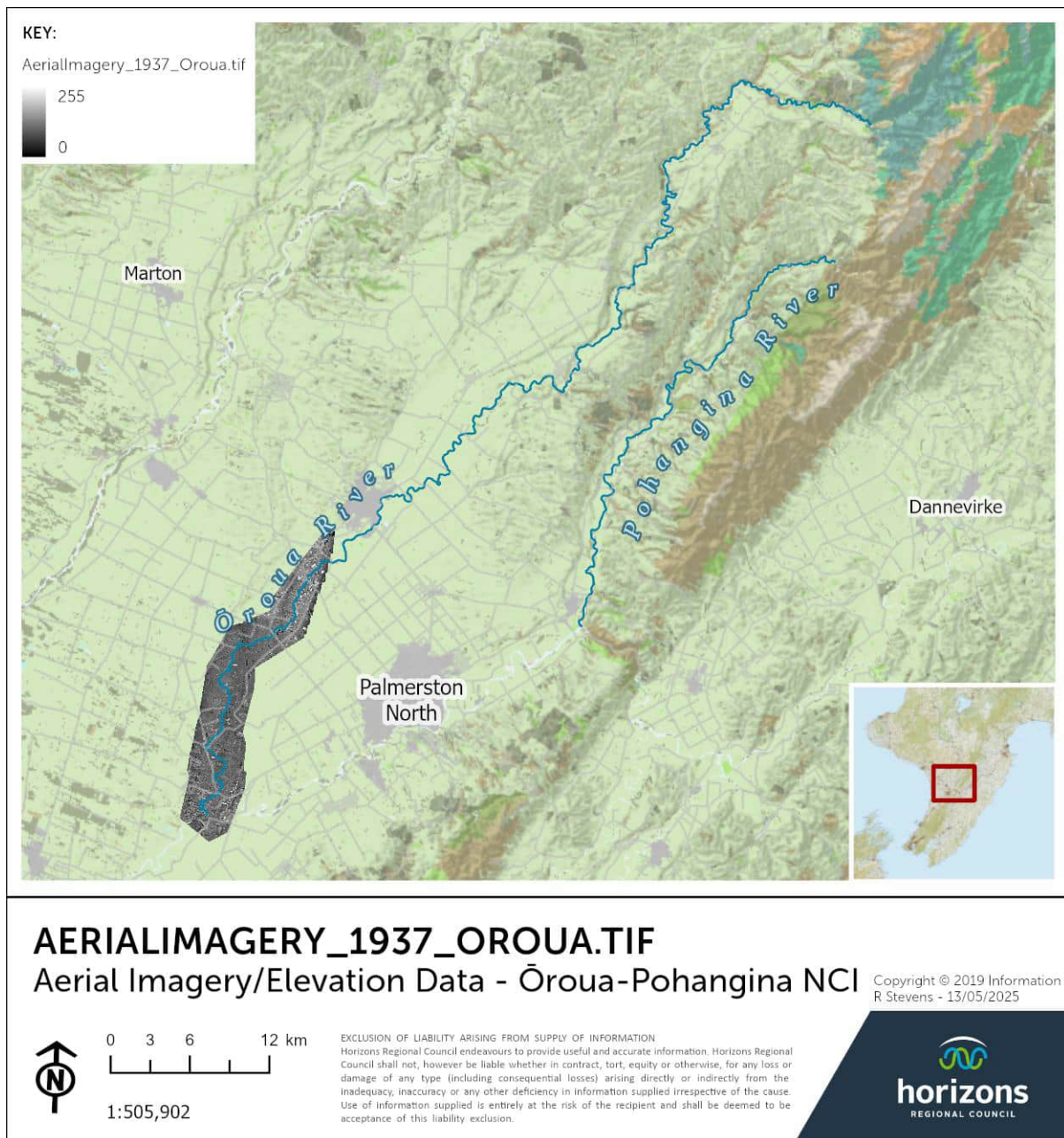
Historic aerial surveys can be grouped together to provide near-complete coverage of the study area for periods in time. Recent surveys often provide coverage of the entire study area within one survey, and as such do not need grouping together.

The earliest near-complete set of historic surveys is 1937-1946, which provides aerial imagery coverage for the majority of the study area (uppermost Ōroua River not available until 1952 (SN509), lowermost Pohangina River not available until 1950 (SN181)).

1937-1946

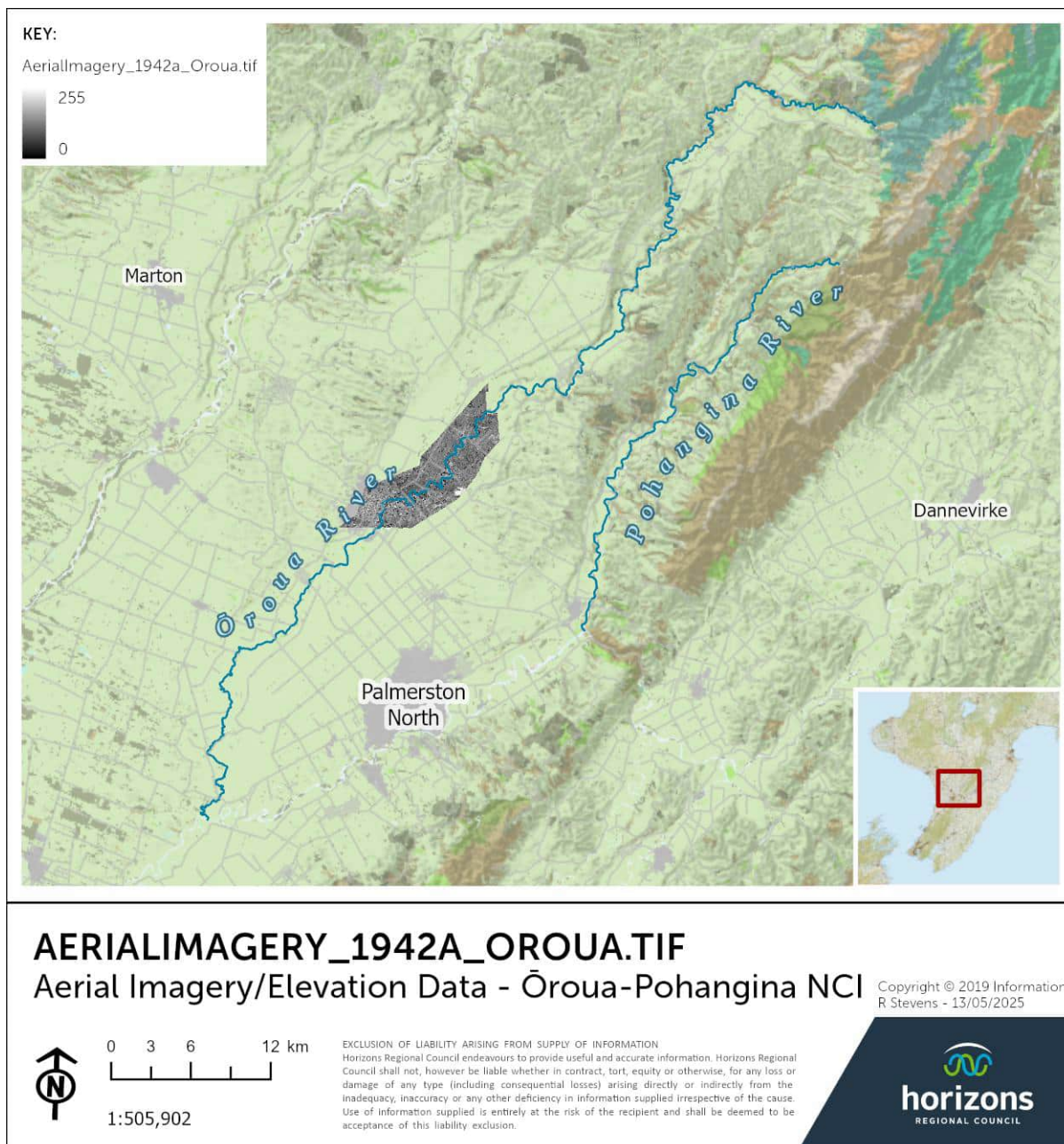
AerialImagery_1937_Oroua

- Survey Number: 60
- Name: Manawatu – Oroua, 1937
- Date Collected: 20th August 1937 - 28th September 1937
- Coverage: Lower Ōroua River
- Resolution: 0.25m
- Details: Grayscale raster. Original dataset held by Horizons Regional Council. Clipped to study area buffer and provided as “AerialImagery_1937_Oroua.tif”



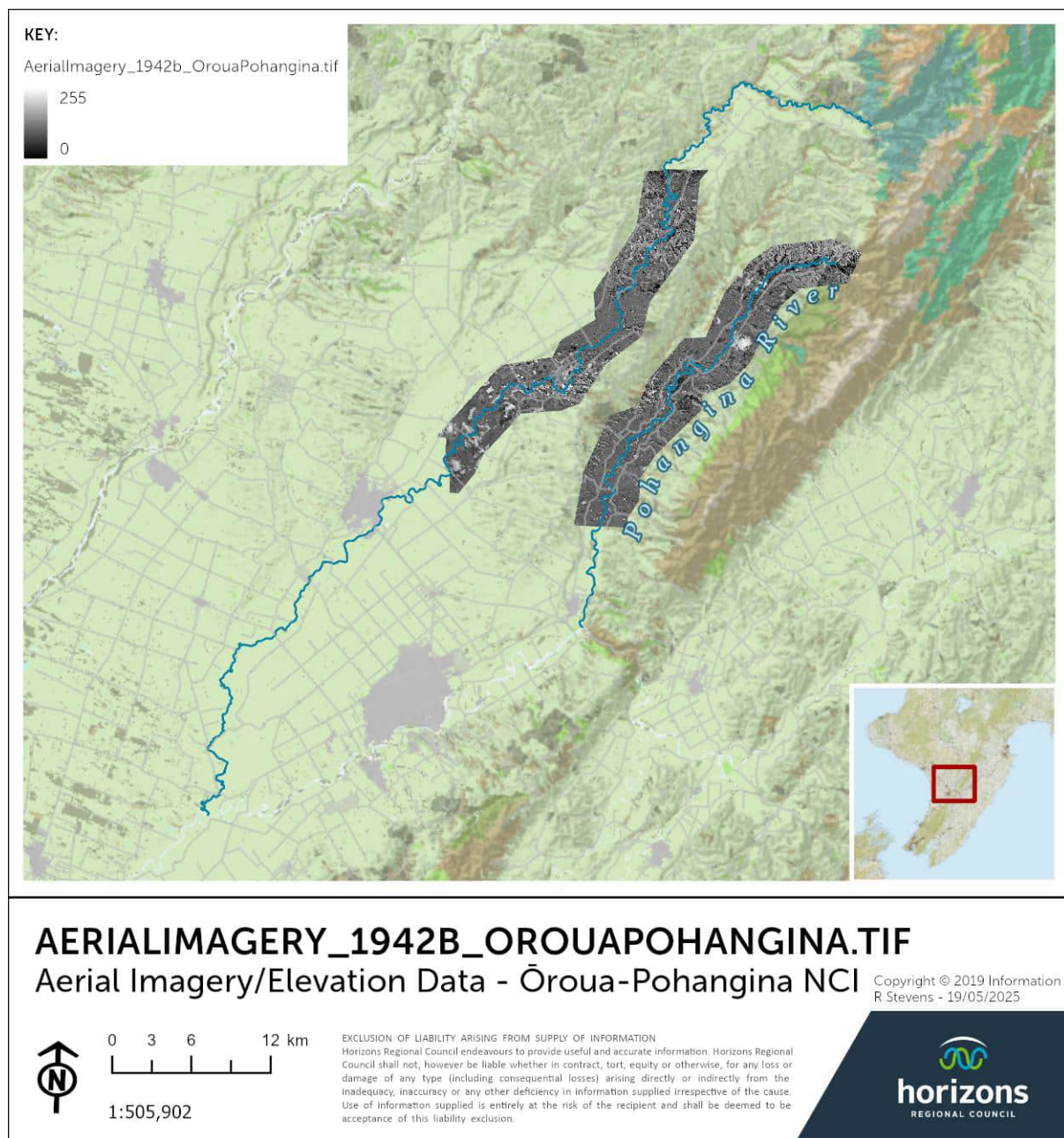
AerialImagery_1942a_Oroua

- Survey Number: 215
- Name: Patea – Feilding, 1942-46-52-53
- Date Collected: 10th June 1942 - 8th April 1952 (Ōroua area flown in July-August 1942)
- Coverage: Middle Ōroua River
- Resolution: 0.32m
- Details: Grayscale raster. Original dataset held by Horizons Regional Council. Clipped to study area buffer and provided as “AerialImagery_1942a_Oroua.tif”



AerialImagery_1942b_OrouaPohangina

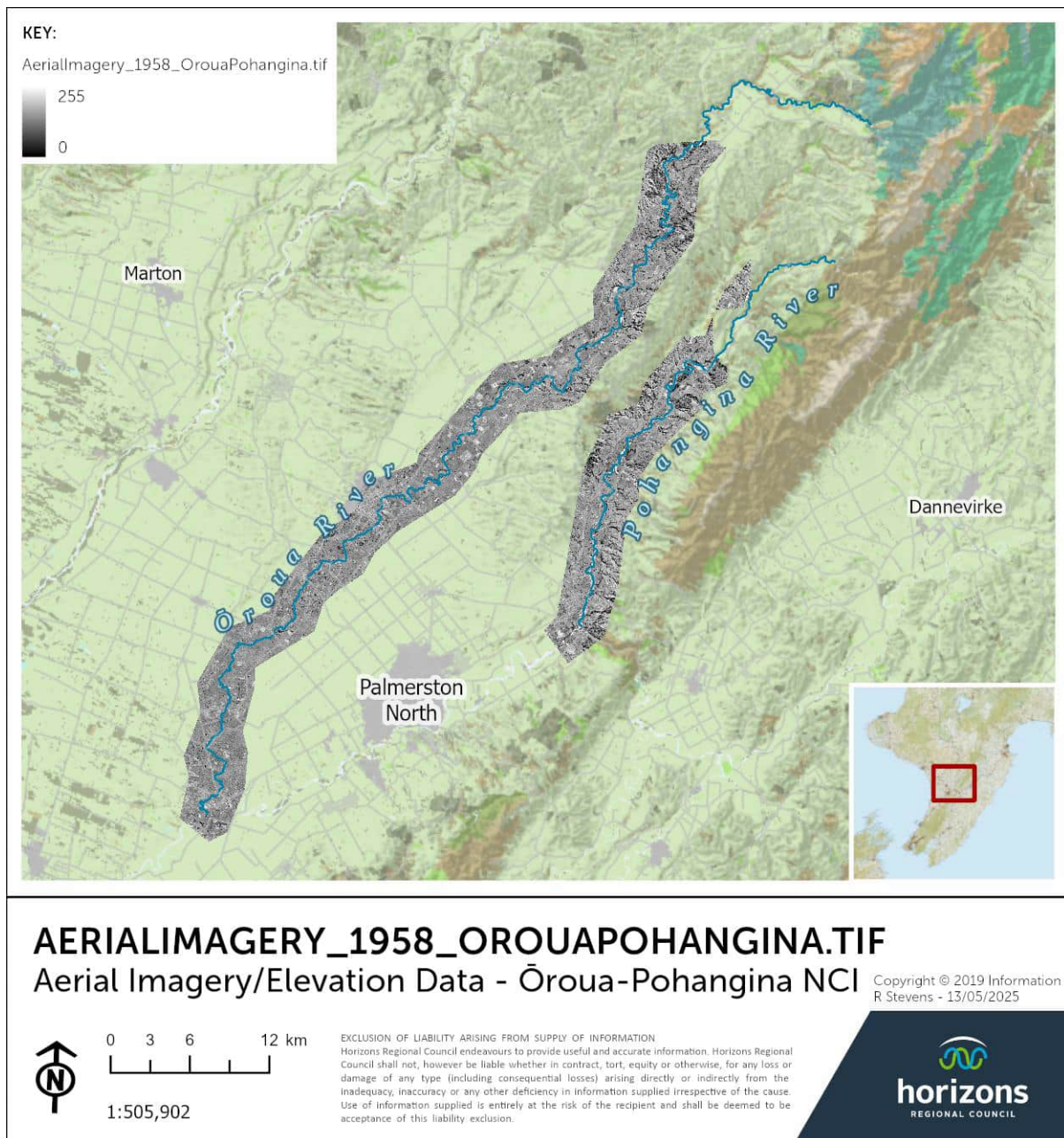
- Survey Number: 230
- Name: Waipukurau – Feilding – Cape Turnagain, 1942-44-46-52-53
- Date Collected: 1st December 1942 - 28th April 1953 (Pohangina-Ōroua area flown in October-December 1946)
- Coverage: Upper Ōroua River and Middle/Upper Pohangina River
- Resolution: 0.32m
- Details: Grayscale raster. Original dataset held by Horizons Regional Council. Clipped to study area buffer and provided as “AerialImagery_1942b_OrouaPohangina.tif”



1958-1961

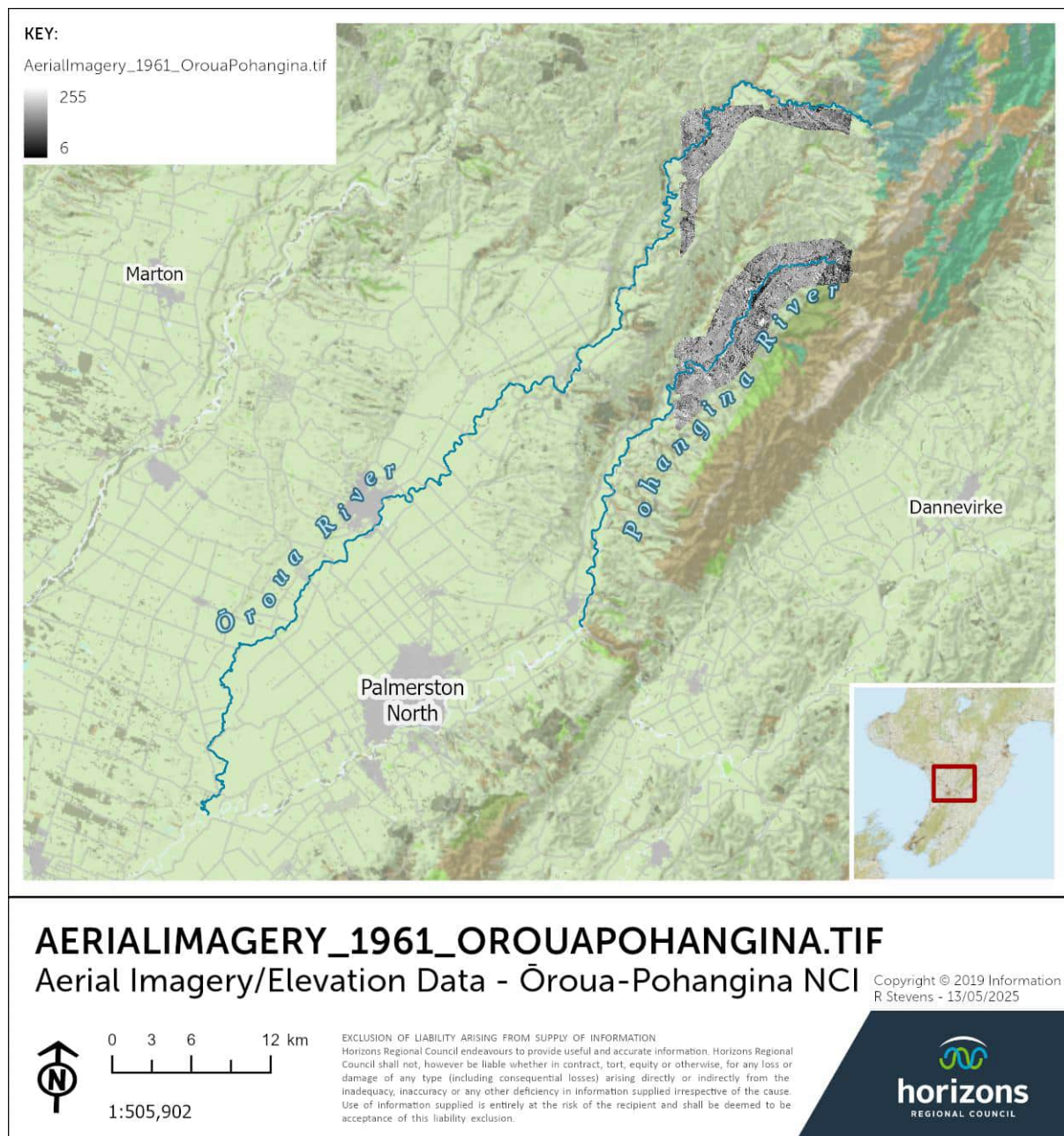
AerialImagery_1958_OrouaPohangina

- Survey Number: 1092
- Name: Wanganui - Palmerston North, 1958
- Date Collected: 19th August 1958 - 18th September 1958
- Coverage: Lower/Middle Ōroua River and Lower/Middle Pohangina River
- Resolution: 0.75m
- Details: Grayscale raster. Original dataset held by Horizons Regional Council. Clipped to study area buffer and provided as "AerialImagery_1958_OrouaPohangina.tif"



AerialImagery_1961_OrouaPohangina

- Survey Number: 1412
- Name: Ruahine Range – Pahiatua, 1961
- Date Collected: 7th December 1961
- Coverage: Part Upper Ōroua River and Upper Pohangina River
- Resolution: 0.6m
- Details: Grayscale raster. Original dataset held by Horizons Regional Council. Clipped to study area buffer and provided as “AerialImagery_1961_OrouaPohangina.tif”

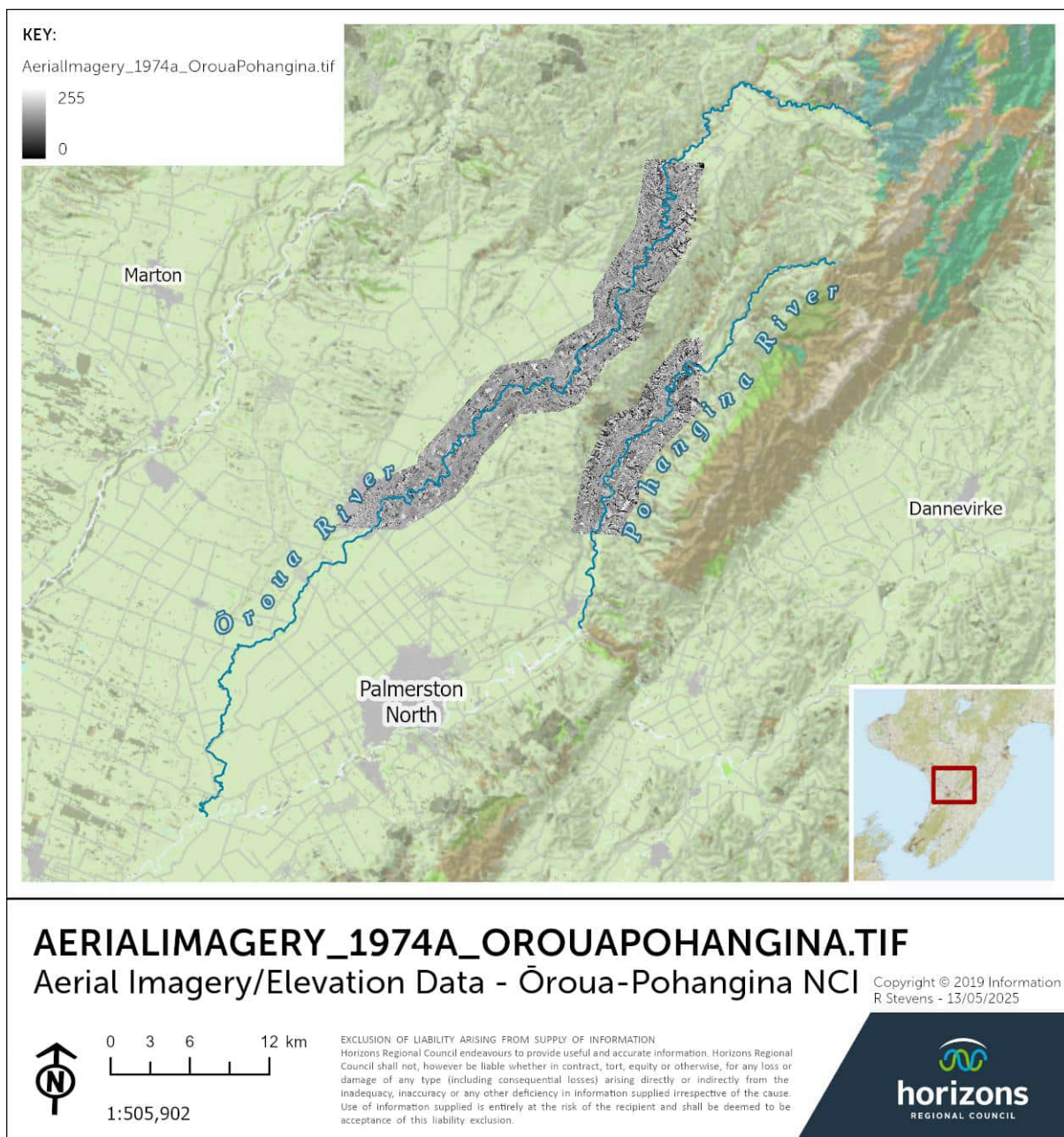


1974-1980

Historic surveys (collected in 1974-1980) which provide aerial imagery coverage for the study area.

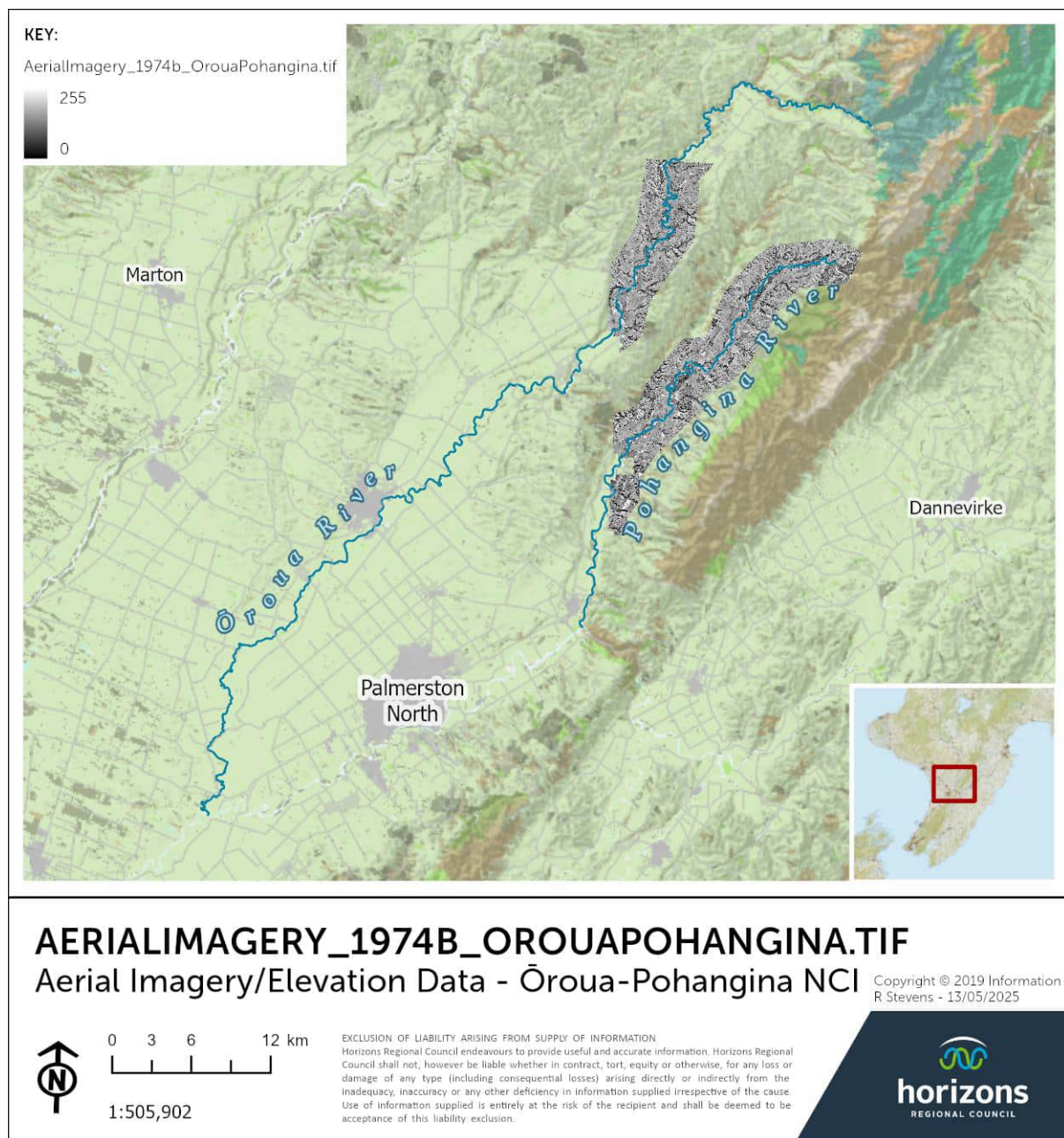
AerialImagery_1974a_OrouaPohangina

- Survey Number: 3720
- Name: Waioru – Feilding, 1974
- Date Collected: 28th March 1974
- Coverage: Middle Ōroua River and Middle Pohangina River
- Resolution: 0.4m
- Details: Grayscale raster. Original dataset held by Horizons Regional Council. Clipped to study area buffer, “AerialImagery_1974a_OrouaPohangina.tif”



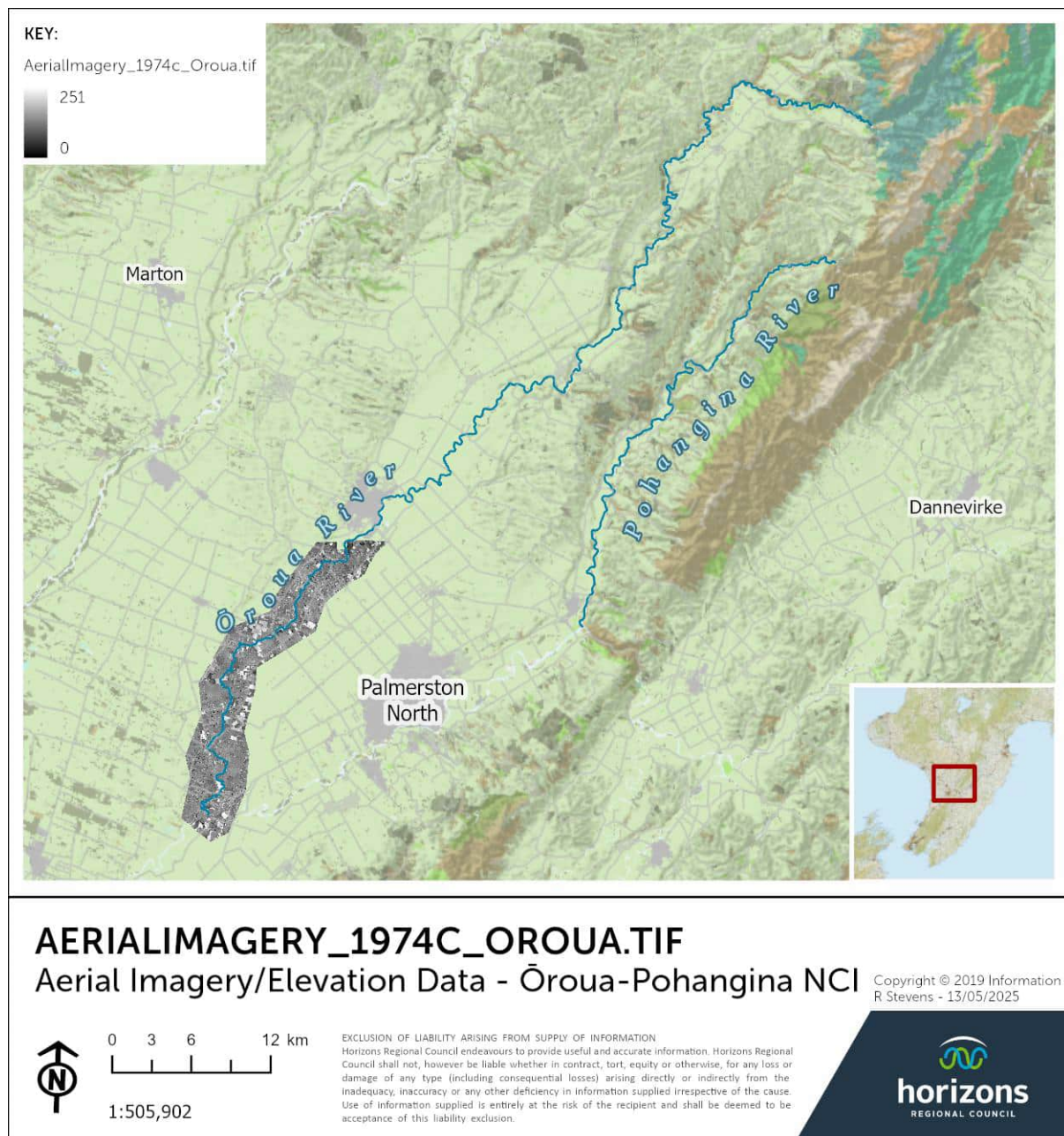
AerialImagery_1974b_OrouaPohangina

- Survey Number: 3721
- Name: Ngamatea – Ruahine Ranges, 1974-75
- Date Collected: 28th March 1974 – 10th August 1975 (Pohangina-Ōroua area flown on 28th March 1974)
- Coverage: Part Upper Ōroua River and Middle/Upper Pohangina
- Resolution: 0.32m
- Details: Grayscale raster. Original dataset held by Horizons Regional Council. Clipped to study area buffer and provided as “AerialImagery_1974b_OrouaPohangina.tif”



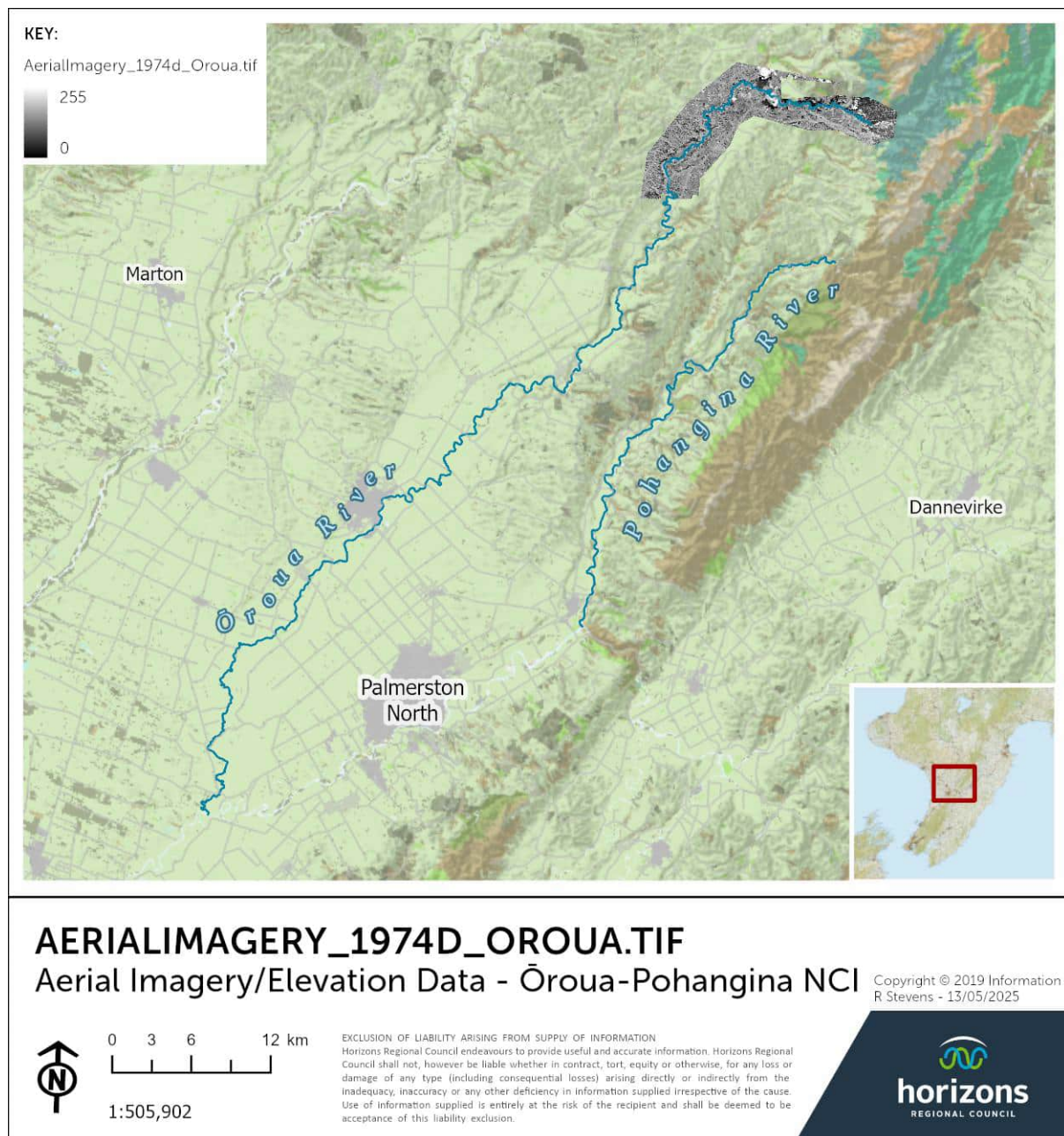
AerialImagery_1974c_Oroua

- Survey Number: 3764
- Name: Foxton – Palmerston North, 1974
- Date Collected: 5th November 1974 - 6th November 1974
- Coverage: Lower Ōroua River
- Resolution: 0.75m
- Details: Grayscale raster. Original dataset held by Horizons Regional Council. Clipped to study area buffer and provided as “AerialImagery_1974c_Oroua.tif”



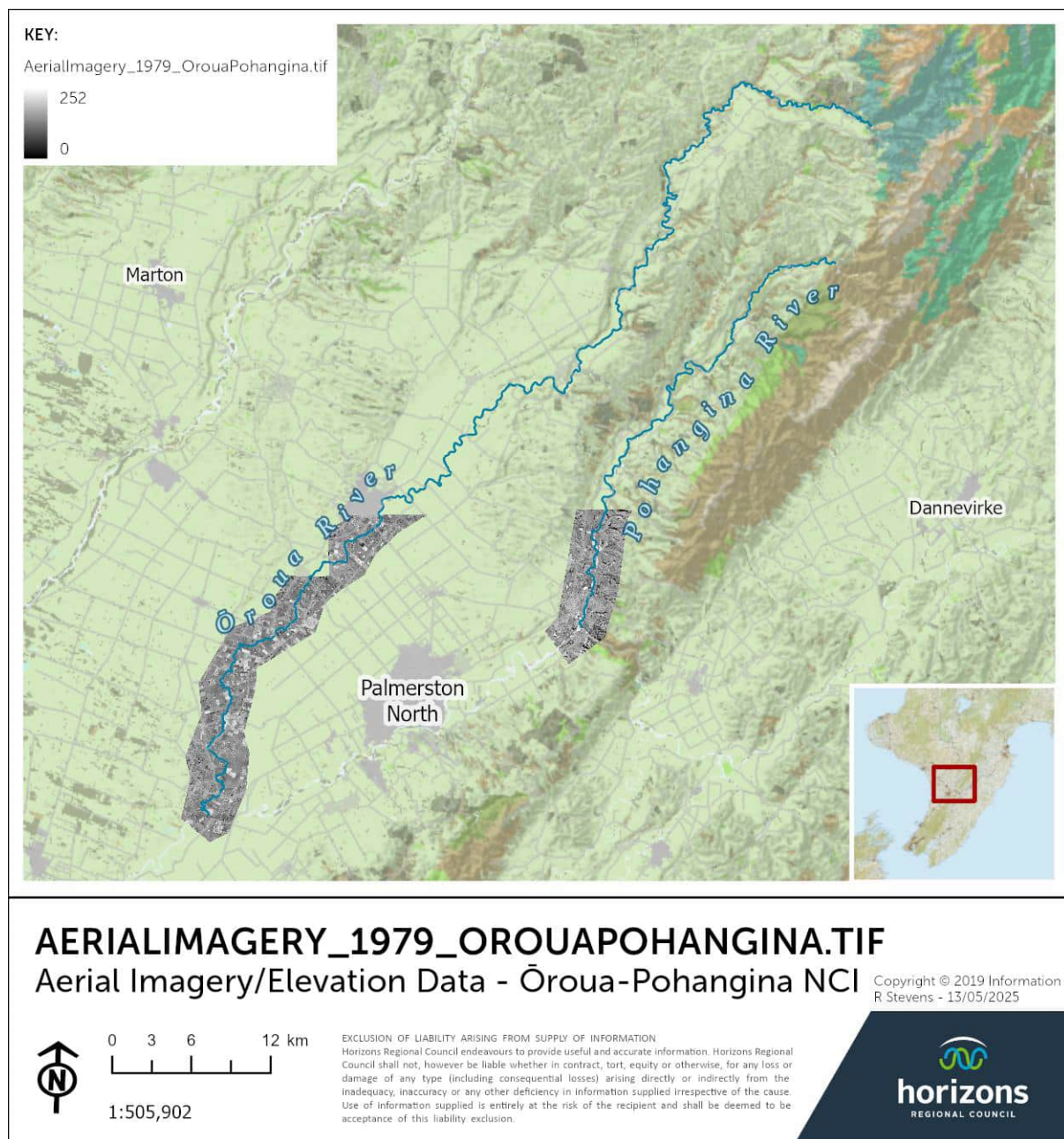
AerialImagery_1974d_Oroua

- Survey Number: 3766
- Name: Mangaweka – Ruahine Ranges, 1974-75
- Date Collected: 6th November 1974 - 2nd September 1975
- Coverage: Part Upper Ōroua River
- Resolution: 0.4m
- Details: Grayscale raster. Original dataset held by Horizons Regional Council. Clipped to study area buffer and provided as “AerialImagery_1974d_Oroua.tif”



AerialImagery_1979_OrouaPohangina

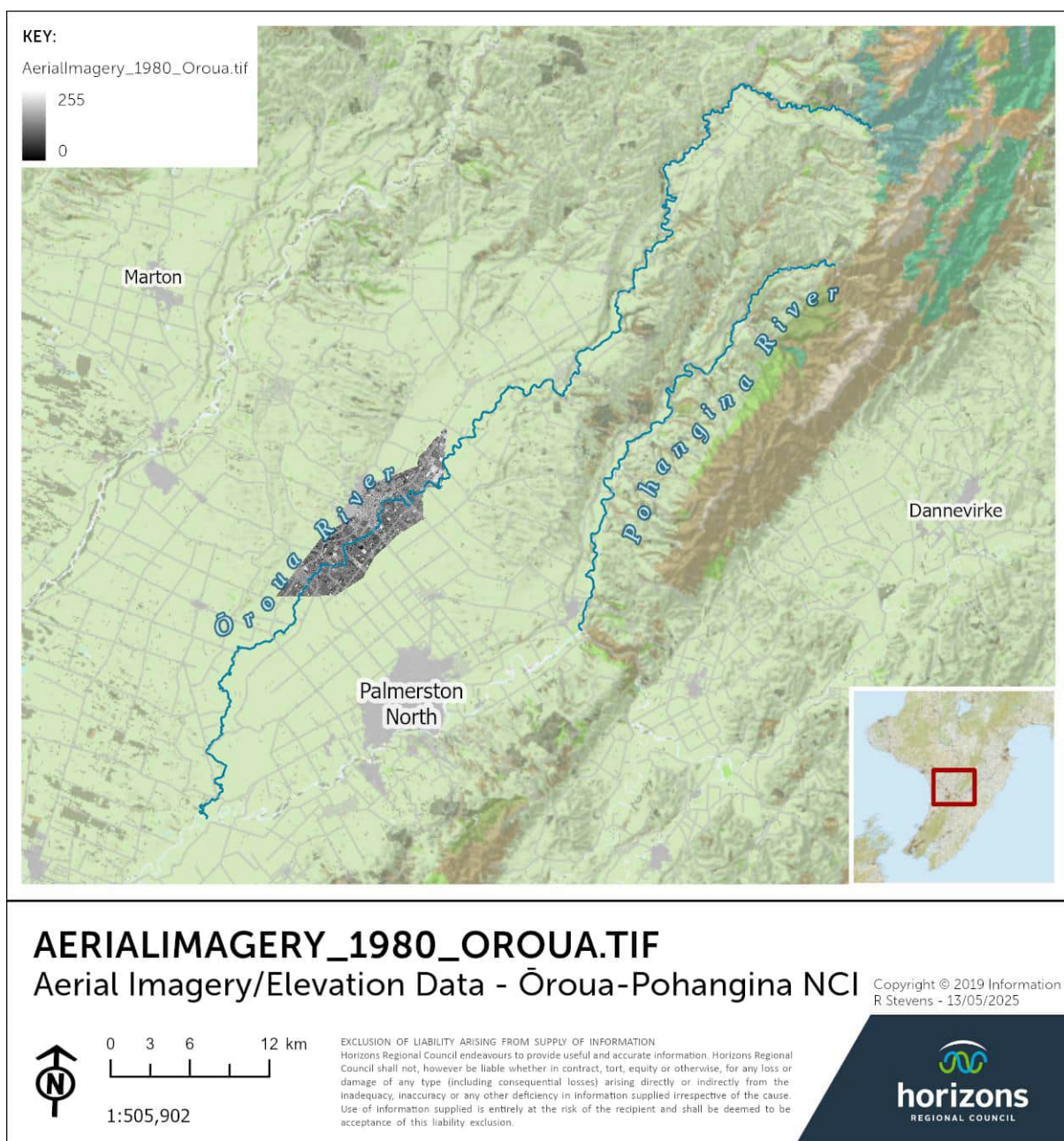
- Survey Number: 5408
- Name: Pahiatua – Palmerston North – Foxton, 1979-80
- Date Collected: 17th April 1979 - 22nd April 1980
- Coverage: Lower Ōroua River and Lower Pohangina River
- Resolution: 0.4m
- Details: Details: Grayscale raster. Original dataset held by Horizons Regional Council. Clipped to study area buffer and provided as “AerialImagery_1979_OrouaPohangina.tif”, and available via LINZ Basemaps (<https://basemaps.linz.govt.nz/@-40.3800284,175.6494140,z10.04?i=manawatu-whanganui-sn5408-1979-1980-0.375m&labels=true>)



1980-1984

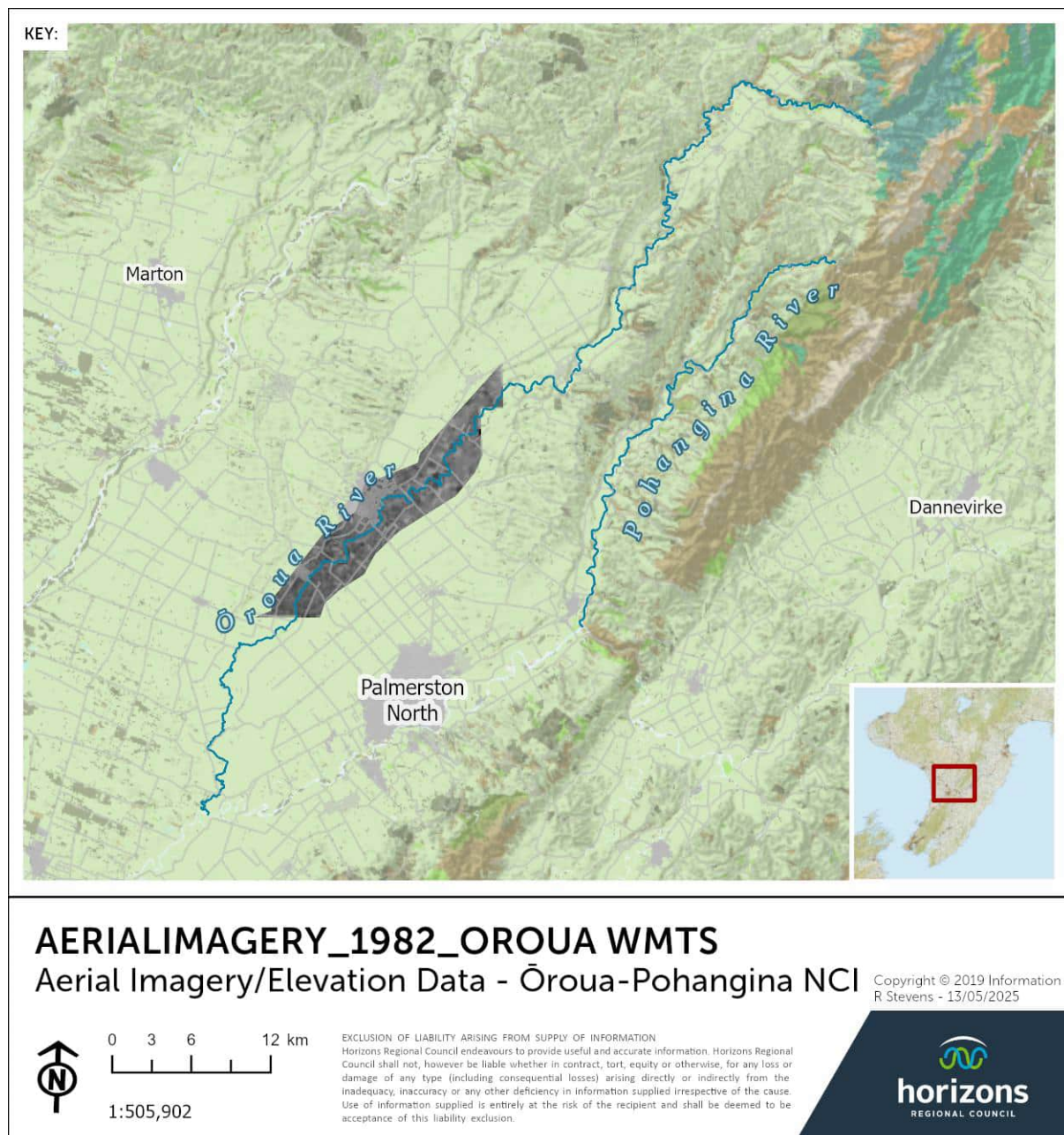
AerialImagery_1980_Oroua

- Survey Number: 5609
- Name: Whangaehu River – Feilding, 1979-80
- Date Collected: 5th November 1979 - 22nd April 1980 (Pohangina-Ōroua area flown on 22nd April 1980)
- Coverage: Part Middle Ōroua River
- Resolution: 0.4m
- Details: Grayscale raster. Original dataset held by Horizons Regional Council. Clipped to study area buffer and provided as “AerialImagery_1980_Oroua.tif”



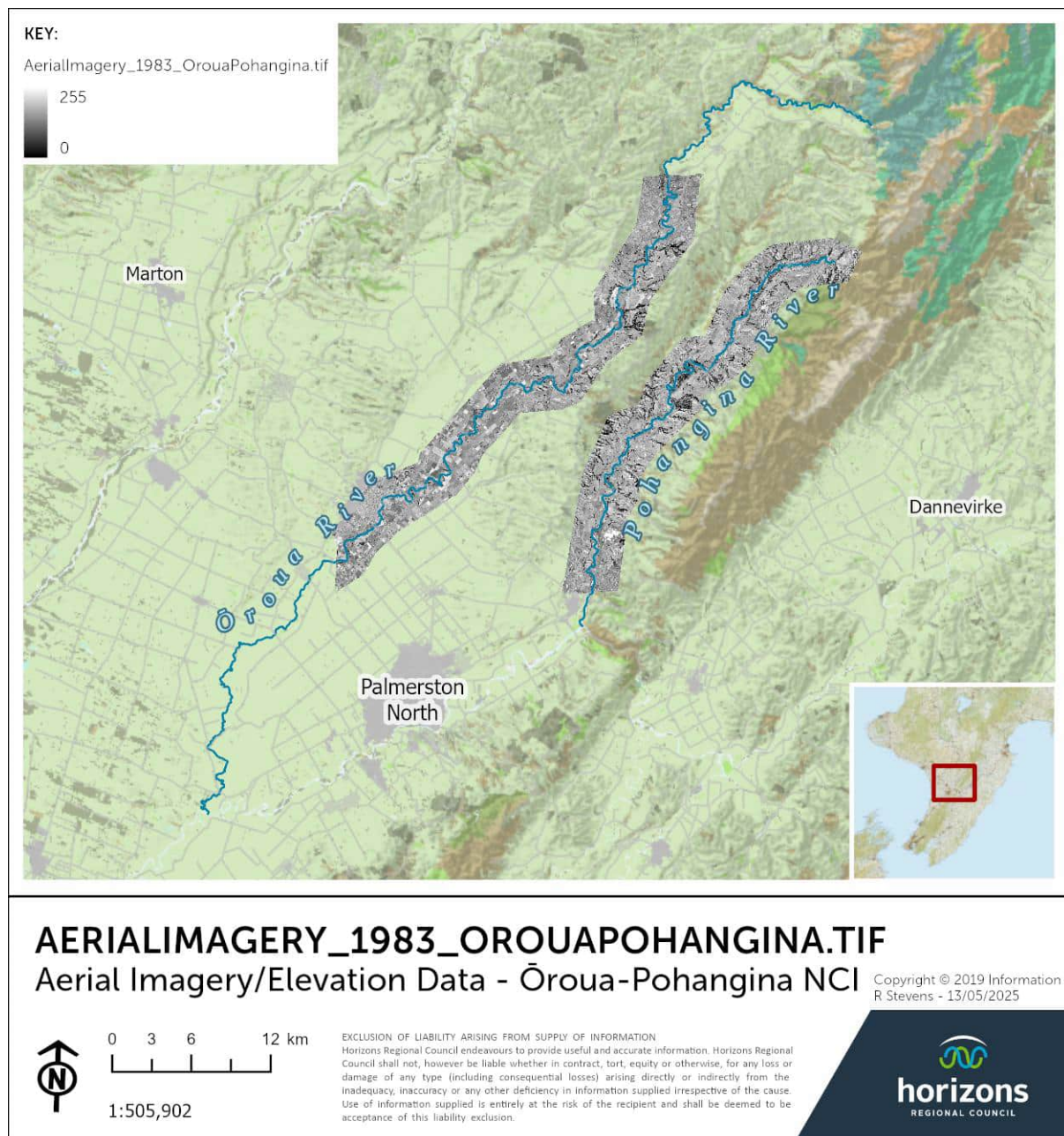
AerialImagery_1982_Oroua

- Survey Number: 8005
- Name: Waverley – Feilding, 1982
- Date Collected: 4th February 1982
- Coverage: Part Middle Ōroua River
- Resolution: 0.8m
- Details: WMTS Service (Grayscale raster). Available from LINZ Basemaps, added to project as “AerialImagery_1982_Oroua WMTS”. (<https://basemaps.linz.govt.nz/@-39.9771202,175.0781250,z9.31?i=manawatu-whanganui-sn8005-1982-0.8m&labels=true>)



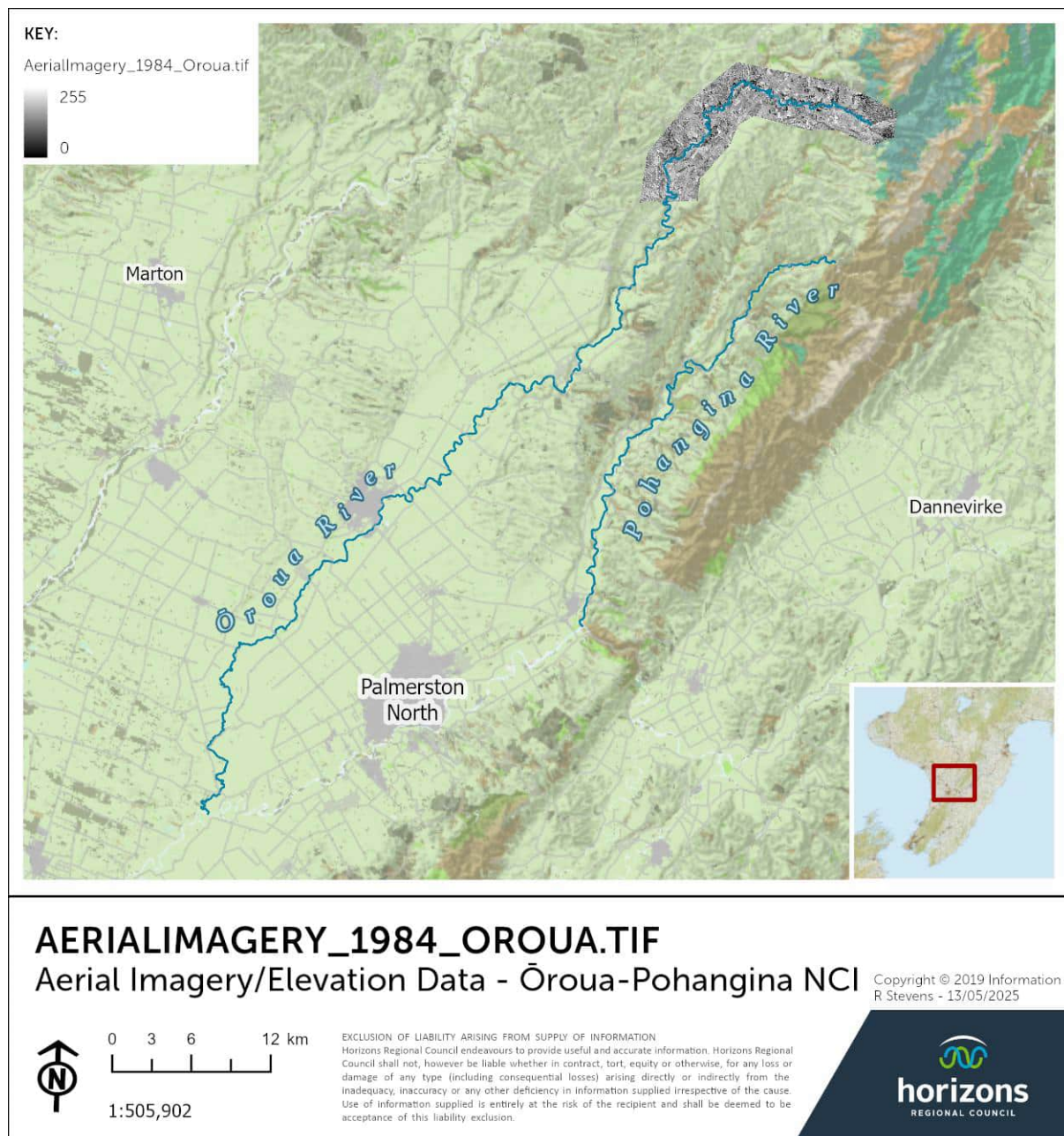
AerialImagery_1983_OrouaPohangina

- Survey Number: 8158
- Name: Waituna West – Oringi, 1983
- Date Collected: 2nd January 1983 - 18th March 1983
- Coverage: Middle Ōroua River and Middle-Upper Pohangina River
- Resolution: 0.4m
- Details: WMTS Service (Grayscale raster). Available from LINZ Basemaps, added to project as “AerialImagery_1983_OrouaPohangina.tif”.
(<https://basemaps.linz.govt.nz/@-40.1452891,175.8251950,z10.31?i=manawatu-whanganui-sn8158-1983-0.4m&labels=true>)



AerialImagery_1984_Oroua

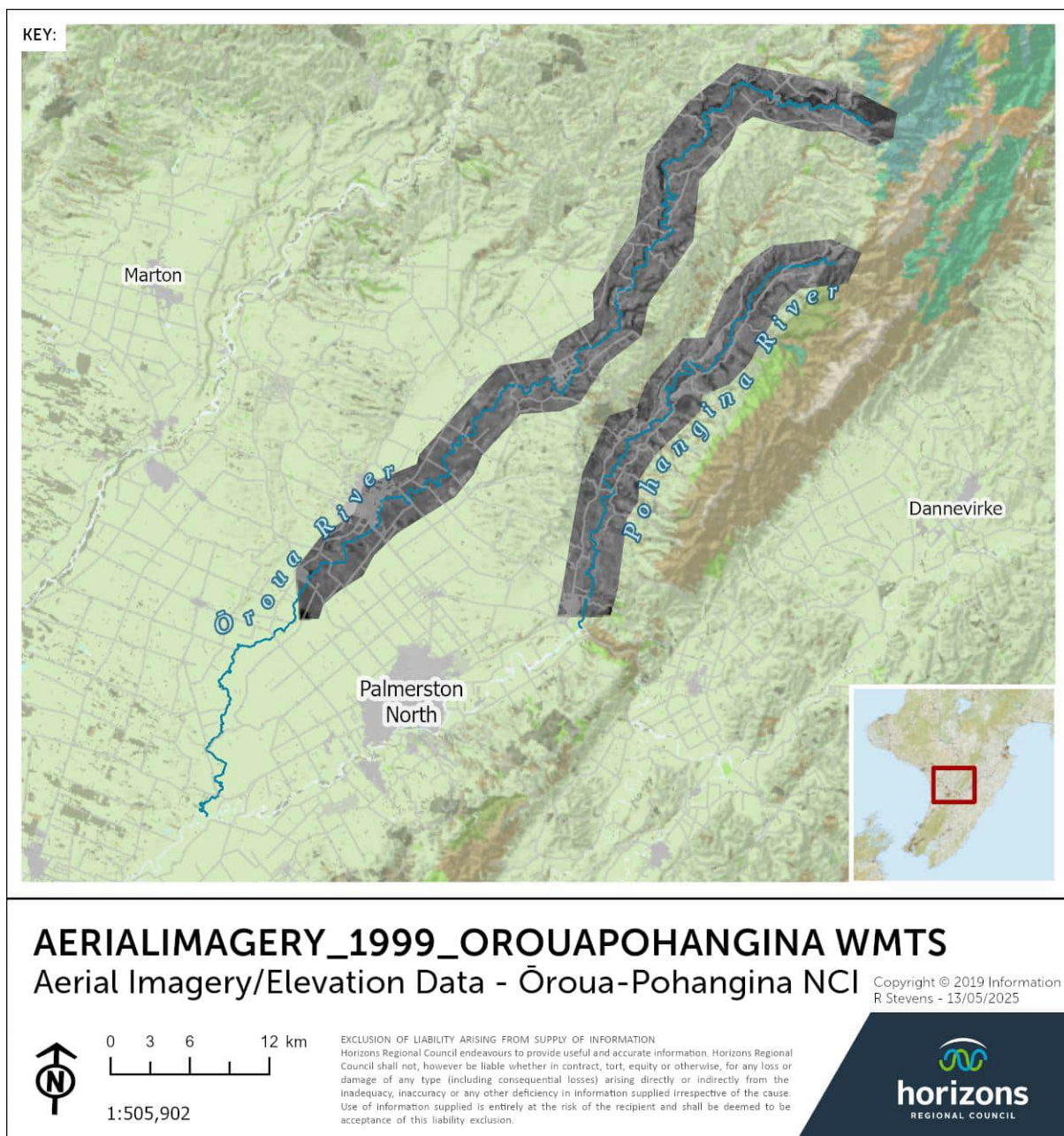
- Survey Number: 8316
- Name: Mangaweka – Apiti, 1984
- Date Collected: 1st February 1984 - 11th April 1984
- Coverage: Upper Ōroua River
- Resolution: 0.4m
- Details: WMTS Service (Grayscale raster). Available from LINZ Basemaps, added to project as “AerialImagery_1984_Oroua.tif”. (<https://basemaps.linz.govt.nz/@-39.8760198,175.8032225,z10.31?i=manawatu-whanganui-sn8316-1984-0.4m&labels=true>)



1999-2001

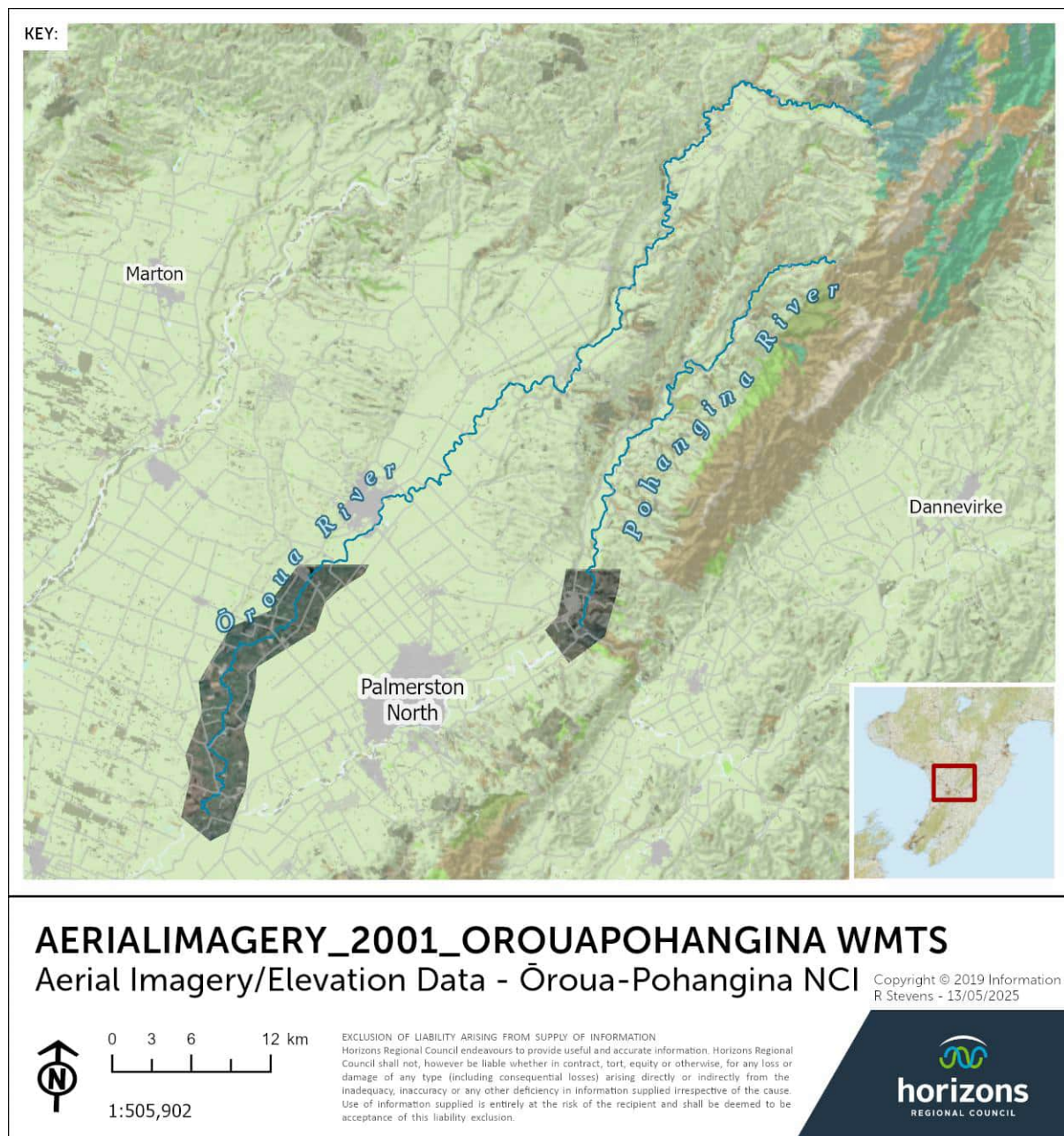
AerialImagery_1999_OrouaPohangina

- Survey Number: 12541
- Name: South Ruahine Range, 1999
- Date Collected: 27th January 1999 – 22nd April 1999
- Coverage: Middle-Upper Ōroua River and Middle-Upper Pohangina River
- Resolution: 0.75m
- Details: WMTS Service (Grayscale raster). Available from LINZ Basemaps, added to project as “AerialImagery_1999_OrouaPohangina.tif”.
(<https://basemaps.linz.govt.nz/@-39.9771202,176.1767580,z9.31?i=manawatu-whanganui-hawkes-bay-sn12541-1999-0.75m&labels=true>)



AerialImagery_2001_OrouaPohangina

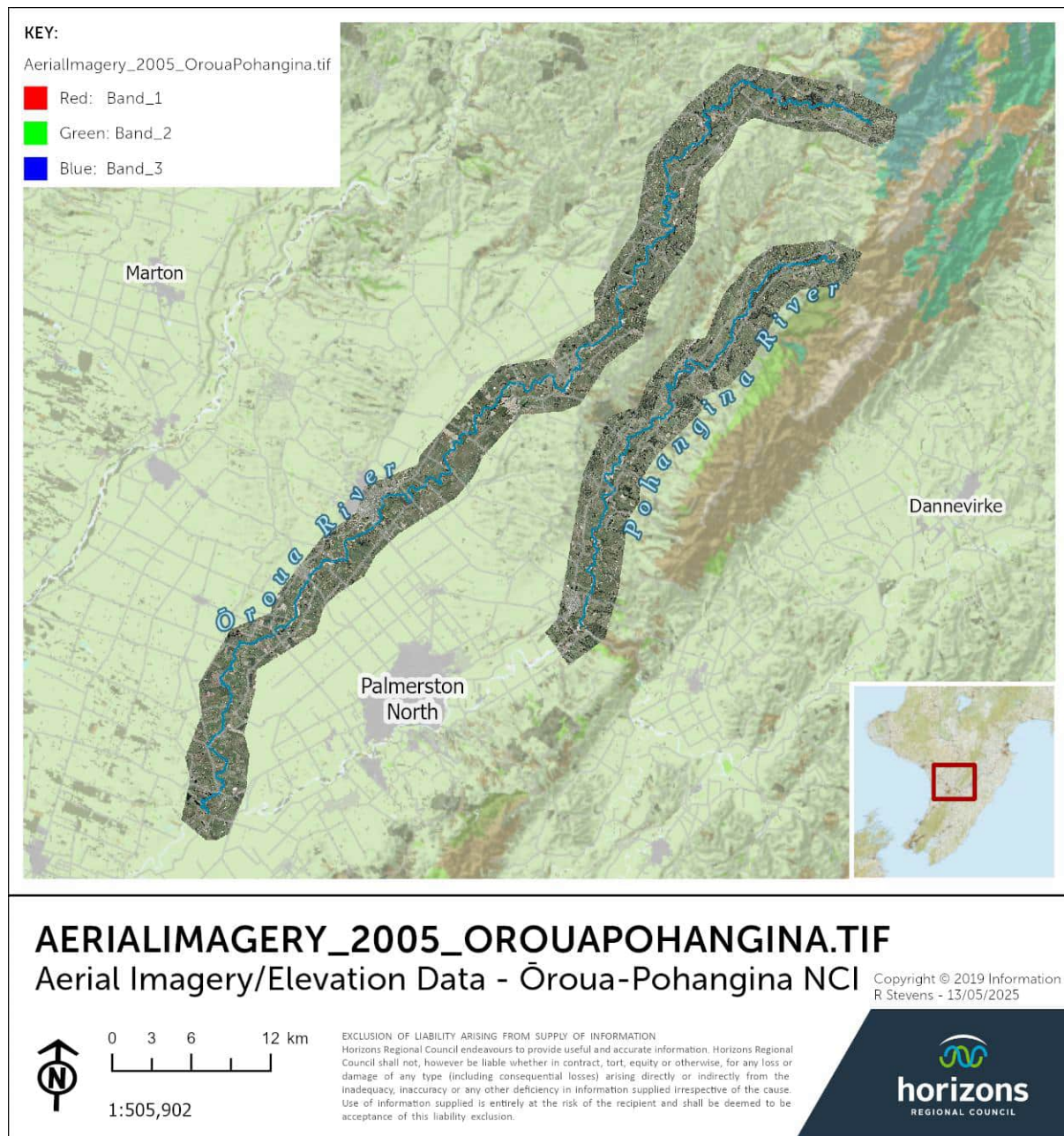
- Survey Number: C25061
- Name: Palmerston North, 2001
- Date Collected: 21st February 2001
- Coverage: Lower Ōroua River and Lower Pohangina River
- Resolution: 0.75m
- Details: WMTS Service (colour raster). Available from LINZ Basemaps, added to project as "AerialImagery_2001_OrouaPohangina.tif". (<https://basemaps.linz.govt.nz/@-40.3800284,175.6933595,z10.04?i=manawatu-whanganui-snc25061-2001-0.75m&labels=true>)



2005

AerialImagery_2005_OrouaPohangina

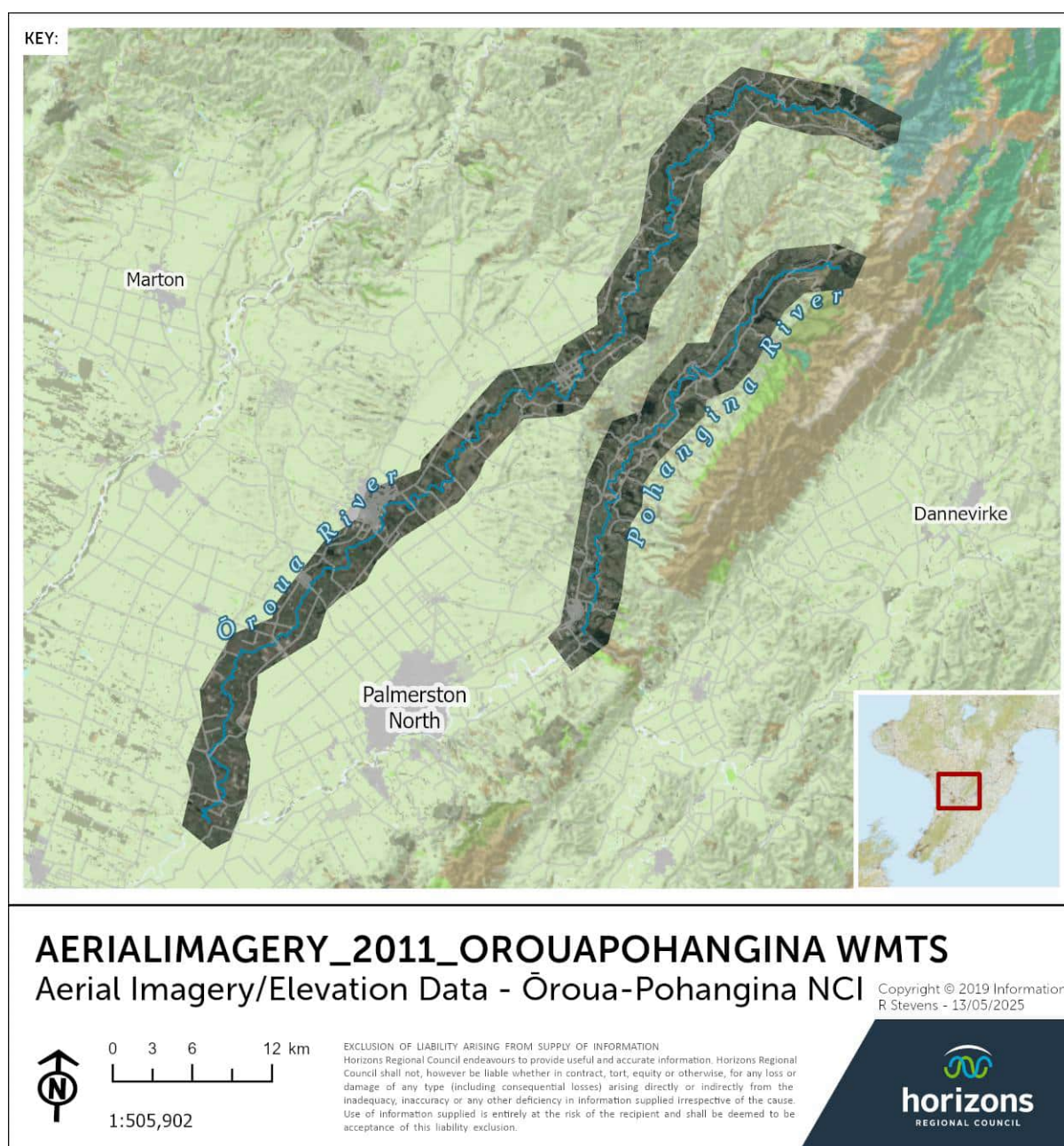
- Survey Number: Unknown
- Name: Manawatū-Whanganui, 2005
- Date Collected:
- Coverage: Entire Ōroua and Pohangina Rivers
- Resolution: 0.75m
- Details: Colour raster. Original dataset held by Horizons Regional Council. Clipped to study area buffer and provided as “AerialImagery_2005_OrouaPohangina.tif”.



2011

AerialImagery_2011_OrouaPohangina

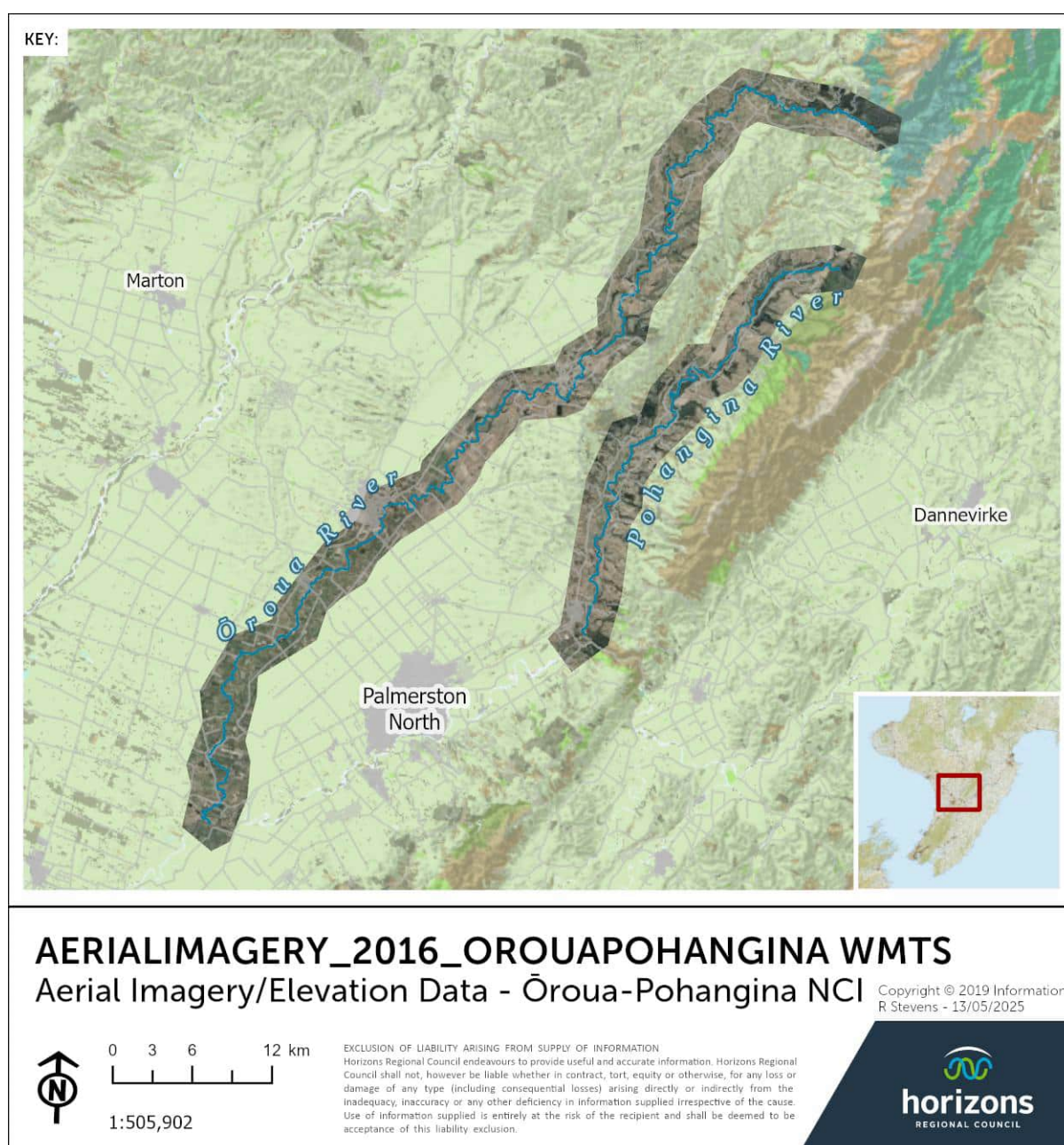
- Survey Number: 50921D
- Name: Manawatu Whanganui, 2010-11
- Date Collected: 1st December 2010 – 30th April 2011
- Coverage: Entire Ōroua and Pohangina Rivers
- Resolution: 0.4m
- Details: WMTS Service (colour raster). Accessed via LINZ Data Service (<https://data.linz.govt.nz/layer/51767-manawatu-whanganui-04m-rural-aerial-photos-2010-2011/>).



