

Meeting of the Franz Josef Rating District Joint Committee

Monday 6th May 2024

6:00pm

At the St John Meeting Room 97 Cron Street

Franz Josef

A G E N D A *(Rarangi Take)*

1. **Welcome (*Haere mai*)**
2. **Apologies (*Ngā Pa Pouri*)**
3. **Declarations of Interest**
 - 3.1 Declaration of interest register
4. **Public Forum, Petitions and Deputations (*He Huinga tuku korero*)**
5. **Confirmation of Minutes**
 - 5.1 December 2023 Franz Josef Rating District Joint Committee Meeting
6. **Presentation of Minutes**
 - 6.1 June 2019 Lower Waiho Rating District Meeting Minutes
 - 6.2 August 2019 Lower Waiho Rating District Meeting Minutes
 - 6.3 November 2019 Lower Waiho Rating District Meeting Minutes
 - 6.4 November 2019 Franz Josef Rating District Meeting Minutes
 - 6.4a Appendix
7. **Ratified Terms of Reference**
 - 7.1 Attachment – Franz Josef Rating District Joint Committee Agreement
8. **Matters Arising**
9. **Reports**

***Financial Report**
Annual Report
Impairment

- 9.1 Requested Previous Update on Kānoa Funded Work
- 9.2 Update New Zealand Transport Agency (*James Caygill*) Verbal Report
- 9.3 Tectra Tech Coffey Report

10. General Business

- Agenda item discussed: north and south side plans and options outlining costs and risks.
- CDEM update
- Stockpiles replenished – JC agreement costings.
- Waiho GCD Analysis Report

Health and Safety Emergency Procedure

In the event of an emergency, please exit through the emergency door in the Saint John Rooms. If you require assistance to exit, please see a staff member. Once you are outside make your way to the assembly point at the grassed area at the front of the building. Staff will guide you to an alternative route if necessary.

** The variance between the closing balance of the Franz Josef Rating District as of June 2021 and opening balance at July 2021 relates to consultation on the merging of the Franz Josef and Lower Waiho Rating Districts during that year and will be discussed verbally at this meeting.*



COUNCIL MEETING

ELECTED MEMBERS INTEREST REGISTER 2024

1. **Pecuniary** (expectation of a gain or loss of money personally), **non-pecuniary** (does not involve money)
2. Conflicts of interest can be **actual, perceived, or potential**:
 - a) An **actual** conflict of interest involves a direct conflict between an Elected Member's current duties and responsibilities and existing private interests.
 - b) A **perceived** or apparent conflict of interest can exist where it could be perceived, or appears, that an Elected Member's private interests could improperly influence the performance of their duties, whether or not this is the case.
 - c) A **potential** conflict of interest arises where an Elected Member has private interests that could conflict with other official duties in the future.

Date Updated	Name	Interest	Type of Interest ¹	Actual, Potential or Perceived Conflict of Interest ²
22.12.22	Mayor Helen Lash	Lash Fisheries Ltd - Director	Non-Pecuniary	Nil
22.12.22		Westland Soroptimists Patron	Non-Pecuniary	Nil
22.12.22		Heritage Hokitika Patron	Non-Pecuniary	Nil
22.12.22		West Coast Mayors, Chairs, and Iwi Forum – Member	Non-Pecuniary	Nil
22.12.22		West Coast One District Plan – TTPP - Member	Non-Pecuniary	Nil
19.07.23		Takiwa Poutini – Localities Steering Group	Non-Pecuniary	Nil
19.07.23		Destination Management Plan Reference Group	Non-Pecuniary	Nil
19.07.23		West Coast Housing Forum Working Group	Non-Pecuniary	Nil
20.10.22	Cr Brian Manera	Hari Hari Community Association	Chairman	Non-pecuniary
20.10.22		Hari Hari Motors Limited	Director	Pecuniary
20.10.22		Kakapotahi Farms	Director	Pecuniary
20.10.22	Cr Ashley Cassin (Deputy)	Shining Light On The Dark (Founder)	Non-Pecuniary	Potential
20.10.22		Versatile West Coast (Employee)	Pecuniary	Actual
24.11.22		Westland Heritage Celebrations Steering Group	Non-Pecuniary	Potential

¹ The type of interest is to be defined as: pecuniary or non-pecuniary.

² The interest needs to be defined whether it is actual, potential or perceived.

3.1

Date Updated	Name	Interest	Type of Interest ¹	Actual, Potential or Perceived Conflict of Interest ²
23.02.23		Community Organisation Grants Scheme West Coast	Non-Pecuniary	Potential
23.02.23		TTPP One District Plan Committee	Non-Pecuniary	Potential
11.07.23		Kiwi Rugby Football Club Committee	Non-Pecuniary	Potential
24.08.23		Te Tai O Poutini / West Coast Conservation Board	Pecuniary	Potential
26.10.23		Hokitika Touch Rugby Club – Committee Member	Non-Pecuniary	Potential
26.03.24		LGNZ – Young Elected Member, Committee Member	Non-Pecuniary	Potential

WEST COAST REGIONAL COUNCIL COUNCILLOR INTERESTS REGISTER

Councillor	Role	Detail of Interest (including Title of the Entity involved with)
Peter Haddock	Chair of West Coast Regional Council and Councillor, Westland constituency	Equip Engineering Ltd (Director, Employee) Equipment Supplies Ltd (Director) Tamil Holdings Ltd (Director) SCF Ltd (Director) Mill Creek Mining Ltd (Director) Haddock Group Properties Ltd (Director) Quadrello Holdings (Director) Steelquip Holdings (Director) Bejoley Ltd Holdings (Director) Aspiring Exploration Ltd (Shareholder) Tiga Minerals Ltd (Shareholder) Haddock Family Trust (Trustee) Greymouth (Residential property) Paroa, Greymouth (Residential property) Punakaiki (Residential property) Okarito (Land) Greymouth (Residential property) Greymouth (Commercial property) Coal Creek, Greymouth (Land) Moana, Greymouth (Land)

3.1

Councillor	Role	Detail of Interest (including Title of the Entity involved with)
Brett Cummings	Deputy Chair of West Coast Regional Council, Chair of Resource Management Committee, and Councillor, Grey constituency	Auto Diesel Sales and Service (Director) Blackwater Coal Ltd (Director) Amalgamated Mining Ltd (Director) Management & Processing Ltd (Director) Stillwater Ltd (Director) Hydraulic Electronic Auto Diesel Services Ltd (Director, Employee) BI & DS Cummings Farm Partnership (Director) Mechanical Repairs and Mining (Employee) Yaldhurst, Christchurch (Residential property) Greymouth (, Commercial property) Punakaiki (Land) Stillwater (Commercial property)
Andy Campbell	Councillor, Westland constituency	Bonar Farms Ltd (Farm) Hari Hari (Land)

Minutes of the Franz Josef Rating District Joint Committee

Monday 18th December 2023 – 11am

St John Meeting Room

Franz Josef

Present:

West Coast Regional Council, Cr A. Campbell (FJ JC Chair), Cr P. Haddock (WCRC Chairman), Cr B. Cummings (WCRC Dept Chairman), Westland District Council, Mayor H. Lash (Dept FJ JC Chair), Cr B. Manera, Cr A. Cassin (via Zoom), NZTA J. Caygill (via Zoom), Department of Conservation M. Davis

In attendance:

West Coast Regional Council, D. Lew (CEO), S. Scott (Infrastructure Manager), K. Jacobsen (Area Engineer), L. Crozier (BSO).

1. Welcome

Chair A. Campbell welcomed the public and committee members to the meeting.

2. Apologies

P. Madgwick, (Te Rūnanga O Makaawhio) S. Bastian (WDC)
B. Green (Community)

Moved (Mayor H. Lash/Chair P. Haddock) that these apologies be accepted.

Carried

3. Declarations of interest

Deputy Chair Mayor H. Lash asked for the declarations of interest register be circulated at the next meeting, Cr P. Haddock declared his son B. Haddocks part ownership of MBD Contracting who is currently completing the Franz Josef Kānoa works.

Moved (Cr B. Manera/Cr A. Campbell) that these declarations be noted.

Carried

4. Confirmation of Minutes

L. Skinner advised that he cannot confirm the North Side minutes until the key points that he handed over to the minute taker at the last meeting have been added, L. Skinner will send corrections to WCRC.

Moved (Mayor H. Lash/M. Davis) that the Joint Committee can only receive the minutes, time has gone by, and memories have changed, they have been recorded at a satisfactory level, amended minutes to be sent out to North Side only in the post with sufficient time to be read for confirmation at the next meeting.

Carried

5. Consideration of Terms of Reference

WCRC Chair Cr P. Haddock said the whole reason of this meeting today is to clarify the Joint Committee, Cr P. Haddock spoke briefly to the background, structure and operations of the committee, Terms of Reference and delegations below:

The Franz Josef committee is an advisory committee to the West Coast Regional Council. The Joint Committee purpose is to advise the Regional Council on capital upgrade, and maintenance of the flood protection assets on the north and south side of the Waiho River.

5.1

The Franz Josef committee was formed as a result of the merger of the north and south side rating districts.

As the Franz Josef committees mandate is confined to the administering of the flood protection assets, any matters associated with future land use planning on the south side including managed retreat will require a different governance arrangement. It is anticipated that central government will be represented on this governance arrangement, along with local authorities and affected landowners.

Recommendations from the Franz Josef committee will be referred to WCRC for decision.

A current term of reference exists for the Franz Josef committee. To date no community representatives have ever been formally appointed under the existing terms of reference.

5.1 First item is to consider a revised terms of reference regarding Structure and Operations of the Committee extract below:

7. Two community members will be appointed to the Joint Committee by the WCRC and WDC, following a call for nominations. The initial community members shall be the spokespersons from the previous rating districts. New community members will be appointed as vacancies arise and the term of the appointments will match the local government constituent's appointments. The nomination process shall be administered by the WCRC, in consultation with WDC.

5.1a The proposed amendments to the Franz Josef Rating District Joint Committee Agreement are as follows (additions underlined, deletions struck through) extract below:

2. *WCRC shall appoint three elected Councillors to the Joint Committee, being two Councillors from the Westland constituency (or a delegate) and the Chair of WCRC. If the Chair of WCRC is from the Westland constituency, then the third Councillor will be appointed from another constituency.*
3. *WDC shall appoint the Mayor for Westland, plus the two elected South Westland Councillors (or a delegate) to the Joint Committee.*
7. *~~Two~~ Four community members, two representing the north, and two representing the south side of the Waiho River, will be appointed to the Joint Committee by the WCRC and WDC, following a call for nominations. ~~The initial community members shall be the spokespersons from the previous rating districts.~~ New community members will be appointed as vacancies arise and the term of the appointments will match the local government constituent's appointments. The nomination process shall be administered by the WCRC, in consultation with WDC.*
13. *A quorum of the Committee shall be not less than ~~five~~ seven members and must include ~~one~~ two or more members from each of the two Councils (~~one~~ two or more from WCRC and ~~one~~ two or more from WDC).*

Cr P. Haddock read the above out, L. Skinner advised, most opposed the joint committee, wanted to keep the one rating group.

Discussion on how much of the maintenance costs NZTA paid.

Consideration on Terms of Reference, L. Skinner would like a quorum from at least the ratepayers to agree to this, can we go back to the rating group of rate payers, actual decisions from the rate payers not the members of the Joint Committee? D. Lew advised he understands that is the model for other rating schemes due to Kānoa.

5.1

Cr P. Haddock advised 2022 June the Joint Committee agreement was signed and listed the parties namely Westland District Council, West Coast Regional Council, Te Rūnanga O Makaawhio, New Zealand Transport agency, Director-General of Conservation, M. Davis said at that time there was a drive to access the Kānoa funding and was a requirement of MBIE at that time to be put in place, Cr P. Haddock said it is written in there that the community members were to be put in place. I suggest we move forward.

South secretary requested four members to D. Lew. Mayor H. Lash explained the requirement by government to push forward, Te Rūnanga O Makaawhio and community members, engagement, consultation, we need to move on and get the structure right and work to that.

D. Lew said to draw down the money it was a government stipulation, twelve million for north side is not fully down for our bank account it gets drawn down in progress program milestones, second thing that there is nothing stopping more regular meetings throughout the year, Cr P. Haddock moves we go to making the agreement, number two discussed first Cr A. Campbell and I are both your representatives, and Cr B. Cummings, Westland District Council should appoint the Mayor, two elected councilors, Makaawhio and NZTA everyone is happy with that.

L. Skinner said NZTA were originally paying maintenance costs. of the works, J. Caygill will go away and confirm what NZTA protects.

Cr P. Haddock read out **point 7.** from the Structure and Operations of the Committee, Cr B. Manera said he can't see anything wrong with adding four. The community said it needs to be rate payers not just community members, advertise and call for nominations in February, South Side have decided their four they are good to go.

D. Lew said it is coming a big committee, with quorums etc, can't be held up, L. Skinner suggested four elected but two for the quorum, amend through the chair only two on the voting but four on the community.

Discussion held by the community, there is concern that there has been no maintenance.

D. Lew advised delegations flying to Wellington in the new year as soon as we get it, we will put a programme of works together, that is the business of Joint Committee for the south side.

Moved (M. Davis/Mayor H. Lash) motion for four from each side join to progress a supportive community.

Carried

Item 13. *A quorum of the Committee shall be not less than five members and must include one or more members from each of the two Councils (one of more from WCRC and one or more from WDC) was discussed, three must be from the committee for a quorum, must have minimum of two from each side ability to spread representation. J. Caygill said you will need to adjust total number for quorum the crown would have wanted the committee to be able to meet sure but not entirely absent from total committee, need to add total amount, can't dilute, need a number of nine, M. Davis thinks that is reasonable for trust and confidence, eleven is for committee, nine is a reasonable number.*

Moved (Mayor H. Lash/Cr. B Manera) That a **quorum** be made up of two community representatives from the south side of the Waiho River, two community representatives from

5.1

the north side, two each from WDC and WCRC, and one from either of the remaining membership NZTA, DOC and Makaawhio totaling nine as the quorum.

Minute/record DOC and NZTA agree to nine for the quorum, put to council that the rules around zoom will be changed, J. Caygill said a minimum from the other group only one member from either DOC, NZTA and Makaawhio will be a quorum NZTA, DOC are happy with that and minute/record P. Madgwick (Makaawhio) is an apology, records from committee to rate paying members and add the word ***scheme***, *pay into the scheme*, this relates to **point 7**.

L. Skinner will call for community nominations, WCRC to call, put a notice-on-notice board around town, L. Skinner wants it to go by mail as well. D. Lew made a suggestion, we send out a letter after Christmas to the north side calling a meeting January, February, call for nominations and a vote will be taken, if you cannot attend that meeting give us a proxy vote.

WCRC Communications Team to get in touch with Sabine a letter should go out to the rate payers, send a letter to the north side rate payers and including who to send their vote to, with clear email address of where they can address their questions to, letter will go out by the 15th of January calling a meeting for last week of January or first week of February, vote on proxy/nominations on the floor of the meetings, Cr P. Haddock said people voting will only be from the north, bring the verifications.

Moved (Mayor H. Lash/Cr B. Manera) There will be a call for nominations after Christmas to the North Side, there will only be a general meeting for the north side, people voting will only be from the north.

6. Reports

6.1 Impairment, condition assessment, level of service (*D. Lew verbal report*).

Discussion under 3190, formally inspects that work after construction to the design of the design engineer, design drawings and specs are signed off. Discussed accounting standard through auditor general that we are maintaining banks to level of service they are designed to.

Joint Committee must consider cost to maintain, dip into reserves to bring back to standards, discussed if you don't get it back to standards the auditor general will lower the conditional assessment and we must lower the level of service auditor general getting tough on this around the country.

D. Lew advised what would have to happen at the AGM the AGM must accept that at the service levels, D. Lew is only advising of these processes, the current service level in terms of scour in rock, will get this is out to L. Skinner in a letter. WCRC to write this up to WDC about how we want approval to upgrade this, then the assets value goes to WDC on their books, council and NZTA banks we must lower if we don't want to pay on impairment and accounting.

