NIWA
Taihoro Nukurangi

Review of ecological and natural hazard management values in Kongahu Wetland

Prepared for West Coast Regional Council

May 2018

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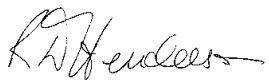	Reviewed by:	Roddy Henderson
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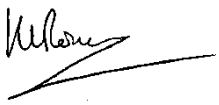	Approved for release by:	Helen Rouse

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Executive summary

This report describes a review of the ecological values and hydrological state of Schedule 1 and 2 Kongahu wetlands KAMP002a and KAMP002b adjoining the Blackwater Creek/drain, which is periodically cleared under resource consent for flood hazard management purposes. The wetlands were identified as having significant ecological values in the mid-late 2000's through a regional plan and Environment Court process. However, in setting rules in the regional plan restricting activities in significant wetlands, it is not clear whether the process took into account an existing 1994 resource consent to clear the drain when there is a flooding risk to the surrounding farmland. Some of the plan hearing documentation also indicates that the ecological assessment of the wetlands was lacking in detail.

The project began with a review of existing materials relating to the development and management of the Kongahu Wetland. A site visit was then made with Lillie Sadler (West Coast Regional Council) and Brian Jones (land-owner and spokesperson of the Kongahu rating district) on 13 March 2018. Based on the information collected a description of the site hydrology and ecology was made.

From a hydrological perspective, the Kongahu Wetland appears not to have changed significantly since the introduction of the drainage scheme that now defines the area. Water within Blackwater Creek is now hydrologically isolated from the wetland in many places, as the banks of the creek have been built-up and the wetland often sits at a lower elevation relative to the creek. Whilst the creek transports surface runoff from the south, the wetlands appear to be predominantly fed by either direct rainfall or groundwater seepage. However, it is likely that some surface water moves from the creek into the wetland and vice versa during large rainfall events and depending on local elevation.

The vegetation within the Schedule 1 wetland was found to be representative of a hydrologically connected swamp forest that is also likely to receive water from the beach ridge to the seaward side of the area. Based on the relative heights of the wetland and the creek, it is likely that the wetland would discharge water into the creek and drainage activities are unlikely to impact on the ecological health of the wetland. Care should be taken in disposal of dredged material to ensure it does not damage adjacent indigenous vegetation.

Given the evidence available, it would seem likely that the proposal to clear sediment build-up and vegetation from the Blackwater Creek, if restricted to the practices previously followed, would have minimal impact on the wetland environment. Similarly, if creek clearance is facilitated by adding a new rule to the Land and Water Plan, the reduction of the risk of surface water flooding from Blackwater Creek and surrounding areas, would reduce the risk of overland flow from surrounding farmland from being transported in to the wetland area. This could facilitate the prevention of undesirable nutrient inflows to the wetlands.

1 Introduction

This report is prepared for the West Coast Regional Council (WCRC). The aim of the report is to review ecological values and the hydrological state of the Schedule 1 and 2 Kongahu wetlands (KAMP002a and KAMP002b) adjoining the Blackwater Creek in the West Coast Region.

The Blackwater Creek has historically been periodically cleared of vegetation and sediment under a 1994 resource consent for flood hazard management when there is a risk of flood to surrounding farmland. However, in mid-late 2000, when the wetlands were identified as having significant ecological value through a regional plan and Environment Court process, the resource consent for channel clearance appears to have been overlooked. As a result, there is a potential conflict between ecological, hydrological and natural hazard management values of the creek and wetland. To resolve this conflict, a submission has been lodged seeking to remove the significant wetland designation on the section of Blackwater Creek that runs between the wetlands (see Figure 1-1). This would enable the local Rating District to continue clearing the creek, as allowed for under the original resource consent.

The Department of Conservation (DOC) was initially opposed to removing the wetland designation of this section of the Blackwater Creek as it was believed to play an important role in supporting the hydrological functioning of the wetlands. As part of the Environmental Court's designation, creek clearance was made a non-complying activity in the Schedule 1 wetland, and a discretionary activity in the Schedule 2 wetland. The implications of the Environmental Court's ruling are that when the Rating District's resource consent (to clear the creek) is due for renewal in May 2019, it will be difficult for the Council to grant consent under the existing plan. Non-renewal of the resource consent however, may increase the risk flooding to farmland in the Kongahu area, and cause the loss of pasture and milk production in connected low-lying areas.

The WCRC seeks advice about whether clearance of the creek can be provided for, whilst preserving the values of the wetlands that make them significant. The information provided within this report will be shared with DOC in a pre-hearing consultation to understand how best to provide for both ecological and natural hazard management values of the Kongahu wetlands and Blackwater Creek in the Land and Water Plan. It will also be incorporated into the Section 42A staff recommendations report (WCRC) on submissions at the Plan Change 1 hearing (in mid-June), to assist the Hearing Commissioners with their decision-making.

