Canterbury 2021 Flood Recovery Update 5

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Executive summary

Purpose:

This report provides an update on flood recovery progress by Environment Canterbury (ECan) for the period from July through September 2022. It follows updates 1 to 4 that have covered flood response and recovery from June 2021 through to the end of June 2022.

It documents progress with recovery works over this three-month period and provides a summary of costs to date. It also provides support for claim five to the National Emergency Management Agency (NEMA) for eligible like-for-like replacement of assets lost as a result of the flood.

Further, it details the additional infrastructure damage sustained during the July-August 2022 period in which five high flow events occurred.

Background:

The significant rainfall event of 28-31 May 2021 over much of Canterbury, resulted in wide-spread flooding across the region. A region-wide state of emergency was declared on 30 May 2021. Flood damage as a result of the exceptional rainfall was significant and widespread across the region, affecting community infrastructure, public and private property and damaging or destroying significant ECan flood protection assets. Physical works in response to this event commenced immediately following the event and flood recovery works are ongoing.

Repair of the damaged infrastructure from the 2021 flood was on track and on budget in June 2022. In the winter of 2022 several high flow events occurred in quick succession in July and August 2022. These high flows exacerbated 2021 flood damage and caused additional damage to recently repaired, yet still vulnerable infrastructure (damage-on-damage). In some areas there was new damage from these flows, at locations not previously damaged in the 2021 flood.

It is understood from initial discussions with NEMA that further damage to both yet to be repaired, and repaired 2021 flood damage sites, will be eligible for NEMA subsidy (subject to the usual verification process). New 2022 flood damage to sites which were not previously damaged in the 2021 flood would need to be the subject of another claim to NEMA.

For completeness, flood recovery from both the 2021 flood and 2022 winter flows are included herein. Further damage to 2021 flood damage sites is referred to as 2022 damage-on-damage, while damage to sites not previously identified or included in the 2021 flood damage, are referred to as new 2022 flood damage.

Response and Recovery Progress – this period July to September 2022:

Planned flood damage repairs during this period was to focus on implementing anchored tree protection and undertake infill tree planting to re-establish tree edge protection in the river berms. The winter 2022 high flows disrupted this programme. As a result, the focus shifted to undertaking emergency and temporary repair works, assessing and prioritising flood damage and re-focusing on immediate high priority repairs.

The interactive web interface at www.ecan.govt.nz/FloodRepairMap provides real time progress on the status of 2021 flood recovery repairs only. There are an additional 62 sites at which there was new flood damage in 2022 which are not shown on the map.

The total number of 2021 flood recovery jobs is now 396 of which 188 have been completed. Several completed jobs were re-opened in order to undertake repairs for damage sustained during the winter high flows.

Financial Status:

The total costs to the end of September 2022 for flood recovery (including response) is $13.8 million. Of these costs, $11.4 million are estimated to be eligible for application to the National Emergency Management Agency (NEMA) for a 60% central government contribution above a threshold for like-for-like asset replacement.

Environment Canterbury has submitted four claims to NEMA and received payment to a total value of $3.5 million on these claims. The NEMA 60% cost share has been applied to eligible costs above the ECan threshold of $4.1 million. Claim five, covering costs to the end of September 2022, is being prepared for submission together with this report and is expected to result in a payment of $0.8 million.

The estimated total cost for 2021 flood recovery at the end of September 2022 has increased from $19.9 to $22.2 million as a result of **2022 damage-on-damage**. Of the $22.2 million, the likely overall claim to NEMA is estimated at $7.1 million. The estimated remaining costs which would sit with Environment Canterbury have increased from $12.2 million to $15.1 million.

The estimate for **new 2022 flood damage**, in the catchments that sustained damage in 2021 is $0.9 million, hence the total estimated cost of flood damage for the catchments affected by the 2021 flood is $16.0 million. This is $3.8 million more that the existing commitment from Environment Canterbury currently limited to $12.2 million.

Additionally, there is an estimated $1.8 million damage in other catchments (Waitaki and Rangitata) as a result of the winter high flows. There will not be a contribution from central government for these new damage costs ($0.9+$1.8 = $2.7 million) as they are below the threshold for a new claim to NEMA.

A report to Council is under preparation to provide options for consideration to fund the additional flood damage costs, and to request pre-approval of this additional funding.

Next Steps:

Next steps are to undertake reprioritised repairs following additional flood damage in July and August 2022. There are several major damage sites from the 2022 winter flows with only small-scale temporary works in place that will be repaired during the summer months. Planned tree planting for the 2022 season, not completed due to the 2022 winter flows has been deferred to the winter of 2023.

Consideration of Climate Change:

Consideration has been given to options for betterment or improvement on what was previously in place, particularly improvements that account for climate change and the likelihood of increased frequency and more intense rainfall events.

As a first step towards addressing climate change more comprehensively across the region, initial conceptualisation of river management zones that could be implemented as part of long-term planning to address climate change, is included in Appendix D.

Since climate change betterment and other infrastructure improvements are outside of the like-for-like replacement of pre-flood infrastructure, they are not eligible for 60% NEMA co-funding. However, ECan has indicated to NEMA that a comprehensive case for co-funding of betterment is likely across all the affected catchments from this event. In parallel with progressing this initiative, Environment Canterbury continues to seek long term sustained central government co-investment in flood protection schemes.

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1 Introduction

This report is the fifth report to be provided to the National Emergency Management Agency (NEMA). It documents Environment Canterbury's flood recovery progress from July to September 2022. The previous four reports have covered flood response and recovery from June 2021 to June 2022.

This report provides an update on recovery works undertaken to the end of September 2022, including a summary of their costs for the period from July to September 2022 inclusive.

Details of the flood event of 28-31 May 2021 have been provided previously so are not repeated in detail here, other than the following summary for completeness.

The significant rainfall event of 28-31 May 2021 over much of Canterbury, resulted in wide-spread flooding across the region. Rainfall amounts exceeding the largest 72-hour rainfall totals on record were recorded at 28 of Canterbury's 84 rain gauges. Mount Somers rain gauge recorded 546mm in 72 hours, more than double the previous record 72-hour total. A region-wide state of emergency was declared on 30 May 2021. Flood damage as a result of the exceptional rainfall was significant and widespread across the region, affecting community infrastructure, public and private property and damaging or destroying significant ECan flood protection assets. Peak flows exceeded design capacities in several rivers in the Ashburton, Timaru and Mackenzie districts resulting in several stopbank breaches and extensive erosion control vegetation loss.

In the winter of 2022 several high flow events occurred in quick succession in July and August 2022. These high flows which exacerbated 2021 flood damage and, in some areas, created new damage, are described in more detail below.

2 2022 High Flow Events

Figures 2-1 and 2-2 show the high flow events that occurred in quick succession over a five-week period in the winter of 2022. While shown for the Ashburton and Opihi rivers, high flows were experienced across the region. Flows were well below the peaks of the 2021 flood, however relatively high flows repeated four to five times over the five-week period caused damage to recently repaired sites and also resulted in new flood damage.

In the Ashburton River, the 10% Annual Exceedance Probability flow (560m^3/s) was exceeded twice between 18 July and 7 August and two other flows exceeding 200m^3/s occurred between 28 July and 22 August 2022.

Similarly, in the Opihi River, two flows were around 600m^3/s and another two exceeded 200m^3/s in the period from 12 July to 7 August 2022, with a fifth flow of around 100m^3/s on 19 August.

Flood damage as a result of these winter 2022 high flow events, occurred at sites already identified as having 2021 flood damage and at new sites not previously identified.

Further damage to the 2021 flood damage sites is referred to as 2022 damage-on-damage while damage to sites not previously identified or included in the 2021 flood damage, are referred to as new 2022 flood damage.

For completeness, flood recovery from both the 2021 flood and new damage from the 2022 winter flows are included herein.

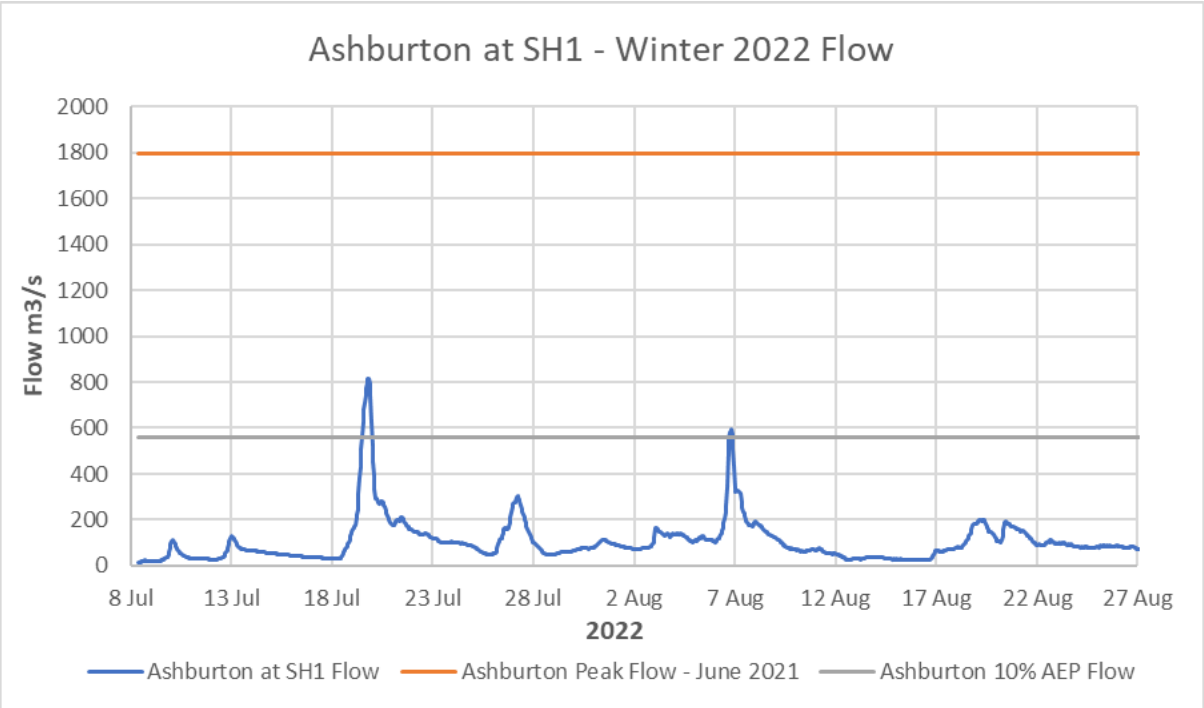


Figure 2-1: Winter 2022 flows in the Ashburton River at SH1.