D. Lew said we will bring a report through to first meeting (Tetra Tech Coffey), the community asked about storm water, but WCRC said this is WDC and WDC have noted this, M. Davis said in support of D. Lew's statement this is what crowns expectation would be. Cr A. Campbell said floods change rivers, D. Lew said we don't make those changes each time the river behaves, it is the longer-term trends on the level of service, D. Lew said we need the eyes and ears of the community essential to us.

6.4 Update on Kānoa Funded Work

5.1

S. Scott spoke to Kānoa funding 6.4 the most prominent works, the link bank the connection Heli port bank to Havil Bank, gone extremely well, put in toe rock to depth of four meters, was peer reviewed, Havil bank 6.6 engineering design been extensively taking into account river flows and velocity, 7-8 meters a second in a major major flood, current state and conditions, teams been doing assessments, surveyed the beds using lidar, 100 – 700 meters worth of change, level of significant toe rock, what is being processed is we duplicate that engineering standard into the Havil wall.

L. Skinner asked about cost S. Scott said it has been allowed for in the project budget, we have designed it to a particular standard, L. Skinner said about cost to ratepayers D. Lew said it is Kānoa funding, L. Skinner said we have to pay a portion he wants to have discussion, D. Lew said if the four members say they do not want to spend that money it puts the Kānoa money in jeopardy. D. Lew said we are doing it to a 100-year flood but will confirm in writing, not just capacity but incorporates velocity and scour, spending local money and government contribution.

Moved (Cr P. Haddock/Mayor H. Lash) to receive the verbal update on Kānoa Funded Work.

L. Skinner would like S. Scotts report in writing.

6.7 Update from Department of Conservation

M. Davis said he is supported by W. Costello, but any questions and details W. Costello is here to help.

Since the 2019 March event DOC been working on long term visitor strategy, need to have one visitor experience going forward, been working with NZTA strategic framework future of Franz Josef, road preferred options in terms of walking in cycling access, been talking to Iwi and community and will continue to do that, in the meantime GHD have identified very high risk section on roads very important for community to know we have taken them from very high risk to high risk but still remains, 50/50 arrangement with NZTA something in the order of ten years on the road to seek agreement on the long term visitor TTPP management plan ten year duration to go through this process and construct.

L. Skinner asked about committed funding for next ten years, if it washed out tomorrow would it be replaced, high level agreements 50/50 but those numbers are not locked in anywhere, will be focusing to obtain security around funding something in order of four hundred thousand dollars of work to maintain current road, need to have this discussions amongst DOC and NZTA, L. Skinner asked if we are all in danger of severe risks and loss of infrastructure, like for like is not a given, what all governments have been saying for years, need to plan and adapt.

The community asked about relocation of road, M. Davis said there was six maybe eight options, community member asked about consultations, M. Davis said community long-term experience, south side still concerned about road, toe, M. Davis said we have money to maintain, W. Costello said M. Healey has done a lot of work at looking at this fairly confident have not lost the toe.

The community asked about quarry being opened up to benefit community, M. Davis said if a case and application is put of course we will consider it, rock not really suitable, M. Davis said it was considered at time not being great quality.

Moved (Mayor H. Lash/Cr P. Haddock) to receive M. Davis (Department of Conservation) verbal report.

6.8 Update New Zealand Transport Agency (verbal report)

J. Caygill had to be excused from the meeting before he could deliver his report.

Note from J. Caygill had said nothing substantial to report will seek detailed advice to south side so committee has that next time, D. Lew said he now has it on list on funding for investigating for moving road out over next three years in discussion with DOC over this, need ten years of current road to have this happen, geotech, alignment.

6.9 Update on CDEM (verbal report)

S. Scott spoke to the CDEM report, to build additional resource and infrastructure to remain intact, need to be adaptable, developing processes and plans, C. Browns team have done a lot of work alongside community response plan, on back of ten year Waiho river strategy, critical action on reviewing current response and community plans, can bolster that, intended moving into first quarter next year a meeting by full service agencies Saint John's, Police, FENZ, WCRC and importantly from the community, some of drivers around the work shop what current situation is, community response plans placed on TAG report, that will underpin some of the key decisions, C. Brown has put this brief together, strong community engagement, how do we embrace technology, any gaps and resources training, is there any new products, plan required, first quarter 2024.

Mayor H. Lash advised Franz Josef is unique are aware of all agencies, very slick operating team, important CDEM come here in listen, learn, the river can split their town in half, each side has their own communication team, wants to see a civil defense program for a south side a combined program won't work, what they want what they need, or it will not work, they rely on themselves and needs to be understood from a civil defense action.

Moved (Mayor H. Lash/Cr B. Cummings) to receive CDEM verbal report.

Financial/Annual Works Report

S. Scott spoke to the 2022-23 financial report discussed opening balance and income stream, internal interest income and rates, L. Skinner suggested the year to date, biggest cost capital expenditure on the true left, S. Scott spoke to the works report, rubbish bank stopbank, 515 tones, more recently in June replacement of rock, and expenditure for the year.

Cr P. Haddock said going forward if community representatives say works needs doing, I imagine we work with the spokesperson, and the council would of contacted those, council do emergency work as required but we need to talk to both as required, going forward L. Skinner agreed that would be ok going forward with an email going out first.

D. Lew said two things here, look forward of 12-34 months, what is work programmed, look at finances, emergency works what typically happens is we work the phones the members, go to spokesperson from each side because we need a quick turnaround, what we will do when there is four and four are elected one and one need to be nominated for emergencies, the community asked again about having two separate sides but Cr P. Haddock said not a conversation for today, we are talking about emergency works, we will contact one from north and one from south and they will get hold of three members.

M. Davis excused from the meeting at 1:30pm.

S. Scott said he really appreciated the feedback and putting those processes in place and thanks to the community.

L. Skinner asked about the rock stockpile, S. Scott said this will be discussed in February.

Mayor H. Lash said in future we will make it a lot clearer in the presentation of the finances.

Community members asked about who makes the decision on the NZTA stopbank. D. Lew said we write formally to NZTA to ask them to spray out their banks, D. Lew said strong works programme for WCRC to spray. K. Jacobsen advised current best practices worldwide to remove toot to be able to inspect stopbank.

L. Skinner asked about the two years of rates and where that money has gone two lots of rates, missing two years of accounts for rating district, L. Skinner directed this question to D. Lew, L. Skinner asked can we commit to the supplying the 2019, 2020, 2021 accounts. D. Lew explained the challenges the engineering team is going back in time with the finances.

Cr P. Haddock advised how much pressure staff have been under, apologized for lack of meetings and consultation, we have recruited a good team, have a massive workload have been working flat out, going forward we have a team that want to work with your community with the best outcomes.

K. Jacobsen spoke to the community about our closing balance which we take and put with the works going out, what is not showing is engineering cost recovery going out happy to go through it with a calculator after the meeting.

L. Skinner discussed WCRC own consultation document, in covid times in 2020 WCRC council were committed to refunding that money to those who had paid into it, 2020 council meeting after the bridge went out, Mayor H. Lash said nothing can happen until we get that document.

Moved (Cr. P Haddock/Mayor H. Lash) to receive the Annual Works Report, to receive the requested financials at the next North Side Meeting.

L. Skinner and the Franz Josef North side committee would like to acknowledge the loss of three members who have put many hours into the river.

Tim Gibb

Paul Wilson

Peter York

Moved (L. Skinner/all in agreement)

Carried

L. Skinner said rates invoices for the town some people are paying river works and some are not, a trend across entire north side. D. Lew said through the chair, what I need in February formal mover and seconder to do a quality assurance check on classification, and the Joint Committee may want a full review to make sure all beneficiaries are paying accurately, total fresh look all direct and indirect benefices are paying costs, L. Skinner talked about the center map, he always pays into town now doesn't so are other people paying for this, D. Lew said motion to undertake formal review on existing Classification.

Moved (Cr P. Haddock/Cr B. Manera) to action D. Lew's suggestion of a full review.

Mayor H. Lash noted that the Franz Josef Rating District Join Committee Terms of Reference point .24 should refer to .18 instead of 8 and that the agreed plan for the community representatives and quorum will be taken back to WDC in January to avoid any further delays for structure of documents to come back in January for formal actions.

5.1

Proposed works will have more details of where stockpiles will be, L. Skinner discussed price of rock, K. Jacobsen said we agreed to spraying and other maintenance work.

D. Lew going away from here staff will spray banks, remove vegetation, channel works on south side, just below Canavan's.

WCRC contact details on board.

8. Closing Meeting

Chair A. Campbell thanked all members of the Joint Committee and closed the meeting at 2:13.

PROVISIONAL

THE WEST COAST REGIONAL COUNCIL
MINUTES OF THE ANNUAL MEETING OF THE
LOWER WAIHO RATING DISTRICT
HELD AT THE ST JOHN'S ROOMS, FRANZ JOSEF
ON 20 JUNE 2019, COMMENCING AT 10.00 A.M.

PRESENT

P. Berry, R. Molloy, N. & L. Frendrup, J & J. Williams, T. Howard, R. Neil, B. Richards

IN ATTENDANCE

West Coast Regional Council

P. McDonnell (WCRC Councillor), S. Challenger (WCRC Councillor)

R. Beal, B. Russ (Staff)

APOLOGIES

T. Bruning, P. Dennehy, K. Molloy, P. Halford, C. Brooks, R. Raewood, S. Dennehy

WORKS UPDATE

Rock recovery – **Blakely's and behind Moraine.**

19,000 tonne recovered @ \$21 per tonne & placed.

2,000 in diversion @ \$21

\$650,000 as at 1 June. & \$300,000 p/m

The dozer is back in action 20 June.

Got prices from alternative sources.

Concrete tetra packs as an option but 4 – 5 times more expensive, more than shot rock.

Possible site at Docherty's for rock recovery.

- Richard Molloy grazing licence.
- Need all contributions – air field ok.
- P. Berry wants to advocate in Wellington.
- PGF application.

Brendon Russ:

- Full height to original length.
- Then drops by 1 – 2 metres to full length to the same spot.

\$170 per \$100,000 of capital value.

ACTION POINTS:

- Email Jen individual prices.

There being no further business, the meeting closed at 11.04 a.m.

THE WEST COAST REGIONAL COUNCIL

MINUTES OF SPECIAL MEETING OF THE
LOWER WAIHO RATING DISTRICT
HELD AT THE AIR SAFARIS ROOMS, FRANZ JOSEF
ON 7 AUGUST 2019, COMMENCING AT 11.00 A.M.

PRESENT

P. Halford, B. Richards, R. Neil, R. Molloy, N, & L. Frendrup, S. Jacobs (Sky Dive Franz), J. Williams, K. Molloy, R. Eatwell, S. Dennehy, P. Dennehy

IN ATTENDANCE

West Coast Regional Council
S. Challenger (WCRC Councillor)
R. Beal, B. Russ (Staff)

APOLOGIES

Cr McDonnell, C. Brooks, J. Willow

BUSINESS

Cr Challenger opened the meeting and welcomed those present.

WORKS UPDATE

Rock recovery – 40,000 tonne of rock has now been recovered as of 2 August 2019. He advised that the full length of earthworks has now been completed. He stated that a decision needs to be made today on whether or not the stopbank is finished to the design of a 2 metre thickness or taper it back to a one metre thickness. R. Beal advised that there is a \$78,000 saving for the rating district if the one metre option is taken. R. Beal recommends that the rating district goes with the 2 metre thickness option. Extensive discussion took place and it was agreed that the 2 metre design would be progressed.

LIDAR SURVEY

R. Beal advised that the LiDAR report is now to hand. He stated that since 2016 there has been over 3,000,000 cubic metres of sediment enter the Waiho River system. 1/3 of this is still at the top of the glacier and there is a 5 – 8 metre aggradation in this area. The last time this amount of aggradation was seen it took about a ten year period for it to move through the system but this is based on weather events. R. Beal advised there is no information on what is happening in the Callery River. The report has revealed that this is now aggradation in the Waiho Loop for the first **time since the 80's**, and it is likely that it will cut into the Tartare River. R. Beal explained photographs in the report. B. Russ answered questions. He advised that like for like will be replaced. R. Beal advised that this project is about reinstating what was destroyed, extending the stopbank is a separate project. He stated that MCDEM are paying 60% of the total rebuild costs. B. Russ explained the design work to the meeting. Discussion took place on rock sources and rock prices. R. Beal advised that as of 2 August \$1.6M has been spent on the rebuild. R. Beal and B. Russ answered questions relating to the insurance claim.

Cr Challenger reconfirmed that the 2 metre design has been accepted by the rating district.

GENERAL BUSINESS

Alternative rock sources were discussed and it was agreed that B. Russ would follow up on these.

6.2

Cr Challenger spoke of the extension of the stopbank down to Rata Knoll and stated that this comes at additional costs to the rating district. Cr Challenger advised that if further work downstream is wanted then there will be the need for a loan. Cr Challenger stated that this area is not directly affected by the erosion forces of the river but if water gets into this area it can still cause problems. Costs will need to be discussed. Discussion took place on future river training and it was noted that engineers will need to consider this once they have received the LiDAR report.

R. Beal advised that by the end of the month the rebuild will be very close to being finished and a final rebuild cost will be brought back to the rating district. R. Beal offered to arrange for the costings to be done for further work as suggested by N. Frendrup and R. Molloy. It was noted that N. Frendrup has paid in a significant amount of money into the rating district over the years.

B. Russ advised that NZTA have received a copy of the LiDAR report.

ACTION POINTS:

- B. Russ to follow up on alternative rock sources.
- R. Beal to investigate costings for future work to the north and south of the stopbank.
- R. Beal to bring an up to date financial report to the next meeting.

There being no further business, the meeting closed at 11.54 a.m.

THE WEST COAST REGIONAL COUNCIL
MINUTES OF THE ANNUAL MEETING OF THE
LOWER WAIHO RATING DISTRICT
HELD AT THE ST JOHN'S ROOMS, FRANZ JOSEF
ON 22 NOVEMBER 2019, COMMENCING AT 1.12 PM.

PRESENT

K. Frendrup, G. Gibb, P. Cumming, I. Hartshorne, P. Halford, T. Howard, B. Richards, J. & J. Williams, R. Molloy, L. Skinner.

G. Gibb, I. Hartshorne and P. Cumming attended on behalf of Future Franz

IN ATTENDANCE

West Coast Regional Council
D. Magner, (WCRC Councillor), S. Challenger (WCRC Councillor)
R. Beal, B. Russ, T. Jellyman, R. Mallinson (Staff)

APOLOGIES

N. & L. Frendrup, P. Dennehy, G. Molloy

J. Williams / I. Hartshorne - Carried

BUSINESS

Cr Challenger opened the meeting and welcomed those present. He introduced himself and the Council staff.

Moved: ***"That the minutes of the previous Annual Meeting held on 29 October 2018, be adopted as a true and correct record of that meeting."***
S. Challenger / R. Beal - Carried

MATTERS ARISING

R. Molloy stated that he has sold his farm to his daughter K. Molloy, he asked if he could ask questions. Cr Challenger agreed.

R. Molloy offered to inspect the rating district after each flood event should P. Dennehy be unable to do this. R. Beal advised that Audit NZ have requested that post event inspections are made for any future weather events.

FINANCIAL REPORT

R. Beal presented the financial statements for the financial period ending 30 June 2019. He advised that the opening balance was \$98,521.75, total revenue was \$727,513.12 (this includes \$546,330.37 which is the first claim from MCDEM following the March flood event). Total expenses for the year were \$1,118,670.15 and the closing balance is \$391,157.03 in deficit.

R. Beal advised that loan balance is \$128,920 and the loan maturity date is February 2024.

R. Beal provided an update on the insurance claim following the March flood event. He advised that the rebuild is likely to cost between \$2.5 - \$2.6M, with \$300,000 on top of this for the temporary works which was the civil defence wall, the diversionary work, and works required immediately after the flood.

6.3

WORKS REPORT

B. Russ presented the works report, which covered the 12-month period; 1 July 2018 to 30 June 2019. B. Russ advised that there were two pieces of work carried out at the start of the year under the maintenance part of the scheme. This included placed rock and a groyne about the Milton & Others Stopbank, work was carried out below this stopbank as well. B. Russ advised that the rock used was from the stockpile onsite. He reported that river training work was done with the D11 dozer in March downstream from the Milton & Others stopbank with both lots of maintenance work costing \$26,660.