2016

AerialImagery_2016_OrouaPohangina

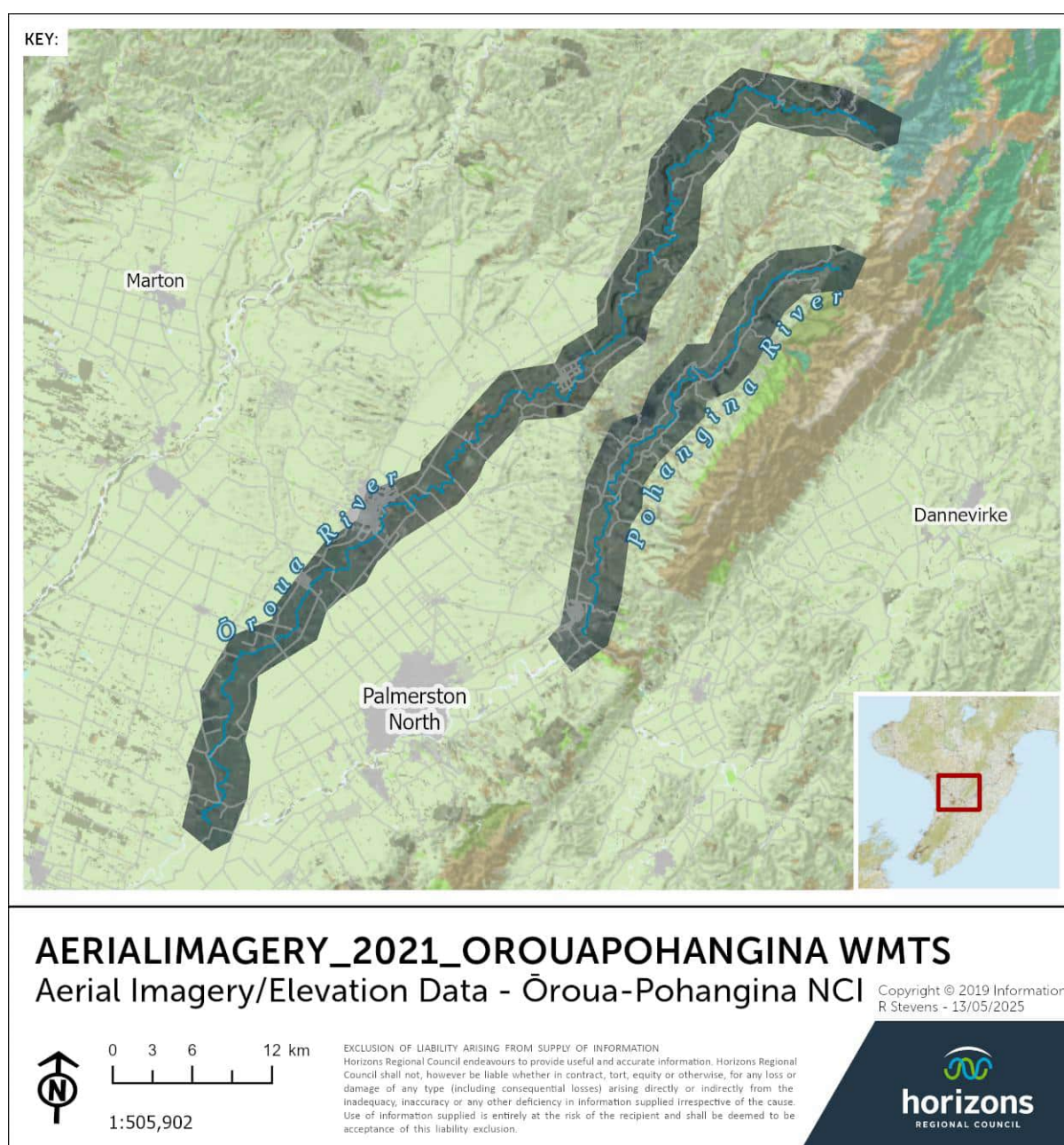
- Survey Number: 13688
- Name: Manawatū-Whanganui, 2015-16
- Date Collected: 11th March 2016 – 8th April 2017
- Coverage: Entire Ōroua and Pohangina Rivers
- Resolution: 0.3m
- Details: WMTS Service (colour raster). <https://data.linz.govt.nz/layer/88146-manawatu-whanganui-03m-rural-aerial-photos-2015-2016/>. Accessed via Basemaps (<https://basemaps.linz.govt.nz/@-39.9434364,175.7373045,z7.87?i=manawatu-whanganui-rural-2015-2016-0.3m&labels=true>)



2021

AerialImagery_2021_OrouaPohangina

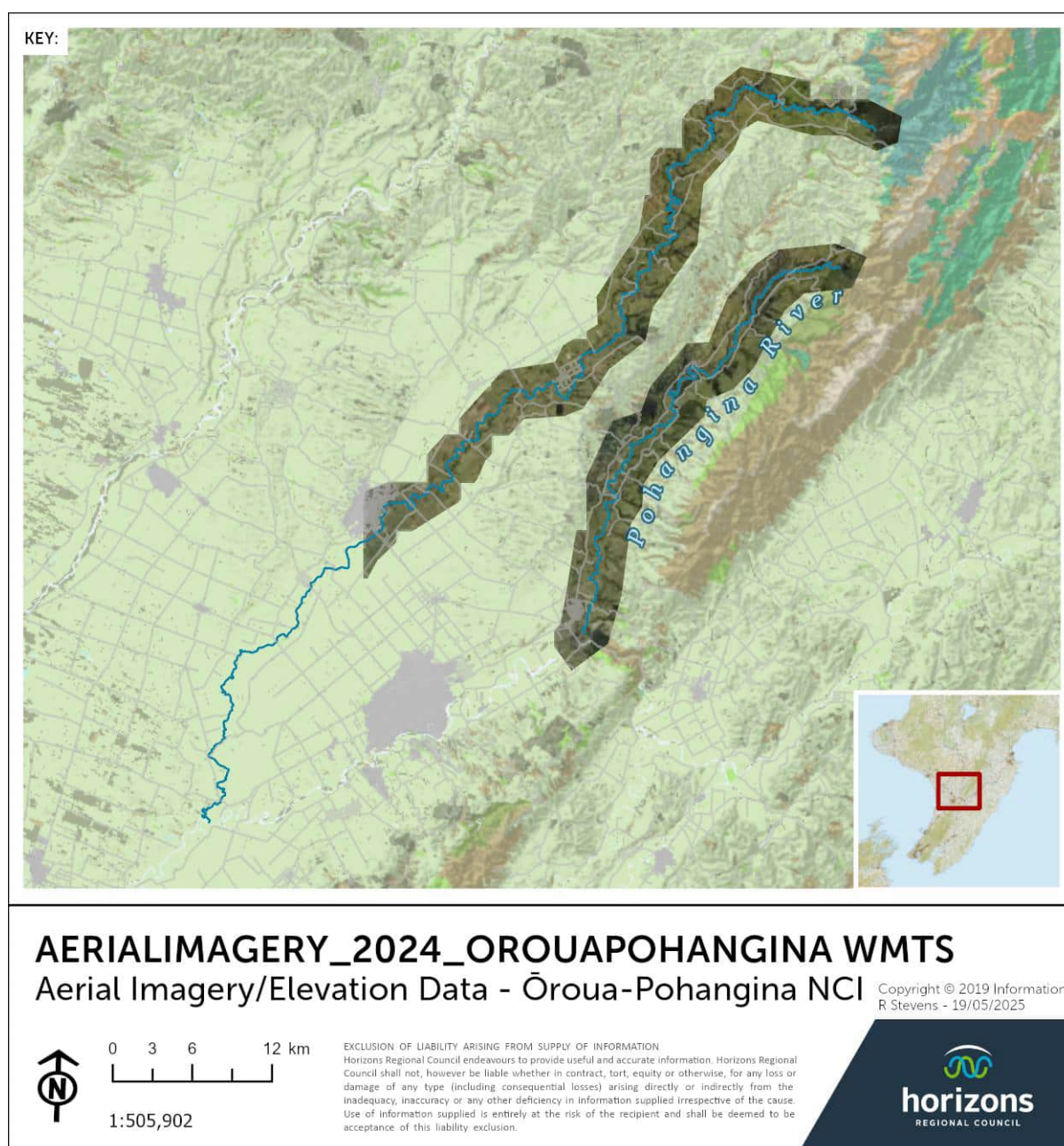
- Survey Number: 14143
- Name: Manawatū-Whanganui, 2021-22
- Date Collected: 27th January 2021 – 4th July 2022
- Coverage: Entire Ōroua and Pohangina Rivers
- Resolution: 0.3m
- Details: WMTS Service (colour raster). <https://data.linz.govt.nz/layer/110729-manawatu-whanganui-03m-rural-aerial-photos-2021-2022/>. Accessed via Basemaps (<https://basemaps.linz.govt.nz/@-39.6395376,175.6384275,z7.50?i=manawatu-whanganui-rural-2021-2022-0.3m&labels=true>)



2024

AerialImagery_2024_Pohangina

- Survey Number: Unknown
- Name: Manawatū-Whanganui, 2023-24
- Date Collected: 21st December 2023 – 10th March 2024
- Coverage: Middle-Upper Ōroua River and Entire Pohangina River
- Resolution: 0.2m
- Details: WMTS Service (colour raster). <https://data.linz.govt.nz/layer/119185-manawatu-whanganui-02m-rural-aerial-photos-2023-2024/>. Accessed via Basemaps (<https://basemaps.linz.govt.nz/@-40.2417986,176.1108395,z8.71?i=manawatu-whanganui-2023-2024-0.2m&labels=true>)

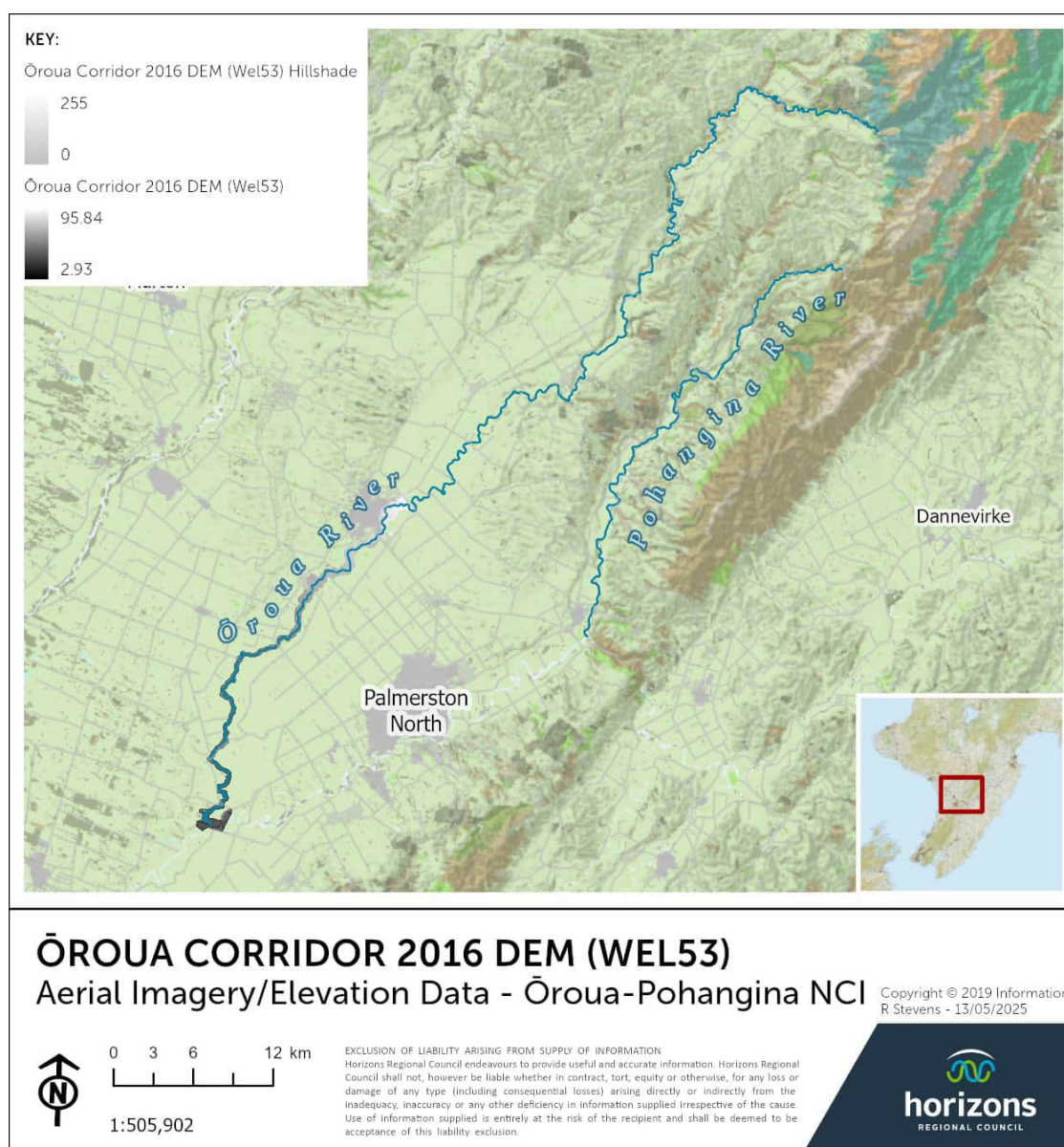


Elevation Models

Ōroua Corridor 2016 DEM (Wel53)

- Name: Oroua - Manawatū Rivers, 2016
- Date Collected: 11th July 2016 – 21st July 2016
- Coverage: Lower Ōroua River
- Resolution: 1m
- Datum: Wellington 1953 Vertical (Height) Datum
- Details: LiDAR-based digital elevation model processed from an Airborne Laser Scanner survey. Original dataset held by Horizons Regional Council. Clipped and saved as “Oroua_RiverCorridorDEM_2016_Wel53”.

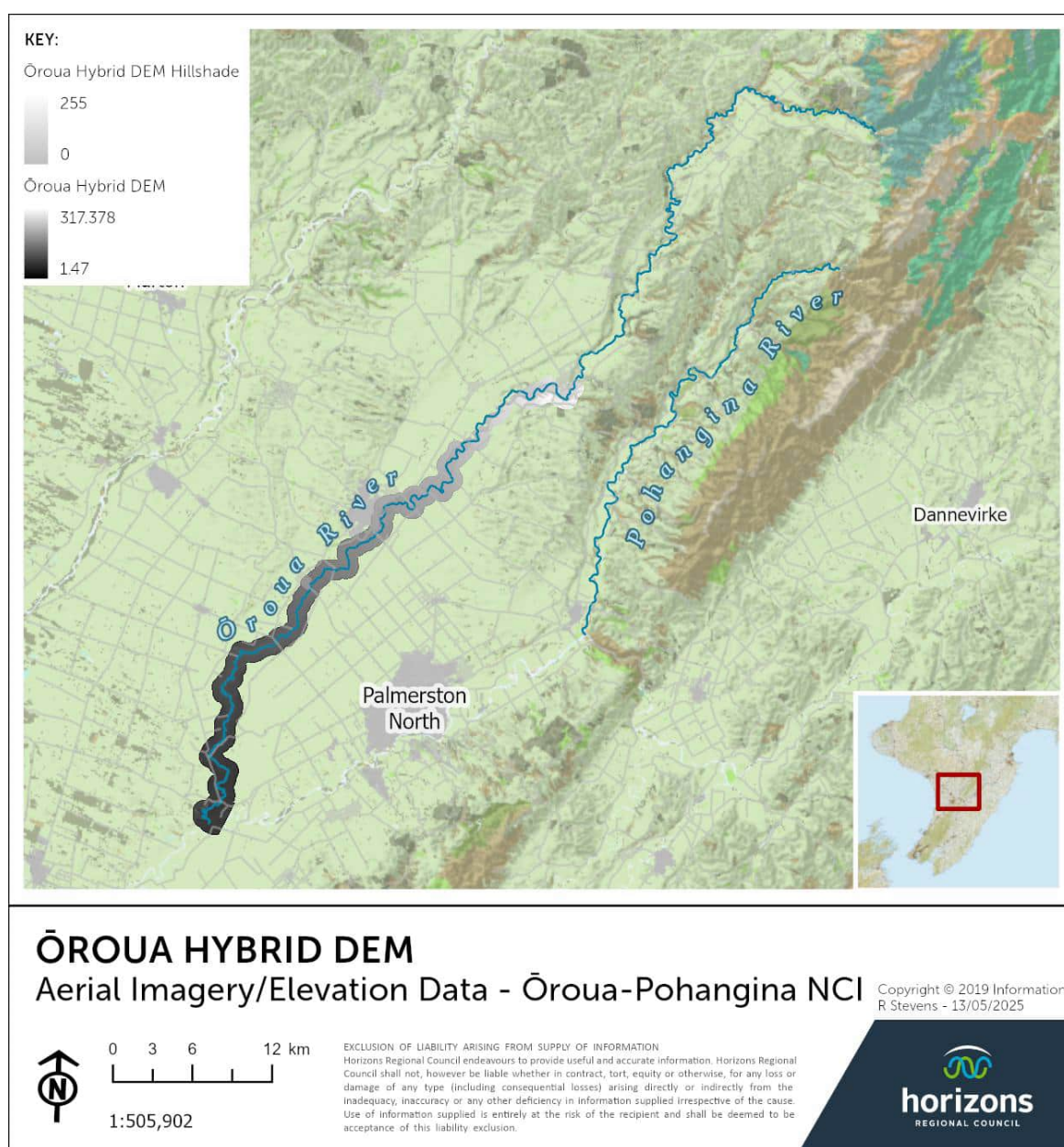
NB: THIS DATASET IS IN A DIFFERENT VERTICAL DATUM TO THE OTHER PROVIDED ELEVATION DATASETS and therefore cannot be directly mosaicked with the other datasets.



Ōroua Hybrid DEM

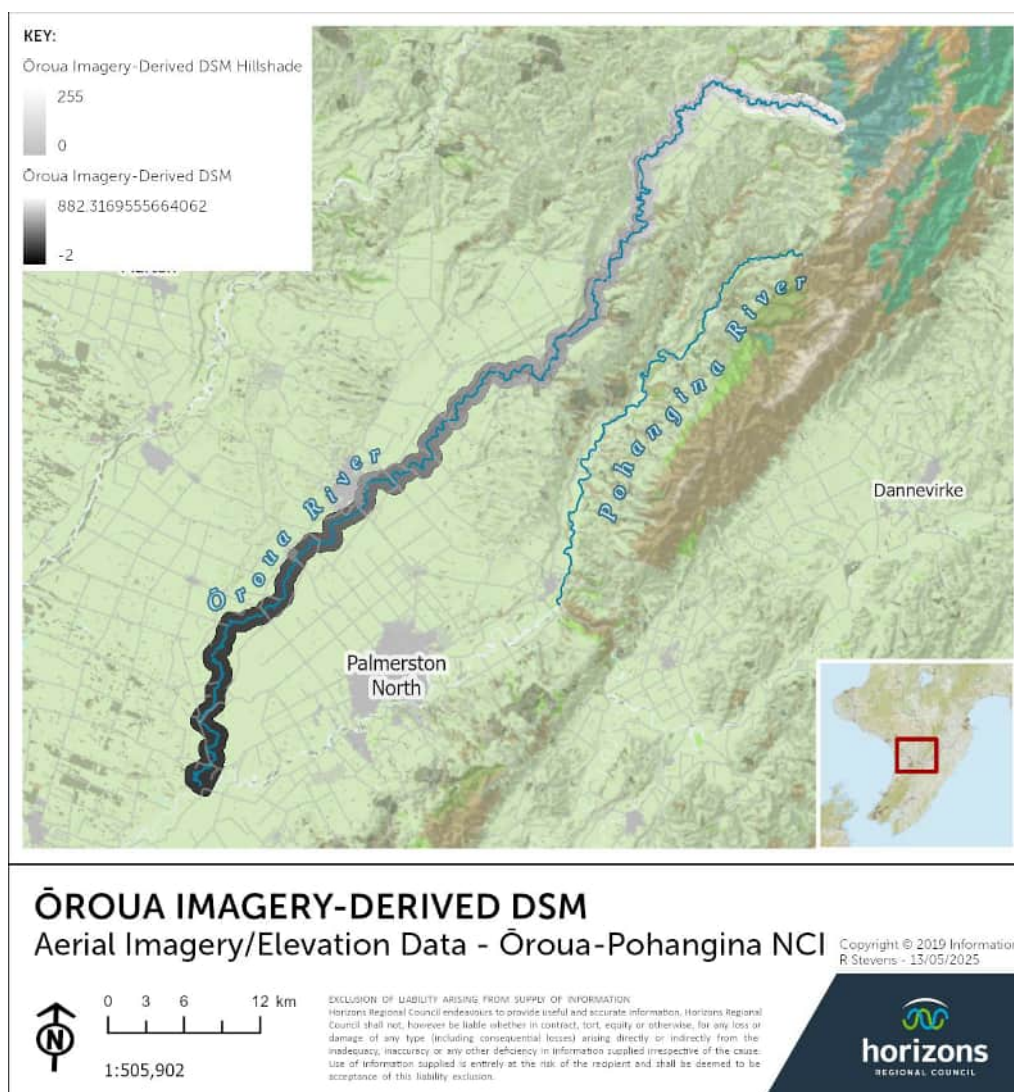
- Name: Manawatū Hybrid LiDAR Digital Elevation Model, 2005-22
- Date Collected: 2005 - 2022
- Coverage: Part Middle and Lower Ōroua River
- Resolution: 1m
- Datum: New Zealand Vertical Datum 2016 (NZVD16)
- Details: Compilation of available LiDAR-based DEMs in NZVD16. Processed on 10/12/2024 using available NZVD16 DEMs at the time (ranging from approx. 2005 to 2022). Original dataset held by Horizons Regional Council. Clipped and saved as "Oroua_HybridDEM_NZVD16".

NB: Due to this dataset being a mosaic of various datasets, there may be some flaws in the elevation model such as "steps" at the seam lines.



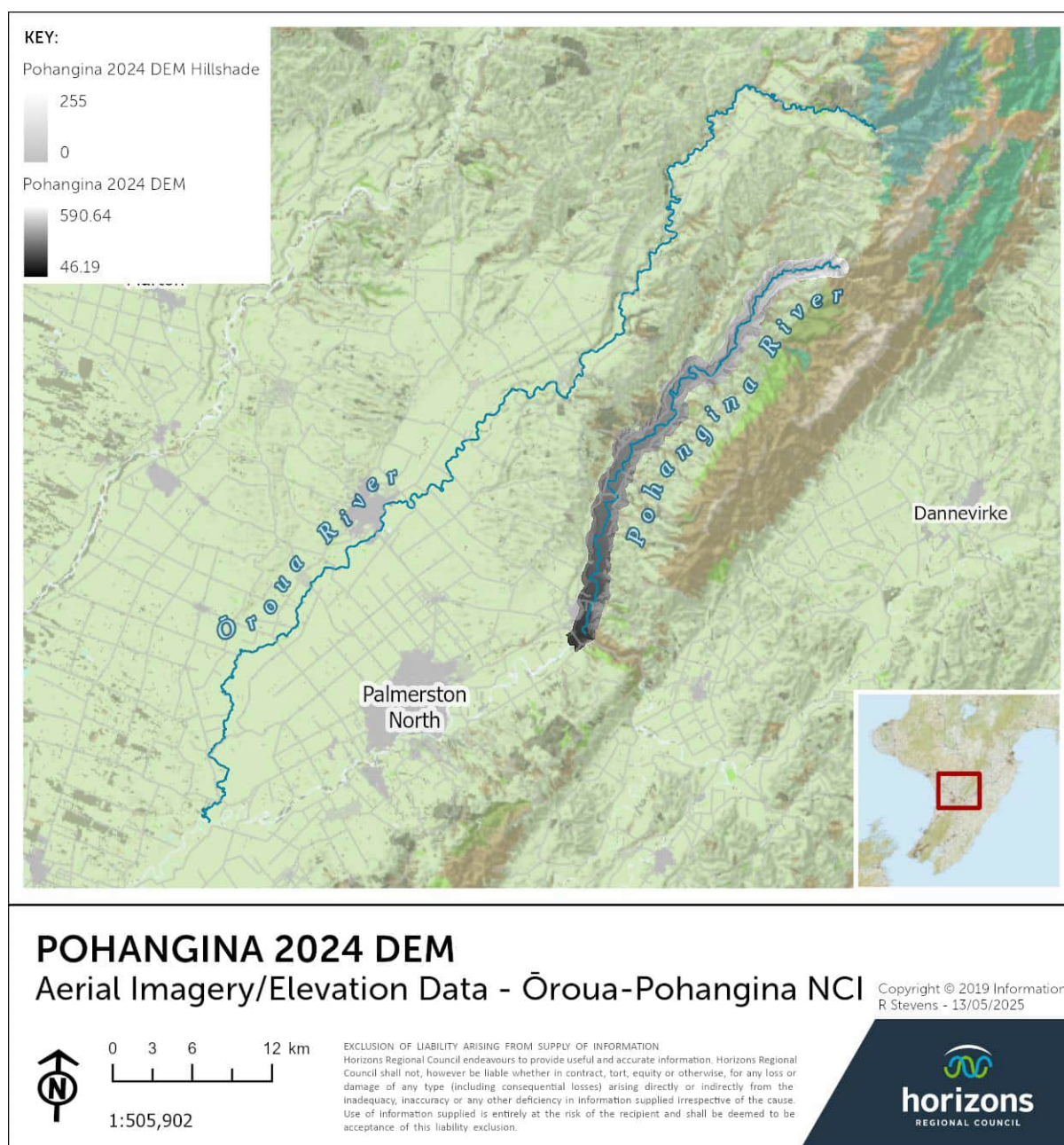
Ōroua Imagery-Derived DSM

- Name: Oroua Point Cloud Filtered Digital Surface Model
- Date Collected: 11th March 2016 – 8th April 2017
- Coverage: Entire Ōroua River
- Resolution: 1m
- Datum: New Zealand Vertical Datum 2016 (NZVD16)
- Details: Processed in 2019 from the 2016 regional aerial imagery. **NB: THIS DATASET IS NOT LiDAR-BASED** - this elevation model has been created through photogrammetry of the 2016 regional aerial imagery. The point cloud dataset created from this photogrammetric analysis has been processed to a digital surface model, which was then filtered to remove isolated features such as trees, fences, some buildings – essentially creating an approximated digital elevation model (in lieu of a LiDAR-based digital elevation model). As this dataset is based on the 2016 aerial imagery, “what you see is what you get” i.e., the elevation model is quite noisy and has some potentially misleading features caused by objects on the ground. The accuracy is +/- 0.6m @ 95% confidence level in clear, open areas.
- Clipped and saved as “Oroua_ImageryDerivedDSM_2016_NZVD16”.



Pohangina 2024

- Name: Manawatū - Whanganui LiDAR 1m DEM (2024)
- Date Collected: 26th January 2024 – 4th May 2024 (Pohangina/Block 3 28th April 2024)
- Coverage: Entire Pohangina River
- Resolution: 1m
- Details: Digital Elevation Model raster. Clipped and provided as “PohanginaDEM2024.tif”. Available from LINZ Data Service, (<https://data.linz.govt.nz/layer/120816-manawatu-whanganui-lidar-1m-dem-2024/>)



Relative Elevation Models

Relative Elevation Models (REM's), also known as Detrended Digital Elevation Models, are useful for visualising landscape features such as terraces, floodplains, and paleo channels¹. An REM is created by firstly creating a detrending surface representing the overall gradient of the area based on the channel centreline elevation change and then subtracting this from the Digital Elevation Model (DEM).

NB: These REM's have not been audited, and in the case of the Ōroua REM are not based on LiDAR DEMs. As such, the REMs are in no way suitable for flood modelling or any risk analyses requiring accurate elevation data – these REMs are intended solely for use as a reference when identifying landscape features.

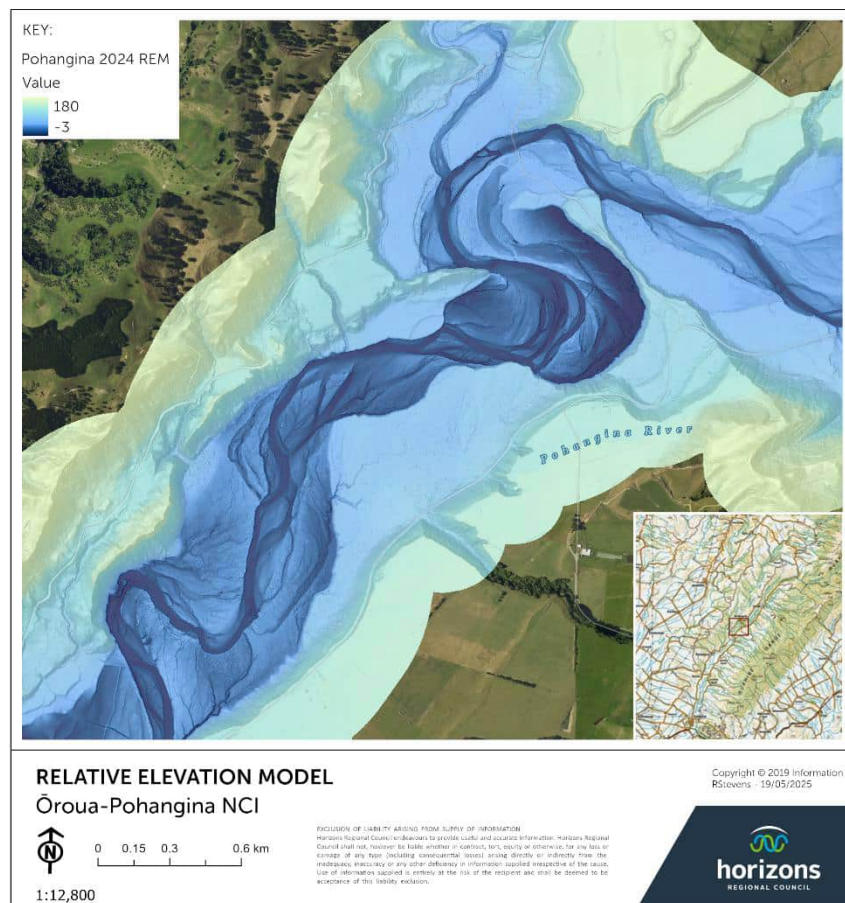
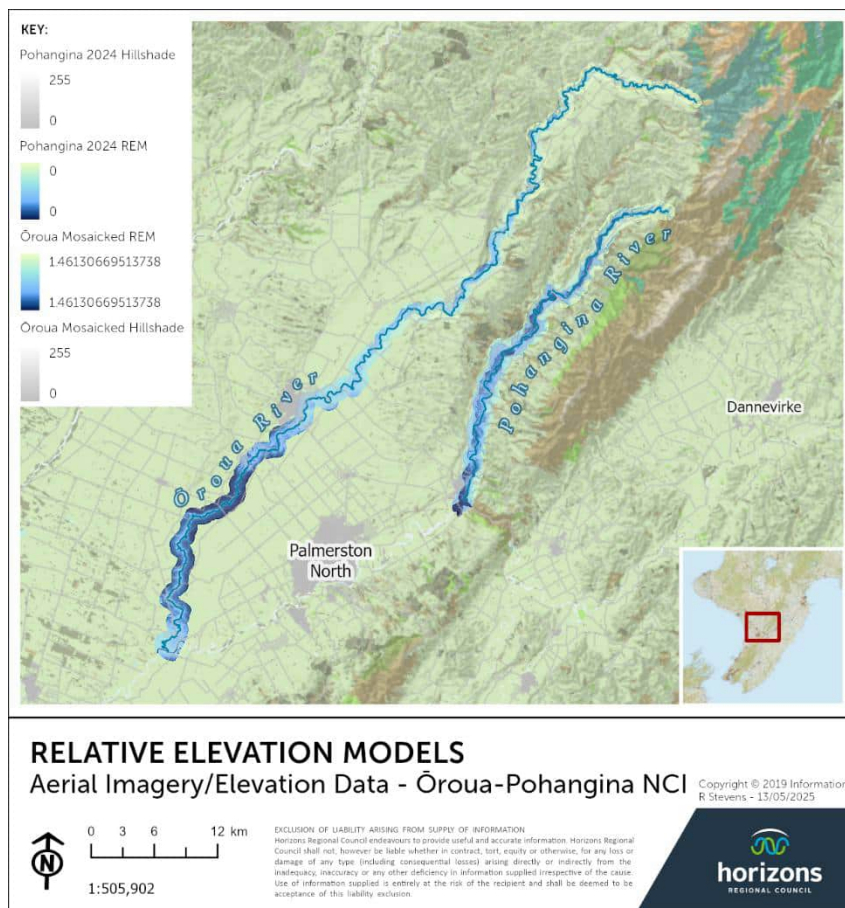
The REM's processed for this project were created in QGIS using the Inverse Distance Weighted (IDW) interpolation method, generally following the process set out in [Dan Coe Carto - Creating REMs in QGIS with the IDW Method](#):

- The DEM was clipped to the approximate study area
- The channel centreline was digitised
- The digitised channel centreline was processed to points using the QChainage tool with chainage every 10m
- These points were given elevation values from the DEM using the Point Sampling tool
- Using the IDW Interpolation tool, an interpolated raster was created from these points at a pixel size of 10m, which was then resampled using the Warp (Reproject) to a 1m pixel size
- Using the Raster Calculator, the interpolated raster was subtracted from the DEM, to give the resulting “de-trended” Relative Elevation Model raster.

The Ōroua REM is a mosaicked composite of two REMs processed from the hybrid LiDAR-based DEM (Oroua_HybridDEM_NZVD16) and the imagery-based Point Cloud Filtered DSM (Oroua_ImageryDerivedDSM_2016_NZVD16), mosaicked together. A hillshade using the same seamlines used to mosaic the REMs has been developed from the corresponding elevation rasters to help provide context. Exported as a layer package file, containing the REM and the elevation mosaic displayed as a hillshade: “OrouaREM.lpkx”.

The Pohangina REM was processed from the Manawatū - Whanganui LiDAR 1m DEM (2024), sourced from the LINZ Data Service <https://data.linz.govt.nz/layer/120816-manawatu-whanganui-lidar-1m-dem-2024/>. Exported as a layer package file, containing the REM and the DEM symbolised as a hillshade: “Pohangina2024REM.lpkx”.

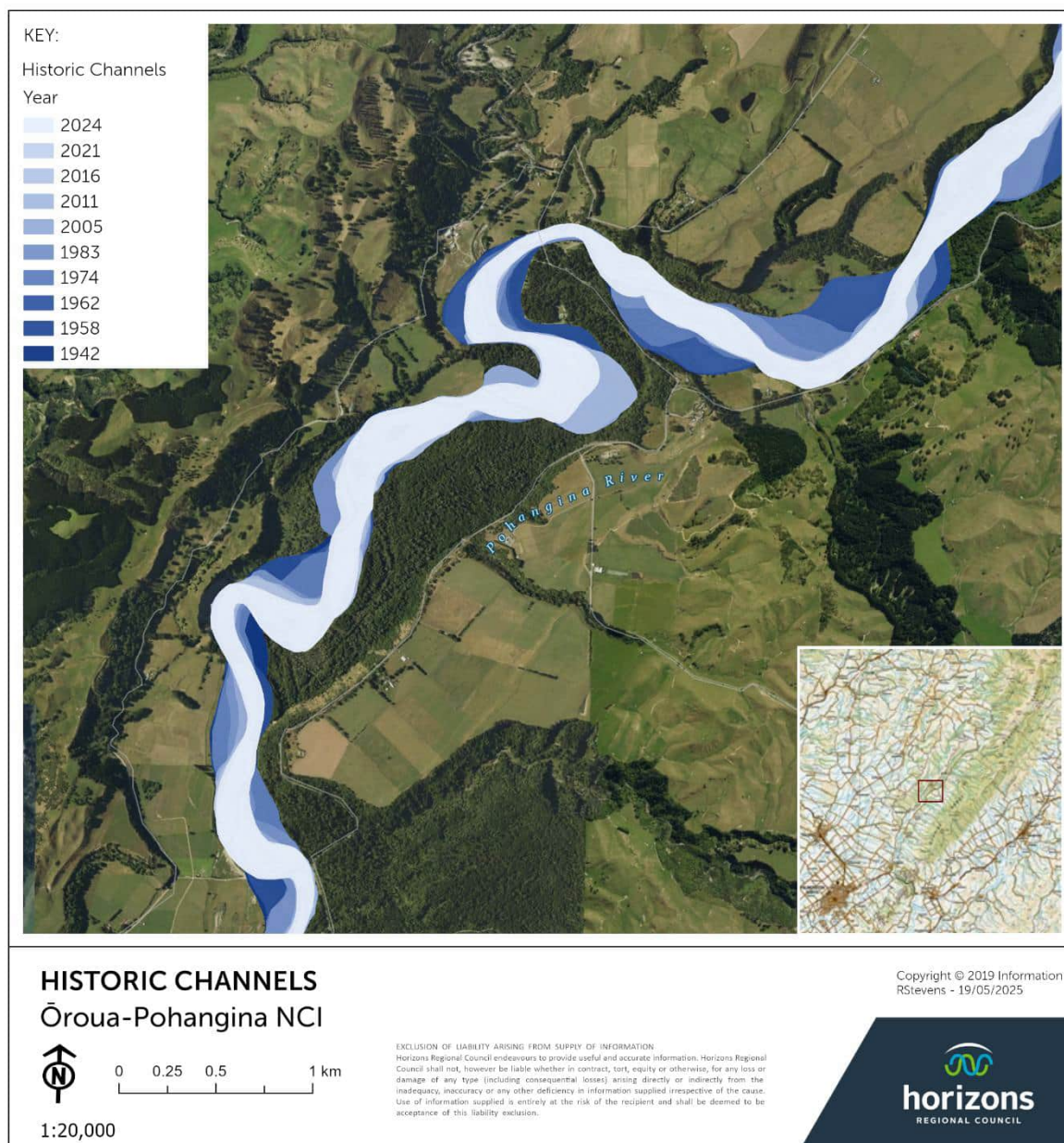
¹ Zhang, S., Ma, Y., Chen, F., Liu, J., Chen, F., Lu, S., Jiang, L., & Li, D. (2020). A new method for supporting interpretation of paleochannels in a large scale — Detrended Digital Elevation Model Interpretation. *Geomorphology*, 369. <https://doi.org/10.1016/j.geomorph.2020.107374>



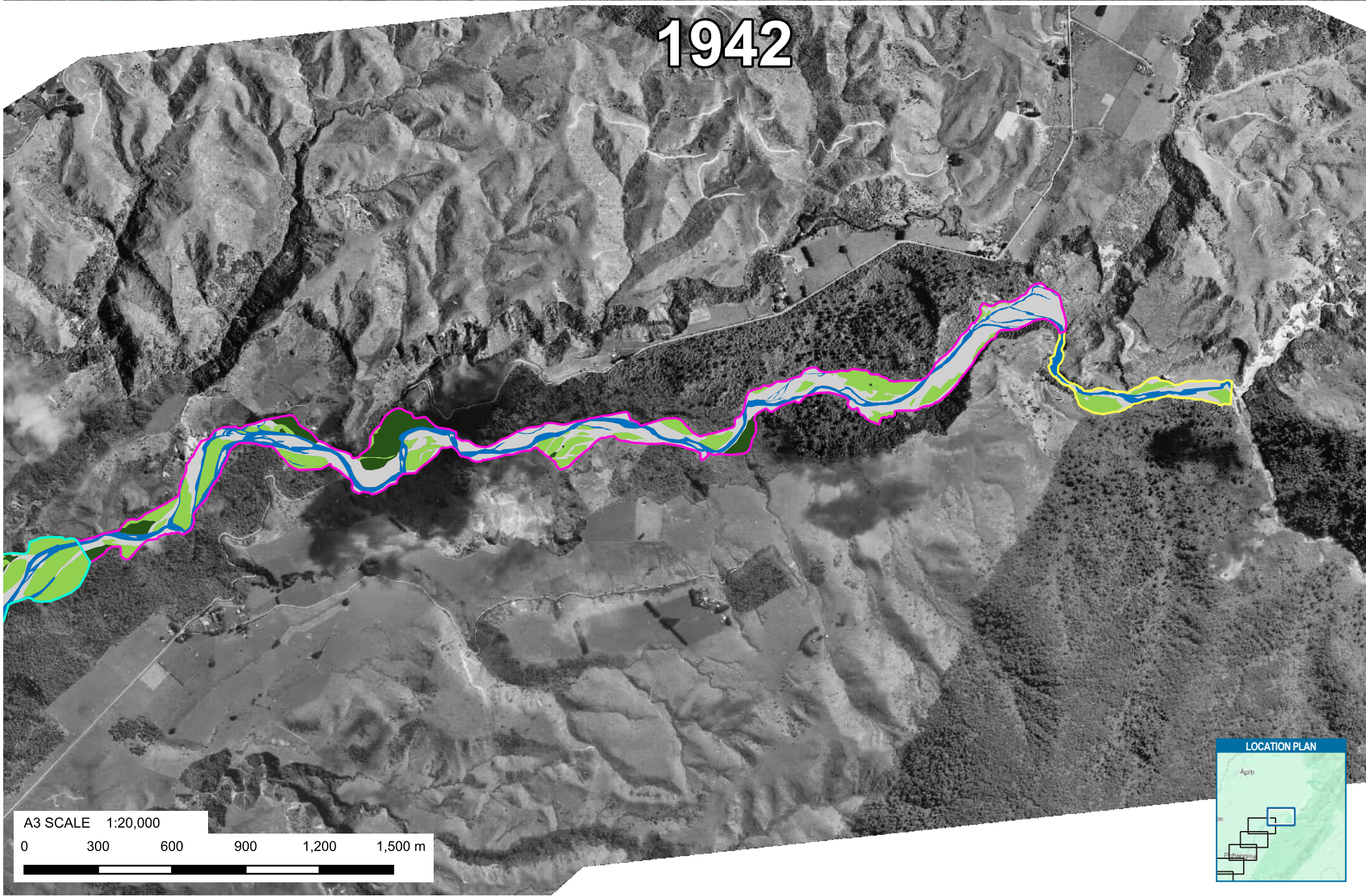
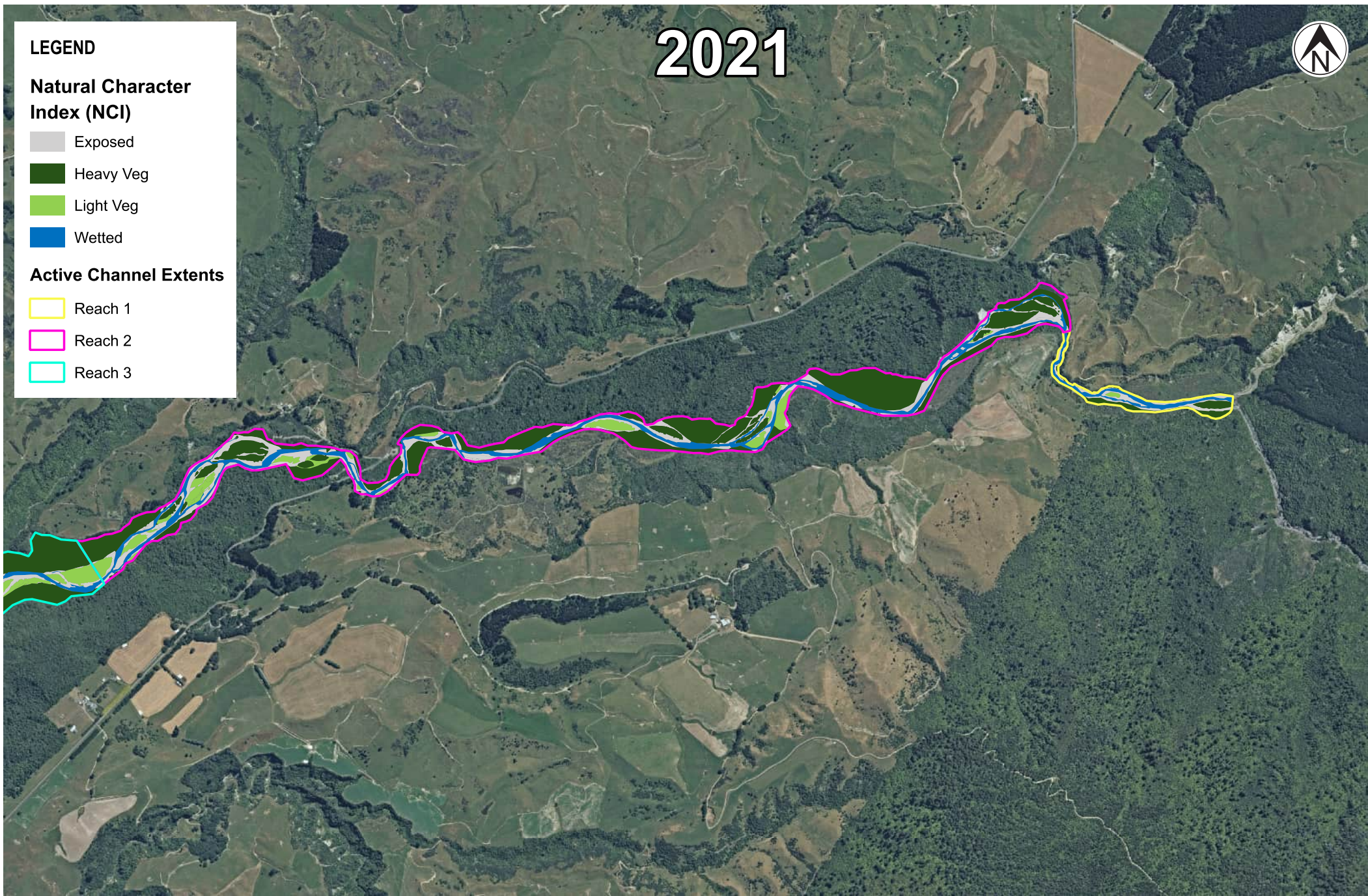
Historic Channels

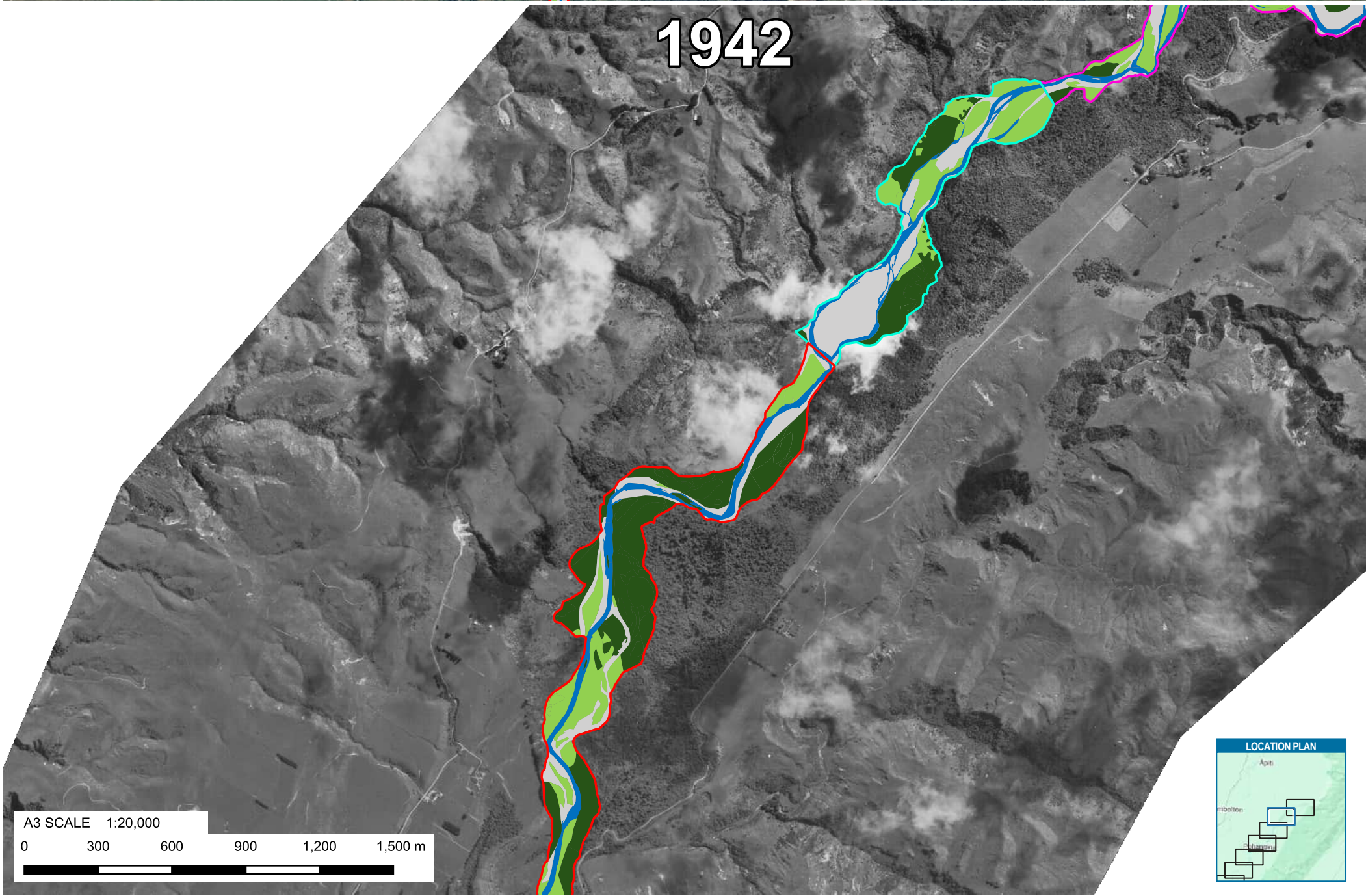
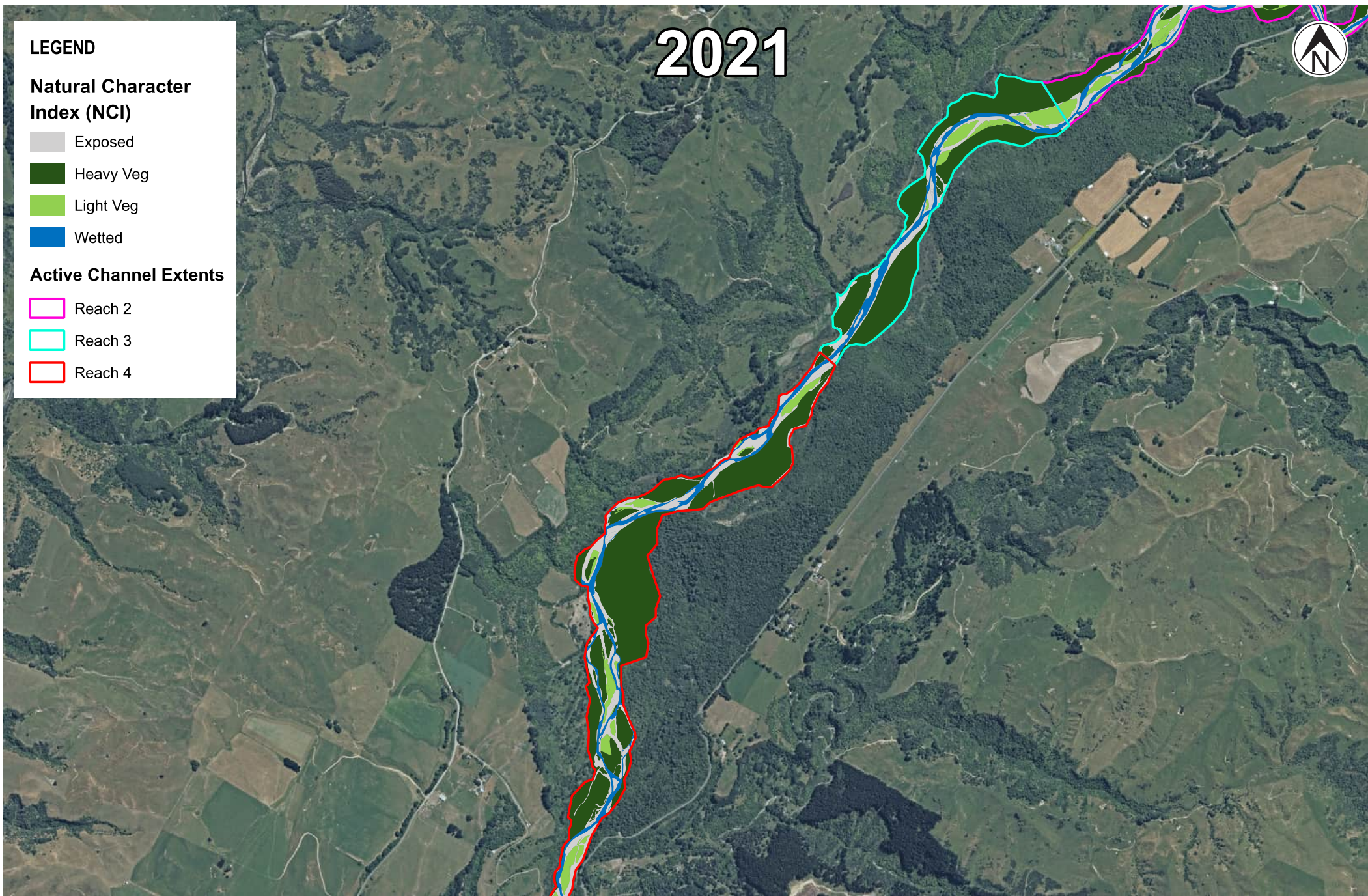
Probably the most reliable and readily available information about a rivers recent (<100 years) behaviour is from analysis of aerial photographs over the longest historic period available. Digitising the movements of the main channel over time provides the most useful data in terms of understanding the width and mobility of the channel. The more recent channel behaviour over past decades and comparison with older information provides the best basis for understanding the current behaviour within the context of a trajectory of change and the bounds of past behaviour.

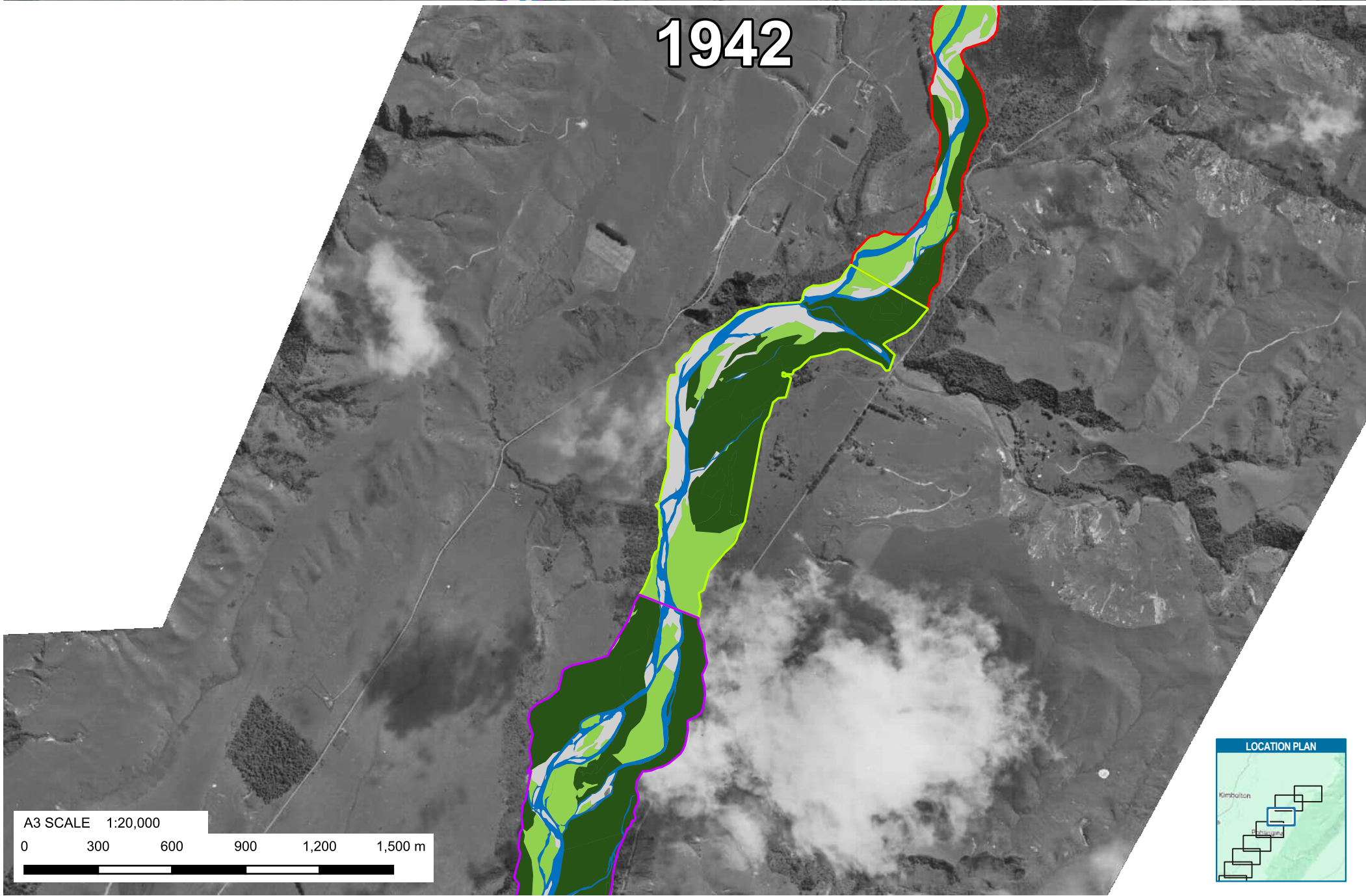
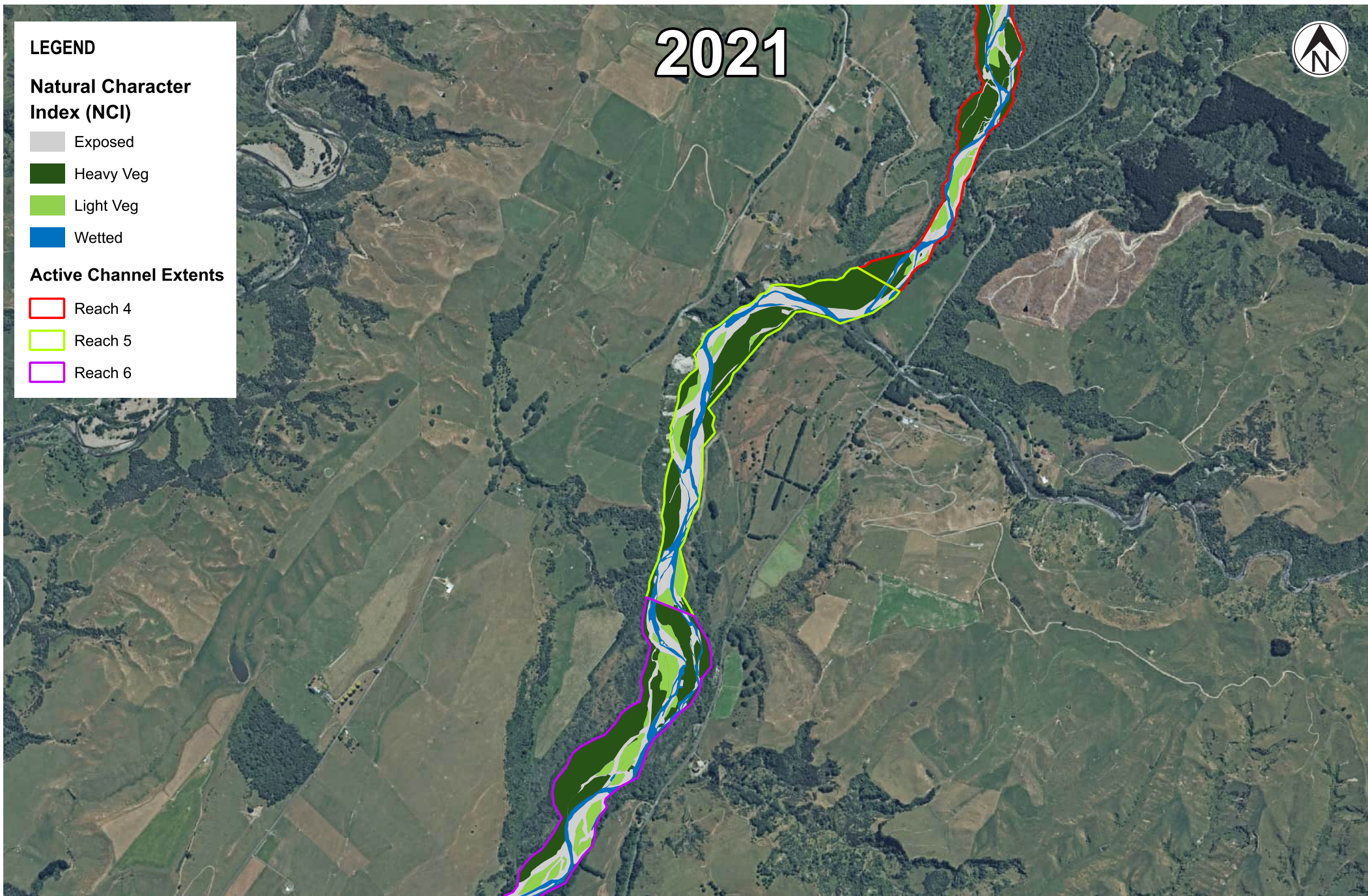
Historic active channel lines have been digitized for the sections of the Ōroua and Pohangina Rivers within the Nature-Based Solutions Investigation study area. Digitizing was carried out by R Wynyard, based on historic aerial imagery from 1937 to 2024. Clipped to study area buffer and exported as a layer package: “HistoricChannels_OrouaPohangina.lpkx”.



Appendix C Pohangina NCI Maps

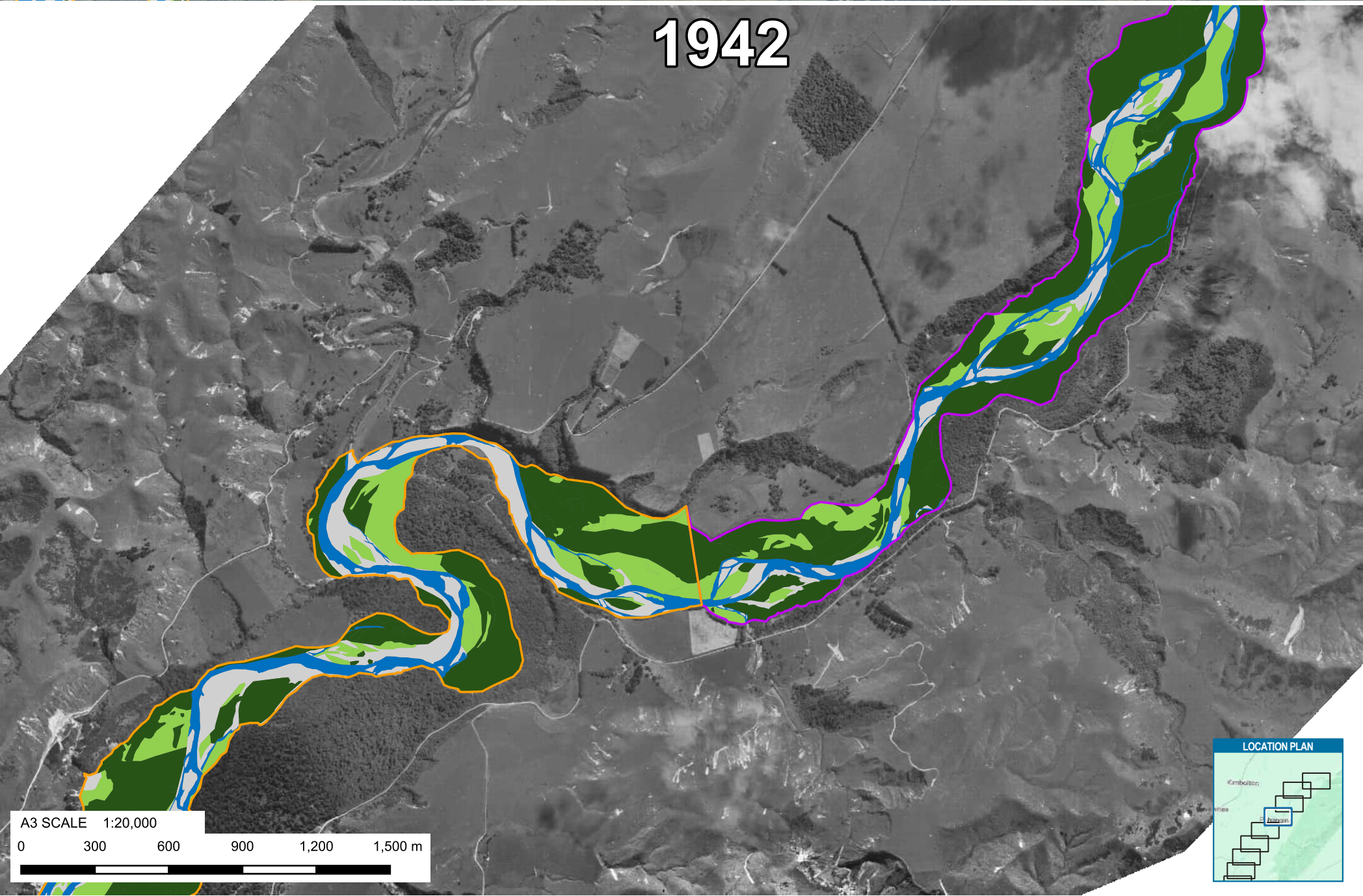
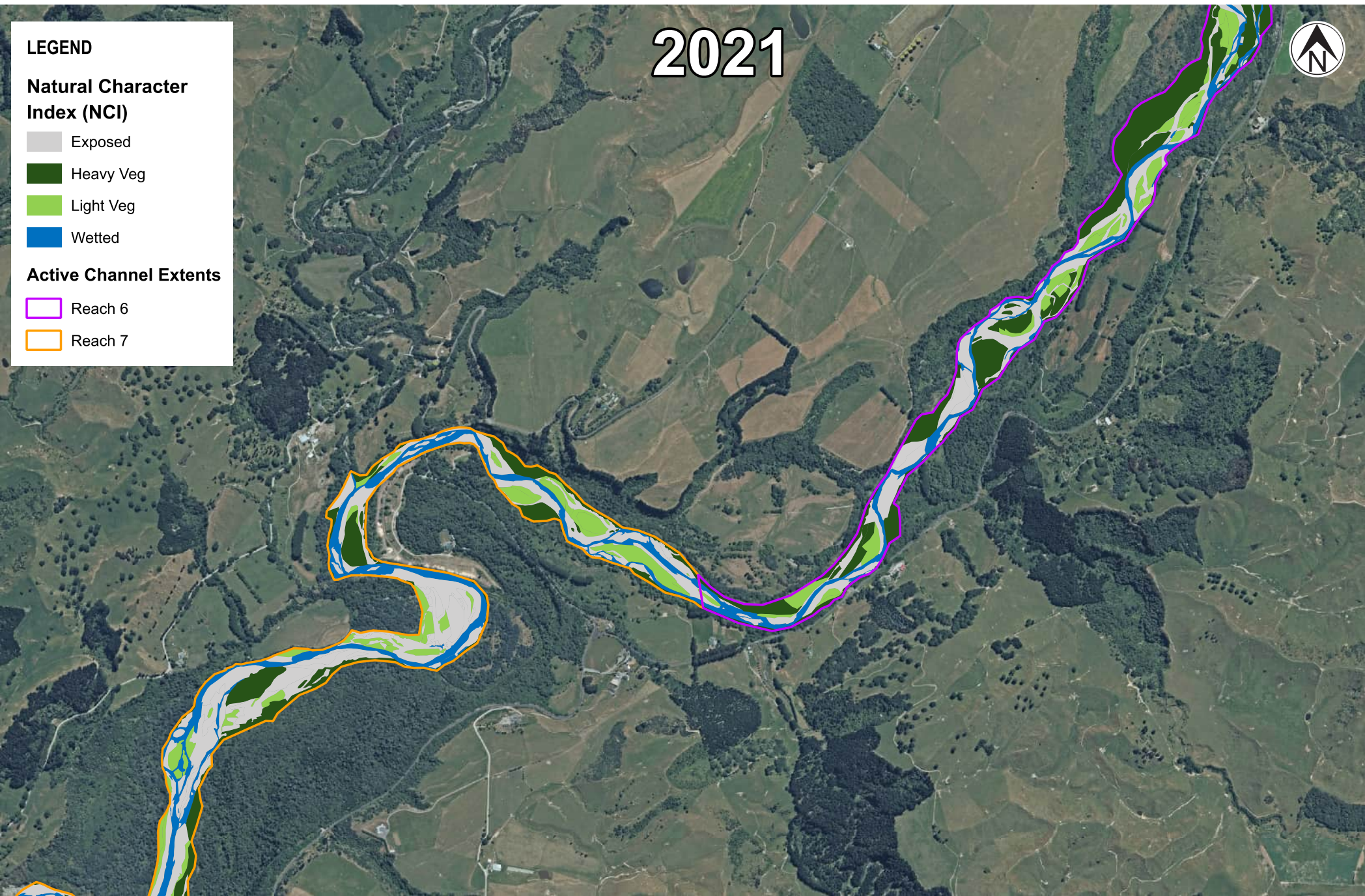


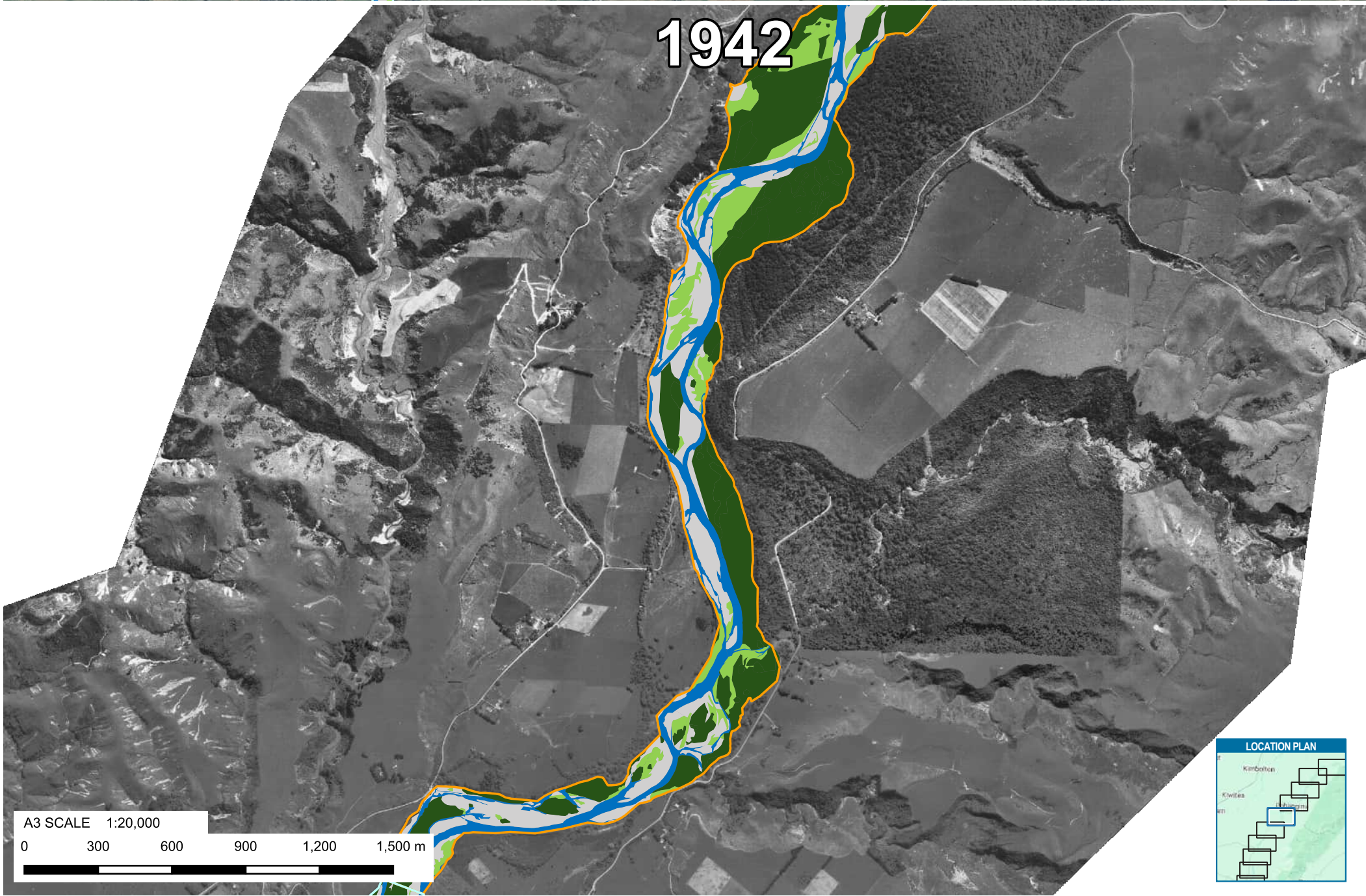
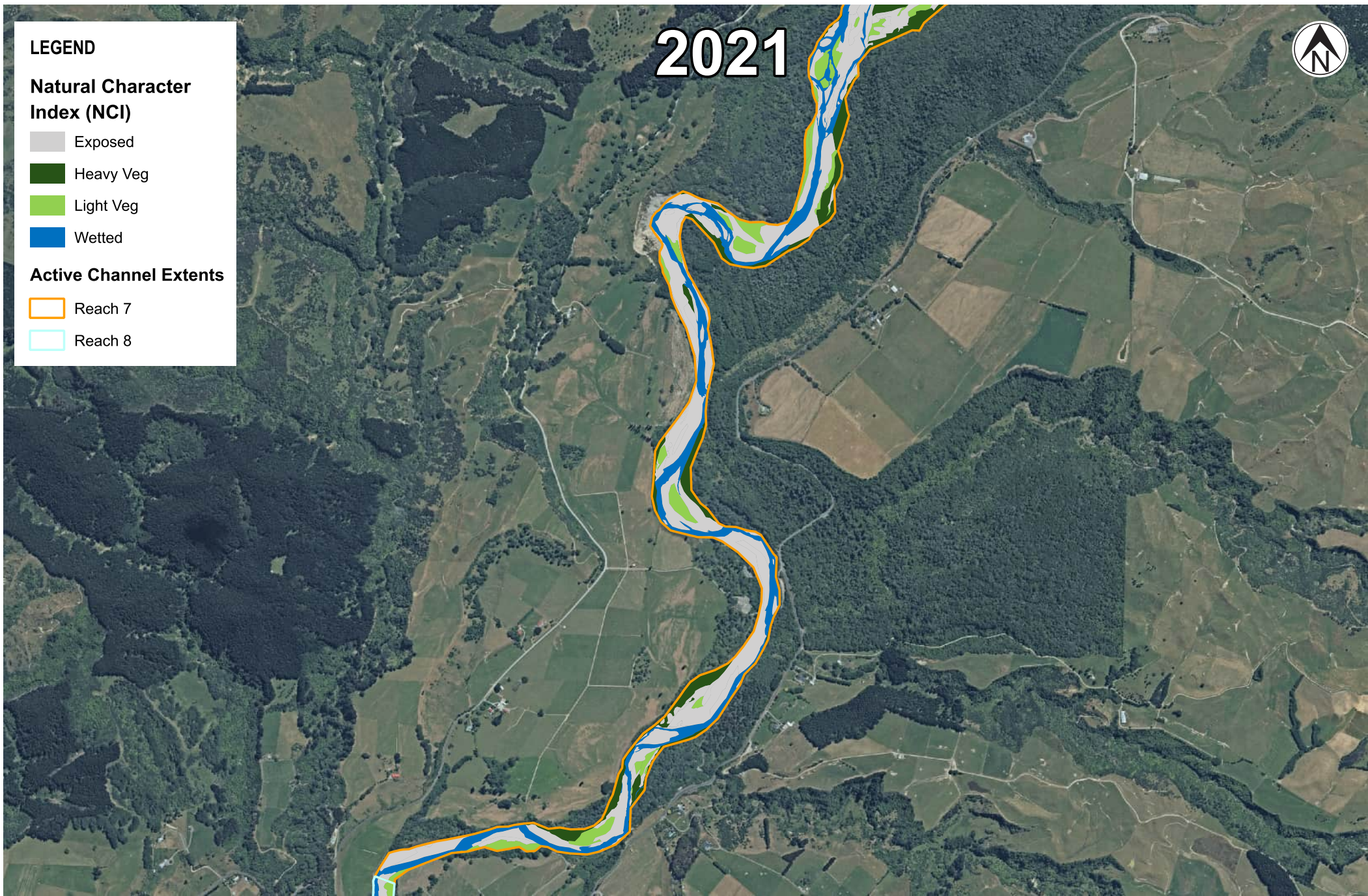


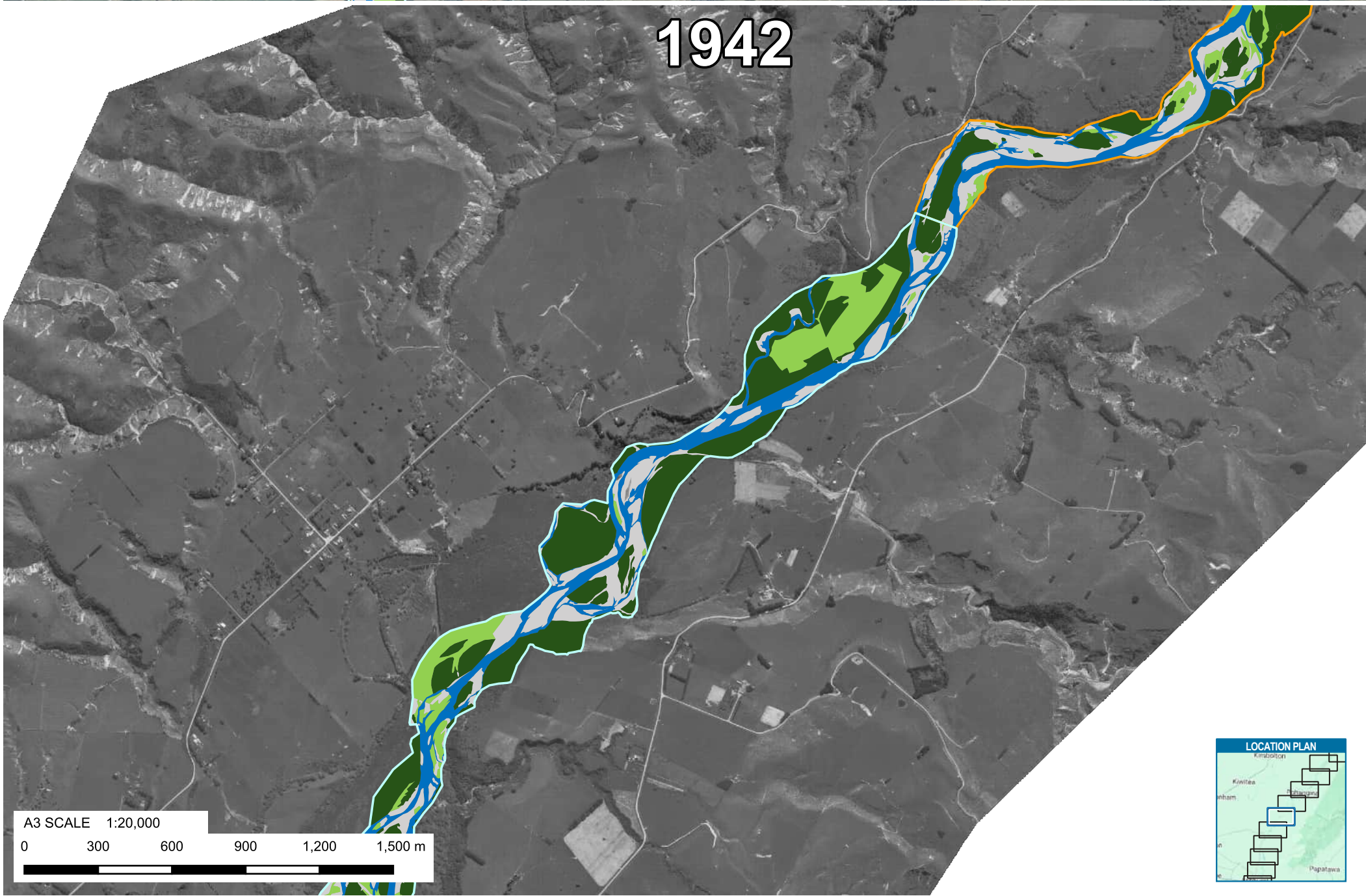
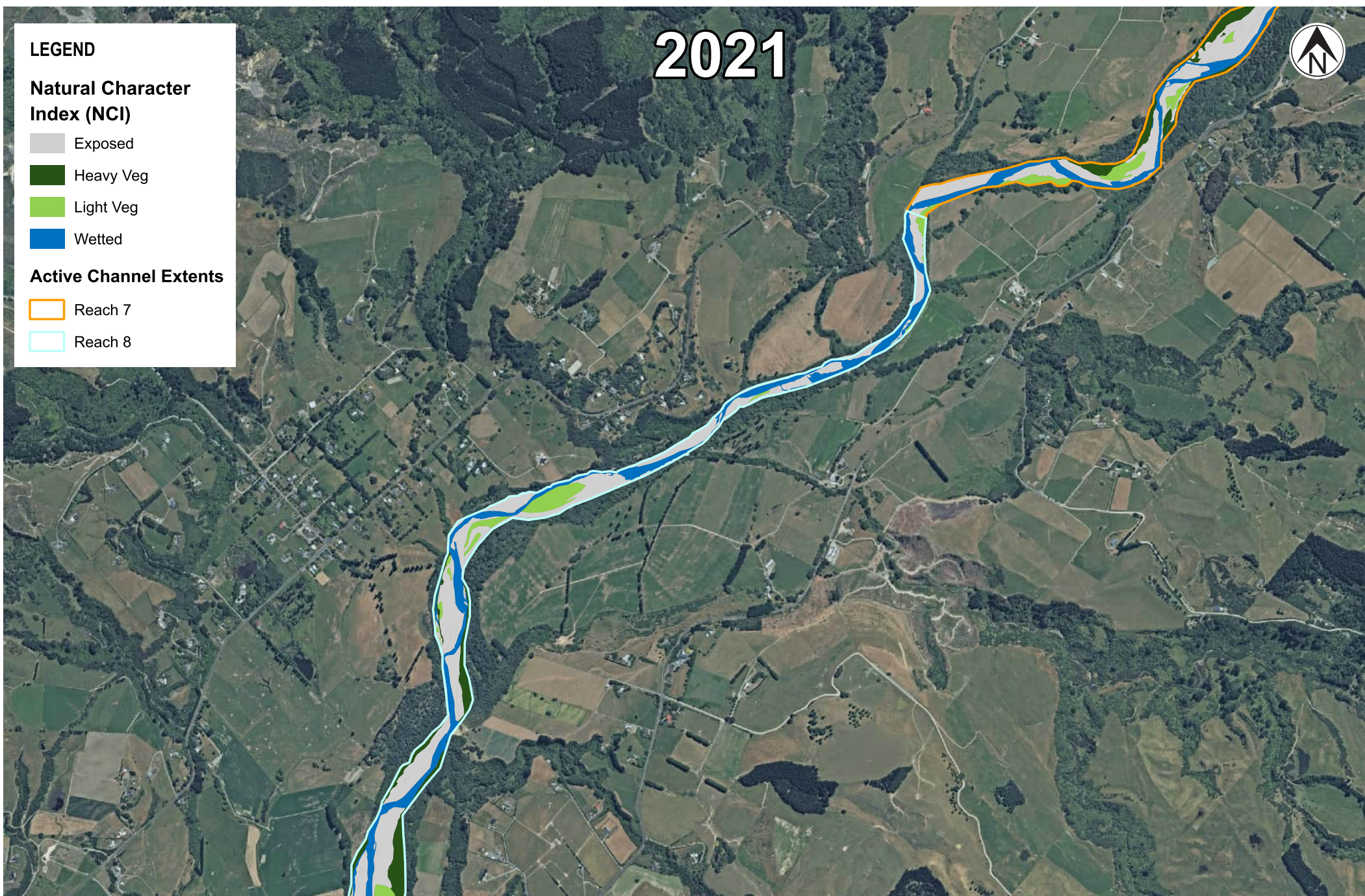


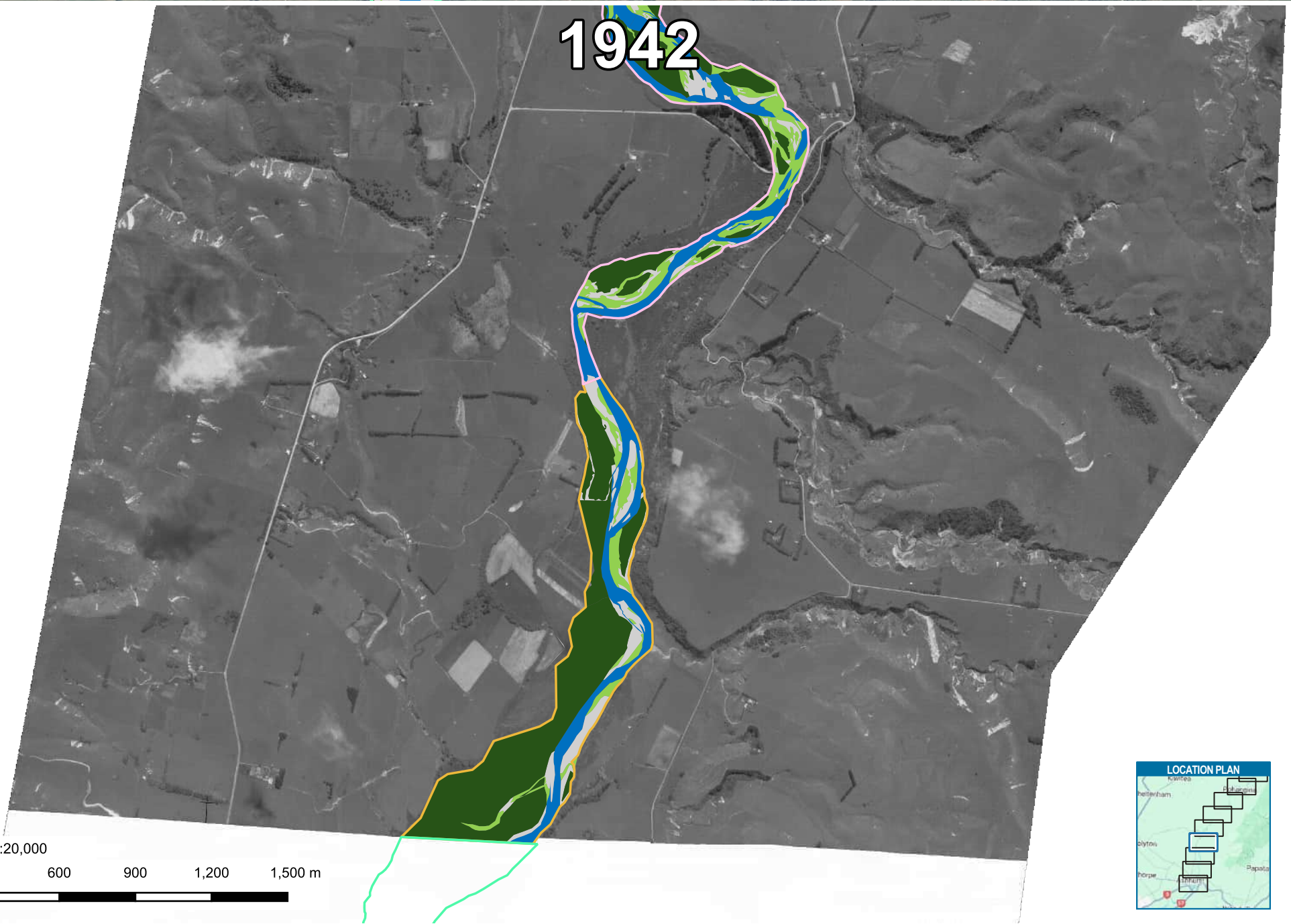
A3 SCALE 1:20,000
0 300 600 900 1,200 1,500 m











A3 SCALE 1:20,000
0 300 600 900 1,200 1,500 m



NOTES:
Imagery: Manawatu-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0.
Aerial Imagery 1942b OrouaPohangina. Data supplied by Horizons Regional Council.