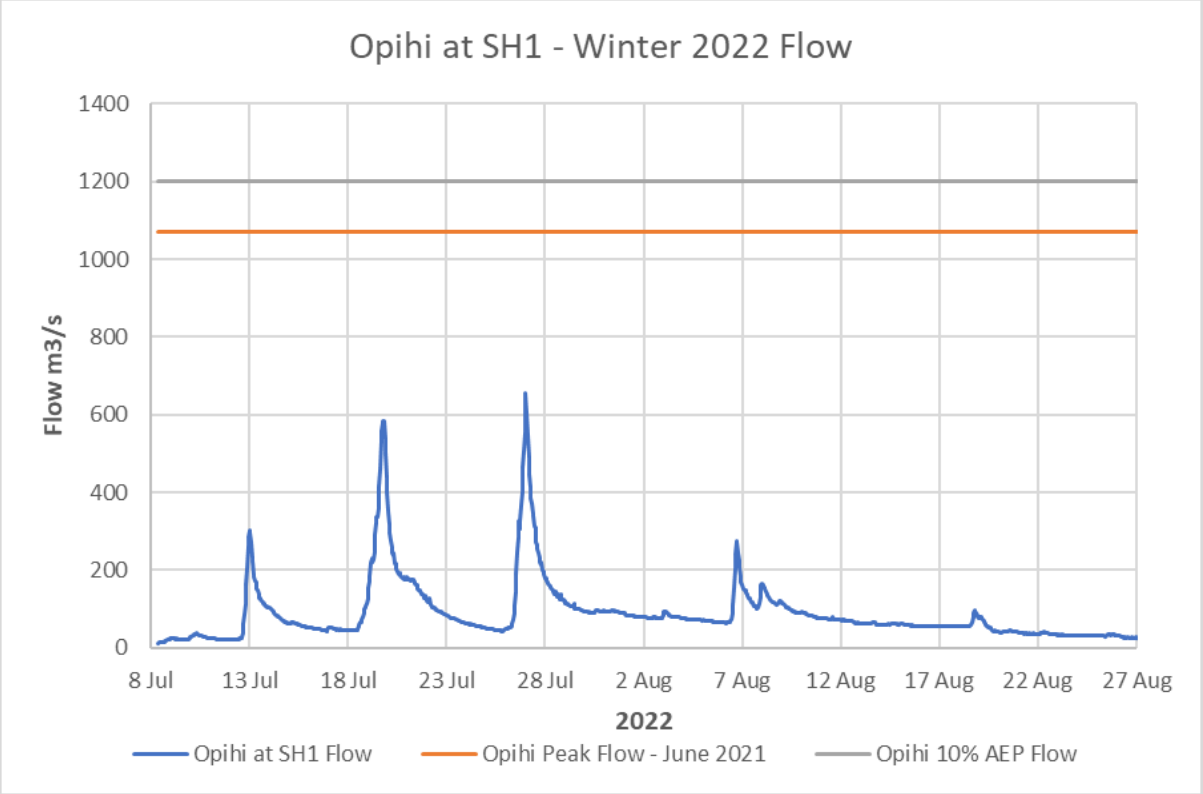


Figure 2-2: Winter 2022 flows in the Opihi River at SH1.

3 Flood Repair Progress at 2021 Damage Sites

2021 flood repair progress is being tracked on the Environment Canterbury flood recovery webpage with an up-to-date flood damage repair status map located at: ecan.govt.nz/FloodRepairMap. A screen clip of this web site is shown in Figure 7-1.

The total number of flood damage repair jobs now stands at 396 of which 188 have now been completed. The number of jobs has increased (from 381 at the end of June 2022) due to new jobs being registered at 2021 flood damage sites as a result of "damage-on-damage" to previously damaged sites resulting from the 2022 high flows.

The number of completed jobs has reduced to 188 (from 190 previously reported), as several completed jobs were re-opened in order to undertake repairs needed for 2022 damage-on-damage.

The status of flood damage repairs (to the end of September 2022) is summarised for each district in Table 3-1 below. While these numbers match the web site snapshot (shown in Figure 7-1), note that the website is updated daily with direct links to the ECan job management system, so will always reflect the latest flood repair status.

Key points to note from the table below is that flood damage repairs have progressed steadily over the three-month reporting period. Due to the high flows in July and August the focus during this period has been on re-assessing damage, re-prioritising repair works and undertaking high priority temporary repairs and ongoing permanent repairs.

Much of the tree infill planting, planned for this period was not able to be completed and has been deferred to the winter of 2023. In some cases, trees previously planted were washed out and have had to be replanted.

Table 3-1: Status of flood damage repairs by District at 30 September 2022.

District or Description	Draft	Accepted	Open	Monitoring	Completed	Total
Selwyn	8		1		8	17
Ashburton	36	3	39	17	109	204
Orari-Waihi-Temuka	28	15	4	6	28	81
Opihi	8	2	1		5	16
Ashley					5	5
Waimakariri-Eyre-Cust	1				13	14
Upper Hinds	5		19		8	32
Lower Hinds	3	1	1		2	7
Little River					1	1
Response including 2022 response					9	19
Totals	**89**	**21**	**65**	**23**	**188**	**396**

3.1 Examples of sites that held up well in winter 2022 high flows

During the winter 2022 high flows, many of the freshly installed and completed edge protection works performed very well, protecting private land and flood protection stopbanks from damage and inundation. Examples of these are shown in Appendix A and include works at large repair sites on the:

- Ashburton South at Walkhams Rd,
- Waihi at Hawke Rd, and
- Waihi at Geraldine.

Further details on each of these sites follows.

Ashburton South at Walkhams Rd
Tree edge protection here consisted of installing a number of lines of anchored tree protection (ATP) as a first step towards re-establishing the tree edge protection that had washed out over a length of approximately 500m in the 2021 flood. Figure A-1 shows the conceptual design of the ATP and Figure A-2 shows an aerial view of the completed ATP taken in May 2022. Figure A-3 shows the ATP during high flow on 19 July 2022, doing what it was designed to do, that is, slowing the flow along the edge of the river reducing potentially damaging flow over private land. The tips of the erosion protection bunds downstream of the ATP were washed out during the 2022 high flows (Figure A-4) however the ATP stood up well to the high flows and provided the desired protection.

Waihi at Beeby Rd
Flood damage on the Waihi River at Beeby Rd consisted of stopbank scour and loss of tree edge protection (see Figure A-5, a). Repairs, consisting of reconstructing the stopbank, with erosion protection bunds and ATP, were complete in July 2022 just days before the winter high flows (Figure A-5, b). The repairs performed very well with the erosion protection bunds and ATP remaining in-tact through the high flows (Figure A-6).

Waihi at Geraldine Highschool
At this location severe bank scour and tree edge protection loss occurred, placing the high school property at risk. Figure A-7 (a) shows the extent of this scour which was repaired with a Heyman Fence and native vegetation planting on the shaped embankment above the Heyman Fence. Figure A-7(b) shows the repairs performing well during high flows on 9 August 2022.

Waihi at Geraldine - Rock groynes at NPD station.
The rock groynes protecting a multi-use access path and industry (NPD filling station) were damaged placing infrastructure at risk (Figure A-8). Repair to the rock groynes was successfully completed in April 2022 (Figure A-9, a). These repairs held up exceptionally well to the 2022 winter flows as shown in Figure A-9 (b) taken on 9 August 2022.

3.2 Damage-on-damage from winter 2022 high flows

In the catchments which already had identified 2021 flood damage, 46 of the 2021 flood damage sites received additional damage-on-damage as shown in Table 3-2 below.

Table 3-2: Sites with damage-on-damage from winter 2022 high flows

District / Catchment	Sites with Damage-on-Damage
Ashburton Rivers	22
Orari-Waihi-Temuka	15
Opihi	9
Total	**46**

Photos of damage-on-damage are included in Appendix B using Ashburton North at Thompsons Track, Ashburton at River Road and the Orari at Stewart Road as examples.

Ashburton North at Thompsons Track
Repairs to 2021 flood damage on the Ashburton North Branch at Thompsons track were partially complete at the time of the winter 2022 high flows. The stopbank and erosion protection bunds had been completed and installation of the ATP was about to start.

During the high flow events, because there was no ATP upstream of the erosion protection bunds, these started scouring away quite quickly. Temporary emergency works to stop the erosion from reaching the stopbank included bringing in 220 tonnes of rock which was placed on the tips of the upper three erosion protection bunds to stop further erosion. This was successful, it protected the stopbank which ultimately protects Thompsons Track and significant private property down gradient. Figures B-1 and B-2 show the extent of the winter 2022 flood scour and damage-on-damage at this site.

Since the winter 2022 high flows, the erosion protection bunds have been reinstated (see Figure B-3) re-using the rock as additional protection at the ends of the upper three erosion protection bunds. Rock

armouring the entire length of the stopbank was considered but ultimately rejected as being prohibitively expensive. Furthermore, rock lining is avoided where possible due to its ongoing maintenance costs. Once the erosion protection bunds were reinstated, the ATP was installed, and infill tree planting undertaken (see Figure B-3).

Ashburton at River Road
Figures B-4 and B-5 show the sequence of repairs on the Ashburton main stem at River Road, including 2022 damage-on-damage in the aerial taken in September 2022 following the winter high flows. The lateral bund in front of the erosion protection bunds was completely washed away, however the ATP on the upstream edge of each erosion protection bund performed relatively well with only the tips of the erosion protection bunds being washed downstream (but remaining attached). The ATP was bent downstream (Figure B-6), and repairs have been planned (Figure B-7) to re-instate the tips of the erosion protection bunds and tie the ends of the ATP to concrete block anchors upstream of each ATP line. This approach was not originally used in the ATP on River Road because it was one of the first 2021 flood damage repairs undertaken. The method of using upstream ATP anchors has been successfully used in other 2021 flood damage repairs, that fared well in the winter 2022 high flows. These included ATP at several sites on the Waihi and Opihi Rivers.

Orari at Stewart Rd
The sequence of flood damage at this site is shown in Figure B-8. It was a lower priority 2021 flood damage repair site as tree edge protection had been partially washed out, however the stopbank was still in place. The winter 2022 high flows exacerbated this damage stripping the stopbank berm of all vegetation along a 230m length and damaging the stopbank severely at two locations. (see September 2022 flood damage line in Figure B-8). The extent of the damage following temporary re-diversion and dewatering of the site is shown in Figure B-9. Repair options have been investigated and a contract awarded for repair works to commence late October 2022.