B. Russ advised that future works include the raising of the stopbank from Canavans Knob to Rata Knoll. B. Russ stated that work is urgent with the most crucial section being the old Rubbish Dump Stopbank. He is proposing that this section is raised by 1 metre, and is rock lined. He advised that the costs of this work would be \$215,000, and would require rock from the Whataroa Quarry. B. Russ stated that rock could also be sourced from around Rata Knoll and this would bring the costs down by quite a lot. Gravel for this section is worth \$66,000 and the rock is worth \$150,000 but he is hopeful of being able to source rock from the site to save money.

B. Russ is also proposing to raise the next section down to Rata Knoll, this is mainly a gravel stopbank and he is proposing to raise this by 1 metre, additional rock is not required and would cost approximately \$53,000. B. Russ advised that the total spend if all work is agreed to would be about \$270,000. He stated that the second section does not have to be done but he would like to see the first section (Rubbish Dump Stopbank) go ahead as there have been a few floods this year and water has got quite high in this area. B. Russ advised that the Milton & Others Stopbank has a 90 metre lower section, and to build this up to the same height as the existing sections, with rock from Whataroa quarry, would cost around \$290,000. He advised that for every other 100 metres to extend, the cost would be around \$440,000, using rock from the Whataroa quarry. B. Russ advised that the price of rock is getting more expensive and this is due to the health and safety requirements in quarries. B. Russ stated that this work will be put out to tender but the rock supply will be negotiated with the supplier. B. Russ advised that the total price from Canavans Knob to Rata Knoll, including the raised 90 metres at Milton & Others, costs would be around \$730,000. Funding options were discussed along with loan options. J. Williams suggested that work is started at the top. He stated that a flood at Christmas time needs to be avoided. Extensive discussion on rock prices, quotes and rock sources took place and it was agreed that B. Russ would prepare a tender which will include possible rock requirements, he will also liaise with consents and compliance staff regarding rock requirements and whether or not a mining licence is required. Discussion took place on the possibility of getting **permission from DoC to retrieve rock around the Docherty's Creek area.**

B. Russ advised that a further \$10,000 is allowed for unforeseen maintenance.

RATES 2020 / 2021

R. Mallinson advised that the maintenance section for rates is \$50,000 and the loan repayment portion is \$34,000, therefore the recommended rate strike is \$84,000. This is the same as previous years. It was noted that the prudent reserve for this rating district is \$120,000.

Moved: *"That rate strike for the Lower Waiho rating district is \$84,000 Excl GST for the 2020 / 2021 **financial year.**"*

J. Williams / K. Frendrup – Carried

Those present acknowledged the huge amount of work the late Mr Robin Richards did on behalf of the rating district. B. Russ also mentioned the significant amount of help, support and information Mr Richards had given to Council over the years.

ELECTION OF OFFICERS

Cr Challenger read out the names of those currently on the committee and asked those present if they would like to remain on the committee and if anyone else present would like to join. Basil Richards and Jeremy Williams agreed to become members of the committee. J. Williams was nominated as deputy spokesperson.

Moved: **"That the present committee is all those present namely:**

*Lee Frendrup
Neil Frendrup
Jeremy Williams
Chris Brooks
Peter Halford
Basil Richards
Peter Dennehy
Dean Frendrup
Kay Frendrup for the 2019 / 2020 **financial year."***

Moved: **"That Peter Dennehy is elected as the spokesperson for the 2019 / 2020 financial year."**

J. Williams / B. Richards – Carried

Moved: **"That Jeremy Williams be elected as the deputy spokesperson for the 2019 / 2020 financial year."**

Jen Williams / B. Richards - Carried

GENERAL BUSINESS

J. Williams stated that there has been some discussion as to whether or not the Milton & Others Stopbank should be fenced, and where the fence should be. R. Beal advised that this can be discussed **with the Frendrup's. R. Molloy spoke of the importance in** keeping vegetation off the new stopbank.

J. Williams expressed concern regarding the spurs at the top of the Milton & Others Stopbank. He stated that the area where the spurs are butted on to does not have any rock behind this area and he is concerned should the spurs fail. B. Russ suggested that this area is looked at when the next piece of work is done in this area and a return could be put in.

B. Russ displayed the LiDAR survey to the meeting. He explained LiDAR to the meeting and advised that a LiDAR survey was done in 2016 and again after the March flood event. This will reveal how much the riverbed has changed over the past three years. B. Russ explained the survey work in detail to the meeting and stated that there is huge aggradation near the glacier as well as severe scouring in some areas. He stated that there is approximately 3.3 million m³ of sediment has entered the river system over the past three years. B. Russ answered questions relating to the LiDAR survey work, and spoke of likely weather phase changes.

Cr Challenger thanked the meeting for their attendance.

There being no further business, the meeting closed at 2.23 p.m.

ACTION POINTS:

- B. Russ to prepare tender for proposed works.
- B. Russ to liaise with Consents and Compliance staff and to ascertain whether or not a mining licence will be required.

MINUTES OF THE ANNUAL MEETING OF THE
FRANZ JOSEF RATING DISTRICT
HELD AT THE ST JOHN'S ROOMS, FRANZ JOSEF
ON 22 NOVEMBER 2019, COMMENCING AT 2.30 PM.

PRESENT

L. Skinner, P. Cumming, G. Gibb, I. Hartshorne, D. Ferguson, P. York, C. Roy, B. McGlynn,
J. Williams

IN ATTENDANCE

West Coast Regional Council
D. Magner (WCRC Councillor), S. Challenger (WCRC Councillor)
R. Beal, B. Russ, T. Jellyman, R. Mallinson (Staff)

APOLOGIES

V. Whittington, T. Skinner, A. Tschampel (Scenic Circle Hotel), T. Gibb, P. Wilson

BUSINESS

Cr Magner opened the meeting and welcomed those present. She introduced herself and the Council staff.

Moved: ***"That the minutes of the previous Annual Meeting held on 29 October 2018, be adopted as a true and correct record of that meeting.***
G. Gibb / P. Cumming - Carried

Minutes

L. Skinner stated that he would like some corrections made to the minutes. He stated that the 4th paragraph of general business should read ***"the rating district would like stockpiled rock moved to the north side of river in case the bridge is out"***.

It was agreed that the words "significant value" would be added to the section of the minutes where the stockpile of rock was discussed.

MATTERS ARISING

L. Skinner asked for an update regarding the relocation of the occupier on the south side of the river. B. Russ advised that this has been mentioned to NZTA but there is no update. It was noted the occupier is no longer a member of the rating district.

L. Skinner asked if NZTA have changed their approach with regard to continuing to use rock spurs on the Waiho River. B. Russ advised that spurs have been used for the work that has recently been done, which is above the bridge on the true right.

R. Beal advised that the global consent which OPUS has been working on over the past year is still 90% complete. He stated that this has been very slow but this is being done by OPUS, not council. It was noted that other consents have been applied for and granted during this time. R. Beal agreed to follow up on the global consent and report back to the Spokesperson.

Extensive debate took place on the purpose of the rating district. B. Russ advised that a few years ago Council had wanted to extend the stopbank which would offer protection to the town, but the rating district turned this down. B. Russ stated that the costs were correct at this time. R. Mallinson advised that the reason rating districts are established is contained in the River & Soil Conservation Act 1941 which empowered regional councils as the successors to Catchment Boards to carry out measures to help mitigate soil erosion and flooding. R. Mallinson advised that the way

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to do that is by using various assets such as building stopbanks and other protection structures. R. Mallinson advised that the rating district members have a very important consultative device for Council to hear the voice of the community as to how this is gone about. Cr Magner advised that **the statement in last year's minutes is correct, but how the rating district wishes to drive this is why they are consulted.** It was agreed that the purpose of the rating district is to talk about protection in accordance with the Soil & River Conservation Act 1941.

Action Points from last year's meeting

B. Russ confirmed that when he sought prices for emergency works for the Milton & Others Stopbank rates would be held for this year. He agreed to renew this in April 2021.

L. Skinner asked for an update on whether or not an asset management plan would become the holistic management plan for the Waiho River. R. Beal responded that the asset management plan is simply a plan to manage the assets in the particular rating district, if a holistic plan was designed this would sit outside of the asset management plan.

R. Beal advised that modelling for the Waiho Loop (cut) was circulated earlier this year. L. Skinner stated that the cut was in the wrong place. B. Russ advised that this work was going to cost \$3M, he stated this would work for a while but gravel would soon get stuck behind it. R. Beal advised that modelling has been done, estimates of costs have also been done and reviewed, and came out at \$10 per cubic metre to move the material.

B. Russ advised that all resource consents are current but they will all be null and void once the holistic consent comes into effect.

FINANCIAL REPORT

R. Beal presented the financial statements for the financial period ending 30 June 2019. He reported that the opening balance was \$391,694.69, total expenses were \$33,997.39 and the closing balance is \$420,902.06. L. Skinner asked what are the resource consents costs made up of. B. Russ responded that the costs for the resource consent for river training, and annual fees for resource consents. B. Russ answered questions relating to individual and historic resource consents and agreed to follow up on questions asked of him.

WORKS REPORT

B. Russ spoke to this report and confirmed that \$39,325 worth of works was carried out during the financial year to the end of June 2019. He advised that the work carried out in April is insurance **claim work and will be paid by Council's insurer, and MCDEM.** B. Russ advised that there is some work that was carried out in October with the D11 which has not yet be paid for, as well as some work from November 2018. **This work will be paid for and will be included in next year's financial report.**

B. Russ reported that following discussion with the spokesperson no maintenance work has been identified but \$120,000 has been allowed for to strengthen the stopbank at the Heliport. This work has now been completed. He recommended that \$30,000 is allowed for unforeseen maintenance. B. Russ answered questions. It was agreed that the Heliport stopbank would now be referred to **as the rating district's heliport, or RD Heliport Stopbank.**

Discussion took place on rock prices, and rock sources. R. Beal advised that Council has no control over rock prices, **and it is likely that rock prices will increase to around mid 20's per tonne.** Extensive discussion on rock recovery took place. It was noted that currently there is 5000 tonne of rock stockpiled.

RATES 2020 / 2021

Cr Magner advised that the recommended rate strike for the 2020 / 2021 financial year is \$50,000 GST Exclusive. She advised that the balance in the rating district account at the beginning of the 2020 / 21 financial year is likely to be \$310,000 GST exclusive.

It was noted that the prudent reserve for this rating district is \$550,000. Extensive discussion took place and it was agreed with the rate strike of \$50,000.

Moved: **"That the rate strike for the 2020 / 2021 financial year is \$50,000 GST Excl."**

L. Skinner / P. Cumming - Carried

ELECTION OF OFFICERS

Cr Magner read out the names of the current members of the rating district committee. She asked if those currently on the committee are happy to remain on it. L. Skinner advised that V. Whittington would like to be on the committee. Ian Hartshorne advised that he does not wish to be the co-spokesperson any longer. Discussion took place on possible co-spokesperson. Both P. Cumming and G. Gibb declined the position. L. Skinner advised the meeting that he has no engineering experience and is not qualified to inspect stopbanks.

Moved: **"That the present committee, namely:**

Chris Brooks

Chris Roy

Grant Gibb

Tim Gibb

Ian Hartshorne

Peter York

Logan Skinner

Paul Cumming

Vicki Whittington

be appointed as the committee for the 2019 / 2020 financial year."

G. Gibb / I. Hartshorne - Carried

Moved: **"That L. Skinner be elected as spokesperson for the 2019/ 2020 financial year."**

I. Hartshorne / C. Roy - Carried

GENERAL BUSINESS

R. Beal and B. Russ answered questions relating to rock recovery from the river. It was agreed that staff would follow up on this with NZTA.

D. Ferguson spoke of the holistic rating district concept. She asked if a plan could be put to the rating district on this matter. R. Beal stated that there needs to be willingness from the community before work is commenced. L. Skinner stated that they are desperate for a river management plan but they do not want a combined rating district.

Extensive discussion took place on the development of a river management plan. R. Beal advised that OPUS think a height increase of eight metres will be required over the next 40 years on the south side stopbanks. R. Beal advised that OPUS also think that over the next 100 years a 17 metre rise may be required. R. Beal advised that this information is yet to be peer reviewed. Options were discussed. R. Beal suggested that other agencies are asked for their five year plans. L. Skinner stated that a plan has been sought for a long time and has not been forthcoming. Cr Challenger stated that maybe this is too hard. He stated that the Waiho River has been investigated for years, and it is very difficult to come up with a plan for a river such as the Waiho. Cr Challenger stated that even if the river was to be released to the south, it will still rise, and would only buy time. Cr Challenger stated that other options for the town might need to be looked at as is stated in the Tonkin & Taylor report. He acknowledged that investments need to be considered with zoning and district plans needing to be taken into consideration. It was agreed that in the short term a plan is needed for the next five years. L. Skinner spoke of the uncertainty faced by the community. Cr Challenger stated that one of the main issues is money, and the limited funding that is available via rates as the rating base is very small. He advised that buying out the south side would be very expensive. It was agreed that all parties, including both councils would need to be involved with a long term plan for the Waiho River. R. Beal asked the meeting if the rating district would be prepared to fund a river management plan. It was agreed that the rating district would make a financial contribution. B. Russ suggested that staff from WCRC, WDC, DoC and NZTA all get together to progress a plan. L. Skinner stated that pushing the Waiho River

in the Tartare River might be the cheapest option and might buy ten years. L. Skinner stated that this should not be a big job as there has been so much work done previously. B. Russ stated that options that are not going to work have previously been ruled out. He stated that current options are raising stopbanks, flood the south side, or moving the town. D. Ferguson asked if there is a possibility of taking a plan, or options, to government because at the moment all that is being done is the topping up of stopbanks. Cr Magner asked R. Beal if it realistic to try to progress a long term plan for the Waiho River. R. Beal responded that funding agreements from other stakeholders would be required to co-fund development as council could not do this by itself, as council does not have the internal resources to do this. R. Beal advised he would ask NZTA to give him their 5 – 10 year infrastructure plan. L. Skinner suggested a plan is put together to compensate neighbouring properties on the south side. L. Skinner read out a statement to the meeting and offered to email it to Council. L. Skinner stated that economic development is at the heart of this, not the river. Cr Magner suggested getting Development West Coast on board to help develop the long term plan for the Waiho River as economic development is their role in the region.

C. Roy stated that the Waiho River is a risk as far as any newcomer coming into the area, along with the consequence of an earthquake or landslide. A. Tschampel stated that Scenic Circle Hotel is noticing a downturn in tourism, he stated that China is very unsure of the West Coast, with tours having been lost already, after the loss of the Waiho Bridge in March. A. Tschampel stated that tourism is impacted by road closures and slips as well. L. Skinner agreed and stated that there were three road closures last summer.

Discussion took place on whether or not stopbanks need to be raised. It was noted that NZTA has recently raised the stopbank on the glacier side. L. Skinner stated that in the past NZTA has offered to help fund the raising of rating district stopbanks, should NZTA raise the height of their stopbanks.

Discussion took place on the co-designed extension to the Heliport wall, the design was rejected by the rating district committee.

Cr Magner thanked those present for their attendance.

There being no further business, the meeting closed at 4.42 p.m.

Action Points:

- R. Beal to follow up with OPUS on the global consent and report back to the rating district spokesperson.
- B. Russ to renew the rate card for rock recovery in April 2021.
- B. Russ to provide an update of current resource consents, and which ones the rating district is being charged for, along with which resource consents the rating district can use.
- B. Russ to update the asset register.
- The Heliport Stopbank is to now be known as the RD Heliport Stopbank.
- B. Russ and R. Beal to follow up with NZTA regarding rock recovery from the Waiho River.
- B. Russ to check with NZTA regarding the possibility of NZTA helping to fund the raising of rating district stopbanks, should NZTA raise the height of their stopbanks.
- R. Beal to approach all agencies involved to provide him with their five year long term plans for the Waiho River, and a funding agreement from stakeholders to progress a short and long term plan. Along with an infrastructure plan.

Franz Josef Rating Group 2019 AGM statement

As we continue to have issues with the accuracy of the minutes I have prepared this in advance so that these comments can be entered in full and accurately to this year's minutes – I will email an electronic copy after this meeting.