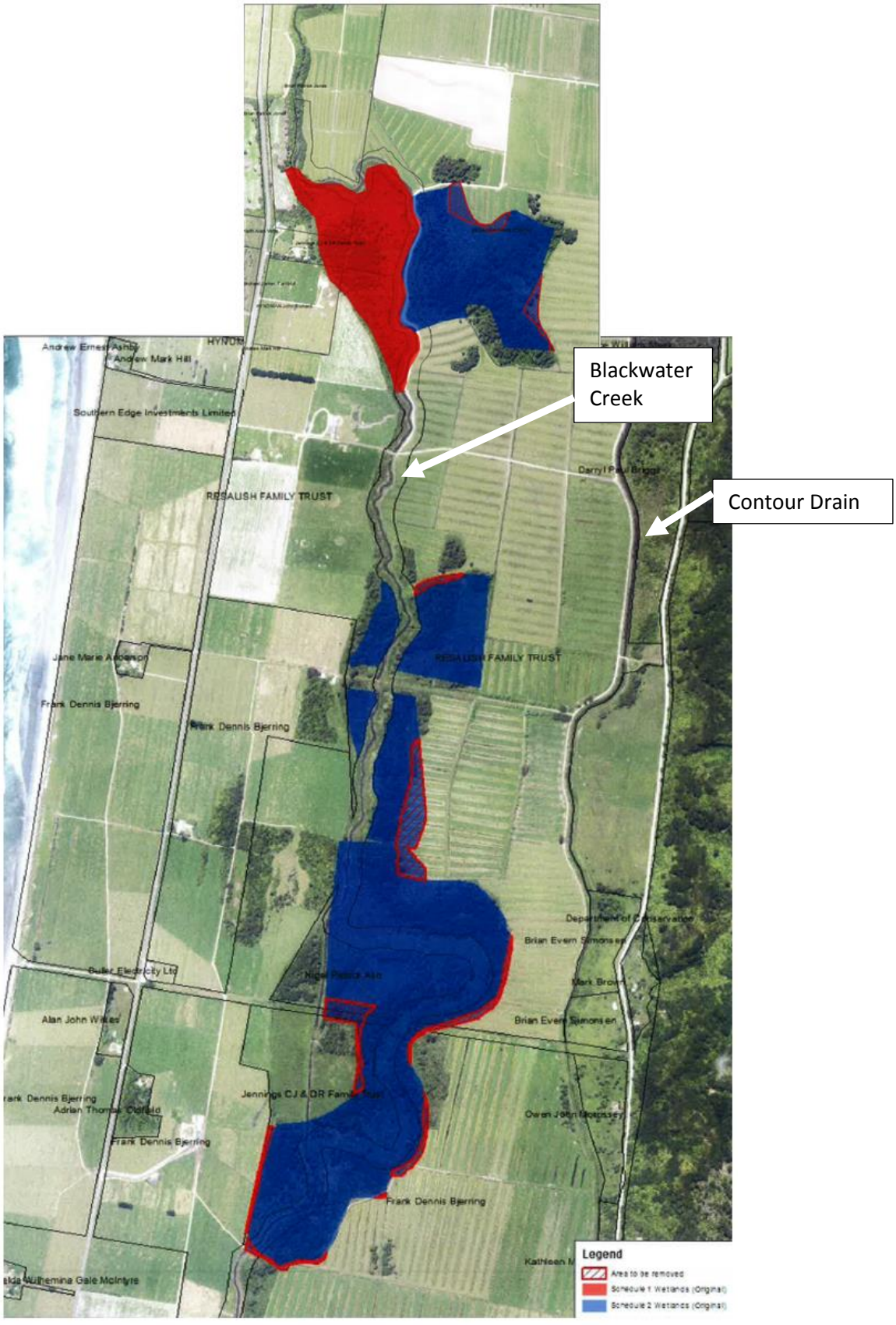

Figure 1-1: Kongahu Swamp North (KAMP002a) and Kongahu Swamp (KAMP002b) illustrating Blackwater Creek between them.

2 Review of existing material

A review of literature relating to the Kongahu wetlands, Blackwater Creek, and surrounding area was first conducted. Documents received from the WCRC included:

- Kongahu Management Strategy (Gerbeaux et al. 1999).
- Significance Assessment Review for Wetlands in the West Coast Region (Boffa Miskell 2008).
- Environment Court assessments of the ecological values of the significant Schedule 1 and 2 Kongahu wetlands KAMP002a and KAMP002b (Environment Court of New Zealand 2010; 2012a; 2012b).
- Kongahu Rating District Asset Management Plan (WCRC 2014).
- Submissions on proposed Plan 1 Change to the Regional Land and Water Plan (2016).

2.1 History

The Kongahu swamp is a peat wetland that previously covered an area of approximately 1000 hectares from the Little Wanganui River in the south to the Otumahana Lagoon in the north. The area has been subjected to drainage and vegetation clearance for agriculture from the 1970's, which resulted in a lowering of the land level and an associated change in species composition (Gerbeaux et al. 1999). The Kongahu Swamp Drainage Scheme, whilst initially conceived in 1938, was completed in 1981 and included:

- Re-grading and realignment of Blackwater Creek.
- A contour drain on the eastern side of the swamp to divert water from the hills to the east.
- Construction of new bridges over the contour drain and Blackwater Creek.
- A flood gated box-culvert from Blackwater Creek to the Otumahana lagoon (WCRC 2014).
- Construction of an outfall drain from Blackwater Creek on the western side of the swamp to provide an outlet for internal farm drains.