3.3 New 2022 flood damage

Approximately 62 locations across the region sustained “new” damage as a result of winter 2022 high flows. These are shown in Table 3-3 below. Of these 50 sites of new damage occurred in the catchments that had already sustained 2021 flood damage (shaded yellow rows in Table 3-3)

Table 3-3: Sites with new damage from winter 2022 high flows

District / Catchment	Sites with New 2022 damage
Ashburton Rivers	10
Orari-Waihi-Temuka	13
Opihi	27
Ashley River	1
Lower Flats Waiau	1
Lower Pareora	3
Omarama Stream	1
Otaio	2
Upper Waitaki Rivers	1
Waihao-Wainono Rivers and Drainage	1
Lower Waitaki	1
Waimakariri-Eyre-Cust	1
Total	**62**

Much of the new flood damage was sustained in the Opihi River catchment. The most significant damage was to a stopbank on the Opihi River just upstream of a small group of dwellings at the end of Mill Road. Due to the high risk of stopbank failure, the dwellings were temporarily evacuated, and repair works undertaken with urgency.

Photos showing damage to the stopbank (20 July) and the completed repairs (9 August 2022) are included Appendix C, Figure C-1

3.4 Tree edge protection reinstatement

As reported previously, the re-establishment of a lost tree edge protection asset will take 5-10 years for trees to grow to where they provide the pre-flood level of river edge protection. Steps in this process include establishing a protected area where trees can be replanted, tying in targe trees to act as an erosion buffer and undertaking infill planting of willow poles. In many cases this will create a suitable environment to interplant with native species once the willow have stabilised the area.

Flood damage repairs are vulnerable to sustain further damage until all the steps have been completed and then still vulnerable until the trees have had the opportunity to grow to a decent size.

At sites where the erosion protection buffers had been established, trees tied in and poles planted, there was very little further damage during the winter 2022 high flows. Examples of these are on the Waihi River at Beeby Rd (Figure A-6) and the Ashburton River South Branch at Walkhams Rd (Figure A-4).

At sites where the erosion protection reinstatement was partially completed, there was much more impact (greater damage-on-damage) from the winter 2022 high flows. Examples of these are on the Ashburton at Thompsons Track (Figures B-1 and B-2), where erosion protection bunds had been established but anchored tree protection not yet trenched and tied in, and no infill planting had been undertaken.

Infill tree planting planned for July to September was initially put on hold during the winter high flows. This recommenced once prioritisation had been undertaken to assess where best to continue with planting. In some cases, this was in areas where planting had washed out, and in other cases it was as planned. Overall, the infill planting programme was severely impacted by the winter 2022 high flows most significantly in the lost opportunity for planting during the 2022 winter period. Planting not now completed will, except for a few cases, need to be deferred to the winter of 2023.

The numbers of infill poles planted in the July to September period are included in Table 3-4 below. It should be recognised that in a number of locations poles have been replanted in locations where they had previously been planted and were washed out by the winter 2022 high flows.

Table 3-4: Infill tree planting to reinstate tree edge protection.

Area	No of poles planted to end June 2022	No of poles planted July-September 2022	Total number of poles planted (or replanted)
Central Area **(Ashburton Rivers)**	18,840	3,325	22,165
Southern Area **(Orari/Waihi/Temuka/Opihi)**	24,500	1,000	25,500
Total	**43,340**	**4,325**	**47,665**

3.5 Next steps

Priorities for October to December 2022 are to continue to undertake prioritised flood damage repairs including 2021 flood damage and damage-on-damage to 2021 flood damage sites. There are several major damage sites from the 2022 winter with only small-scale temporary works in place that will be repaired during the summer months. Specifically these large, key sites are:

- Several major erosion sites with extensive tree loss on the North Ashburton in the vicinity of the Rangitata Diversion Race.
- A stopbank reconstruction and tree reinstatement site on the Orari in the vicinity of Stewart Road.
- Replacement of gradient control rock weirs on Sweetwater Creek.
- A series of erosion sites on the South Ashburton in the vicinity of Mt Somers township.
- Ashburton Main Stem at River Road.

There are dozens of smaller work sites which will also receive attention during this period.

Pole planting will cease for the summer season and will be re-commenced in the winter of 2023. The re-establishment of berm vegetation is critical to the success of most of the repairs carried out to date.

4 Procurement

Previous emergency response work and temporary flood damage repairs were undertaken using ECan's list of pre-qualified contractors. The same procedure is being followed with the current emergency and temporary works. Some reinstatement works, particularly anchored tree protection will also need to still be procured in this way. This is because the work is complex and hard to specify, it is best completed by experienced operators on an hourly rate basis under adequate supervision.

Wherever possible, larger works have been and will continue be put to tender for competitive pricing following best procurement practice. In particular, a competitive pricing process has been followed for the following larger worksites where work was completed during this period:

- North Ashburton at Thompsons Track - $51,000
- Orari at Stewart Road - $244,000
- Orari at SH79 Anchored Tree Installation - $80,000

5 Financials

5.1 Flood Response and Recovery

Flood response costs to the end of September 2022 are $13.8 million as summarised in Table 5-1 below. Approximately $1.5 million has been spent on flood recovery during the report period from July to September 2022. Costs are subdivided into the flood affected river rating districts. A summary of the total costs to date separated into estimated non-eligible and eligible costs for claim to NEMA for subsidy is provided in Table 5-2.

Table 5-1: Canterbury 2021 flood response costs for reporting period and total costs at 30 September 2022.

Description	Costs for period July to Sep 2022 $	Total Costs to Date $
Flood monitoring costs	0	289,693
Selwyn 2021 Flood Repair	251,707	403,979
Ashburton 2021 Flood Repair	821,749	8,438,021
OWT 2021 Flood Repair	417,207	2,609,872
Opihi 2021 Flood Repair	11,513	208,882
Ashley 2021 Flood Repair	897	131,519
WEC 2021 Flood Repair	-	517,026
Upper Hinds 2021 Flood Repair	493	176,162
Lower Hinds 2021 Flood Repair	131	122,309
Little River 2021 Flood Repair	-	4,487
Sub-total	1,503,698	12,901,950
CDEM Response	0	414,541
Regional Parks Repair	0	334,775
Other Costs	0	171,802
TOTAL	1,503,698	13,823,068

Table 5-2: Canterbury 2021 Flood Response Costs at 30 September 2022.

Description	Estimated Non-Eligible Costs $	Estimated Eligible Costs $	Total Costs to Date $
River Rating Districts	1,463,022	11,438,928	12,901,950
CDEM Response	414,541		414,541
Regional Parks Repair	330,511	4,264	334,775
Other Costs	150,059	21,742	171,802
TOTAL	2,358,133	11,464,934	13,823,068

Figure 5-1 below shows the 2021 flood recovery expenditure profile to date. Prior to the winter 2022 high flows and subsequent damage-on-damage, expenditure was tracking the expected spend profile to complete flood damage repairs for an estimated $19.9 million by June 2023.

The adjusted estimate of total 2021 flood recovery costs, including damage-on-damage is now $22.2 million (see Table 5-4 that follows). The estimated time to complete the repairs has been extended by six months to December 2023 as shown in the adjusted spend profile below. More time is needed to complete the damage-on-damage repairs and to undertake infill planting since the opportunity for planting in the winter of 2022 has largely been lost. Expenditure from July to September has closely tracked the adjusted estimated future spend profile.

Note that "new" flood damage costs are not included in the expenditure profile below.

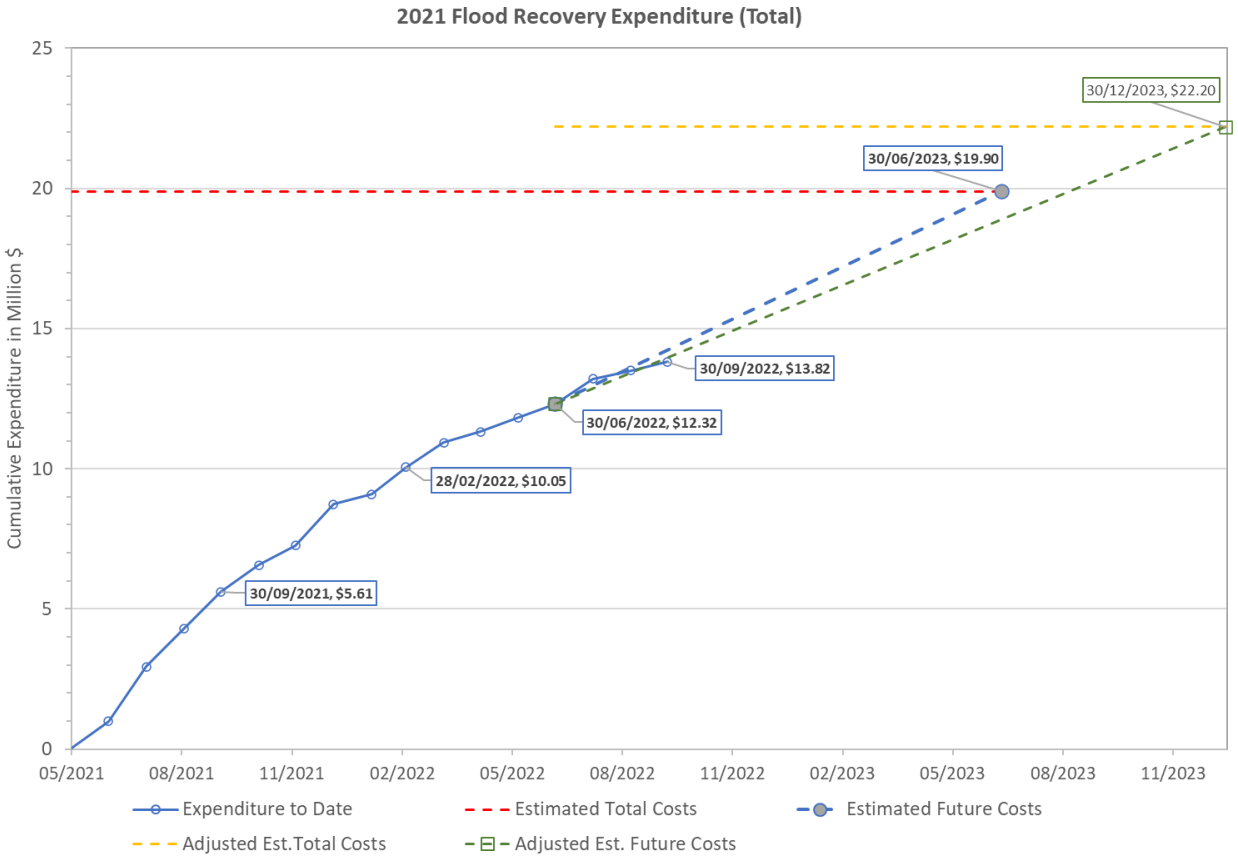


Figure 5-1: 2021 flood recovery expenditure profile.