REV	DESCRIPTION	GIS	CHK	DATE
0	First version	GIHU	KJOH	03/07/25
1	Final version	GIHU	KJOH	15/08/25

PROJECT No. 1098311.0000

DESIGNED	GIHU	JUL.25
DRAWN	GIHU	JUL.25
CHECKED	KJOH	AUG.25

BMQ 15/08/25

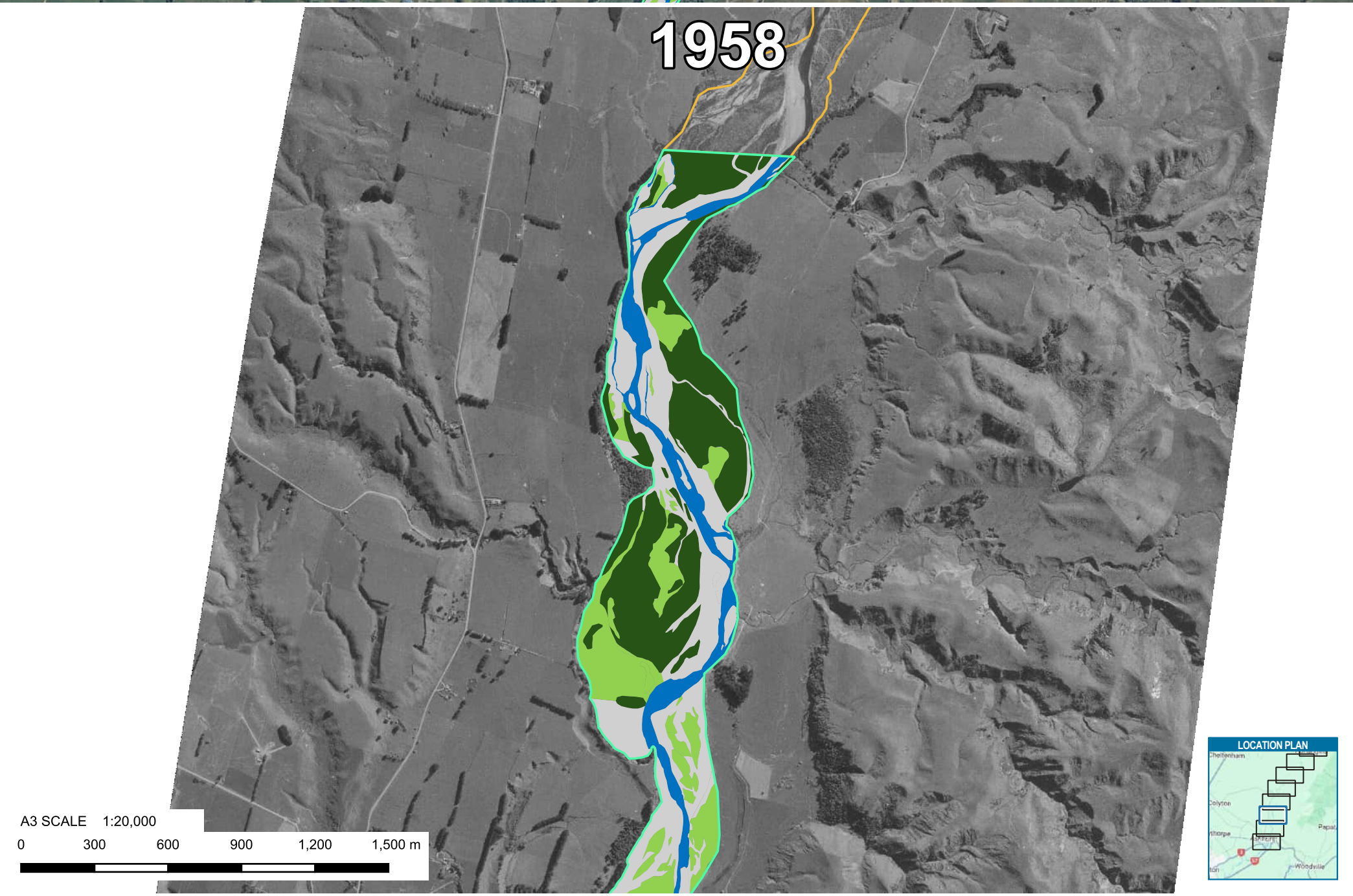
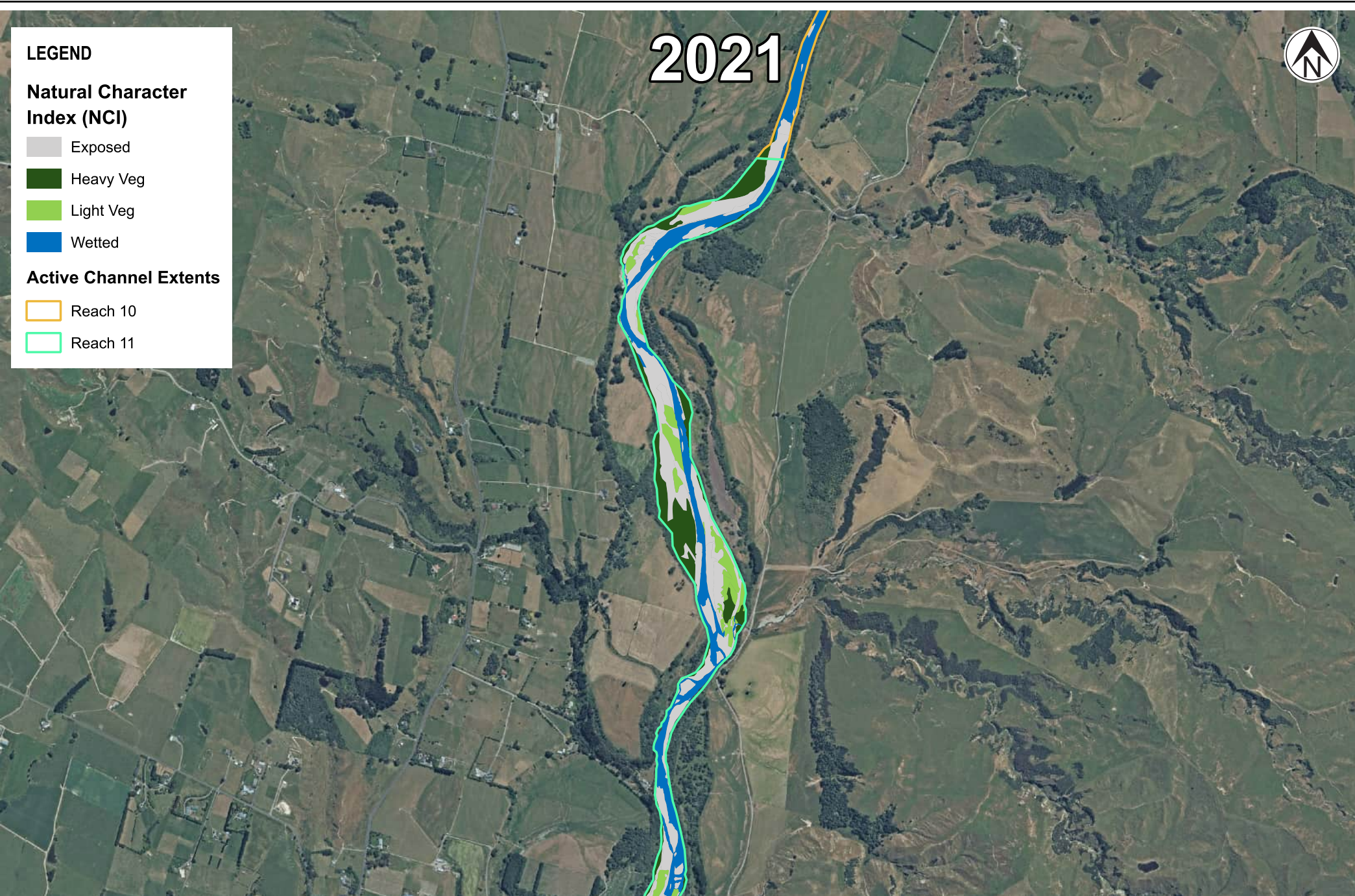
APPROVED DATE

CLIENT **HORIZONS REGIONAL COUNCIL**
PROJECT **POHANGINA AND ŌROUA NCI ASSESSMENTS**

TITLE **POHANGINA RIVER**
NATURAL CHARACTER INDEX - EPOCH 1

SCALE (A3) 1:20,000 FIG No. FIGURE 8

REV 1



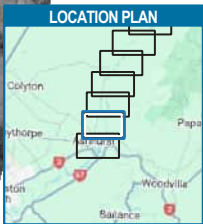
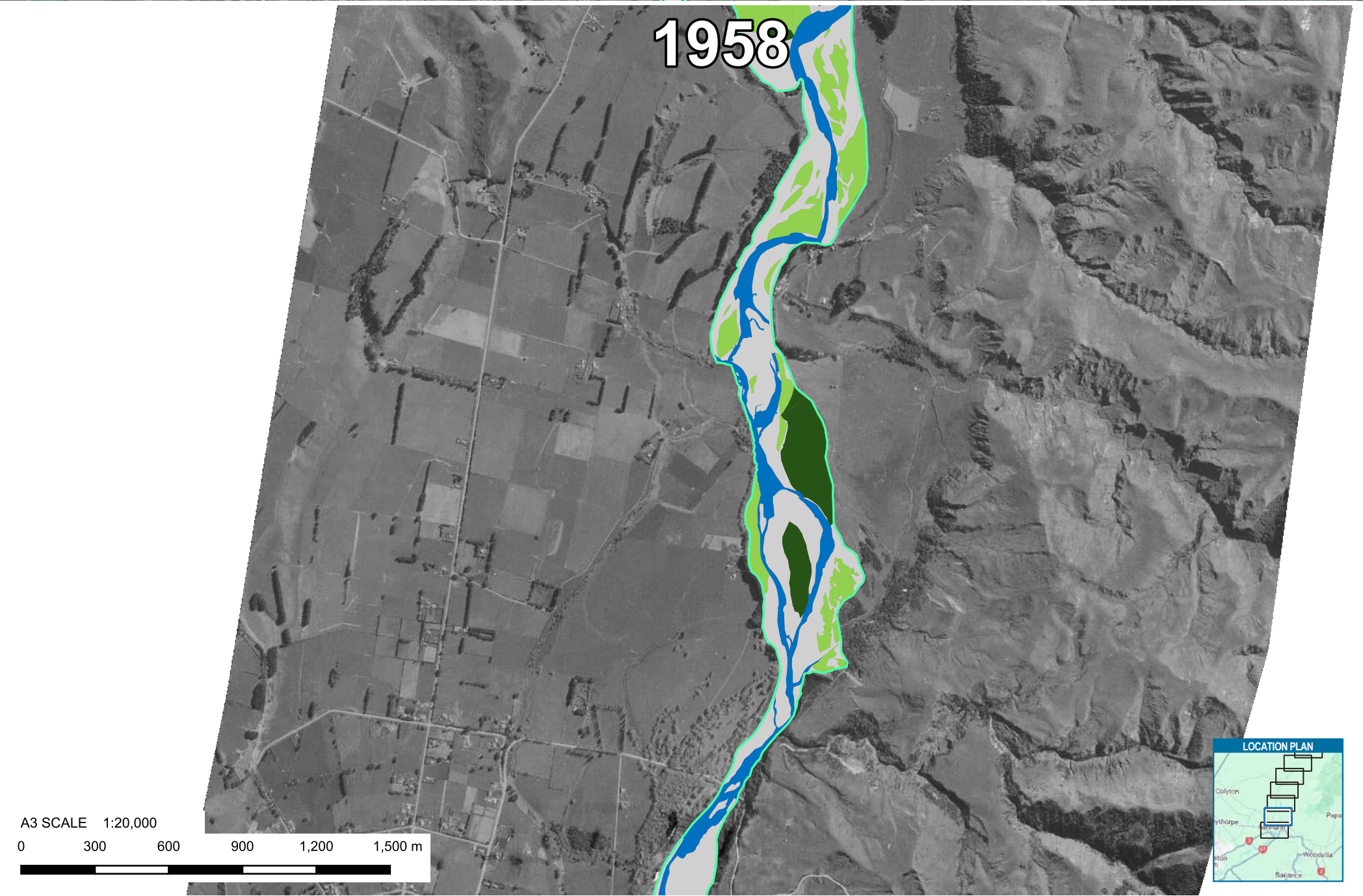
A3 SCALE 1:20,000
0 300 600 900 1,200 1,500 m

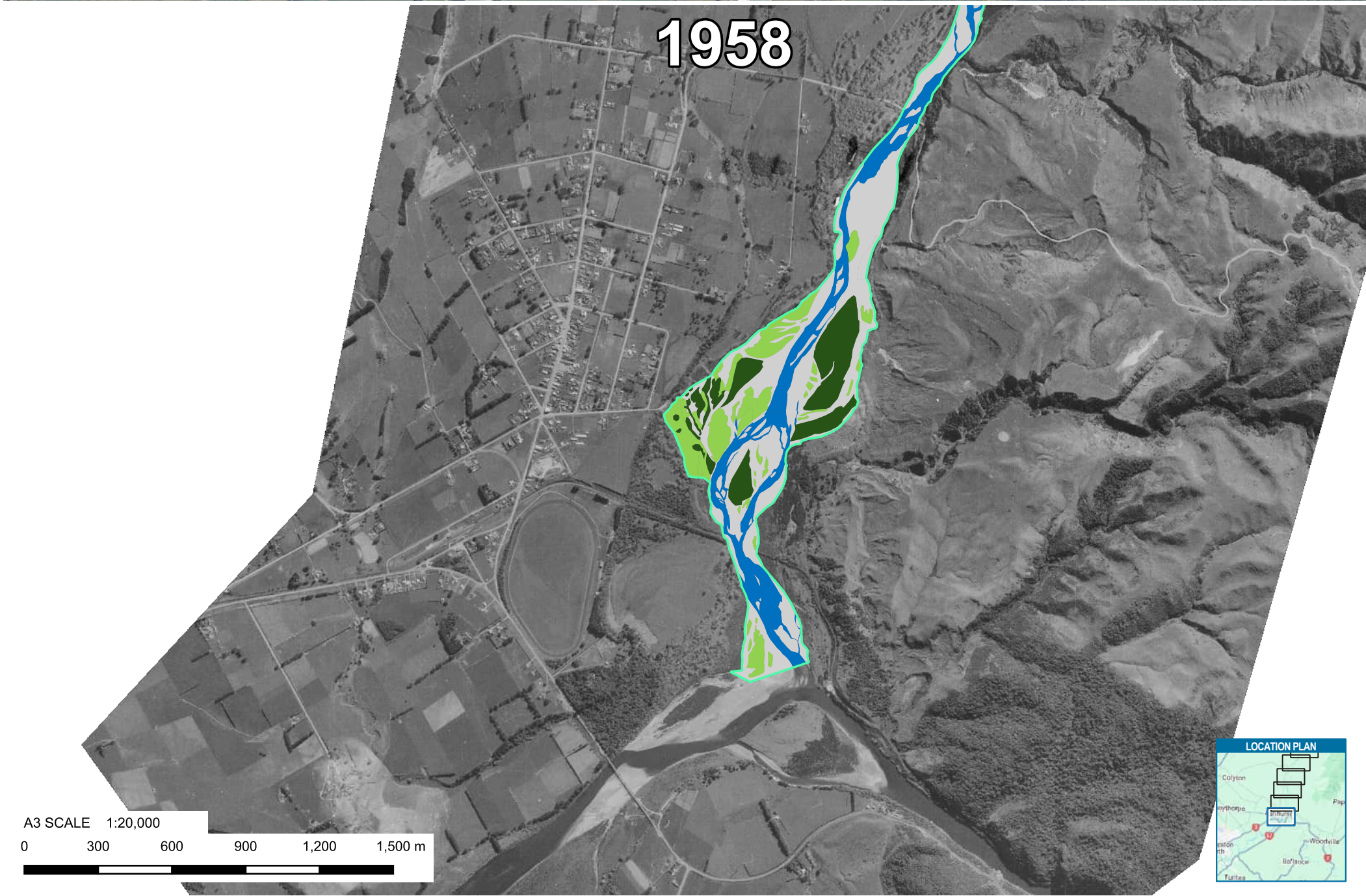
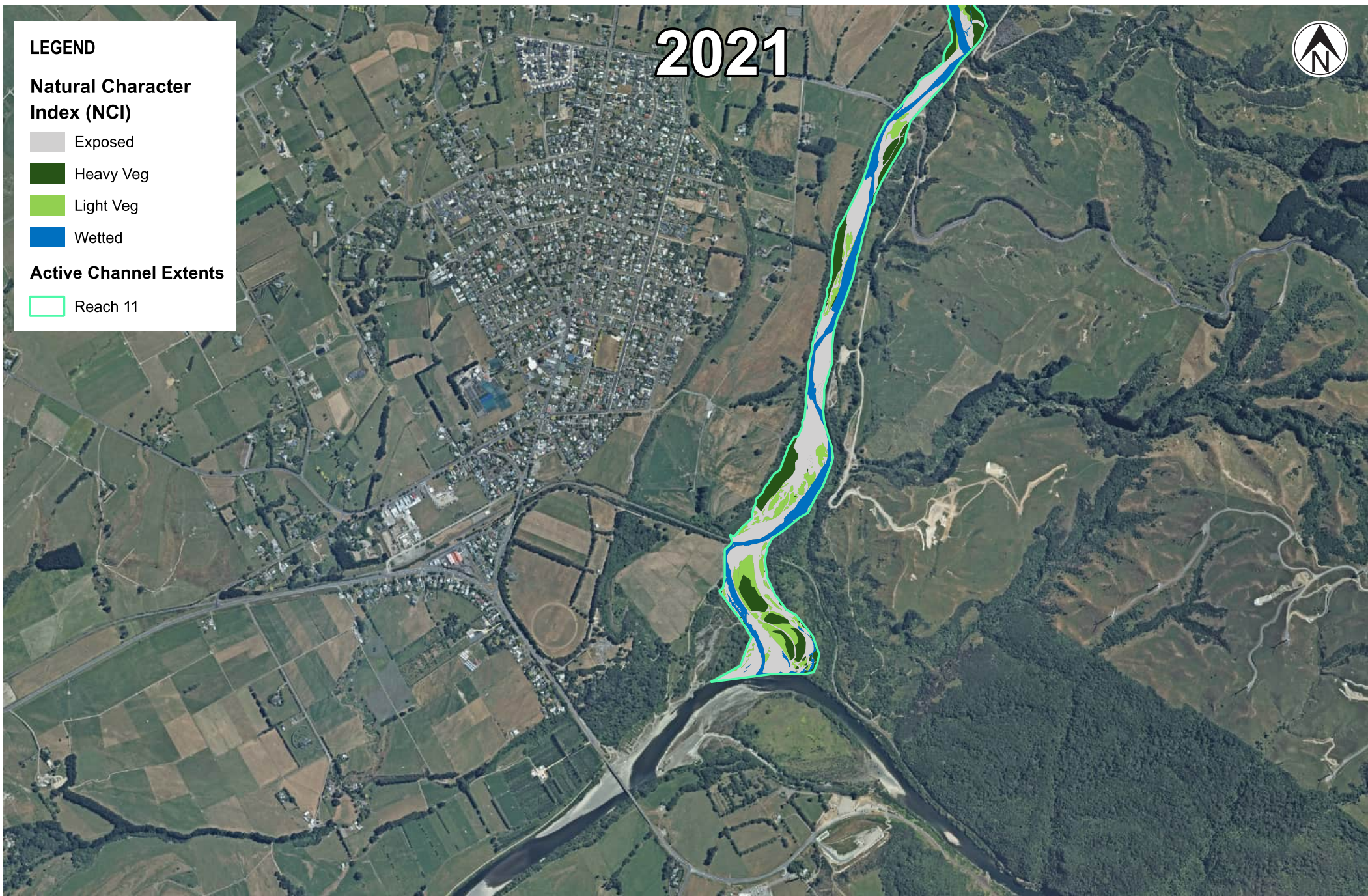


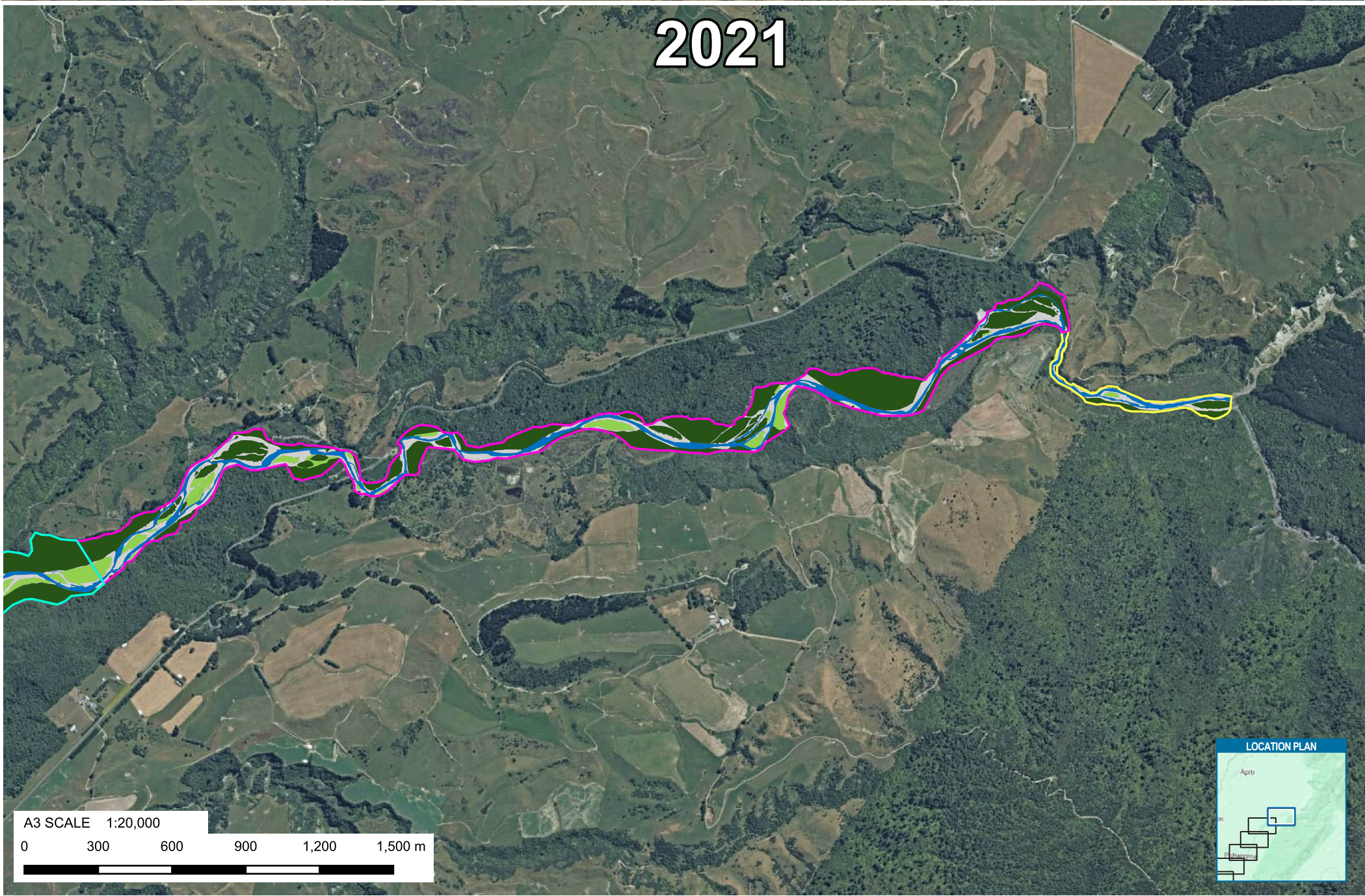
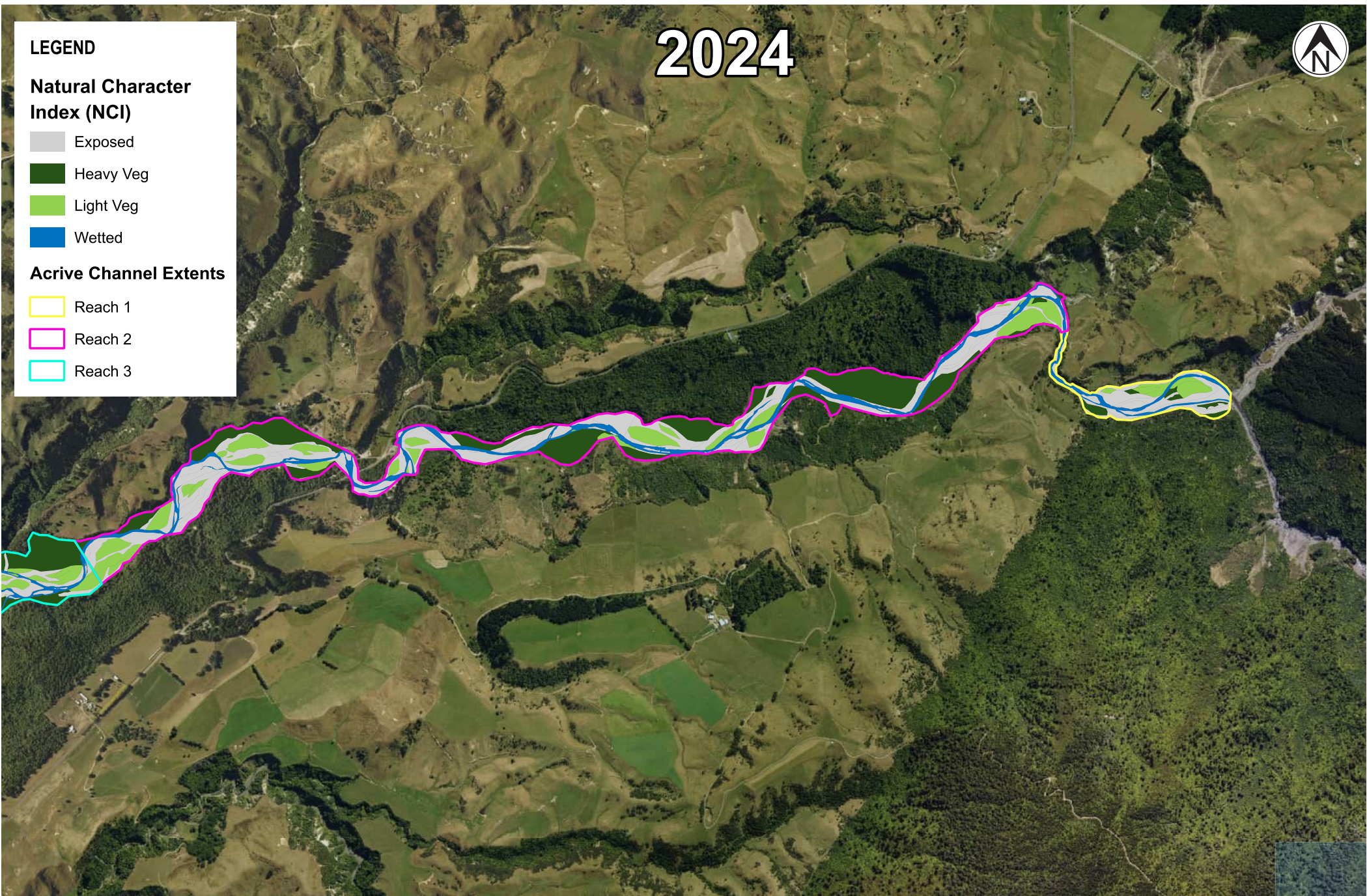
NOTES: Imagery: Manawatu-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0. Aerial Imagery 1958 OrouaPohangina. Data supplied by Horizons Regional Council.				
0	First version	GIHU	KJOH	03/07/25
1	Final version	GIHU	KJOH	15/08/25
REV	DESCRIPTION	GIS	CHK	DATE

PROJECT No. 1098311.0000		
DESIGNED	GIHU	JUL.25
DRAWN	GIHU	JUL.25
CHECKED	KJOH	AUG.25
BMQ	15/08/25	
APPROVED	DATE	

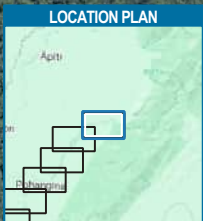
CLIENT	HORIZONS REGIONAL COUNCIL		
PROJECT	POHANGINA AND ŌROUA NCI ASSESSMENTS		
TITLE	POHANGINA RIVER NATURAL CHARACTER INDEX - EPOCH 1		
SCALE (A3)	1:20,000	FIG No.	FIGURE 9
REV	1		

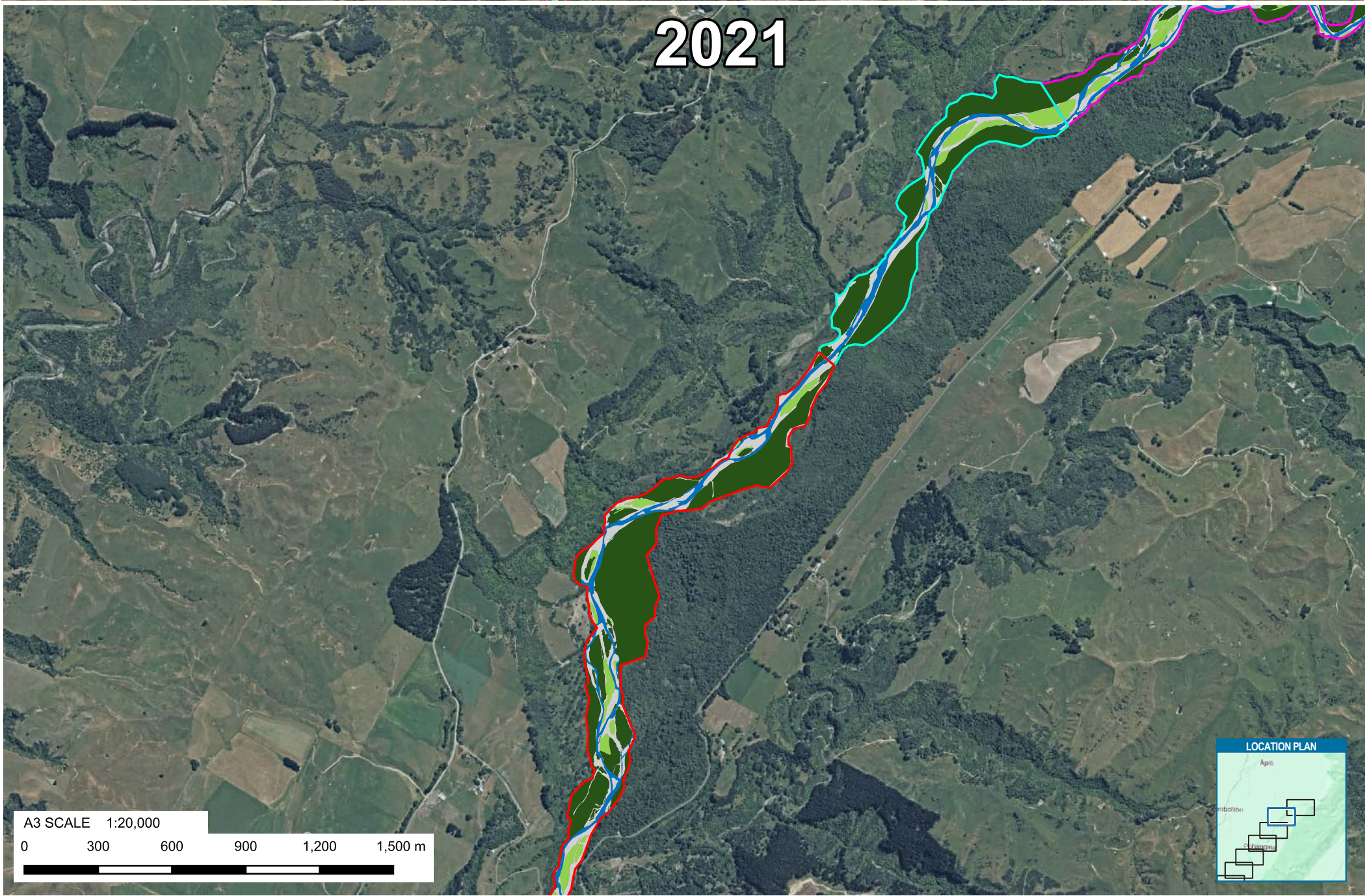
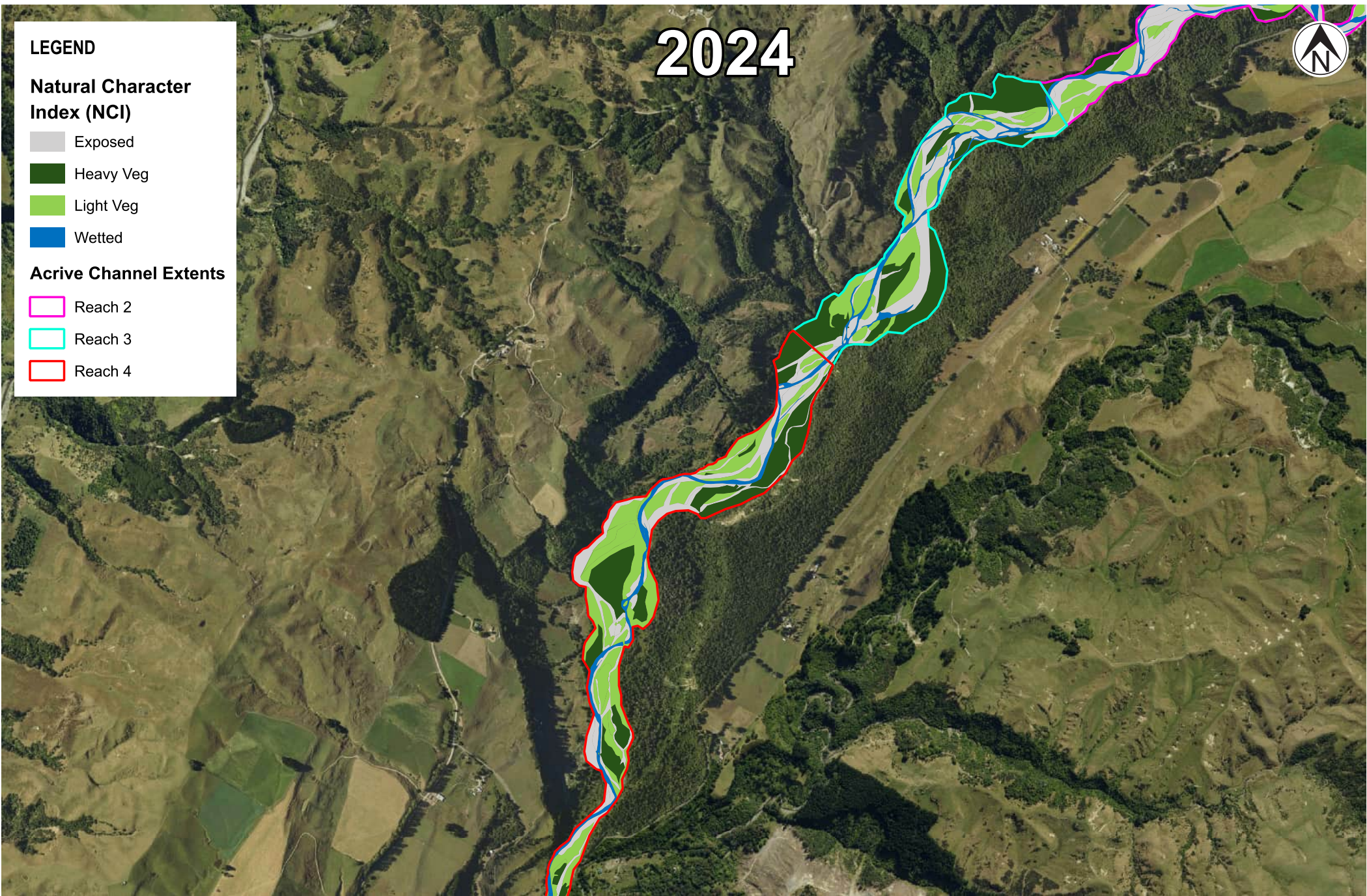




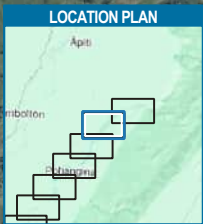


A3 SCALE 1:20,000
0 300 600 900 1,200 1,500 m





A3 SCALE 1:20,000
0 300 600 900 1,200 1,500 m



NOTES:
Imagery: Manawatu-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ.
Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0.

REV	DESCRIPTION
0	First version
1	Final version

GIHU	KJOH	03/07/25
GIHU	KJOH	15/08/25

PROJECT No. 1098311.0000

DESIGNED
DRAWN
CHECKED

GIHU
GIHU
GIHU

JUL.25
JUL.25
AUG.25

APPROVED

DATE

BMQ 15/08/25

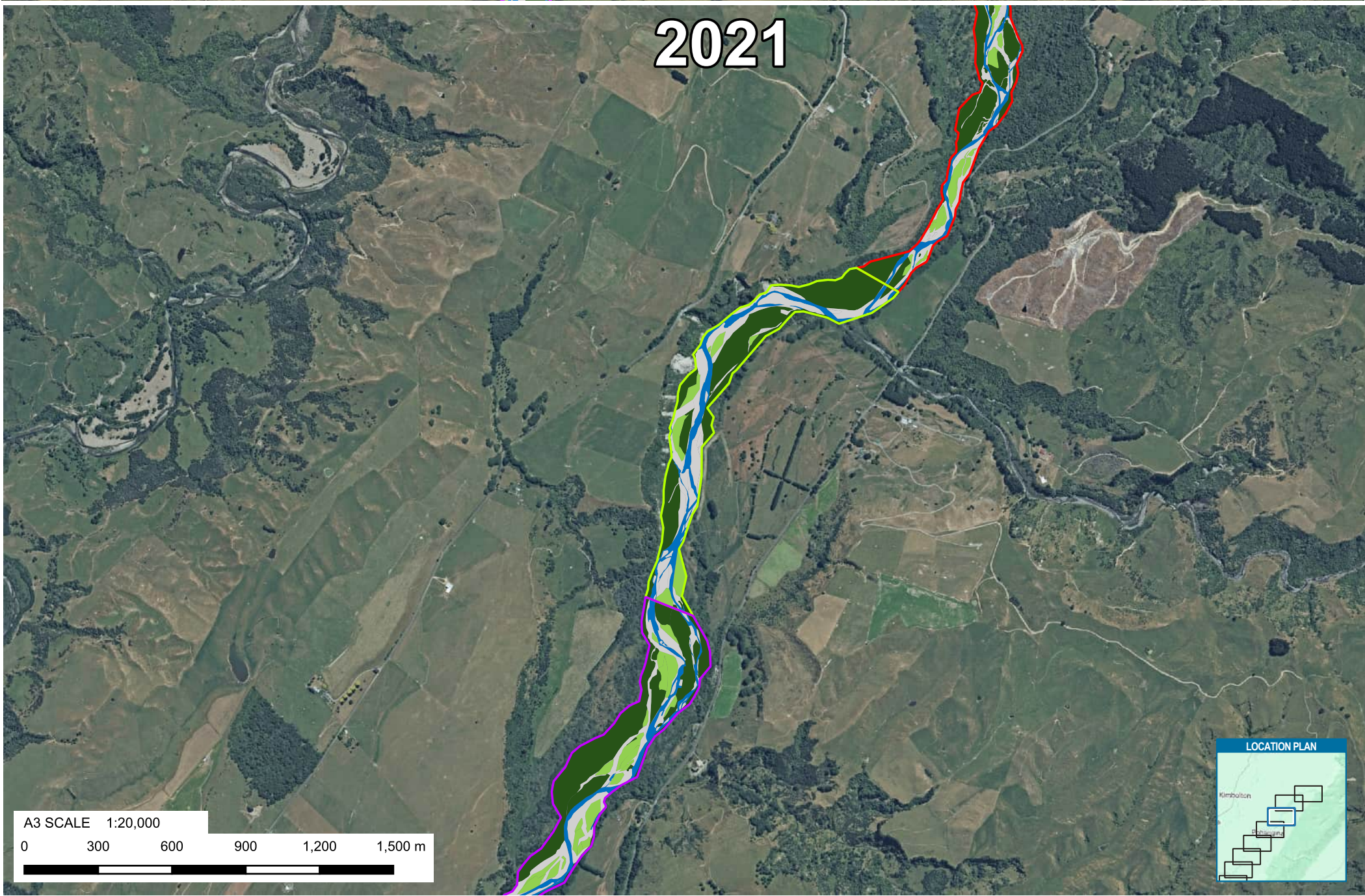
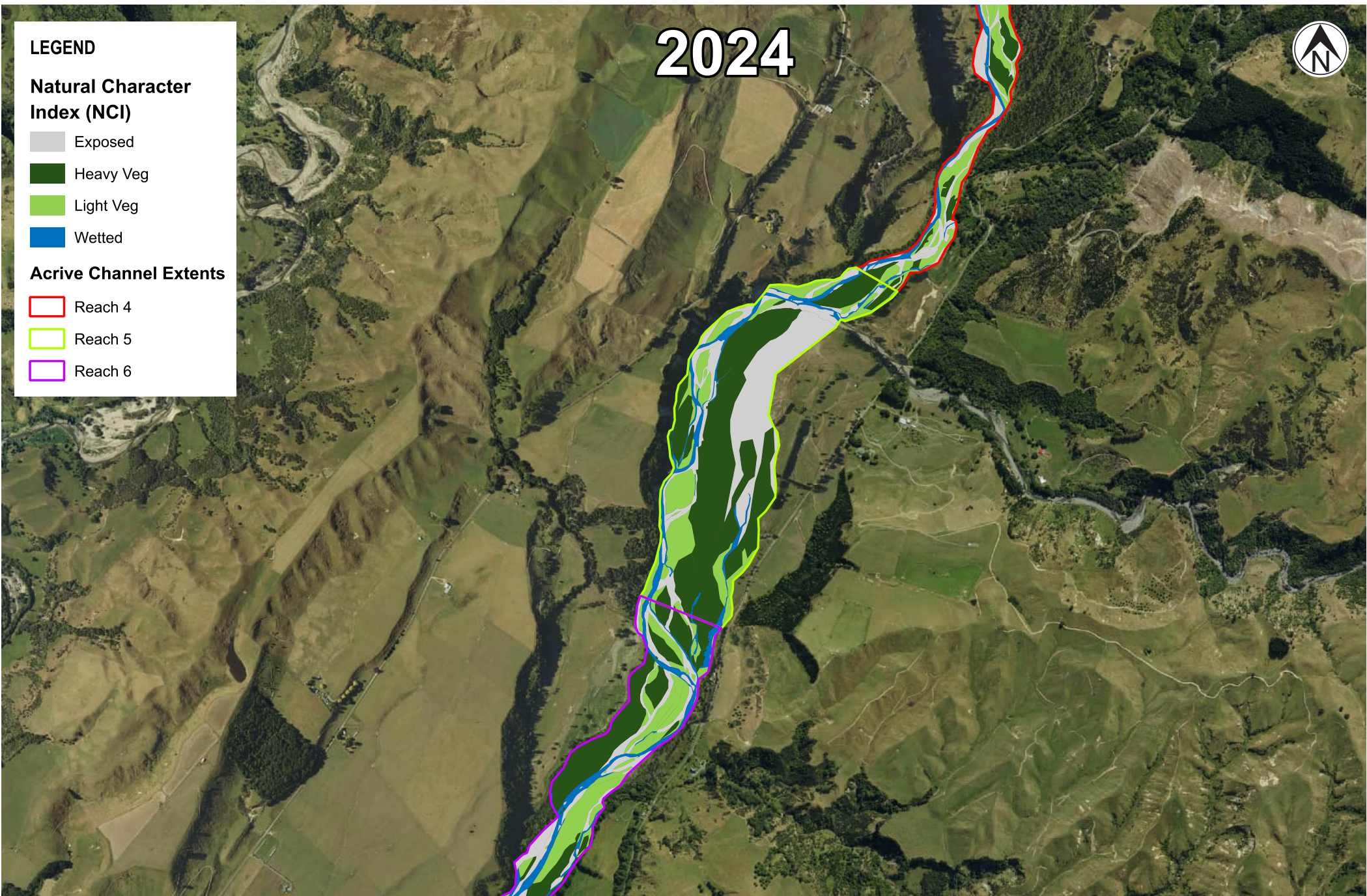
CLIENT **HORIZONS REGIONAL COUNCIL**
PROJECT **POHANGINA AND ŌROUA NCI ASSESSMENTS**

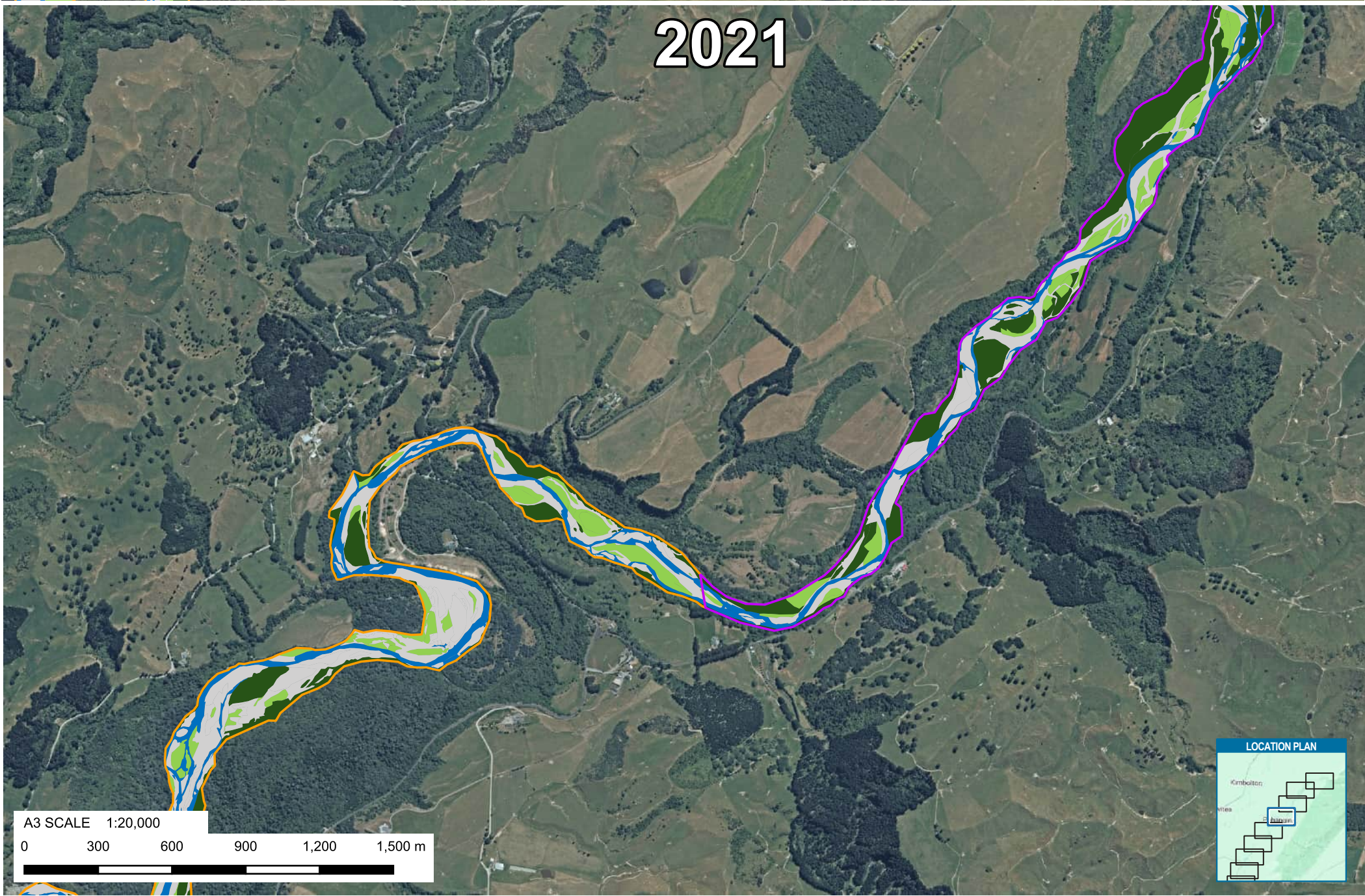
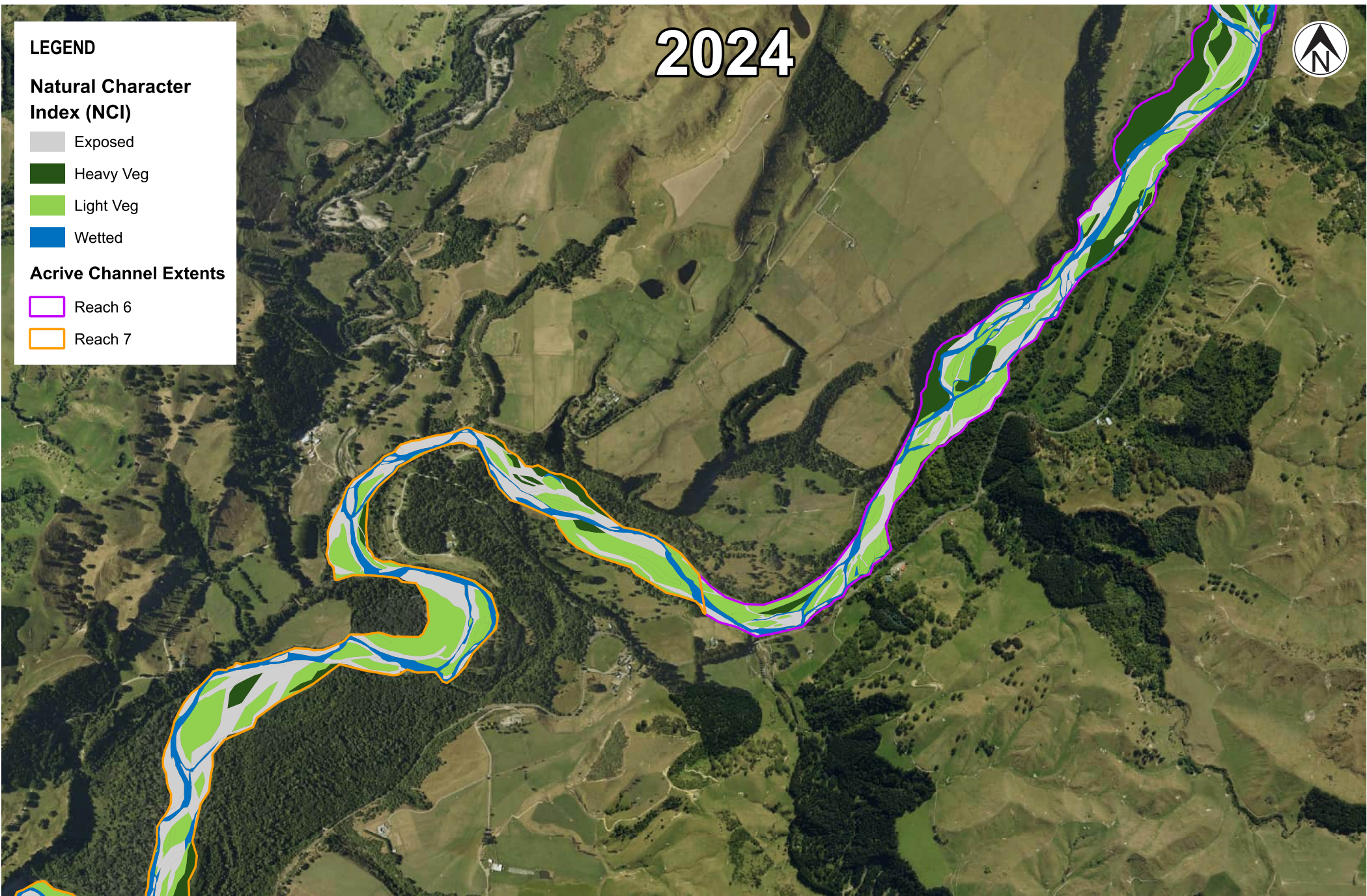
TITLE **POHANGINA RIVER
NATURAL CHARACTER INDEX - EPOCH 2**

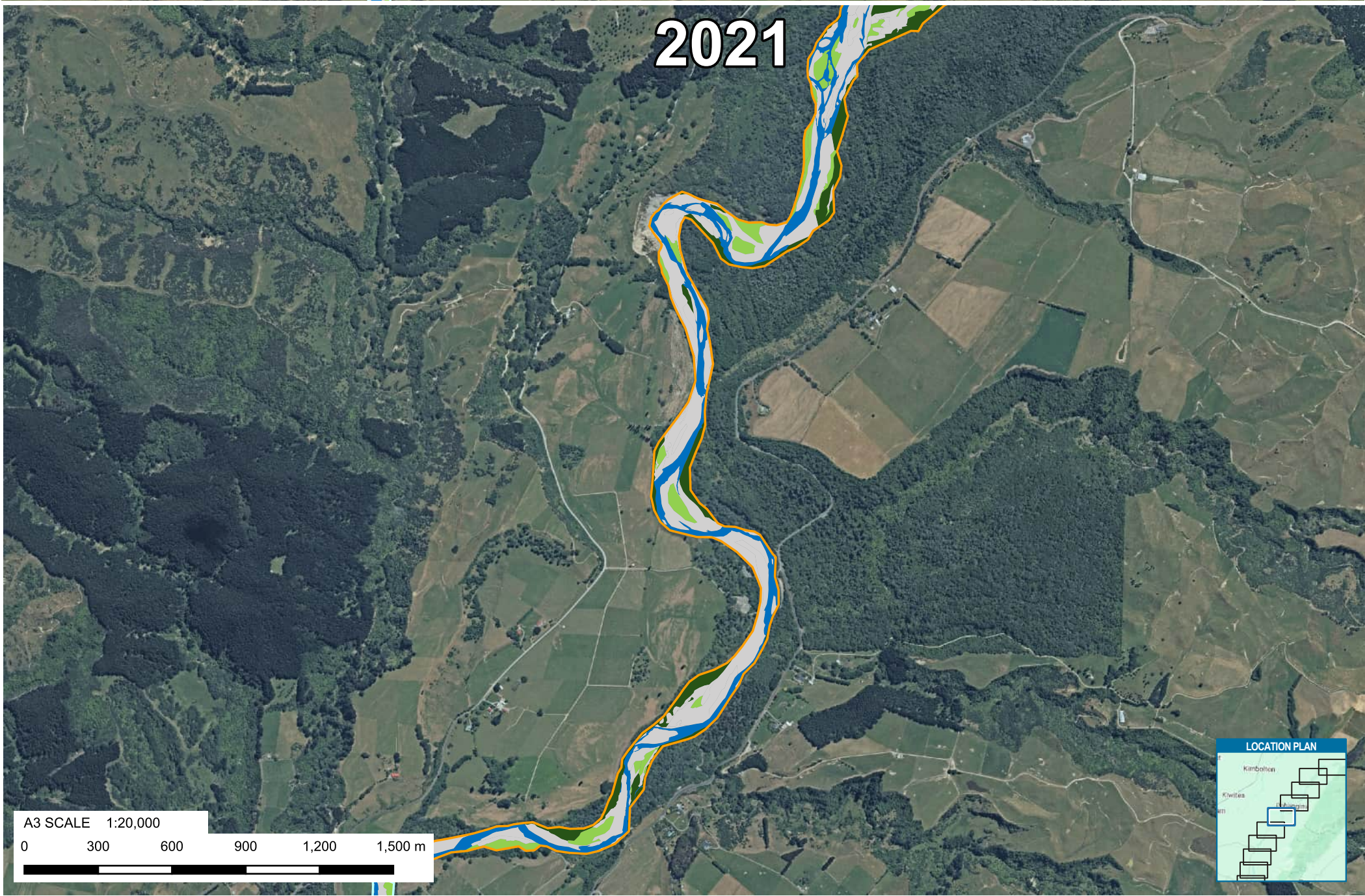
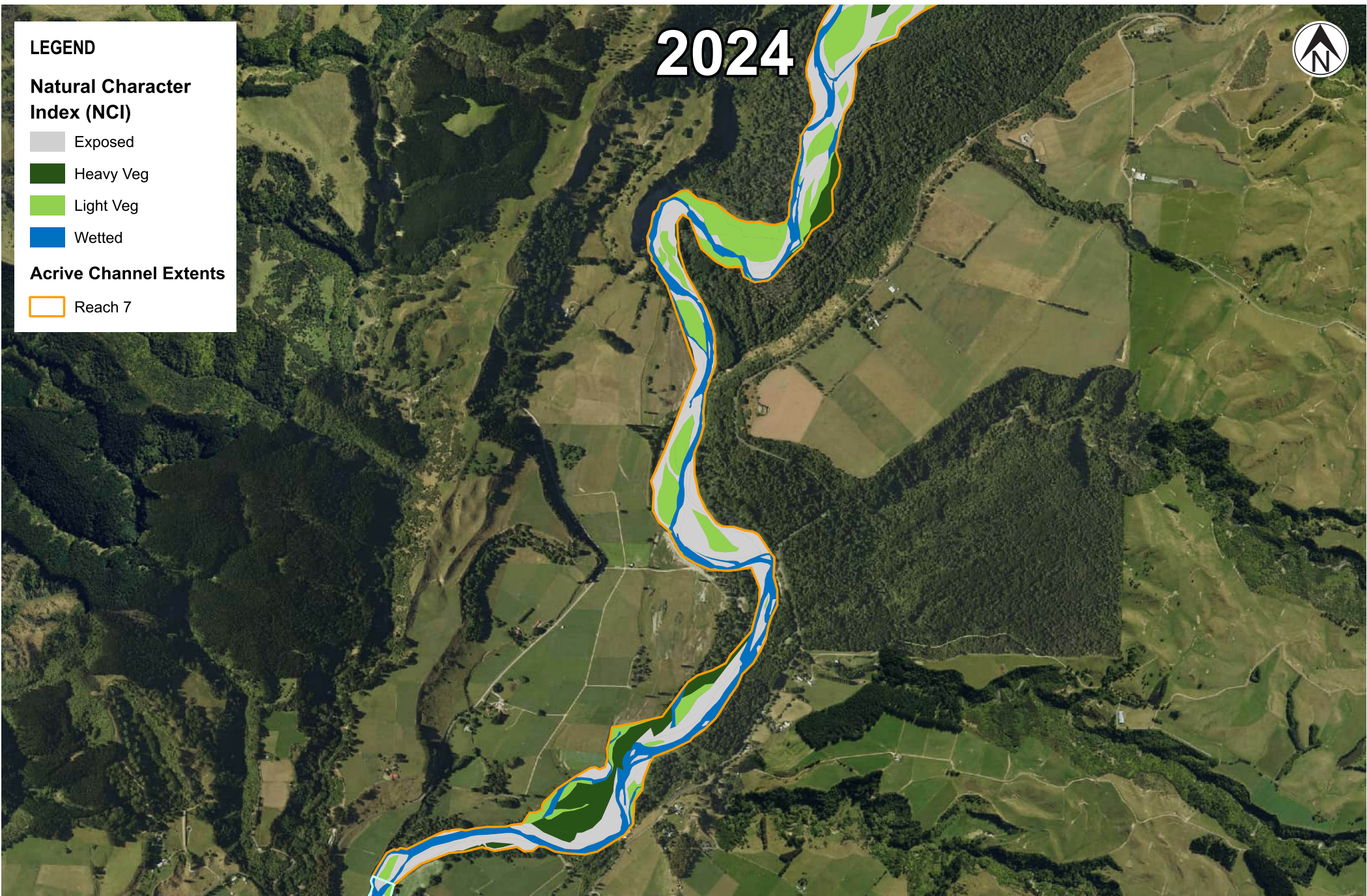
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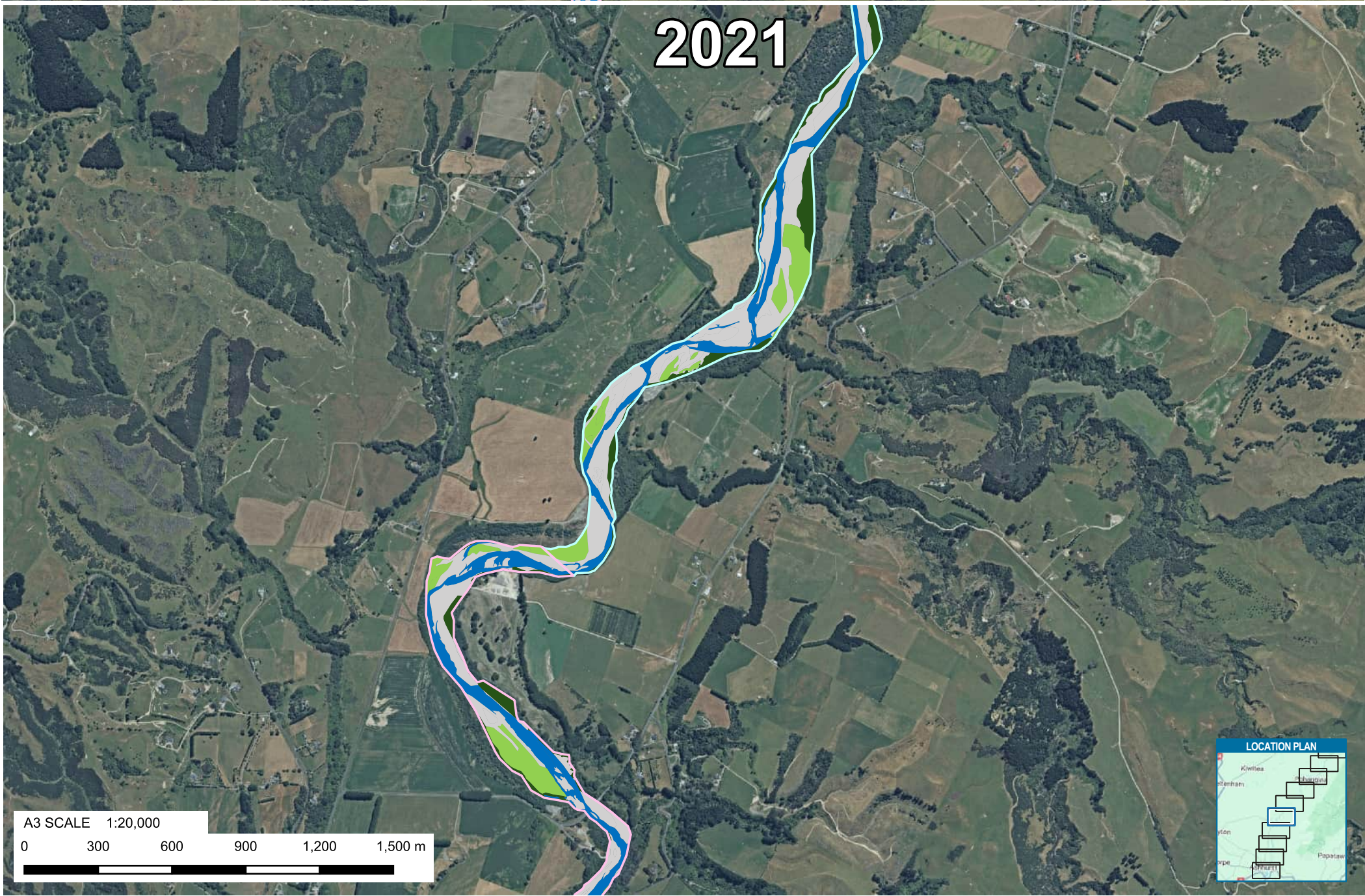
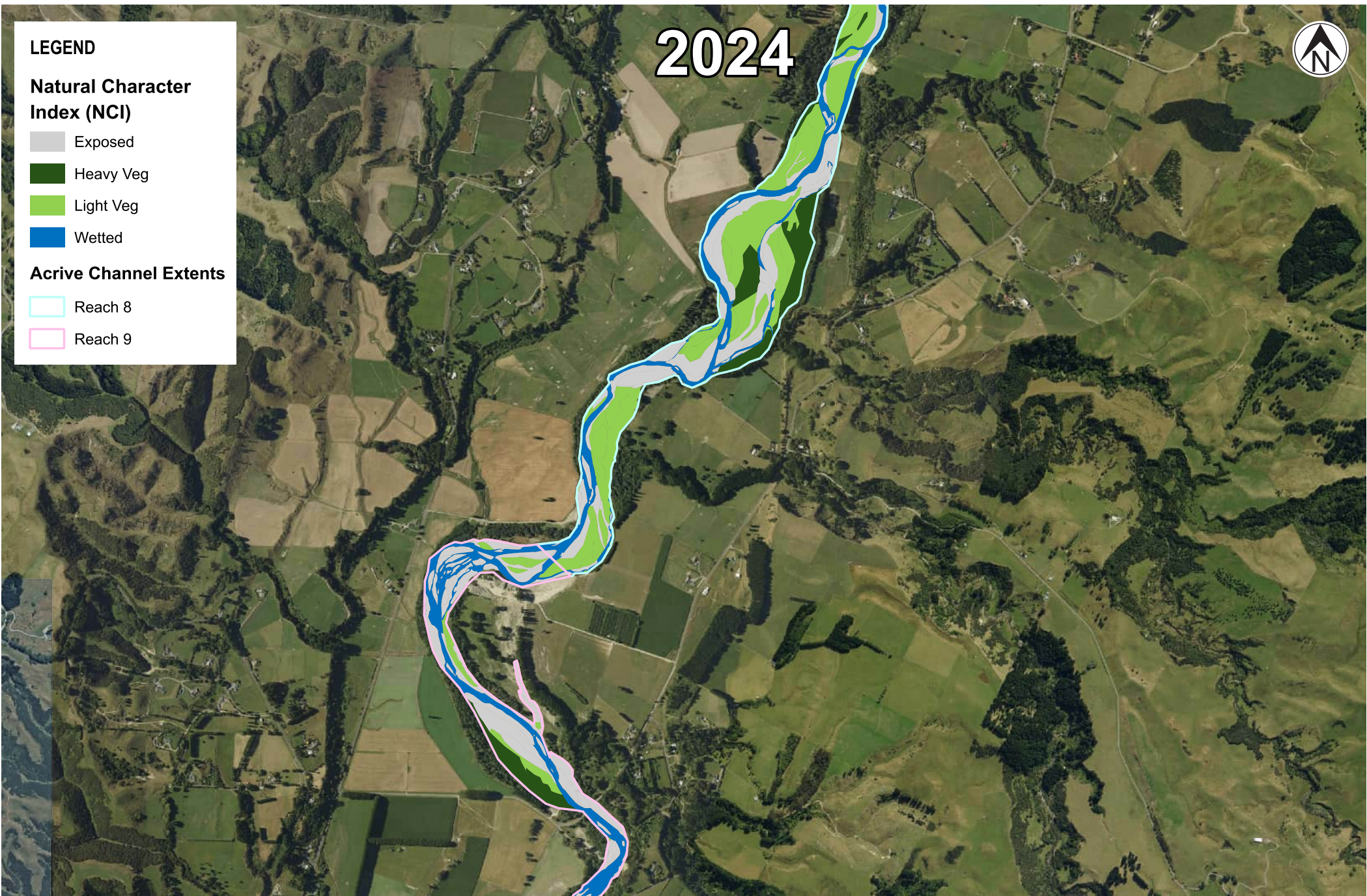
FIG No. **FIGURE 13**

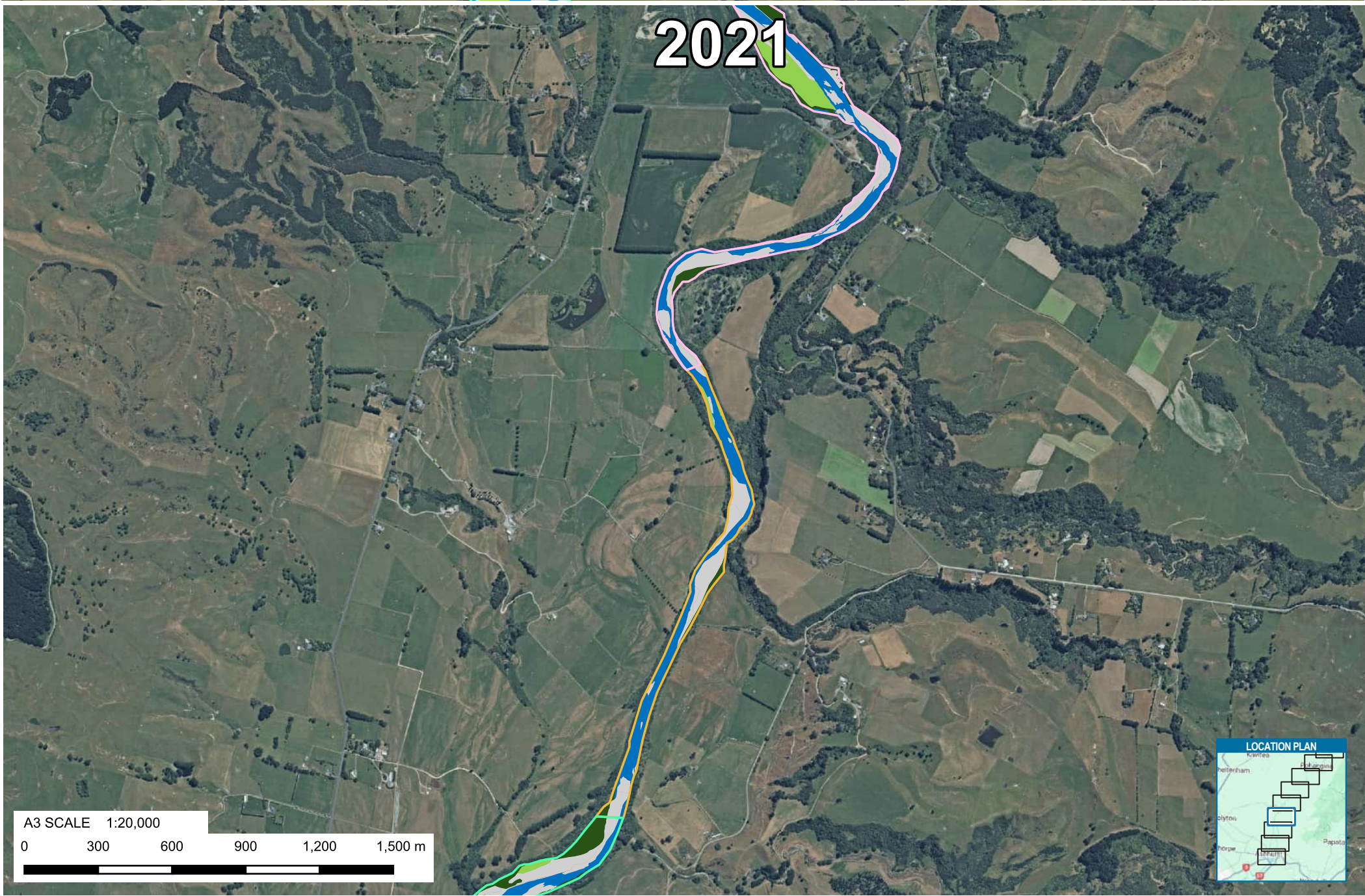
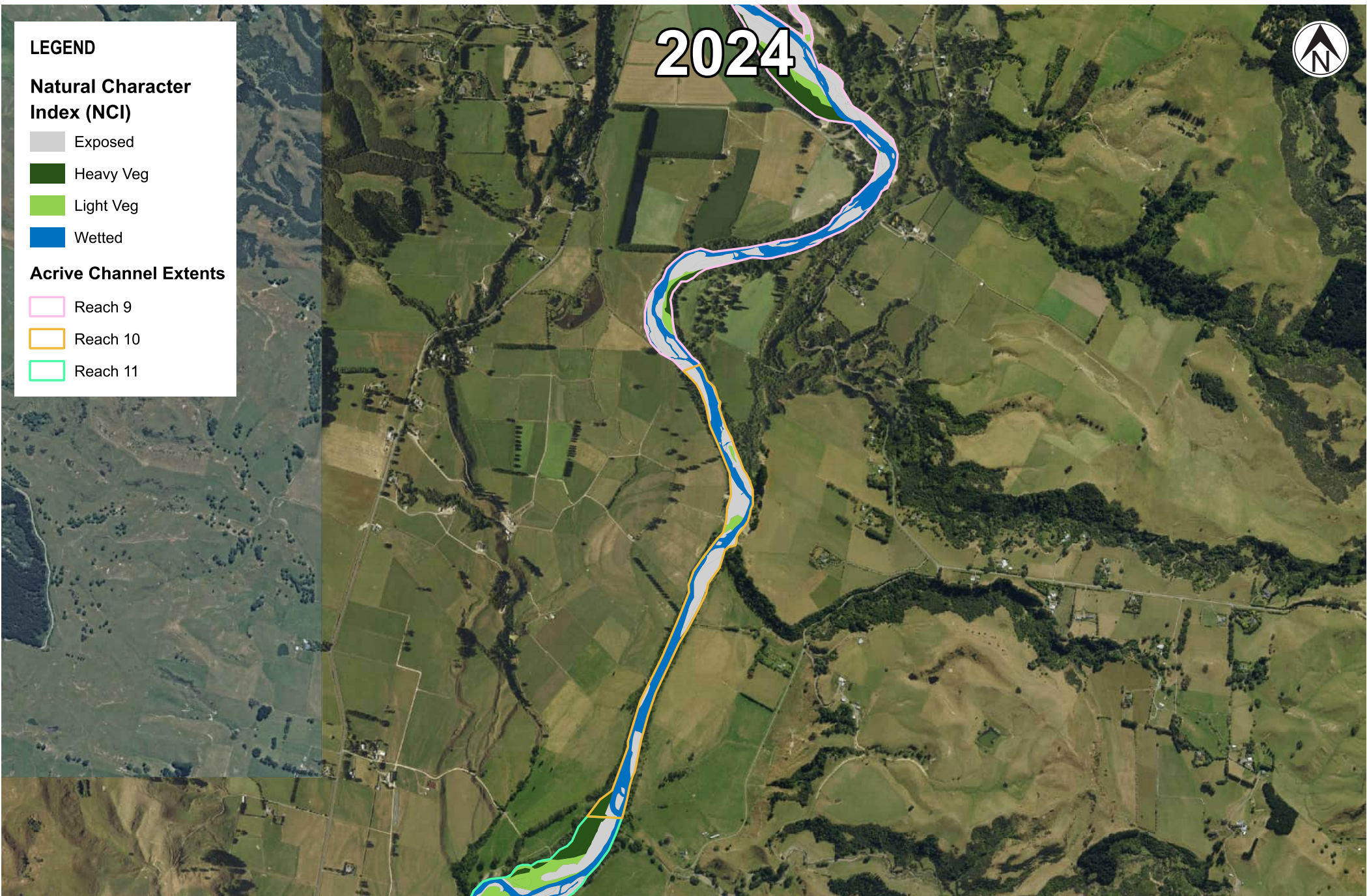
REV 1

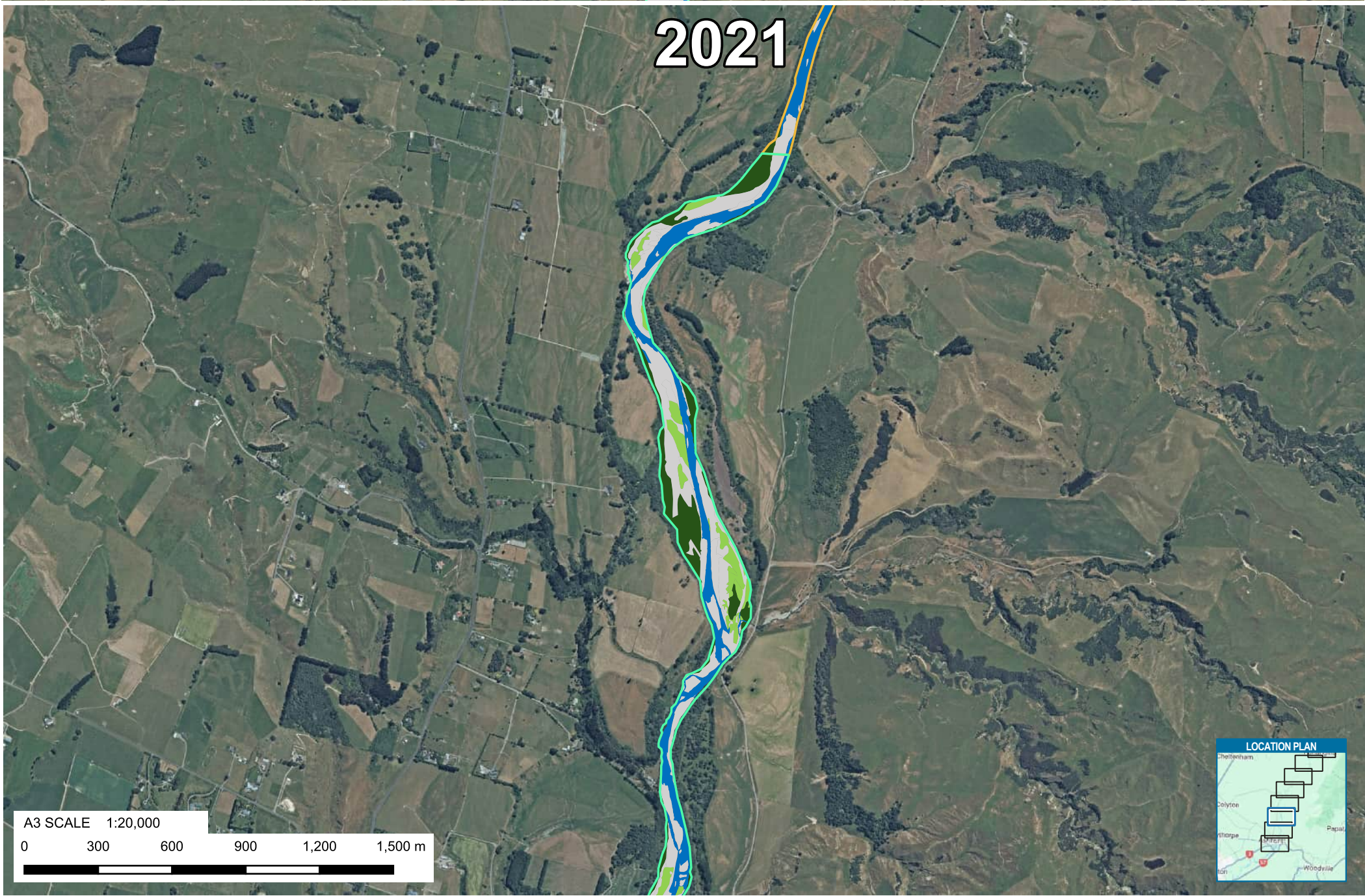
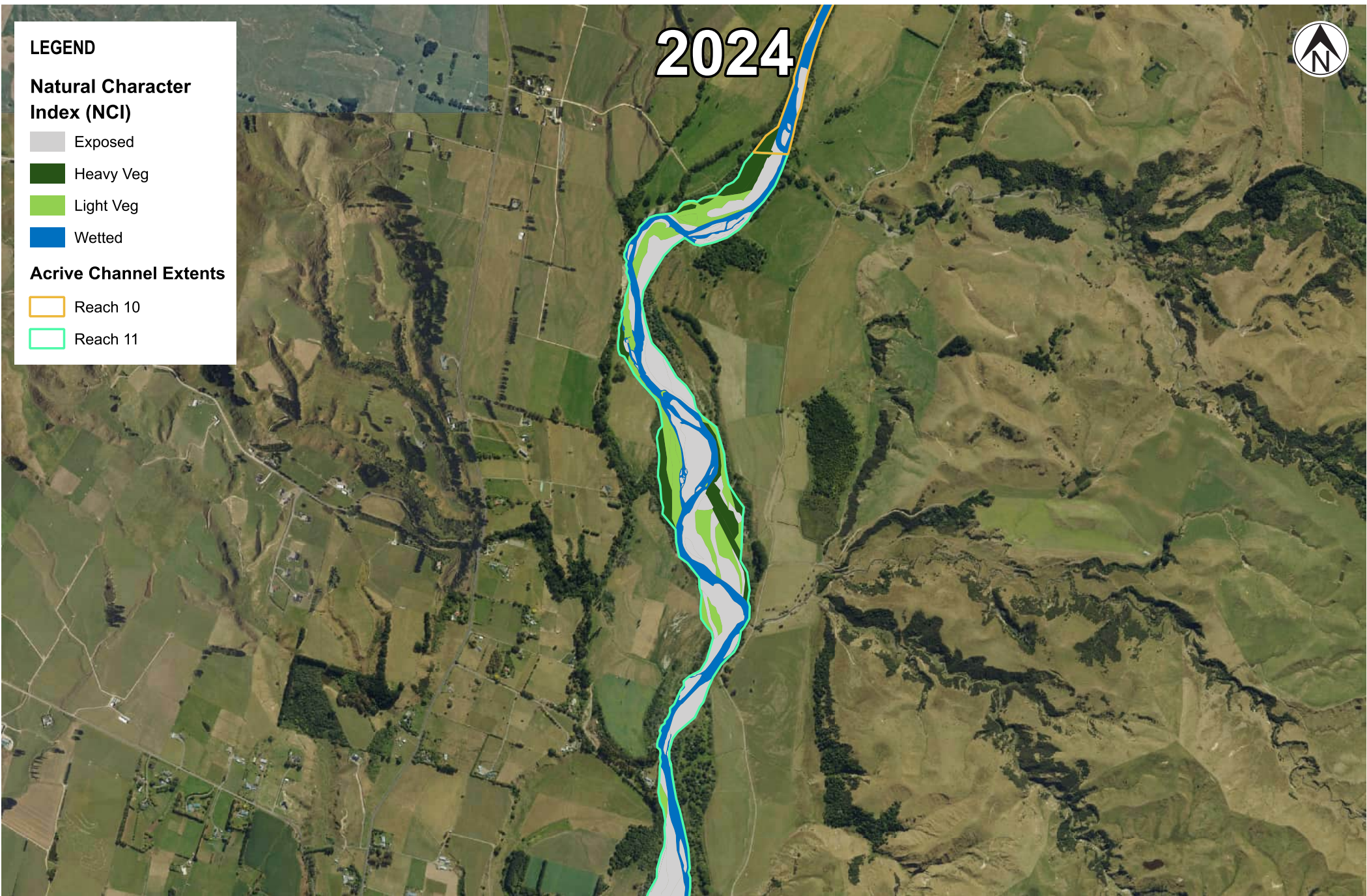