Firstly congratulations to Stuart and Debra we look forward to working with you and resolving these challenges. We would also like to thank Pete for his help and time over the last 6 plus years.

As I am sure the councillors are aware this is not really a meeting about river management. Most people at this meeting are business owners and managers who want to see this town grow in a sustainable manner. We are all really here to talk about how we achieve economic growth by managing one of the blockers to economic growth in this region, the Waiho River. We are here because we want to see economic growth, not because we like walking the stop banks on a regular basis. I hope WCRC also wants to see Economic growth in the region.

As numerous reports have said Franz Josef is one of or the key tourism attraction on the West Coast. As I have said before, at council meetings, the elephant in the room is that the Glacier is going back and becoming less attractive. We need to gain critical mass as a town with enough attractions to remain attractive, in a very competitive global tourism market, before we drop off the tourism map – thereby affecting the entire tourism industry on the West Coast.

We now appear to be at the end of this economic cycle where basically no new external investment has happened for the entire economic “boom” in the town, only existing businesses have reinvested. Many people, including myself believe this is due to the lack of a river management plan and the resulting uncertainty. This has to be seen as a massive failure for any organisation with responsibility for economic development in the region.

We have requested for many years to have a river management plan, Council has also asked staff to progress this, yet we are still no closer to having a plan. WCRC senior management know the rate payers groups do not wish to amalgamate, however put this “poison pill” at the start of every conversation about the river management plan. This rating group has never struggled to fund any constructive works, we continue to request a plan before we discuss the funding of it.

WCRC senior management has suggested flooding certain properties in the district, this has however only been done in closed meetings. Given there is no mechanisms or current funding that we are aware of this appears to be very dangerous talk. The only plan we have heard from WCRC is completely unfunded and appears unaffordable. We continue to request a river management plan that is capable of being funded within the district. Given the years WCRC management has been requested to do this and failed, we have no faith in their ability to achieve this.

They say the path to hell is paved with good intentions. Rather than help this community WCRC has done more economic damage in recent years. Early in the process of creating the Tonkin and Taylor report (which effectively started again work of previous groups setting progress back around a year) the question was asked if this report would lead to a definitive answer or just lead to a request for more money for another report. While this outcome which has left the community effectively in limbo for the last three years was easily foreseen by the Mayor of WDC, it was not foreseen by WCRC management.

6.4a

On more tactical points many people feel let down by the actions or lack actions of WCRC.

WCRC will be well aware of the rumours that the Scenic Hotel was flooded in part due to the actions of a council contractors work in the river. The rating group has requested several times for information about the on going works in the river channel and the monitoring processes of WCRC – to date there appears to be minimal if any regular monitoring occurring of the risk these works pose to our assets.

Last year we discussed service levels. After the rain event in March the out of town engineers walked our stopbanks and quickly highlighted that both the width and the batter slope were not adequate. It is concerning that WCRC had not raised this in past years.

We have asked numerous times for WCRC to more actively consider and monitor the consent conditions of the spurs above the bridge. We have also asked the WCRC to put forward to NZTA a proposal from the rating group to put a solid rip wrap wall above the bridge. It is probable had the WCRC been successful in either of these activities with NZTA the West Coast economy would have not lost the estimated \$50m as a result of the bridge washout.

We have discussed at length in these meetings in the past and agreed that WCRC will get the agreement of this committee before incurring any significant expenditure. Yet WCRC management continue to ignore the wishes of this committee when we do not agree with them, even though it is our money being spent.

It has been a difficult year trying to progress both river works and a river plan with council management. Rather than council drive the protection works and planning this committee has had to take the initiative and drive all actions. I would like to thank all committee members for the significant volunteer time they have given up, driving long distances at times and giving up income earning opportunities to attend meetings.

We would like to see a step change in WCRC management approach and service level to this community.

At this point I would like the following correspondence to be recorded in the minutes:

Letter to NZTA and reply warning of the risk to the bridge the day before it was destroyed

Letter from the CEO of WCRC to the committee

Letter from the then Chair of WCRC to the committee



Franz Josef Rating District Joint Committee Agreement

June 2022

Updated March 2024

DOCUMENT CONTROL

Reason for Submission	Revision Number	Revision Date	Approval
New Document		1 July 2021	
Version 1 - draft		November 2021	Initial review by West Coast Regional Council and Westland District Council
		December 2021	Review by Department of Conservation and Waka Kotahi
	Final	14 December 2021	Adoption by West Coast Regional Council
	Final	24 March 2022	Adoption by Westland District Council
Version 2	2	February 2024	Revision drafted to amend membership and quorum, and other minor amendments (version2)
		28 March 2024	Adoption of Version 2 by West Coast Regional Council
		28 March 2024	Adoption of Version 2 by Westland District Council

This Deed is made this **26th** day of **July 2022**

Updated **28 March 2024**

PARTIES

WESTLAND DISTRICT COUNCIL (“WDC”)

WEST COAST REGIONAL COUNCIL (“WCRC”)

TE RŪNANGA O MAKAAWHIO (“MAKAAWHIO”)

NEW ZEALAND TRANSPORT AGENCY (“WAKA KOTAHI”)

DIRECTOR-GENERAL OF CONSERVATION (“DOC”)

AGREEMENT

BACKGROUND

- A. The WDC is empowered by Sections 12 and 130 of the Local Government Act 2002 to manage stormwater and amenity issues within its district; and
- B. The WCRC is empowered by Section 126 of the Soil Conservation and Rivers Control Act 1941 to take such steps as are necessary for the prevention of damage by floods; and
- C. Both Councils are empowered by the Local Government (Rating) Act 2002 to raise the funds necessary to carry out their respective functions; and
- D. Both Councils are empowered by Sections 12 and 137 and clauses 30 and 30A of Schedule 7 of the Local Government Act 2002 to enter into joint agreements and form a joint committee to co-ordinate the management of overlapping functions; and
- E. Any Franz Josef flood protection structure built as a result of this agreement will be owned by the WCRC. The land the flood defence assets are on is under various ownership; and
- F. Both Councils wish to record their agreement to jointly manage the maintenance of the Franz Josef flood defence assets, via a Joint Committee of the two Councils, Makaawhio, Waka Kotahi, DOC and community members.

STRUCTURE AND OPERATION OF THE COMMITTEE

1. The Joint Committee shall be formed initially, with its membership reappointed at or after the first meeting of WCRC and WDC following each triennial general election.
2. WCRC shall appoint three elected Councillors to the Joint Committee, being two Councillors from the Westland constituency (or a delegate) and the Chair of WCRC. If the Chair of WCRC is from the

Westland constituency, then the third Councillor will be appointed from another constituency.

3. WDC shall appoint the Mayor for Westland, plus the two elected South Westland Councillors (or a delegate) to the Joint Committee.
4. Makaawhio shall be represented on the Joint Committee by the Chair of Te Rūnanga O Makaawhio or a representative delegated by the Chair.
5. Waka Kotahi will appoint a member to the Joint Committee.
6. The Director-General of Conservation will appoint a member to the Joint Committee.
7. Eight community members from the rating district, to be made up of four representing the north side and four representing the south side of the Waiho River, will be appointed to the Joint Committee by the WCRC and WDC following a call for nominations. New community members will be appointed as vacancies arise and the term of the appointments will match the local government constituent's appointments. The nomination process shall be administered by the WCRC, in consultation with WDC.
8. In relation to DOC, membership of the Joint Committee does not:
 - affect any of its rights, powers or duties, in particular as they relate to river and flood management at Franz Josef (such as under the Resource Management Act 1991); or
 - bind it to any funding commitments or decisions relating to transfer of assets.
9. The Chair shall alternate one year to the next being a WDC elected representative one year and a WCRC elected representative the next, with the term of the chairpersonship being 12 months from 31 October each year except in years where the triennial election is held, where the term ends at the date of the election. The appointment of the Chair shall be made by the relevant Council who has responsibility for the Chair.
10. The function of the secretariat will alternate as per the term of chairpersonship.
11. The Council not exercising the role of Chair in any year shall appoint a Deputy Chair. The term of the deputy chairpersonship shall be 12 months from 31 October each year except in years where the triennial election is held, where the term ends at the date of the election.
12. Unless otherwise specified in this Agreement, the Committee shall use the current standing orders of the WCRC, noting that the committee wishes to achieve consensus decisions wherever possible.
13. A quorum of the Committee shall be not less than nine members, and must include:
 - two or more members from each of the two Councils (two or more from WCRC and two or more from WDC);
 - two or more of the appointed community representatives from the rating district representing the north side of the Waiho River;
 - two or more of the appointed community representatives from the rating district representing the south side of the Waiho River;

- one or more members from the other three parties to the Agreement (New Zealand Transport Agency, Director-General of Conservation, or Te Rūnanga O Mākaahio).

14. Meetings shall be held biannually or as otherwise agreed by the Joint Committee.

15. Notification of meetings and the publication of agendas and reports shall be conducted in accordance with the requirements of Part 7 of the Local Government Official Information and Meetings Act 1987, and will be undertaken by the secretariat.

16. Minutes of all Joint Committee meetings shall be provided to the next meeting of the respective Councils.

TERMS OF REFERENCE & DELEGATIONS

17. Each year the Joint Committee shall consider any staff and/or expert reports, ascertain what work and budget requirements will be for the coming year and make a recommendation to each parent Council for annual planning and action.

18. The Committee shall not have any funding or rate setting authority.

19. WCRC as the Rating Body for the Franz Josef Rating District is the final decision maker on the annual work plan and setting the appropriate rate to fund the agreed works.

20. The Joint Committee's role is to review the annual work plan provided to it by the WCRC, receive and consider any independent expert advice, and make informed recommendations to WCRC for the final decision. The Committee may also make recommendations to the WCRC regarding:

- Commissioning independent expert reports; and
- Undertaking public consultation on boundary changes, major capital works and other areas of significant public interest.

WCRC will consider any recommendations of the Committee in making any decisions on the above.

21. Where Committee recommendations relate to the functions of the WDC, WDC shall consider and make decisions on any recommendations accordingly.

22. Without limiting the ability of the Joint Committee to recommend the most appropriate arrangements for works and funding, in relation to the Franz Josef flood defence assets the WDC shall be responsible for all works and funding relating to:

- Stormwater management, including any pump station operation and maintenance and floodgates on drainpipes and their operation and maintenance.

23. Without limiting the ability of the Joint Committee to recommend the most appropriate arrangements for works and funding, in relation to the Franz Josef flood defence assets the WCRC shall be responsible for all works and funding relating to:

- The maintenance and repair of the structural integrity of the flood defence assets managed under WCRC Asset Management Plans;
- The provision of flood warning advice to WDC for the Waiho River; and
- Ownership of the flood defence assets as identified in WCRC Asset Management Plans.

24. The WCRC has constituted a "Franz Josef Rating District" and reserves the right to raise such funds as it may need to carry out its functions under clause 23 above from this source.
25. The WDC will fund the performance of its functions under clause 22 above from such sources that are available that it may determine.

Variation of this Agreement

26. This agreement may be amended at any time, at the request of either Council, but such amendment will only take effect once both parent Councils have formally received and adopted those changes sought.

SIGNATURES

SIGNED by

WESTLAND DISTRICT COUNCIL

In the presence of:

by its authorised signatory

Witness signature

Witness name

Witness Occupation

Witness Town of Residence

SIGNED by

WEST COAST REGIONAL COUNCIL

In the presence of:

by its authorised signatory

Witness signature

Witness name

Witness Occupation

Witness Town of Residence



7.1



SIGNED by

TE RŪNANGA O MAKAAWHIO

In the presence of:

_____ by its authorised signatory

_____ Witness signature

_____ Witness name

_____ Witness Occupation

_____ Witness Town of Residence

SIGNED by

NEW ZEALAND TRANSPORT AGENCY

In the presence of:

_____ by its authorised signatory

_____ Witness signature

_____ Witness name

_____ Witness Occupation

_____ Witness Town of Residence

SIGNED by

DIRECTOR-GENERAL OF CONSERVATION

In the presence of:

_____ by its authorised signatory

_____ Witness signature

_____ Witness name

_____ Witness Occupation

_____ Witness Town of Residence

WEST COAST REGIONAL COUNCIL

FRANZ JOSEF RATING DISTRICT

FINANCIAL STATEMENT 1 JULY 2019 TO 30 JUNE 2020

OPENING BALANCE		\$420,902.06
Rates	51,342.81	
NEMA Recovery	2,523.00	
Excess credited	239.35	
Interest Earned	<u>10,293.06</u>	
TOTAL REVENUE		<u>64,398.22</u> 485,300.28
Less Expenses :		
Staff Time	4,860.00	
Contractor costs	108,974.47	
Aircraft hire	1,530.00	
Surveyor	3,913.70	
Resource consents	<u>915.00</u>	
TOTAL EXPENSES		-120,193.17
CLOSING BALANCE		<u><u>\$365,107.11</u></u>

**West Coast Regional Council
Franz Josef Rating District**

Financial Statement 1 July 2020 to 30 June 2021

Opening Balance		\$365,107.11
Rates	49,998.95	
Insurance Recovery	8,888.79	
Interest Earned	<u>749.24</u>	
TOTAL REVENUE		<u>59,636.98</u> 424,744.08
Less Expenses :		
Staff Time	10,000.00	
Resource consents	<u>539.99</u>	
TOTAL EXPENSES		-10,539.99
Closing Balance		<u><u>\$414,204.09</u></u>

**WEST COAST REGIONAL
COUNCIL**

FRANZ JOSEF RATING DISTRICT

**FINANCIAL STATEMENT 1 JULY 2021 TO 30
JUNE 2022**

		2021/22 YTD
Opening Balance		-
Add Incomings:		
Insurance Recoveries	-	
Internal interest income / (expense)	7,912.28	
Rates	167,312.93	
Total Incomings		175,225.21
		175,225.21
Less Outgoings:		
Contractors and Consultants	(6,024.50)	
Insurance	(13,051.00)	
Resource Consents	-	
Staff Time	(35,000.00)	
Total Outgoings		(54,075.50)
Closing Balance		121,149.71

**West Coast Regional Council
 Franz Josef District Financial Accounts
 For the 12 Months to 30 June 2023**

	2022/23 YTD
Reserve Opening Balance 1 July 2022	121,149.71
Add Incomings:	
NEMA Insurance Recoveries	2,587.36
Internal interest income / (expense)	2,607.81
Rates - Maintenance	97,731.15
Rates - Loan	123,719.53
Total Incomings	226,645.85
	347,795.56
Less Outgoings:	
Capital Expenditure	(119,760.00)
Contractors and Consultants	(130.00)
Insurance	(13,351.00)
Loan Interest	(54,783.08)
Loan Principal	(68,929.31)
Other Expenditure	(142.61)
Staff Time	(35,805.00)
Total Outgoings	(292,901.00)
Reserve Balance at June 2023	54,894.56

Loan Summary at June 2023	
Opening Balance 1 July 2022	1,494,083
Loan Principal repayment	(68,929)
Closing Balance 30 June 2023	1,425,154

*All figures are GST exclusive

WEST COAST REGIONAL COUNCIL

LOWER WAIHO RATING DISTRICT

FINANCIAL STATEMENT 1 JULY 2019 TO 30 JUNE 2020

18/19		19/20
98,521.75	OPENING BALANCE	-391,157.03
	ADD	
79,581.38	Rates	84,000.00
546,330.37	NEMA Claims	1,084,626.30
0.00	Insurance	947,993.75
0.00	Excess credited	163,056.57
0.00	Borrowing	200,000.00
3,079.62	Interest	<u>0.00</u>
<u>628,991.37</u>	TOTAL REVENUE	<u>2,479,676.62</u>
727,513.12		2,088,519.59
	Less Expenses :	
16,800.00	Staff Time	35,640.00
220.00	Resource consents	220.00
	Contractors- Mtce }	
1,072,980.34	Contractors- Rebuild }	2,164,375.00
	Surveyor	7,520.00
	Consultant	2,965.00
143.48	Other	0.00
	Aircraft hire	1,530.00
24,860.00	Loan Principal repaid	27,120.00
<u>3,666.33</u>	Interest on bank loan	<u>2,406.94</u>
-1,118,670.15	TOTAL EXPENSES	-2,241,776.94
<u>(\$391,157.03)</u>	CLOSING BALANCE	<u>(\$153,257.35)</u>