5.2 NEMA Eligible Costs

Government policy[1] is to reimburse 60 percent of the combined eligible costs. These include response and essential infrastructure costs above 0.002 percent of the net capital value in the case of regional councils. For ECan, this threshold has been determined to be $4.1 million.

As presented in Table 5-2 above, ECan has assessed that of the flood recovery expenditure to the end of September 2022, approximately $11.3 million are NEMA eligible costs (subject to NEMA confirmation).

ECan has submitted four claims to NEMA covering costs through the end of June 2022. Table 5-3 below shows the value of each f these claims which have all already been reimbursed to a total value of $3.5 million.

Note that Claim 1 was subject to deduction of the initial threshold of $4.1 million.

Claim 5 is under preparation to be submitted concurrently with this report. The estimated reimbursement value of Claim 5 is $0.8 million.

Table 5-3: Estimated flood recovery costs with portion estimated as claimable from NEMA.

Claim	Period	Eligible Cost ($)	Threshold ($)	Claimable from NEMA (60%)	Status
Claim 1	June - Sep 2021	4,930,462	4,113,817	489,987	Claimed
Claim 2	Oct 2021-Feb 2022	3,075,412		1,845,247	Claimed
Claim 3	Mar-May 2022	1,650,540		990,324	Claimed
Claim 4	June 2022	334,772		200,863	Claimed
Claim 5	July-Sep 2022	1,357,014		814,208	In preparation
	TOTAL	$11,348,200		$4,340,630	

5.3 Estimated flood recovery costs and their apportionment

5.3.1 2021 Flood Recovery (including 2022 damage on damage)

The estimated total cost for 2021 flood recovery at 30 September 2022 has increased to $22.2 million. A summary of costs including those to the end of September 2022 is provided in Table 5-4 below.

Based on these estimates and what we have learnt through processing NEMA claims to date, the overall cost for 2021 flood recovery to ECan is estimated to be $15.1 million with an expected central government contribution of $7.1 million through claims to NEMA.

[1] Section 33 of the Guide to the National CDEM Plan, 2015.

Table 5-4: Estimated 2021 flood recovery costs.

Estimated Costs	At 30 June 2022 (Million $)	At 30 Sept 2022 (Million $)
Flood Recovery costs	12.3	13.8
Estimated Future Flood Recovery Costs	7.6	8.4
Total Flood Response & Recovery Estimate	**19.9**	**22.2**
Estimated non-Eligible Recovery Costs	-4.4	-6.2
ECan Threshold for NEMA claim	-4.1	-4.1
Eligible for 60% government subsidy (NEMA)	**$11.40**	**$11.90**
Estimated Funding Mix	**Million $**	**Million $**
ECan initial threshold	4.1	4.1
ECan – Non Eligible Costs	4.4	6.2
ECan – 40% of Eligible Costs	4.6	4.8
Total ECan Estimated Cost	**13.1**	**15.1**
NEMA – 60% of Eligible Costs	6.8	7.1
Total	**19.9**	**22.2**

5.3.2 New 2022 damage costs

The estimated cost for new 2022 flood damage $2.7 million. Of this, $0.9 million is for damage that occurred in the same catchments as those that sustained 2021 flood damage (Ashburton, Orari-Waihi-Temuka and Opihi). The remaining $1.8 million is for damage in the Lower Waitaki and Rangitata catchments as shown in Table 5-5 below. There will not be a contribution from central government for these new damage costs as they are below the threshold for a new claim to NEMA.

Table 5-5: Estimated new 2022 flood damage costs.

District / Catchment	New damage cost ($)
Ashburton Rivers	177,500
Orari-Waihi-Temuka	324,000
Opihi	370,000
Lower Waitaki	300,000
Rangitata	1,500,000
Total	**2,671,500**

5.3.3 Funding considerations.

Council has committed $12.2 million of general rate funding towards flood recovery in the rating districts (Ashburton, Orari-Waihi-Temuka and Opihi) in which 2021 flood damage occurred. It is now estimated that an additional $3.8 million will be required for flood damage repairs in these catchments as indicated in Table 5-6 below.

Table 5-6: Flood recovery funding requirements.

2021 Flood Recovery Catchments	Estimated cost (million $)
Oct 2022 estimate of required ECan contribution to 2021 flood recovery	15.1
Plus: New 2022 damage	0.9
Equals: Overall funding requirement	16.0
Current Council committed funding	12.2
Estimated deficit (Oct 2022)	**3.8**
Other Catchments (Lower Waitaki, Rangitata)*	**1.8***

* Note that repair costs in Lower Waitaki and Rangitata have been included within ECan's Climate Resilience programme of work and will be eligible for co-funding from Kanoa (MBIE) – subject to usual eligibility review process.

Funding options to consider for these rating districts may include:

(a) Requesting additional funds from general rates, or
(b) Allocating costs to each rating district based on the additional expenditure in that district, or
(c) Limiting the flood recovery effort to the currently approved $12.2 million Council contribution and accepting that an elevated level of residual risk will remain.

A paper is being prepared to be brought to Council for consideration of funding options together with the financial implications of each option.

6 Risks

Most of the major stopbank breaches have now been repaired. Without vegetation adjacent to them though, these stopbanks still remain a vulnerable point in the schemes. This risk became a reality during the winter 2022 high flows when fragile erosion protection bunds were partially washed away because anchored tree protection had not yet been fully established and tree edge protection either not yet established or was in the process of being established. Re-establishing this vegetation remains a high priority through the winter of 2023, however it is acknowledged a return to 'full strength' will take years as this vegetation will take time to grow.

The following table provides a summary of residual risk and ongoing risks to the flood recovery programme together with mitigation actions to reduce the likelihood of the risks becoming issues.

Table 6-1: Residual and Flood Recovery Project risks

Risk	Description	Mitigation Action
Further Floods	Severe weather may cause further flooding before or during flood damage repairs. This could increase the flood damage.	Undertake temporary repairs as soon as possible. (Complete) Communicate elevated residual risk to the community, especially in areas where river break-out has occurred. (Complete & Ongoing)
Spring thaw	High spring flows in the rivers when snowmelt occurs could pose further flood risk.	Assess most likely locations of high flows following spring thaws. Undertake priority temporary repairs in these areas. (Complete)
Funding	Security of funding	Ongoing communication with ECan Councillors is needed to keep them aware of funding needs from Council Reserves and potential risks. (Underway / Ongoing) Work closely with NEMA to maximize NEMA contributions and flood recovery. Closely monitor

Risk	Description	Mitigation Action
		contractor and materials cost. Follow council procurement processes. Public tender for large works. (Underway / Ongoing)
Cost of Works: Fuel Cost Increases	The cost of fuel has increased significantly since the initial cost estimate was undertaken. Contractor rates are starting to reflect this.	A contingency amount of 10% of the remaining physical works estimate has been added to the overall project cost estimate. This is one of the elements of the total $19.9 million estimate.
Material availability	The availability of material, particularly to undertake tree replacement. Both heavy and light anchored bank protection requires significant lengths of cable and anchors (typically concrete blocks).	Councils around the country have been made aware of ECan's need for steel cable. Alternative sources are being investigated. Immediate needs are covered. The availability of concrete blocks for ATP is critical and currently in short supply. Arrangements are being made to use moulds closer to the points of need and stockpile blocks before the 2023 planting season. Contingencies may need to be considered, including the use of higher cost rock protection where material availability limits the reinstatement of anchored tree protection.
Tree growth time	The time for re-establishment of tree edge protection poses a risk until trees can be established.	In critical areas of high risk, alternatives, particularly rock protection, may need to be considered to mitigate risk. As far as is practicable, live trees are being salvaged from the river fairways and being utilised in repair works. Many of these large trees will resprout and form the future erosion protection.
Staff Resource	Staff resources are limited to undertake oversight and coordination of significant flood damage repairs.	Consider additional contract resource for flood damage assessment, prioritisation and works and on-site works supervision that cannot be delivered in-house.
Programme length	Property owners want works associated with their property undertaken first.	Prioritise flood damage repairs based on risk and develop and implement a communications plan. (ongoing) Communicate directly with property owners, and with the community as a whole keeping them informed of works priorities. (ongoing)
Ground conditions	River levels from time to time will restrict access and be generally unsuitable to undertake large scale works.	Monitor river levels and plan works for drier months if possible. Communicate this risk to directly affected landowners. (ongoing)

7 Communications and Community Engagement

An essential part of undertaking flood recovery is ongoing communication and community engagement.

The Environment Canterbury Flood Recovery web page is the primary means of communicating information regarding flood recovery efforts. Communication via the website is an effective way to communicate project progress to a wide audience and engage the community, particularly during periods where community engagement has been somewhat hampered by Covid 19 restrictions. The Flood Recovery webpage is located at: ecan.govt.nz/flood-recovery

A live map indicating the status and location of flood damaged sites needing repairs is still available. This interactive map can be accessed from the above webpage, or located directly at: ecan.govt.nz/FloodRepairMap

This map and its associated summary tables provide information on all flood damage repair jobs for the affected Canterbury districts. Summaries can be viewed based on user selection either of “All” areas, or by selecting a specific district. Clicking on each individual repair site on the map gives high-level information about the nature of the repair at that location and its status. A screen clip of the website is included in Figure 7-1 below.

One-on-one communication continues with affected landowners particularly around works planned or underway on or adjacent to their land. The interactive web page provides a valuable tool to keep landowners updated on the status of works at specific sites that affect them or are of interest to them.

Meetings

Further updates have been provided by way of the following meetings with council and rating district liaison committees. Written or verbal updates and/or field visits have been carried out with all other flood related Committees between July and September 2022. Additionally, many one-on-one meetings with impacted landowners have been undertaken to discuss works proposed at their properties.

Table 7-1: Summary of public / external meetings, since previous report.