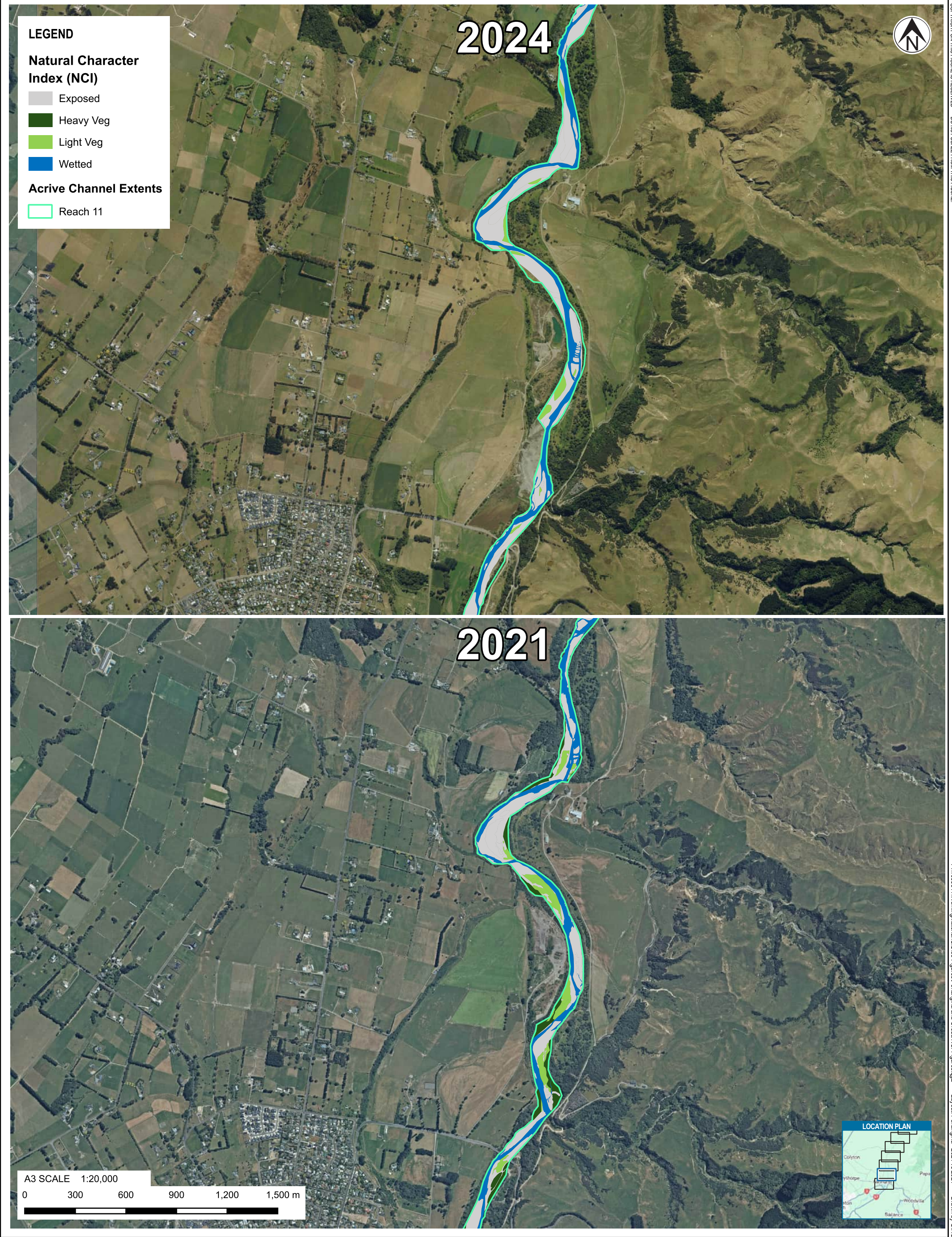






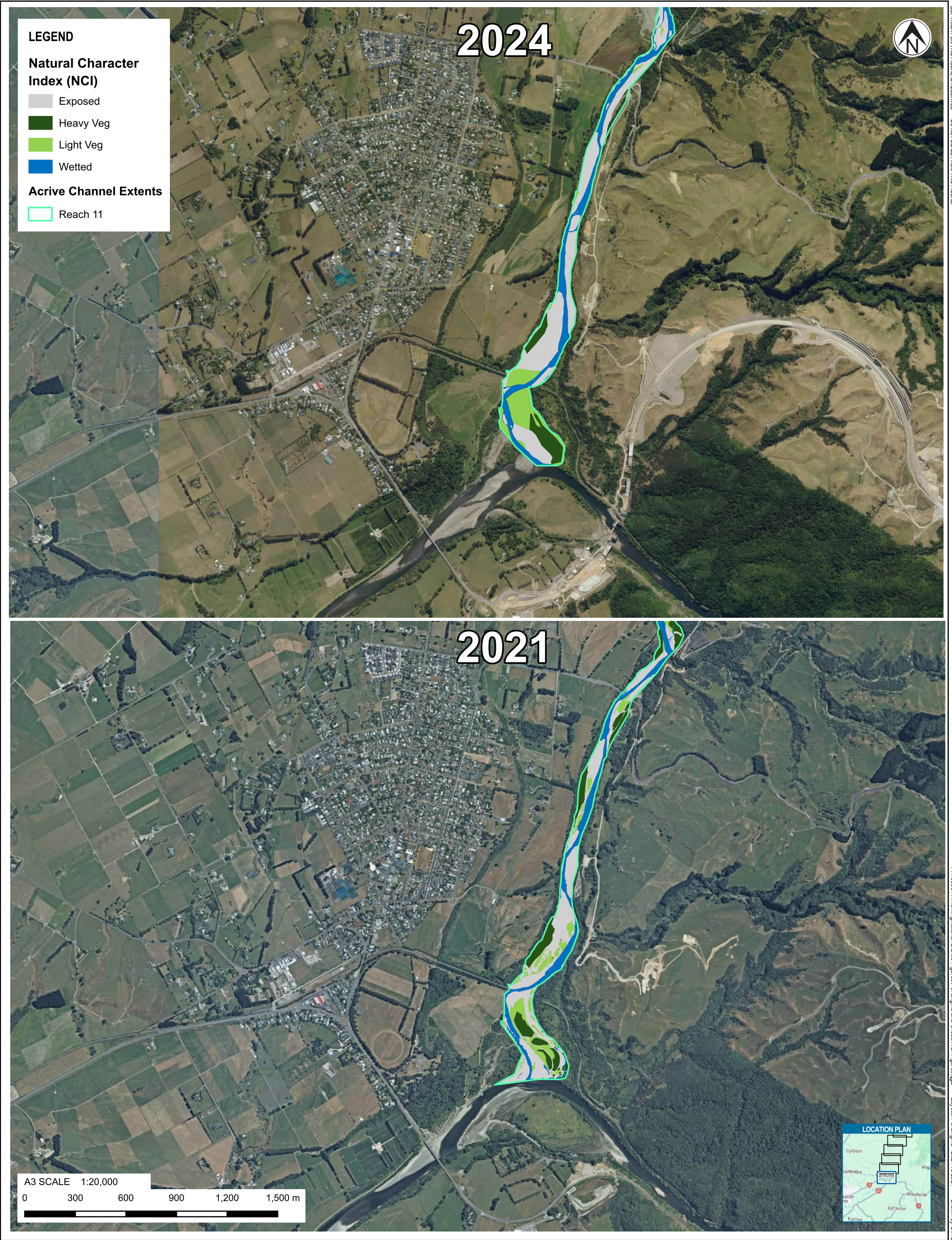






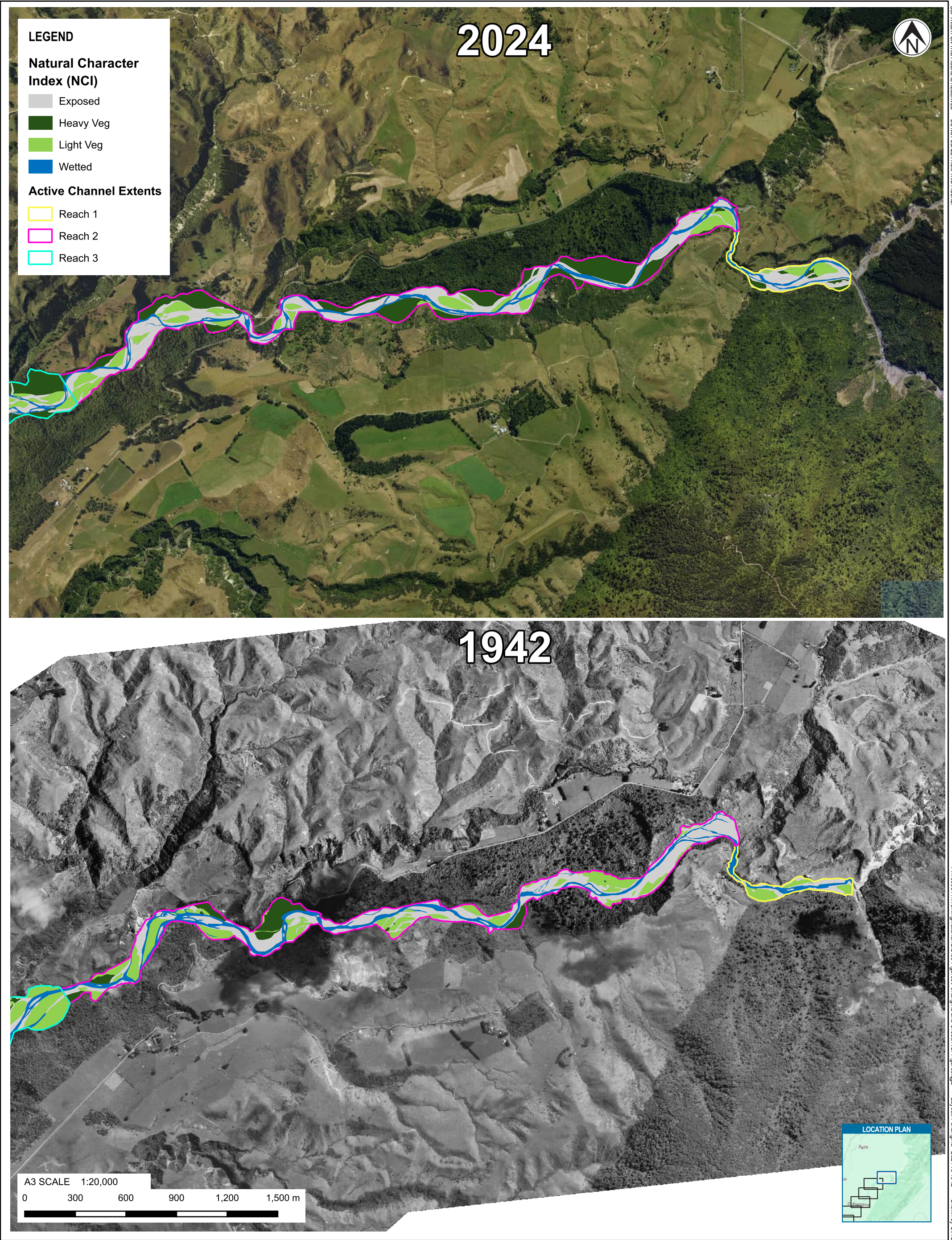
Tonkin+Taylor www.tonkintaylor.co.nz Exceptional thinking together	NOTES: Imagery: Manawatu-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0.	PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL		
					PROJECT POHANGINA AND ŌROUA NCI ASSESSMENTS		
					TITLE POHANGINA RIVER NATURAL CHARACTER INDEX - EPOCH 2		
					SCALE (A3) 1:20,000 FIG No. FIGURE 21 REV 1		
0	First version	GIHU	KJOH	03/07/25	BMQ	15/08/25	
1	Final version	GIHU	KJOH	15/08/25			
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE	

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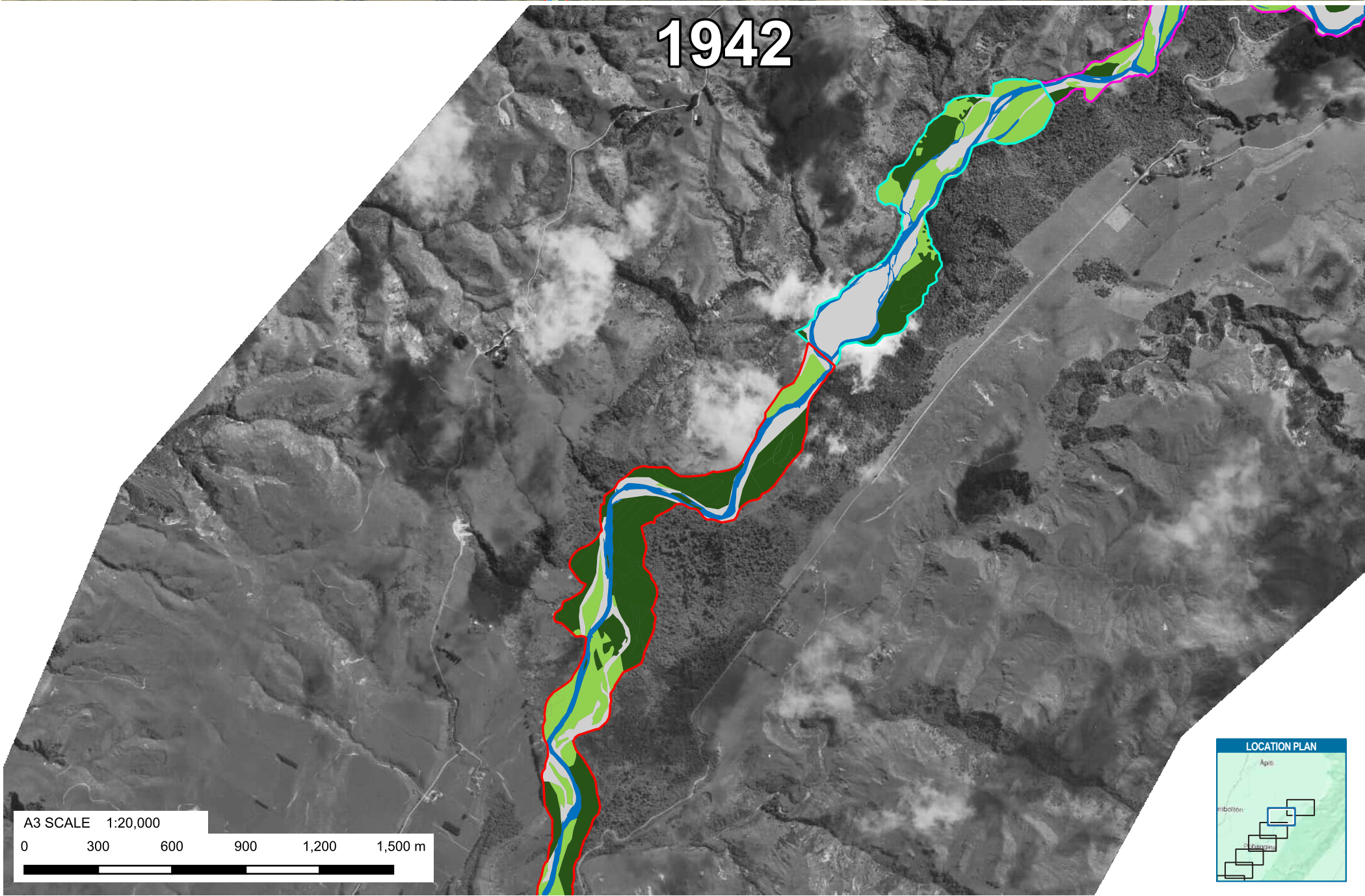
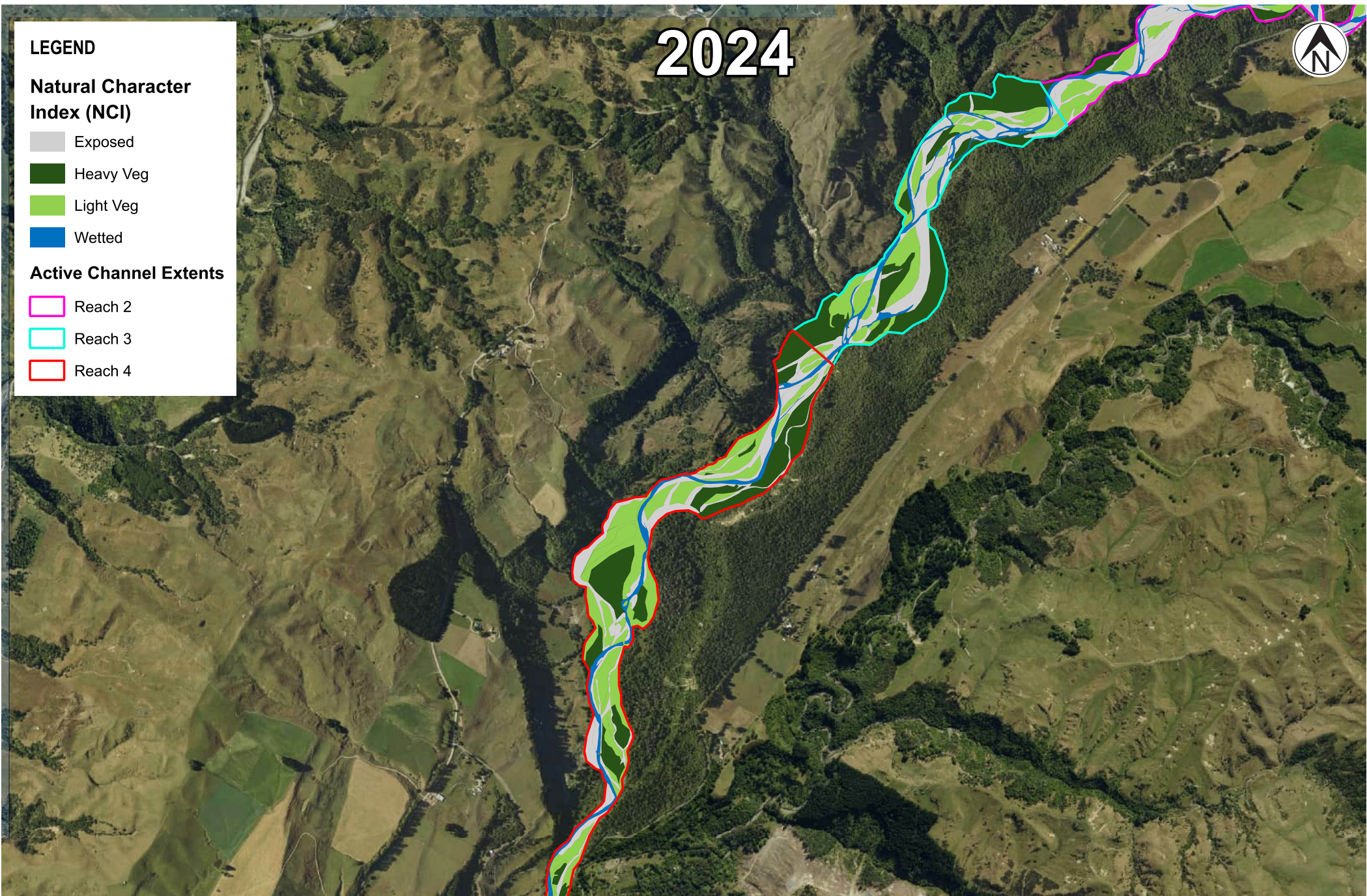
Tonkin+Taylor www.tonkintaylor.co.nz Exceptional thinking together	NOTES: Imagery: Manawatu-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0.				PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL			
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					CHECKED	GIHU	AUG.25	TITLE POHANGINA RIVER NATURAL CHARACTER INDEX - EPOCH 2			
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1	Final version	GIHU	KJOH	15/08/25							
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE	SCALE (A3) 1:20,000	FIG No. FIGURE 22	REV 1		

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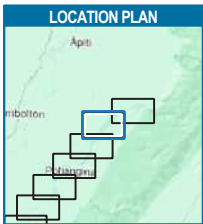


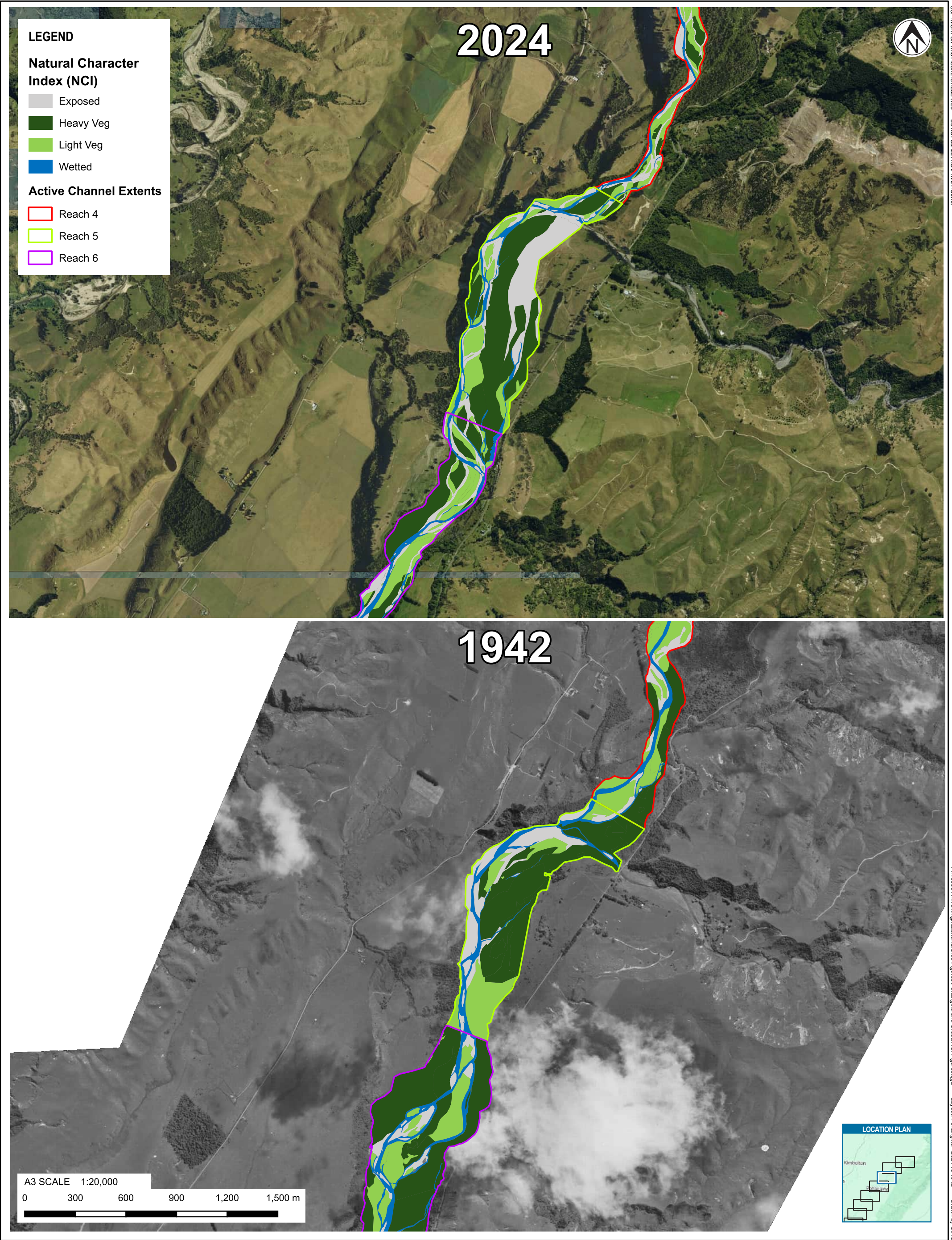
 Tonkin+Taylor www.tonkintaylor.co.nz Exceptional thinking together					NOTES: Imagery: Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0. Aerial Imagery 1942b OrouaPohangina. Data supplied by Horizons Regional Council.				PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL			
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					CHECKED	KJOH	AUG.25								
0	First version			GIHU	KJOH	03/07/25	BMQ		15/08/25		TITLE POHANGINA RIVER NATURAL CHARACTER INDEX - EPOCH 3				
1	Final version			GIHU	KJOH	15/08/25									
REV	DESCRIPTION				GIS	CHK	DATE	APPROVED		DATE		SCALE (A3) 1:20,000	FIG No. FIGURE 23	REV 1	

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A3 SCALE 1:20,000
0 300 600 900 1,200 1,500 m

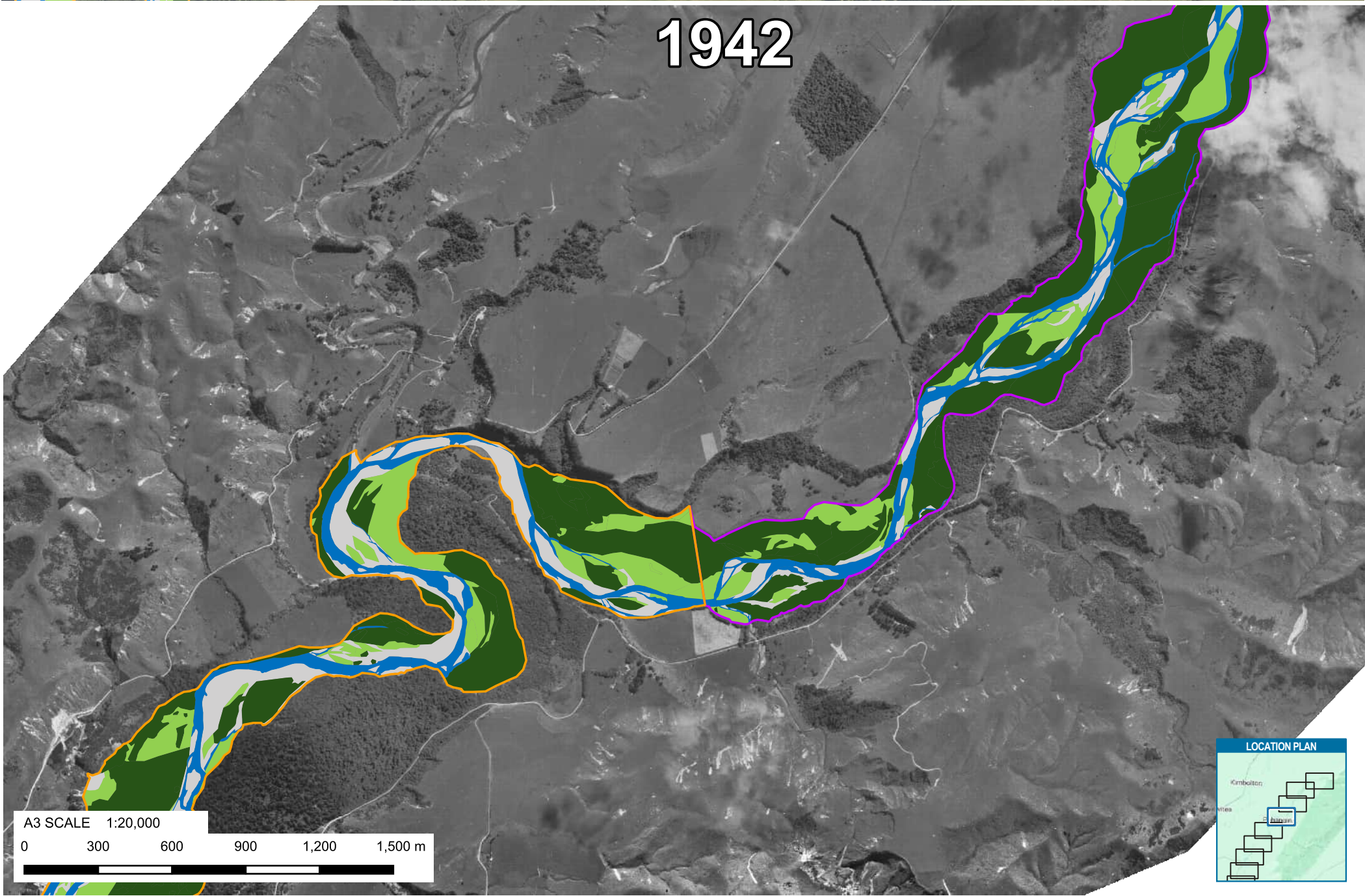
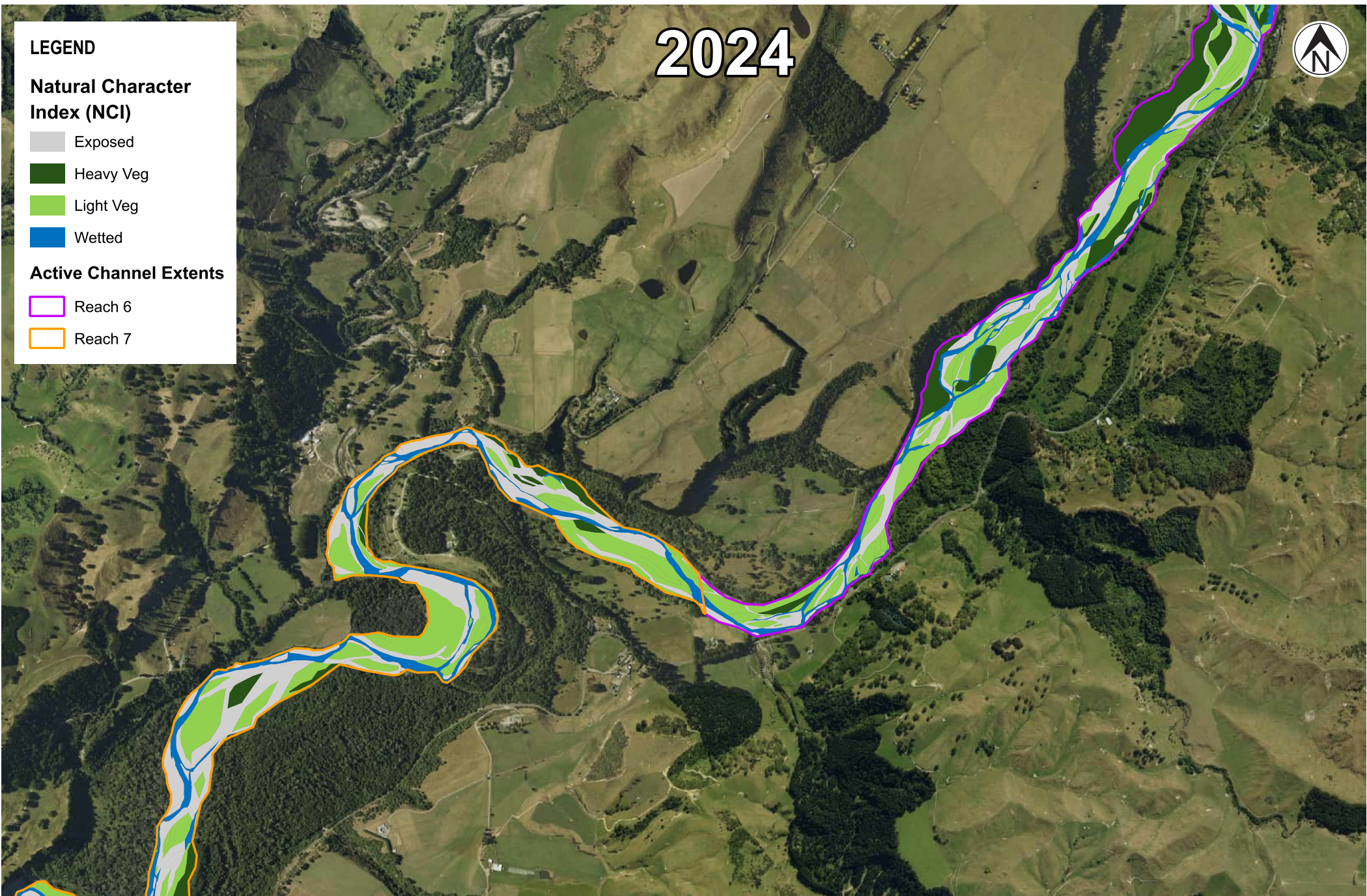


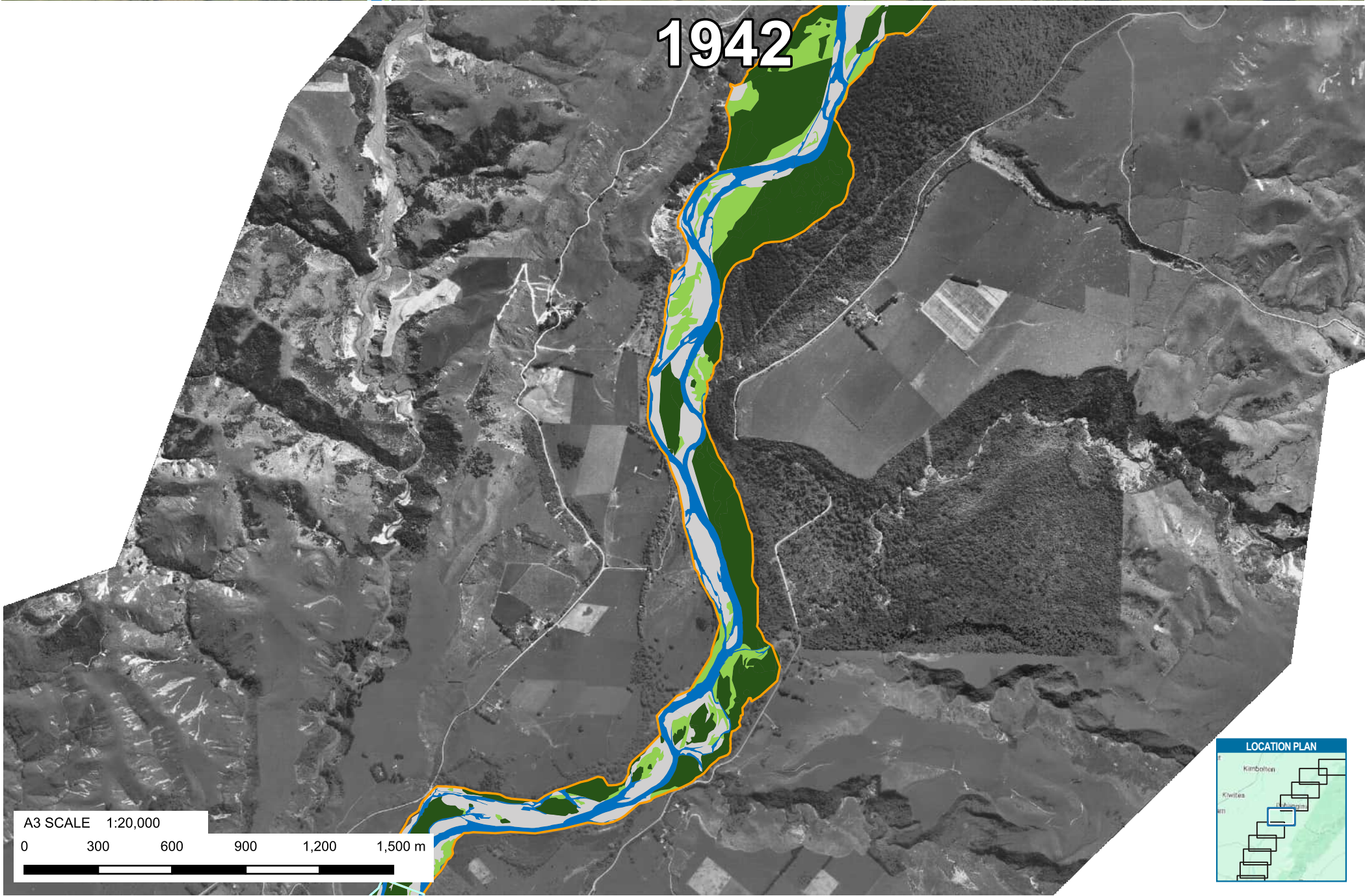
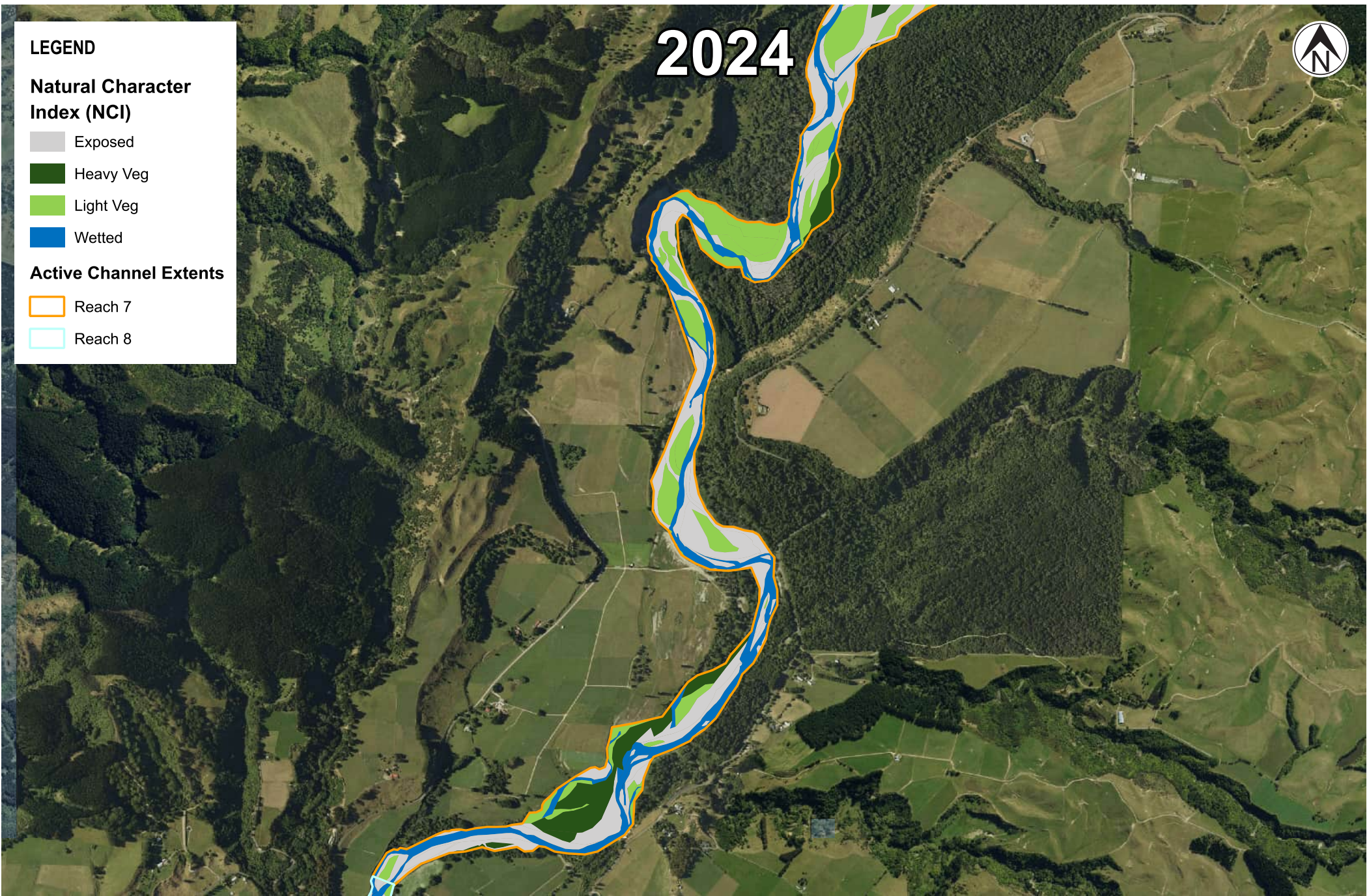


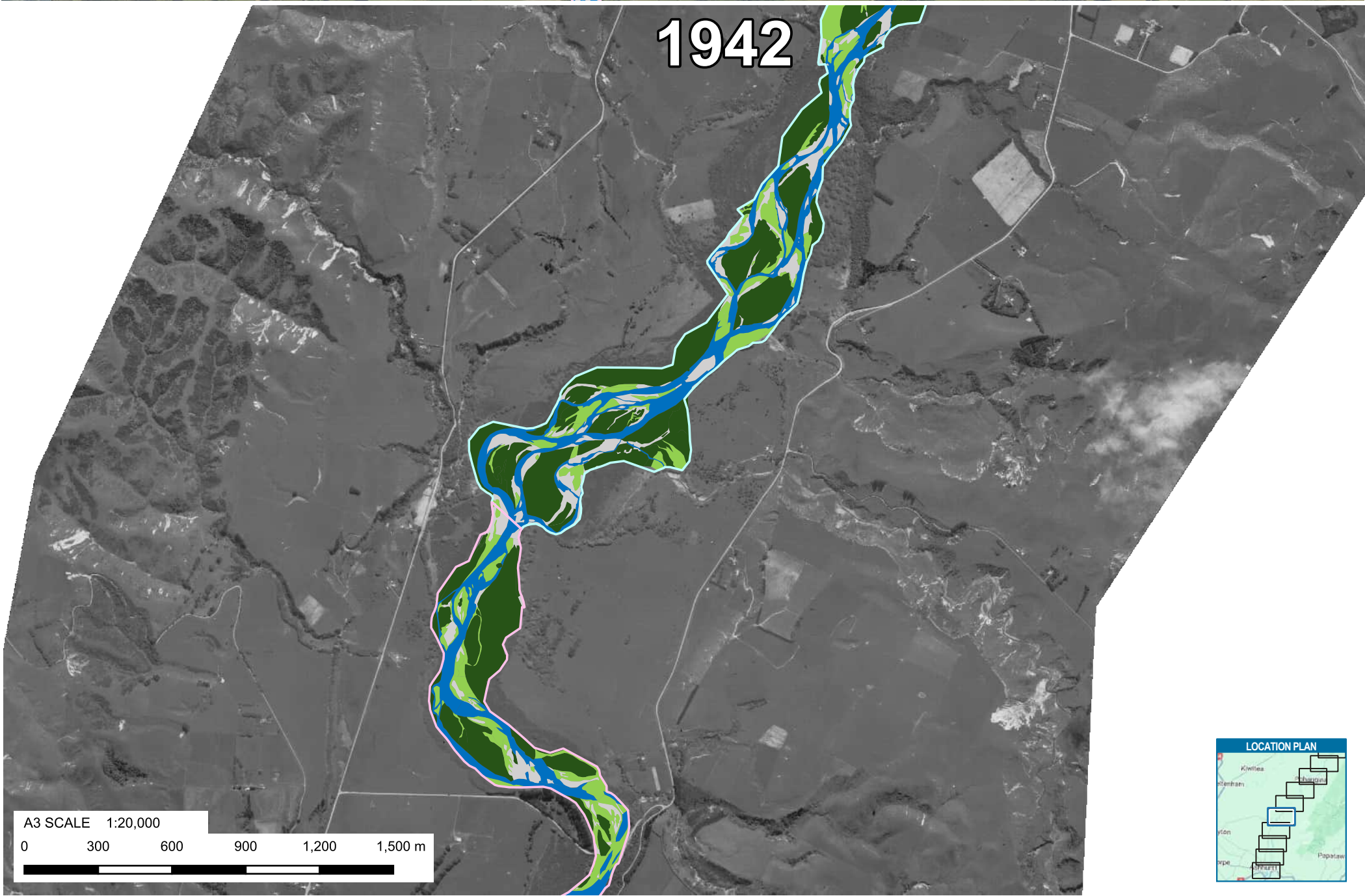
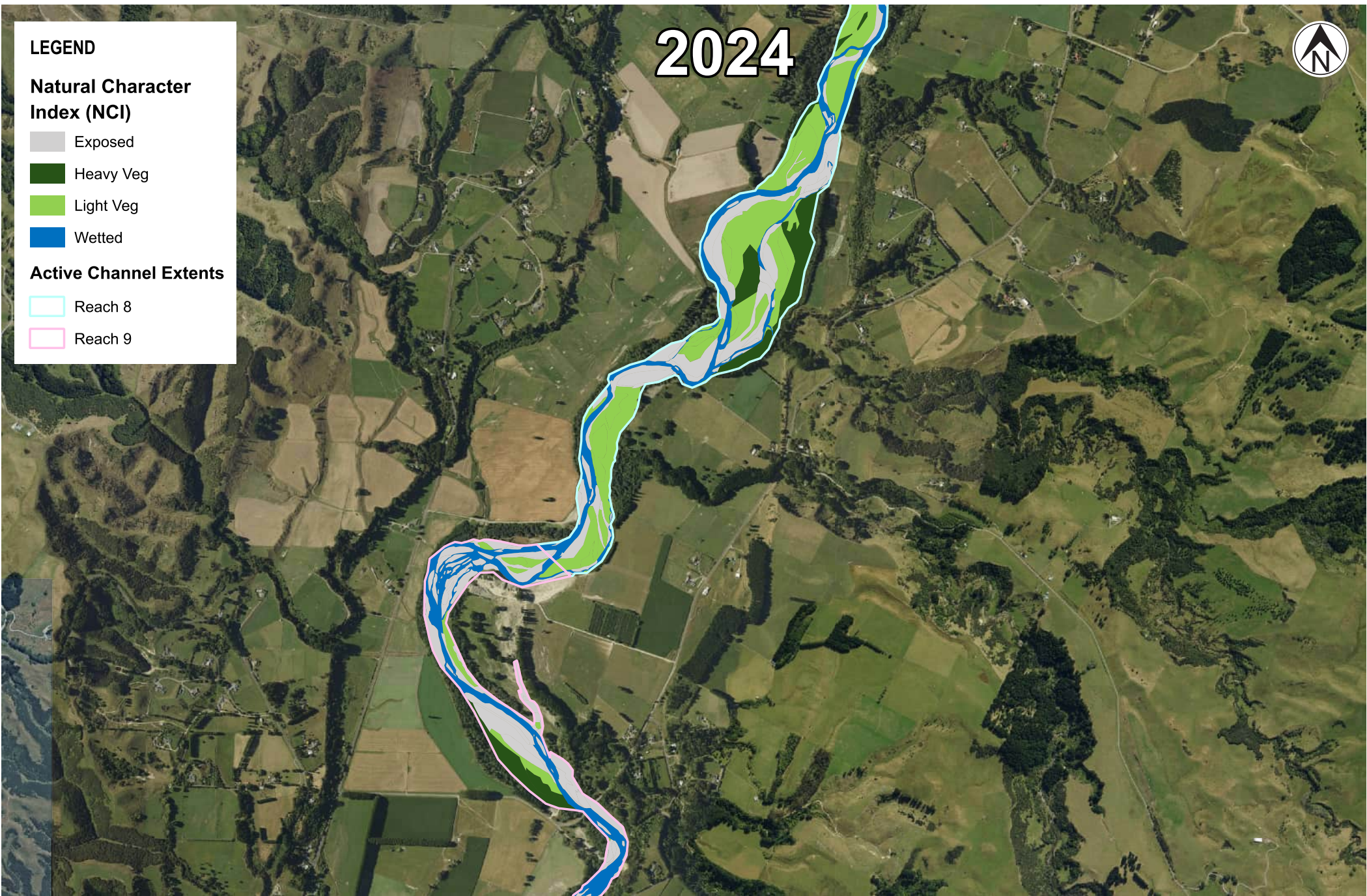
 Tonkin+Taylor www.tonkintaylor.co.nz Exceptional thinking together	NOTES: Imagery: Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0. Aerial Imagery 1942b OrouaPohangina. Data supplied by Horizons Regional Council.	PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL		
					PROJECT POHANGINA AND ÔROUA NCI ASSESSMENTS		
					TITLE POHANGINA RIVER NATURAL CHARACTER INDEX - EPOCH 3		
0	First version	GIHU	KJOH	03/07/25	BMQ	15/08/25	SCALE (A3) 1:20,000
1	Final version	GIHU	KJOH	15/08/25			FIG No. FIGURE 25
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE	REV 1

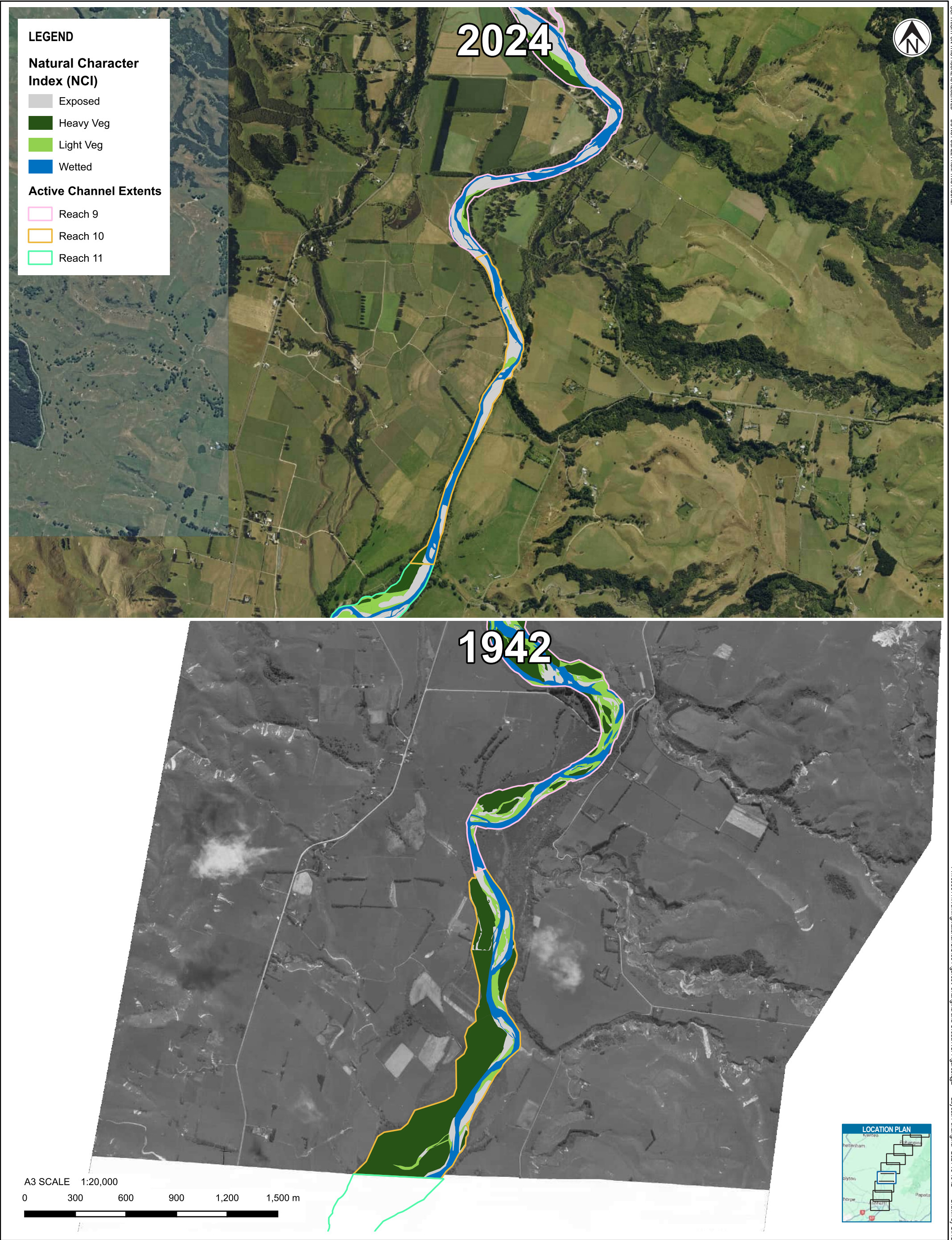
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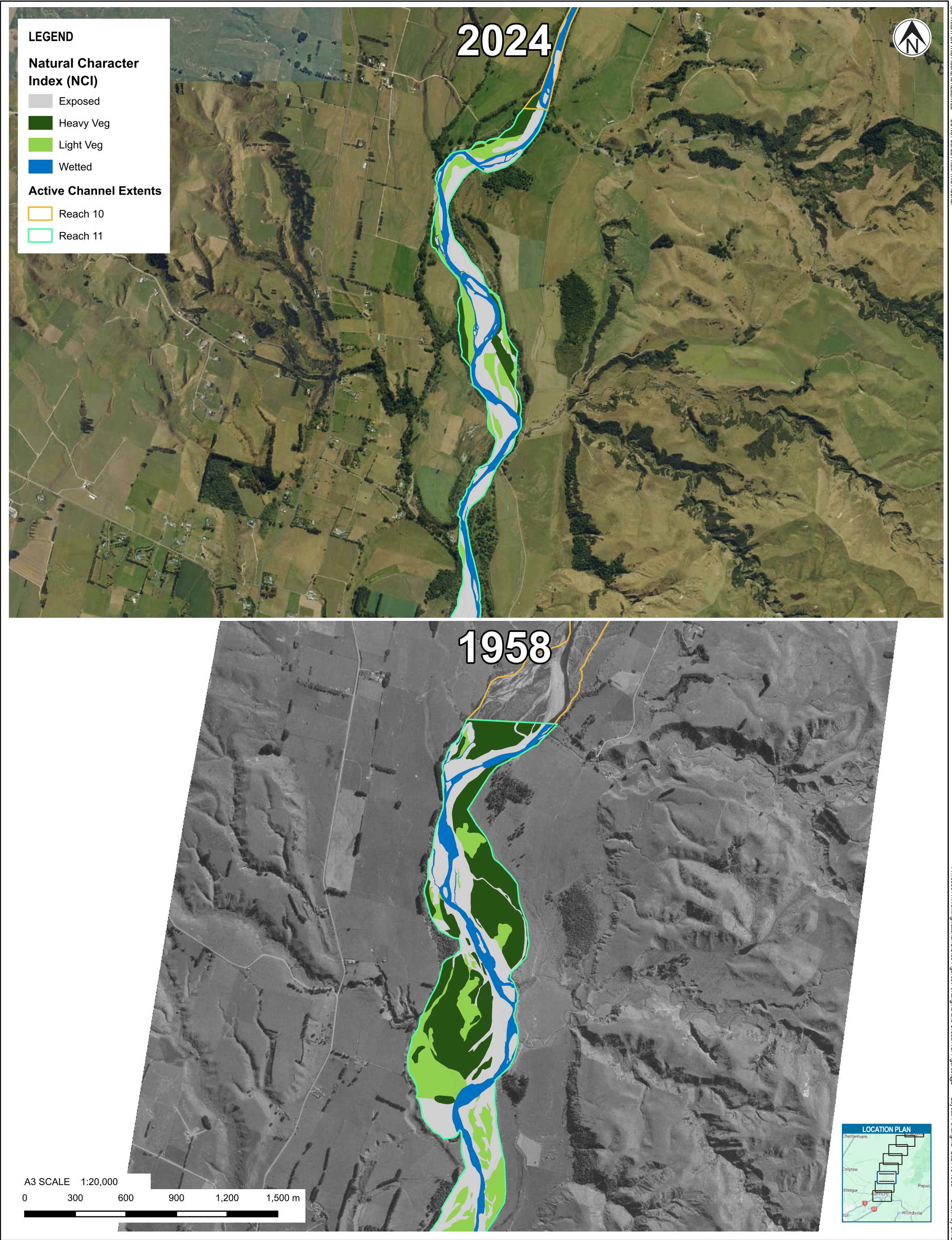




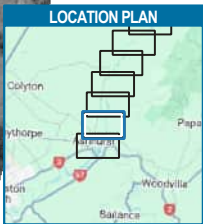
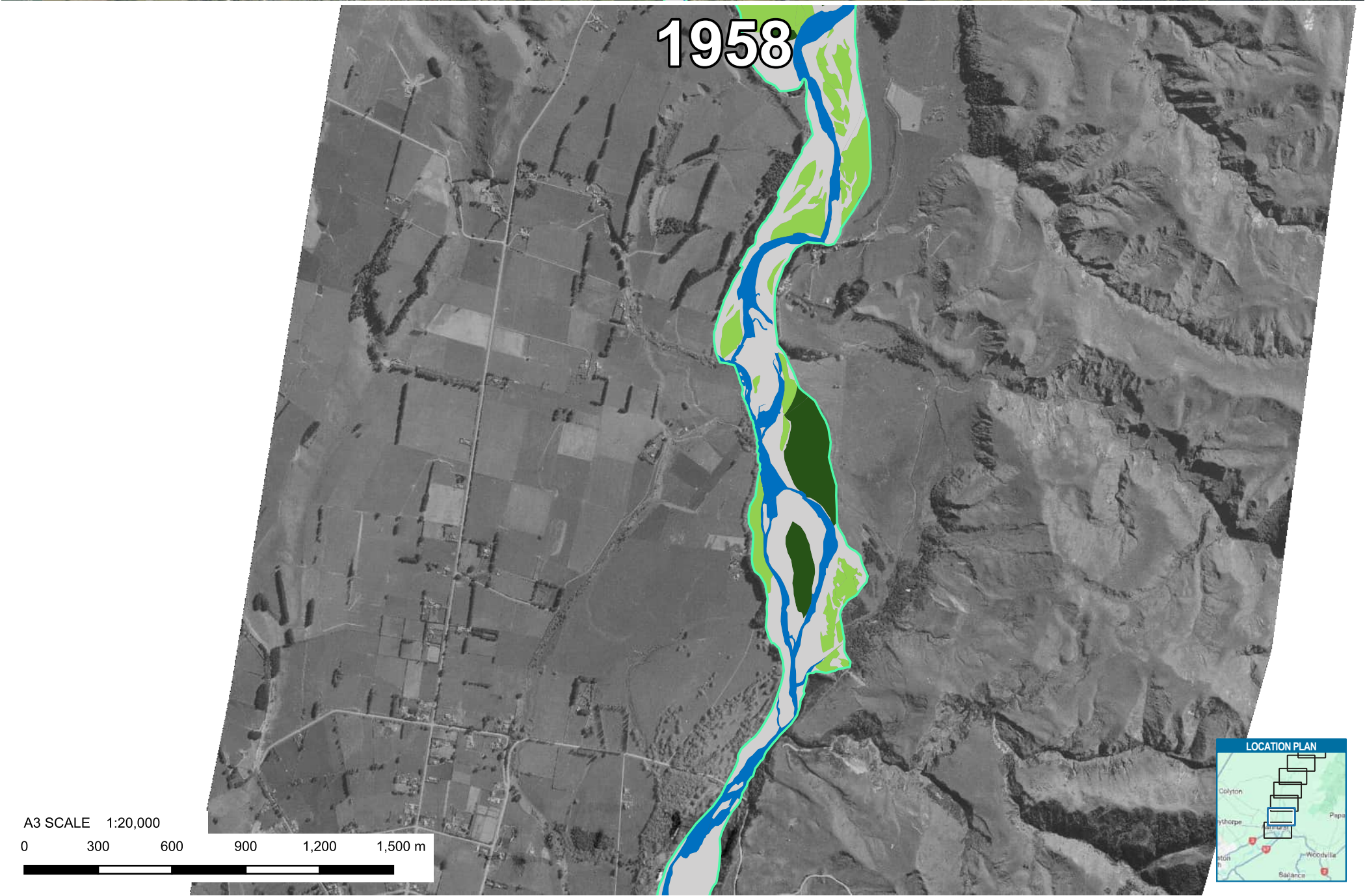


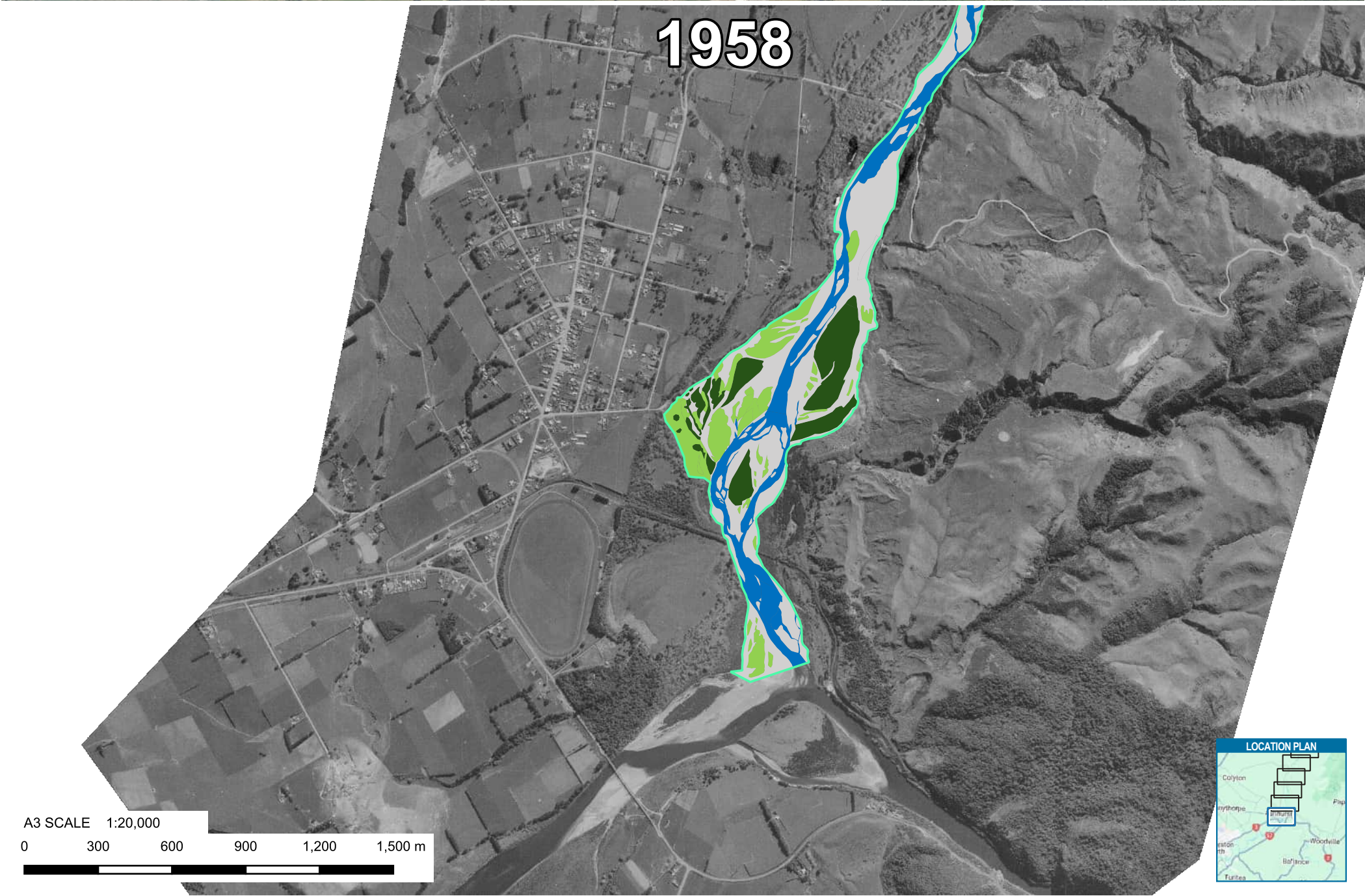
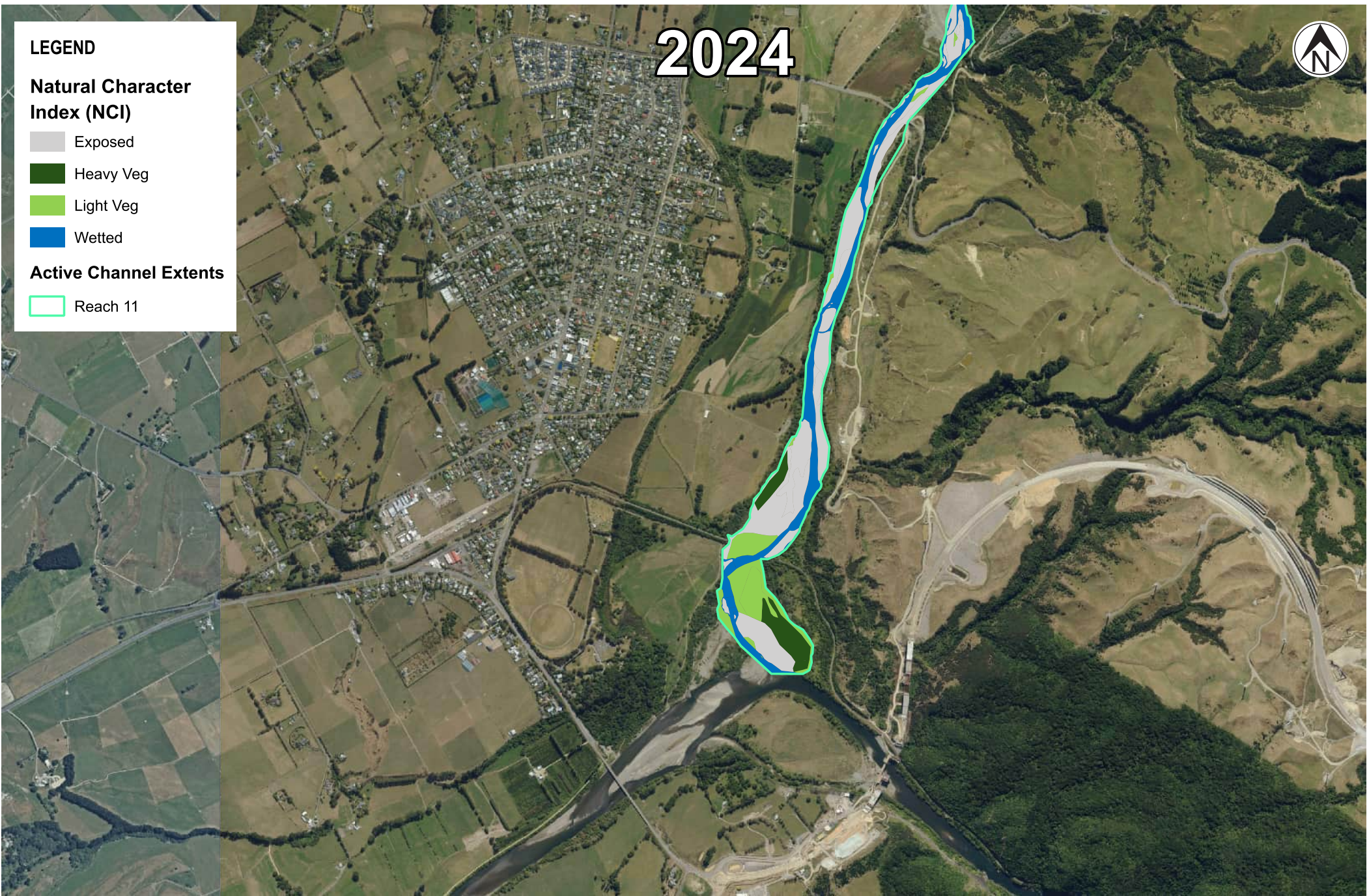
 Tonkin+Taylor www.tonkintaylor.co.nz Exceptional thinking together	NOTES: Imagery: Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0. Aerial Imagery 1942b OrouaPohangina. Data supplied by Horizons Regional Council.	PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL		
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					TITLE POHANGINA RIVER NATURAL CHARACTER INDEX - EPOCH 3		
0	First version	GIHU	KJOH	03/07/25	BMQ	15/08/25	SCALE (A3) 1:20,000 FIG No. FIGURE 30 REV 1
1	Final version	GIHU	KJOH	15/08/25			
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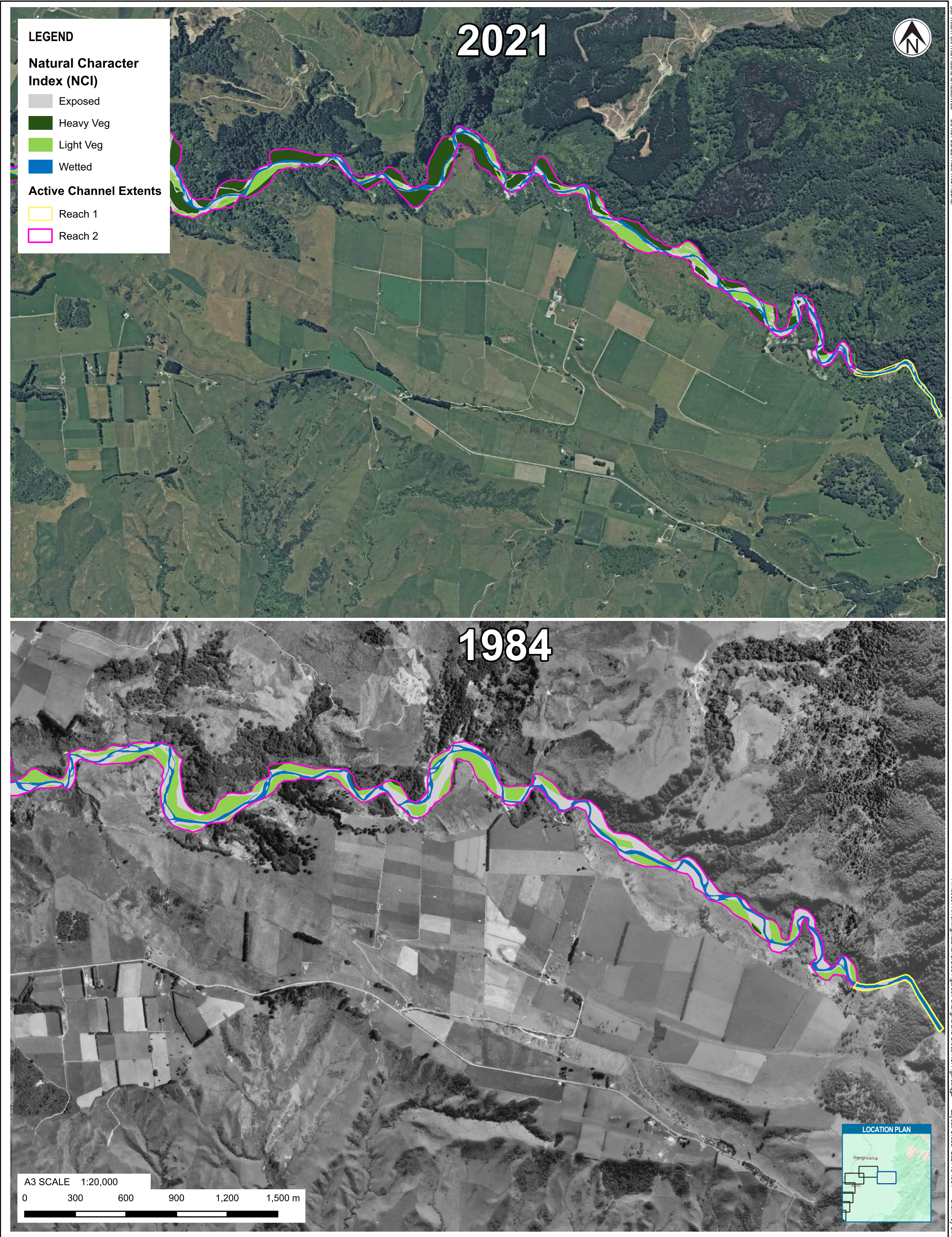


 Tonkin+Taylor www.tonkintaylor.co.nz Exceptional thinking together					NOTES: Imagery: Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0. Aerial Imagery 1958 OrouaPohangina. Data supplied by Horizons Regional Council.				PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL			
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1	Final version	GIHU	KJOH	15/08/25											
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED		DATE		SCALE (A3) 1:20,000		FIG No. FIGURE 31	REV 1			



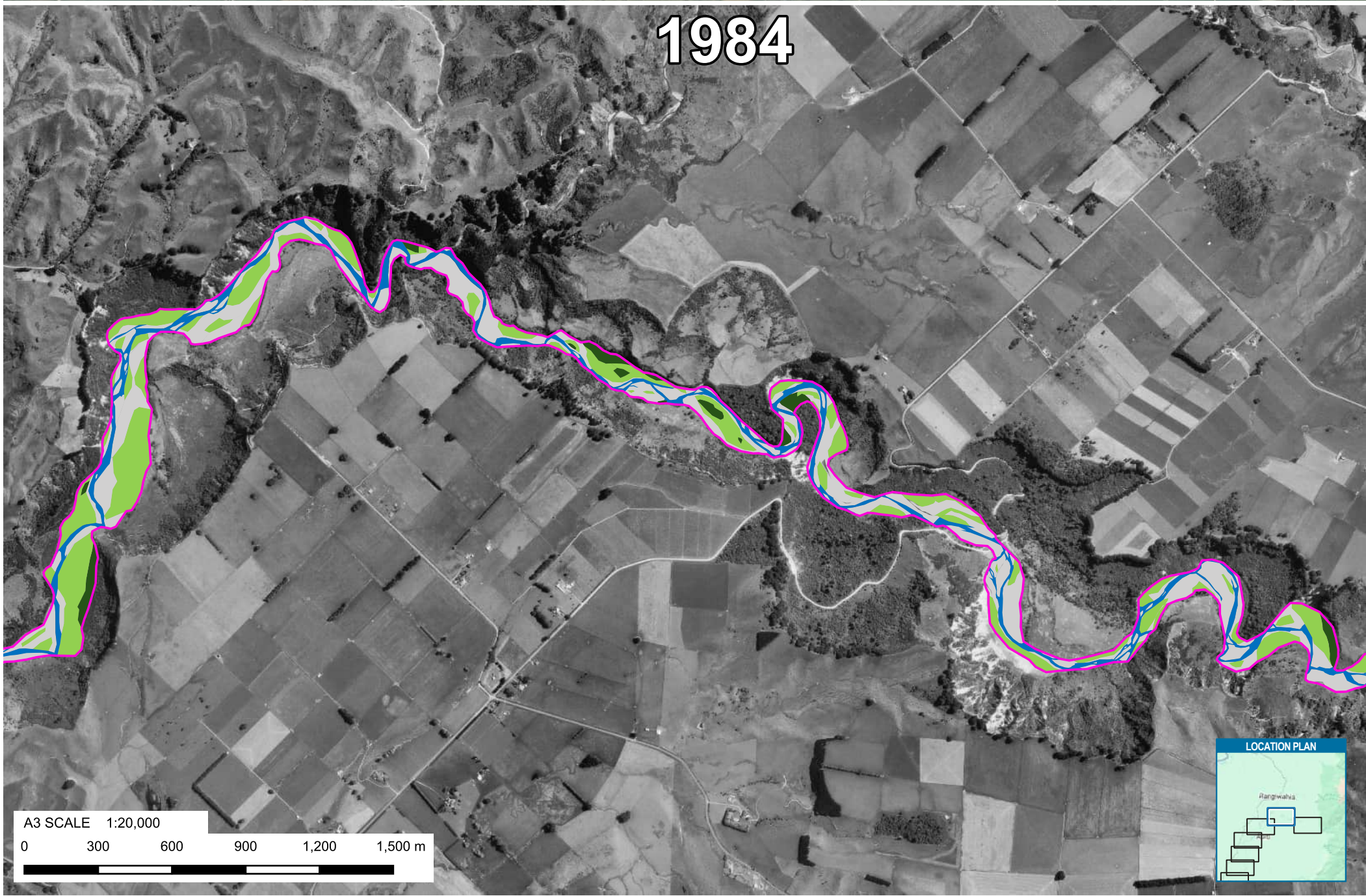
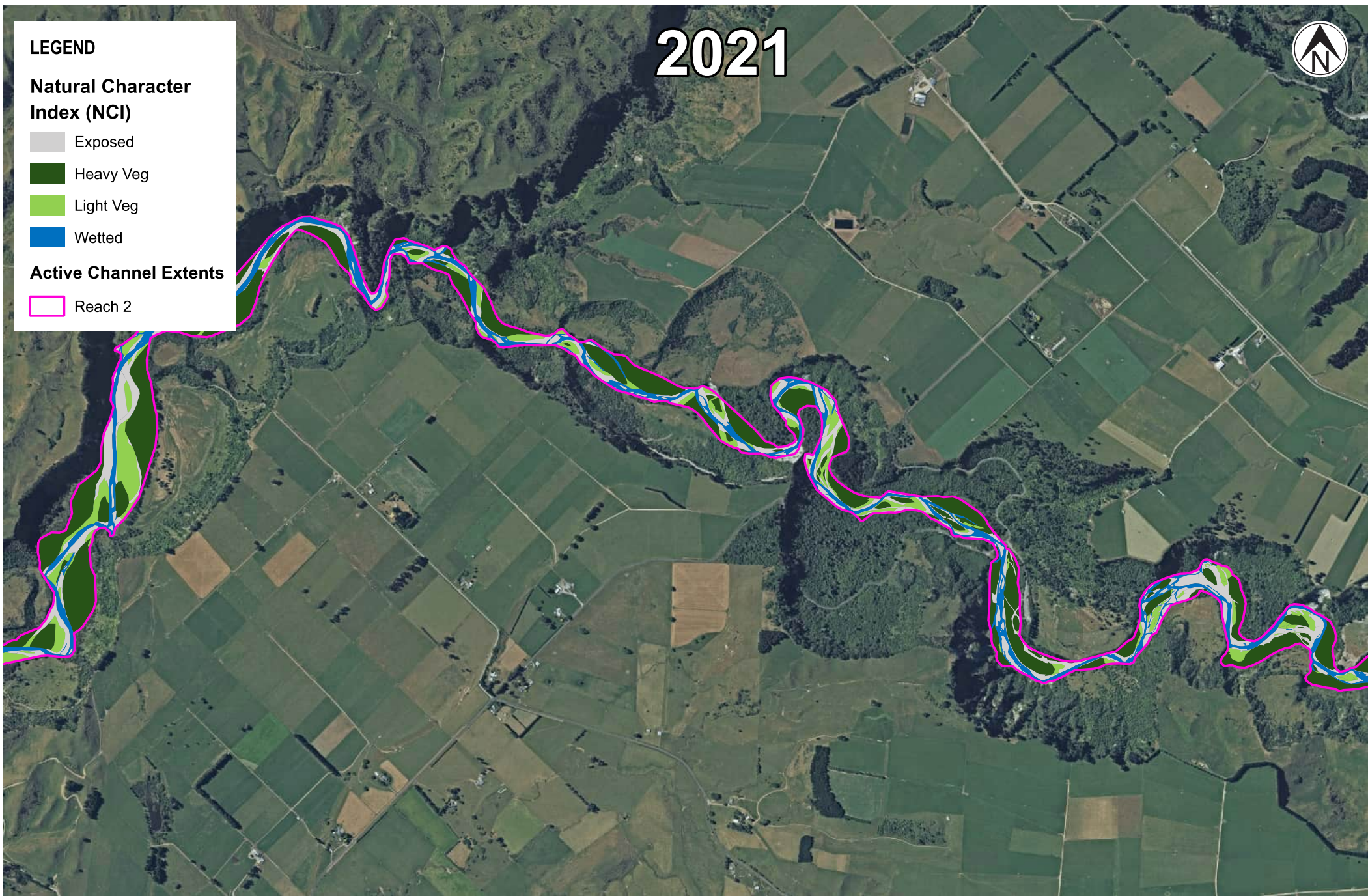


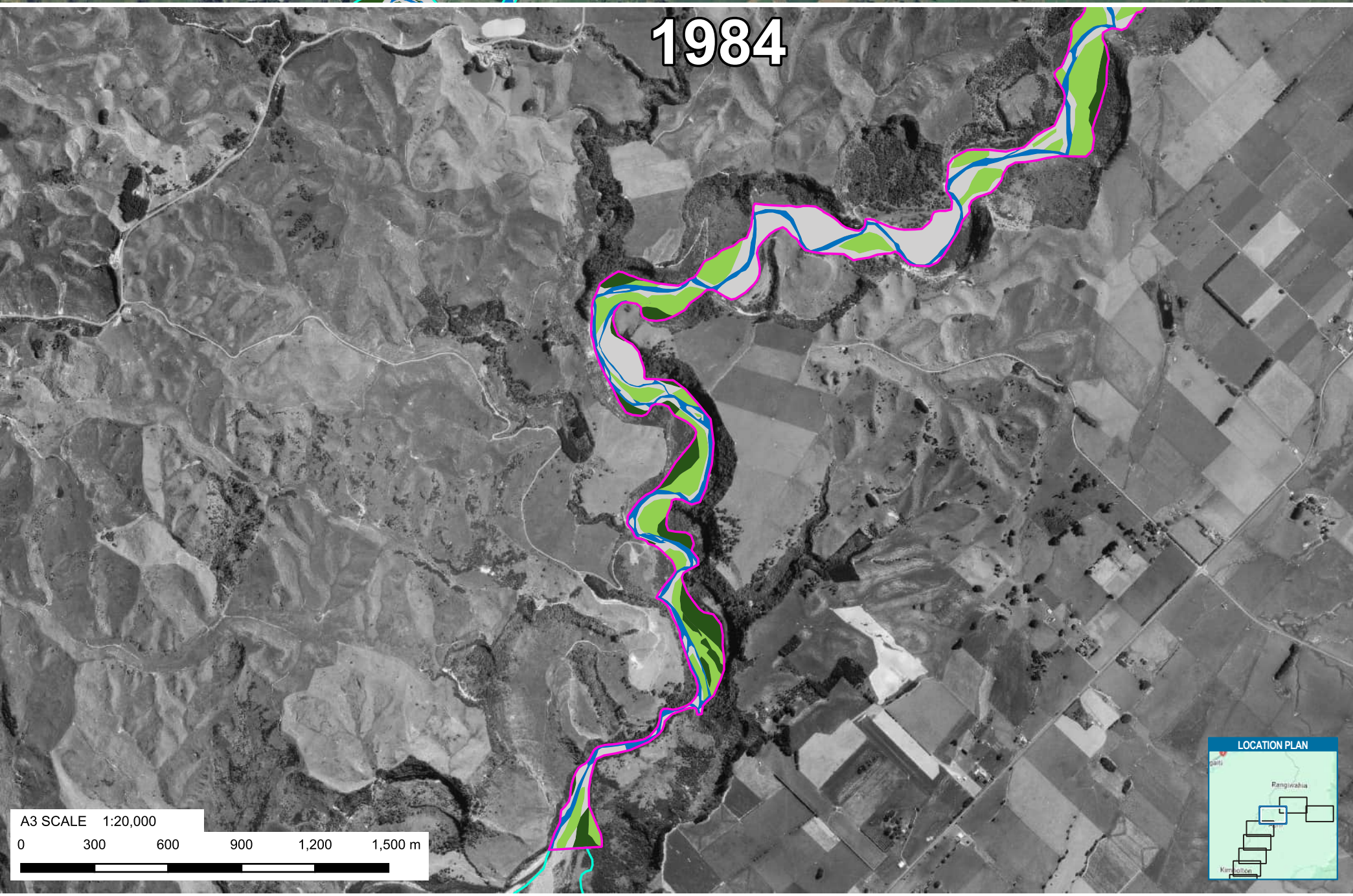
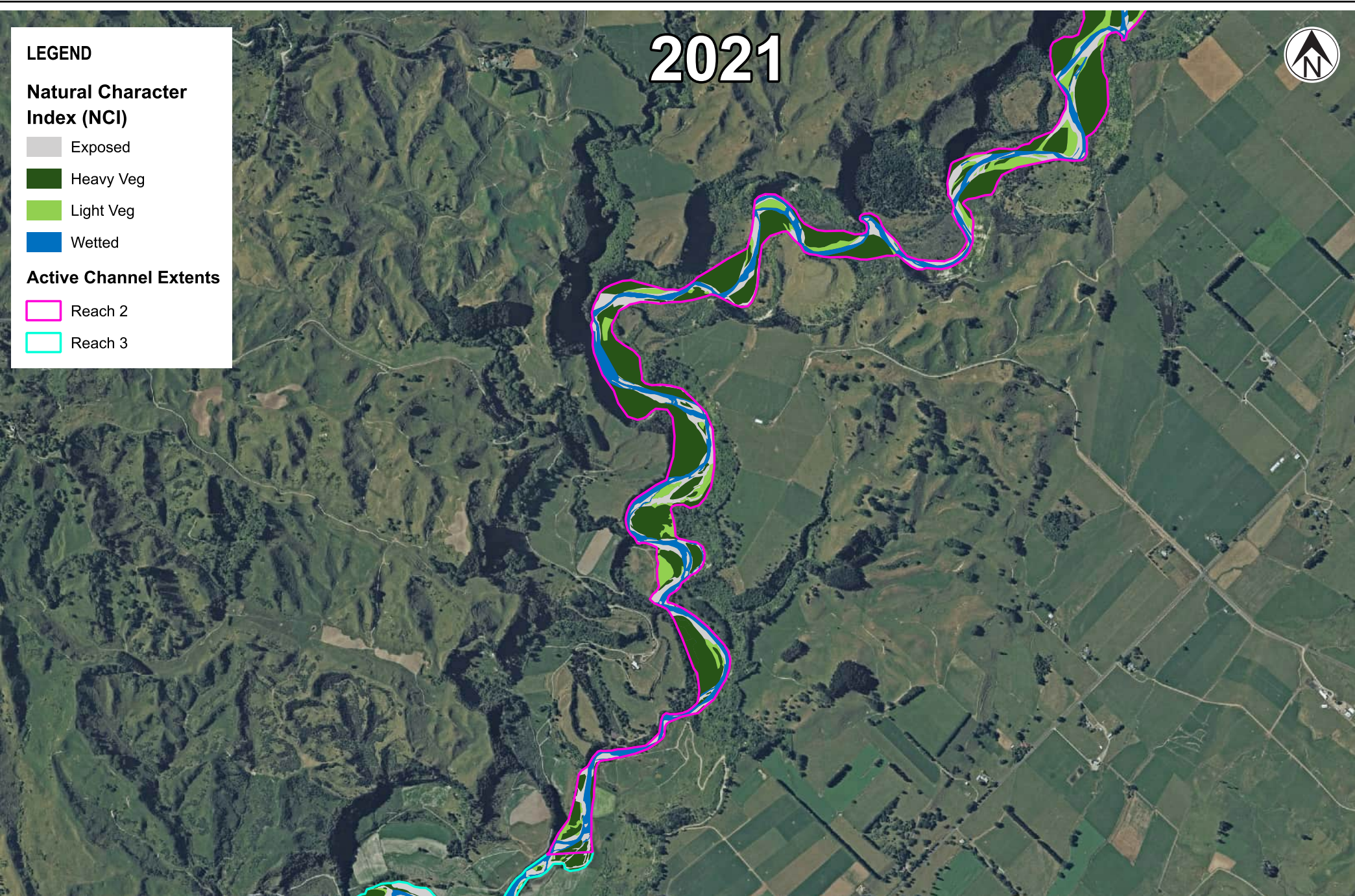
Appendix D Ōroua NCI Maps



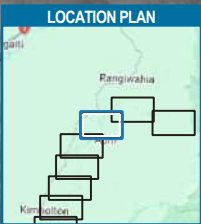
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1	Final version	GIHU	KJOH	15/08/25								
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE	SCALE (A3)	1:20,000	FIG No.	FIGURE 1	REV	1

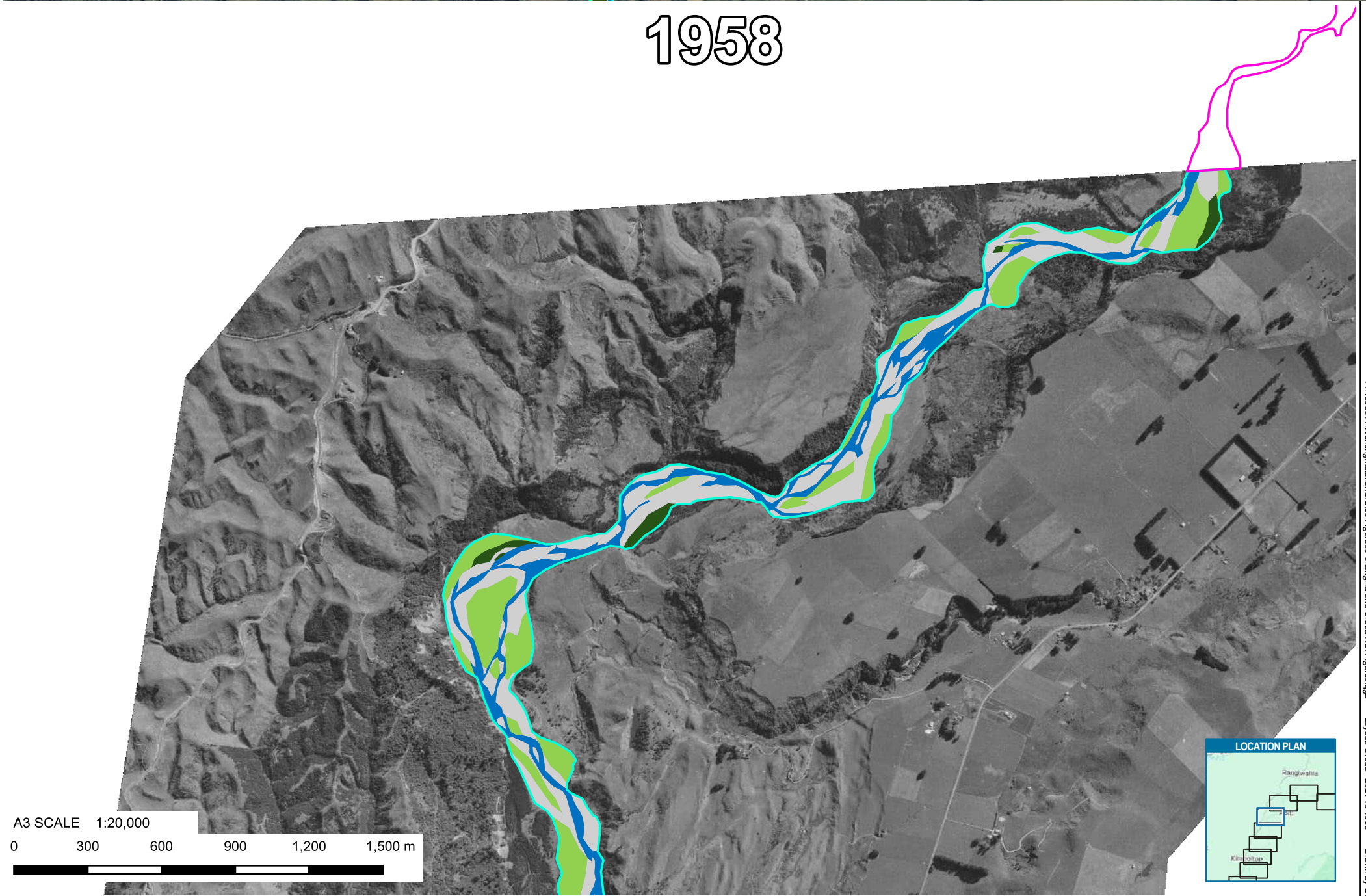
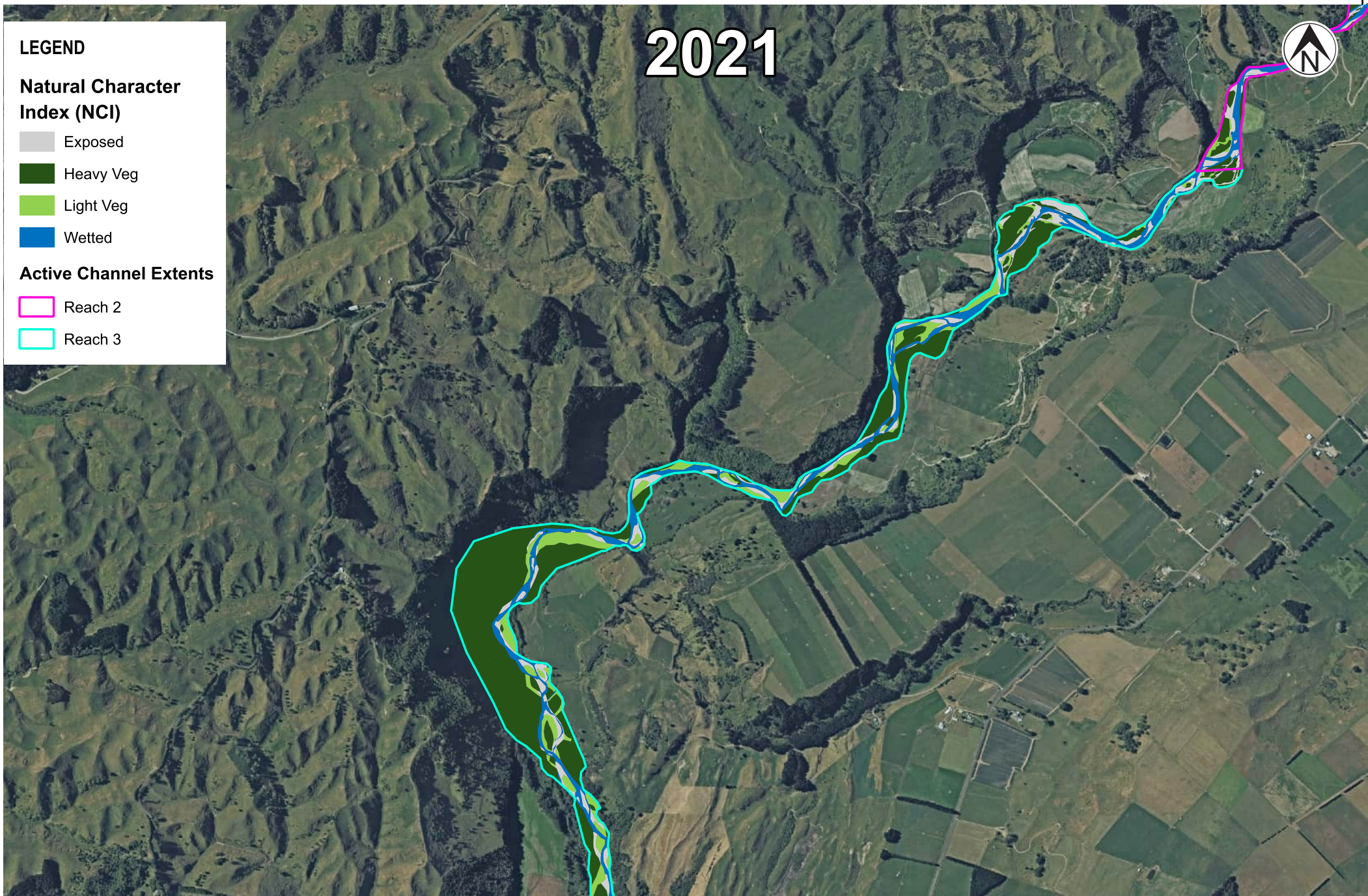
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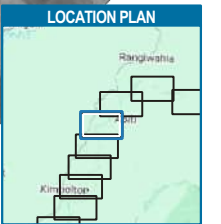


A3 SCALE 1:20,000
0 300 600 900 1,200 1,500 m





A3 SCALE 1:20,000
0 300 600 900 1,200 1,500 m



NOTES:
Imagery: Manawatu-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0.
Aerial Imagery 1958 Ōroua Pohangina. Data supplied by Horizons Regional Council.