LOAN	
Original Amount borrowed	\$ 260,000
Loan balance at 30 June 2020	\$ 101,800
Borrowed 19/20	\$ 200,000
Balance @ 30 June 2020	\$ 301,800

WEST COAST REGIONAL COUNCIL

LOWER WAIHO RATING DISTRICT

FINANCIAL STATEMENT 1 JULY 2020 TO 30 JUNE 2021

OPENING BALANCE -153,257.33

ADD

Rates 86,443.92

Insurance 56,430.56

Borrowing 70,000.00

Interest 1,956.55

TOTAL REVENUE 214,831.06

61,573.73

Less Expenses :

Resource consents 540.01

Loan Principal 22,271.00

Loan Interest 6,203.33

-29,014.34

Closing Balance

32,559.39

LOAN	
Original Amount borrowed	\$ 260,000.00
Balance @ 30 June 2021	\$ 349,529.00

**WEST COAST REGIONAL
COUNCIL**

LOWER WAIHO RATING DISTRICT

**FINANCIAL STATEMENT 1 JULY 2021 TO 30
JUNE 2022**

		2021/22 YTD
Opening Balance		32,559.39
Add Incomings:		
Borrowing	-	
Insurance Recoveries	-	
Internal interest income / (expense)	665.14	
Rates	29,593.21	
Total Incomings		30,258.35
		62,817.74
Less Outgoings:		
Contractors and Consultants	(2,700.00)	
Loan Interest	(7,272.86)	
Loan Principal	(9,375.00)	
Resource Consents	-	
Total Outgoings		(19,347.86)
Closing Balance		43,469.88

Lower Waiho Loan

Original amount borrowed	260,000.00
Additional borrowing	200,000.00
Total borrowing	460,000.00
Loan balance at end of period	340,154.00

**West Coast Regional Council
Lower Waiho District Financial Accounts
For the 12 Months to 30 June 2023**

		2022/23 YTD
Reserve Opening Balance 1 July 2022		46,169.88
Add Incomings:		
Internal interest income / (expense)	822.70	
Rates	29,575.53	
Total Incomings		30,398.23
		76,568.11
Less Outgoings:		
Capital Expenditure	(21,253.74)	
Loan Interest	(7,177.60)	
Loan Principal	(13,232.04)	
Total Outgoings		(41,663.38)
Reserve Balance at June 2023		34,904.73

Loan Summary at June 2023		
Opening Balance 1 July 2022		340,154
Loan Principal repayment	(13,232)	
Closing Balance 30 June 2023		326,922

*All figures are GST exclusive

West Coast Regional Council

Franz Josef Rating District

Annual Works Report

1. Maintenance works carried out from 1 July 2022 to 30 June 2023

No maintenance work completed

2. Capital works carried out from 1 July 2022 to 30 June 2023

Nov 2022 Glacier Concrete and Contracting

Lower Waiho at Rubbish Dump Stopbank

Emergency Rock Protection

Place 516 tonnes of rock	\$21,253.74
--------------------------	-------------

June 2023 Glacier Concrete and Contracting

Lower Waiho at Rubbish Dump stopbank

Repair and Construction of Riprap Protection

Place 3150 tonnes of rock	\$119,760.00
---------------------------	--------------

Total Capital works for the 2022 / 2023 financial year:	\$141,013.74
--	---------------------

3. Administration (other business)

Insurance	\$13,351.00
-----------	-------------

Other Expenditure	\$142.61
-------------------	----------

Loan interest & Principal	\$20,409.64
---------------------------	-------------

Staff Time	\$35,805.00
------------	-------------

Total administration costs for the 2022 / 2023 Financial Year:	\$69,708.25
---	--------------------

4. Works carried out from 1 July 2023 to 1 April 2024

Capital works:

See Kanoa report

Maintenance works:

Spraying of stopbank (woody weed growth/tutu)

River diversion works at Rubbish Dump Bank groyne

River training works at Canavan's Knob

Pillage for buried rock and assist for river training works

5. Franz Josef Rating District financial balance

The balance in the combined rating district accounts at the end of 2022/2023 financial year was \$89,799.29

This target balance for the 'prudent reserve' for this rating district is suggested to be \$670,000.

This prudent reserve is immediately available for urgent emergency works that may be required following a major flood event.

It is therefore likely the current reserve will only cover a portion of the actual cost of the potential damage that could occur.

6. Proposal for the allocation of the \$414,204.09 prudent reserve (June 2021)

In acknowledgement of the closing balance of the Franz Josef Rating district prudent reserve of \$414,204.09 on June 30, 2021 the West Coast Regional Council recommend the committee resolve to adopt one of three options presented to ensure the balance is returned to the scheme, which is currently sitting in an independent council reserve balance sheet.

Option one: The committee resolve to allocate the credit to offset the Franz Josef loan to reduce the long-term debt held by the community.

Option two: The committee resolve to allocate the credit to the Franz Josef Joint Committee prudent reserve which is currently well under the target balance of \$670,000.00

Option three: The committee resolve to undertake a secondary round of consultation to ensure ratepayers agree on the allocation of the credit as the options proposed in the 2020 consultation document do not align with current council procedures.

7. Proposed options for the use of the Franz Josef Rock stock pile

In acknowledgement of the Franz Josef rock stockpile at September 2020 of 5,300T it is recommended this quantity of rock be allocated for use within the current Joint committee scheme.

8. Proposed maintenance rates for the 2024 / 2025 financial year

Rates Maintenance	\$106,800.00
Prudent Reserve (achieved)	
Engineers Cost Recovery	\$37,380
Infrastructure Insurance	\$3,907.00
Total:	\$144,180.00

The Council recommends a total rate strike of \$144,180.00 excluding GST.

NOTE: This has not included financial inputs to building the prudent reserve.

NOTE: This rating does not include rating against the Franz Josef or Lower Waiho Loan which are rated separately.

9. General business

Vegetation spraying on other banks (NZTA bank included)

Place buried rock on surface to act as a kicker.

Surveying or LIDAR

Moving of the heliport rock stockpile

MEMORANDUM

Subject: Impairment of Rating District infrastructure assets and the associated implications for the Community, Rating Districts, and Regional Council?

Impairment is **unexpected damage** to the asset (*e.g. unscheduled damage due to a flood*), whereas depreciation is based on expected / scheduled wear and tear over the useful life of the asset based on either the straight-line or diminishing value methods.

Impairment can occur because of an unusual / one-time event (*e.g. flood event or earthquake*), and/or damage that impacts an asset (*e.g. the potential impact of climate changes leading to flood protection assets no longer being fit for purpose from a design or level of service perspective*).

Generally accepted accounting principles (GAAP) and PBE IPSAS 21: Impairment of Non-Cash-Generating Assets require **assets be tested for impairment regularly** (*i.e. WCRC complete impairment testing annually*) to ensure the asset values recorded on Councils balance sheet are not overstated. Impairment exists when an asset's fair value is less than its carrying value (or book value) on the balance sheet.

A summary of implications to WCRC due to a flood protection asset impairment event follows:

1. There would be no impact to rating district financials in the event of impairment nor would there be any more or less rates required because of it. There are however accounting impacts at an all of Council level, but no impact to rate or funding requirements *in the first instance*. There could be flow on impacts around restoring assets back to fit for purpose state.
2. It would impact Council books with asset values would go down, and there would be an accounting 'loss' that would potentially make it appear Council was in the red at the end of the financial year but would cost no cash or outgoings. It is purely an accounting book loss.
3. Impairment event could trigger a capital investment decision needed if asset levels of service are to be remediated back to a fit for purpose state, and that *would* require money from community, or the repayment of debt should the RD agree to major works on their assets. That would be no different to current practices today about levels of service (LOS) with community even without impairment. Same process would apply.
4. Impairment would impact on the community around what (LOS) they are going to accept (and Council would maintain) from their assts going forward, and any downward change in LOS should be formally documented and agreed in writing. This would be the most real world significant and strategic impact to Council and RD from a risk perspective if an impairment event were to happen.
5. The implications for a RD not accepting a Council proposal to remediate the assets back to acceptable LOS would heighten the risk to Council as it relates to their legislative duties of care around river management and flood protection. It is uncertain what sort of legal defence the Council could offer by allowing communities to drop levels of service knowing that the impact could be significant to life and property in the event of a flood scenario.
6. There would likely be insurance implications to Council assets (premiums go up due to heightened risk or become uninsurable), but also could impact private property holders who may be suddenly considered now in a high-risk area if the flood protection assets are no longer deemed fit for purpose (particularly pertinent considering the insurance retreat is already well documented elsewhere given climate change assumptions).
7. There could be impacts to planning and consents for various activities at a Regional Plan or District Council level that may no longer allow building or development in affected areas. This could impact property market values significantly and create a strong drag effect on economic development.

9.1

FRANZ JOSEF UPDATE

PROJECT	Franz Josef Stopbanks Phase One	DATE	14/12/2023
SUBJECT	JC Meeting Update		
ISSUED BY	Scott Hoare	WCRC Programme Manager	
ISSUED TO	Sam Scott	West Coast Regional Council	
FILE / REF No.	15408		

Introduction

The purpose of this report is to provide an update and overview of the Franz Josef Stopbanks portion of the Infrastructure Resilience Group (IRG) project.

PROJECT OVERVIEW

- The project start was delayed due to delays in the issuing of the Resource Consent. Consent documentation was completed, and consents applied for in May 2022,
 - Consent application was notified to ten affected parties,
 - Affected Party Approval was granted by nine of ten parties,
 - The remaining affected party was required to submit their objection on a limited notified basis; this led to a hearing under an Independent Commissioner and Consent was approved by the commissioner in September 2023,
- To minimise the risk of further delays to the start of construction Council instructed that the works should commence under the Emergency Works provisions of s330 of the RMA in May 2023,
- Works commenced on the North Bank (Franz Josef Phase One) in June 2023,
 - The Link Bank (New NZTA Bank) has had placement and compaction of bulkfill to the complete height, and supply and placement of rock armoring to approximately 2 m below finished height, equal to the height of the existing banks,
 - The Havil Wall has had placement and compaction of bulkfill to the complete height across approximately half the length, the other half has been bulkfilled behind the wall to existing height and will be raised to finished height before 22 December 2023,
 - Rock armoring to the new bank height will be placed on the Link Bank and Havil Wall commencing in the New Year
 - Following completion of these two banks the contractor will commence work on the Church and Heliport banks
 - The total volume of bulkfill placed and compacted to 30 November 2023 is 124,298 m³,
 - The total weight of rock supplied and placed to 30 November 2023 is 43,374 T,
 - The North Bank is on track for completion in June 2024,

- The spend to date on the project to the end of November is approximately 44 % of the original budget.

Regards



Scott Hoare

WCRC Programme Manager

021 242 0455

scott@inovo.nz



Waiho River

Geomorphic Change Detection Analysis: 2019, 2023 and 2024

25 March 2024

Client: West Coast Regional Council
Report by: Rose Beagley & Matthew Gardner
Land River Sea Consulting Limited
www.landriversea.com

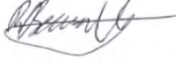
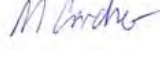


Land River Sea
CONSULTING



THE WEST COAST
REGIONAL COUNCIL

REVISION HISTORY

Author:	Rose Beagley Geomorphologist / Water Resources Scientist	Matthew Gardner Water Resources Engineer, CMEngNZ, CPEng
Signature:		
Date:	25 March 2024	
Revision:	02	
Authorised by:	Darryl Lew	
Signature:		
Organisation:	West Coast Regional Council	
Date:		

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1. INTRODUCTION

1.1. SCOPE

Land River Sea Consulting has been contracted by the West Coast Regional Council (WCRC) to carry out an analysis of the change in bed levels which have occurred in the Waiho River between 2016, 2019, 2023, and 2024. In particular, this study focuses on the changes which have occurred since 2023 as well as the developing avulsion of the Waiho River into the Tatare Stream upstream of the Waiho Loop.

1.2. CONTEXT

The Waiho River is located on the West Coast of the South Island of New Zealand and drains from the Western slopes of the Southern Alps and across a 16 km long floodplain, to the Tasman Sea (Figure 1-1).



Figure 1-1 – Location map of the Waiho River highlighting the two main subcatchments that feed the river (Callery and upper Waiho).

The upper part of the catchment is comprised of two main subcatchments – the Callery and the upper Waiho (Figure 1-1 and Figure 1-2). The Callery has multiple small glaciers in its upper reaches that feed into a steep, long and narrow gorge. The upper Waiho hosts the rapidly receding Franz Josef glacier.

Immediately downstream of the junction between the Callery and the Waiho rivers, the Waiho River is crossed by the State Highway 6 (SH6) Bridge which is operated by Waka Kotahi - New Zealand Transport Authority (NZTA) and flows adjacent to the town of Franz Josef / Waiau, situated on the true right bank of the river. This marks the start of the 16 km long floodplain.

In the upper reach of this floodplain, from the SH6 Bridge down to the Waiho Loop (a terminal moraine feature) the river widens out into a natural alluvial fan (Figure 1-2). However, the current fan is constrained by man-made stopbanks, which have forced the river to aggrade in its current alignment, rather than naturally deposit sediment over a wider area. This has resulted in the need for ongoing upgrades to the stopbank network to contain the river. Additionally, this aggradation has built up the Waiho fan surface so that it is now level with the Tatare fan surface.

- The Tatare flows to the north (true right side) of the Waiho, and previously has joined the Waiho just downstream of the Waiho Loop.
- Since the early 2000's floodwaters from the Waiho have on occasion overtopped the Tatare fan surface, with small and brief breakouts reaching the Tatare upstream of the Waiho Loop. Yet the river was always able to be rediverted away from the Tatare Stream and fan surface.
- However, because the Waiho fan is now level with the Tatare fan, in February 2023 a significant flow path (avulsion channel) developed from the Waiho into the Tatare upstream of the Waiho Loop. This channel continued to deepen and widen over the following 12 months, and in January 2024, 95% of the Waiho flow was using this channel. Since then, this percentage of flow has fluctuated as the channel network shifts across the fan surface, alternating the amount of flow going through the gap between Rata Knoll and the Waiho Loop, and down the avulsion into the Tatare Stream.

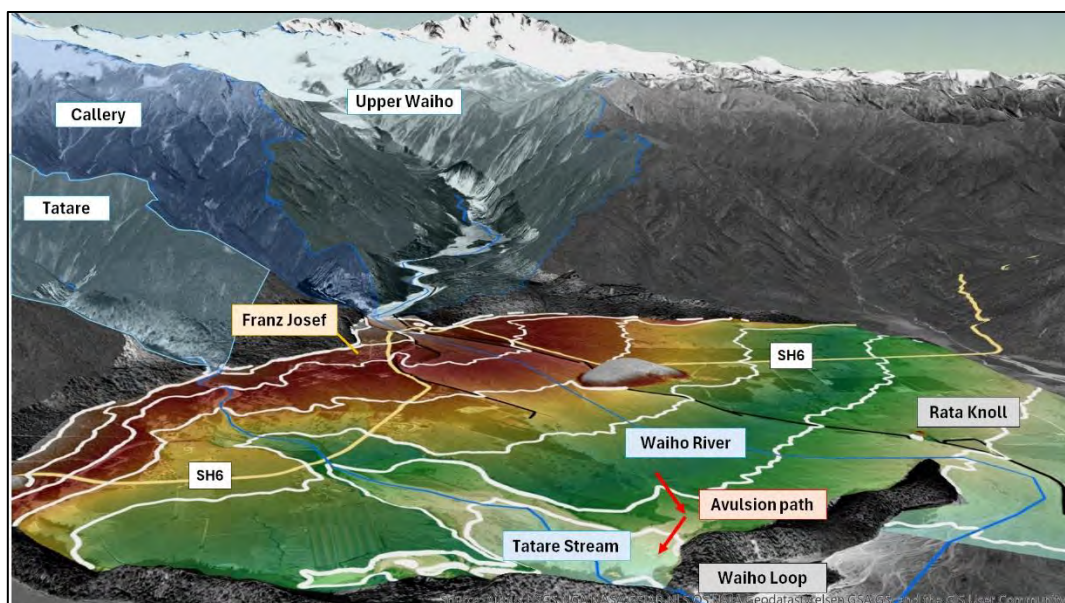


Figure 1-2 – June 2023 LiDAR contours and shaded DEM of the Waiho and Tatare fans. Labels denote the Franz Josef township, Waiho Loop, Rata Knoll, avulsion path, SH6, and Callery, Tatare and upper Waiho subcatchments labelled.