Date	Meeting Description
10 August	Canterbury Regional Council Catchment Sub-committee
6 September	Ashburton River Rating District - update meeting

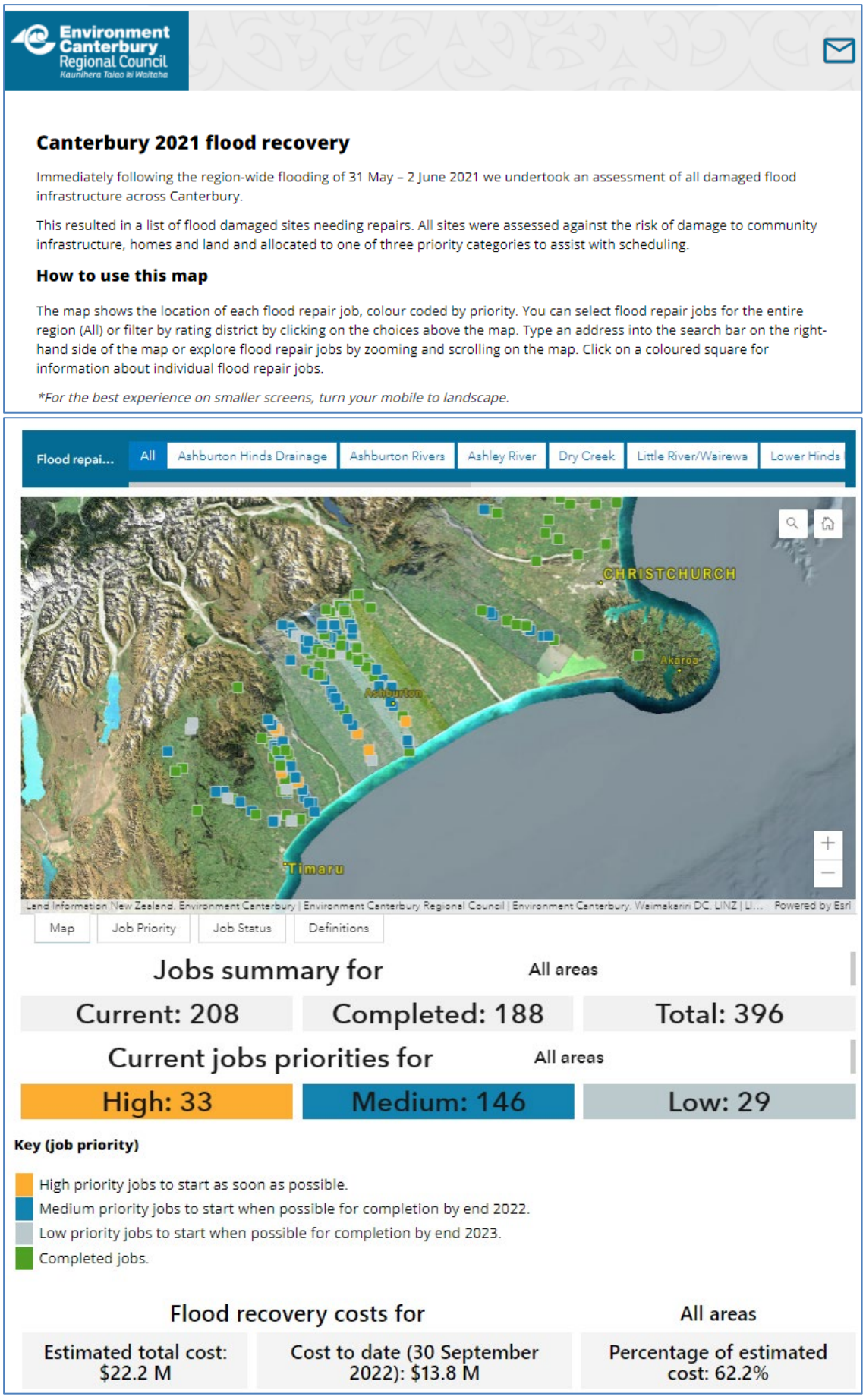


Figure 7-1: Screen clip of flood recovery interactive job status web page at 30 September 2022.

8 Betterment Opportunities

The future state of Canterbury's braided rivers may well look different to the pre-flood state, particularly when referencing overall river width, indigenous biodiversity, mahinga kai, recreation and other values. Because fairway widths have been reduced over the last 50 years, in many cases it may not be acceptable to simply build back 'like-for-like'.

In undertaking flood recovery repairs consideration is being given to opportunities for betterment that create a better balance between:

- providing an acceptable (or design) level of flood protection,
- incorporating the effects of climate change,
- restoring river ecosystems,
- incorporating "Te Mana o te Wai" principles,
- allowing more room for rivers,
- recognizing land owner expectations and
- providing a fair and reasonable transition pathway for change.

Appendix D has been included to show initial concepts of River Management Planning for Climate Change, including ways to better manage river systems moving forward.

Furthermore, there may be some inadvertent betterment. This includes the need to replace the function of an asset with a different asset that performs the same function. For example, there may be certain locations where it is necessary to replace tree river edge protection with rock protection because of the level of risk, and the time limitations to re-establish replacement tree edge protection. As these opportunities are considered there will be ongoing discussion with NEMA as to the government co-funding eligibility.

A. Flood repair sites that performed well in winter 2022 high flows

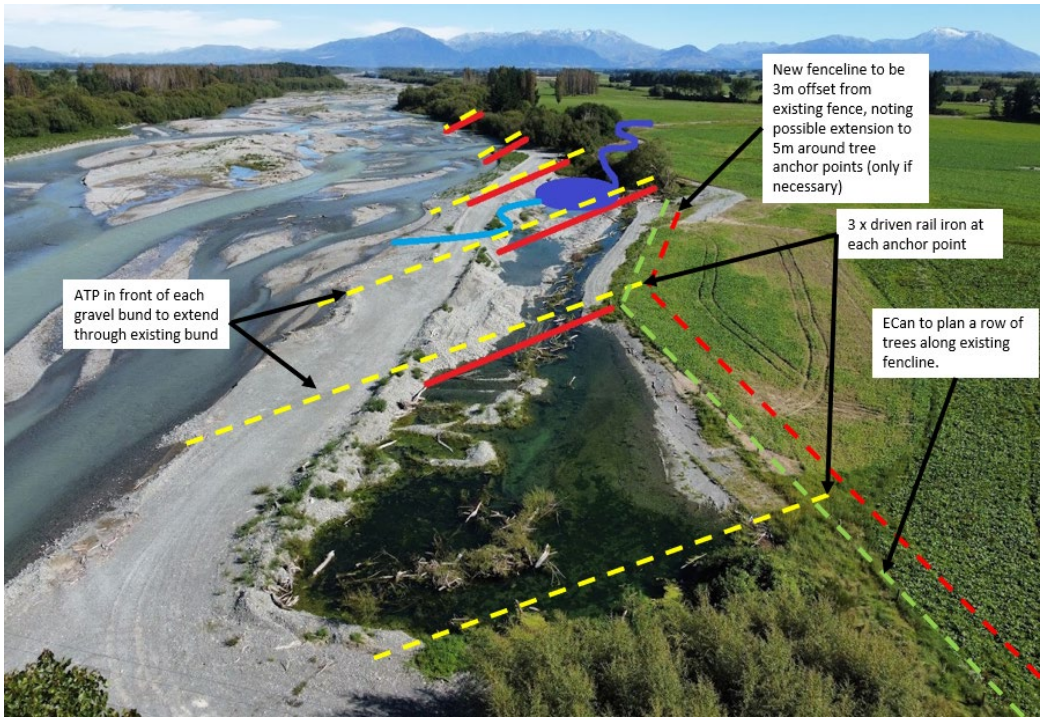


Figure A-1: Ashburton South Branch at Walkhams Road - conceptual design of anchored tree protection (ATP). (b) after completion of ATP (May 2022)floodbank reinstatement.

Figure A-2: Ashburton South Branch at Walkhams Road, after completion of ATP (May 2022).

Figure A-3: Ashburton South Branch at Walkhams Road, operation of ATP during high flow (19 July 2022).

Figure A-4: Ashburton South Branch at Walkhams Road, ATP following high flows of July/August 2022.

Figure A-5: Waihi River at Beeby Rd, (a) after 2021 flood with temporary bund, and (b) following completion of stopbank repair, erosion protection bunds and ATP (6 July 2022).

Figure A-6: Waihi River at Beeby Rd in late August 2022 showing good condition of erosion protection bunds and ATP following July/August high flows

Figure A-7: Waihi at Geraldine High School (a) following flood damage before repair, (b) after repair of embankment with Heyman Fence and native planting on bank holding up well in 2022 high flows (9 August 2022).

Figure A-8: Waihi at Geraldine NPD following 2021 flood showing (a) bank scour and (b) displacement of rock groyne.

Figure A-9: Waihi at Geraldine NPD showing rock groyne repair (a) after completion and (b) after high July/August high flows (9 August 2022).

B. Damage-on-damage from winter 2022 high flows

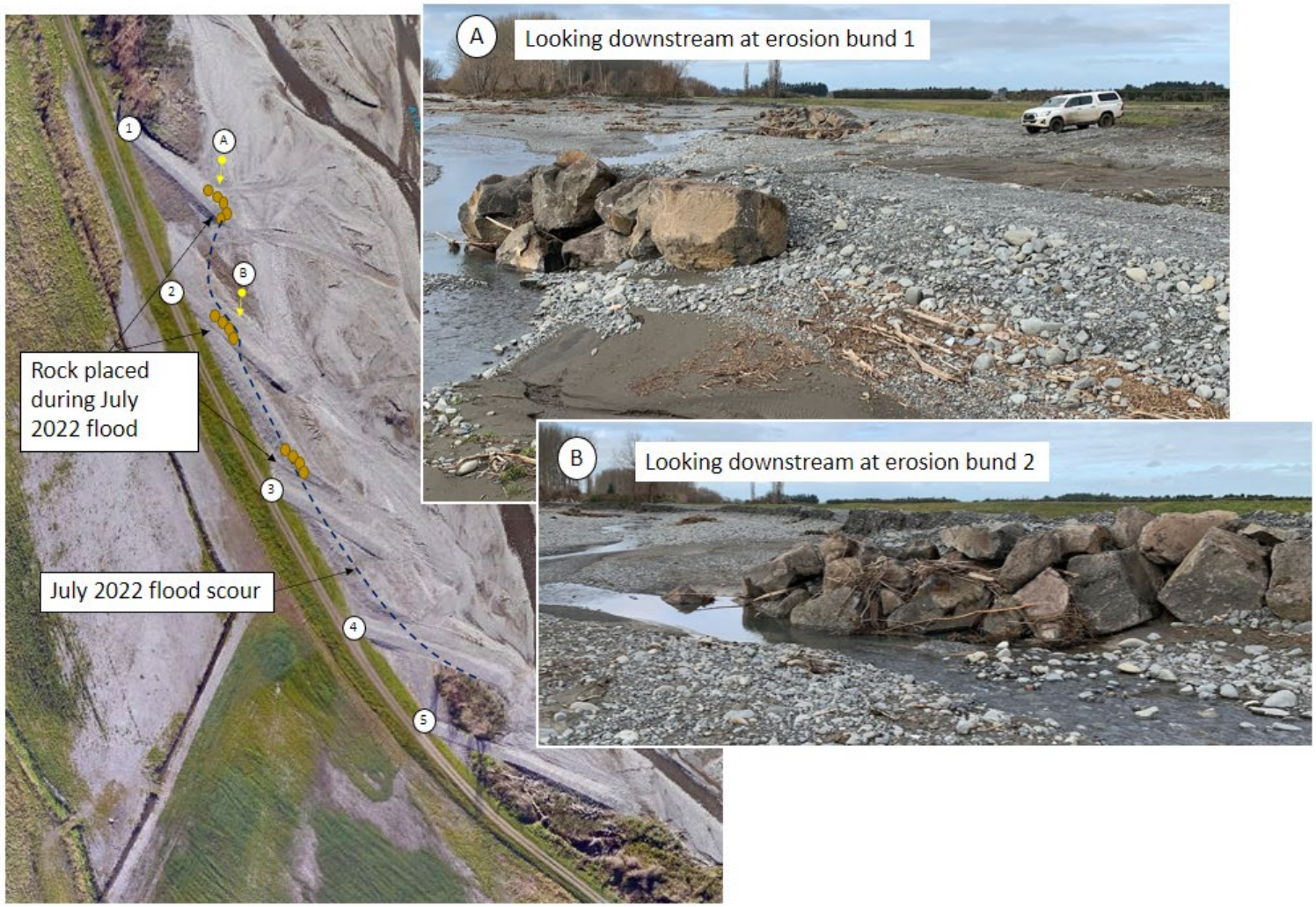


Figure B-1: Ashburton North at Thompsons Track overlay of July 2022 flood scour on aerial image of partially completed 2021 flood damage repair.