The current layout and location of the Blackwater Creek, contour drain, and associated network of drains and culverts, is shown in the Kongahu Rating District Drainage Scheme (Sheets 1 and 2), see Appendix A. Sheet 2 indicates the fact that whilst the creek runs through the centre of the northerly Schedule 1 and Schedule 2 wetland areas, it runs predominantly west of the southerly Schedule 2 wetland area.

2.2 Management

Sorrell and Partridge (1999) described the Kongahu Swamp as being highly modified with a mosaic of near-pristine to highly degraded vegetation types; and consists of a variety of wetland types ranging from high-nutrient swamps (fed by groundwater and creeks) to low-nutrient bogs fed mainly by rainfall. The current condition was the result of various management practices in the wetland, including lowering of the water-table, fire, grazing, and humping and hollowing, that have resulted in a loss of conservation value.

Sorrell and Partridge (1999) recommended that future management of the wetland should be based on strategies that are integrated across property boundaries, and that provide a balance between agriculture and the promotion of wetland values. They also stressed that co-operation with landowners was essential.

The Kongahu Development Rating District Asset Management Plan (WCRC 2014), described creek maintenance as consisting of excavation of material build-up from the creek bed, and removal of vegetation from within and around waterways to allow the faster passage of flood flows and prevent overtopping of creek banks. The most recent maintenance work on the channel was completed in June 2003 (by contractor Ken Kees). Prior to that, a clean out of the drain is suspected to have occurred in 1995 (Grant Thomas Contracting) [source Brian Jones]. Drains that feed into the creek are also periodically maintained and repaired. Since 2014, the aquatic weed 'parrot's feather' (*Myriophyllum aquaticum*) had become prevalent in both the creek and adjoining drainage channels, causing less efficient flow within channels. Slumping and erosion of channel banks was also a long-term maintenance issue.

3 Site visit

A site visit was arranged with Lillie Sadler (WCRC) and Brian Jones (land-owner and spokesperson of the Kongahu rating district) on 13 March 2018. The locations visited are listed in and shown in Table 3-1 and shown in Figure 3-1. Elevations and direction of surface water gradients, which are predominantly south to north or parallel to the Blackwater Creek are shown in Table 3-1 and Figure 3-1. Whilst locations in Table 3-1 are predominantly at the boundary of the wetland area, a traverse of the Schedule 1 wetland at location 1 was also made.

Table 3-1: Location description of sites visited on 13th March 2018.

Number	Location	Elevation (Google Earth)
1a	  Outfall drainage ditch (from farmland) at western boundary of the Schedule 1 wetland: facing north (top) and facing south (lower)	4 m on bank above ditch area

Number	Location	Elevation (Google Earth)
1b	 Farmland outflow drainage ditch shown in 1a	3 m
2	  North-east boundary of the Schedule 1 wetland (at shared boundary with Schedule 2 wetland): shows Blackwater Creek facing north (left) and Blackwater Creek facing south (right)   North boundary of the Schedule 2 wetland: facing west (left) and facing south (right)	5 m on road adjacent creek

Number	Location	Elevation (Google Earth)
3	  North boundary of the Schedule 1 wetland: showing west-running Blackwater Creek (left) and north-running drainage ditch (right)	4 m on bank of Blackwater Creek
4	  Western boundary of southern Schedule 2 wetland at Blackwater Creek: north-facing(left) and south-facing (right)	4 m

Number	Location	Elevation (Google Earth)
5	  South-western boundary of Schedule 2 wetland on bridge over Blackwater Creek (top), and facing east along boundary drainage ditch (lower)	2 m
6	  Southern boundary of Schedule 2 wetland showing drainage ditch at boundary: facing west (left) and facing east (right)	0 m