2. DATA COLLECTION

2.1. LIDAR

A summary of the LiDAR data used for the analyses in this report is provided in Table 2-1. The data was supplied in the form of a 1 m DEM together with a raw point cloud in LAS (.las) format classified into ground and non-ground points.

The elevation accuracy of the resulting 3D point cloud was assessed using checkpoint survey observations acquired on bare earth surfaces. The average difference and standard deviation of differences between the checkpoints and locally interpolated point cloud are included in Table 2-1. LiDAR datasets for all survey years had low standard deviation (SD) and root mean square (RMS) error suggesting minimal bias.

Table 2-1 - Summary of LiDAR data

	2016	2019	2023	2024
Collection Date	June 2016	16 April	8 June	31 January
Collected By	New Zealand Aerial Surveys Ltd	Waikato University	University of Canterbury	
Collection Method	Fixed wing aircraft	Helicopter	Helicopter	
Sensor	Optech Orion H300	Riegl VUX-1LR	Riegl VUX240	
Altitude	1190-2375 m	350 m	300 m	
No. checkpoint surveys	(Unknown)	97	298	1640
Standard deviation of checkpoint/point-cloud difference	0.016 m	0.017 m	0.051 m	0.047 m
Average checkpoint/point-cloud difference	0.007 m	0.001 m	-0.006 m	0.003 m
RMS error	(Unknown)	0.017 m	0.051 m	0.047 m

2.2. CROSS-SECTIONAL SURVEYS

Cross-sectional survey data from the Franz Josef Glacier terminus to the Waiho Loop has been collected since 1983, with the most recent complete survey carried out by Chris J Coll & Associates in April 2016. Cross-section locations are provided in Figure 2-1. For further information on this survey data see previous reports (Gardner, 2016; Gardner & Brasington, 2019).

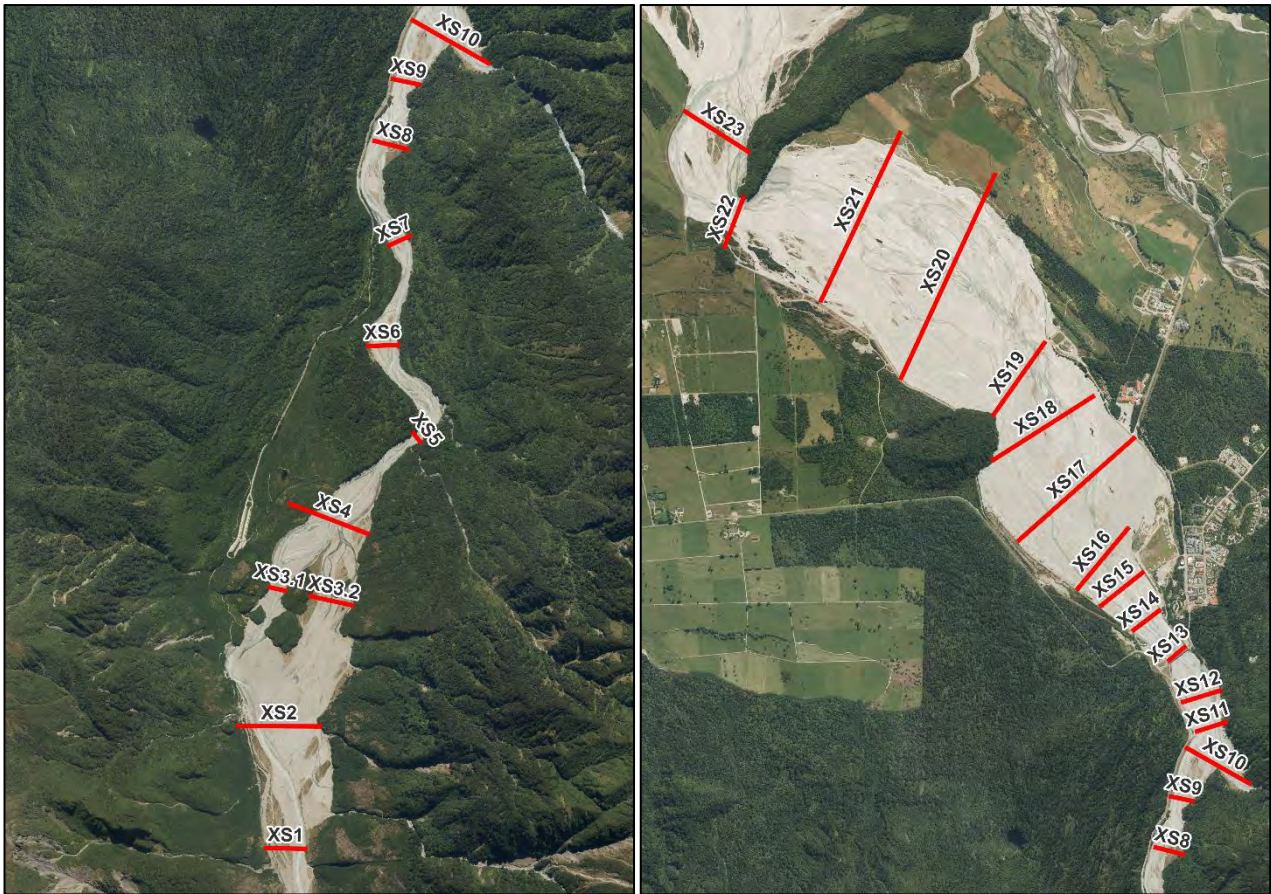


Figure 2-1 – Cross-section locations.

The mean bed level (MBL) for each cross-section has been calculated by extracting and averaging the elevation values from the 2019, 2023 and 2024 LiDAR surveys along each cross-section line. Plots of the change in mean bed level at each cross-section (relative to 1983 MBLs) were published in the Gardner and Brasington (2019) report and have been extended to include the data from 2023 and 2024 – see Appendix A.


This cross-sectional data and MBL analysis have been used in both the geomorphic change detection (GCD) results and the discussion sections to provide a longer record of bed level change.

2.3. SATELLITE IMAGERY

To assist with understanding the influence the Waiho fan surface has on channel patterns, as well as how this has and may continue to affect the development of the avulsion, we have downloaded satellite imagery from the Sentinel Hub. Fourteen cloud-free images from the Sentinel-2 L2A (atmospherically corrected) data source have been downloaded in False Colour (Urban) at a 10 m resolution (Table 2-2). An example has been included below.

The full set of downloaded Sentinel imagery is presented in Appendix B.

Table 2-2 – Dates and an example of downloaded cloud-free Sentinel Hub satellite imagery.

Date	
2023-02-10	
2023-02-25	
2023-03-22	
2023-04-06	
2023-05-11	
2023-06-05	
2023-07-20	
2023-07-25	
2023-08-09	
2023-09-03	
2023-10-18	
2023-11-17	
2023-12-07	
2024-01-26	

We have traced the main channel of the Waiho River in each of these satellite images and then overlaid them with one and five metre contours from the 2023 and 2024 LiDAR DEMs in order to see how much influence the shape of the fan has on where the main channel flows and therefore its likelihood to flow down the avulsion channel, further developing it.

This analysis has been used in the discussion of the Waiho fan aggradation and shape in section 5.1.

2.4. HYDROLOGY

Rainfall data has been provided by the West Coast Regional Council at two monitoring sites within the Waiho catchment (Figure 2-2 and Table 2-3).

Table 2-3 – Rainfall and water level monitoring sites in the Waiho catchment.

Monitoring site	Owner	Elevation	Data	Period
Waiho Rv at SH6	WCRC	146 m	Rainfall/Water level	2009 to current
Waiho Rv at Douglas Hut	NIWA	221 m	Rainfall	1983 to current



Figure 2-2 - Locations of the monitoring sites used in this analysis.

2.4.1. RAINFALL DATA

From the rainfall data timeseries recorded by each site we have extracted:

- Daily rainfall totals for the February 2023 and January 2024 weather events
- Monthly totals for all years and long-term monthly means

We have also completed frequency distribution analyses (Gumbel; calendar year) within the Hilltop software for a range of durations including:

- **Short:** 1, 2, and 3 hours
- **Medium:** 6, and 12 hours
- **Long:** 1, 2, 3, and 6 days

Given the Waiho Rv at Douglas Hut site has a much longer timeseries, we ran the frequency distributions for its entire timeseries (1983 to 2024) and for the same period of data available for the

Waiho Rv at SH6 site (2009 to 2024). This allowed us to see how the annual recurrence intervals (ARIs) changed with more data and between the two sites:

- **Short:** ARIs remained the same.
- **Medium:** ARIs increased from the 2009-2024 analyses to the 1983-2024 analyses by 0.1 year
- **Long:** ARIs increased from the 2009-2024 analyses to the 1983-2024 analyses by between 0.1 to 0.3 years.

ARIs between the two sites were also very similar, with differences between 0.1 and 0.3 years.

As the ARIs between the two sites aren't significantly different we have chosen to use the frequency distribution analysis for the full time series at the Waiho Rv at Douglas Hut site. This has allowed us to include the bigger events that occurred during the previous positive phase of the Interdecadal Pacific Oscillation (IPO; discussed in section 6.2) and therefore provided better context to the events that triggered and rapidly developed the avulsion, and for what may be expected now that we have entered another positive phase of the IPO.

3. GEOMORPHIC CHANGE DETECTION - METHODOLOGY

3.1. GCD SOFTWARE

The GCD analysis has been undertaken using the Geomorphic Change Detection toolkit (GCD, see gcd.riverscapes.xyz) developed by James Brasington (University of Canterbury), Joe Wheaton (Utah State University) and Philip Bailey (North Arrow Research).

The GCD toolkit facilitates the measurement of bed level change by comparing time-series of digital elevation models and accounting for the uncertainty that arises from survey instrument errors, interpolation artefacts, surface roughness and the pattern of spatial sampling. Users are therefore able to classify the probability that elevation differences observed between two DEMs are likely to be significant (real) relative to the underlying data uncertainty.

See the previous Waiho GCD report “Waiho River: Change Detection Analysis” (Gardner & Brasington, 2019) for further information.

3.2. DEM UNCERTAINTY MODELLING

A spatial model of DEM uncertainty was constructed for each surface (2016, 2019, 2023 and 2024) based on the observed pattern of land cover.

Given the high quality (low magnitude of vertical errors reported) of the four LiDAR datasets, the surface cover has first order control on data quality. This reflects the combined effects from vegetation cover on the ability of the LiDAR survey to penetrate through to ground level, the local surface roughness (e.g., riverbed gravels vs pasture) and laser reflectivity – in particular the lack of data retrievals on wet/inundated areas. To represent these effects, surface error masks (Figure 3-1 and Figure 3-2) were developed for all four datasets.

- For the 2016 and 2019 data, automatic image classification tools were used on the imagery from the Sentinel 2 platform using a supervised classification of the land cover at a 10 m resolution.
- For the 2023 and 2024 data, areas of significant change from the 2016 and 2019 datasets were manually delineated from high resolution orthoimagery for each survey.

For each land cover class, an estimated vertical uncertainty was set, guided by the local pattern of elevation uncertainty revealed in the raw point cloud. The resulting land-cover classification and DEM elevation uncertainty is shown in Table 3-1.

Note that there was significantly more water present during the 2024 survey as it was flown immediately following a weather event due to the urgency of the situation (i.e. 95% of the Waiho flowing down the avulsion channel). This has increased the uncertainty in the DEM.

Table 3-1 – Vertical uncertainty values for the GCD analyses.

Land Cover Class	Characteristic Vertical Uncertainty (m)
Grass	0.15
Exposed river gravels	0.13
Tall vegetation	0.30
Inundated areas (without correction)	0.50
Inundated areas (with section corrections, 2016 only)	0.25
Coastal water (2024)	0.75
Deep water (through the Tatare cut in 2024)	1.00