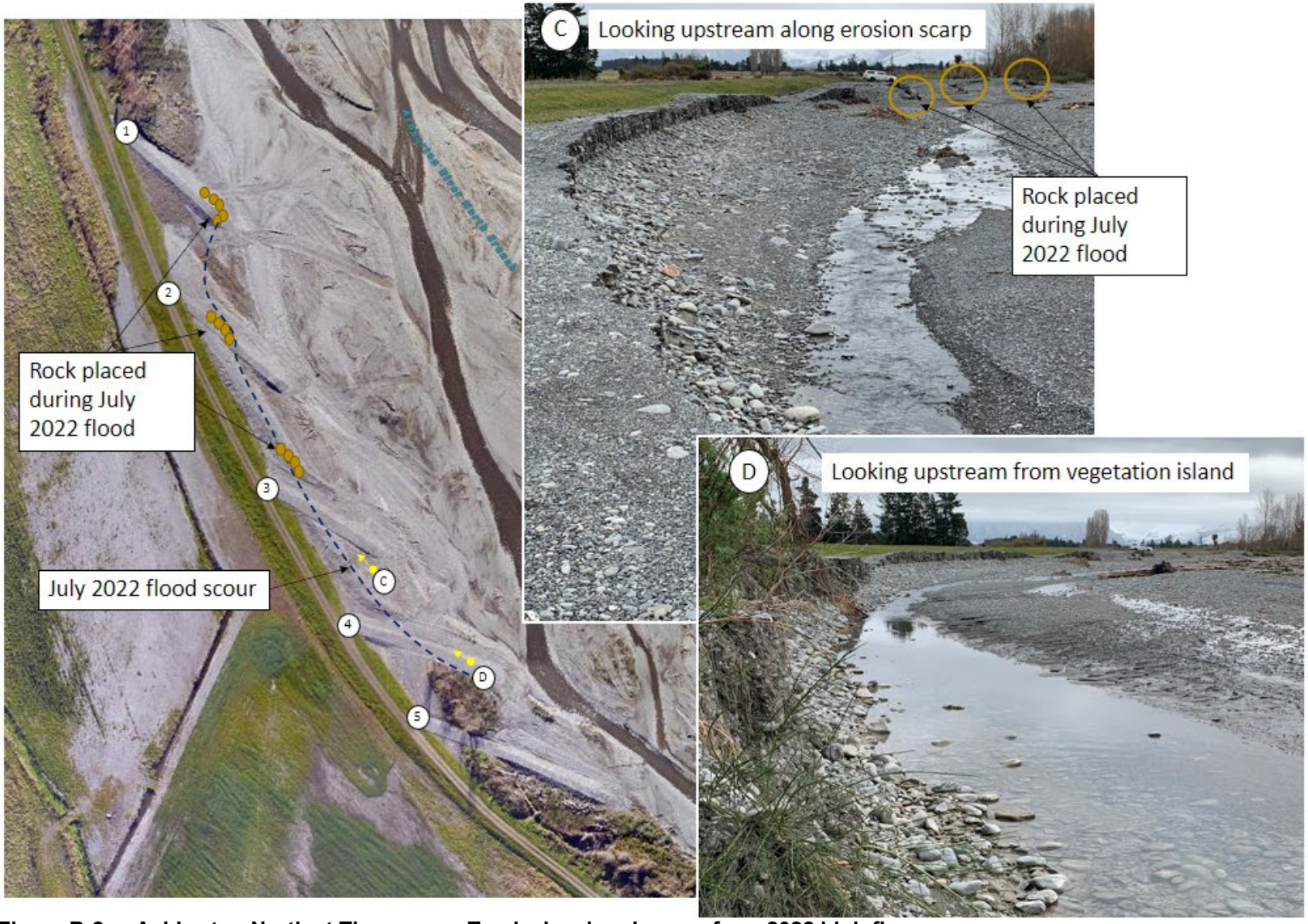


Figure B-2: Ashburton North at Thompsons Track showing damage from 2022 high flows.

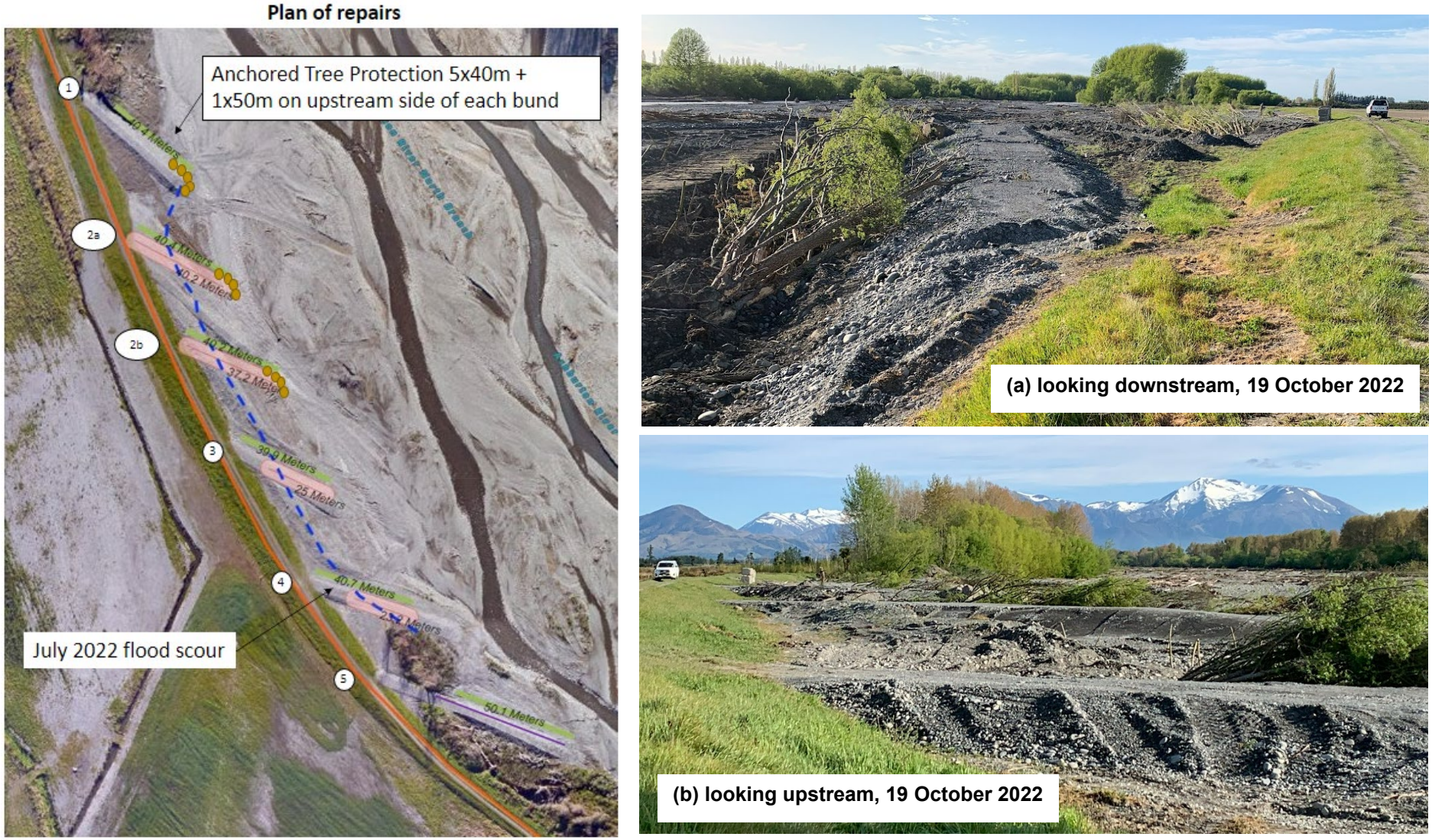


Figure B-3: Ashburton North at Thompsons Track, plan of repairs following 2022 high flows, and completed damage-on-damage repairs (a) looking downstream, and (b) looking upstream (19 October 2022).