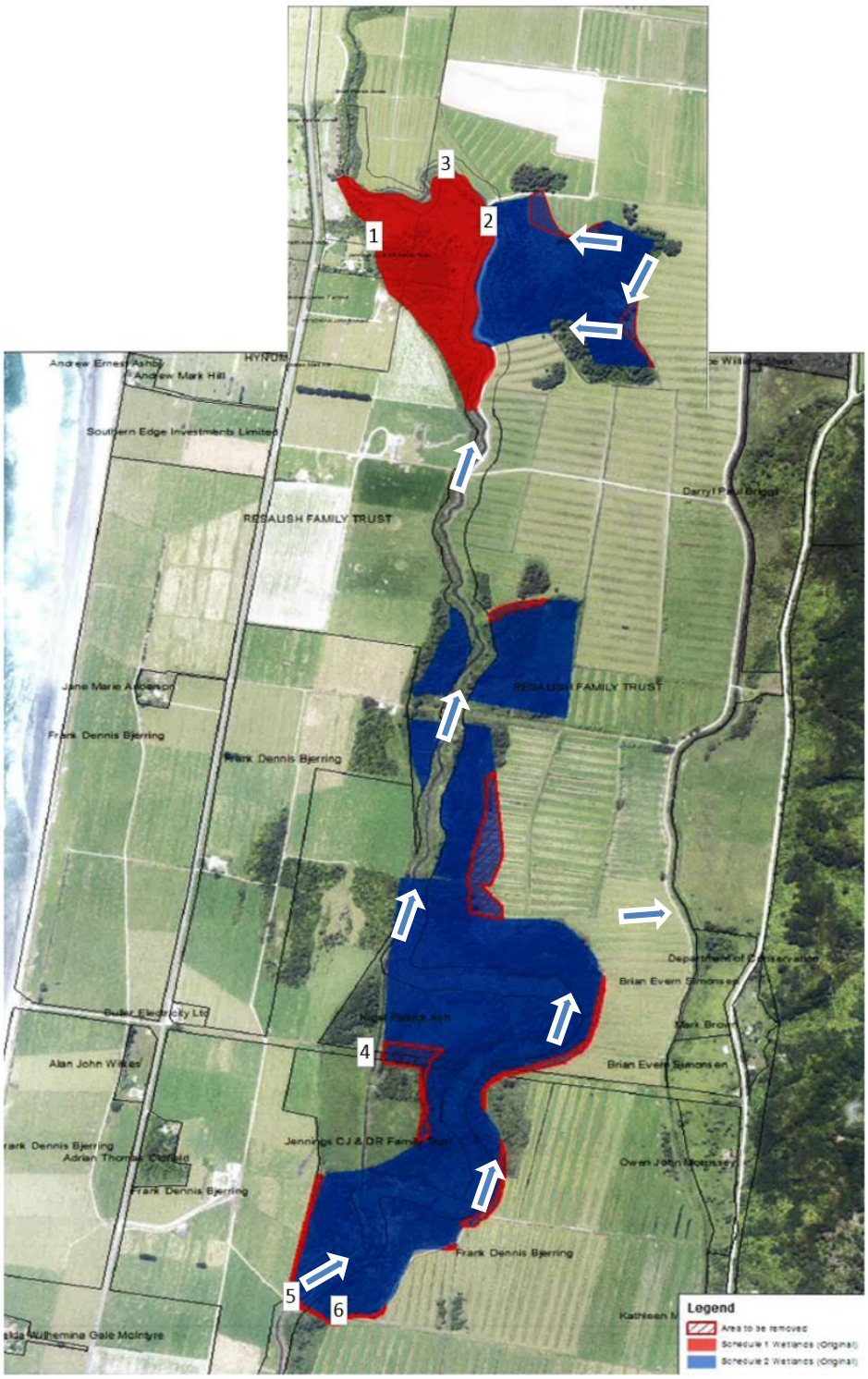

Figure 3-1: Locations of the Kongahu Wetland area visited on 13 March 2018.

4 Site hydrology and implications

The hydrological status of a wetland is critical in determining its character and function. Key factors that will affect the dynamics and functioning of a wetland include: the source of influent water; the direction and magnitude of surface and groundwater flows; variability of water levels within and around the wetlands; and the frequency of inundation.

4.1 Current conditions

The Kongahu Wetland lies on quaternary swamp deposits consisting of poorly consolidated sand, mud and peat. Underlying the area west of the wetland, are beach deposits consisting of gravel with sand and mud and boulder banks (GNS 1998). The wetland has most recently been described as an area of indigenous vegetation on peat soil (Boffa Miskell 2005), with the surrounding areas heavily modified by conversion to agriculture.

4.1.1 Source of wetland water

Water within the boundary of the defined Schedule 1 and Schedule 2 wetlands is derived from direct rainfall, surface water runoff and groundwater seepage. The exact ratio of surface-groundwater interaction with the wetland is unknown but it is likely to vary seasonally with greater surface-water being delivered in winter and during high rainfall events. Groundwater seepage is promoted by permeable sands and gravels that underlie the peat soils and would be greatest in spring and summer. The creek and adjacent channels within the wetland were observed to have predominantly silt/sand beds and will thus have good hydraulic conductivity with influent groundwater. The lower elevation of the wetland relative to surrounding pastureland means that some lateral flow through the soil layer will also occur where not prevented from doing so by drainage ditches.

4.1.2 Direction and magnitude of water flow

Water from the contour drain to the east of the wetland flows into Granite Creek (north-east of the wetland), before it then enters the Otumahana Lagoon. If bank-full discharge in contour drains is exceeded under high rainfall conditions, water will move in the down-gradient direction towards the wetland. In a similar manner, when the Little Wanganui River to the south of the wetland is in flood, flood water may enter the Kongahu swamp from the Wangapeka Road area.

Flooding of the wetland may occur from Blackwater Creek when high tides cause water to back-up from the Otumahana Lagoon. Localised flooding may also occur along the Blackwater Creek during high flow conditions or when the channel becomes choked with vegetation around culverted sections. Water from the creek will then overflow into the wetland.

4.1.3 Variability of water levels

The maximum and minimum water-levels in the Blackwater Creek and adjoining wetlands are unknown. Anecdotal evidence obtained during the site visit suggests that flood waters exceed the Blackwater Creek bank at various locations during flooding. During the time of the site visit water levels within the Creek were approximately 1 m below bank-full discharge and flow at a rate of approximately 250 L/s.