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1	Final version	GIHU	KJOH	15/08/25

PROJECT No. 1098311.0000

DESIGNED	GIHU	JUL.25
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CHECKED	KJOH	AUG.25

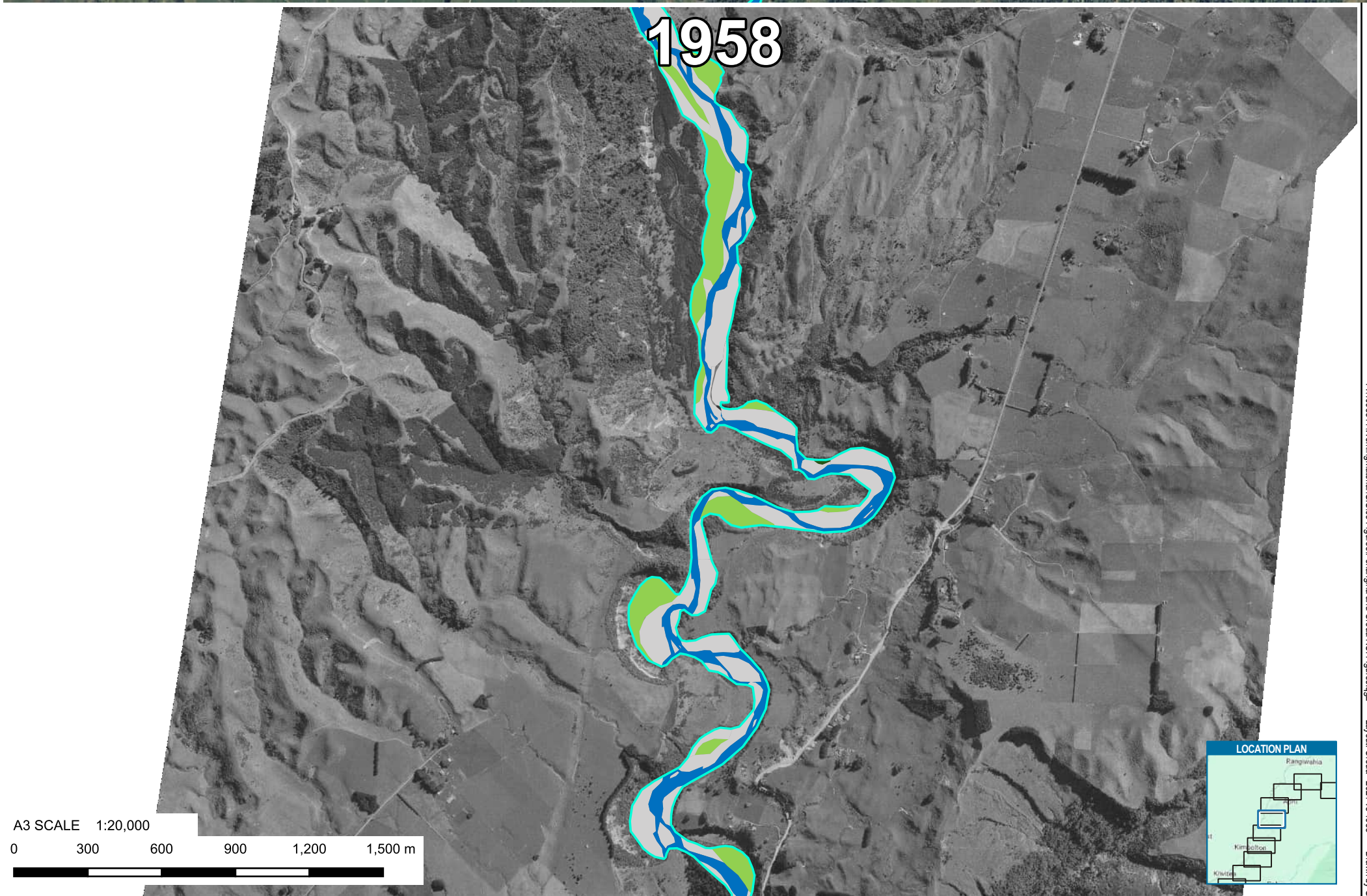
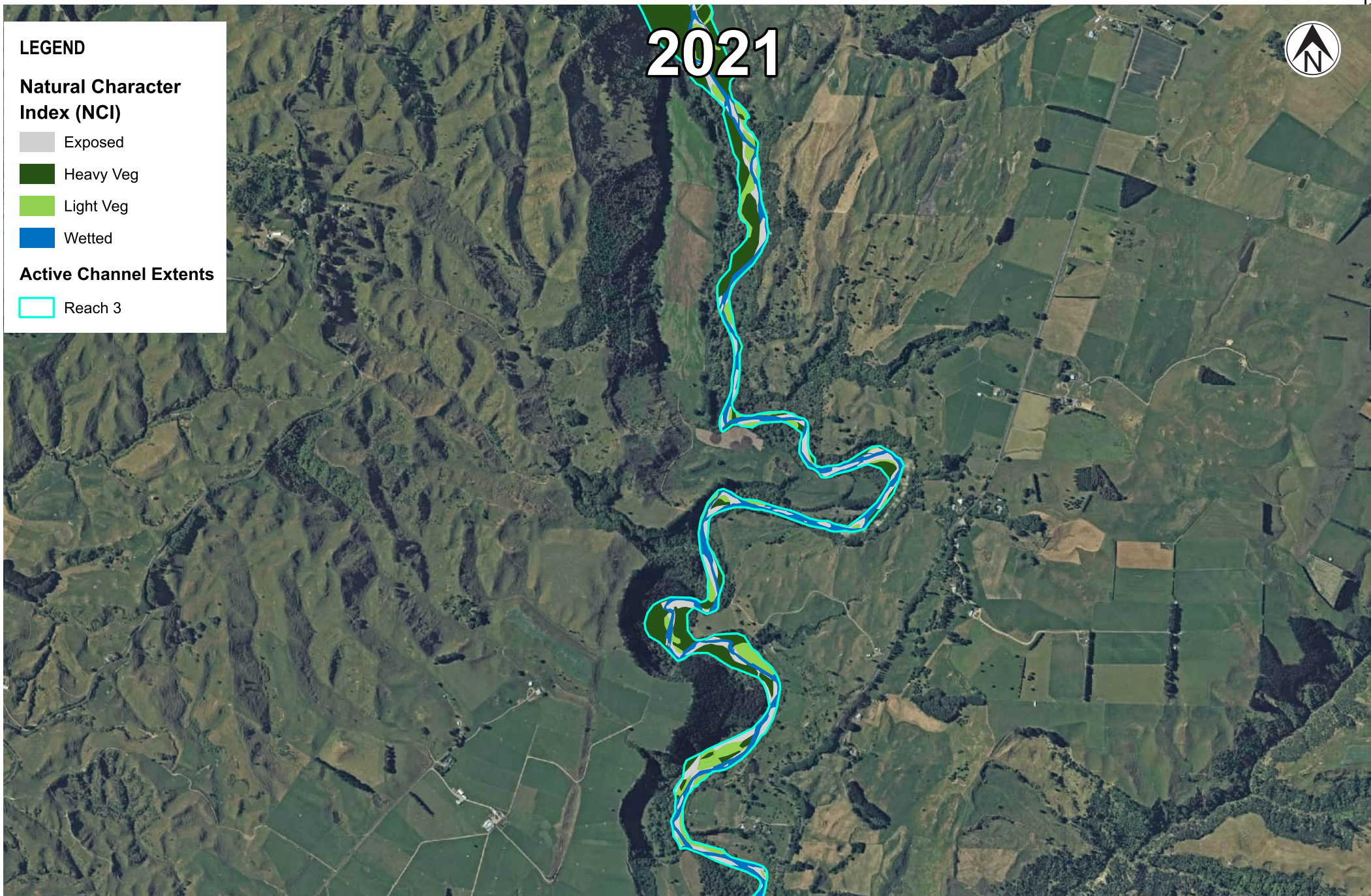
BMQ 15/08/25

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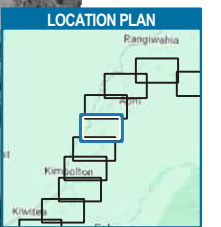
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NATURAL CHARACTER INDEX - EPOCH 1

SCALE (A3) 1:20,000 FIG No. FIGURE 4 REV 1



A3 SCALE 1:20,000
0 300 600 900 1,200 1,500 m



NOTES:
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Aerial Imagery 1958 OrouaPohangina. Data supplied by Horizons Regional Council.

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1	Final version	GIHU	KJOH	15/08/25
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PROJECT No. 1098311.0000

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CHECKED	KJOH	AUG.25

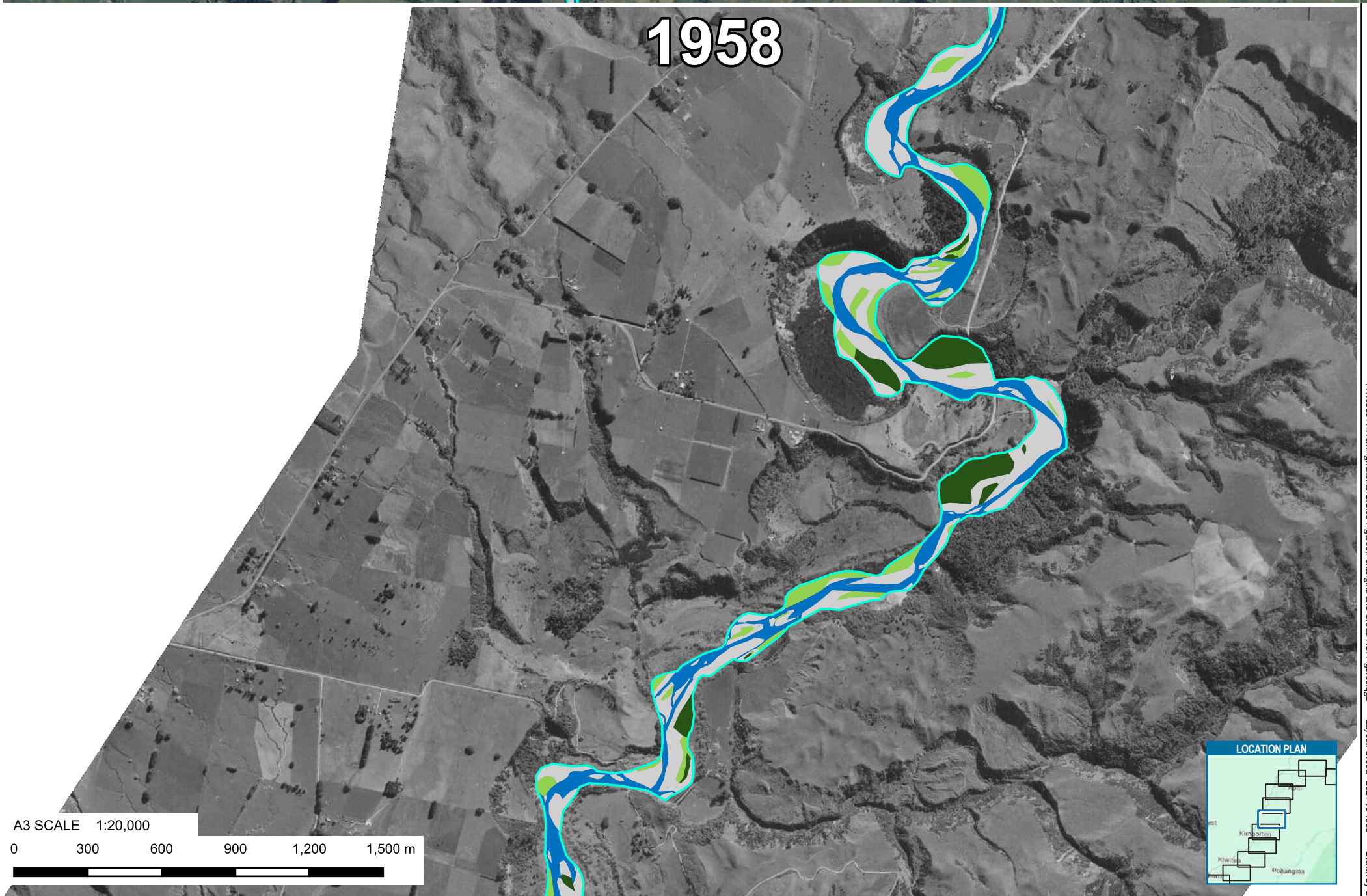
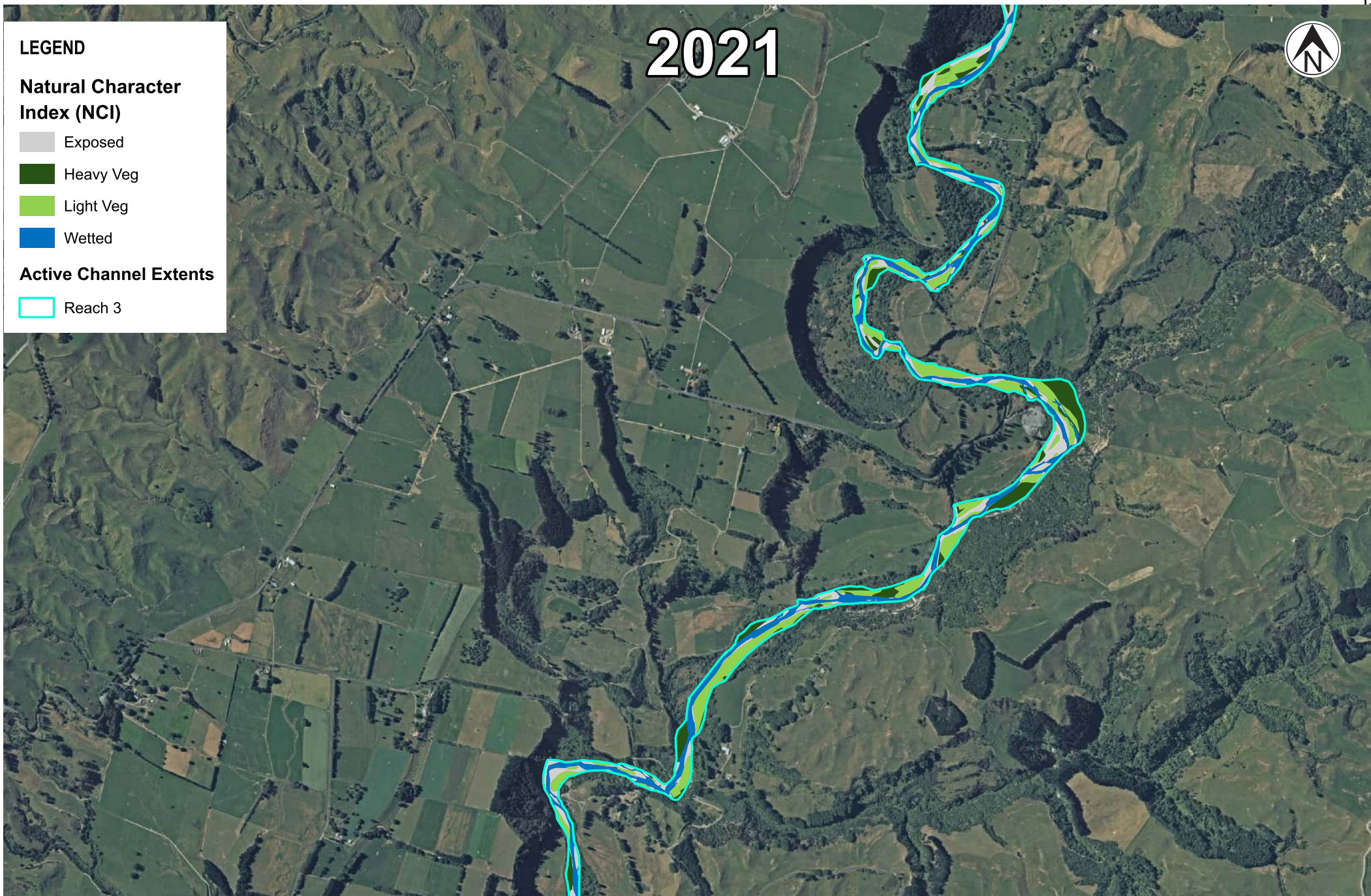
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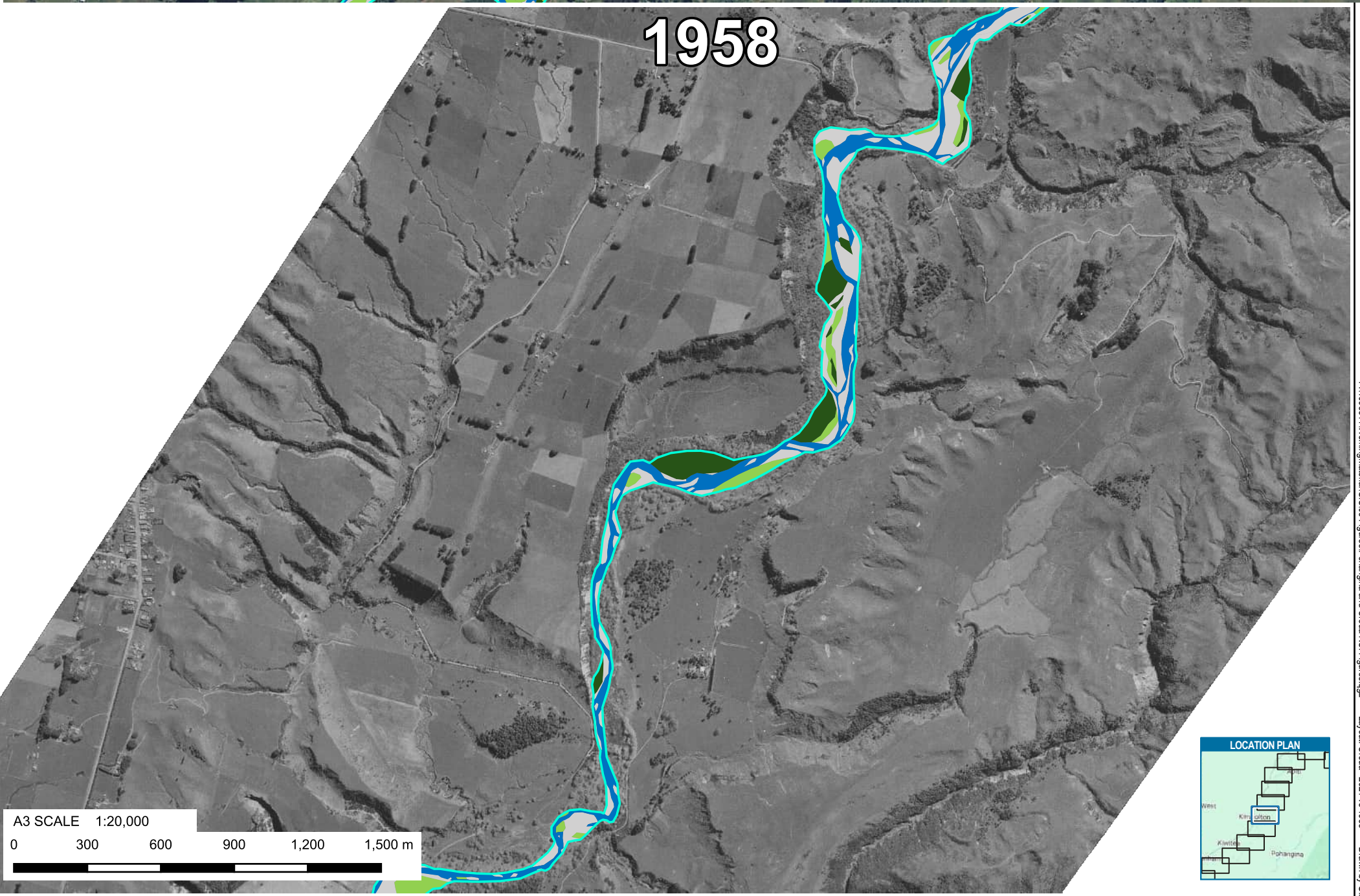
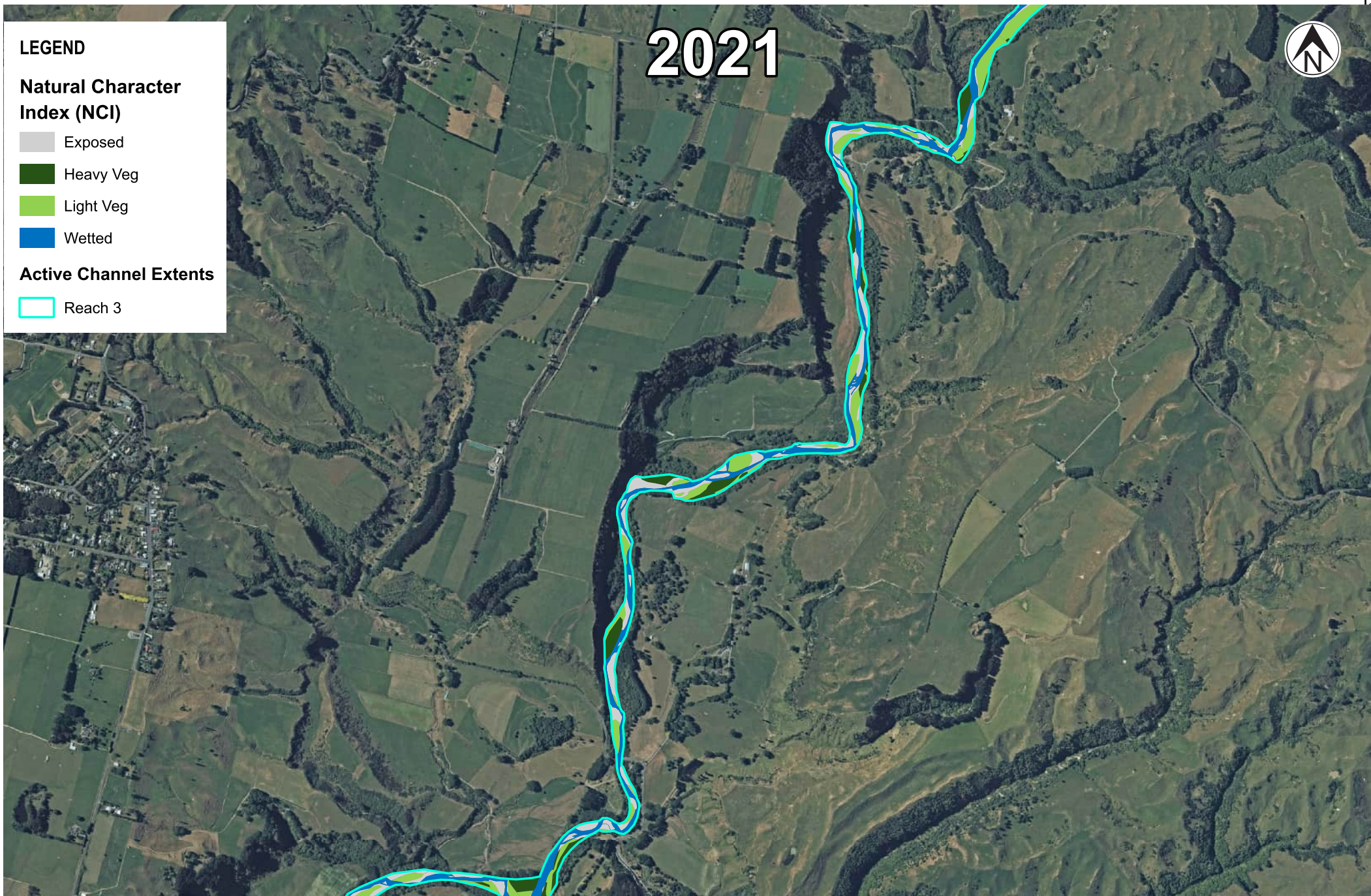
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TITLE **ŌROUA RIVER**
NATURAL CHARACTER INDEX - EPOCH 1

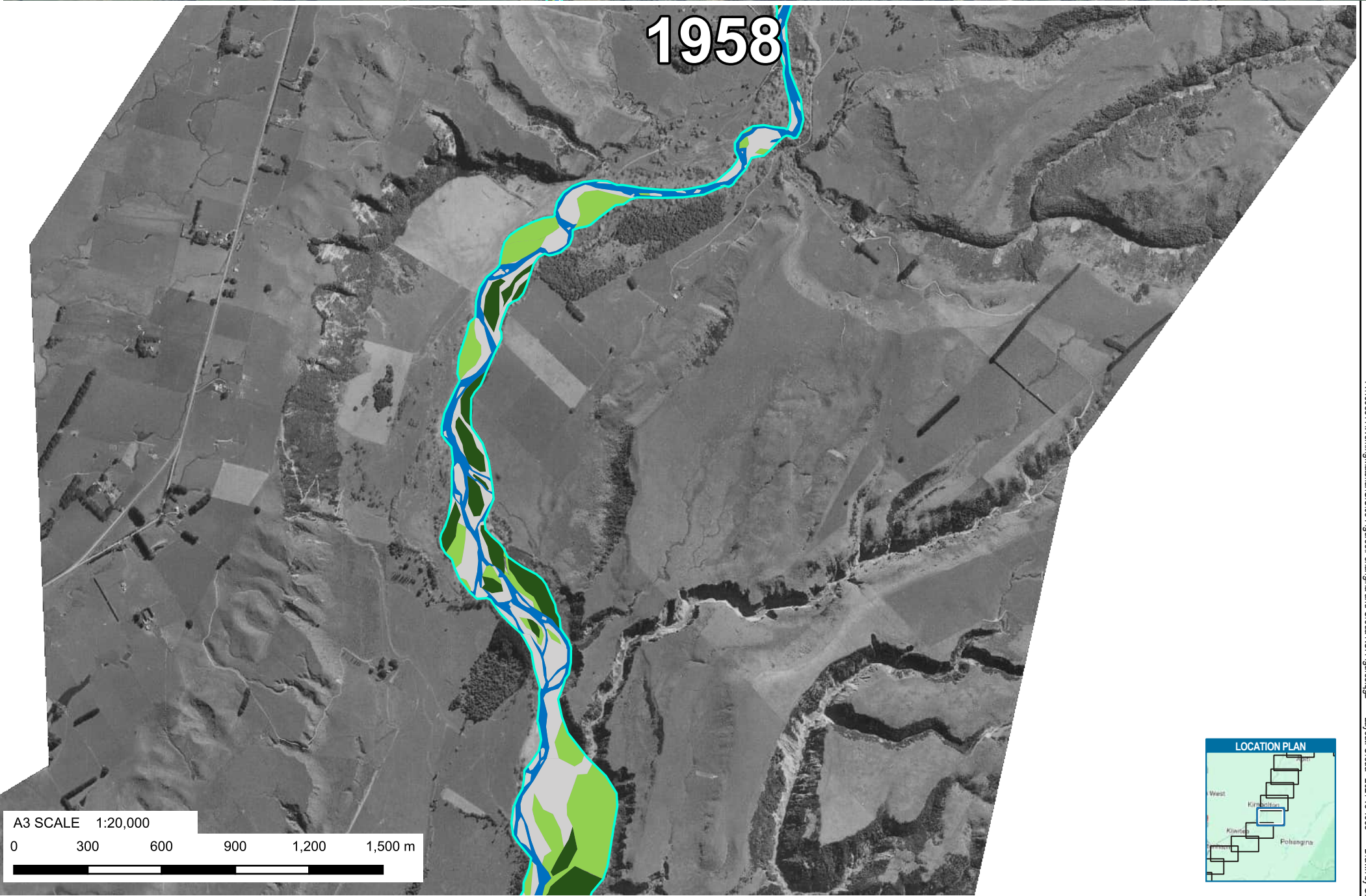
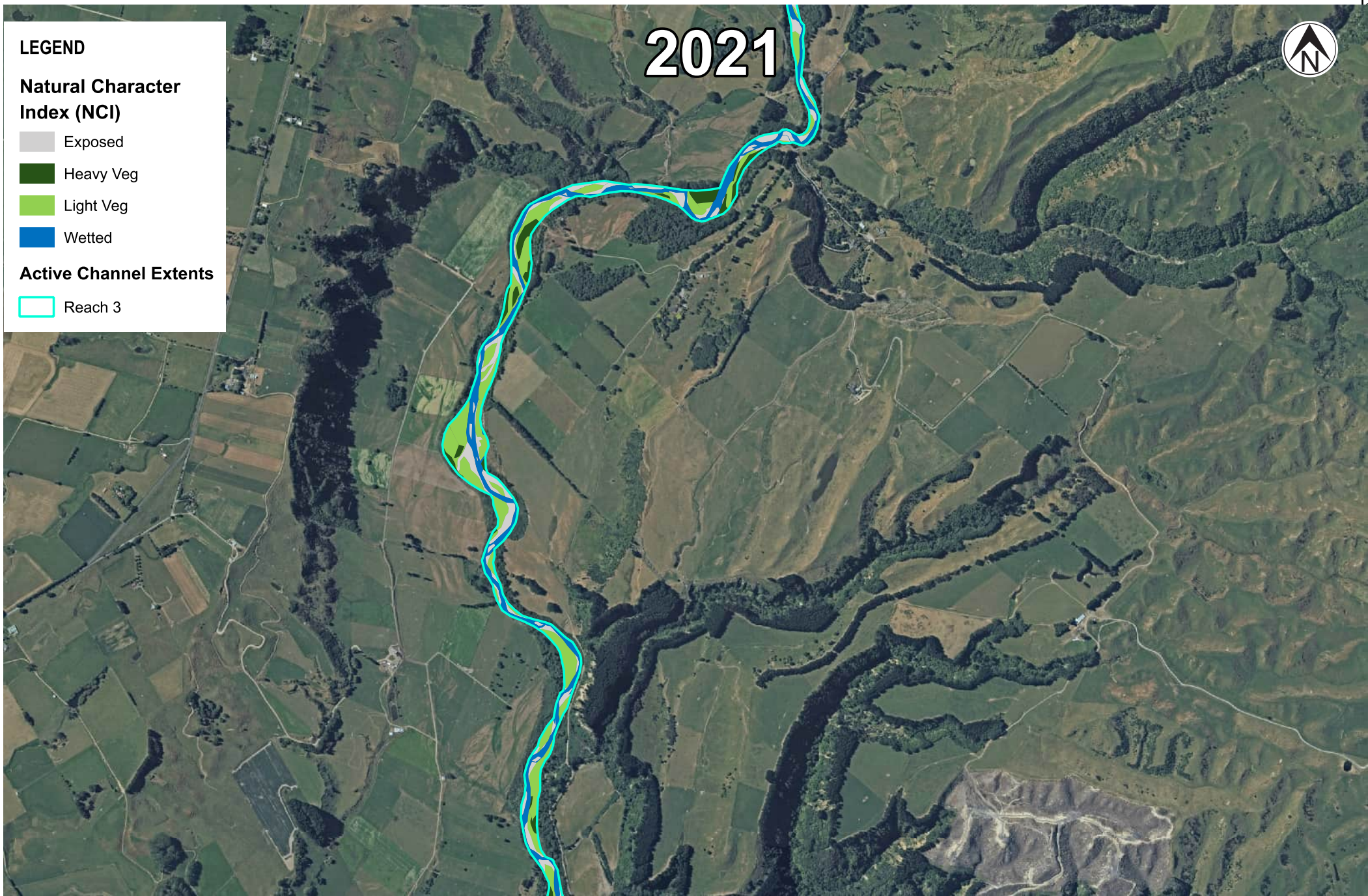
SCALE (A3) 1:20,000 FIG No. FIGURE 5 REV 1

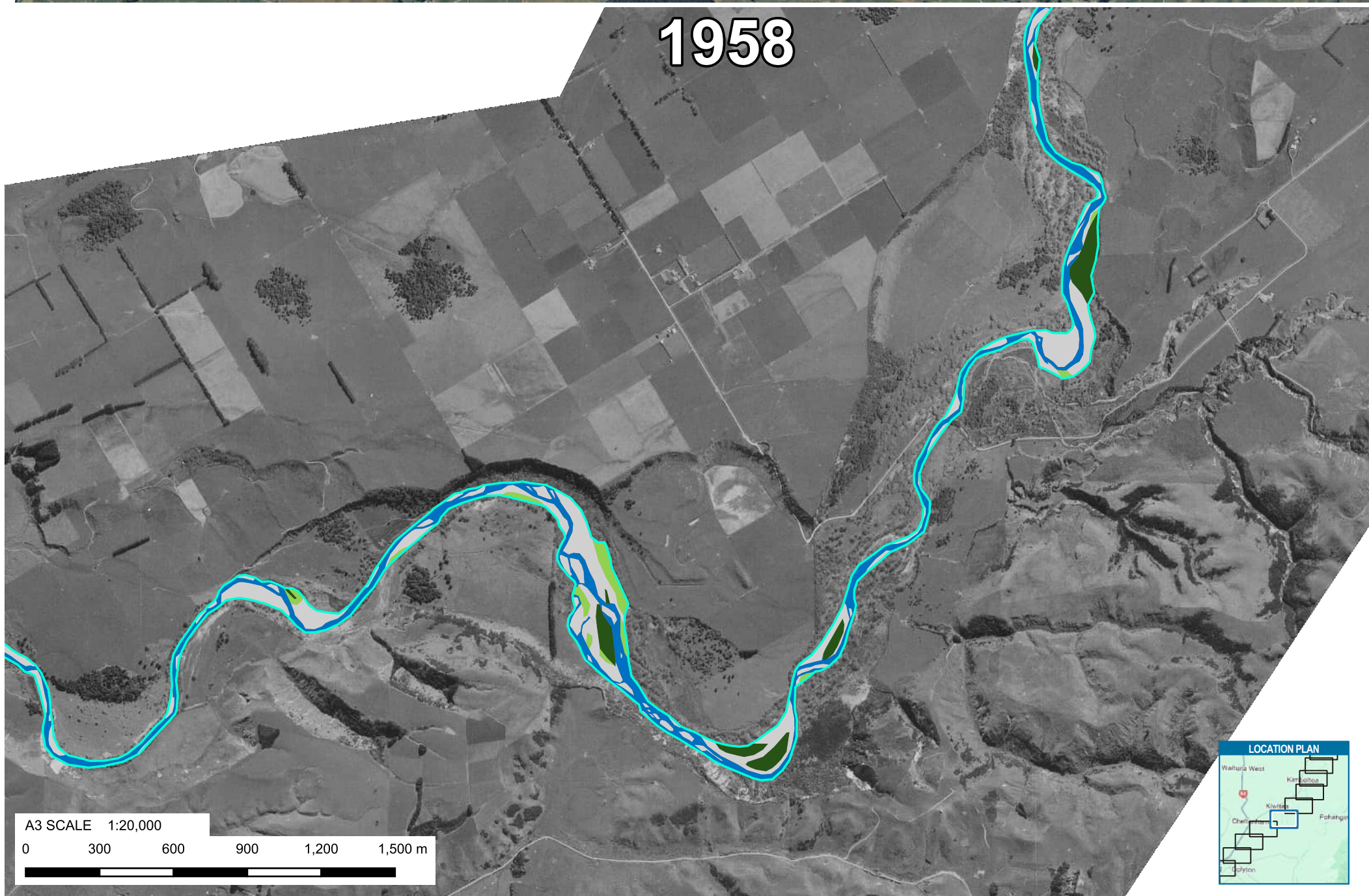
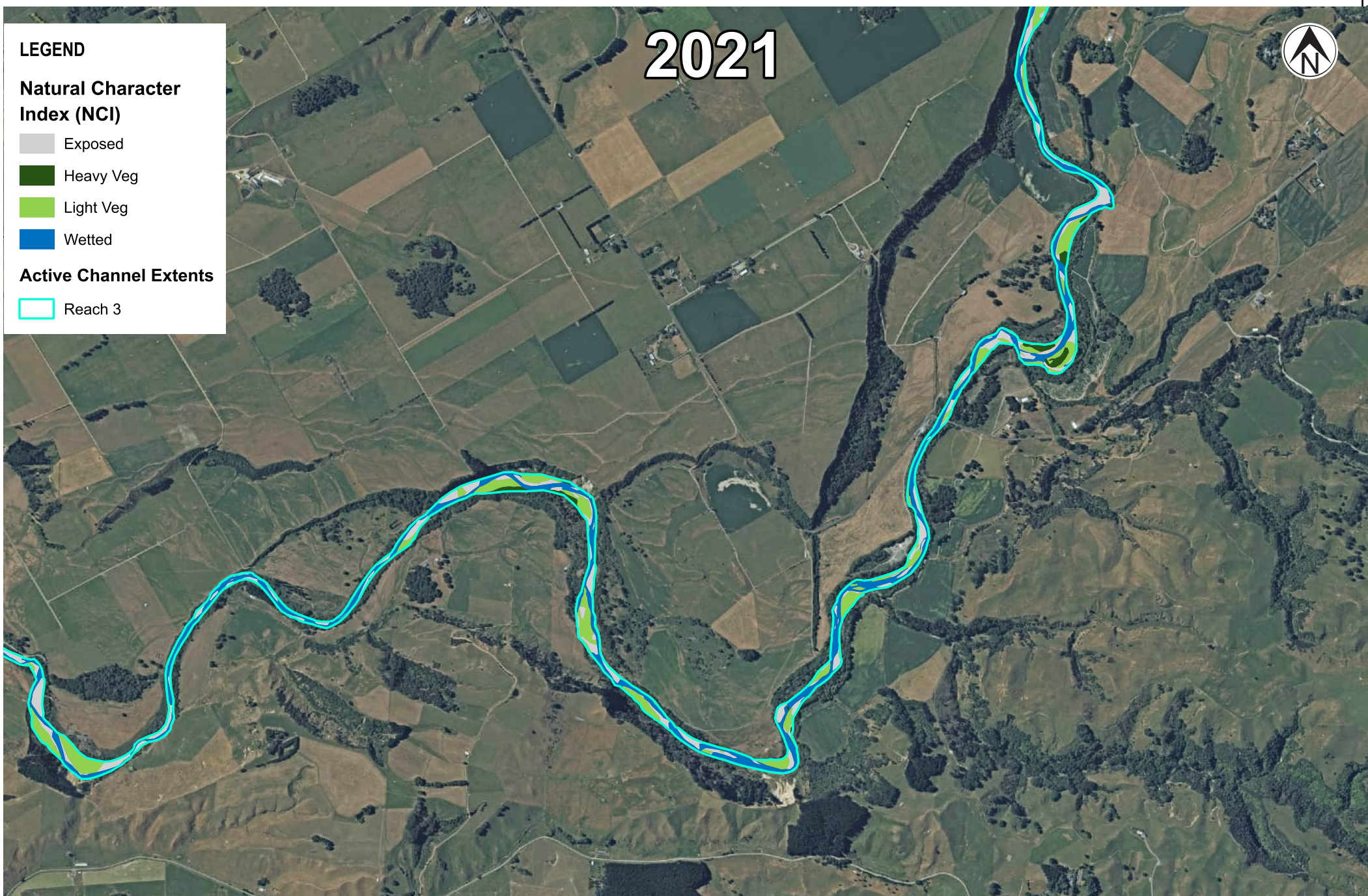


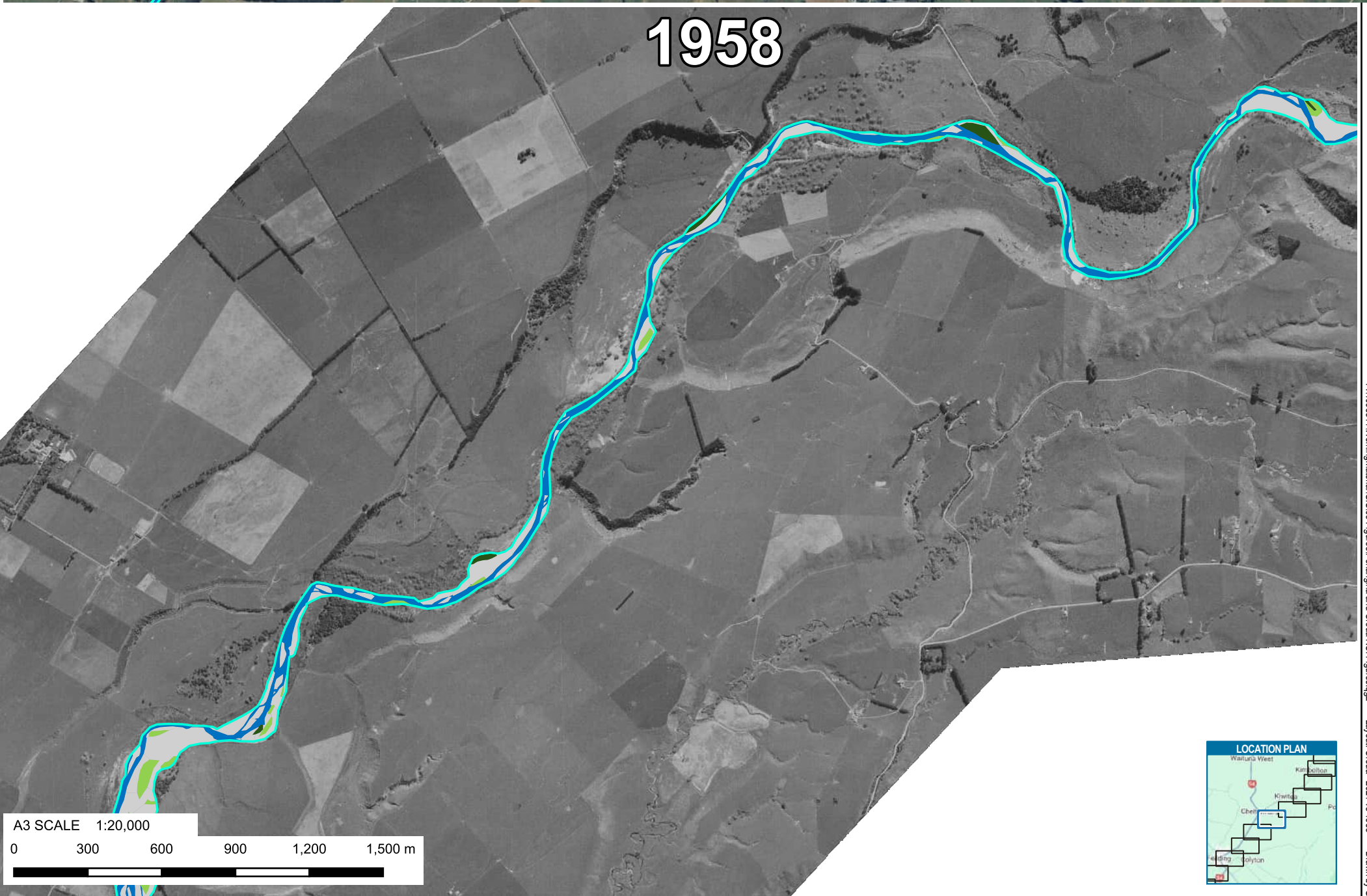
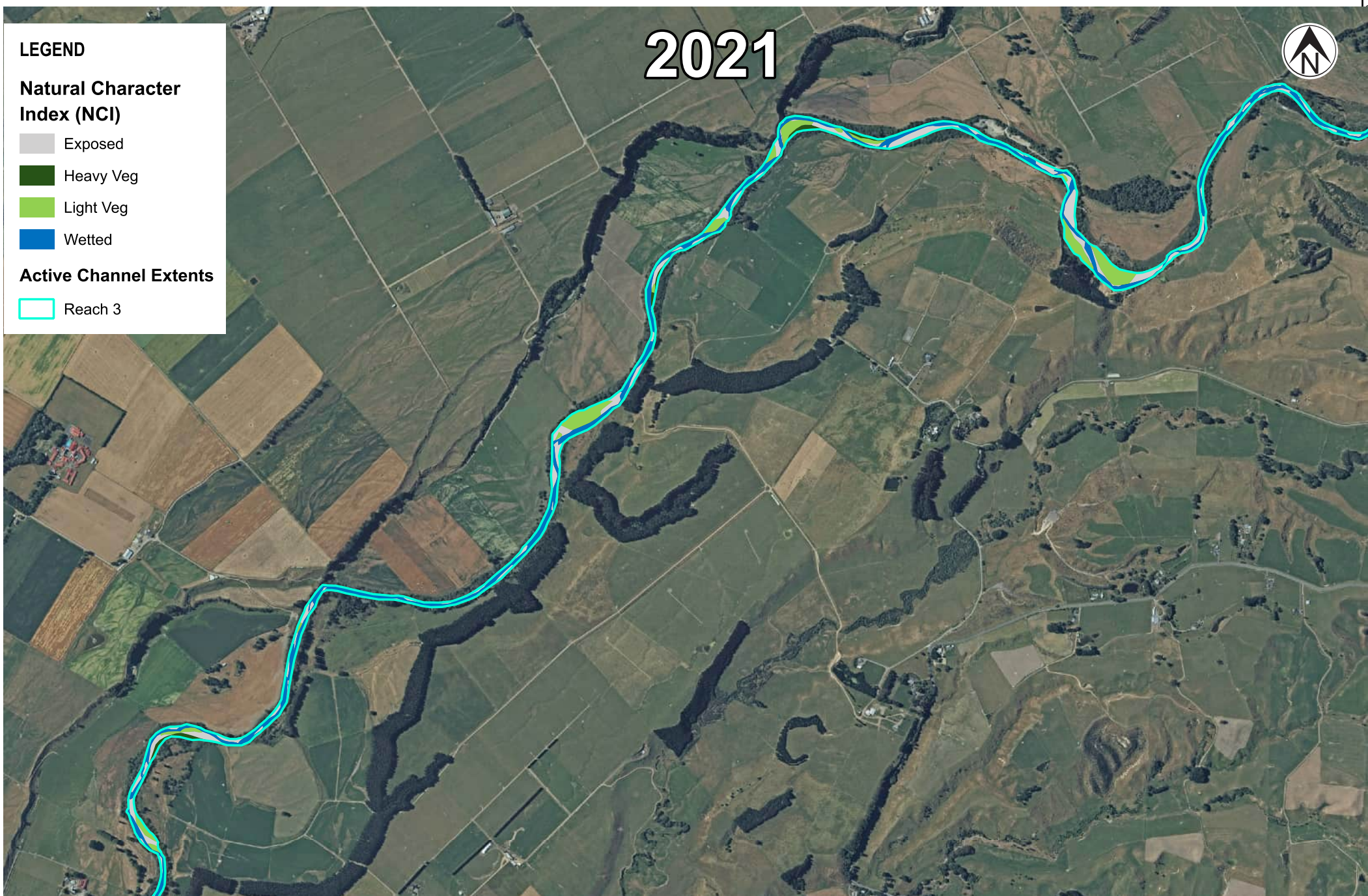


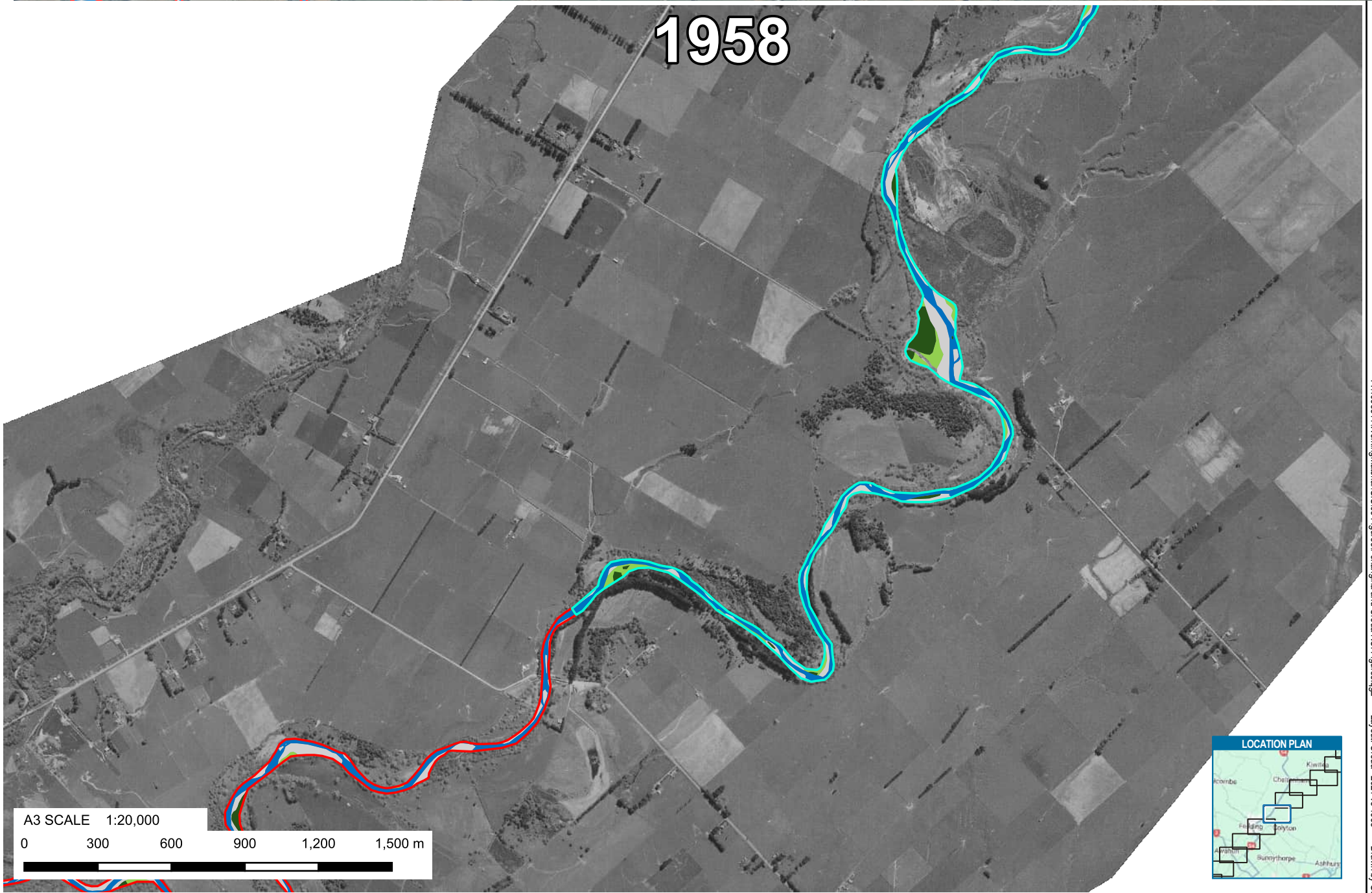
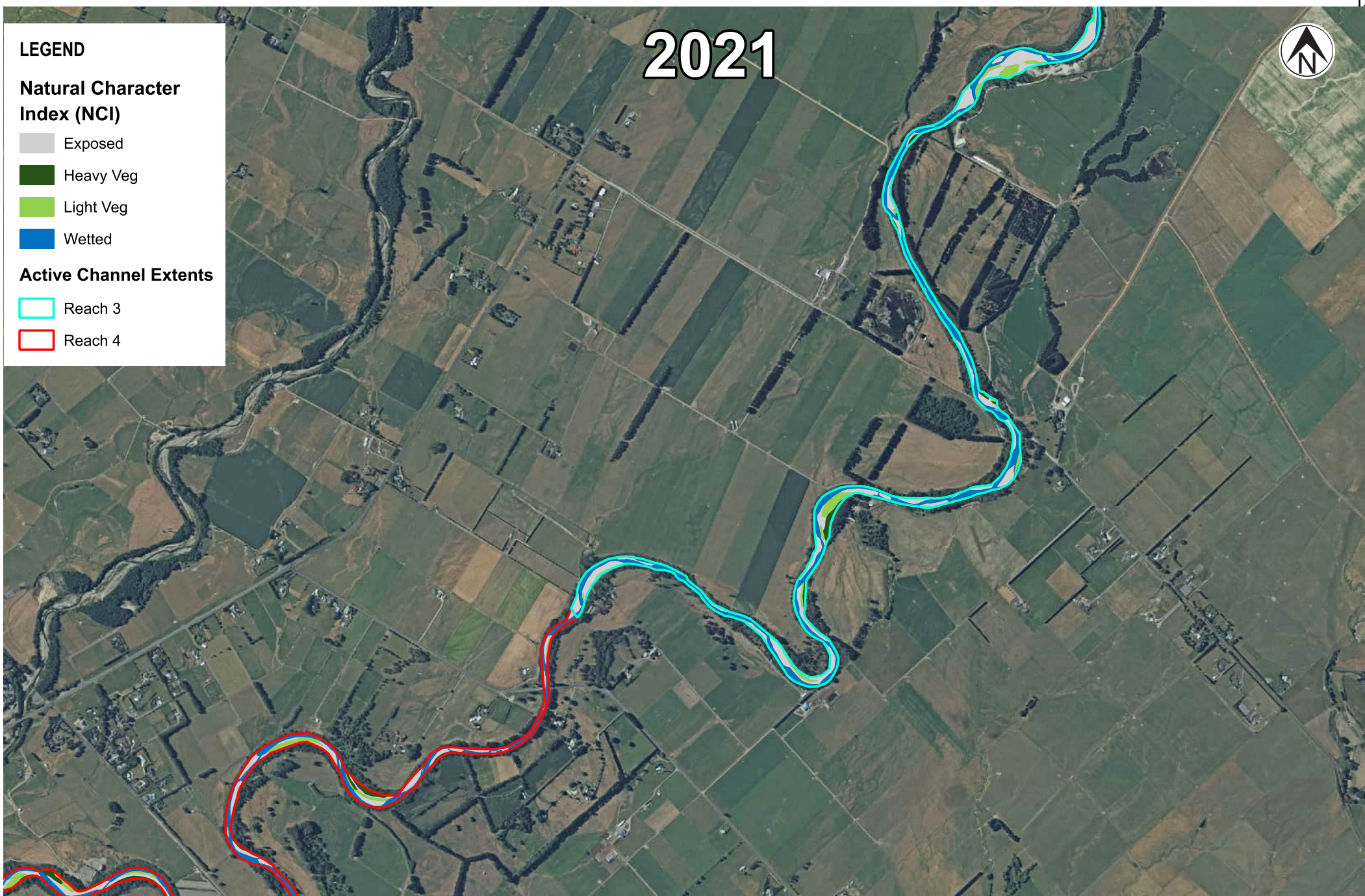
 Tonkin+Taylor www.tonkintaylor.co.nz Exceptional thinking together	NOTES: Imagery: Manawatu-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0. Aerial Imagery 1958 OrouaPohangina. Data supplied by Horizons Regional Council.	PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL		
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					TITLE ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 1		
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1	Final version	GIHU	KJOH	15/08/25			
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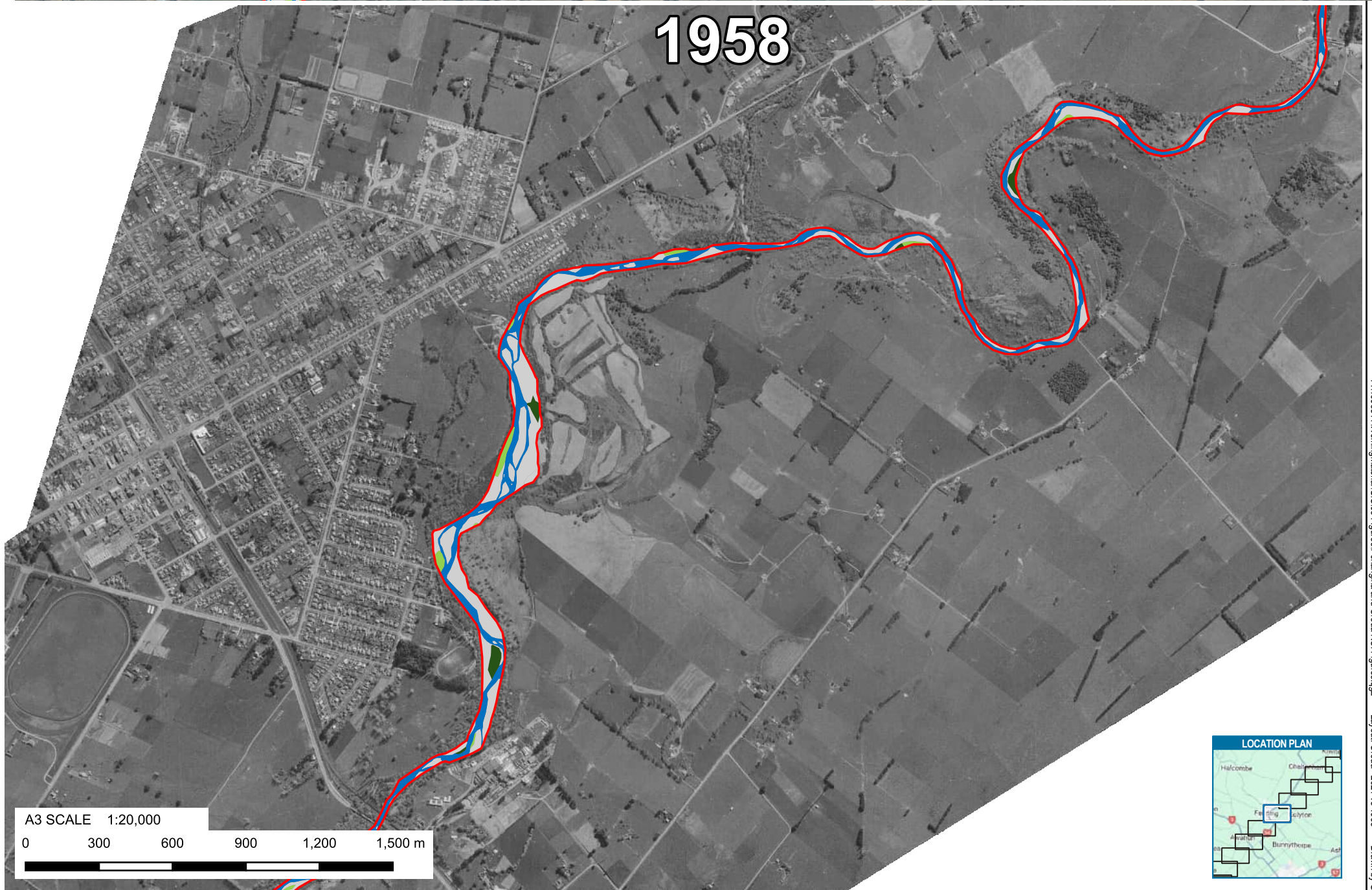
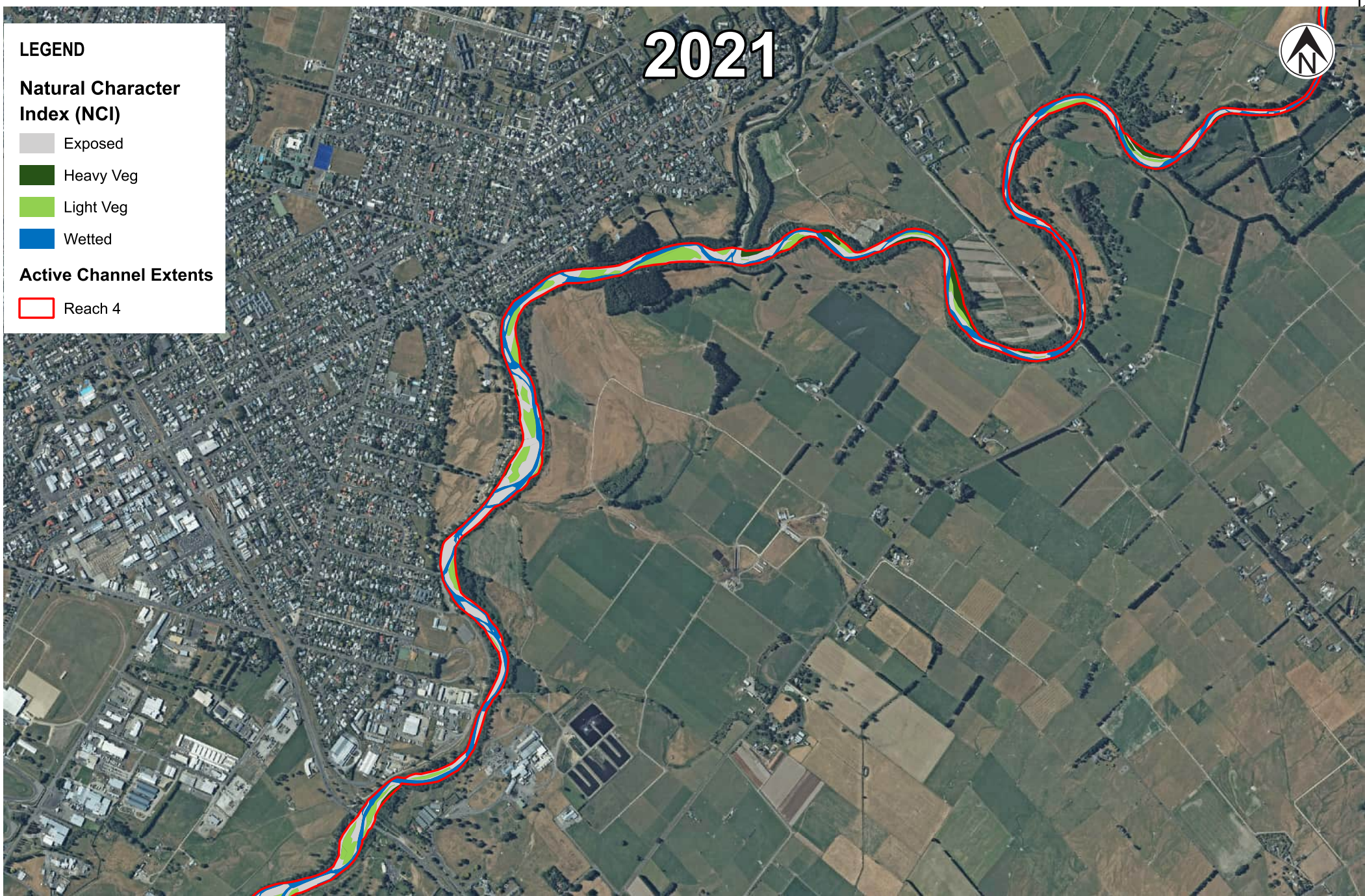
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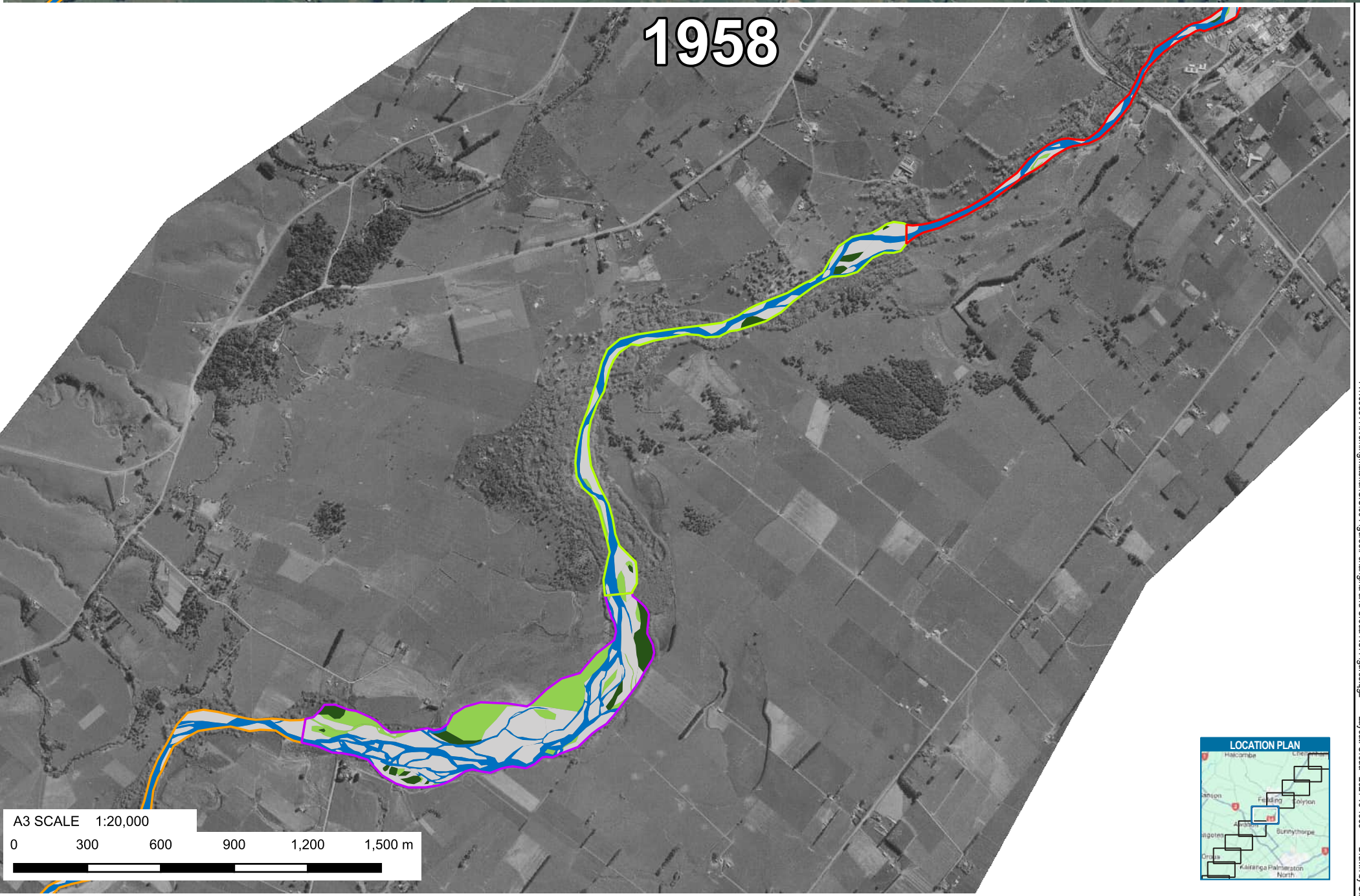
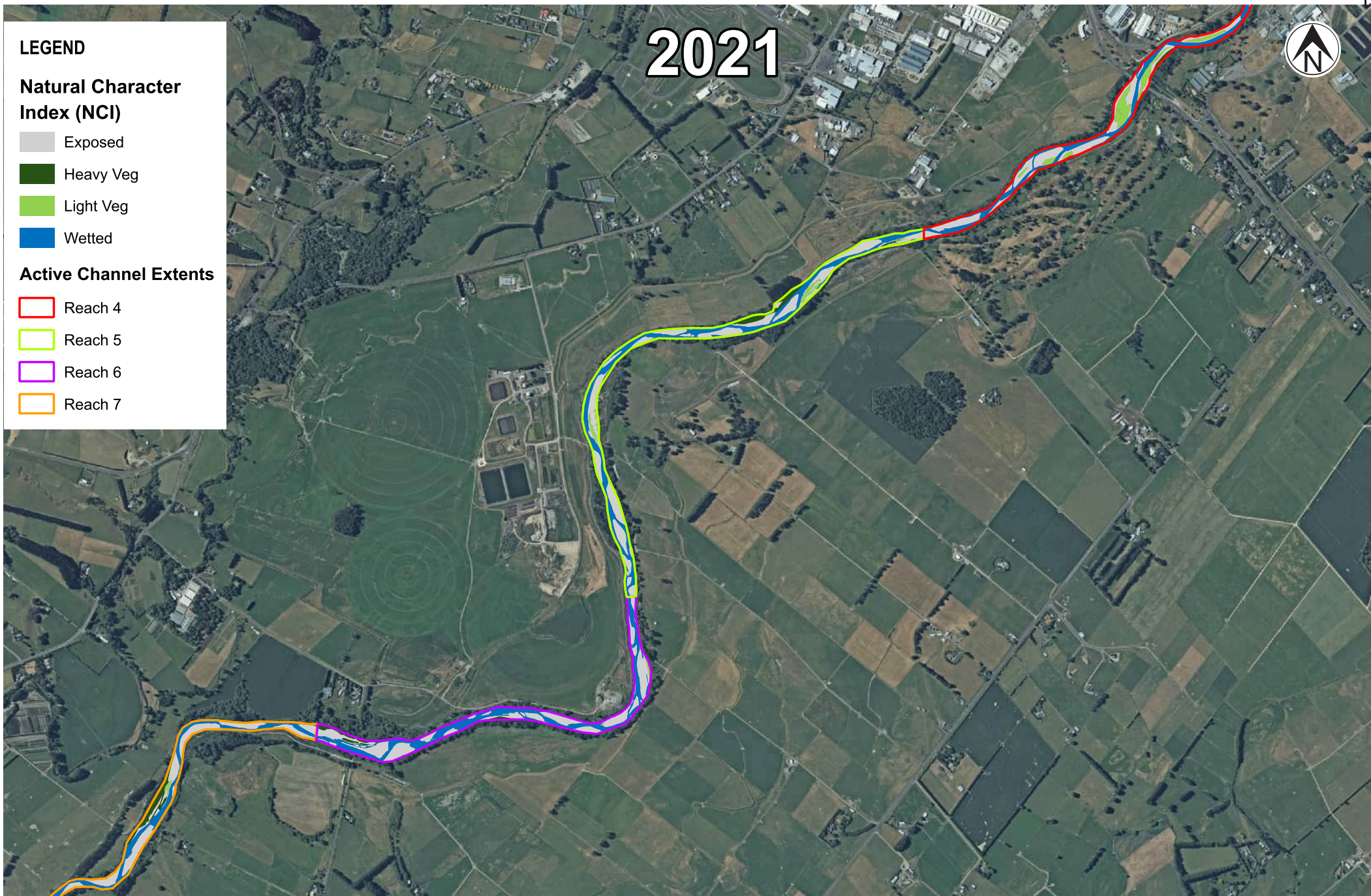




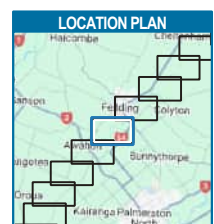








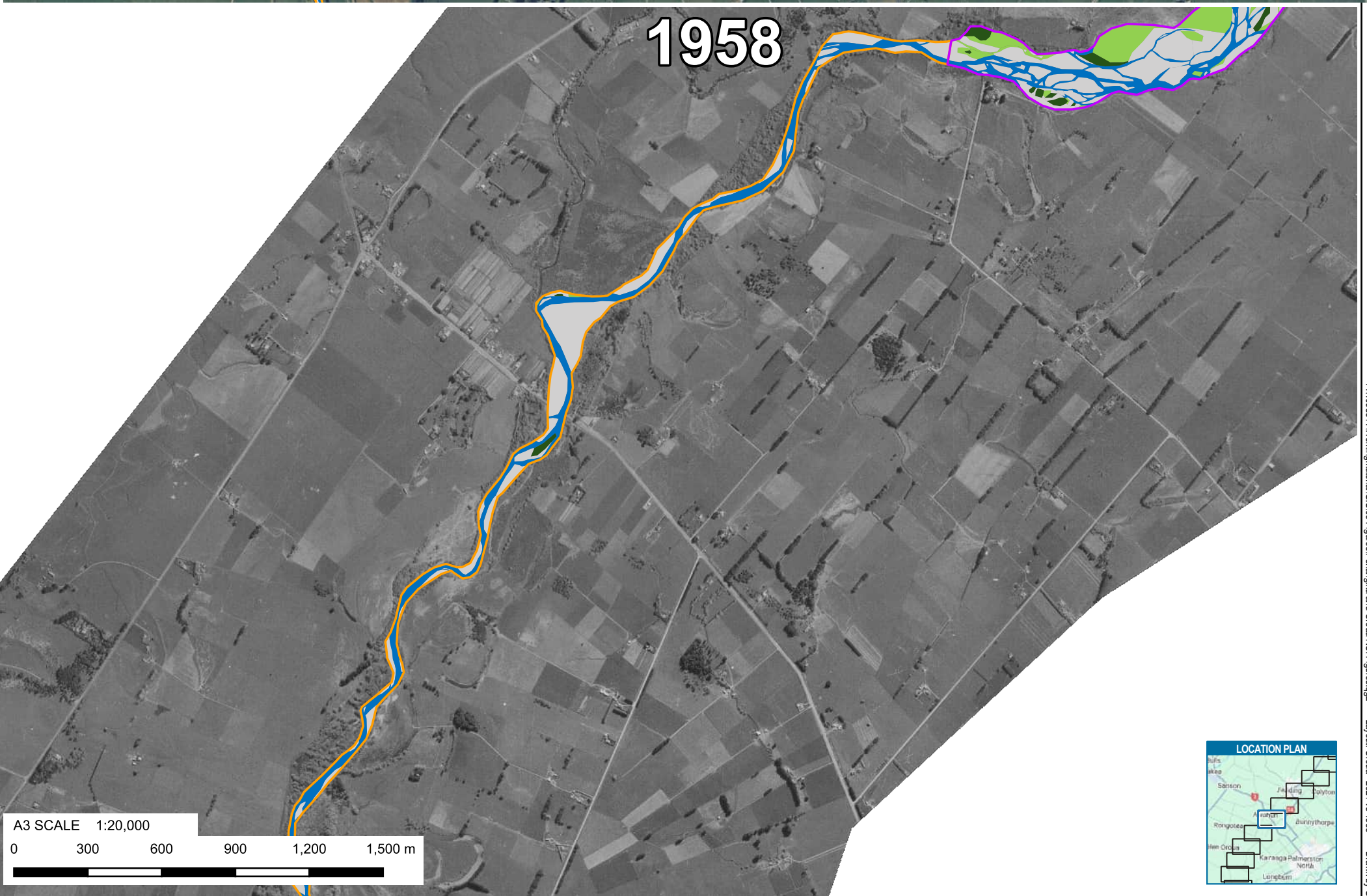
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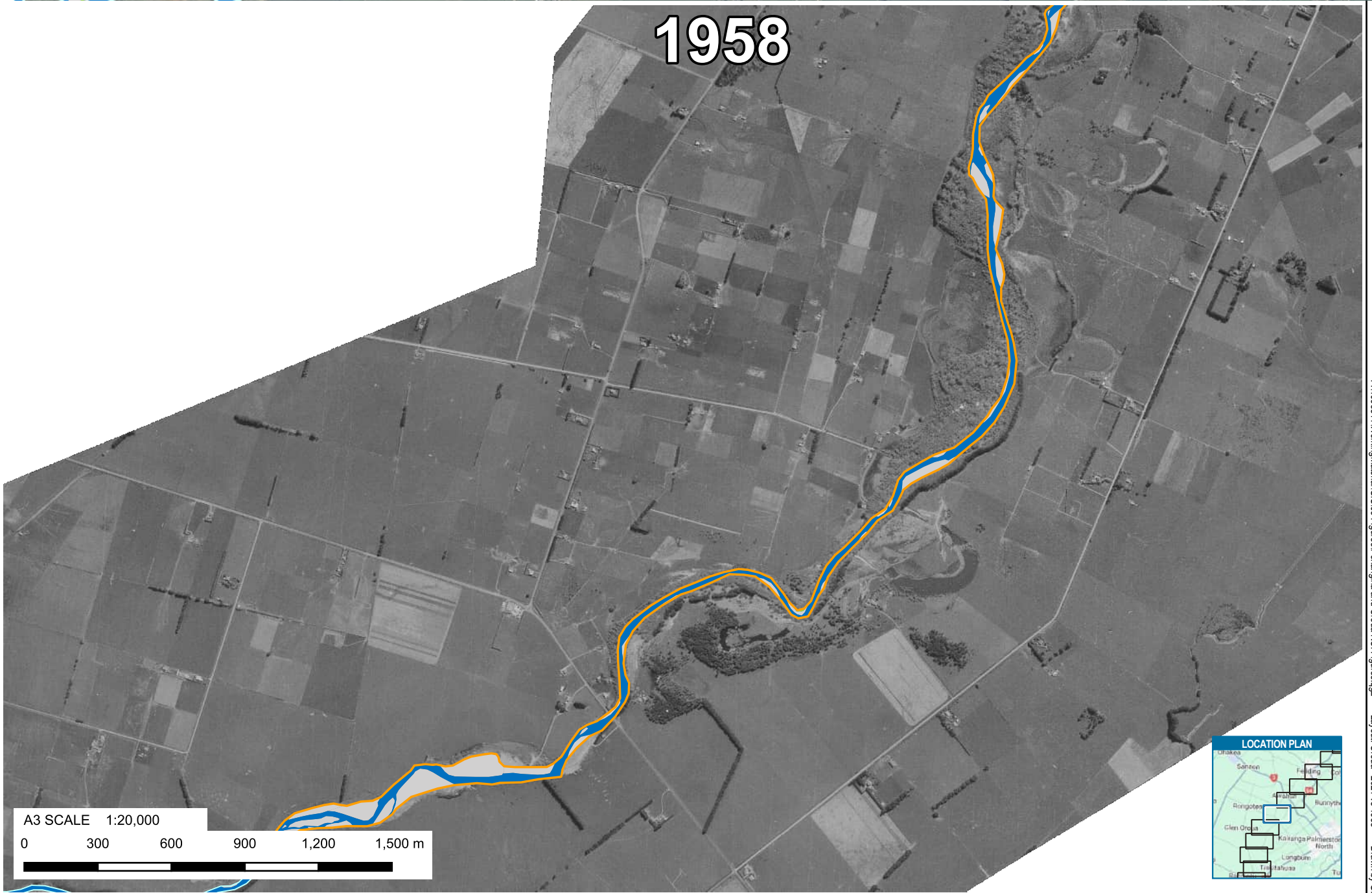