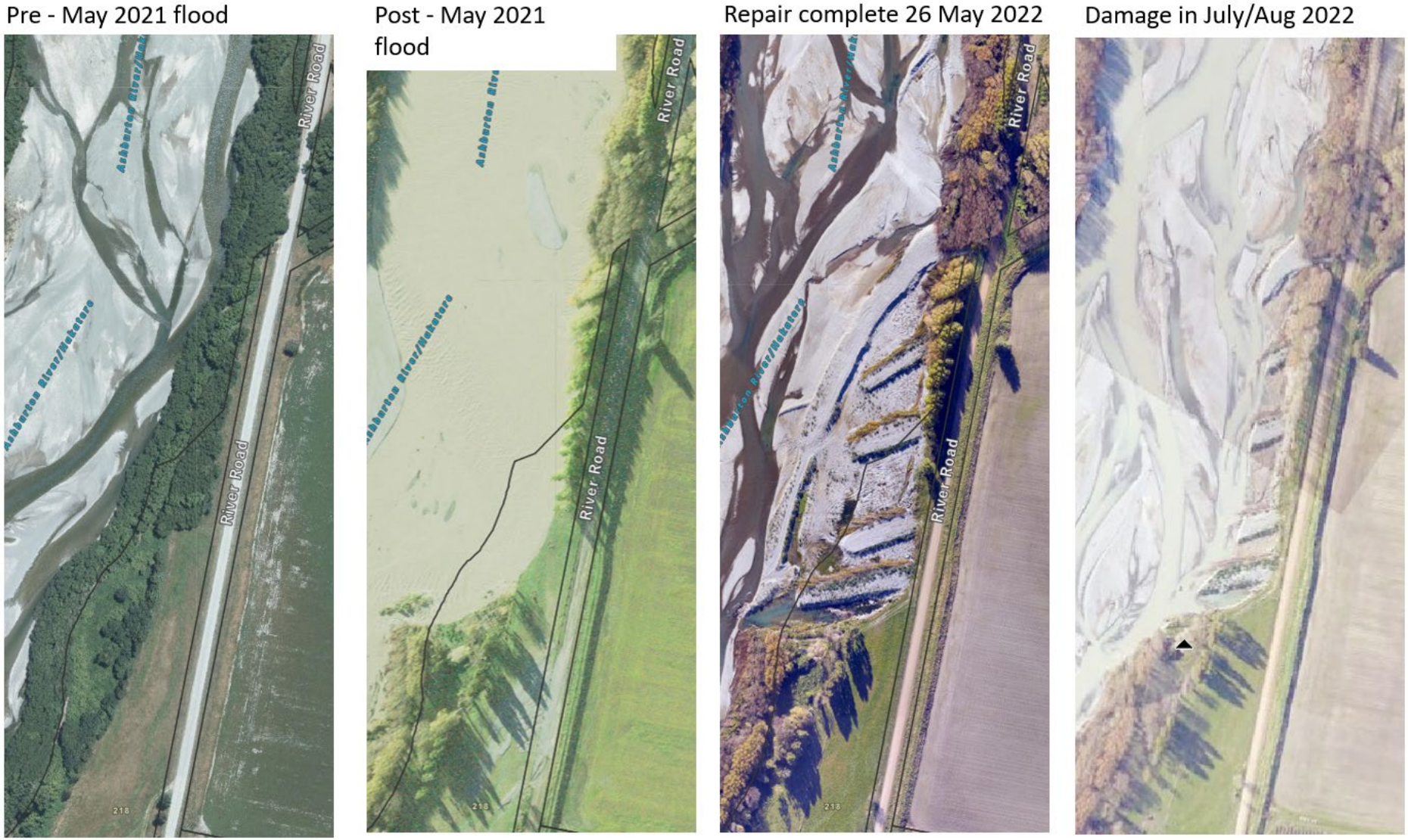


Figure B-4: Ashburton at River Road timeline of aerial images showing pre-flood status, post flood damage, completed flood damage repairs, and 2022 damage-on-damage.

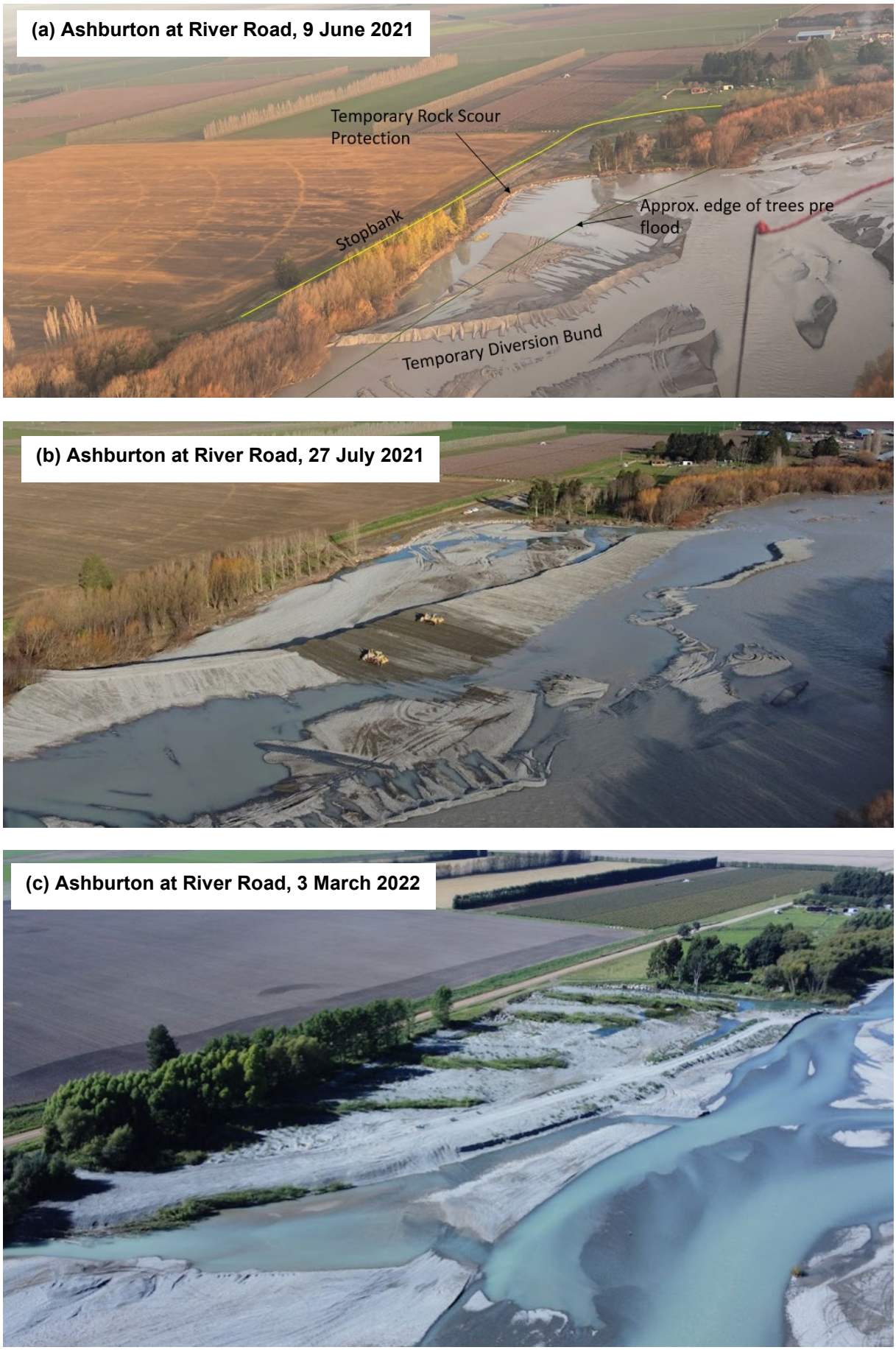


Figure B-5: Ashburton at River Road sequence of flood damage repairs.

Figure B-6: Ashburton at River Road during and immediately following winter 2022 high flows.

Figure B-7: Ashburton at River Road, planned repairs to 2022 damage-on-damage.

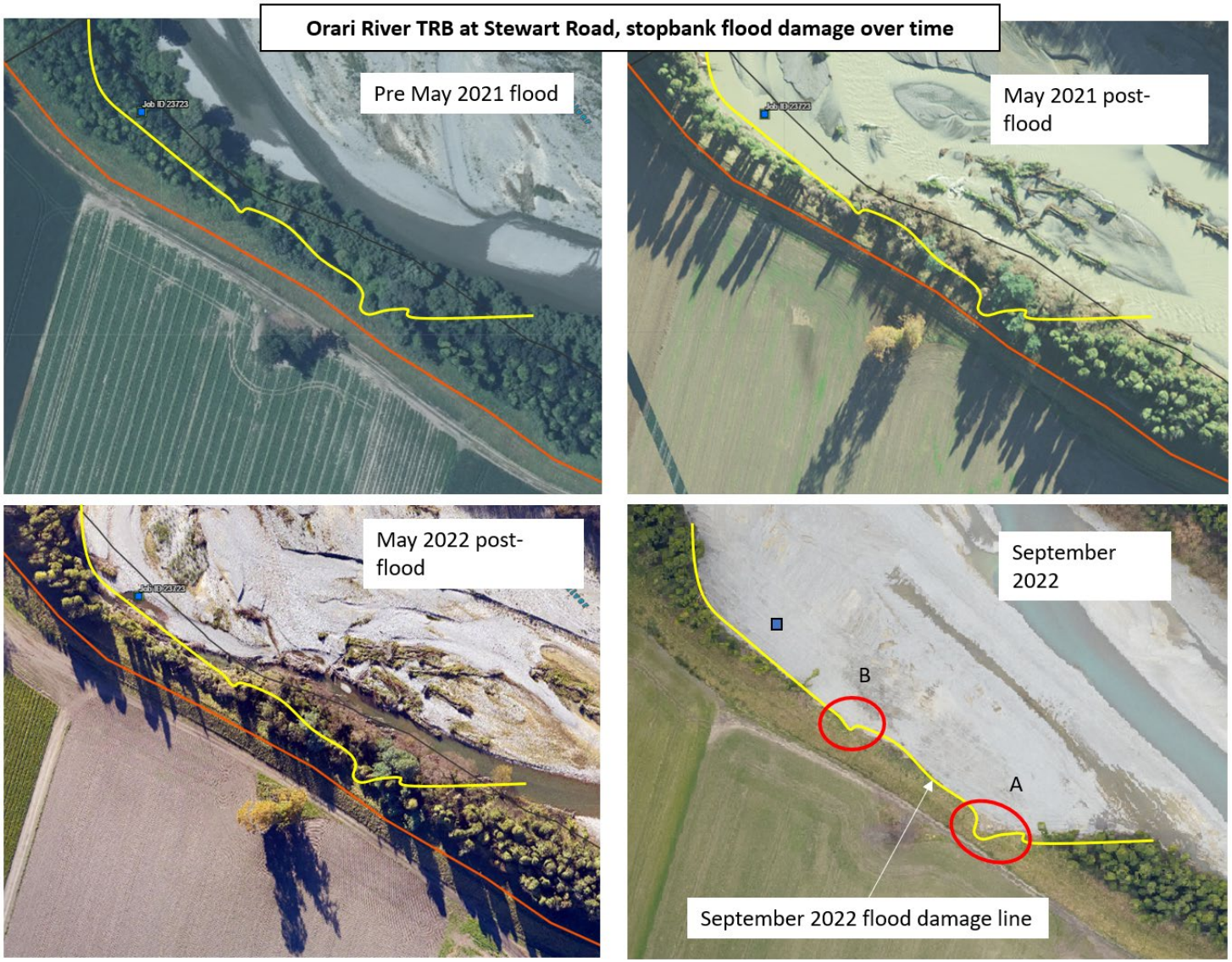


Figure B-8: Orari at Stewart Road, timeline of aerial images showing pre-flood status, post flood damage and exacerbation to damage from the winter 2022 high flows.