4.1.4 Flood frequency

Generally, the area is susceptible to both coastal and rainfall induced flooding and erosion (Measures and Rouse 2012). However, there is no hydrological information relating to the design magnitude of

floods that the drainage scheme is designed for. Similarly, no flow measurements have been conducted to assess the total drainage from the scheme. Anecdotal evidence indicates that extensive flooding of the irrigated plain occurs under high rainfall conditions (e.g., 1988 floods).

Stop banks around the Otumahana Lagoon to the north, and the Little Wanganui to the south provide some protection from coastal flooding, however for tides over 3 m, some salt seepage from the lagoon may occur.

The Little Wanganui is known to flood into the Kongahu swamp area when in flood (WCRC 2012). The frequency of flood water inundation into the drainage scheme is unknown, however, information relating to the flow characteristics of the Little Wanganui, just south of the Wangapeka Road (catchment area = 64 km^2), is presented in Table 4-1. Whilst lowest flows generally occur in February, the catchment is quite 'flashy', and floods (greater than 3 x median flow) occur on average 26 times a year. However, it is understood that large-scale flooding, similar to that which occurred in 1988 is much less frequent, with a return period of greater than 30 years.

Table 4-1: Flow characteristics of the Little Wanganui River at Wangapeka Road.

Flow Characteristic	Value
1 in 5-year low flow Defined as the one in 5-year low flow after applying a 7-day running average and assuming that annual low flows are normally distributed. *Based on methods by Booker and Woods (2014)*	0.8 m^3/s
Mean of the annual low flow (MALF) The series after having applied a 7-day running average *(Based on methods by Booker and Woods 2014)*	0.948 m^3/s
Median Flow	3.3 m^3/s
Mean Flow	5.39 m^3/s
Lowest mean flow month	February
February flow seasonality Seasonality is the mean flow in February divided by the long-term mean flow, and represents the extent to which mean flow in February is less than the long-term mean flow (after *Booker and Woods 2014)*	0.638
FRE3 The average number of events per year that are three times greater than the median flow (events/year). Provides an estimate of flow flashiness, with lower values representing less frequent events *(Booker 2013)*	26.1 (events per year)

Viewing a time-lapse of aerial/satellite imagery (Figure 4-1), it appears that the medium-term (10-year period of observation) stability of channel forms and wetland boundaries is consistent over time. Historic photos contained within the Kongahu Management Strategy (Gerbeaux et al. 1999) also indicated significant flooding within the pastureland humps and hollows in 1998.