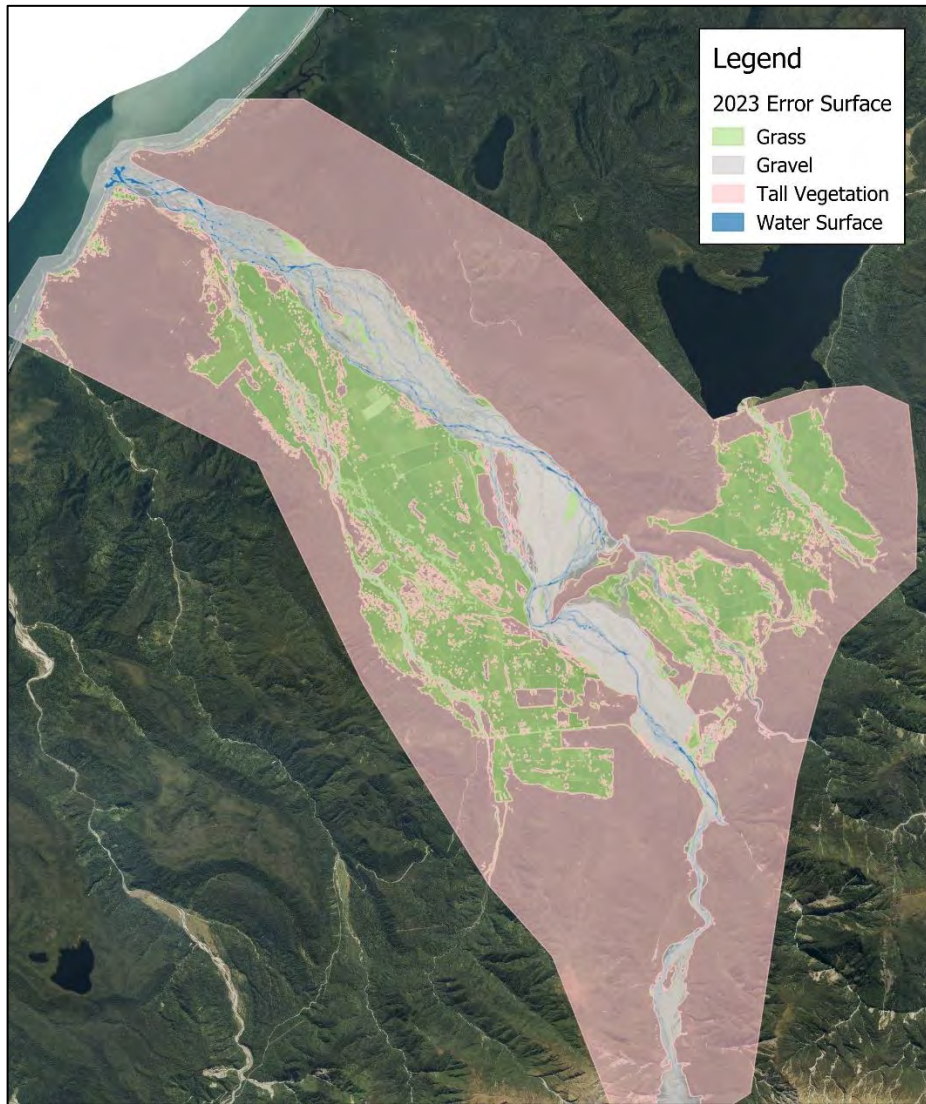


Figure 3-1 – Uncertainty mask 2023 LiDAR

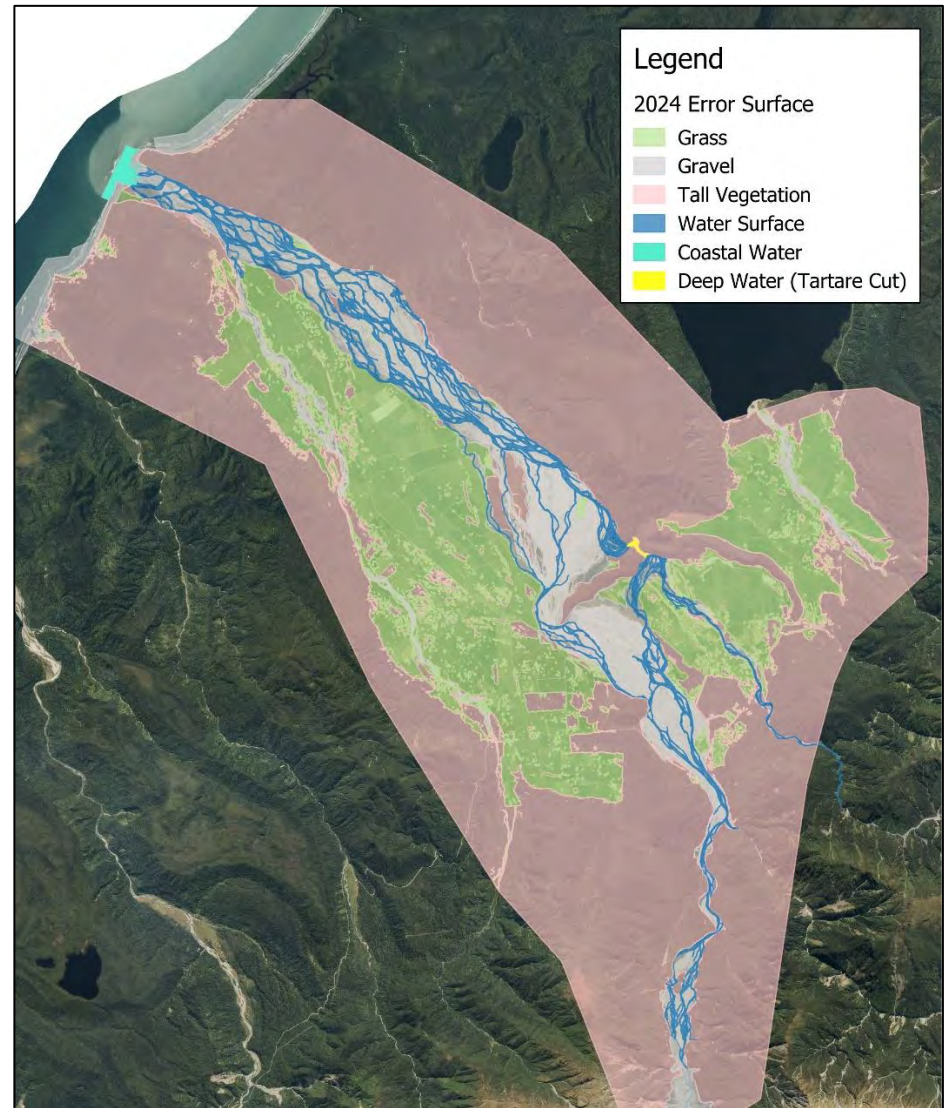


Figure 3-2 – Uncertainty mask 2024 LiDAR

3.3. BROADSCALE AREAS OF INTEREST

There are two broadscale areas of interest (AOI) for the geomorphic change detection (GCD) analysis. These have been defined as the active channel of the Waiho River (from glacier to sea), and the Tatare Stream (from the range front to where it joins the Waiho downstream of the Waiho Loop).

These areas of interest are presented in Figure 3-3 below.



Figure 3-3 - GCD areas of interest (AOI)

To better understand how the Waiho-Tartare avulsion is developing, there is an additional area of interest which extends from the start of the incision at the top of the avulsion to the toe of the fan forming downstream of the Tatare cut through the Waiho Loop. The avulsion area of interest is shown in Figure 3-4.

Our GCD analysis of this area compares the volume of erosion through the avulsion channel, and widening of the cut in the Waiho Loop, with the volume of deposition occurring in the Tatare as a result of the avulsion.

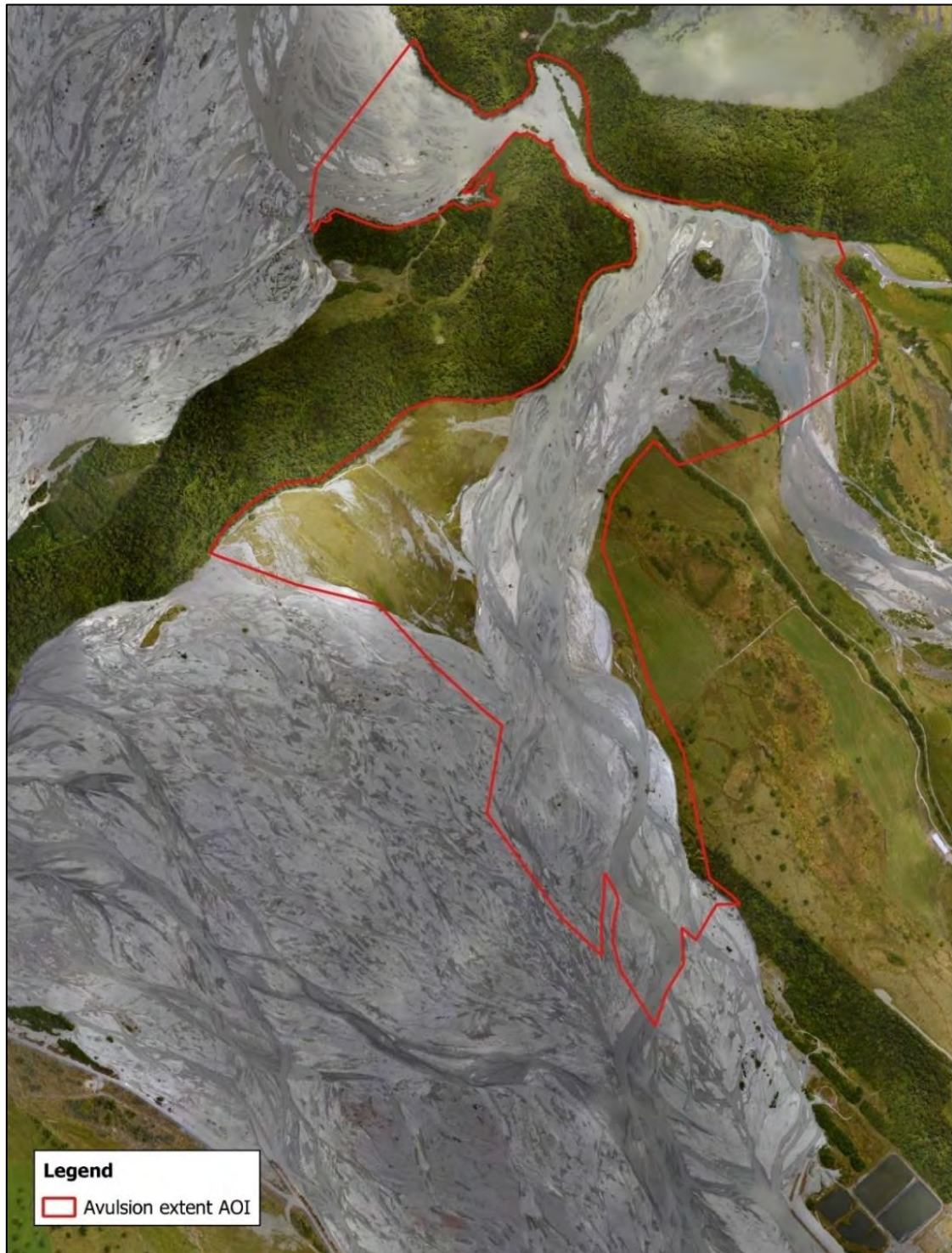


Figure 3-4 – Avulsion extent AOI over the 2024 ortho image.

3.4. SUB-REACH CHANGE DETECTION UNITS

A more detailed analysis of the Waiho River has been carried out by dividing the channel into a series of downstream units or 'budget cells', in order to quantify the longitudinal pattern of bed-level response from the glacier to the coast.

Two different models of downstream cells were used. First, the analysis has been divided up into reaches bounded at each end by the location of historic cross section surveys (XS0-XS23). This approach provides a measure of average bed-level changes across each reach and mitigates potential bias from specific cross-section measurement locations. This cross sectional analysis has been used as it provides a consistent manner of bed level comparison with historic investigations which have been based on these historic cross section locations.

However, since the historic cross sections do not extend significantly downstream of the Waiho Loop (XS23), a separate longitudinal analysis has also been completed, in which the entire length of the river was divided into a set of regular 500 m cells based on the channel centreline. This method is advantageous in that it provides an analysis over a uniform interval for the entire river reach.

The resulting pattern of cells for the cross-sectional and 500 m delineated longitudinal models is shown in Figure 3-5 and Figure 3-6, respectively, on the following pages.

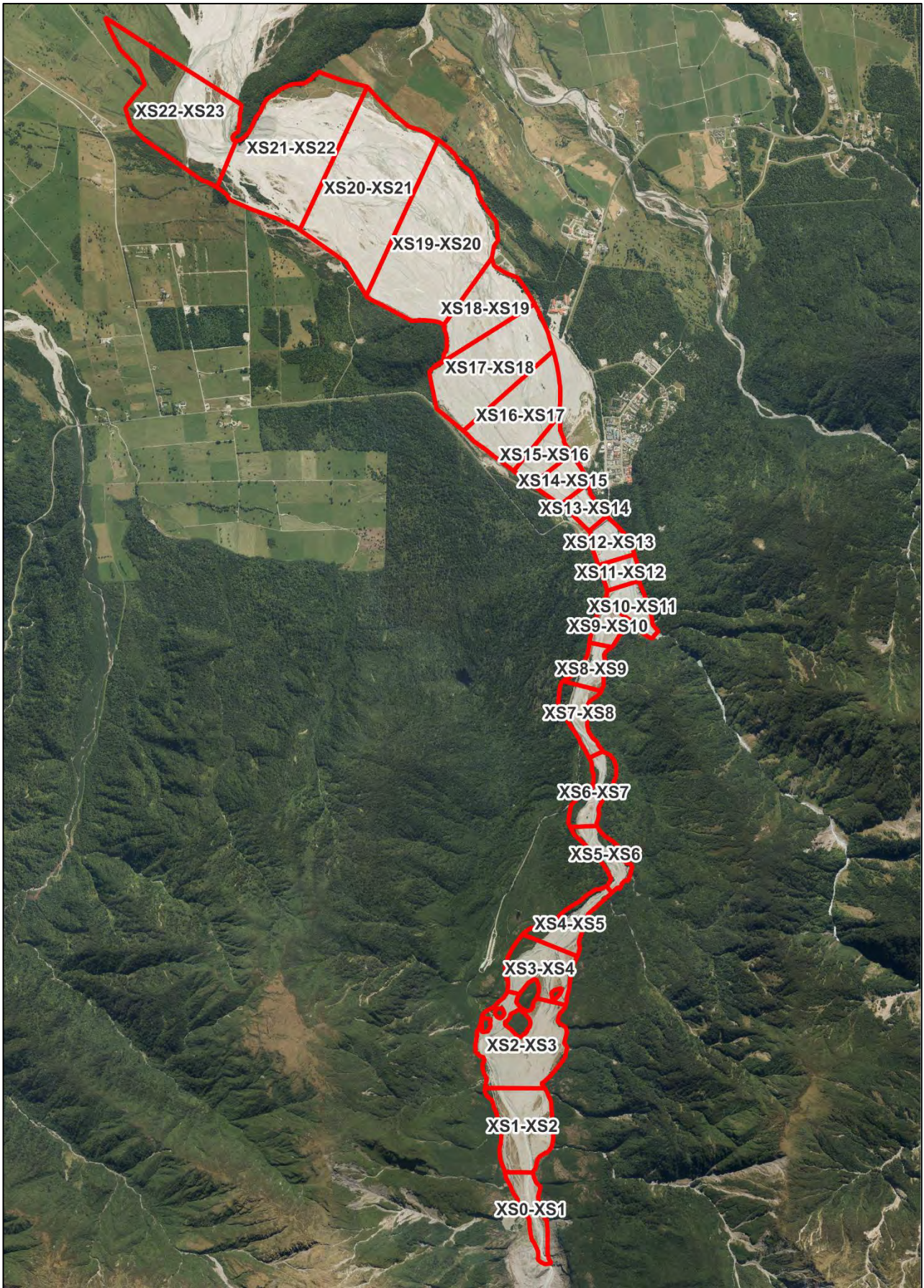


Figure 3-5 – GCD budget cells defined by the historic cross sections.

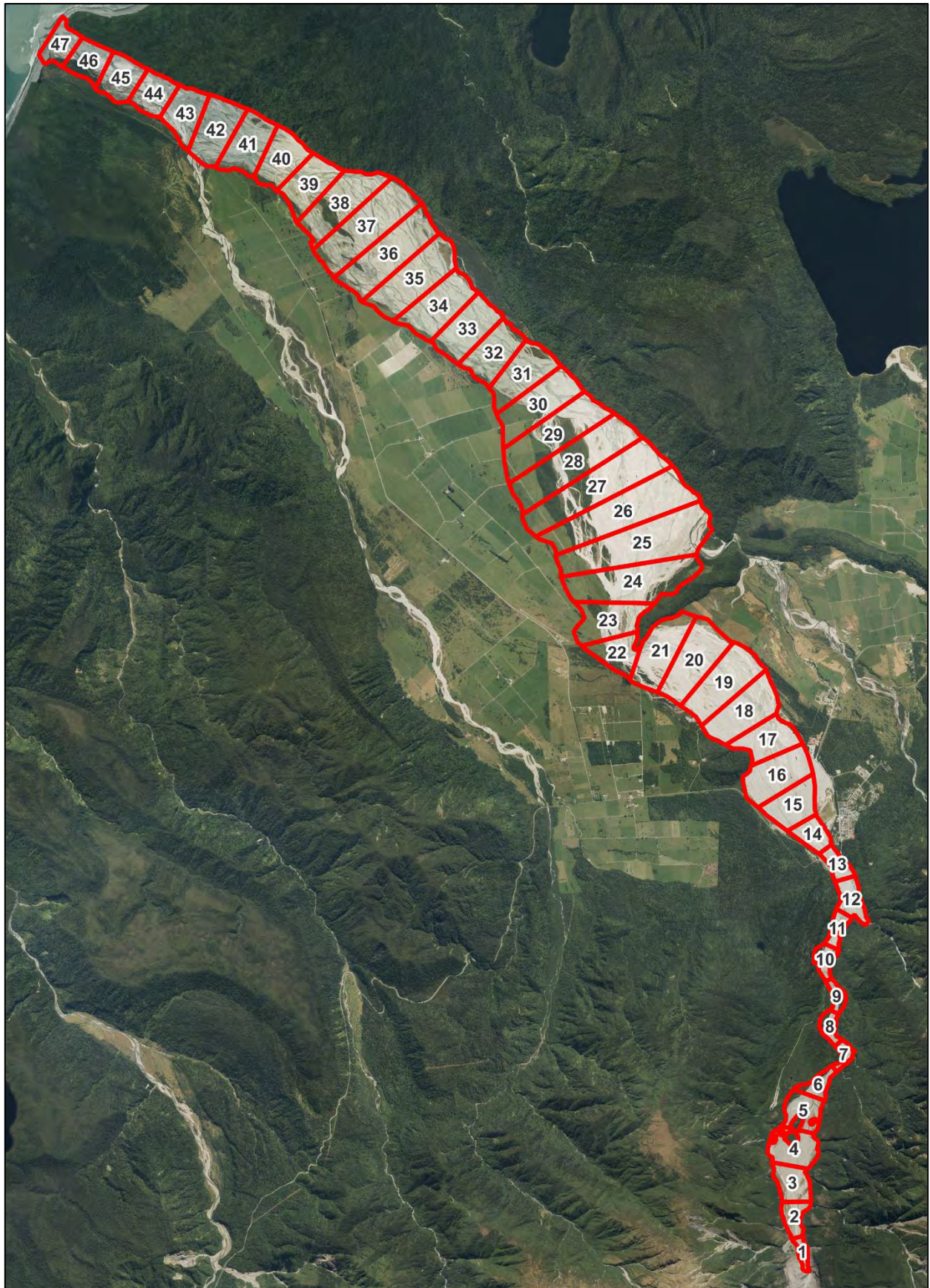


Figure 3-6 - GCD budget cells defined by 500 m cross sections.