Figure B-9: Orari at Stewart Road, stopbank damage at A and B and scour of 230m length of stopbank berm.

C. New 2022 flood damage

Figure C-1: Opihi at Mill Road during flooding on 20 July 2022 (above) and following urgent repairs on 9 August 2022 (below).

D. River Management Planning for Climate Change

Some of the key challenges facing Council Rivers staff as increased flood frequency and more intense rainfall become more prevalent with climate change, are the restrictions that have been imposed on rivers through floodplain development and human interventions over time. As a starting point for discussion to enable better river management in future which takes into account climate change, a conceptual framework is presented below. Some of the challenges are conceptualised in Figure D-1 below and then a way forward developed conceptually in Figure D-2.

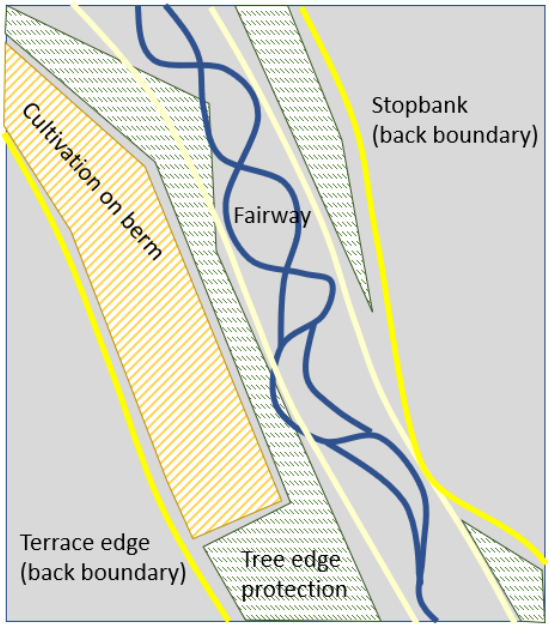
Past and current actions such as cultivation on berms, restrictions of the location of stopbanks due to property boundaries or development encroachment (e.g. centre pivots) lead to narrow and in some cases no tree edge protection between the active river fairway and areas where active management is required. In other words, as soon as the river or braid moves naturally out of the fairway there is no room for “inactive management” and actions are needed to redivert the river back to the fairway, or urgent repair of damaged stopbanks is needed.

To address this, steps toward the long-term management of rivers could include development of “River Management Action Zones” conceptualised in Figure D-2. In this conceptualisation of future river management, when the river moves naturally into an area of vegetated edge protection (Zone 2), no immediate action is required, as in time the river and its braids may move back out of this zone. When the river moves into Zone 3, planning should start for actions to be implemented when the river moves into Zone 4. Again, the river may in time retreat from Zone 3, so only when it moves into Zone 4 is action required, according to plans made when the river was in Zone 3.

To get to this “Future Vision” of river management, shown side-by-side with the current reality in Figure D-4, there needs to be considerable planning and community consultation. Current reality has many such pinch points or constriction zones. Figure D-3 shows a conceptual cross section of what is needed to shift from the current situation to a more manageable future with climate change.

Back boundaries and river management action zones would need to be worked out and laid out for all reaches of the current flood control schemes. Further benefit would be gained if these were also mapped outside of flood control schemes. Consultation with the community will be needed and a timeline (50 years is a reasonable target) implemented by when those zones should be achieved for all catchments. Opportunities need to be sought to gradually establish these river management zones, piece-by-piece using whatever means are available. These could include relinquishing leases, not renewing water takes, voluntary retreat and other methods still to be determined.

River Management – Current Challenges

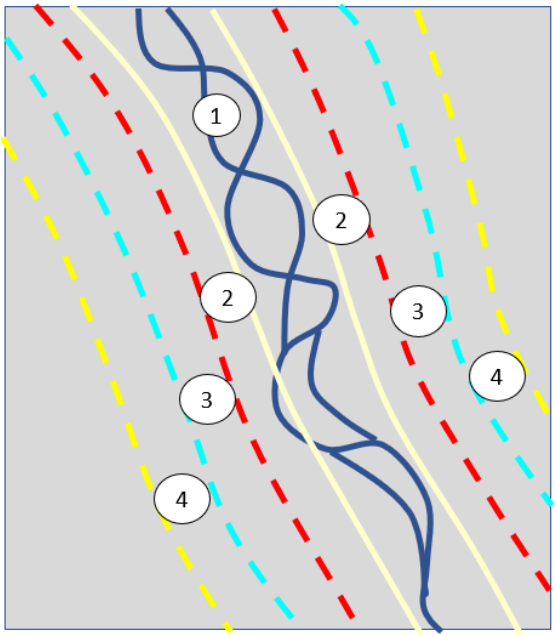


Current challenges include:

- Vegetation growth in fairway
- Cultivation on berms
- Back boundaries too close to fairway
- Places with little or no tree edge protection between river braids
- No defined management strategy between fairway and back boundaries
- Constriction zones (pinch points) where flooding will always be an issue

Figure D-1: Conceptualisation of some (not all) current river management challenges.

River Management - Action Zones



Zone 1 – Fairway. Active Clearance

Zone 2 – Free movement zone. No action to restrict erosion or braid movement

Zone 3 – Vegetation Buffer Zone. Attempt to maintain vegetation but allow for some erosion to occur before starting work

Zone 4 – Critical Vegetation Zone. Take action immediately if erosion is occurring here.

Figure D-2: Concept of River Management Zones to address some river management challenges.

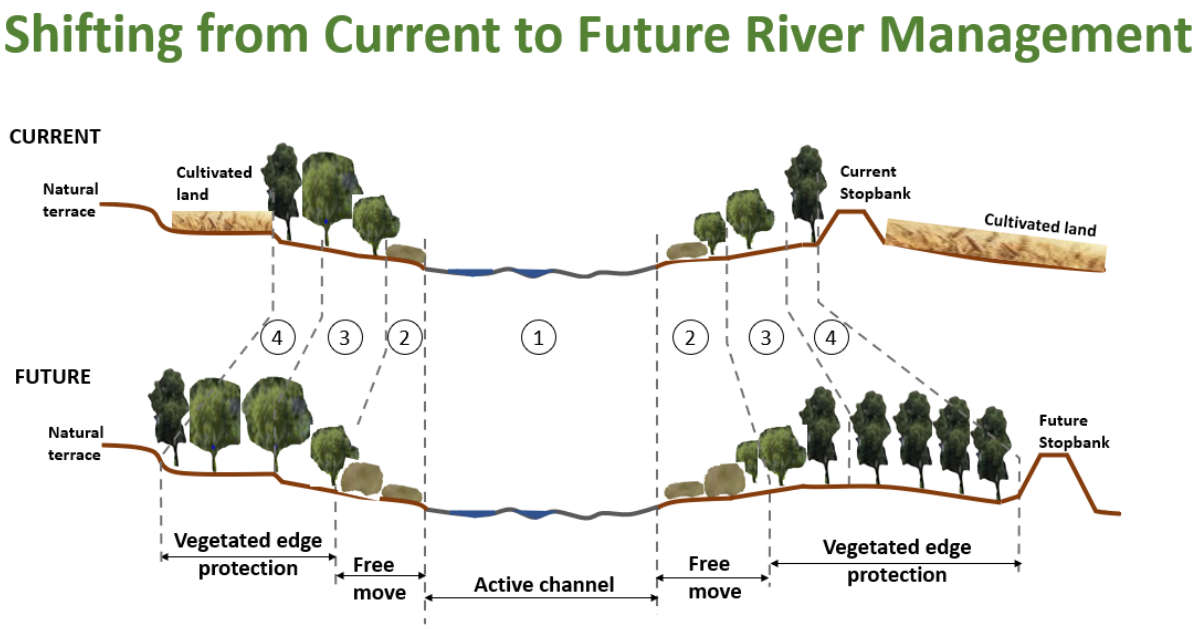


Figure D-3: Concept of current (restricted) and possible future river management zones in cross-section.

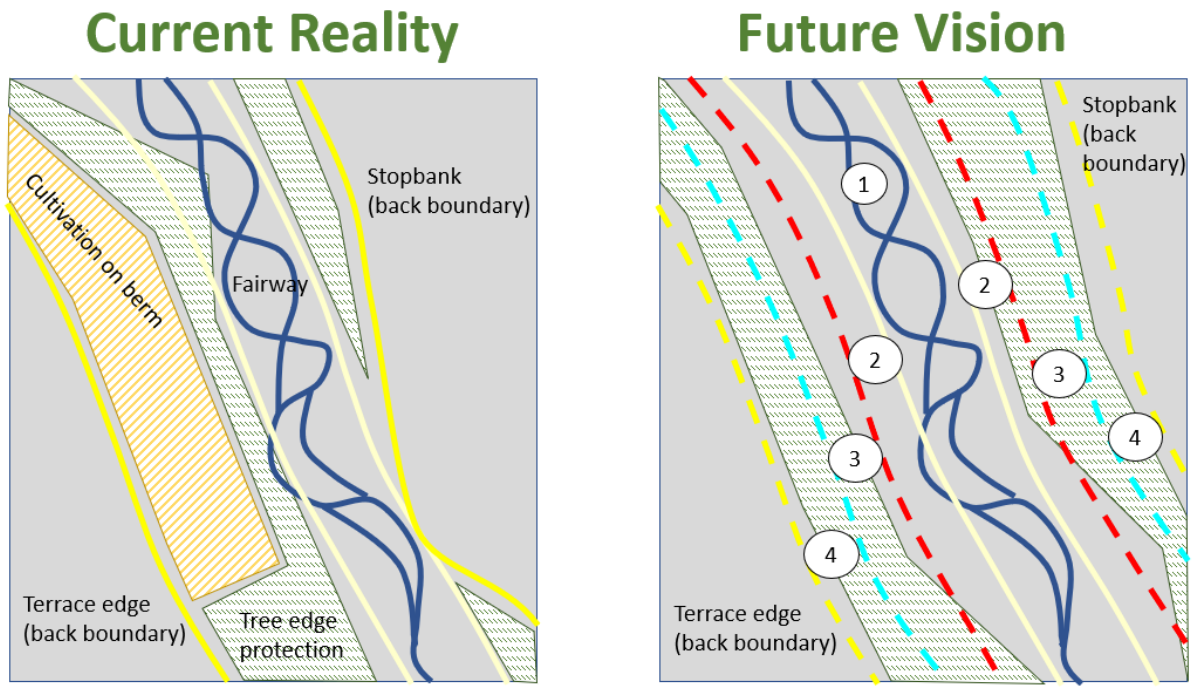


Figure D-4: Side-by-side concept of current and possible future river management zones in plan-view.