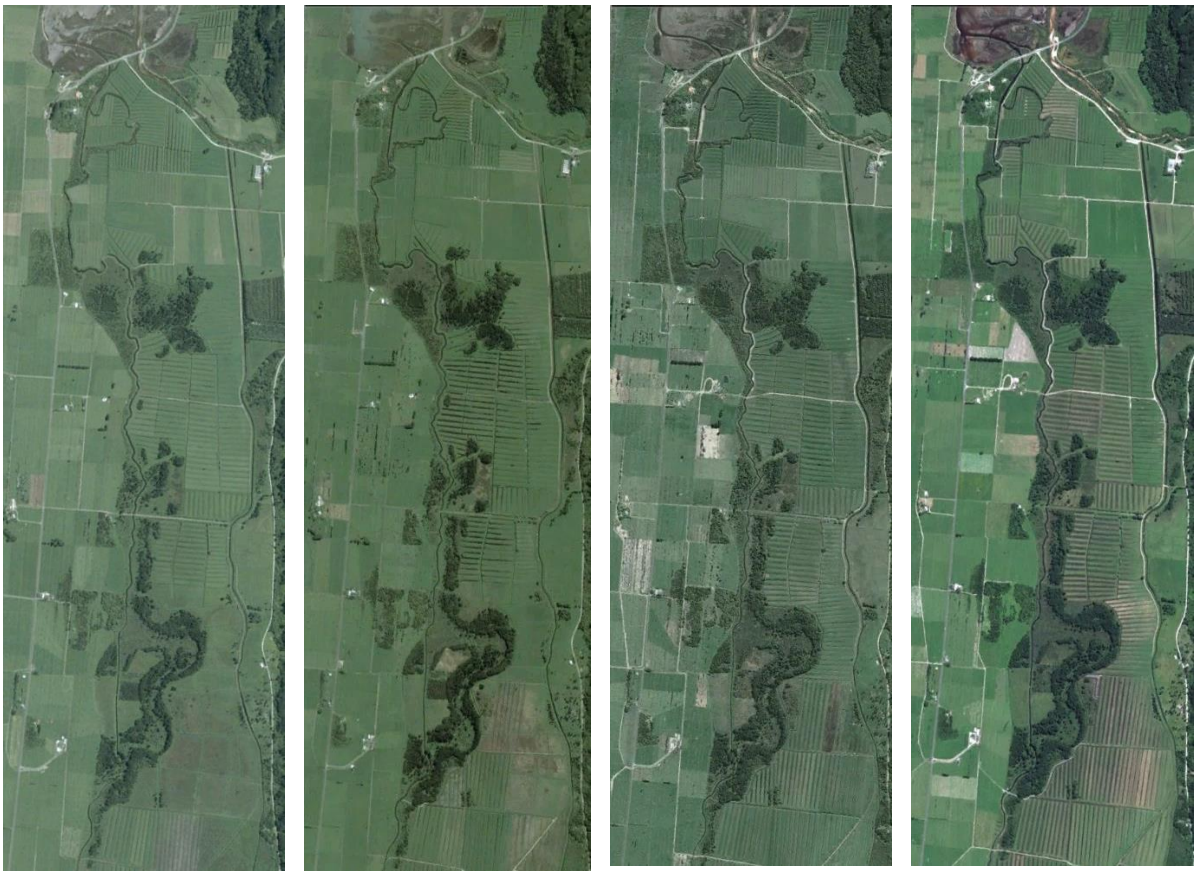

Figure 4-1: Google Earth images indicating little change to the location of channels and wetland boundaries between 2003 and 2013.

5 Site ecology and implications

The kahikatea dominated forests at the northern end of Kongahu, adjacent to the Blackwater Creek have been designated as significant wetlands by WCRC (2012), with the Schedule 1 (highest value) shown in red and Schedule 2 wetlands shown in blue in Figure 3-1. These sites were visited on 13 March 2018 with locations shown in Figure 3-1.

A transect through the Schedule 1 wetland was undertaken from the Hedgeman property to Blackwater Creek to record plant species and vegetation within this wetland (Appendix C). Previous ecological investigations (Gerbeaux et al. 1999, Sorrell and Partridge 1999 and Boffa Miskell 2005) described the area as regenerating, cut-over kahikatea forest, describing similar vegetation to that observed on the field visit. The wet nature of the area compared to the other forest remnants was a prime factor in its designation being described as the 'best remaining example of indigenous vegetation on peat soils in the Northern Ecological Region, with only 11% of this vegetation type remaining within both the Ecological District and Ecological Region (WCRC 2012). The Schedule 2 wetlands were described as predominantly drained.

The Schedule 1 vegetation was predominantly indigenous, with only four non-native species noted in the forest area (with 51 indigenous species found). Plant species are ideal integrators of wetland condition and the majority of species including the dominant components of forest and understorey vegetation being adapted to wetland habitats. There were nine obligate (restricted to wetlands) species (based on Clarkson et al. 2013), including five sedges, swamp astelia (*Astelia grandis*) and three dicotyledonous herbs. Several seedlings/saplings and one adult puketea (*Laurelia novae-zelandiae*) tree were found (Figure 5-1). This site represents the southern known distribution of this predominantly wetland species. Thus, this vegetation is still regarded in good condition and could be described as kahikatea swamp forest, with sufficient hydrology to support obligate wetland plants.

Figure 5-1: Sapling puketea (*Laurelia novae-zelandiae* – yellow arrow) and swamp astelia (*Astelia grandis* – orange arrow) in the Schedule 1 wetland at Kongahu.

Blackwater Creek was dominated by the invasive weed parrot's feather, being first recorded in Kongahu by Sorrell and Partridge (1999) at the northern end of the wetland complex. Despite efforts to manage this species, it now dominates Blackwater Creek with some stretches being completely smothered by this species e.g., Figure 1-1 (sites 2 and 4). Additional species found, usually where parrot's feather was absent, included the native species *Nitella* sp. aff. *cristata*, swamp willow weed (*Persicaria decipiens*) and blunt pondweed (*Potamogeton ochreatus*).

The creek appeared to be at least one metre below the level of the wetland vegetation where it flowed alongside this area.

6 Summary and Recommendations

From a hydrological perspective, the Kongahu Wetland has not changed significantly since the introduction of the drainage scheme that now defines the area. Whilst it is believed that the Blackwater Creek has been cleared four to five times in the last 24 years, such clearance appears to have had little impact on the pre-existing wetland hydrology. Water within Blackwater Creek is hydrologically isolated from the wetland in many places, as the banks of the creek have been built-up and the wetland often sits at a lower elevation relative to the creek. Whilst the creek transports surface runoff from the south, the wetlands appear to be predominantly fed by either direct rainfall or groundwater seepage. During either extreme pluvial or coastal flooding however, it is likely that surface water moves from the creek into the wetland. Conversely, areas of the wetland that are elevated relative to the Blackwater Creek will provide some surface runoff to the creek during large rainfall events.

The vegetation within the Schedule 1 wetland is representative of a hydrologically connected swamp forest and is likely to receive water from the beach ridge to the seaward side of the area. Based on the relative heights of the wetland and the creek, it is likely that the wetland would discharge water into the creek and drainage activities are unlikely to impact on the ecological health of the wetland. Care should be taken in disposal of dredged material to ensure it does not damage adjacent indigenous vegetation.

Given the evidence available, it would seem likely that the proposal to clear sediment build-up and vegetation from the Blackwater Creek, if restricted to the practices previously followed, would have minimal impact on the wetland environment. Similarly, if creek clearance is facilitated by adding a new rule to the Land and Water Plan, the reduction of the risk of surface water flooding from Blackwater Creek and surrounding areas would reduce the risk of overland flow from surrounding farmland from being transported in to the wetland area. This could facilitate the prevention of undesirable nutrient inflows to the wetlands.