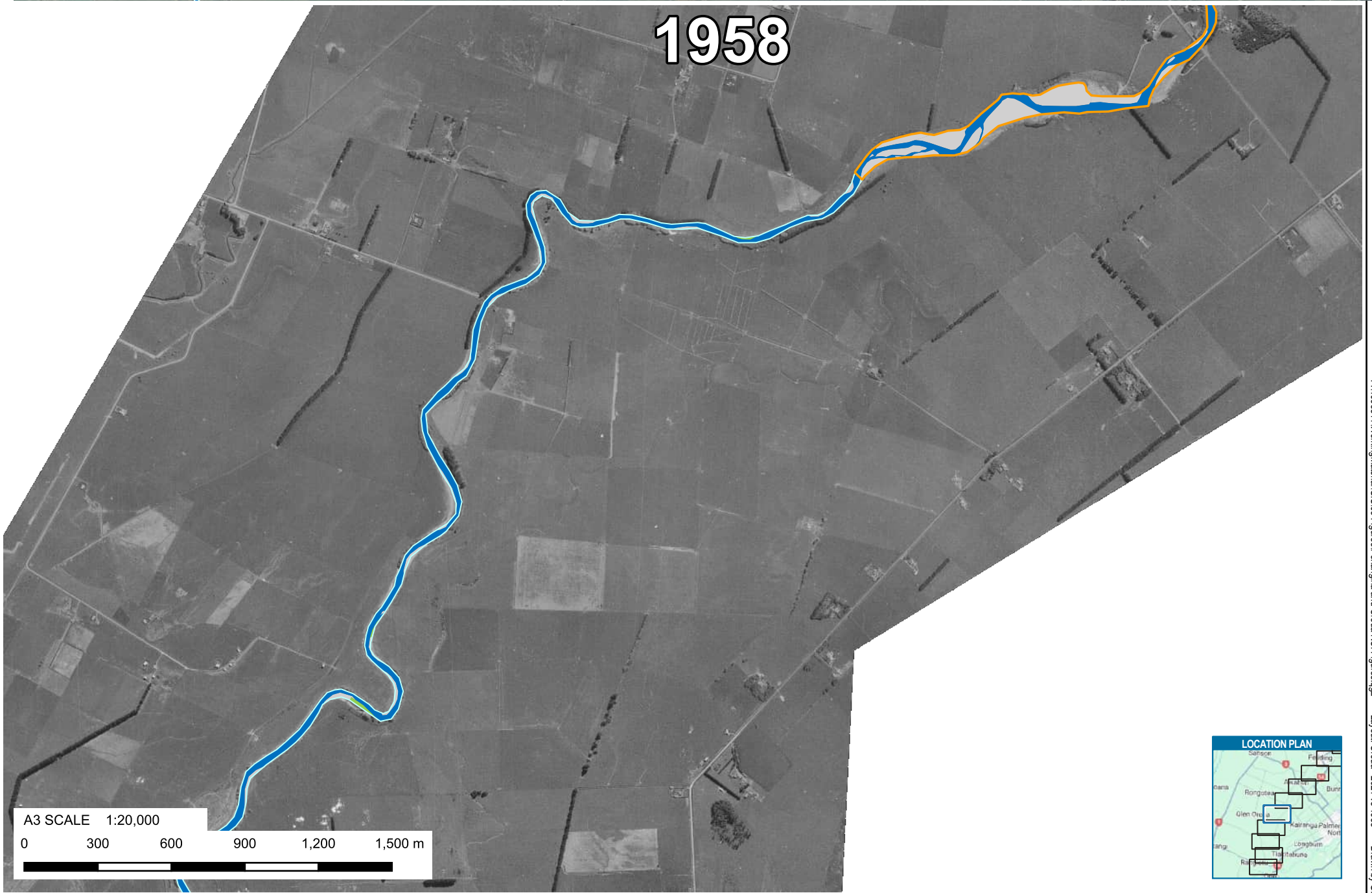
NOTES: Imagery: Manawatu-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0. Aerial Imagery 1958 Ōroua Pohangina. Data supplied by Horizons Regional Council.				
0	First version	GIHU	KJOH	03/07/25
1	Final version	GIHU	KJOH	15/08/25
REV	DESCRIPTION	GIS	CHK	DATE

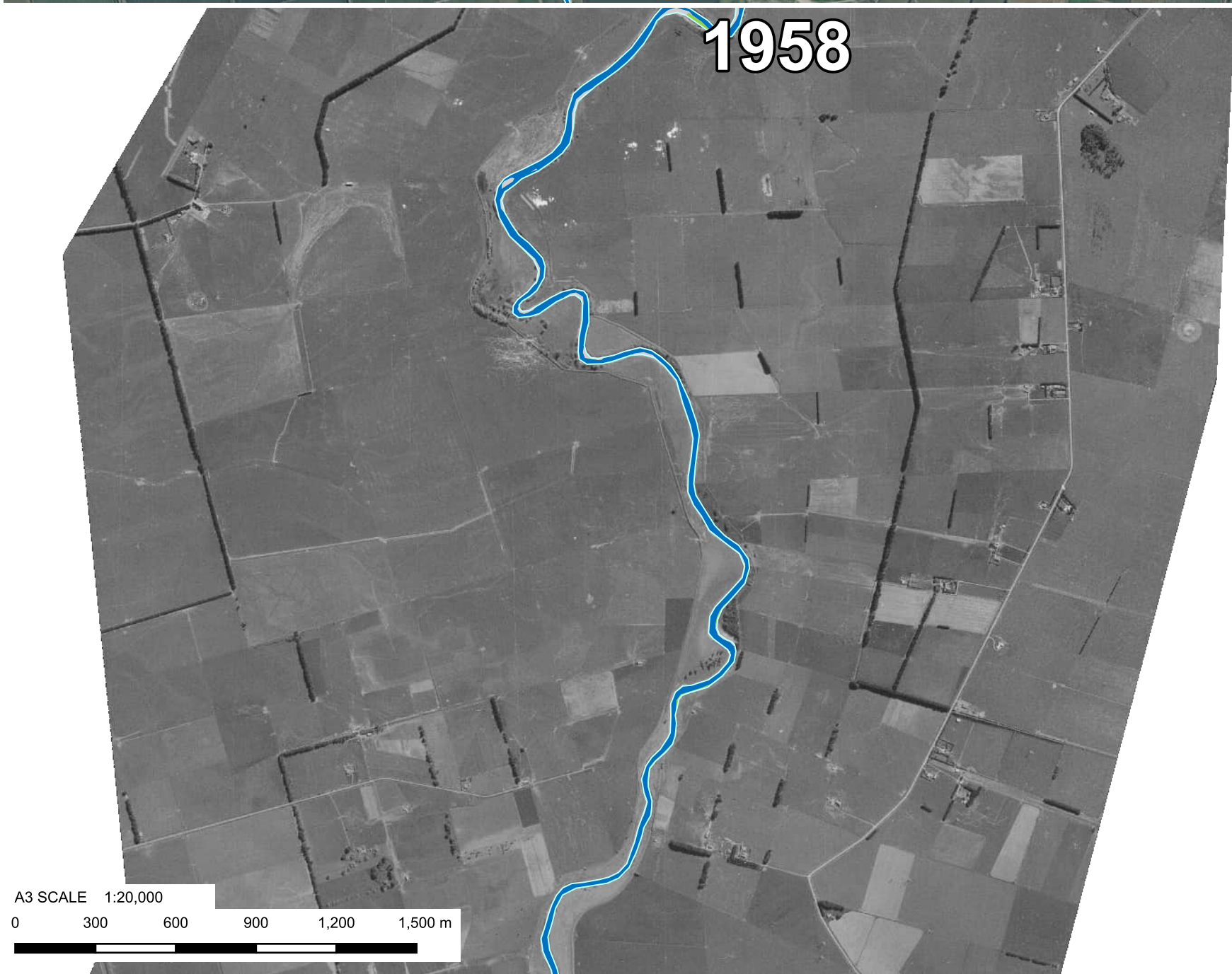
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		DATE		

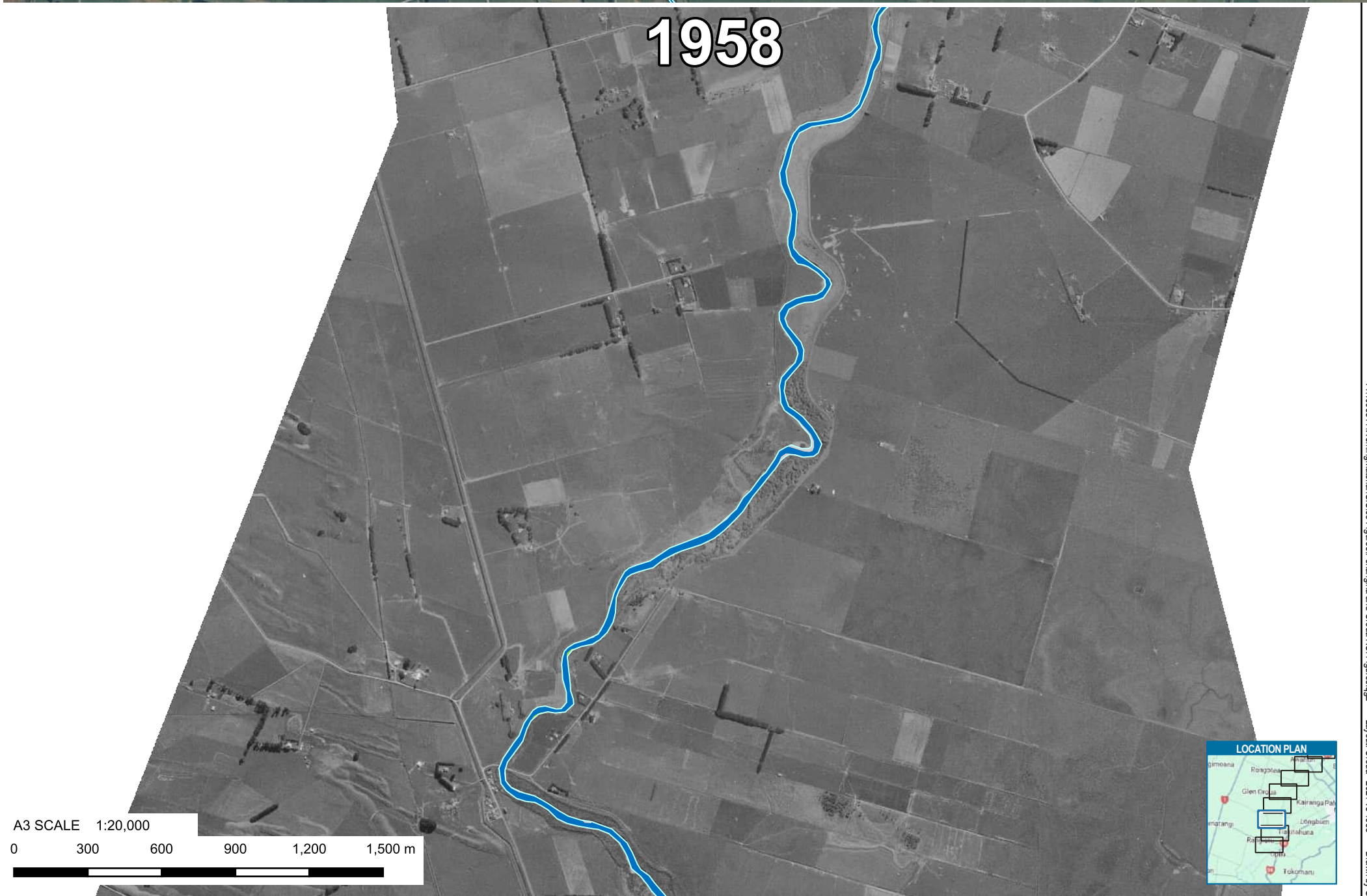
CLIENT	HORIZONS REGIONAL COUNCIL			
PROJECT	POHANGINA AND ŌROUA NCI ASSESSMENTS			
TITLE	ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 1			
SCALE (A3)	1:20,000	FIG No.	FIGURE 15	REV 1

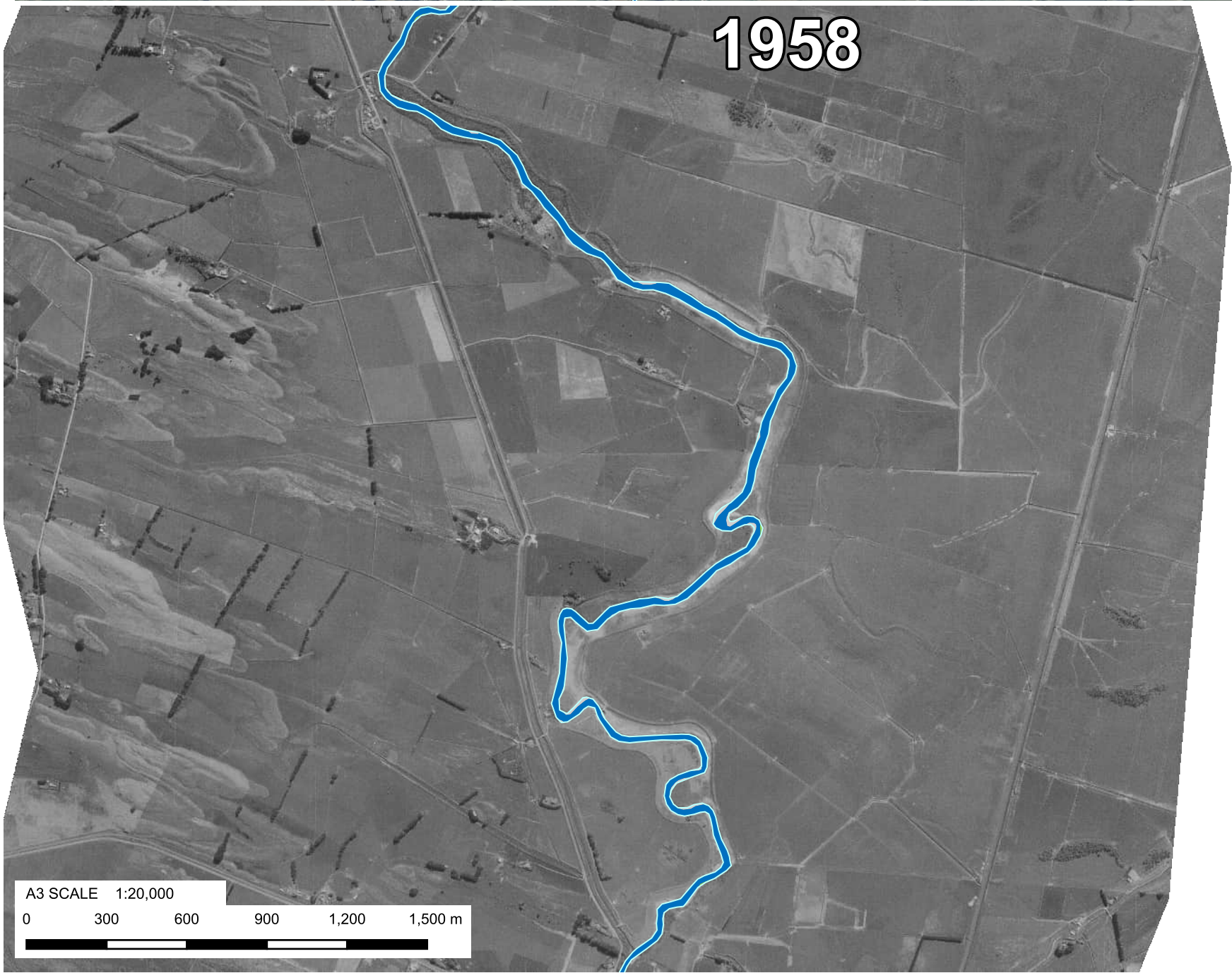


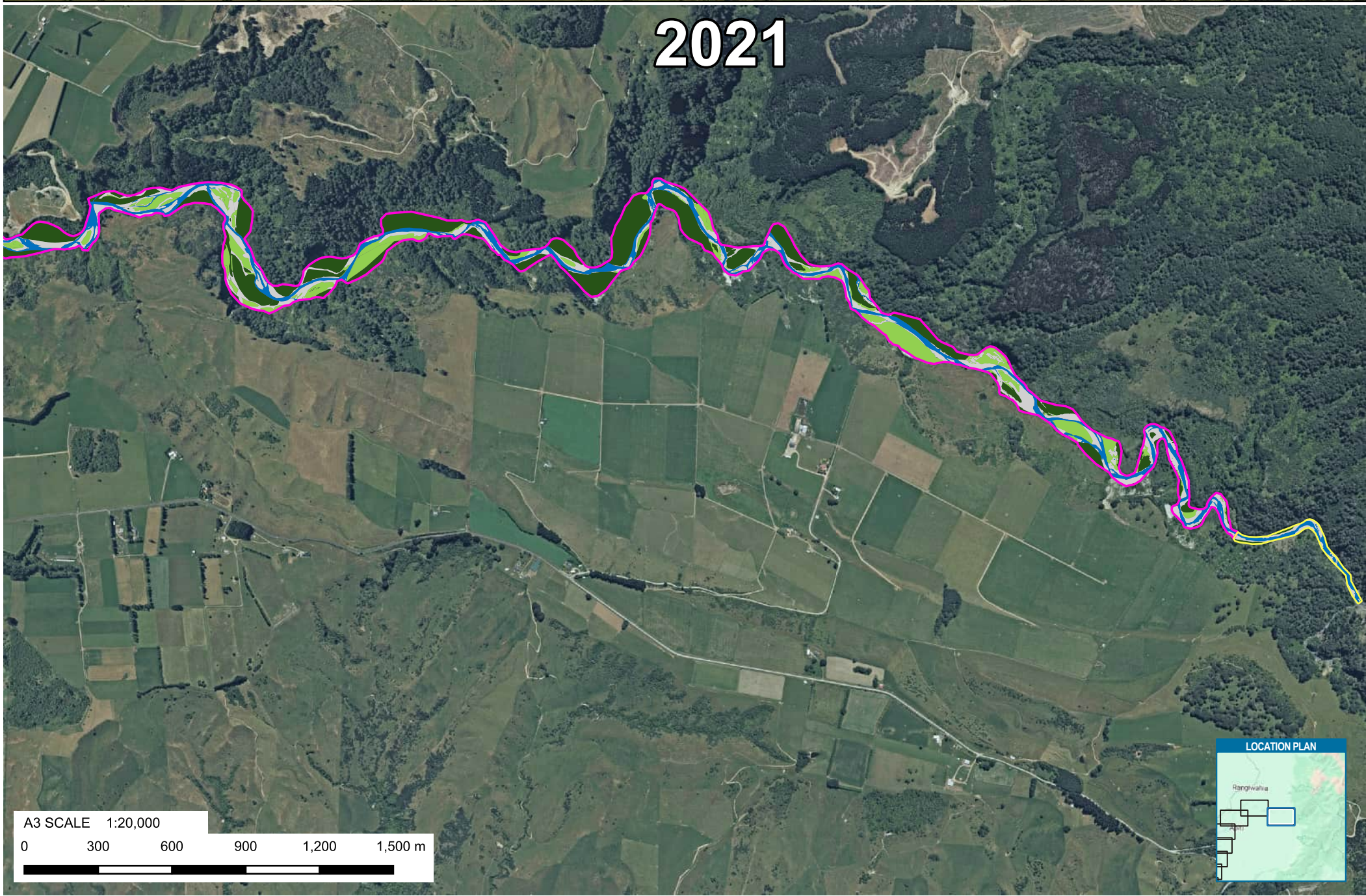
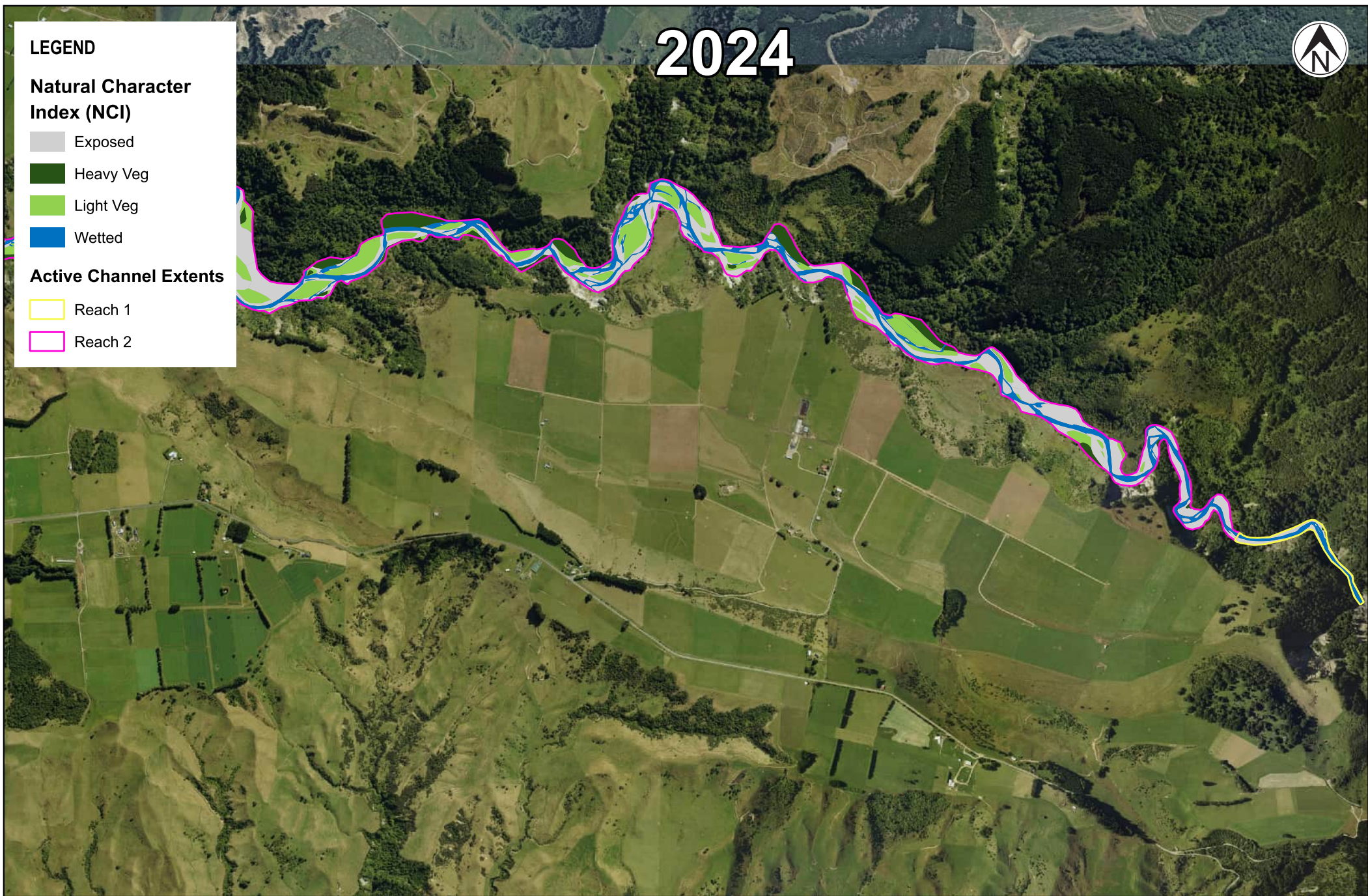








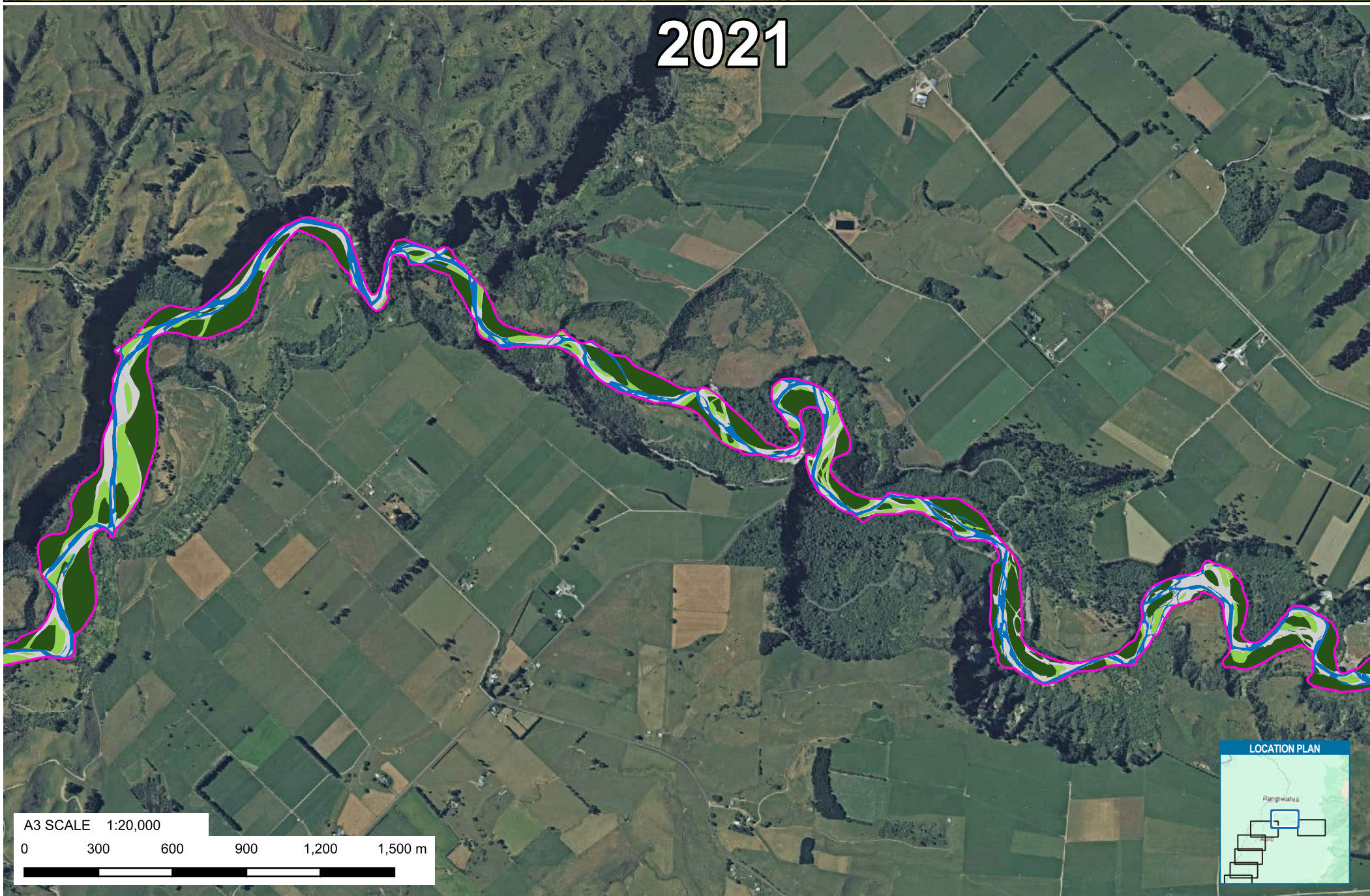
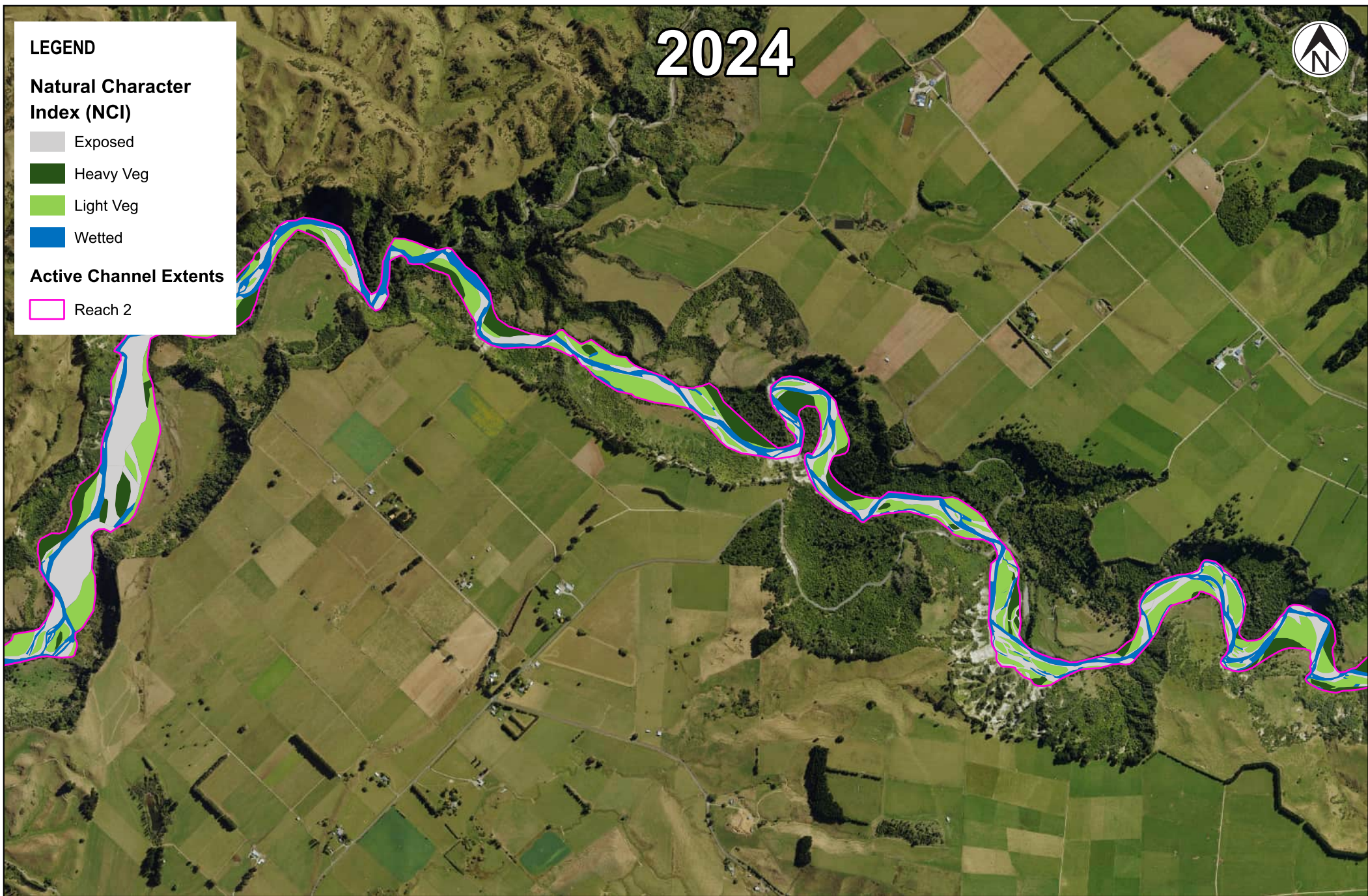


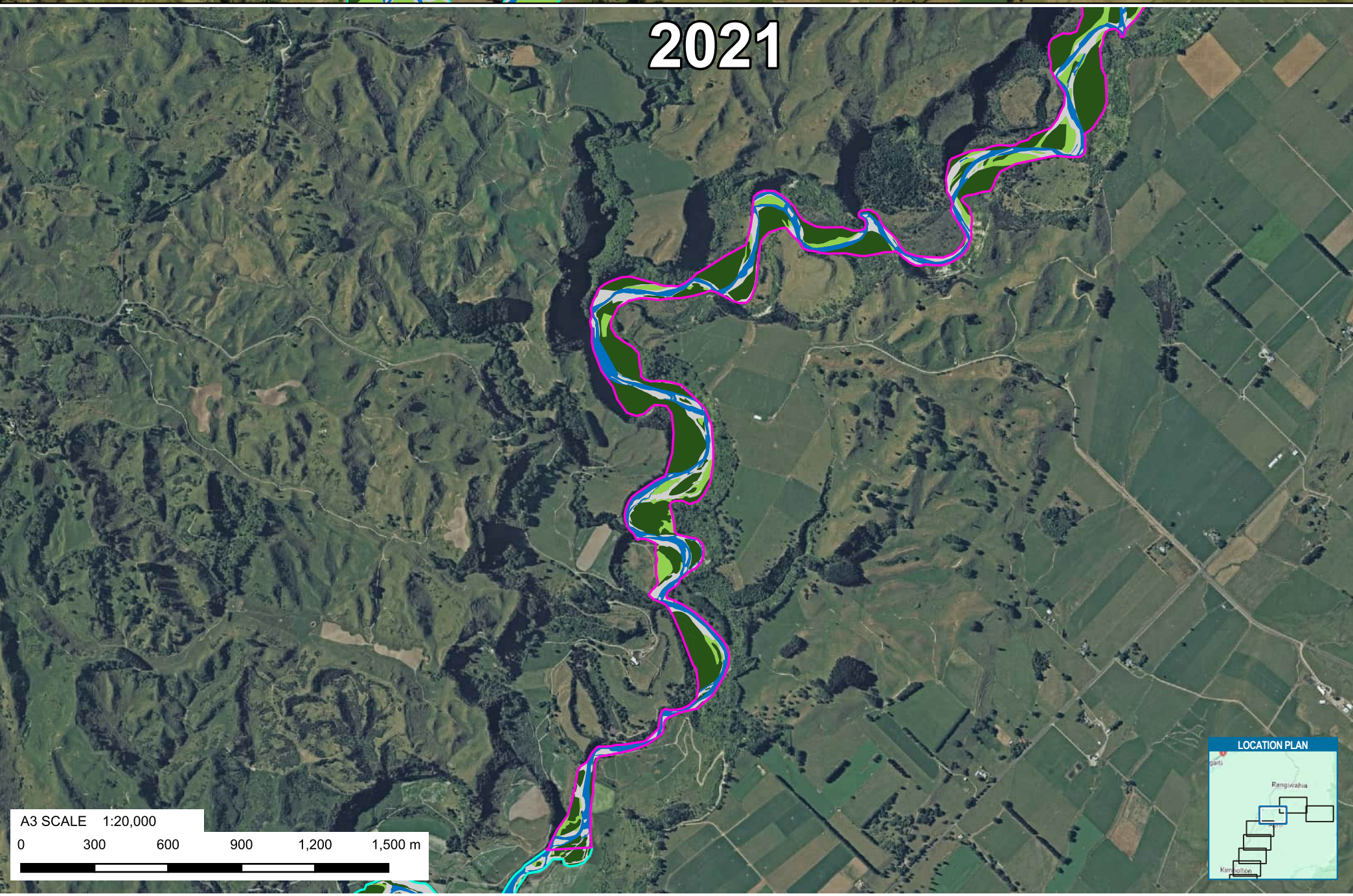
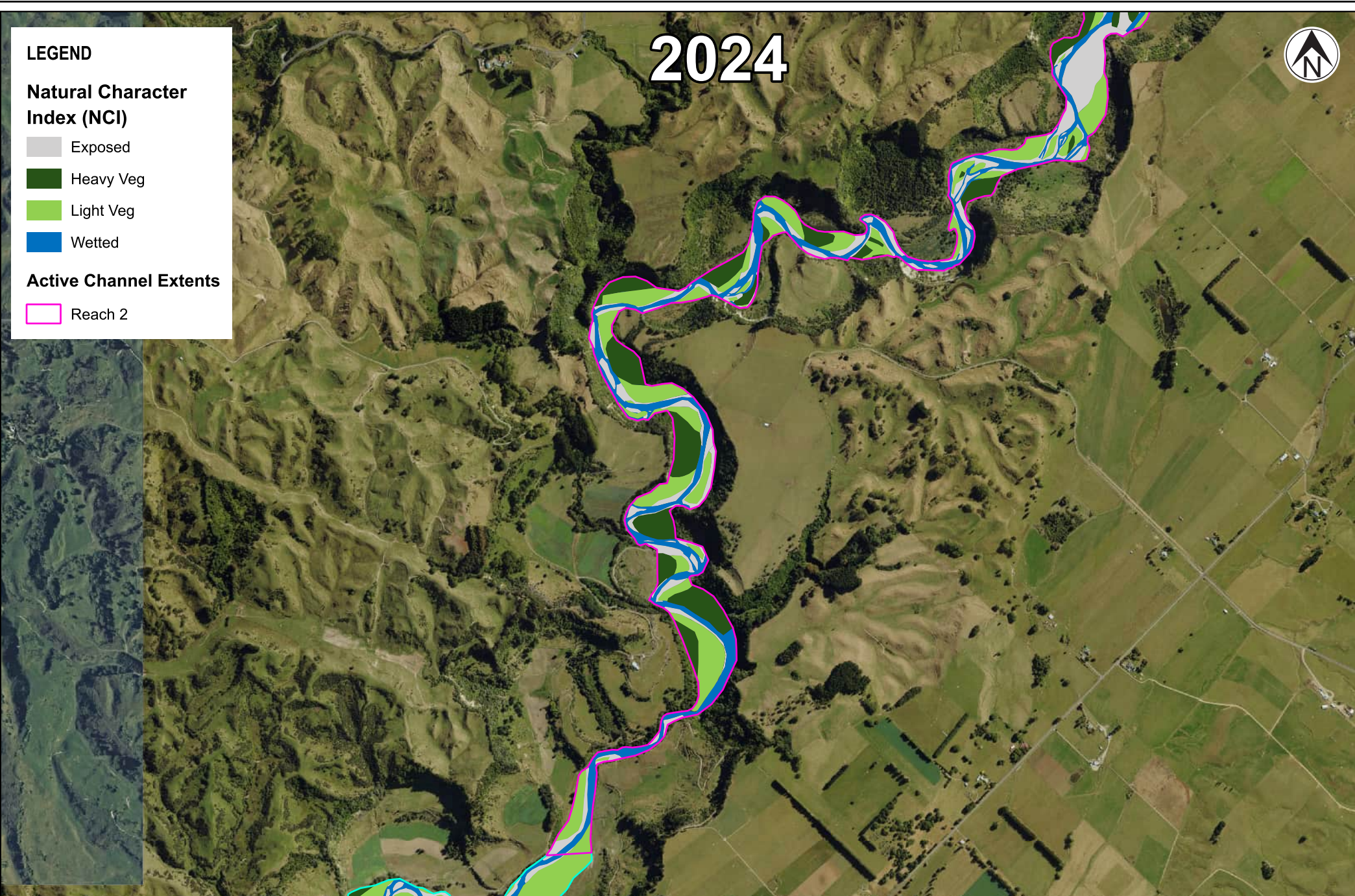


NOTES: Imagery: Manawatu-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0.				
0	First version	GIHU	KJOH	03/07/25
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CHECKED	KJOH	AUG.25
BMQ	15/08/25	
APPROVED	DATE	

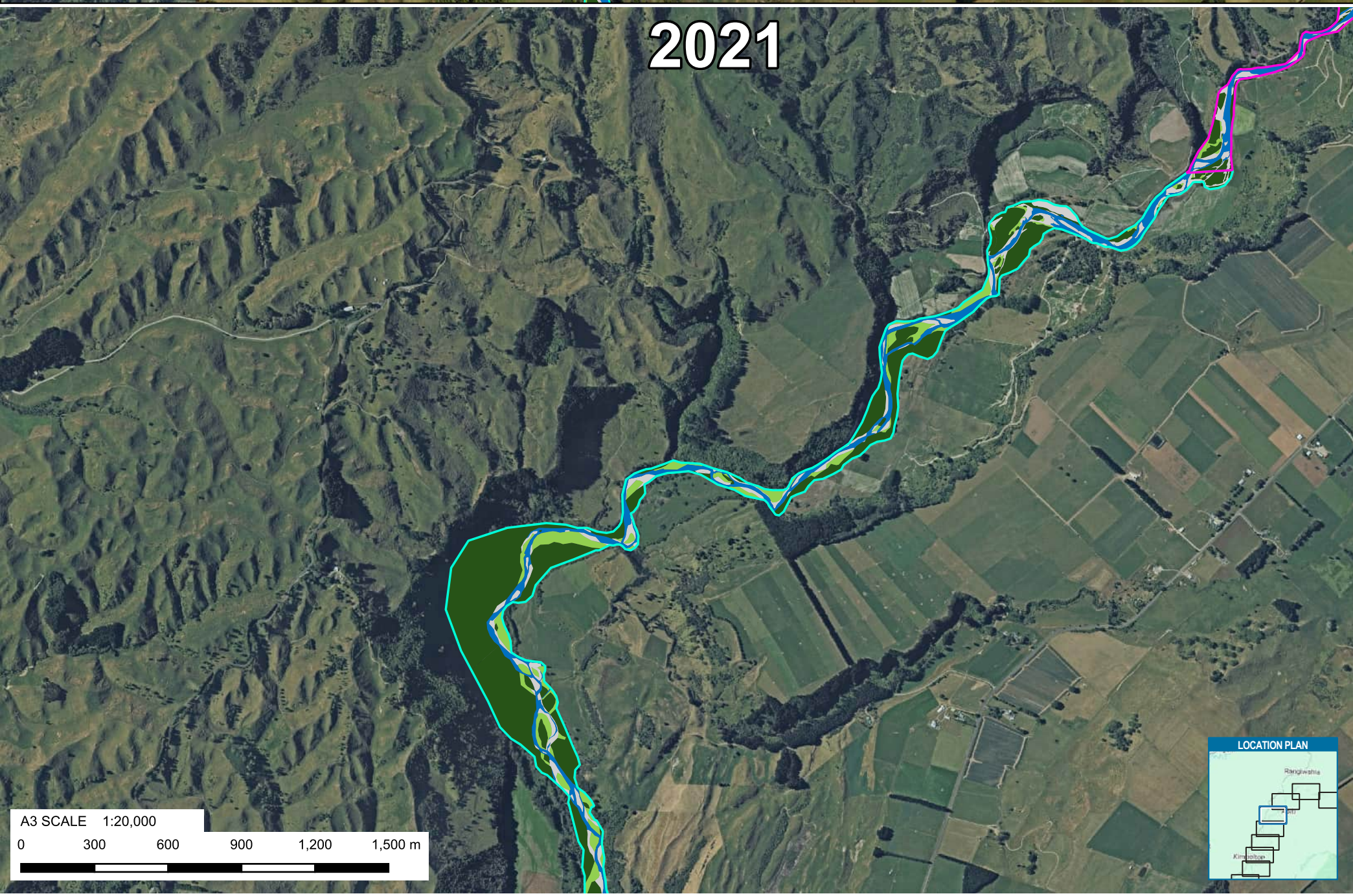
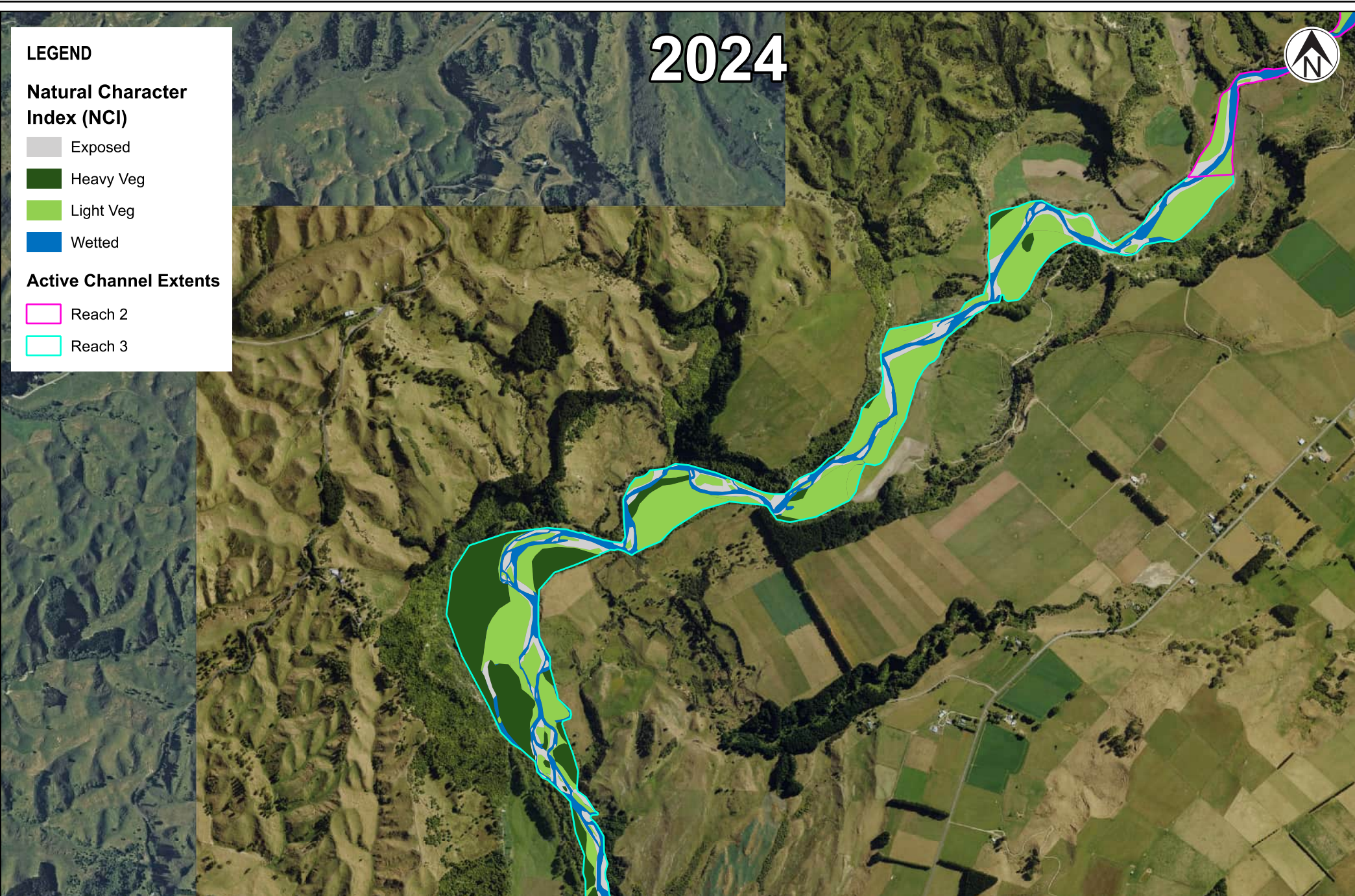
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PROJECT	POHANGINA AND ŌROUA NCI ASSESSMENTS		
TITLE	ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 2		
SCALE (A3)	1:20,000	FIG No.	FIGURE 23
REV	1		





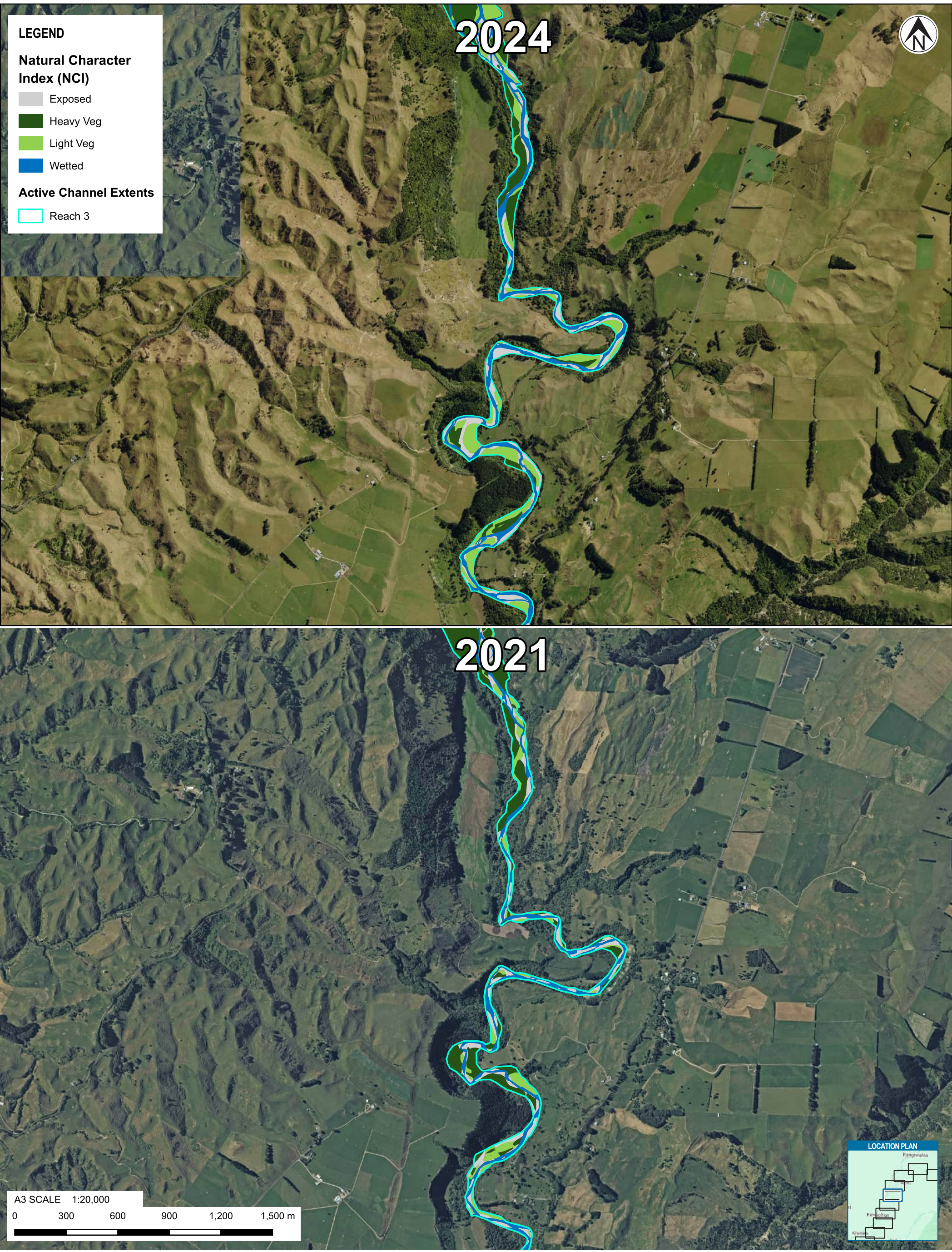
 Tonkin+Taylor www.tonkintaylor.co.nz <i>Exceptional thinking together</i>		NOTES: Imagery: Manawatu-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0.				PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL				
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								TITLE ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 2					
								SCALE (A3) 1:20,000 FIG No. FIGURE 25 REV 1					
0	First version	GIHU	KJOH	03/07/25	BMQ		15/08/25						
1	Final version	GIHU	KJOH	15/08/25									
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE							

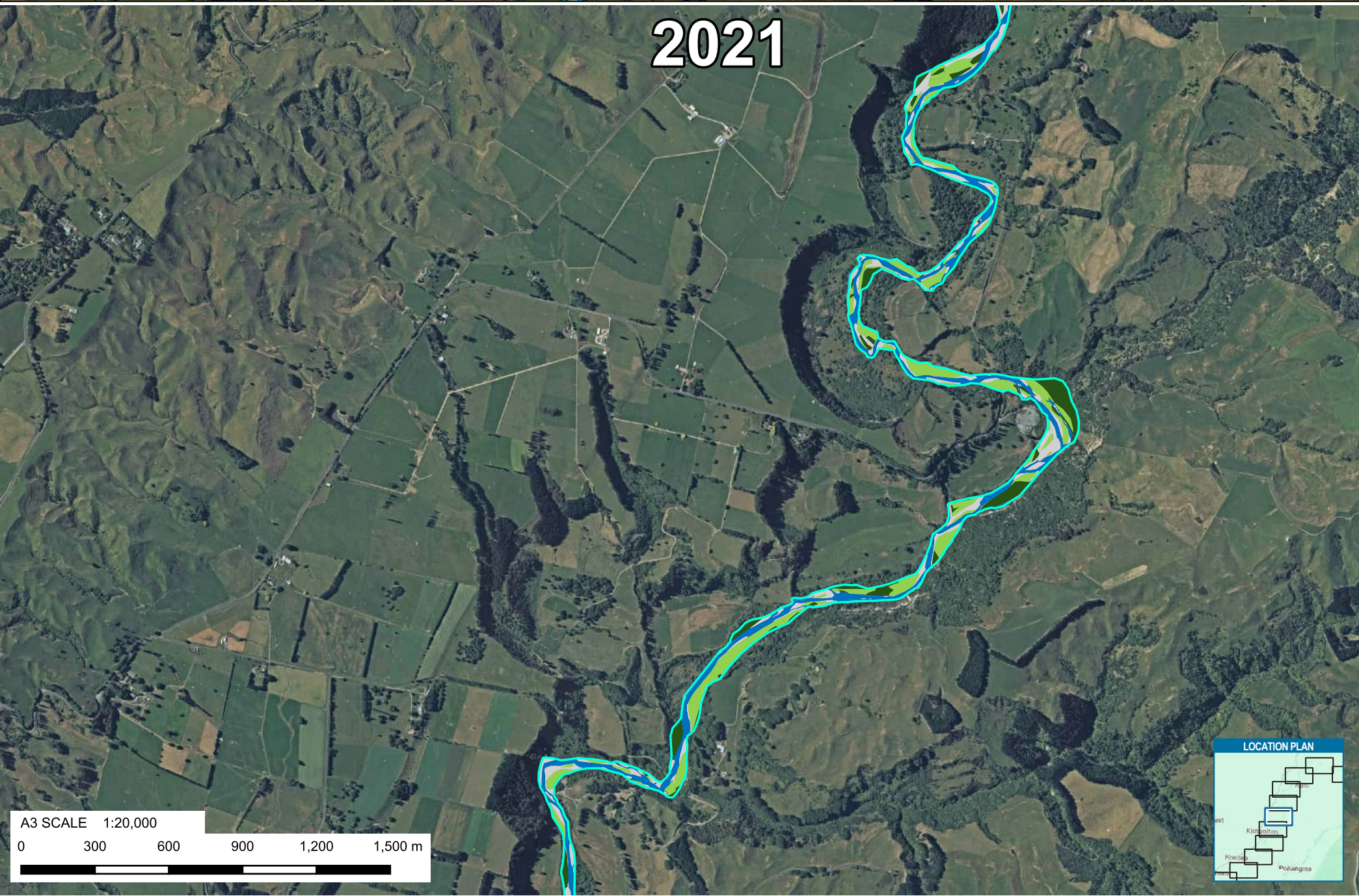
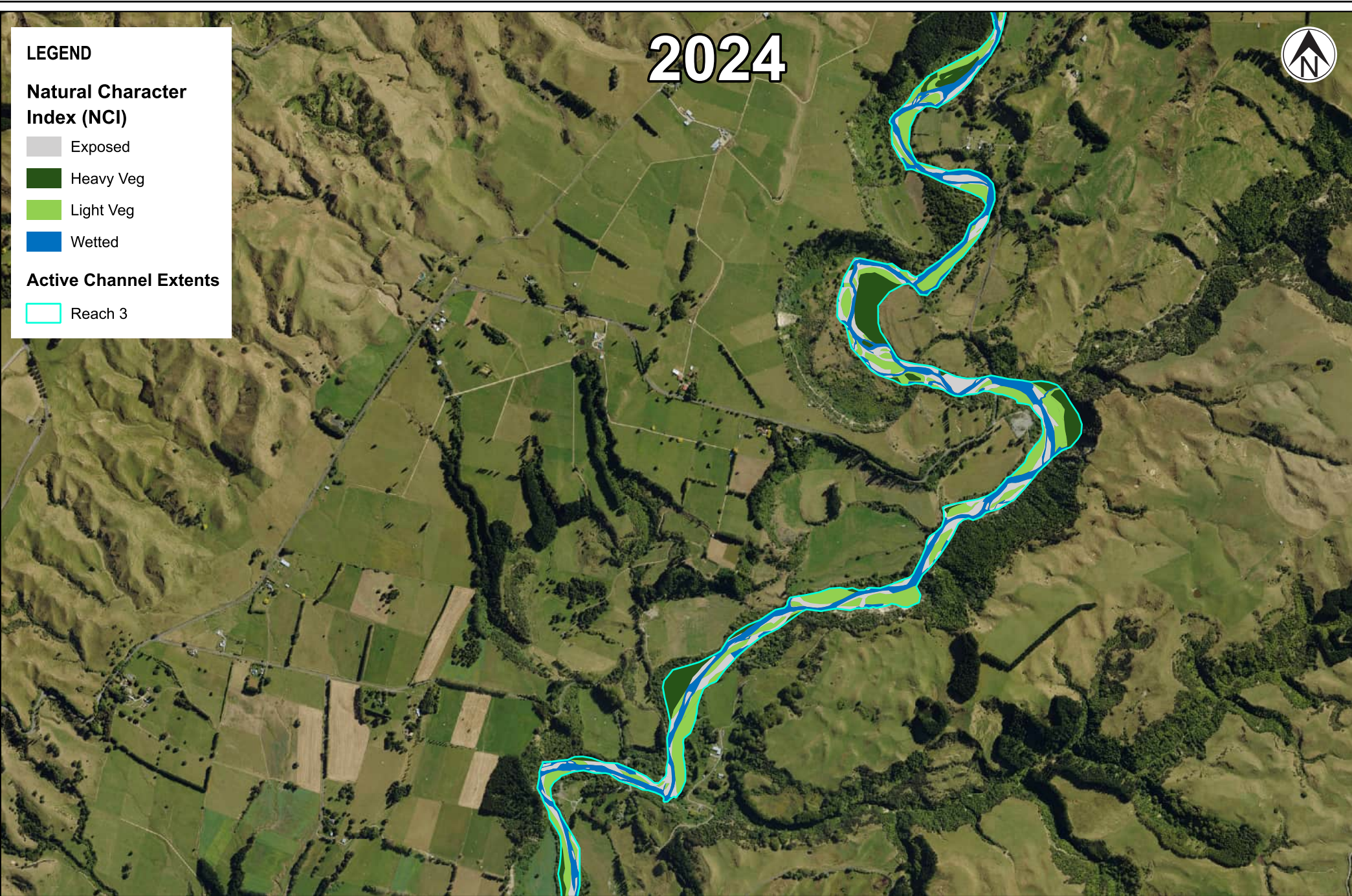
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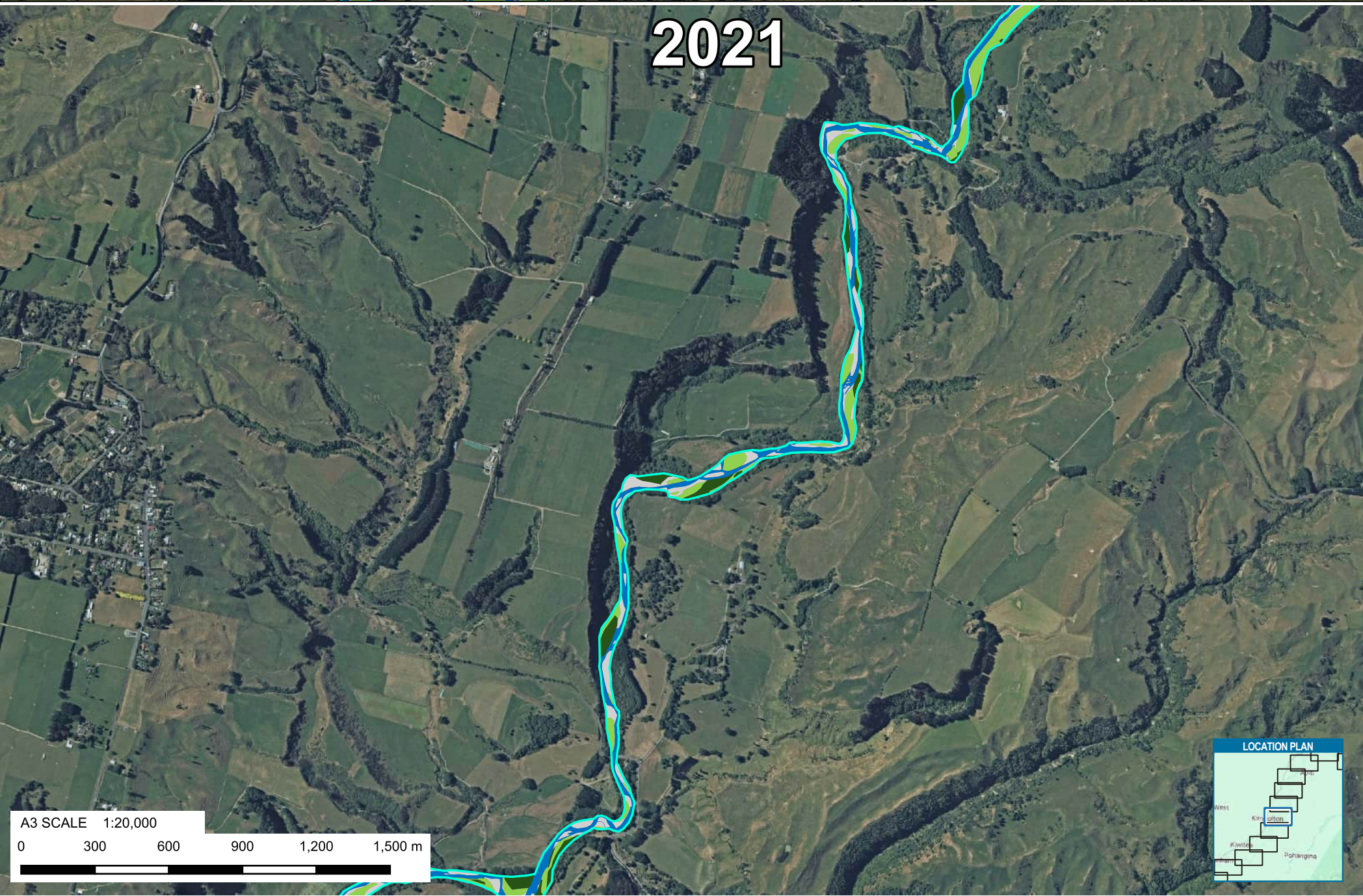
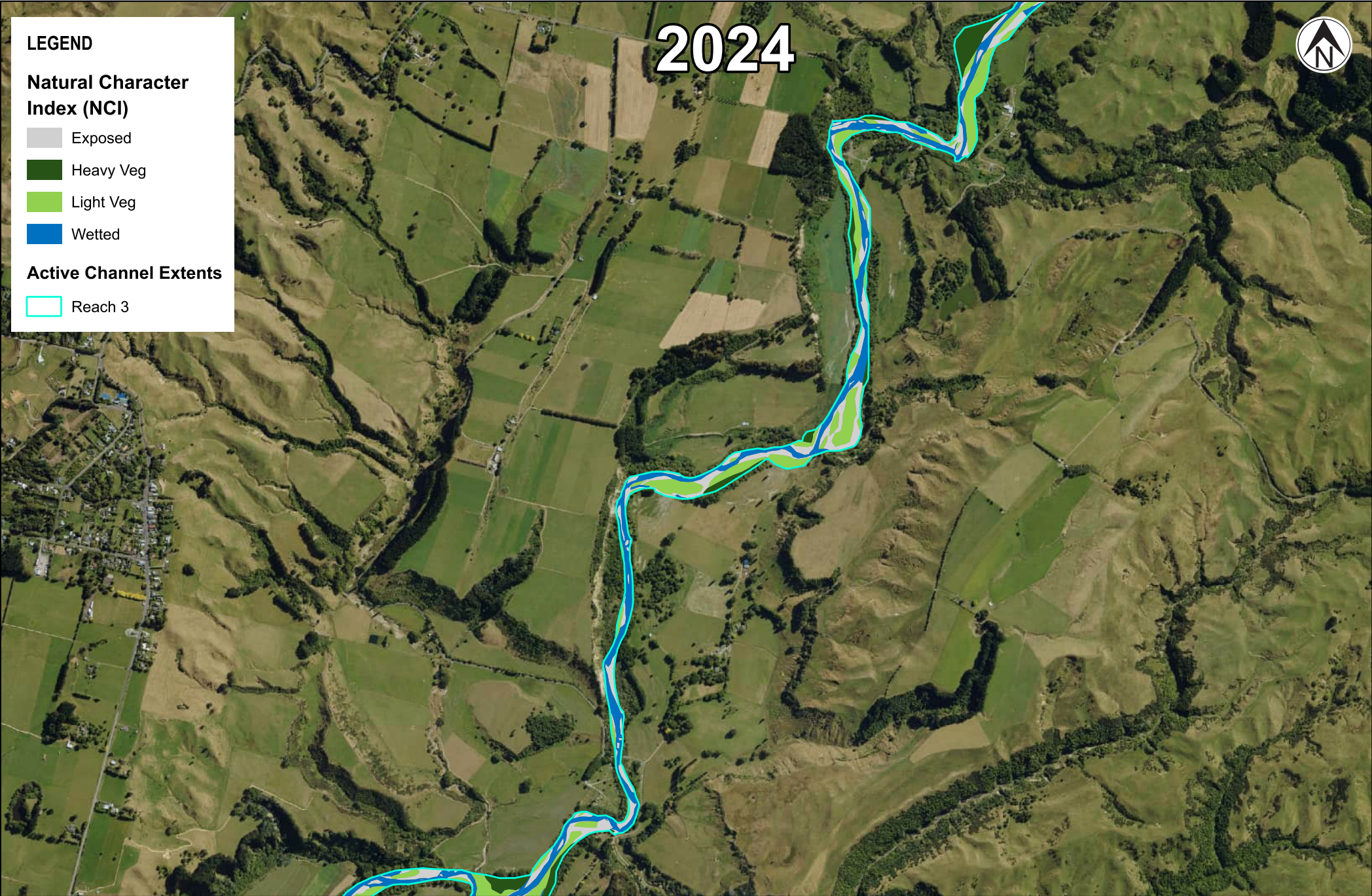


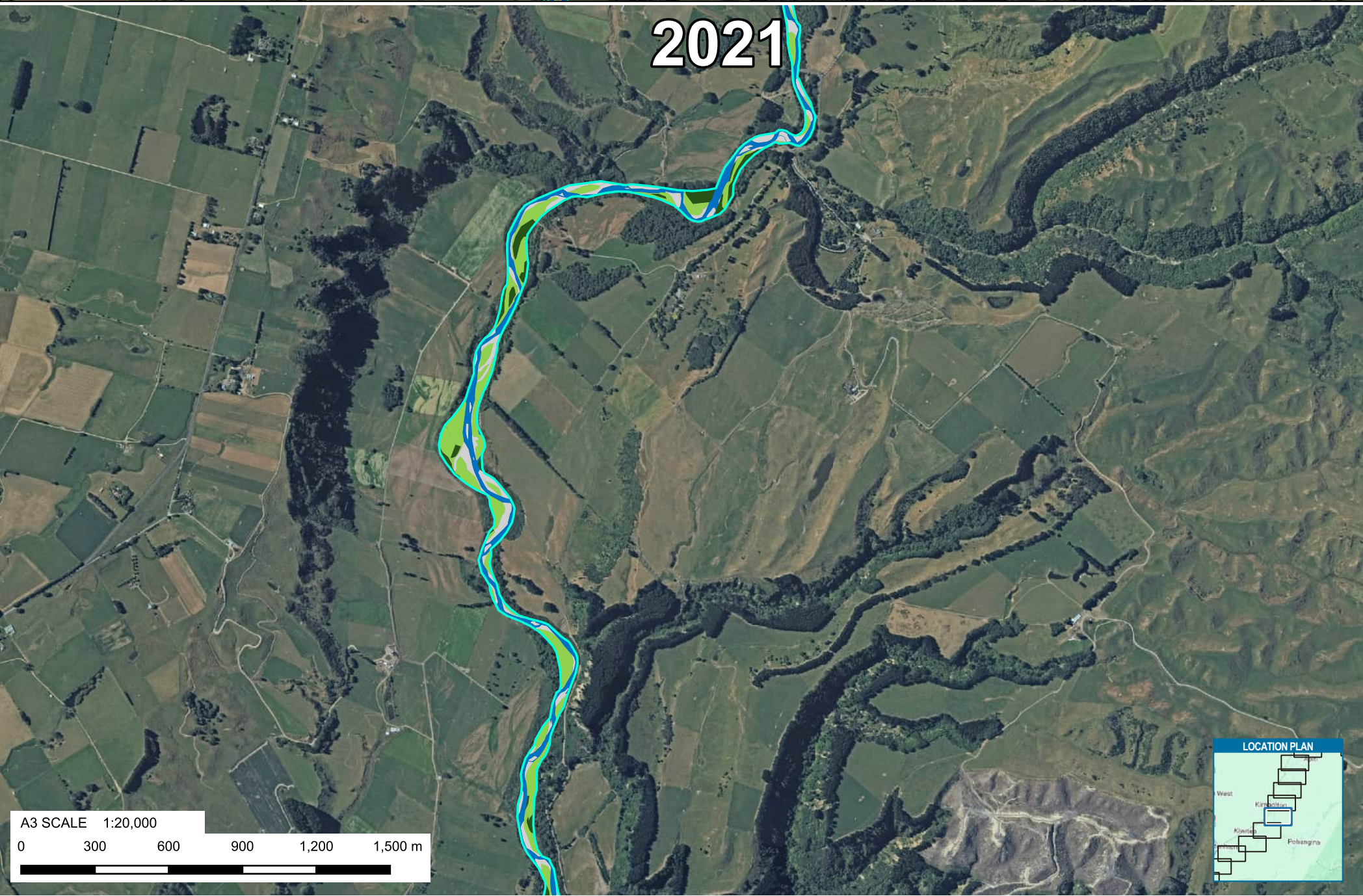
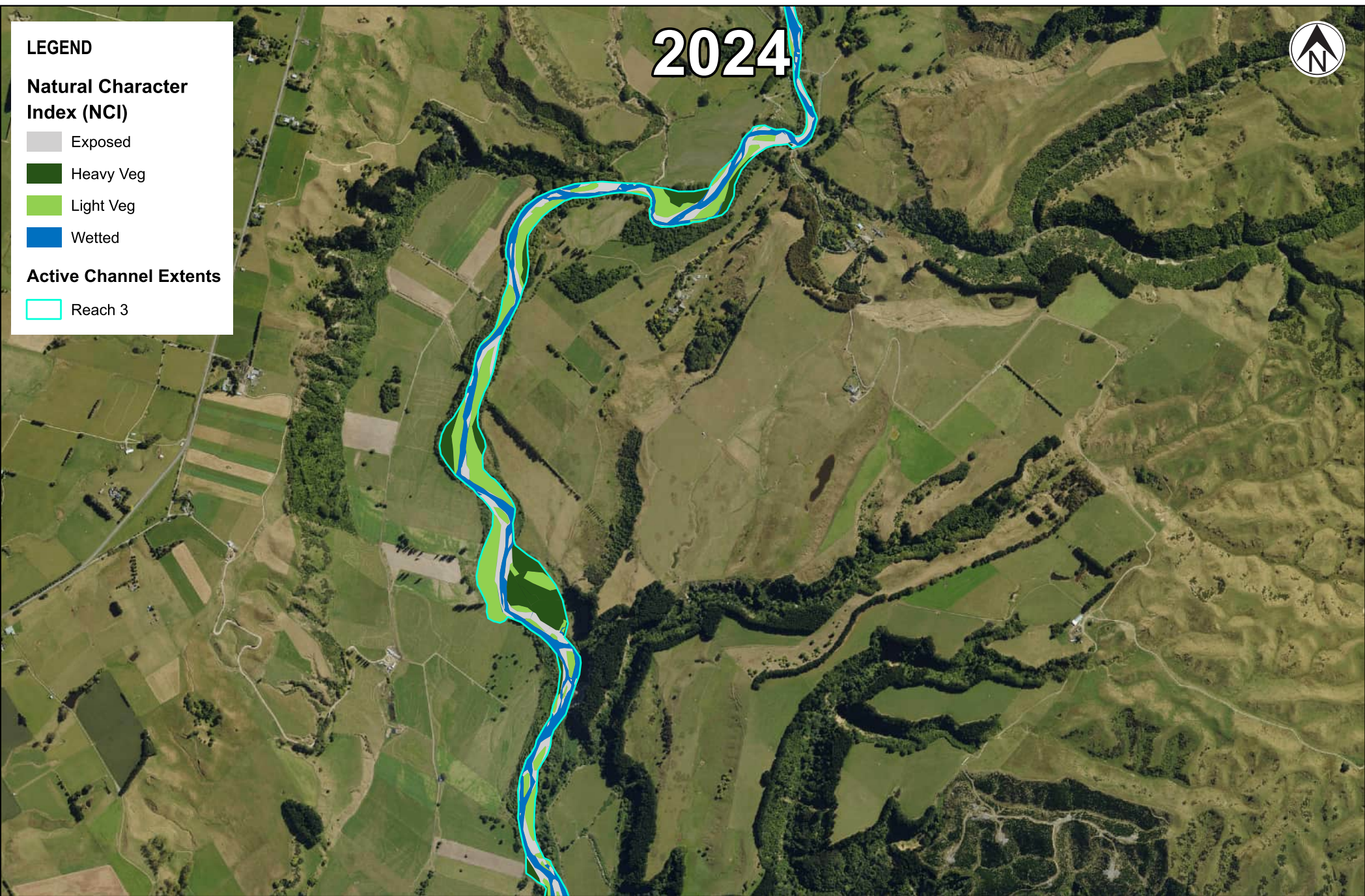
Tonkin+Taylor www.tonkintaylor.co.nz Exceptional thinking together	NOTES: Imagery: Manawatu-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0.	PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL		
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0	First version	GIHU	KJOH	03/07/25	BMQ	15/08/25	SCALE (A3) 1:20,000
1	Final version	GIHU	KJOH	15/08/25			
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE	FIG No. FIGURE 26
							REV 1

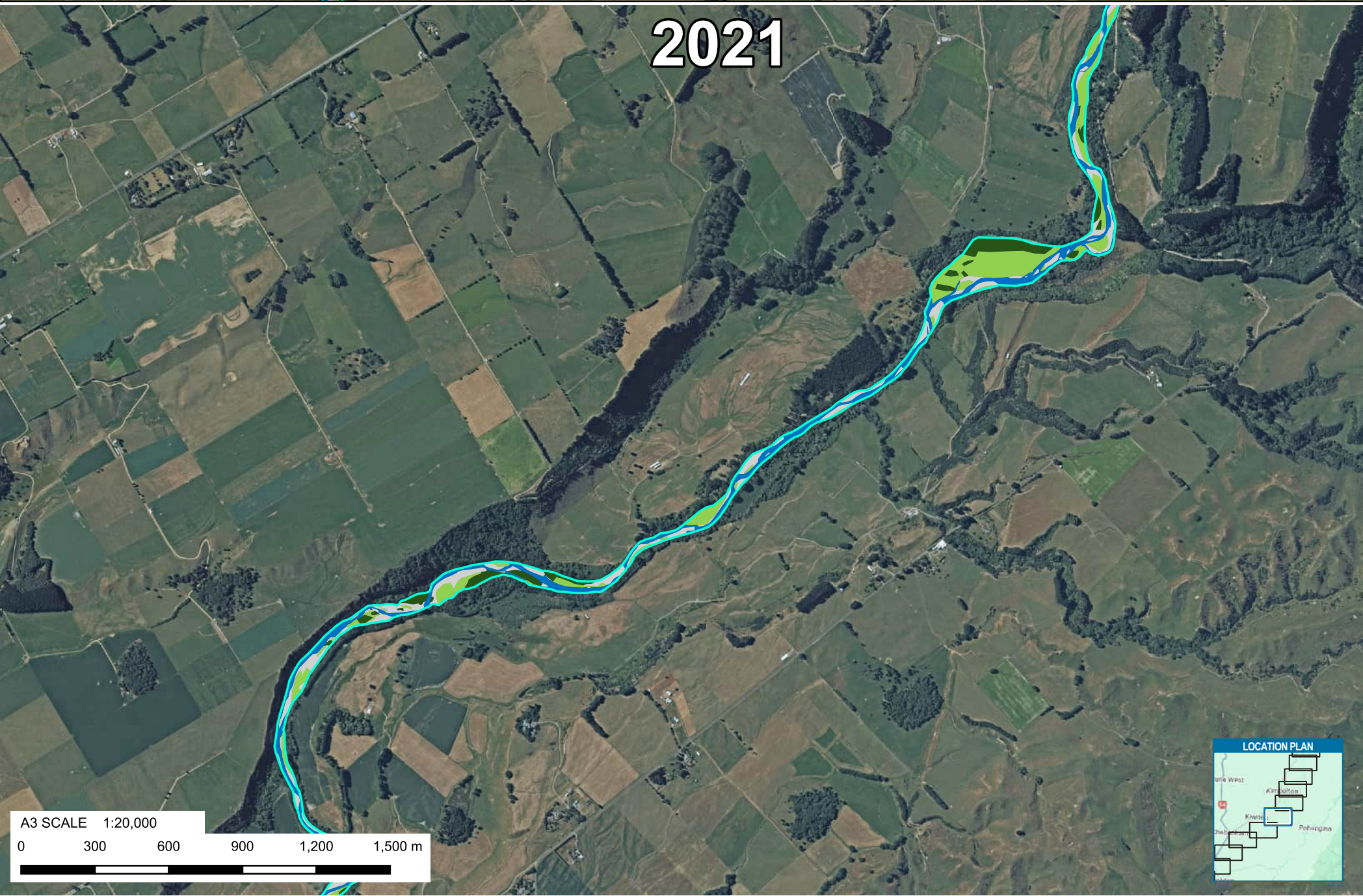
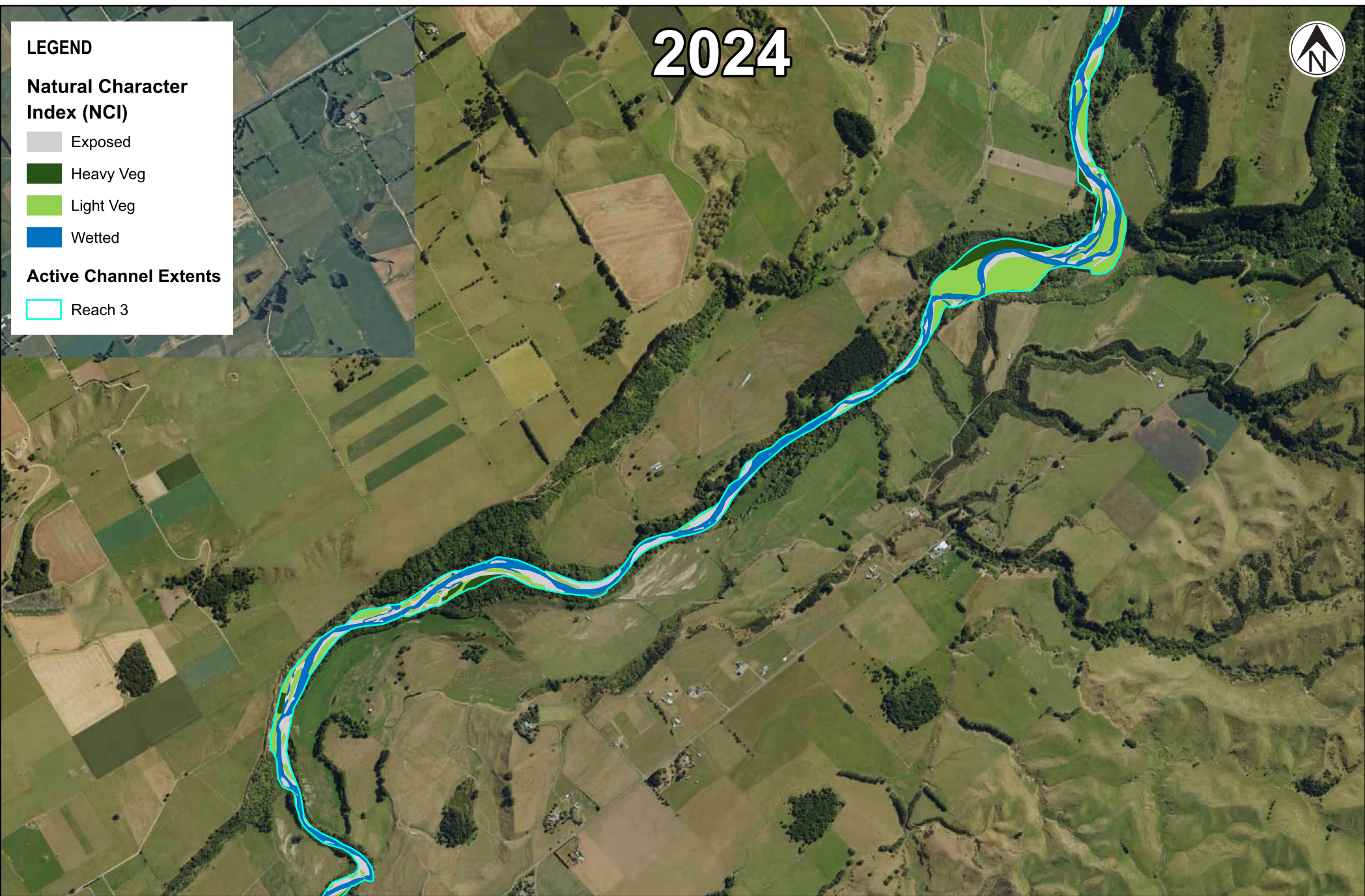
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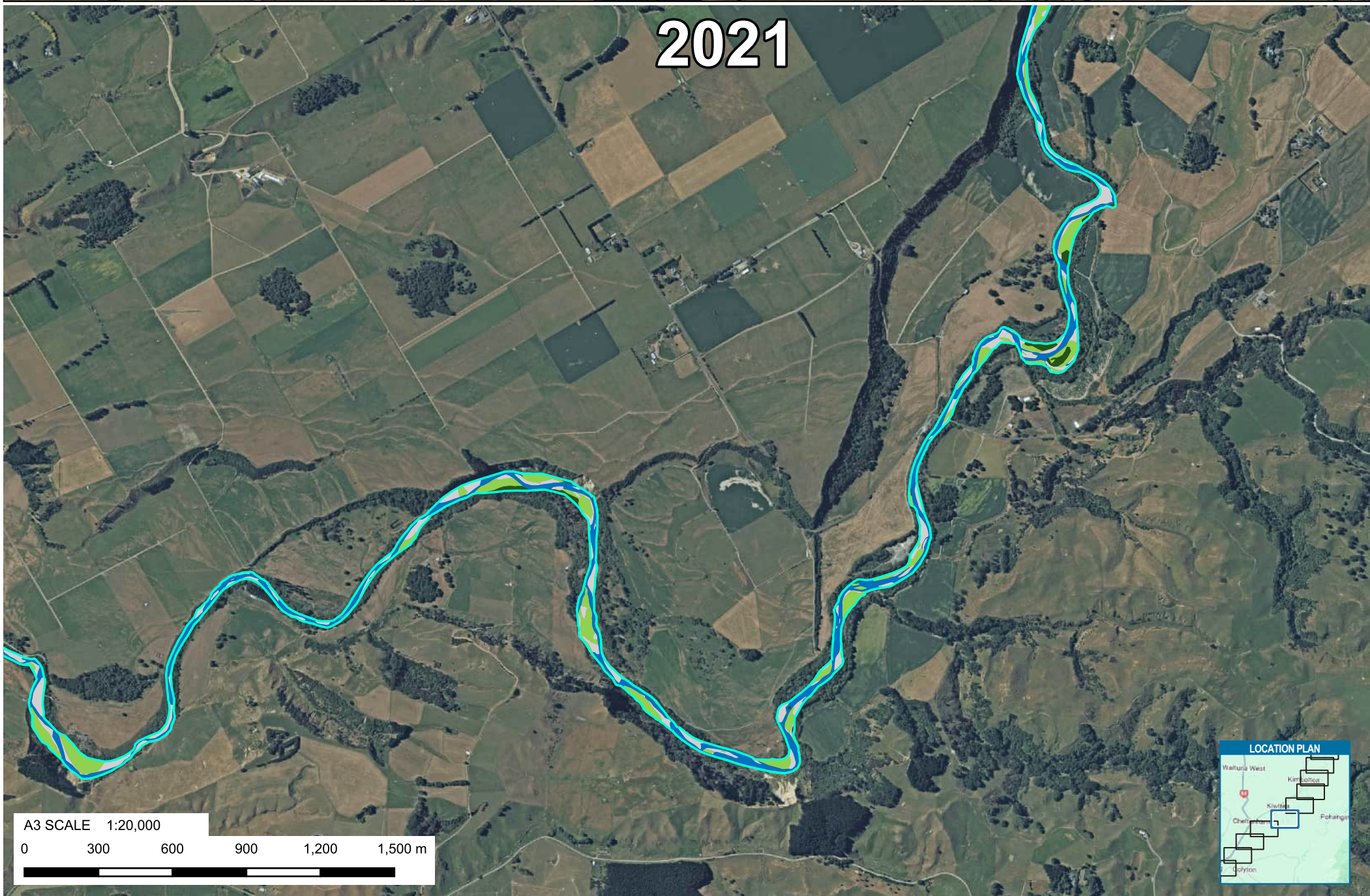
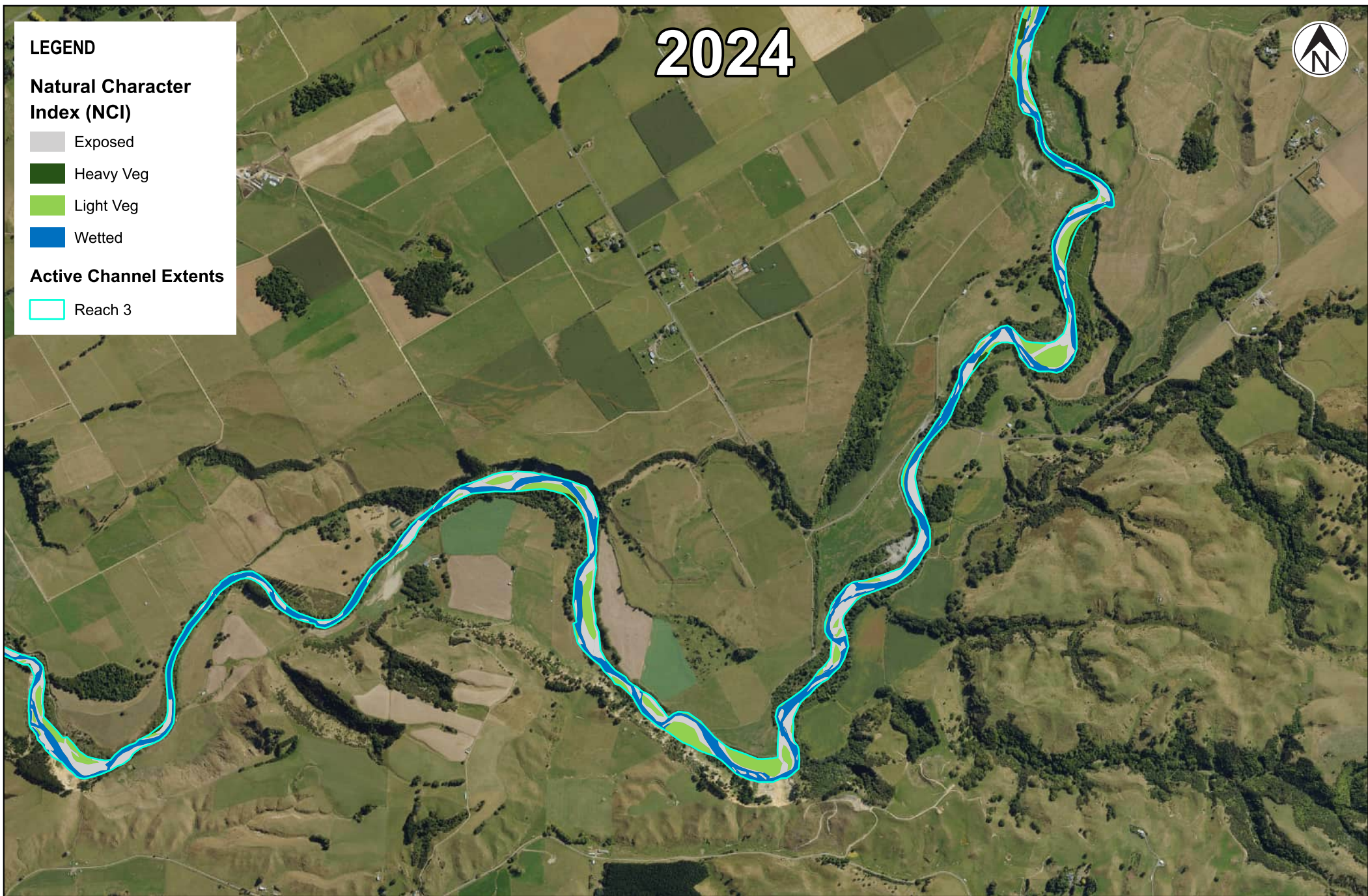