7 References

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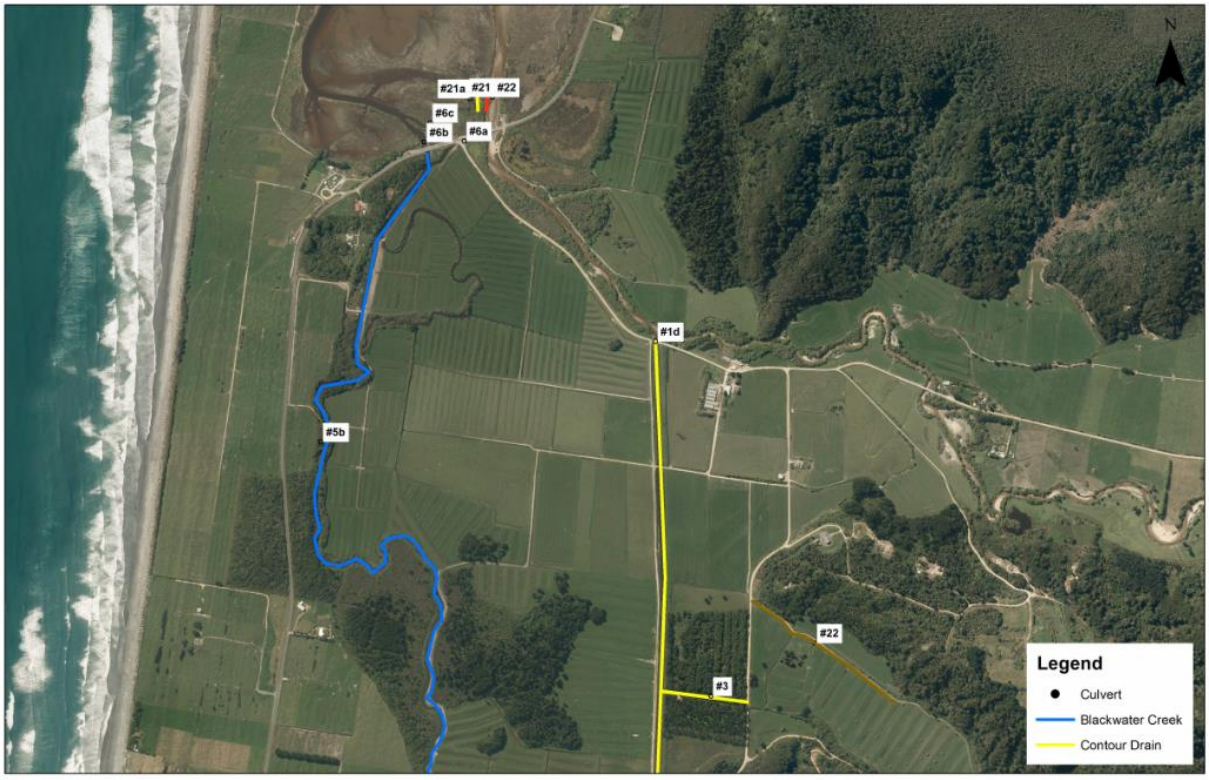
Appendix A Kongahu Rating District Drainage Scheme (WCRC)



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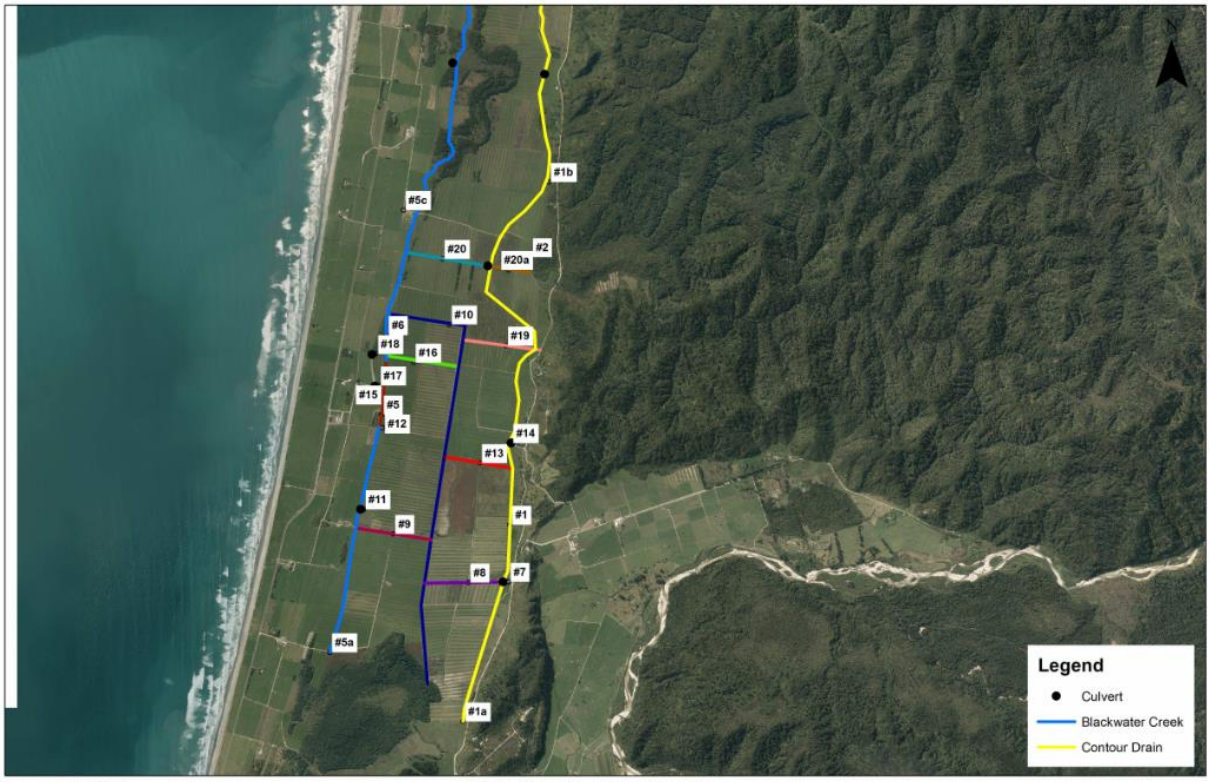
Kongahu Rating District
Drainage Scheme
Sheet 1