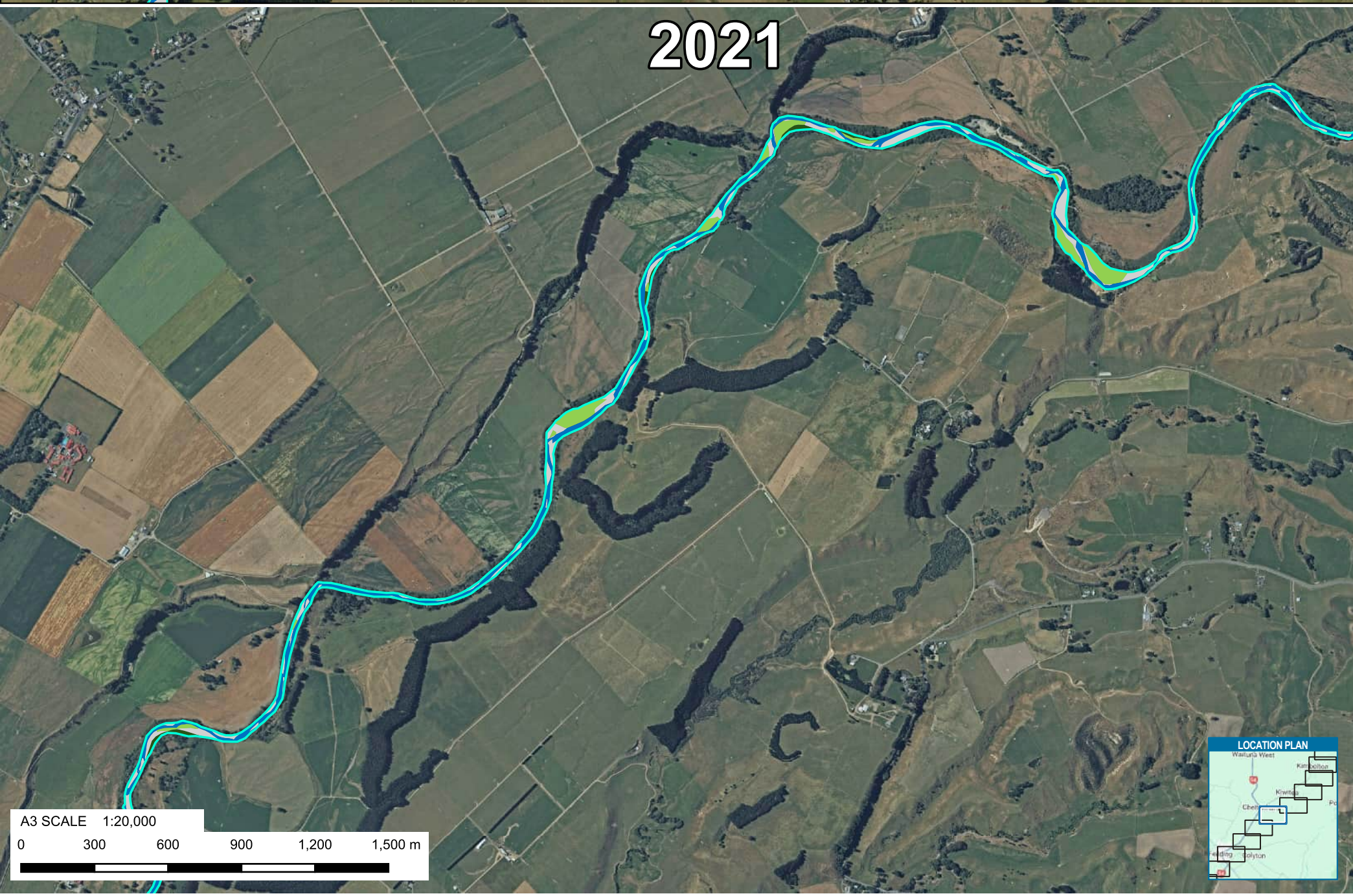








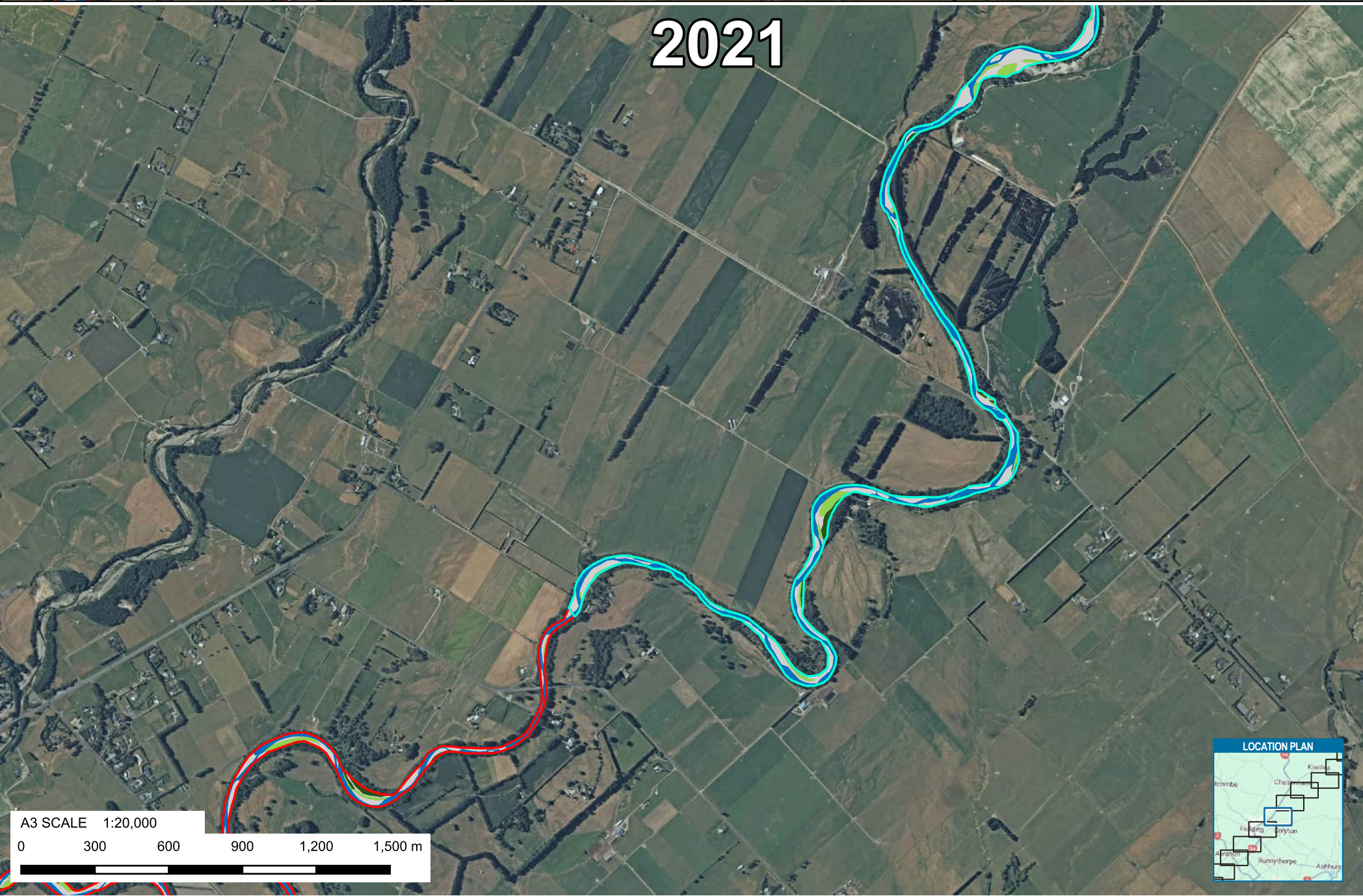
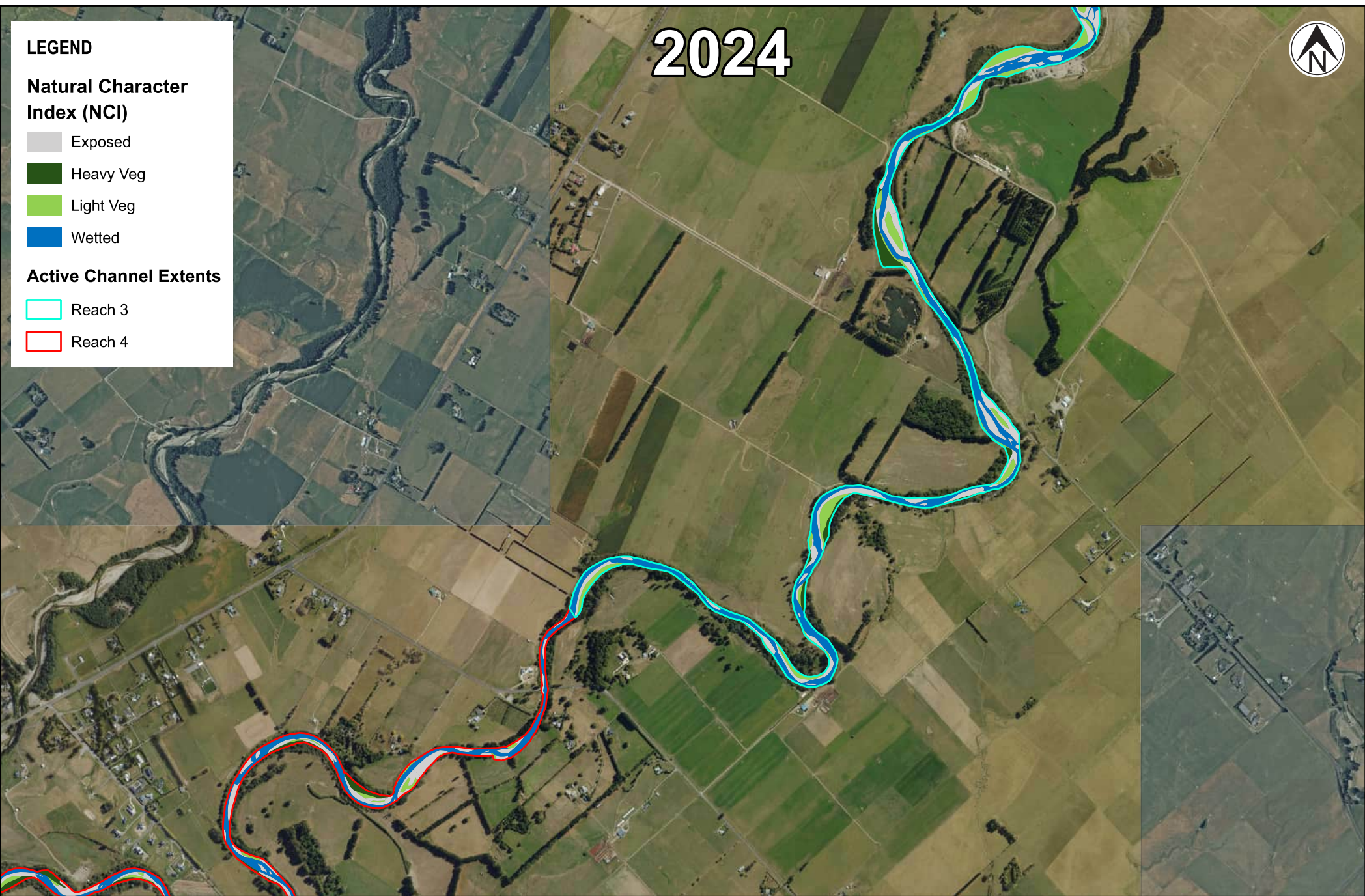


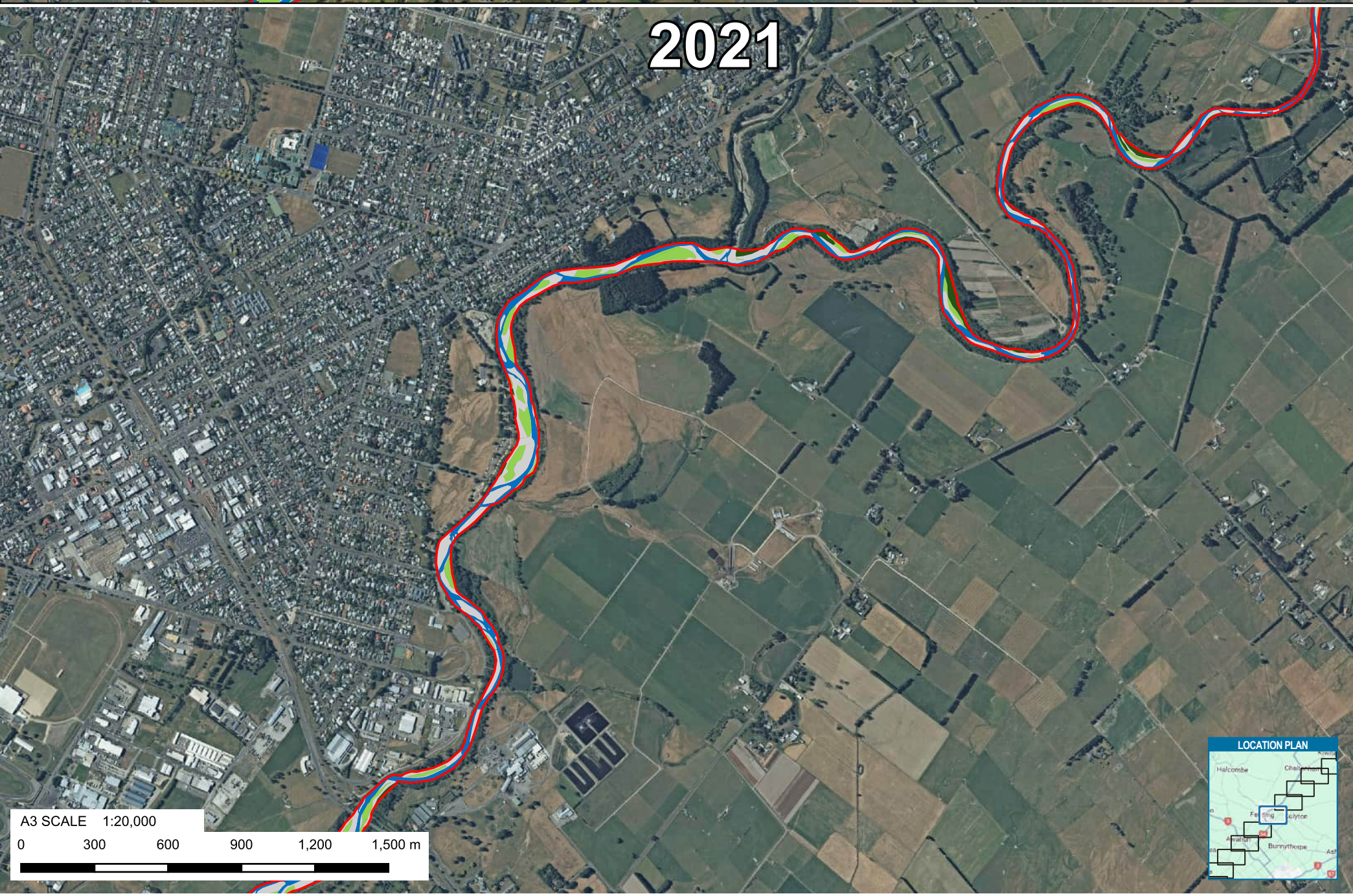


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					PROJECT POHANGINA AND ŌROUA NCI ASSESSMENTS		
					TITLE ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 2		
0	First version	GIHU	KJOH	03/07/25	BMQ	15/08/25	SCALE (A3) 1:20,000 FIG No. FIGURE 33 REV 1
1	Final version	GIHU	KJOH	15/08/25			
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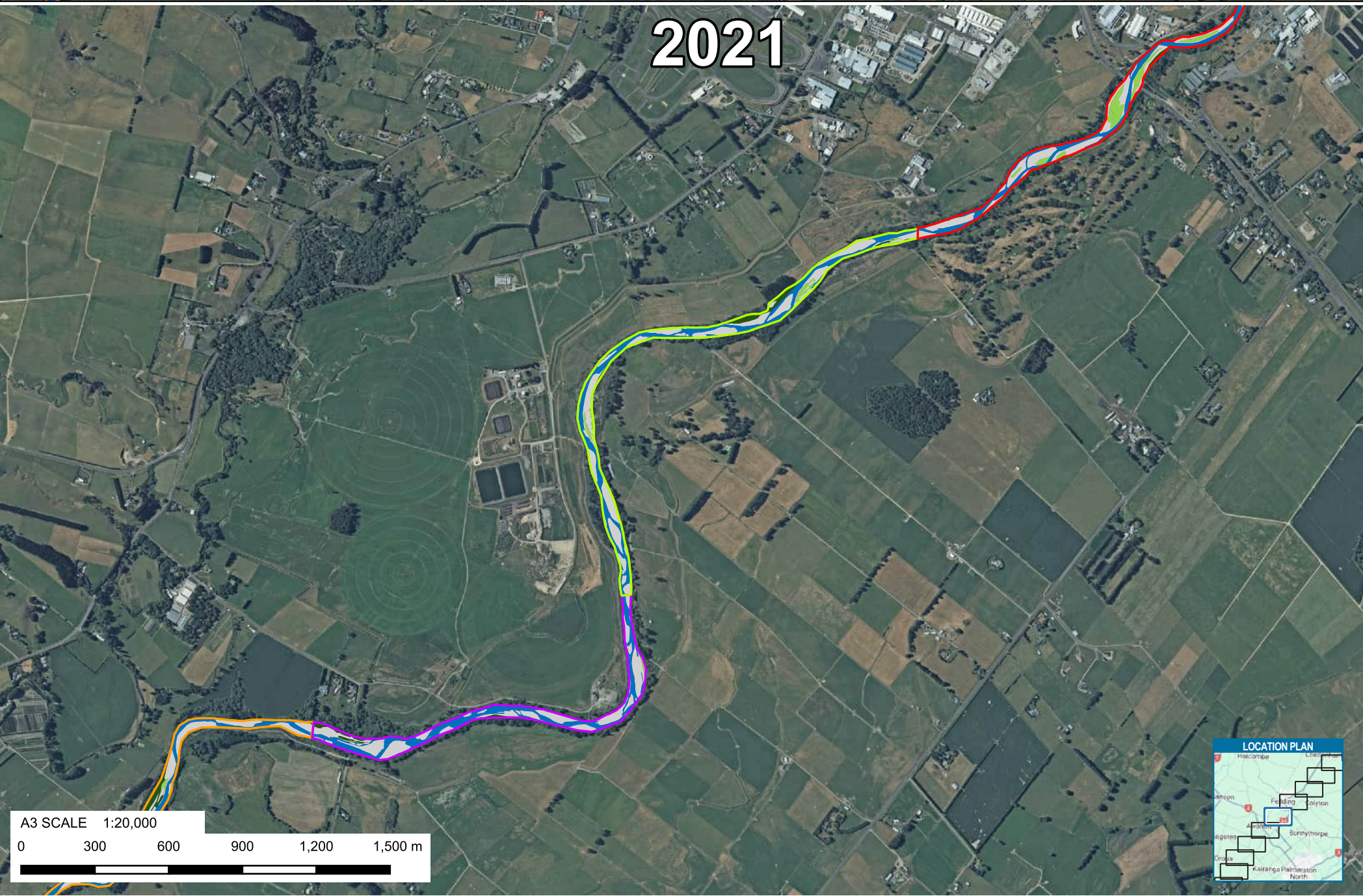
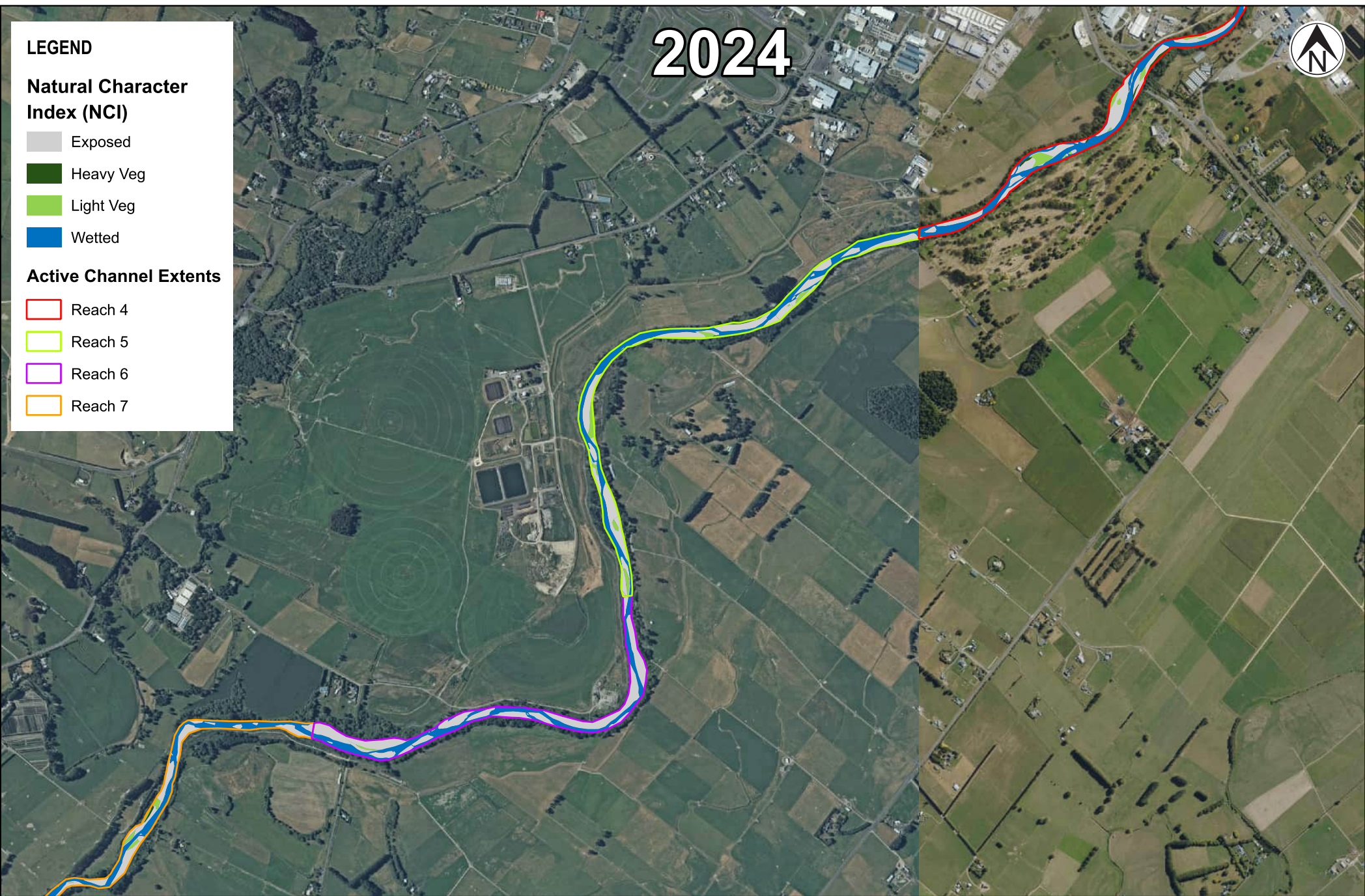




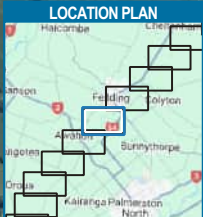
Tonkin+Taylor www.tonkintaylor.co.nz Exceptional thinking together	NOTES: Imagery: Manawatu-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0.	PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL		
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					TITLE ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 2		
0	First version	GIHU	KJOH	03/07/25	BMQ	15/08/25	SCALE (A3) 1:20,000
1	Final version	GIHU	KJOH	15/08/25			
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE	FIG No. FIGURE 36
							REV 1

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A3 SCALE 1:20,000
0 300 600 900 1,200 1,500 m



NOTES:
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Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ.
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REV	DESCRIPTION
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GIHU	KJOH	03/07/25
GIHU	KJOH	15/08/25
GIS	CHK	DATE

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GIHU
KJOH

JUL.25
JUL.25
AUG.25

BMQ 15/08/25

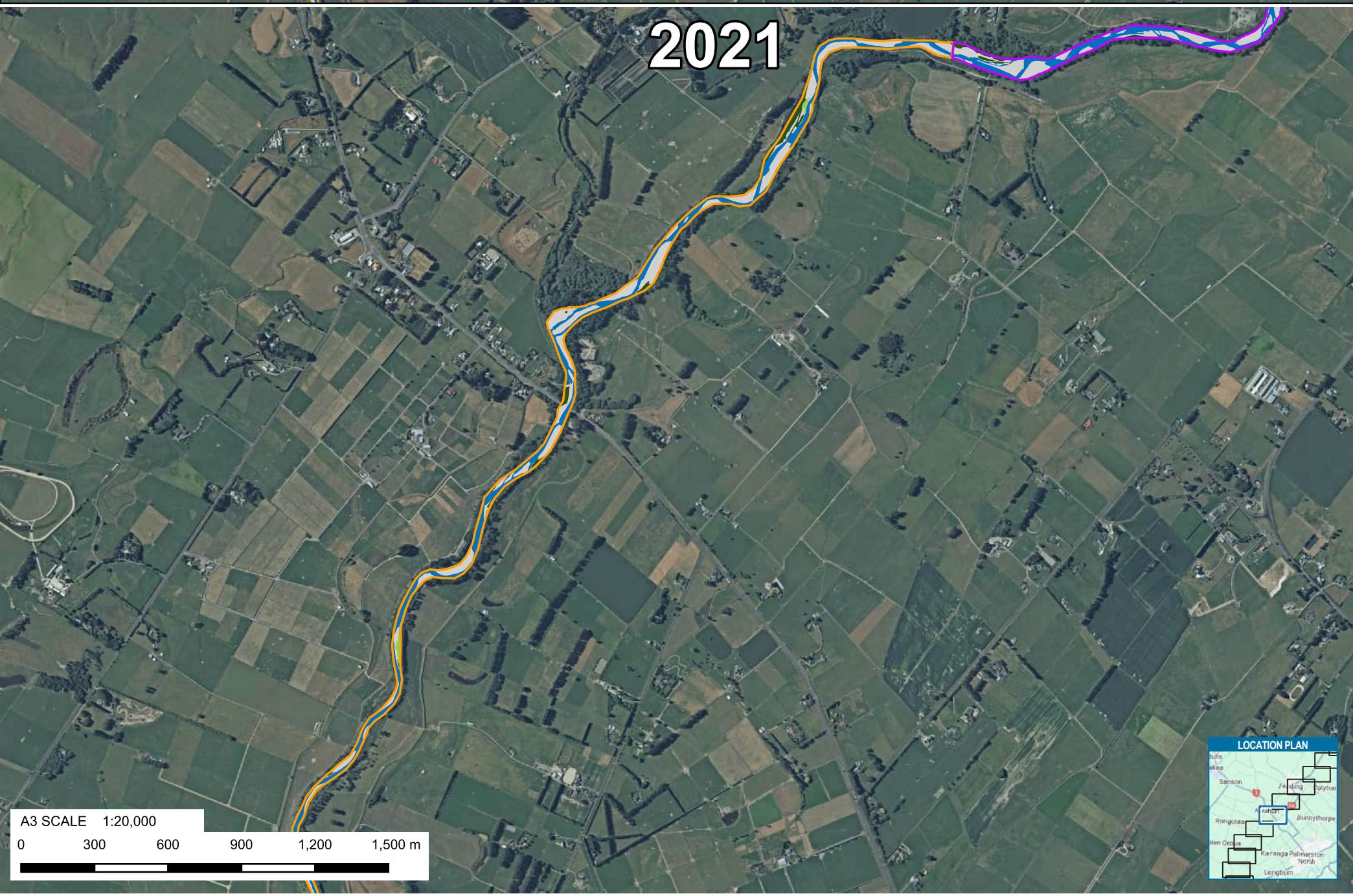
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CLIENT **HORIZONS REGIONAL COUNCIL**
PROJECT **POHANGINA AND ŌROUA NCI ASSESSMENTS**

TITLE **ŌROUA RIVER**
NATURAL CHARACTER INDEX - EPOCH 2

SCALE (A3) 1:20,000 FIG No. FIGURE 37

REV 1



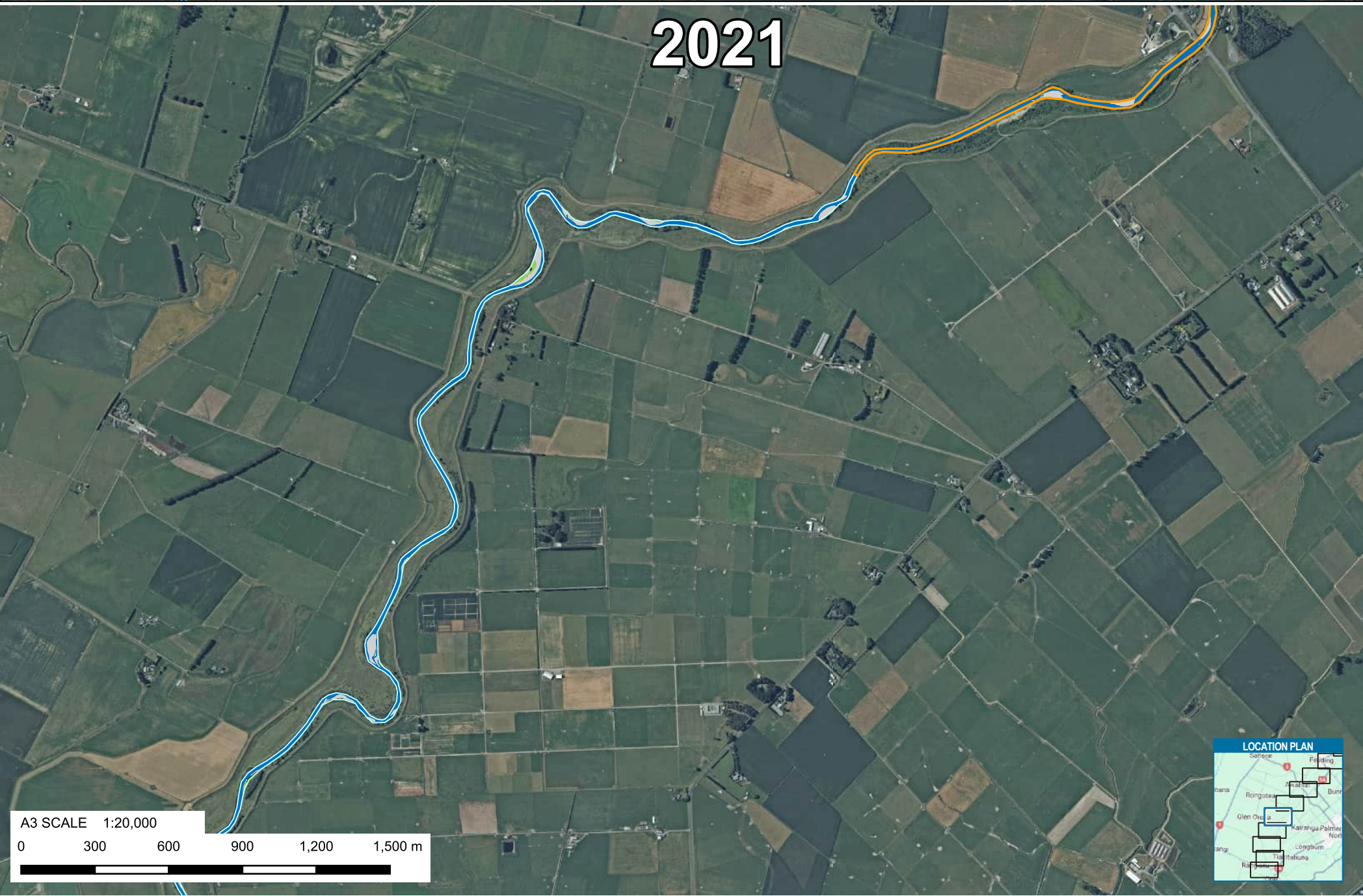
 Tonkin+Taylor www.tonkintaylor.co.nz <i>Exceptional thinking together</i>		NOTES: Imagery: Manawatu-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0.				PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL		
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					TITLE ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 2						
		0 1 First version Final version		GIHU GIHU	KJOH KJOH	03/07/25 15/08/25	BMQ 15/08/25				
		REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE	SCALE (A3) 1:20,000	FIG No. FIGURE 38	REV 1

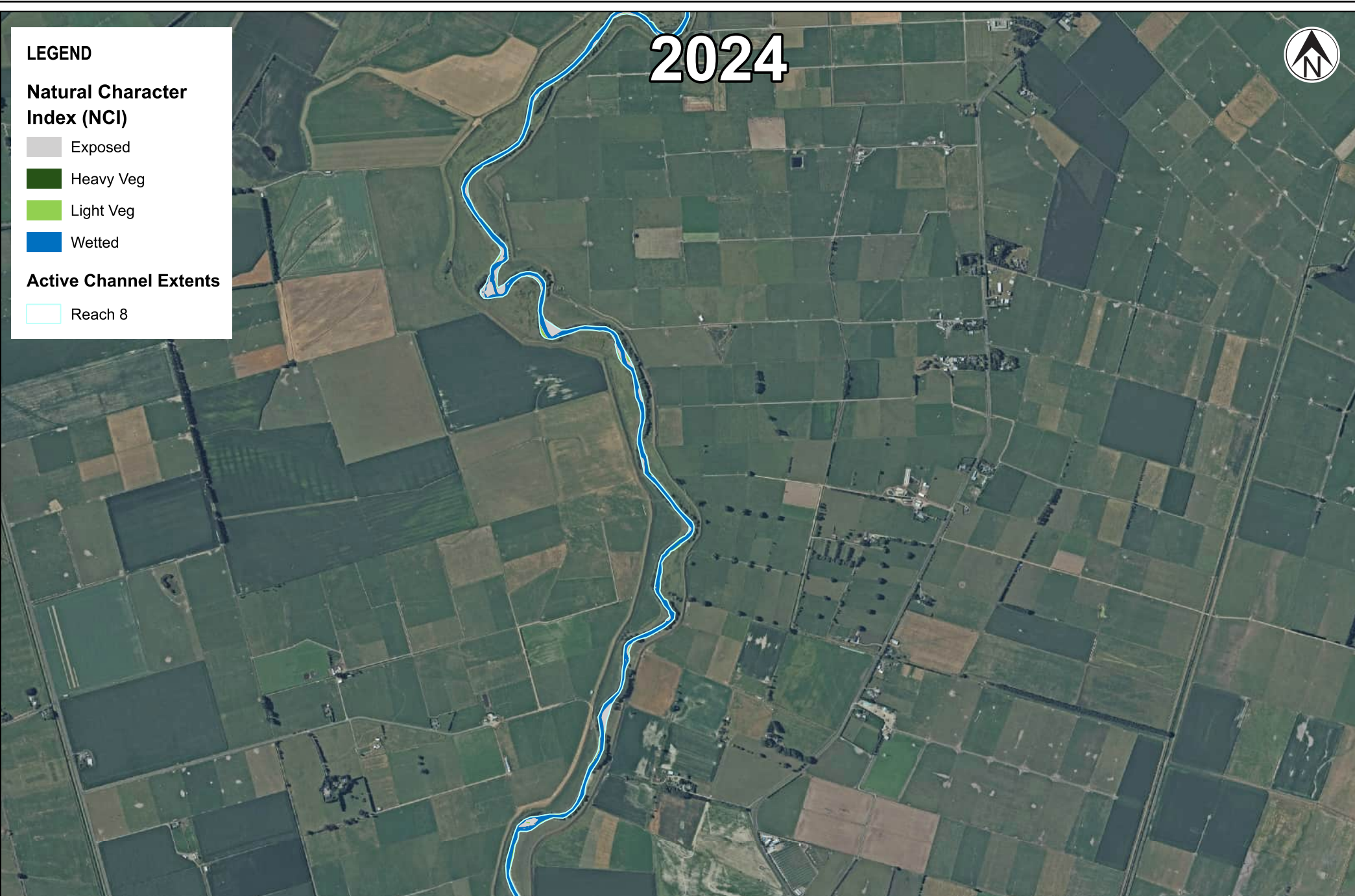
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					TITLE ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 2		
0	First version	GIHU	KJOH	03/07/25	BMQ	15/08/25	SCALE (A3) 1:20,000 FIG No. FIGURE 39 REV 1
1	Final version	GIHU	KJOH	15/08/25			
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE	

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A3 SCALE 1:20,000
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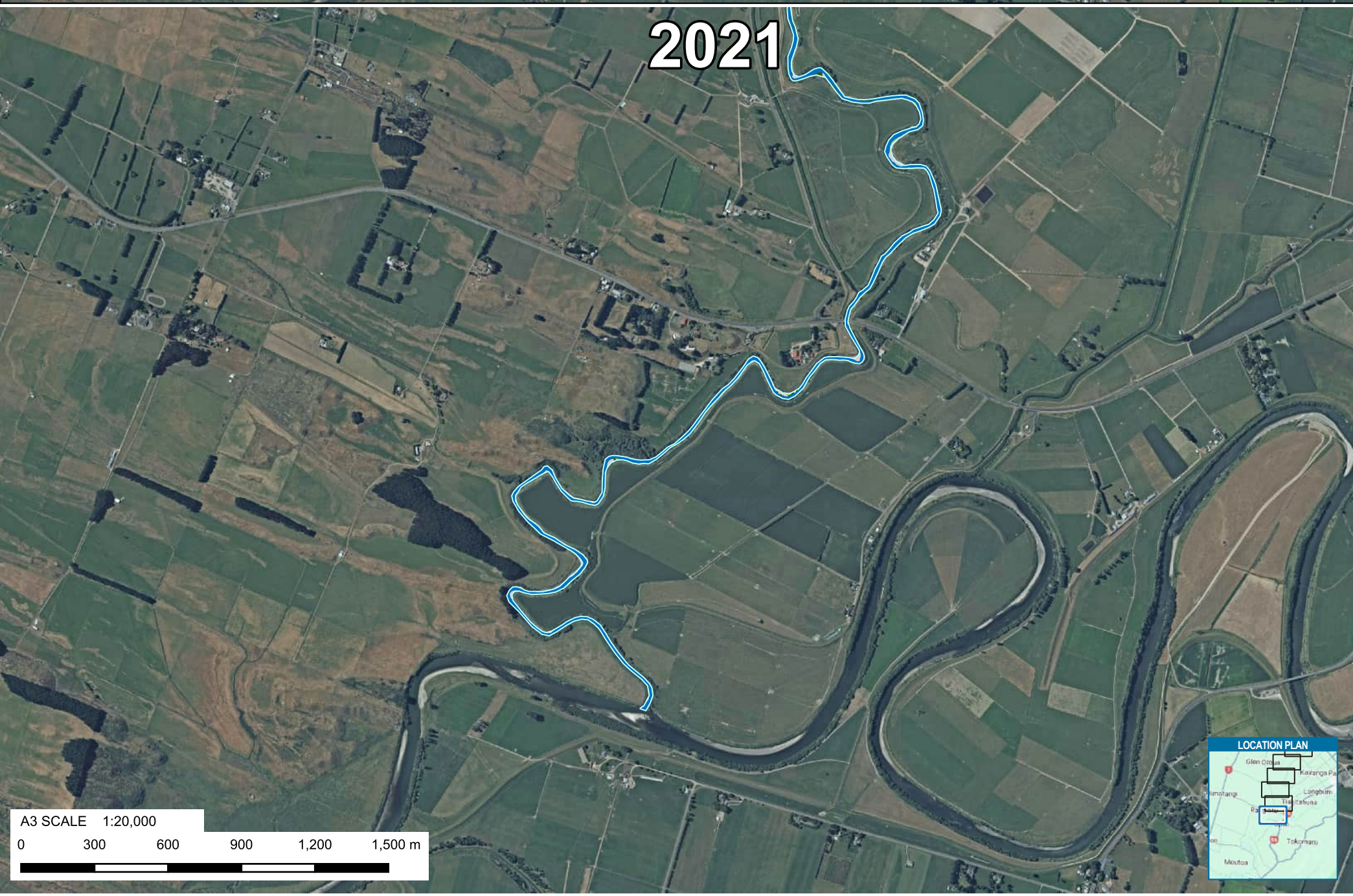


 Tonkin+Taylor www.tonkintaylor.co.nz <i>Exceptional thinking together</i>		NOTES: Imagery: Manawātū-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Manawātū-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0.				PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL		
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						CHECKED					
0	First version	GIHU	KJOH	03/07/25	BMQ		15/08/25		SCALE (A3) 1:20,000 FIG No. FIGURE 42 REV 1		
1	Final version	GIHU	KJOH	15/08/25							
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED		DATE				



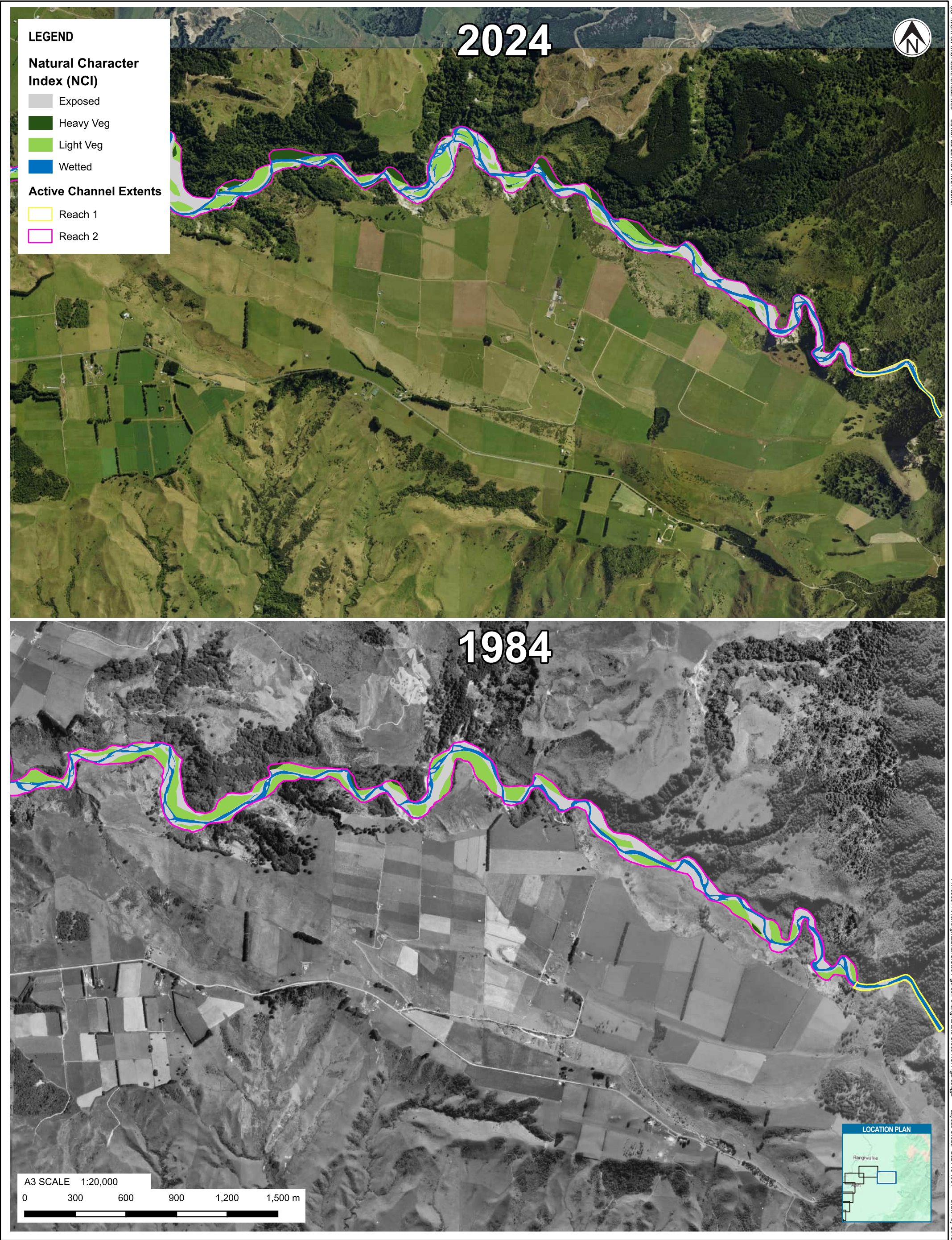
 Tonkin+Taylor www.tonkintaylor.co.nz <i>Exceptional thinking together</i>	NOTES: Imagery: Manawātū-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Manawātū-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0.				PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL			
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	CHECKED		KJOH	AUG.25							
	0	First version	GIHU	KJOH	03/07/25	BMQ		15/08/25		TITLE ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 2	
1	Final version	GIHU	KJOH	15/08/25							
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED		DATE		SCALE (A3) 1:20,000	FIG No. FIGURE 43	REV 1

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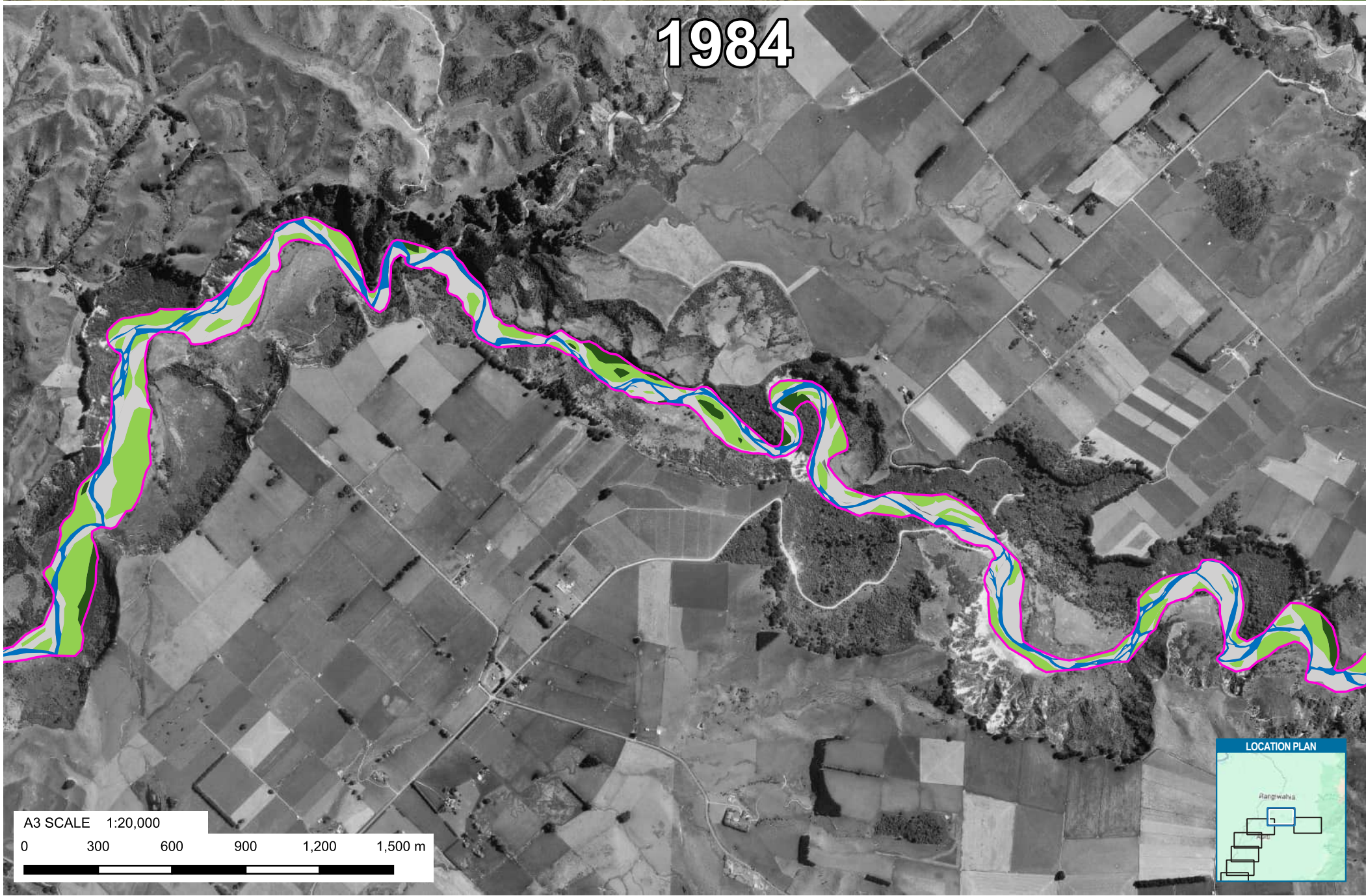
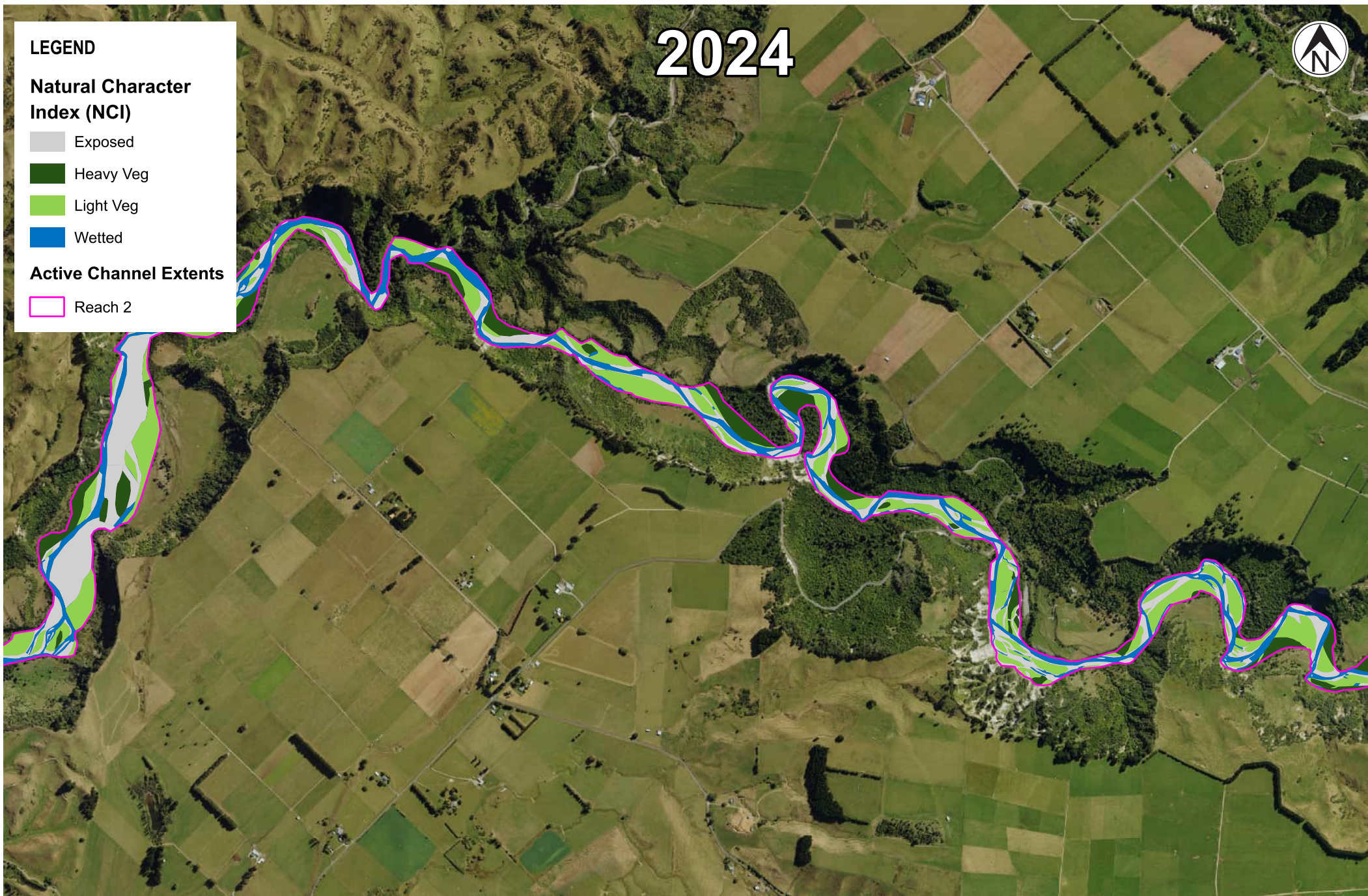
 www.tonkintaylor.co.nz Exceptional thinking together	NOTES: Imagery: Manawatu-Whanganui 0.3m Rural Aerial Photos (2021-2022) from LINZ. Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0.	PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL		
					PROJECT POHANGINA AND ŌROUA NCI ASSESSMENTS		
					TITLE ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 2		
0	First version	GIHU	KJOH	03/07/25	BMQ	15/08/25	SCALE (A3) 1:20,000 FIG No. FIGURE 44 REV 1
1	Final version	GIHU	KJOH	15/08/25			
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE	

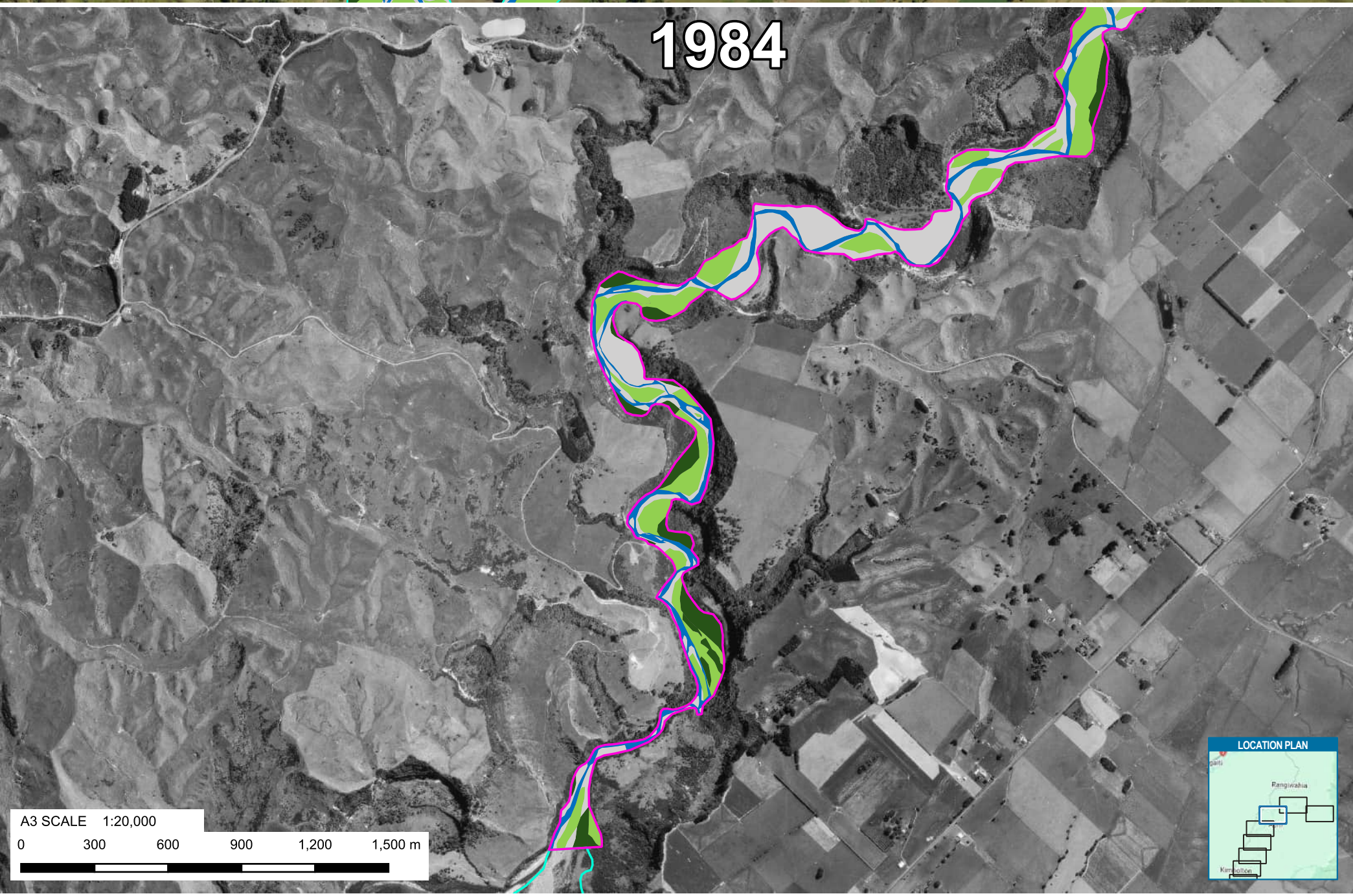
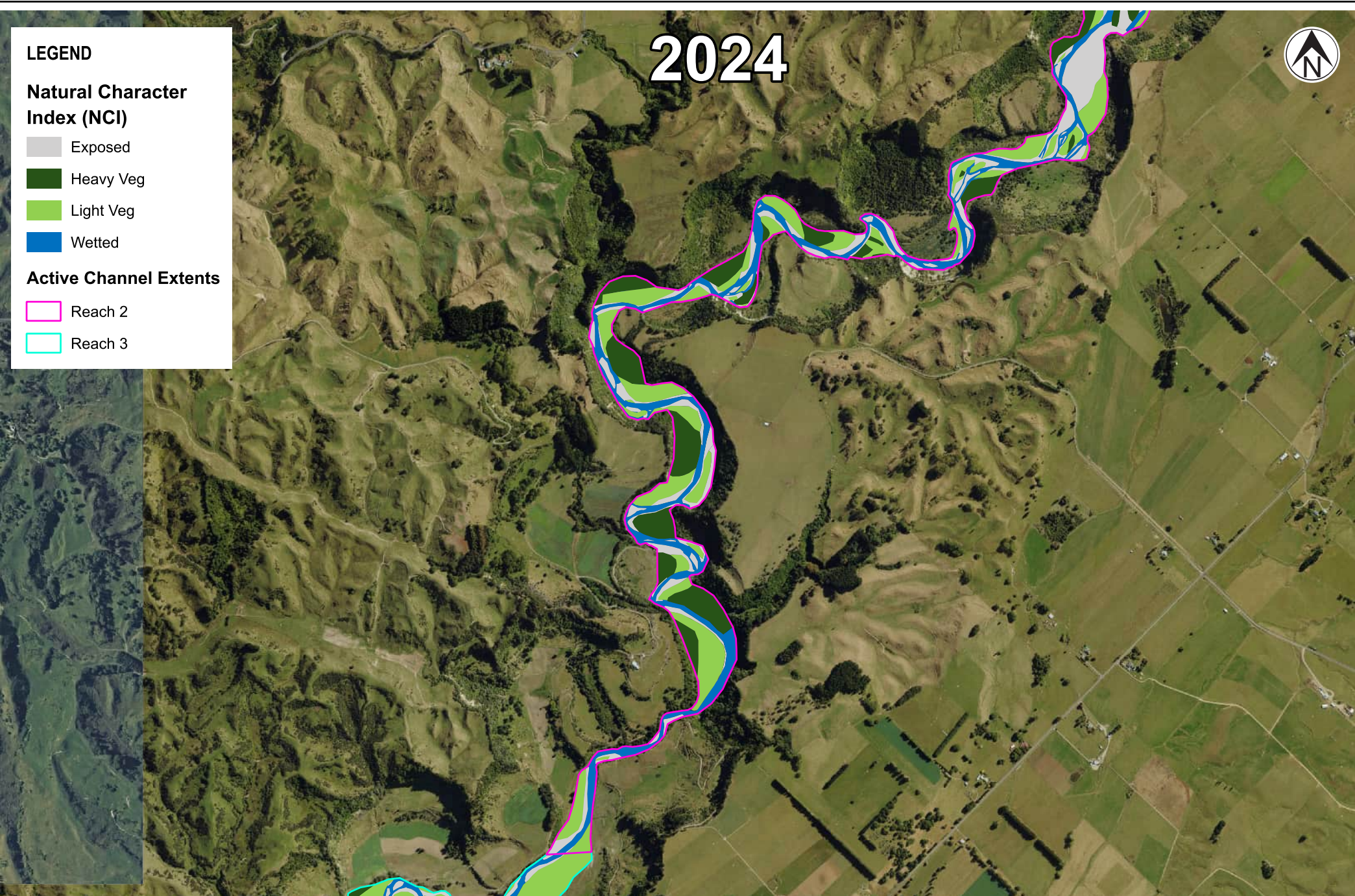
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					TITLE ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 3		
0	First version	GIHU	KJOH	03/07/25	BMQ	15/08/25	SCALE (A3) 1:20,000 FIG No. FIGURE 45 REV 1
1	Final version	GIHU	KJOH	15/08/25			
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE	

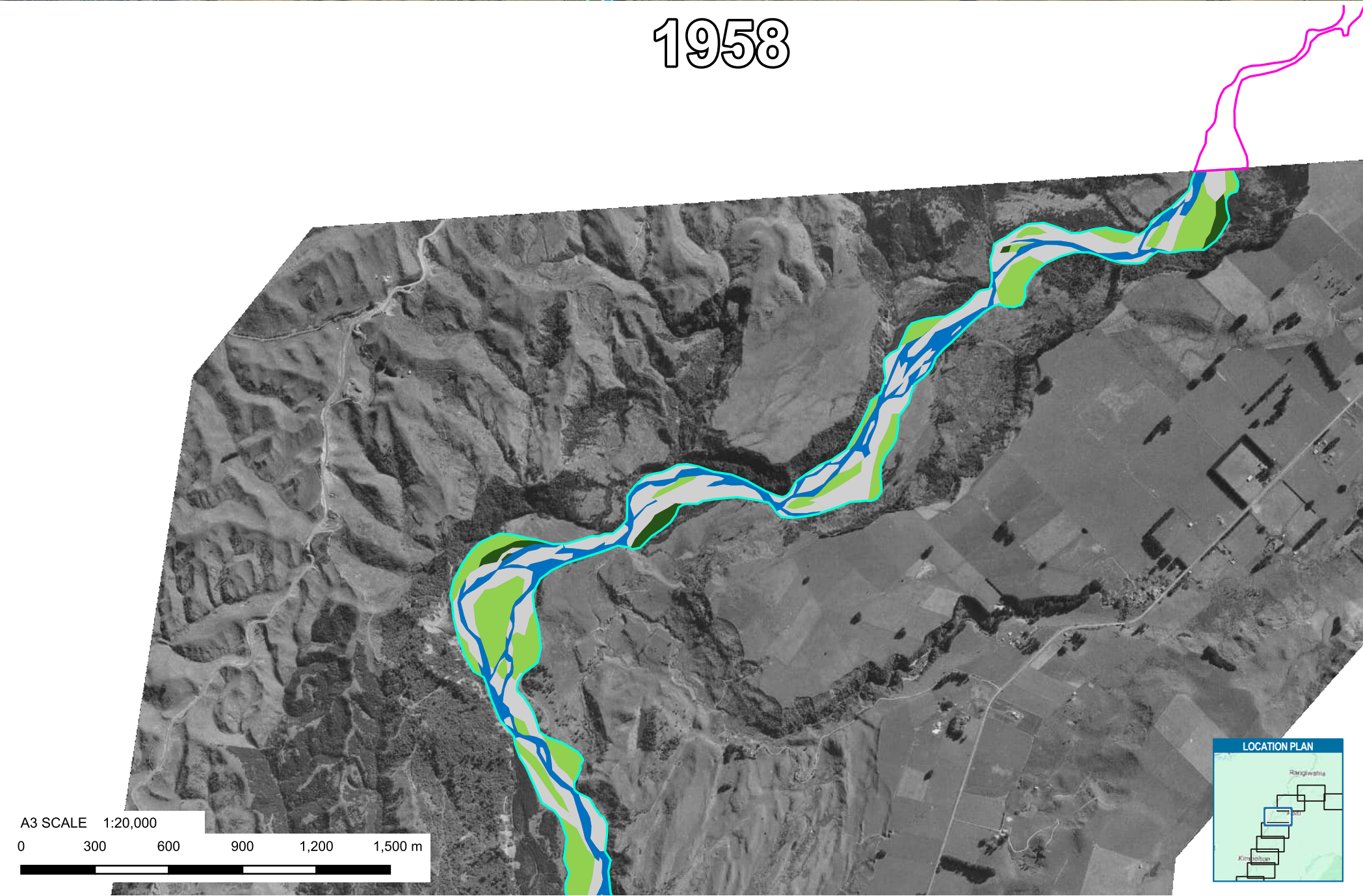
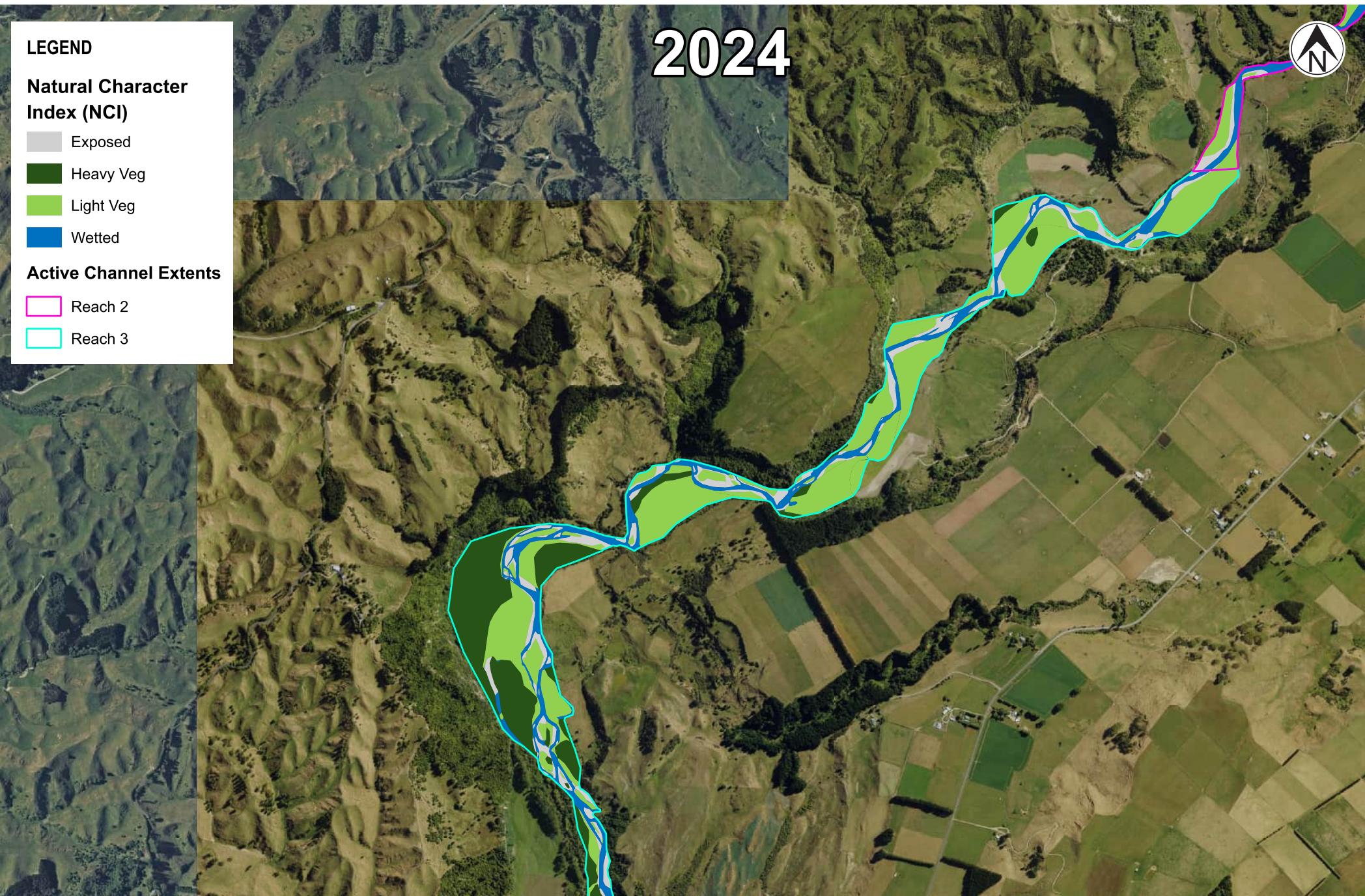
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					PROJECT POHANGINA AND ŌROUA NCI ASSESSMENTS		
					TITLE ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 3		
0	First version	GIHU	KJOH	03/07/25	BMQ	15/08/25	SCALE (A3) 1:20,000
1	Final version	GIHU	KJOH	15/08/25			
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE	FIG No. FIGURE 47
							REV 1

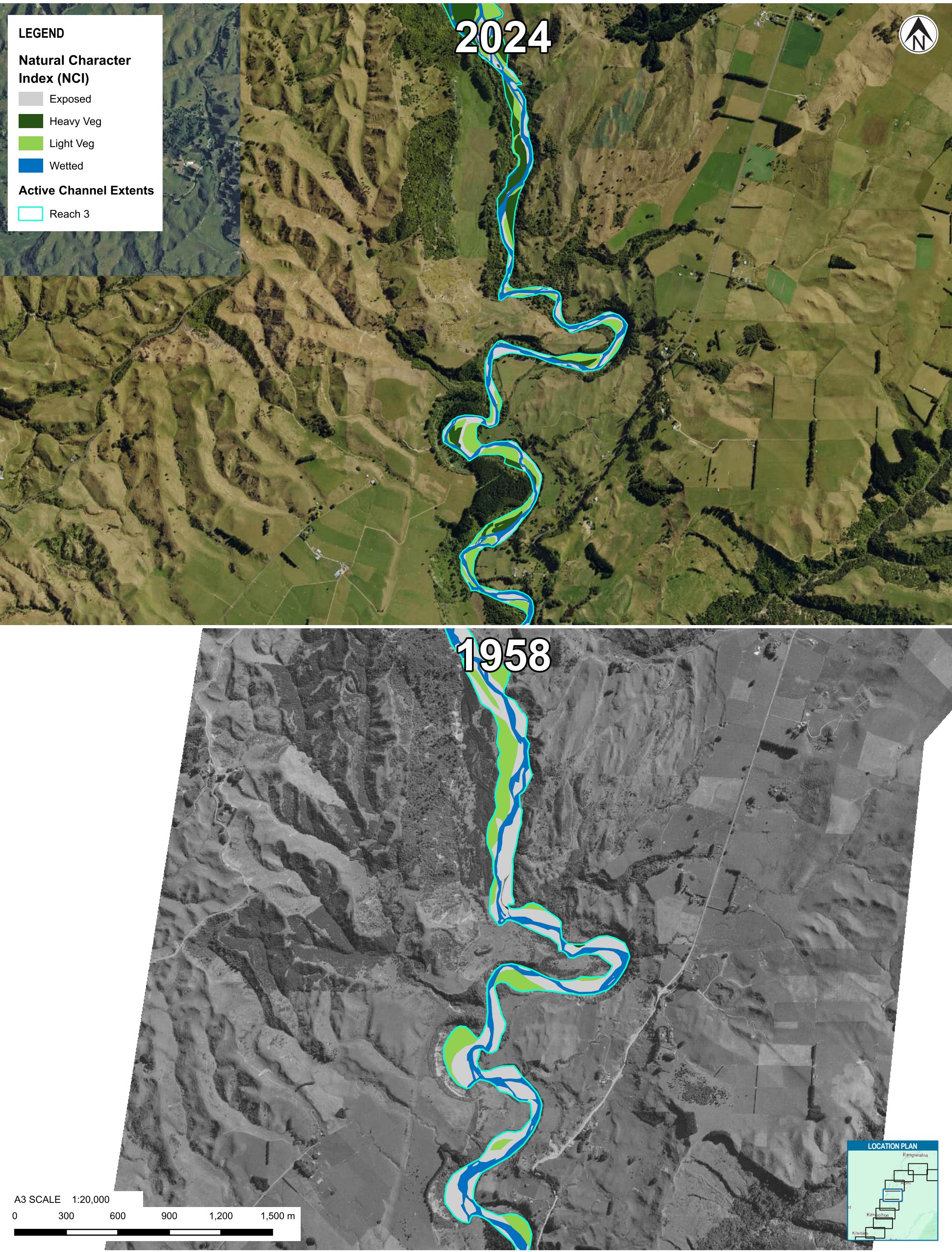
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A3 SCALE 1:20,000

0 300 600 900 1,200 1,500 m

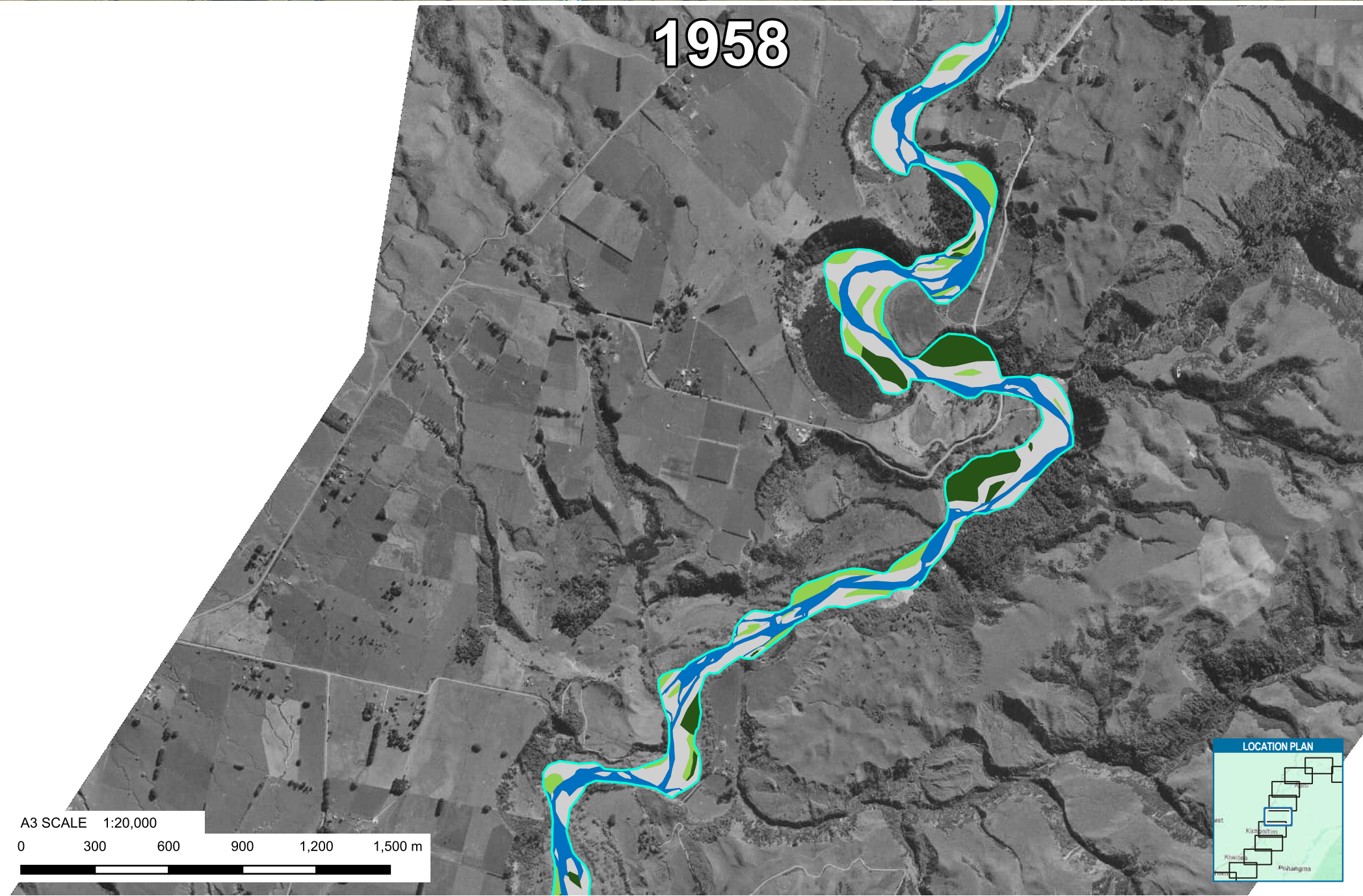
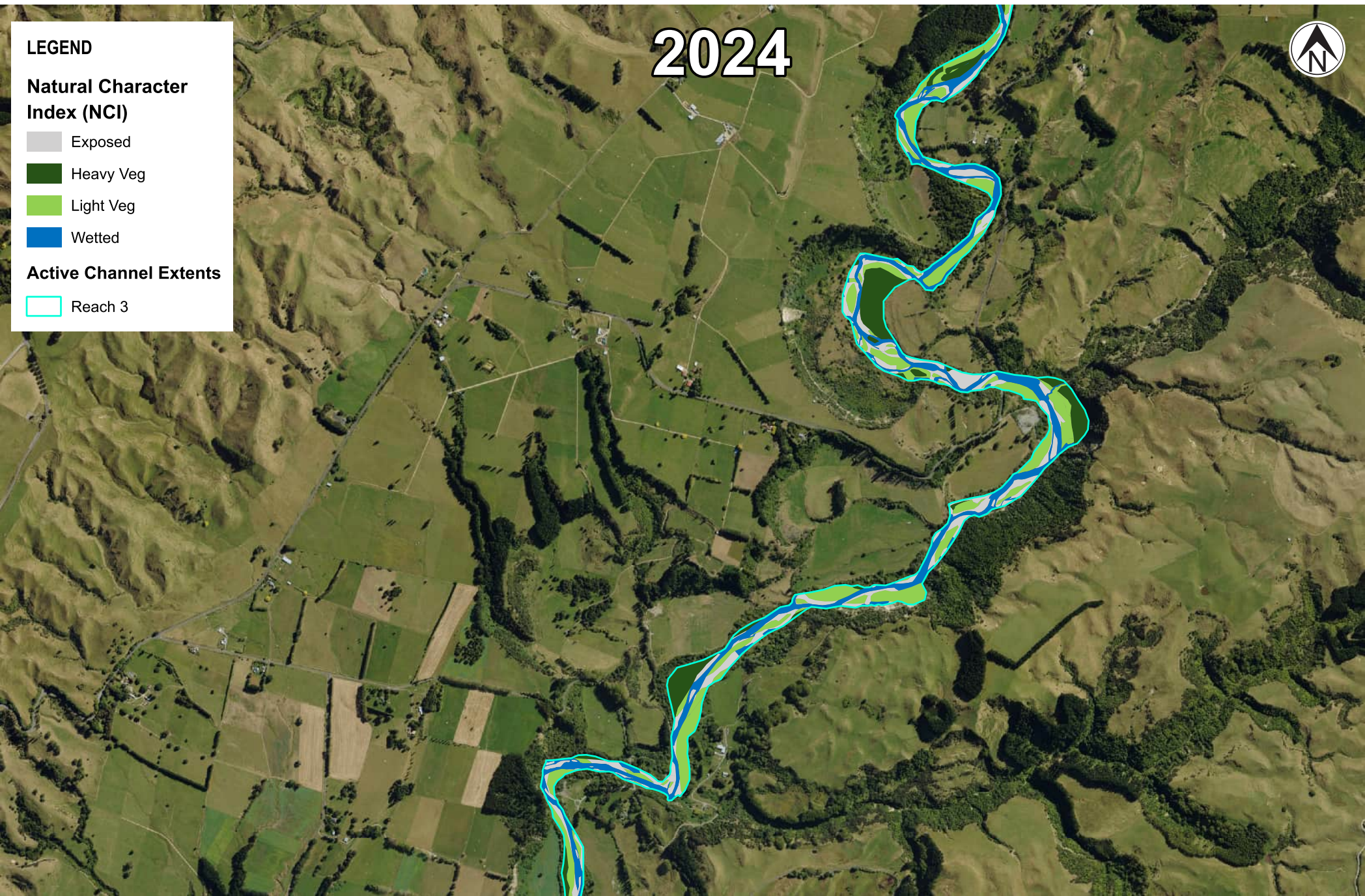