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Kongahu Rating District
Drainage Scheme
Sheet 2

Appendix B Timeline

Table B-1: Timeline of events affecting Kongahu wetland areas.

Year	Event
Late 1970's	Kongahu Swamp Drainage Scheme
1985	Introduction of humping and hollowing drainage technique in area
1994	Resource consent in place to clear the drain when there is a flooding risk to the surrounding farmland
mid-late 2000	Wetlands were identified as having significant ecological values in through a regional plan and Environment Court process
Present	Submission to remove wetland designation on section of Blackwater Creek
Due 2019	Renewal of the Rating District's resource consent to clear Blackwater Creek

Appendix C (KAMP002a) Plant species list from Schedule 1 Kongahu wetland

Table C-1: Plant species list from Schedule 1 Kongahu wetland. Status: n = native (indigenous), I = introduced (naturalised). Wetland indicator status (Clarkson et al. 2013): OBL = obligate wetland species, FAC = facultative wetland species (FACW mostly wetland, FACU, mostly dry habitats), UPL = upland, or dry terrestrial habitat.

Vegetation type		Species	Status	Wetland indicator status
Trees and shrubs	ferns	*Dicksonia squarrosa*	n	FACU
	gymnosperms	*Dacrycarpus dacrydioides*	n	FACW
		Dacrydium cupressinum	n	FACU
	monocots	*Cordyline australis*	n	FACW
		Rhopalostylis sapida	n	FACU
	dicots	*Carpodetus serratus*	n	FACU
		Coprosma grandifolia	n	FACU
		Coprosma tenuicaulis	n	FACW
		Coprosma xcunninghamii	n	FACW
		Elaeocarpus hookerianus	n	FACU
		Hebe leiophylla	n	FACW
		Hedycarya arborea	n	UPL
		Laurelia novae-zelandiae	n	FAC
		Melicytus micranthus	n	FAC
		Melicytus ramiflorus	n	FACU
		Myrsine australis	n	FACU
		Myrsine salicina	n	UPL
		Neomyrtus pedunculatus	n	FAC
		Rubus fruticosus	i	FACU
		Sophora microphylla	n	FACU
		Weinmannia racemosa	n	FACU
Epiphytes and lianes	ferns	*Asplenium flaccidum*	n	UPL
		Asplenium polyodon	n	UPL
		Microsorium pustulatum	n	UPL
		Microsorium scandens	n	UPL
	monocots	*Astelia hastata*	n	UPL
		Astelia trinervia	n	UPL
		Freycinettia baueriana	n	FACU
	dicots	*Griselinia lucida*	n	UPL
		Metrosideros diffusa	n	UPL

		Metrosideros perforata	n	UPL
		Muehlenbeckia australis	n	FACU
		Muehlenbeckia complexa	n	FACU
		Parsonsia heterophylla	n	FACU
		Ripogonum scandens	n	FACU
		Rubus australis	n	FAC
Ground cover	ferns	*Blechnum minus*	n	FACW
		Blechnum novae-zelandiae	n	FAC
	rushes	*Juncus effusus*	i	FACW
		Juncus pauciflorus	n	FACW
	sedges	*Carex dissita*	n	FAC
		Carex lessoniana	n	FACW
		Carex maorica	n	OBL
		Carex sinclairii	n	OBL
		Carex virgata	n	OBL
		Isolepis prolifera	n	OBL
		Machaerina rubiginosa	n	OBL
		Schoenus tendo	n	FAC
	other monocots	*Astelia grandis*	n	OBL
		Phormium tenax	i	FACW
	dicot herbs	*Bidens frondosa*	i	FACW
		Hydrocotyle pterocarpa	n	OBL
		Lotus pedunculatus	i	FAC
		Persicaria decipiens	n	OBL
		Ranunculus amphitrichus	n	OBL