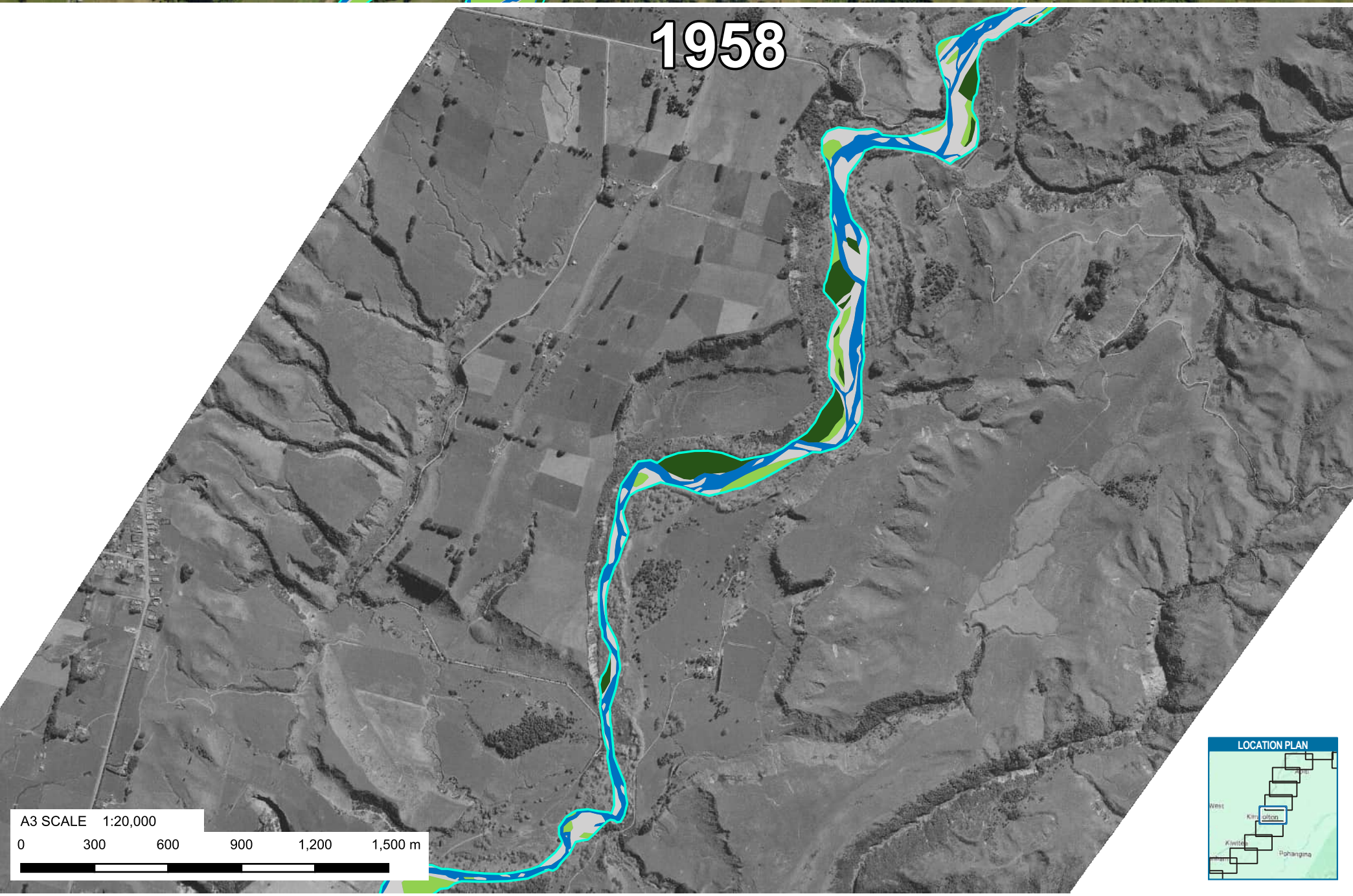
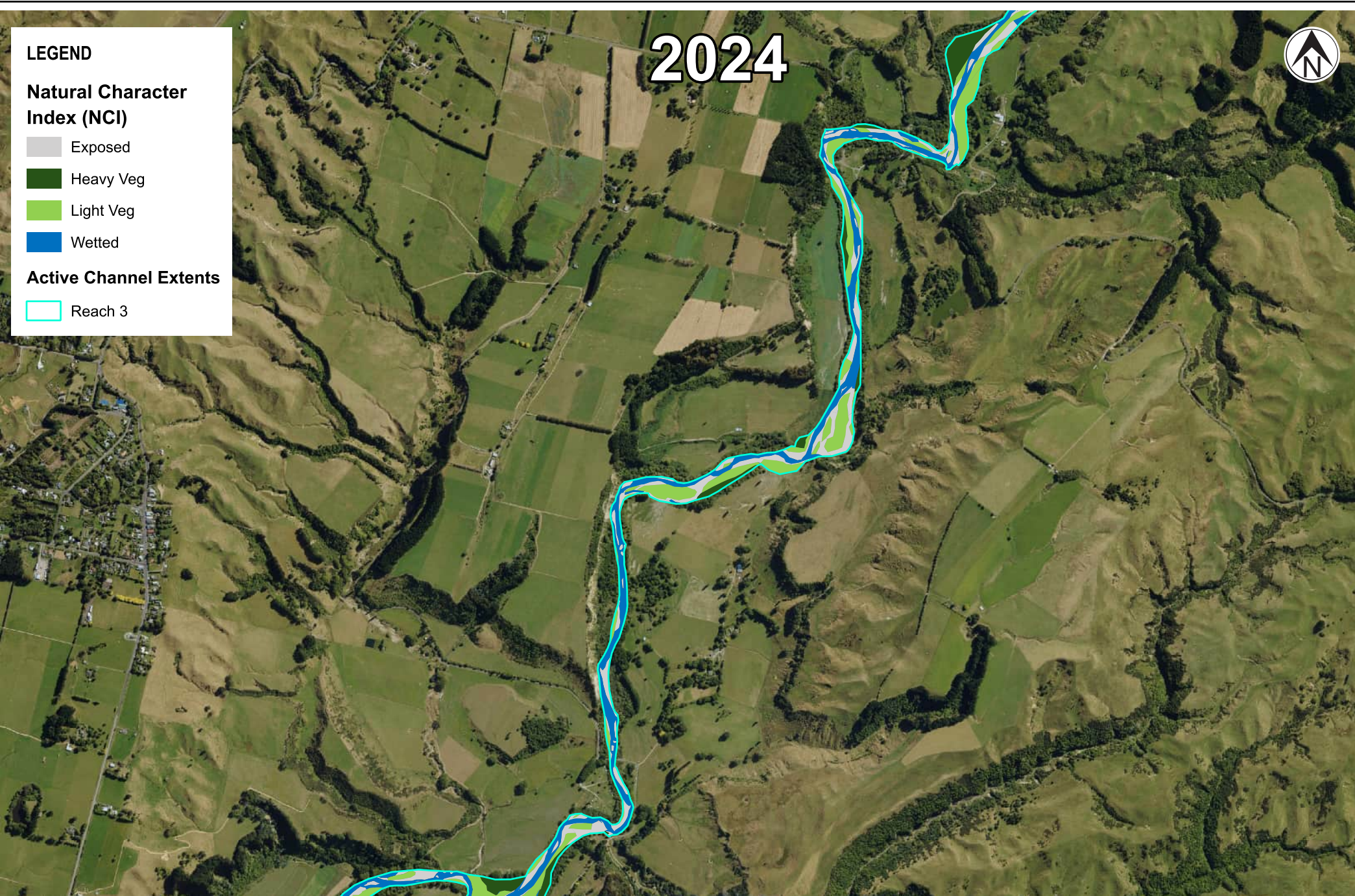


NOTES: Imagery: Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0. Aerial Imagery 1958 OrouaPohangina. Data supplied by Horizons Regional Council.					
0	First version	GIHU	KJOH	03/07/25	
1	Final version	GIHU	KJOH	15/08/25	
REV	DESCRIPTION	GIS	CHK	DATE	

PROJECT No. 1098311.0000		
DESIGNED	GIHU	JUL.25
DRAWN	GIHU	JUL.25
CHECKED	KJOH	AUG.25
BMQ		15/08/25
APPROVED	DATE	

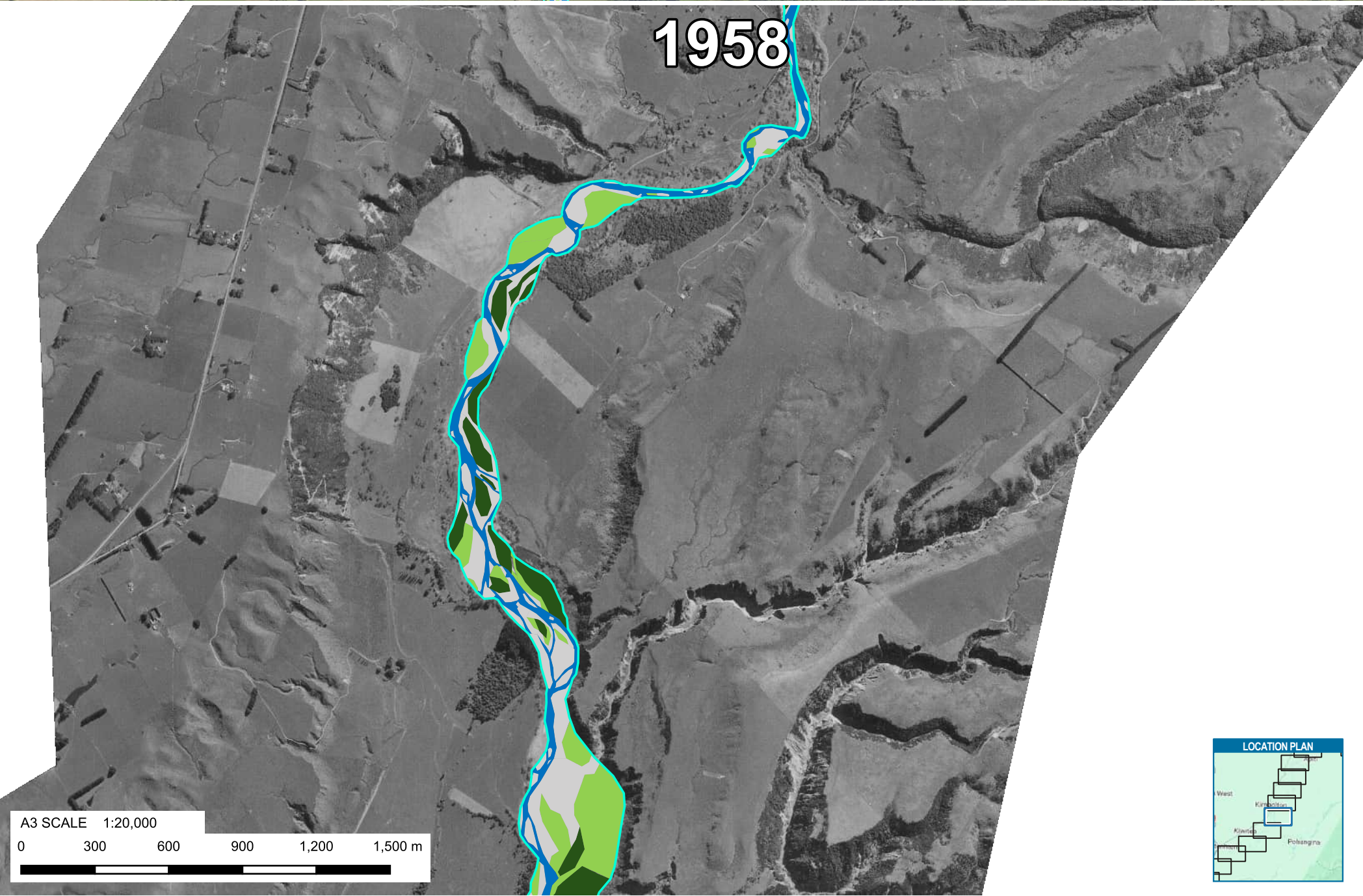
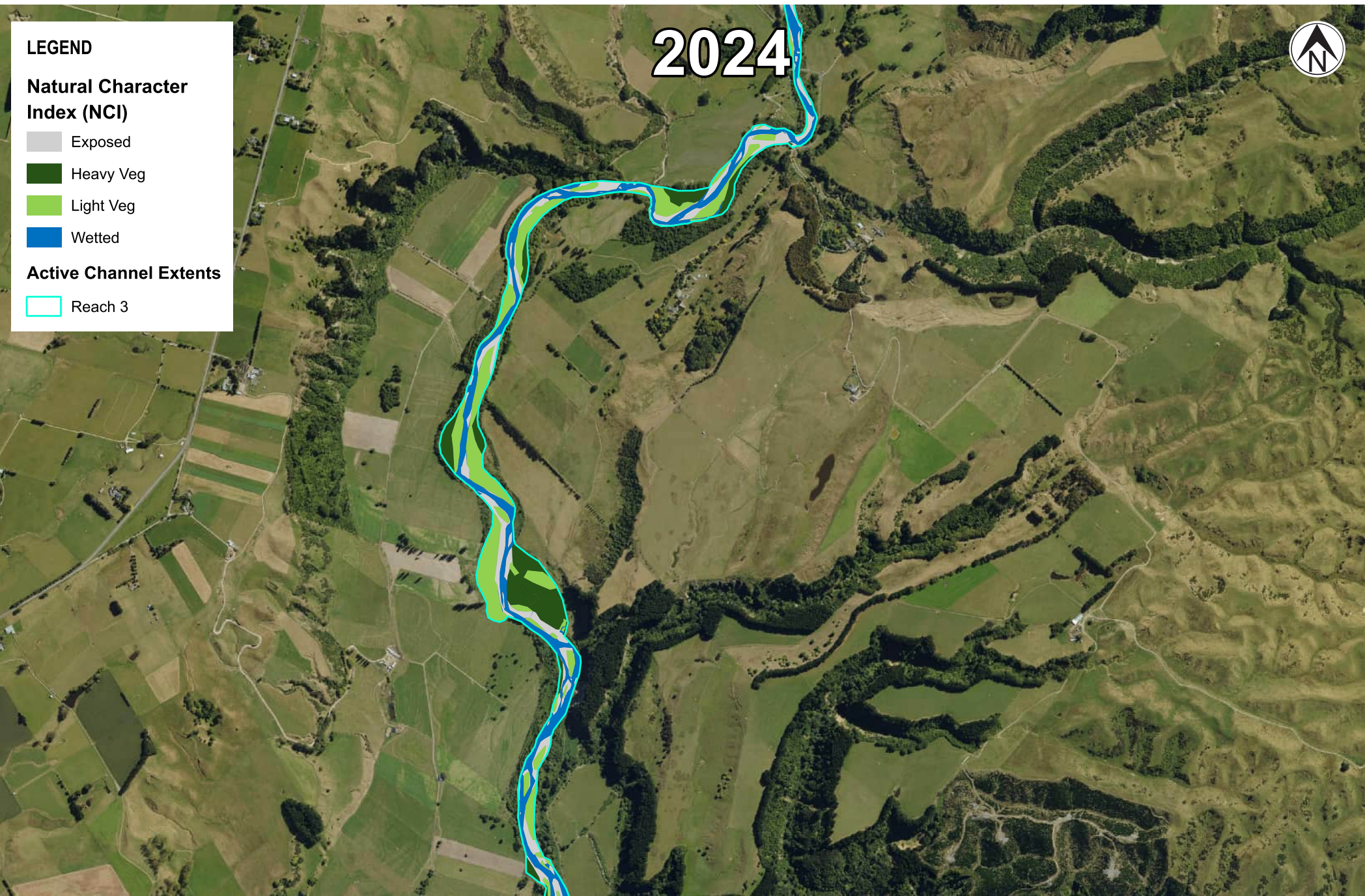
CLIENT	HORIZONS REGIONAL COUNCIL		
PROJECT	POHANGINA AND ŌROUA NCI ASSESSMENTS		
TITLE	ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 3		
SCALE (A3)	1:20,000	FIG No.	FIGURE 49
REV	1		

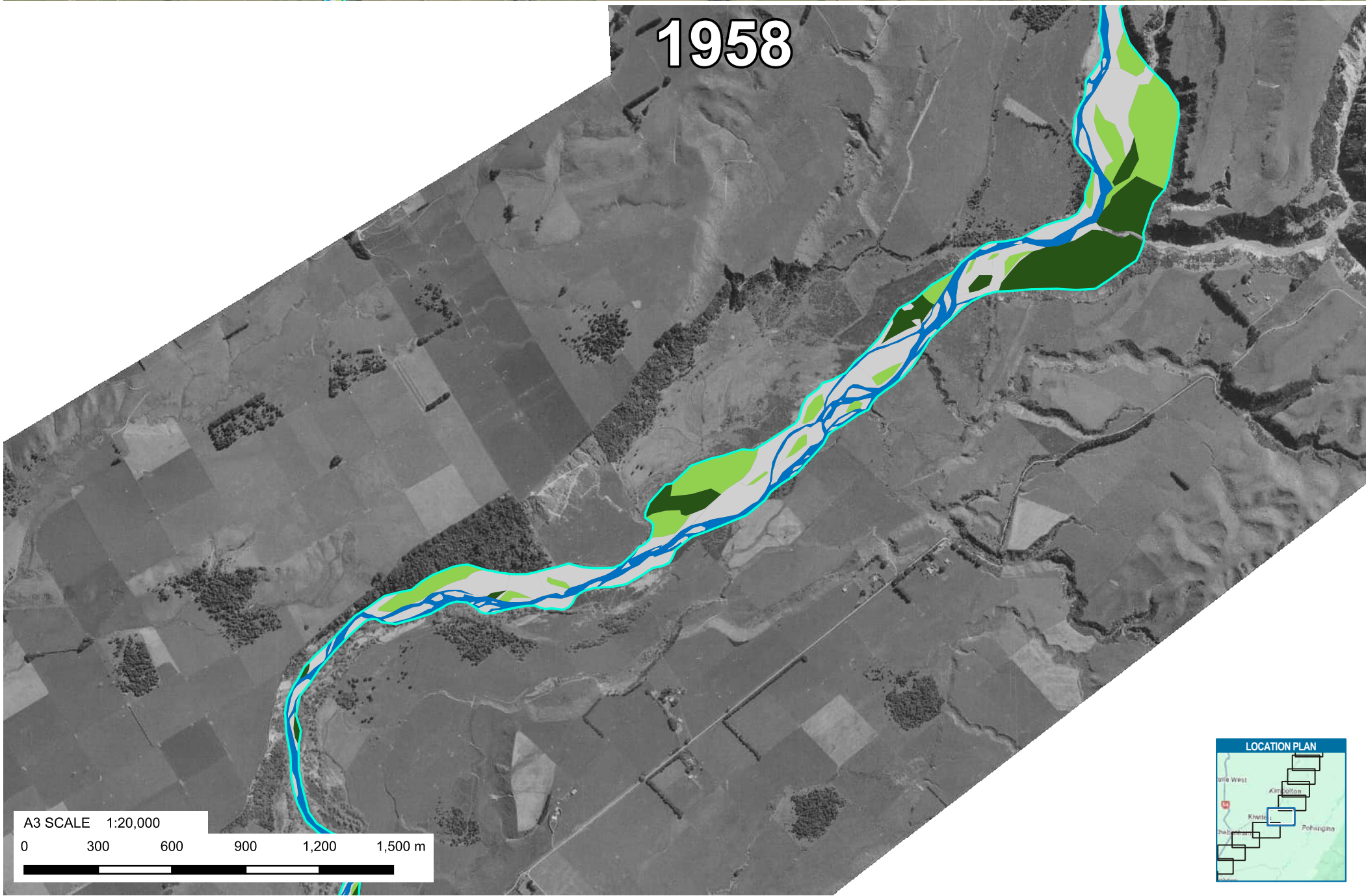
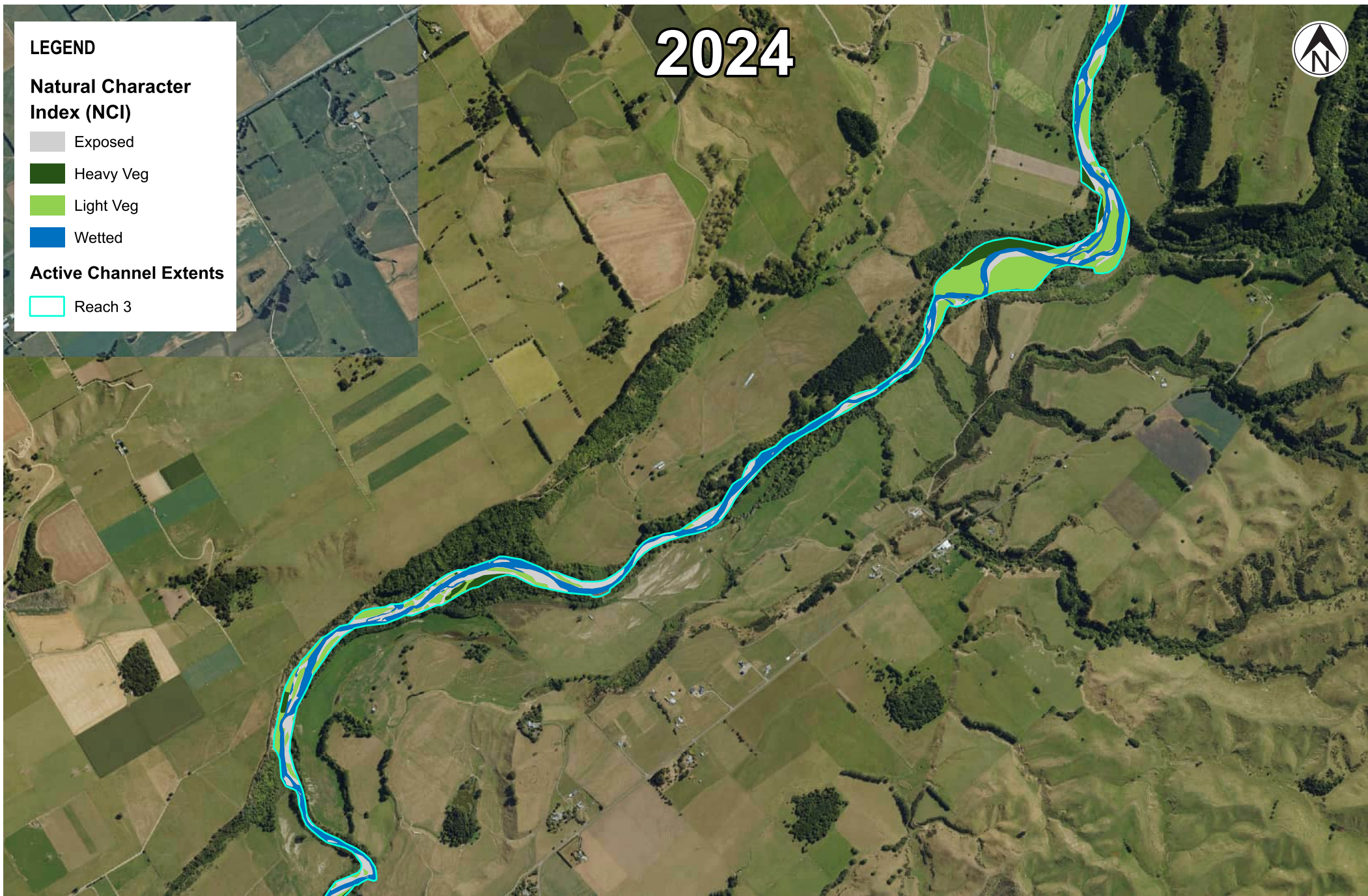


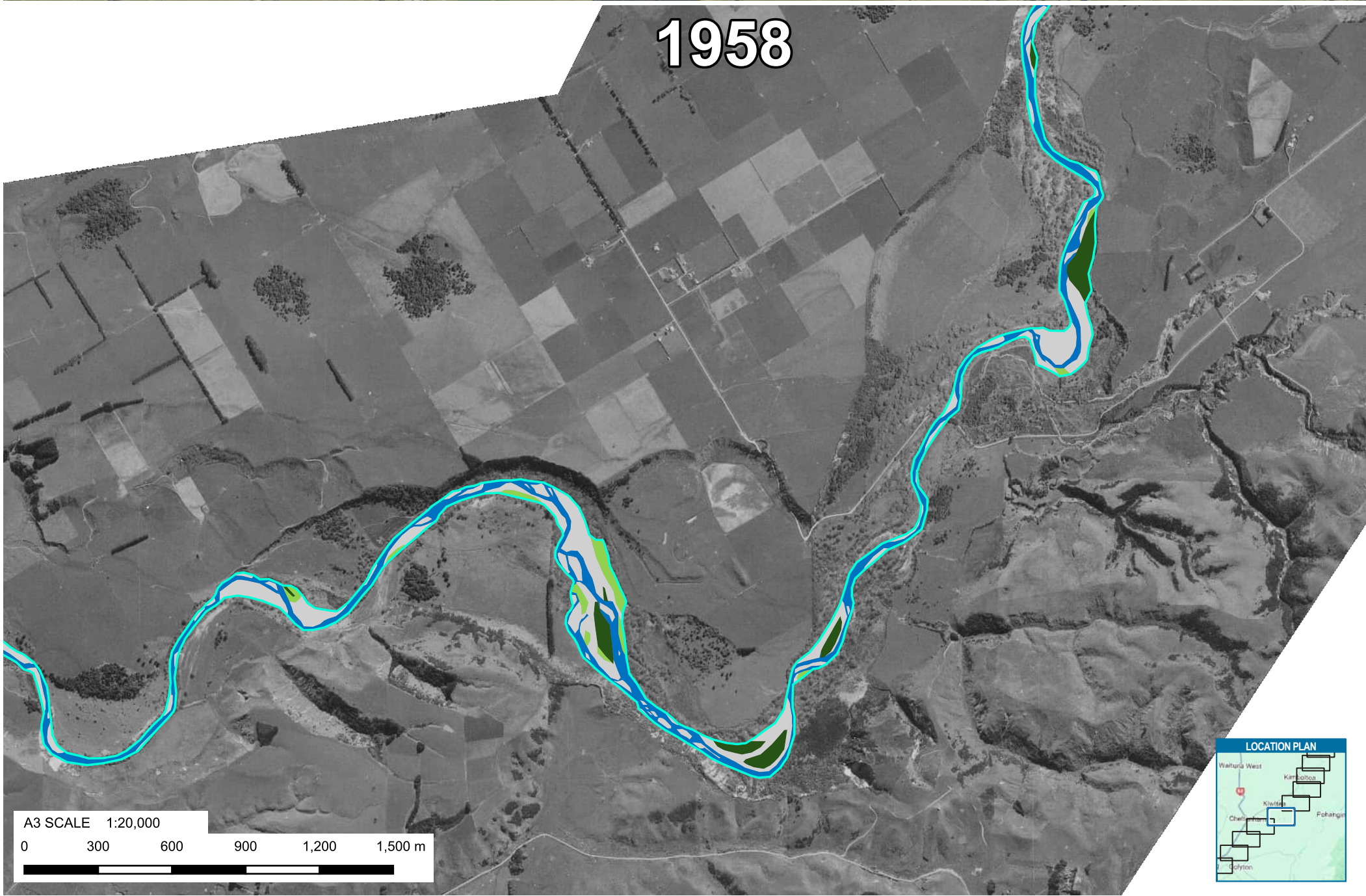
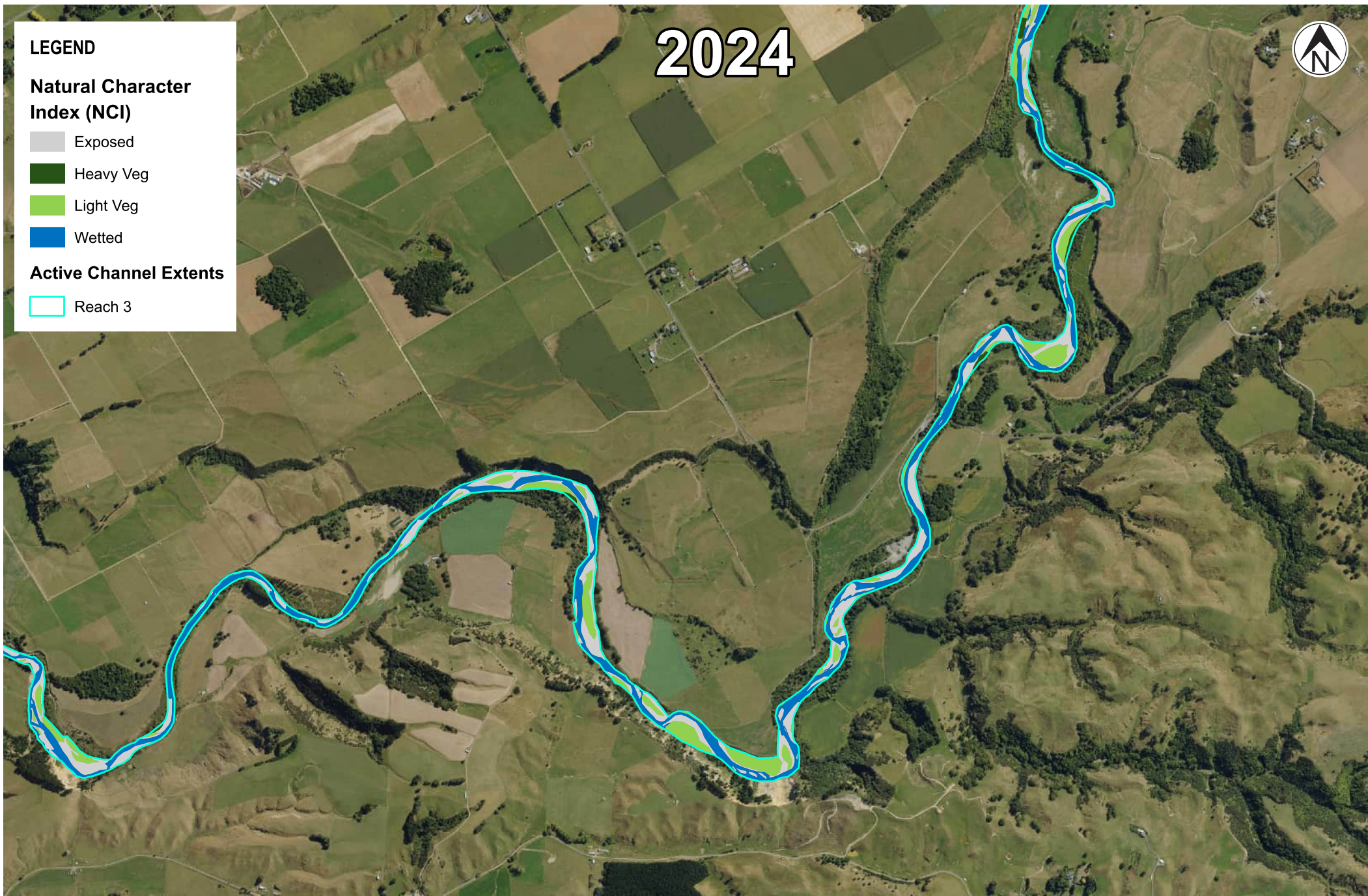


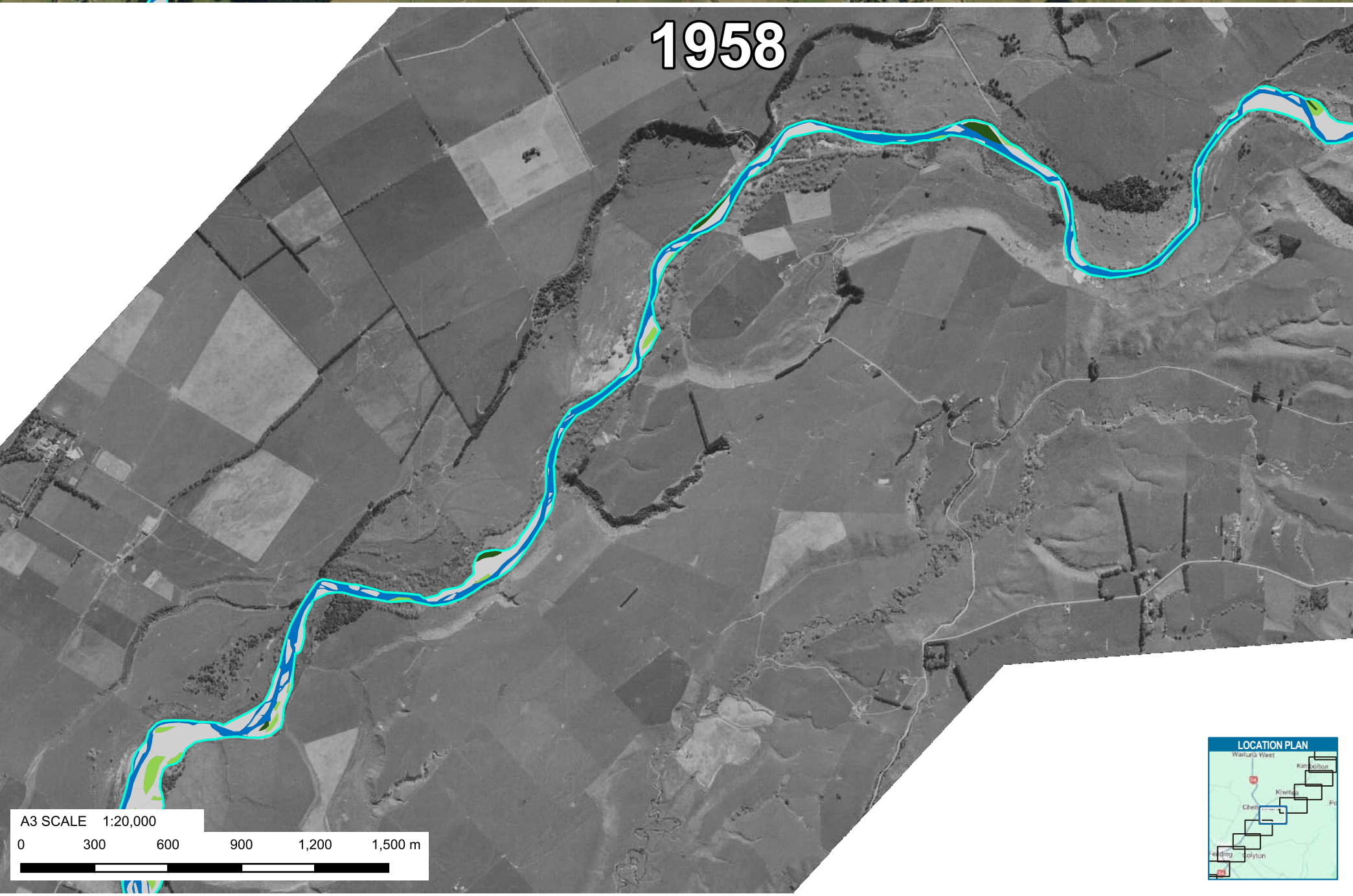
Tonkin+Taylor www.tonkintaylor.co.nz Exceptional thinking together	NOTES: Imagery: Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0. Aerial Imagery 1958 Ōroua Pohangina. Data supplied by Horizons Regional Council.	PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL		
					PROJECT POHANGINA AND ŌROUA NCI ASSESSMENTS		
					TITLE ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 3		
0	First version	GIHU	KJOH	03/07/25	BMQ	15/08/25	SCALE (A3) 1:20,000
1	Final version	GIHU	KJOH	15/08/25			
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE	FIG No. FIGURE 51
							REV 1

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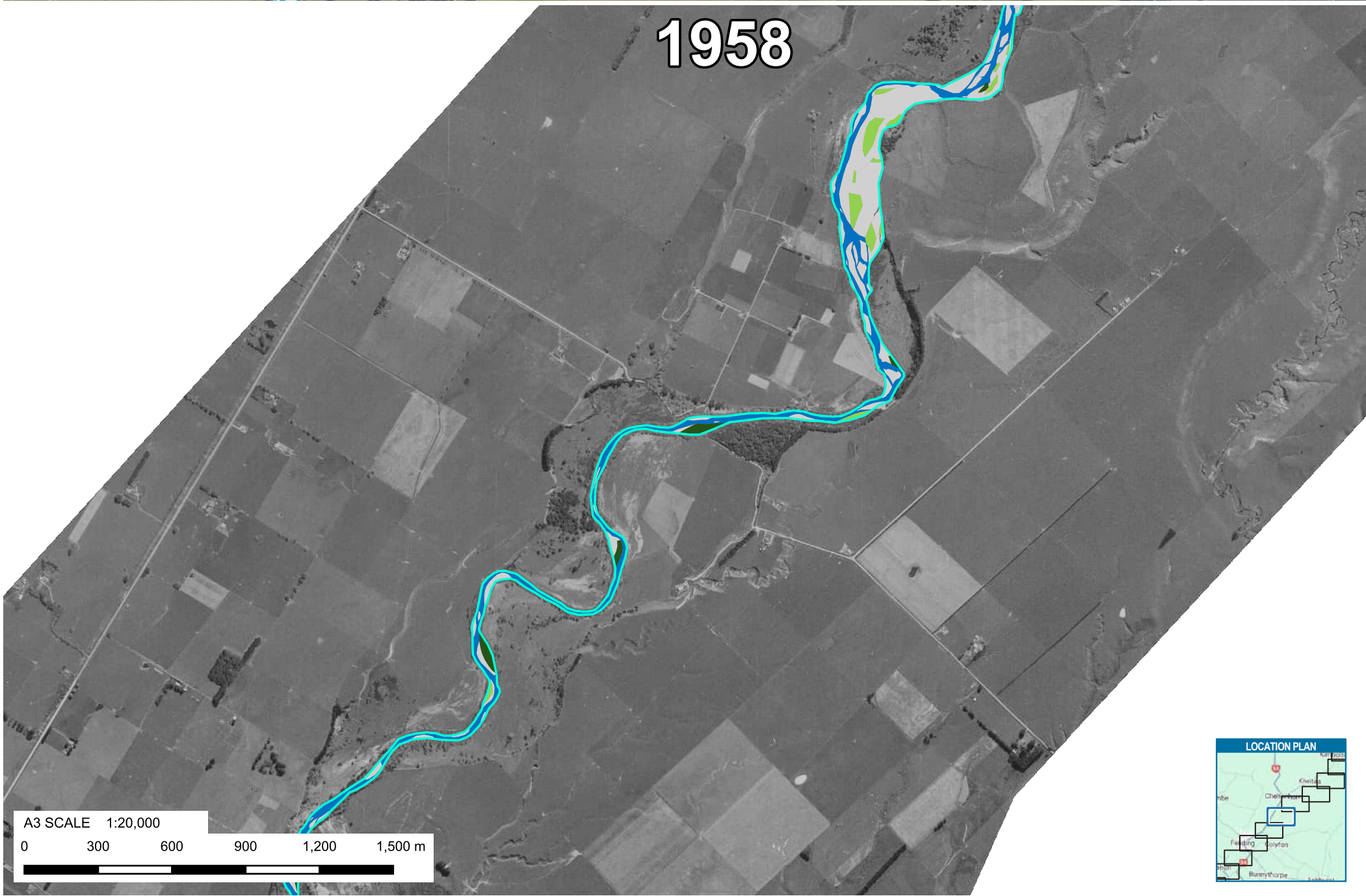


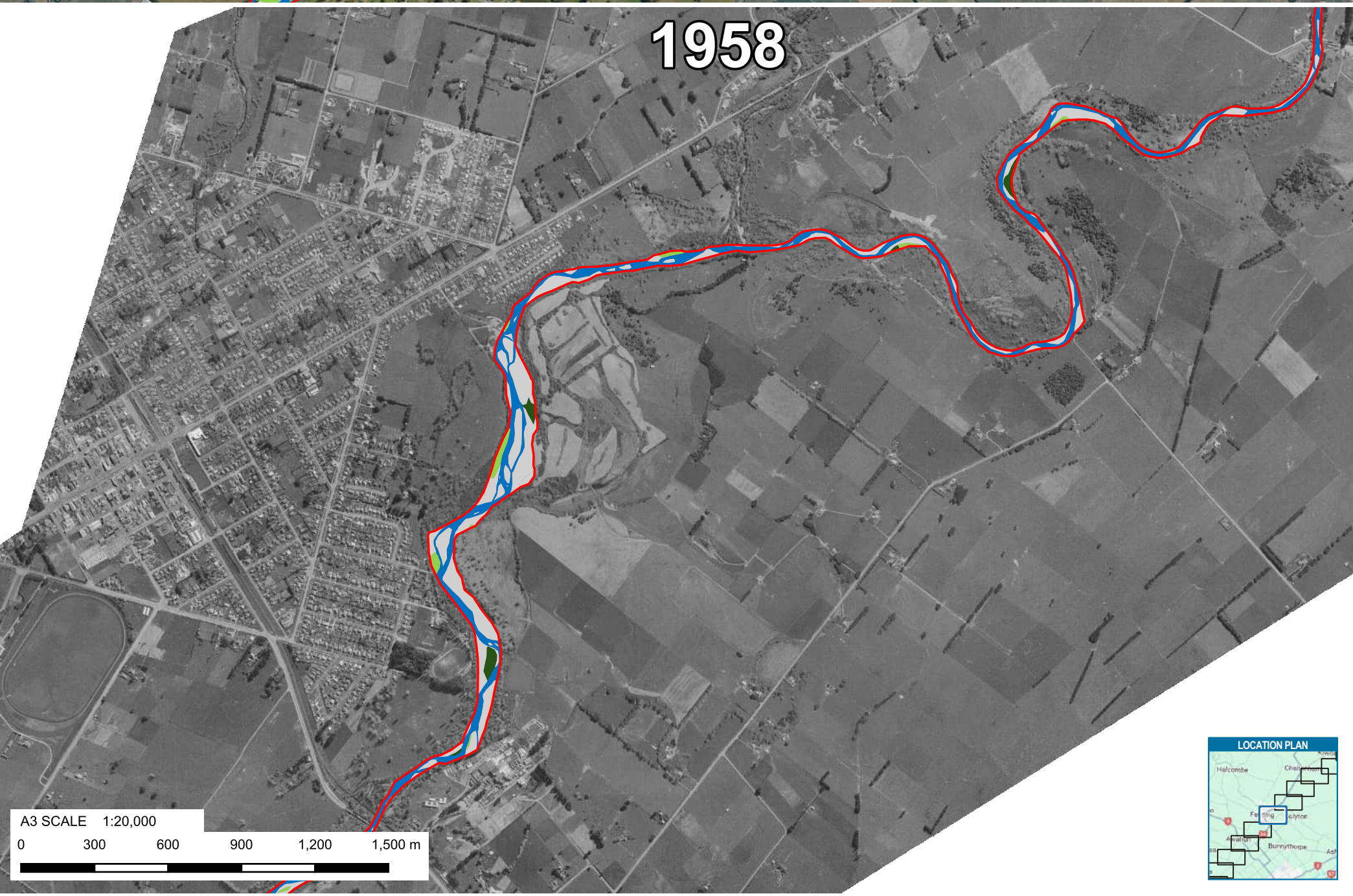




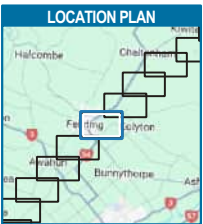
 Tonkin+Taylor www.tonkintaylor.co.nz Exceptional thinking together	NOTES: Imagery: Manawatu-Whanganui 0.2m Rural Aerial Photos (2023-2024) from LINZ. Contains data sourced from the LINZ Data Service licensed for reuse under CC BY 4.0. Aerial Imagery 1958 OrouaPohangina. Data supplied by Horizons Regional Council.	PROJECT No. 1098311.0000			CLIENT HORIZONS REGIONAL COUNCIL		
					PROJECT POHANGINA AND ŌROUA NCI ASSESSMENTS		
					TITLE ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 3		
0	First version	GIHU	KJOH	03/07/25	BMQ	15/08/25	SCALE (A3) 1:20,000 FIG No. FIGURE 55 REV 1
1	Final version	GIHU	KJOH	15/08/25			
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE	

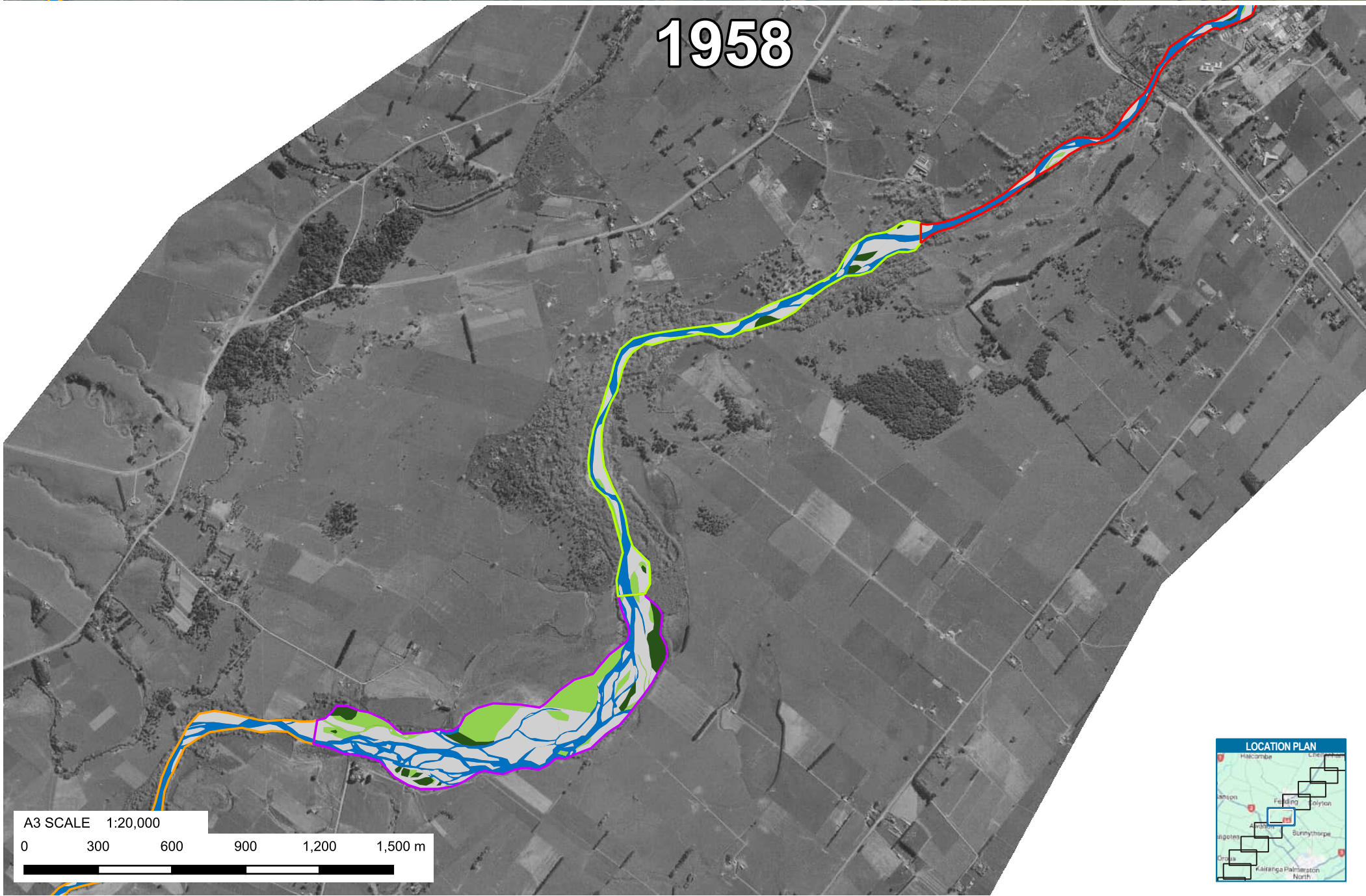
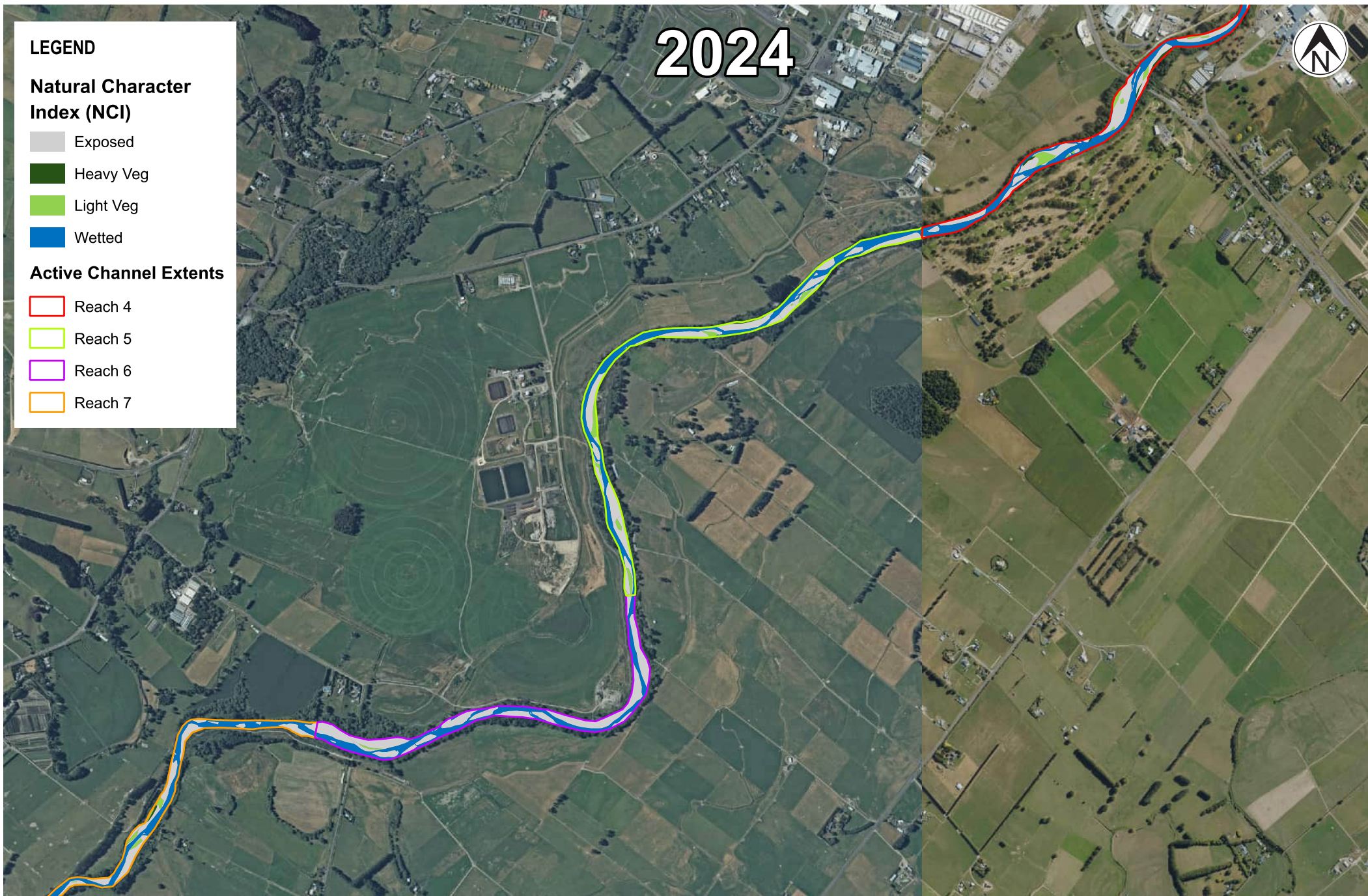
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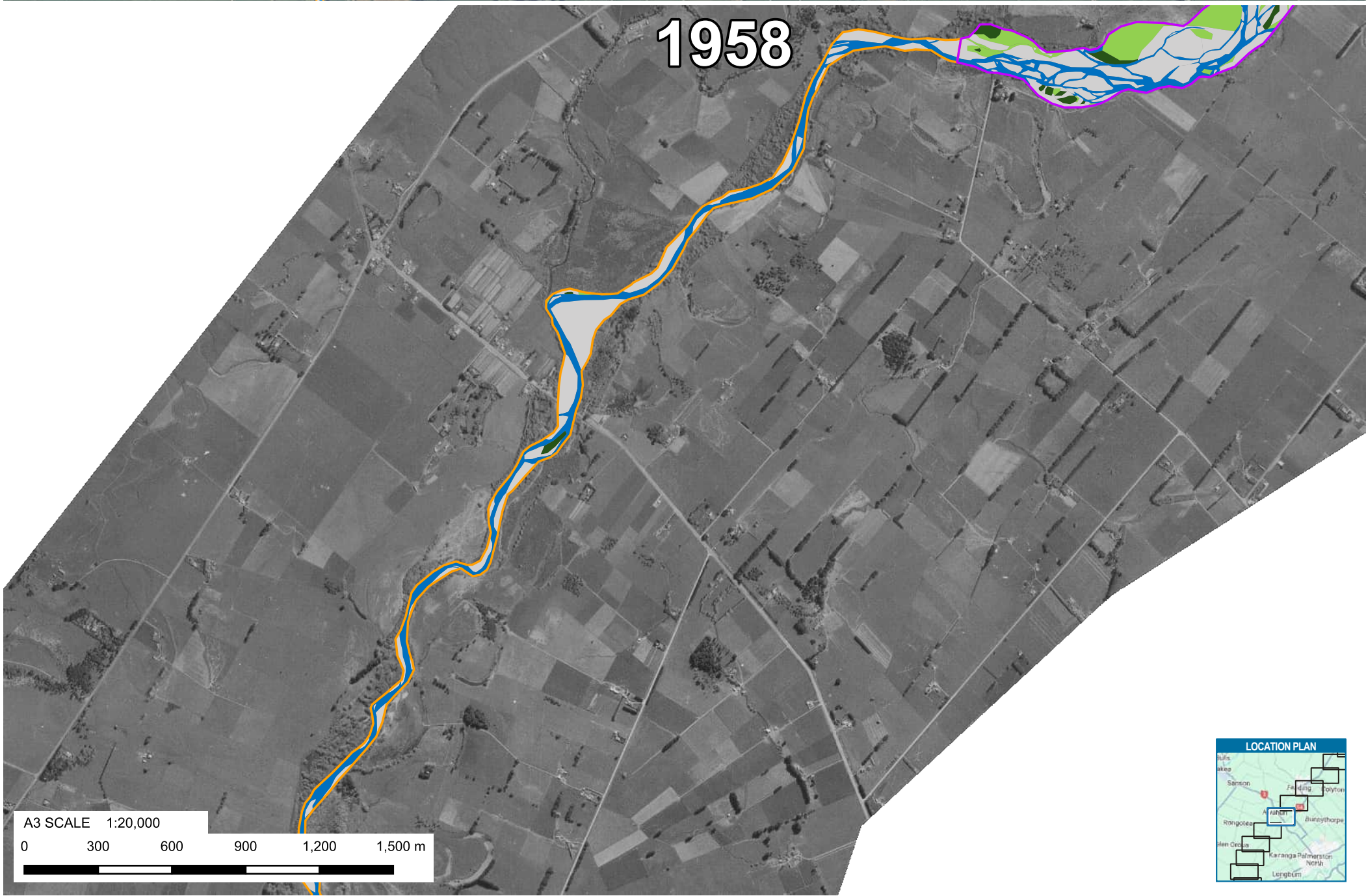
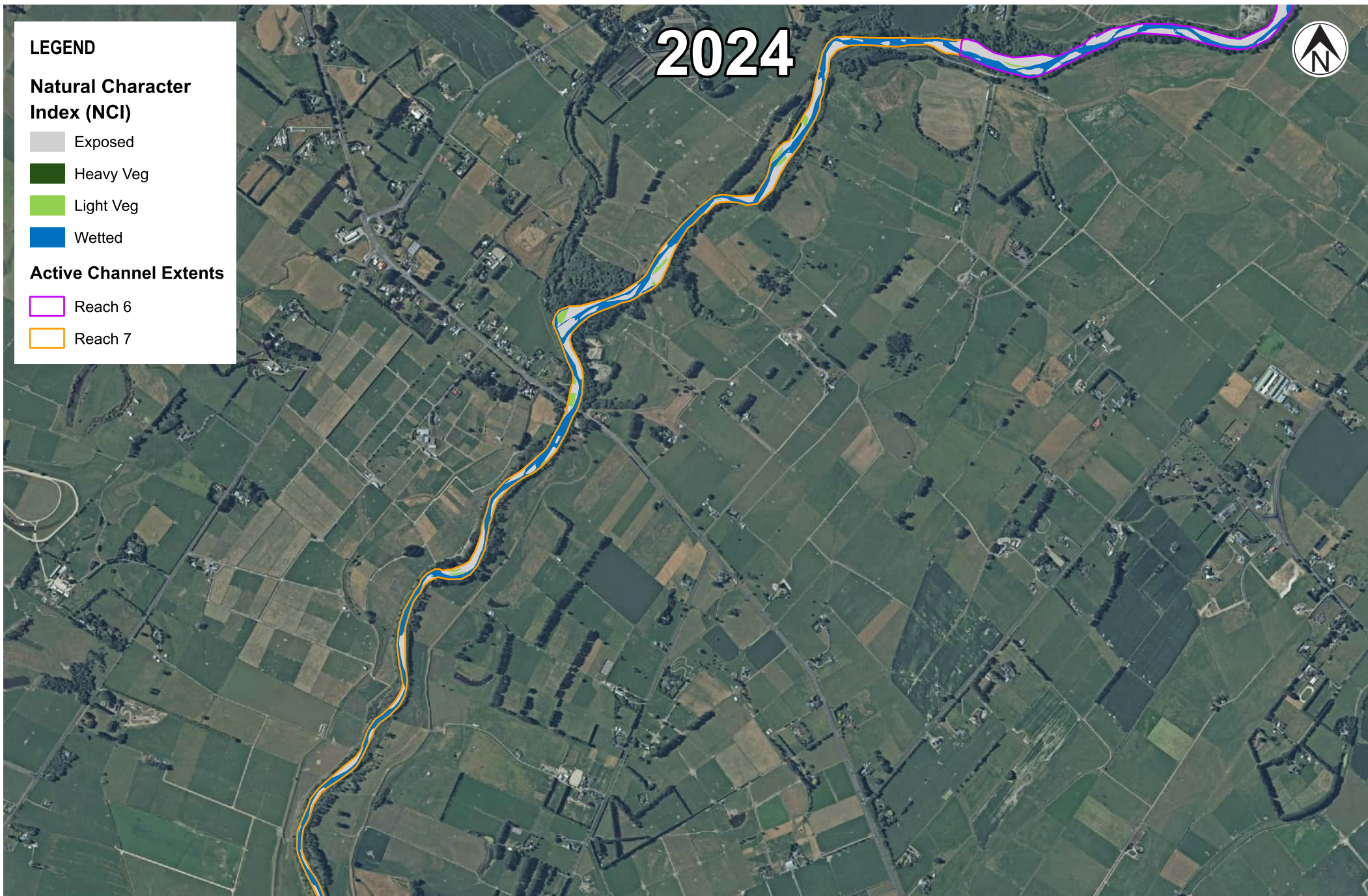


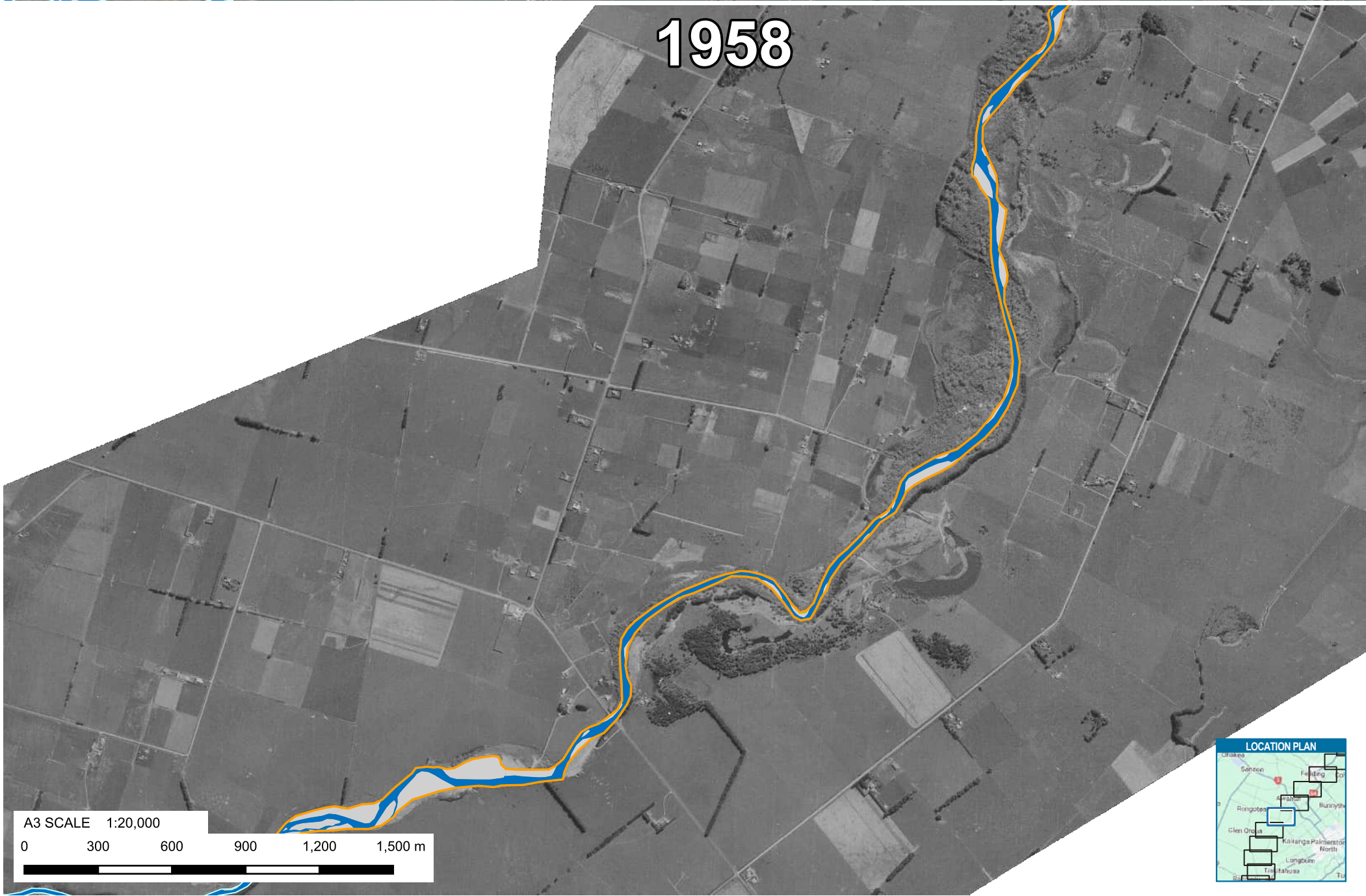


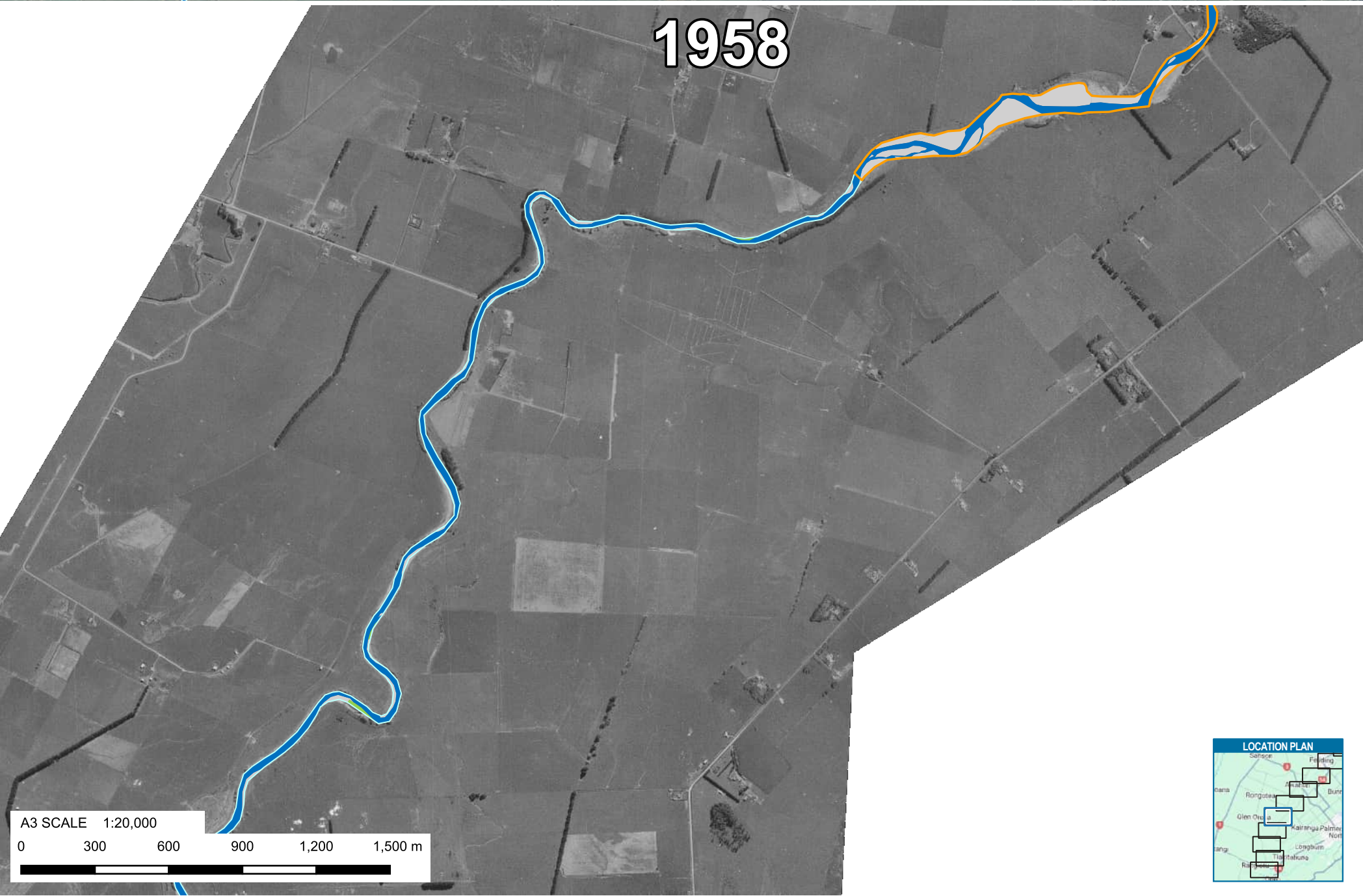
A3 SCALE 1:20,000
0 300 600 900 1,200 1,500 m

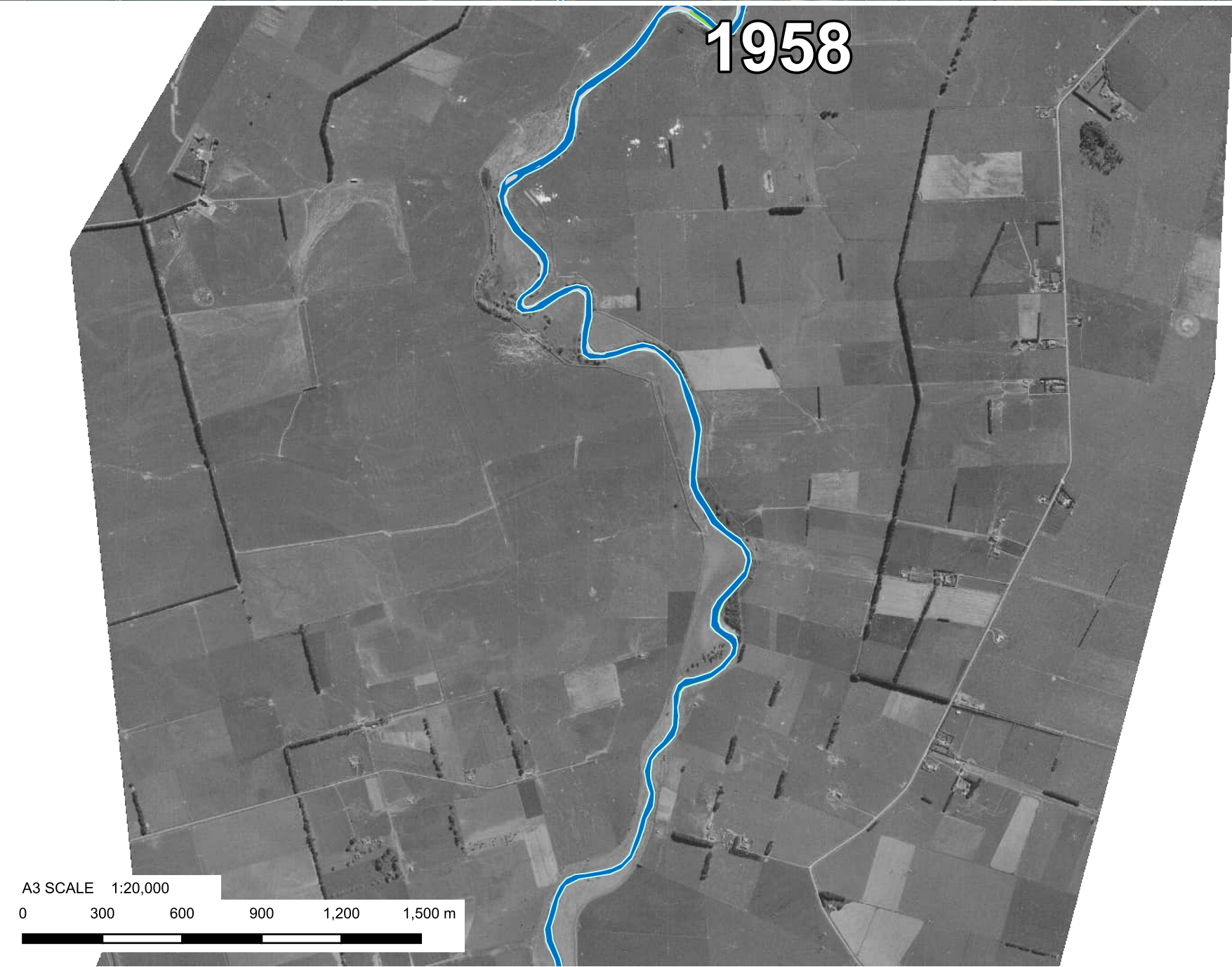


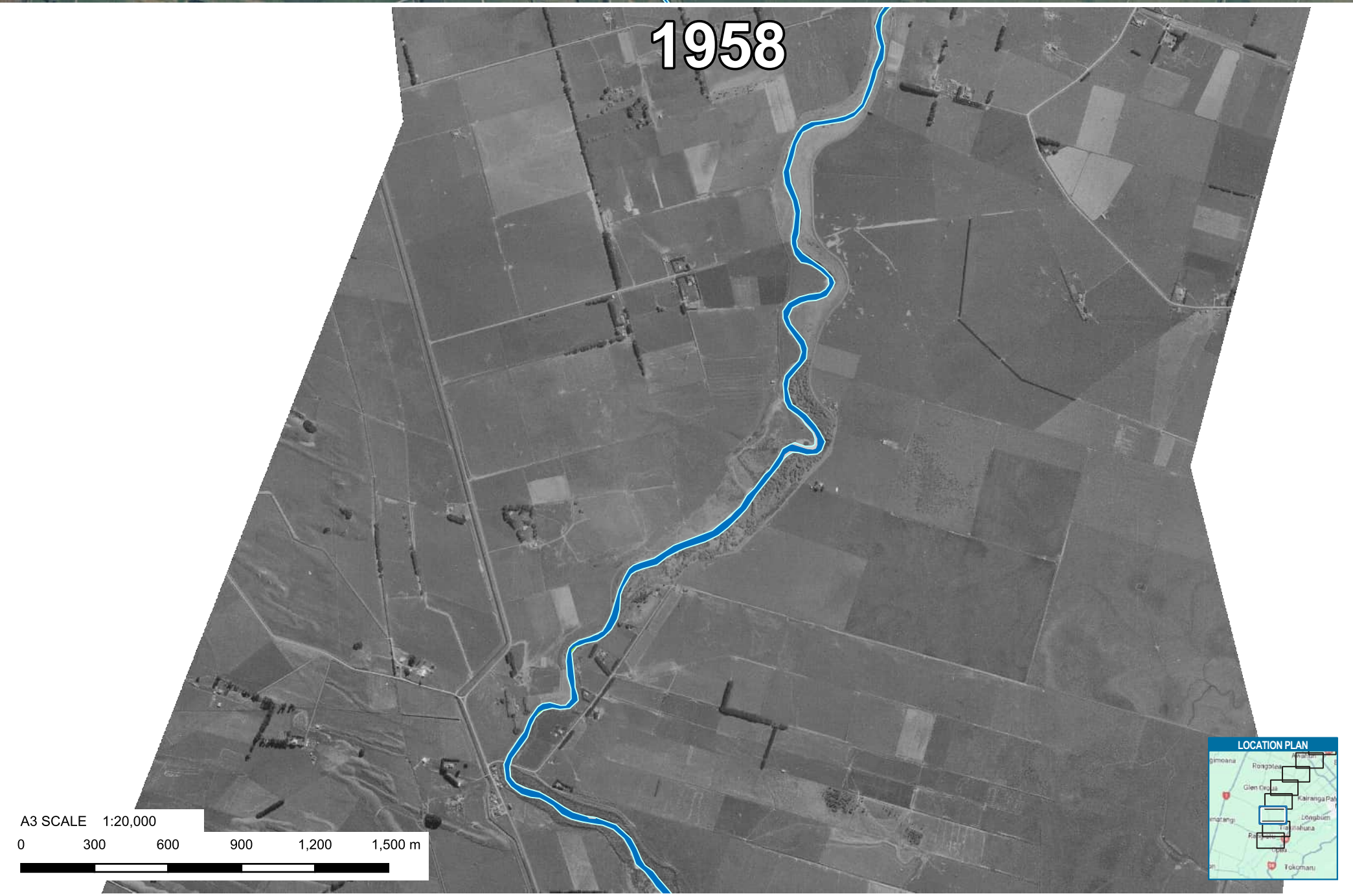
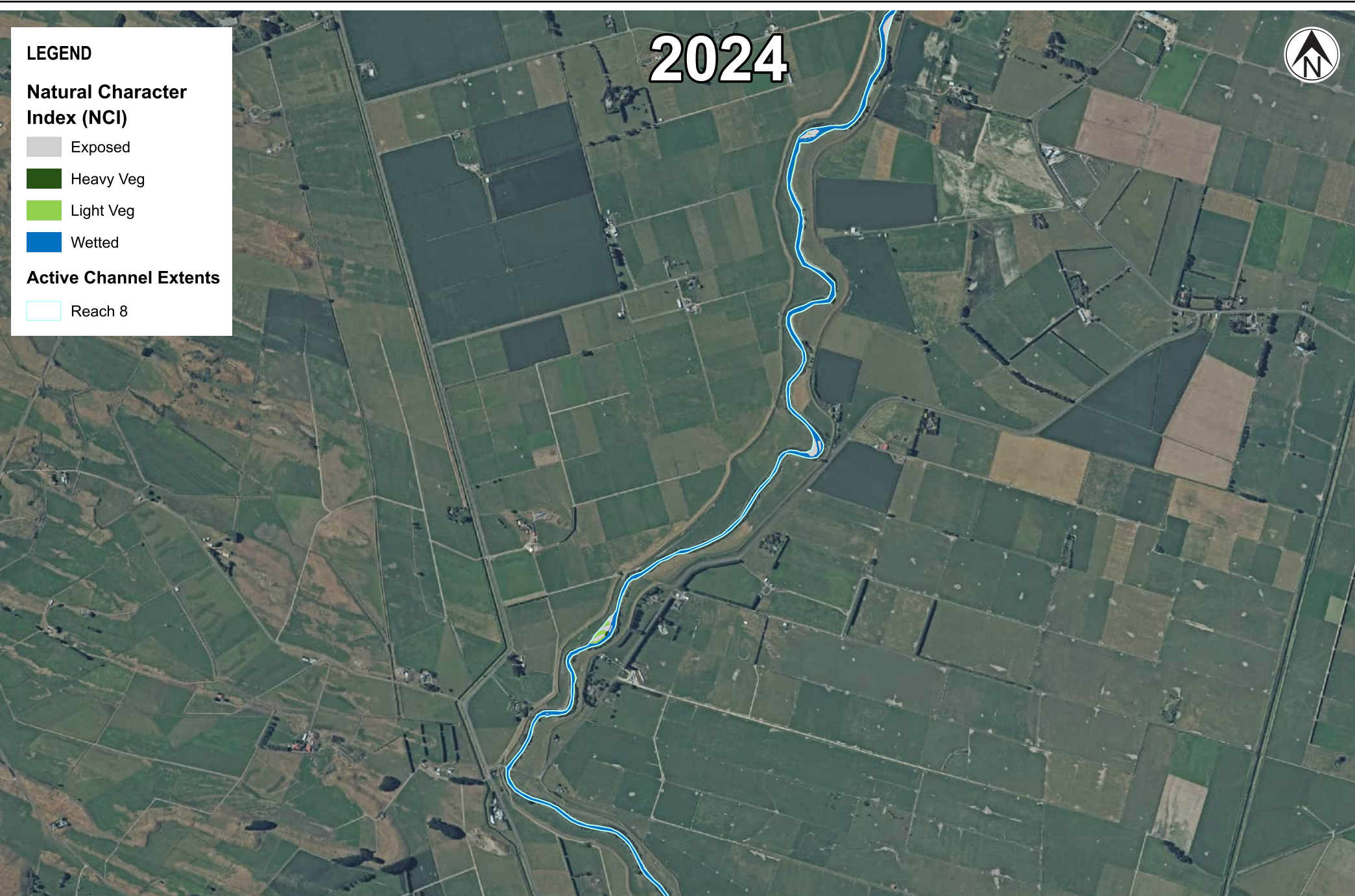












A3 SCALE 1:20,000
0 300 600 900 1,200 1,500 m





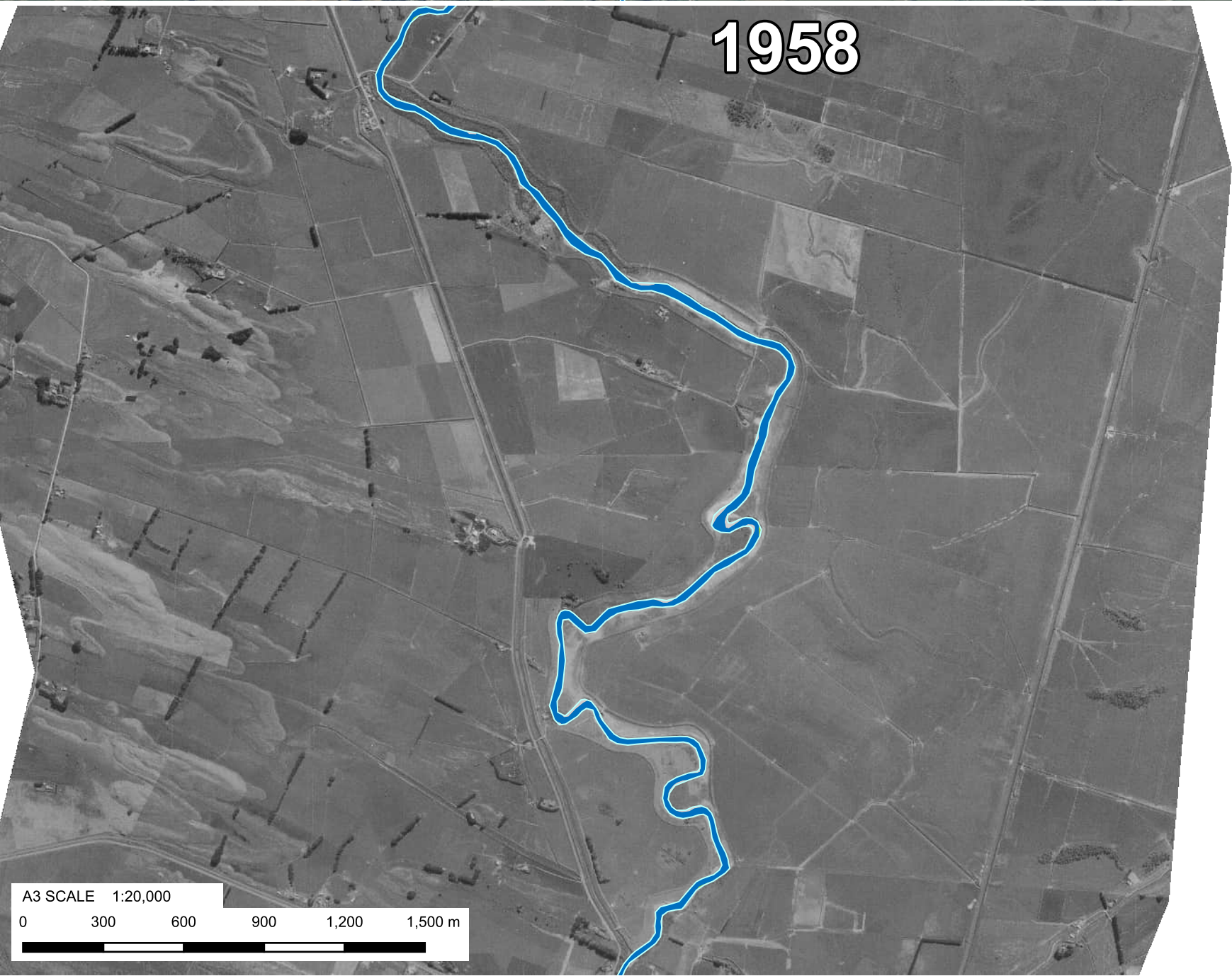
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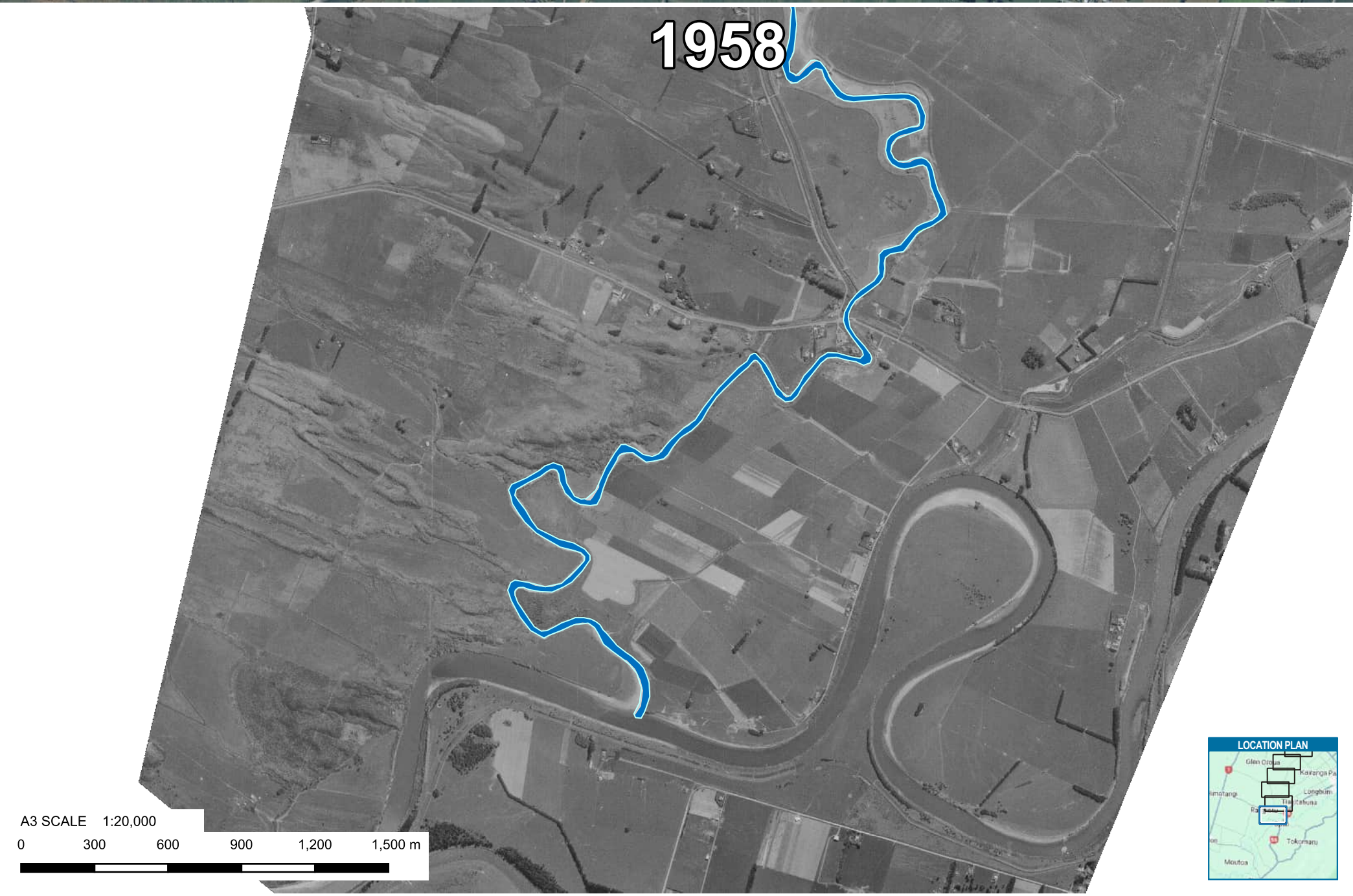
NOTES:
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Aerial Imagery 1958 Ōroua Pohangina. Data supplied by Horizons Regional Council.

0	First version	GIHU	KJOH	03/07/25	BMQ	15/08/25
1	Final version	GIHU	KJOH	15/08/25		
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TITLE ŌROUA RIVER		
NATURAL CHARACTER INDEX - EPOCH 3		
SCALE (A3)	1:20,000	FIG No. FIGURE 64
REV	1	

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					TITLE ŌROUA RIVER NATURAL CHARACTER INDEX - EPOCH 3		
0	First version	GIHU	KJOH	03/07/25	BMQ	15/08/25	SCALE (A3) 1:20,000 FIG No. FIGURE 66 REV 1
1	Final version	GIHU	KJOH	15/08/25			
REV	DESCRIPTION	GIS	CHK	DATE	APPROVED	DATE	

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