4. GEOMORPHIC CHANGE DETECTION – RESULTS

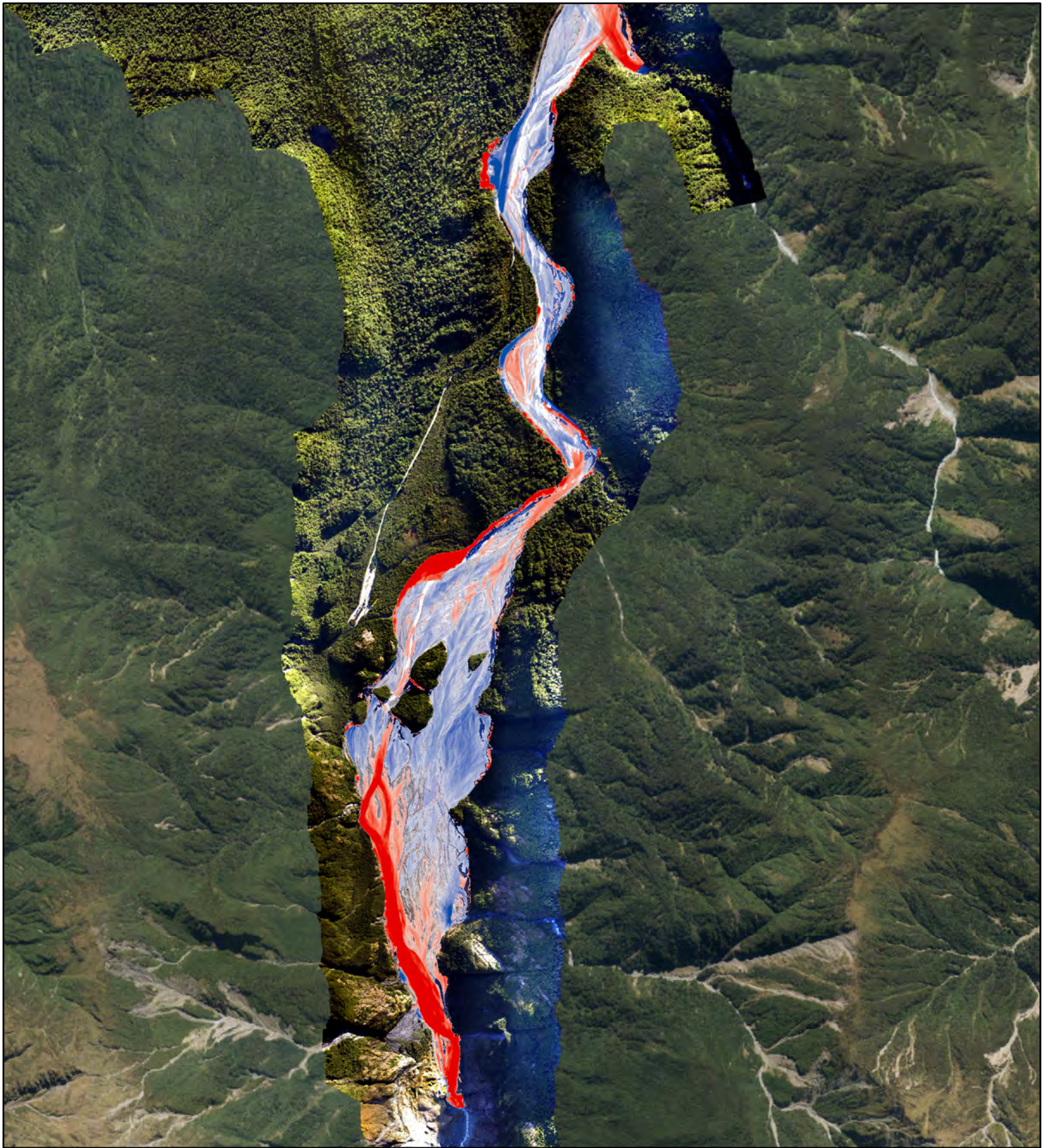
The results of three GCD analyses for the periods 2019-2023, 2023-2024 and 2016-2024 are discussed in the following sections. The findings are intended to be reviewed alongside the 2016 to 2019 GCD analysis report (Gardner & Brasington, 2019).

Areas of aggradation and degradation are visualised by DEMs of Difference (DoDs) and are provided in the maps on the following pages.

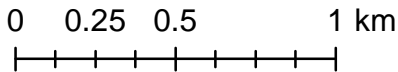
Section 4.1 presents the GCD results of the longitudinal pattern and average change in bed-level response, based on the cross-sectional and 500 m 'budget cells' extending from the glacier to the coast, as discussed in Section 3.4.

In Section 4.2, general patterns of bed level change are discussed to provide insight into the scale and speed at which sediment is transported through the Waiho and Tartare systems respectively.

In Section 4.3 more detailed analysis of bed level change is provided at a reach-based scale with the inclusion of the avulsion area.



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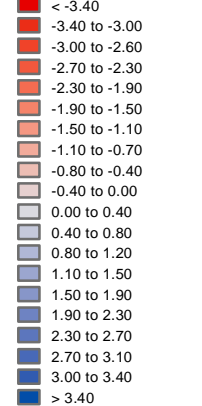
**Waiho River
Change Detection Analysis**



Legend

2019-2023

Elevation Difference (m)



TITLE **Bed Level Change Detection
Glacier to Callery Confluence
Change in Bed Level 2019 to 2023
(95% Threshold)**

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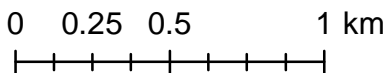
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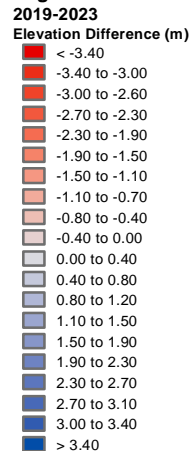


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Waiho River Change Detection Analysis



Legend



TITLE **Bed Level Change Detection
Callery to Waiho Loop
Change in Bed Level 2019 to 2023
(95% Threshold)**

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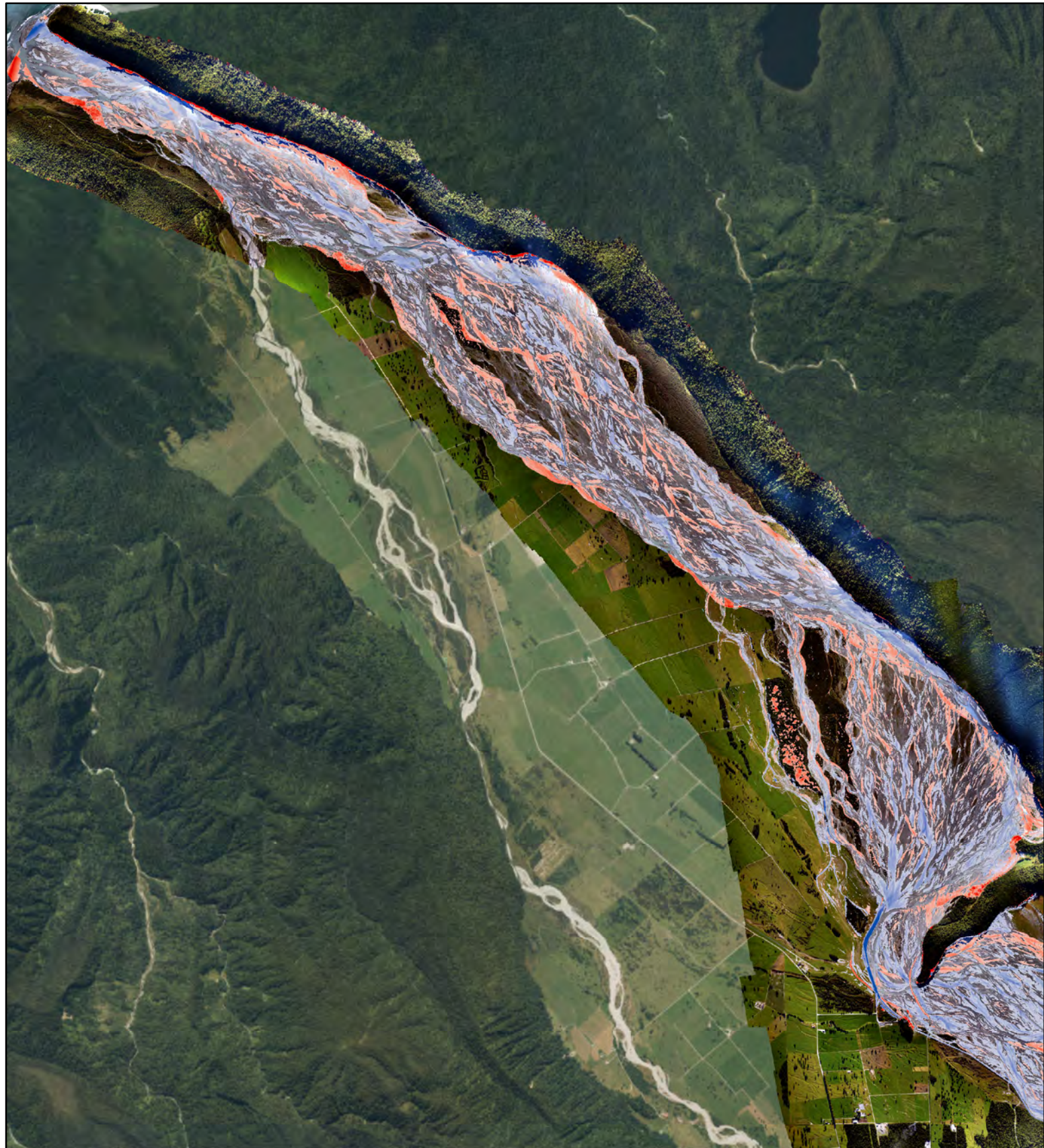
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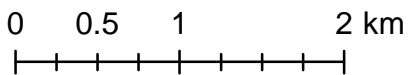
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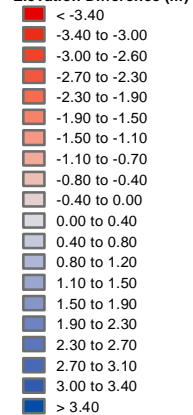
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**Waiho River
Change Detection Analysis**



Legend
2019-2023

Elevation Difference (m)



TITLE
Bed Level Change Detection
Waiho Loop to Mouth
Change in Bed Level 2019 to 2023
(95% Threshold)

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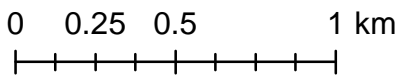
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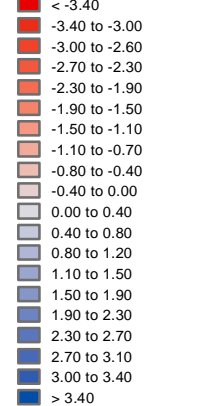
**Waiho River
Change Detection Analysis**



Legend

2023-2024

Elevation Difference (m)



TITLE **Bed Level Change Detection
Glacier to Callery Confluence
Change in Bed Level 2023-2024
(84% Threshold)**

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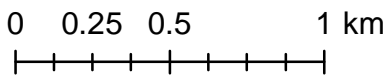
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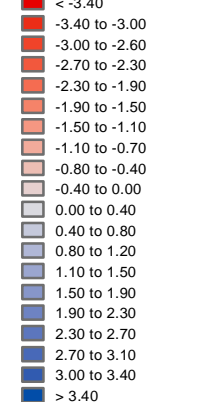
**Waiho River
Change Detection Analysis**



Legend

2023-2024

Elevation Difference (m)



TITLE **Bed Level Change Detection
Callery to Waiho Loop
Change in Bed Level 2023-2024
(84% Threshold)**

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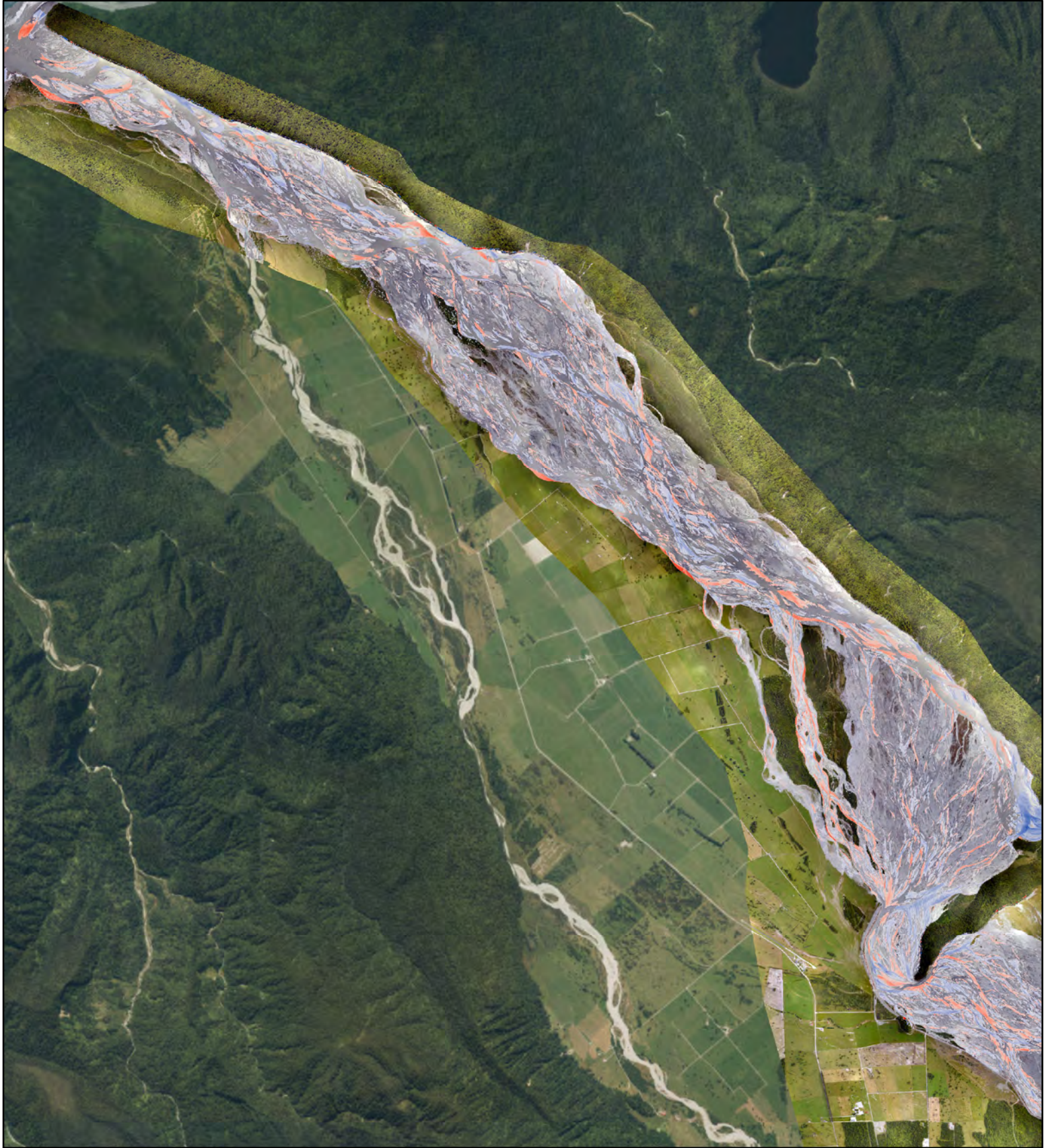
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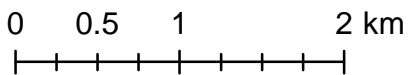
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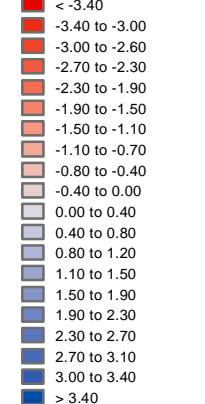
**Waiho River
Change Detection Analysis**



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2023-2024

Elevation Difference (m)



TITLE Bed Level Change Detection
Waiho Loop to Mouth
Change in Bed Level 2023-2024
(84% Threshold)

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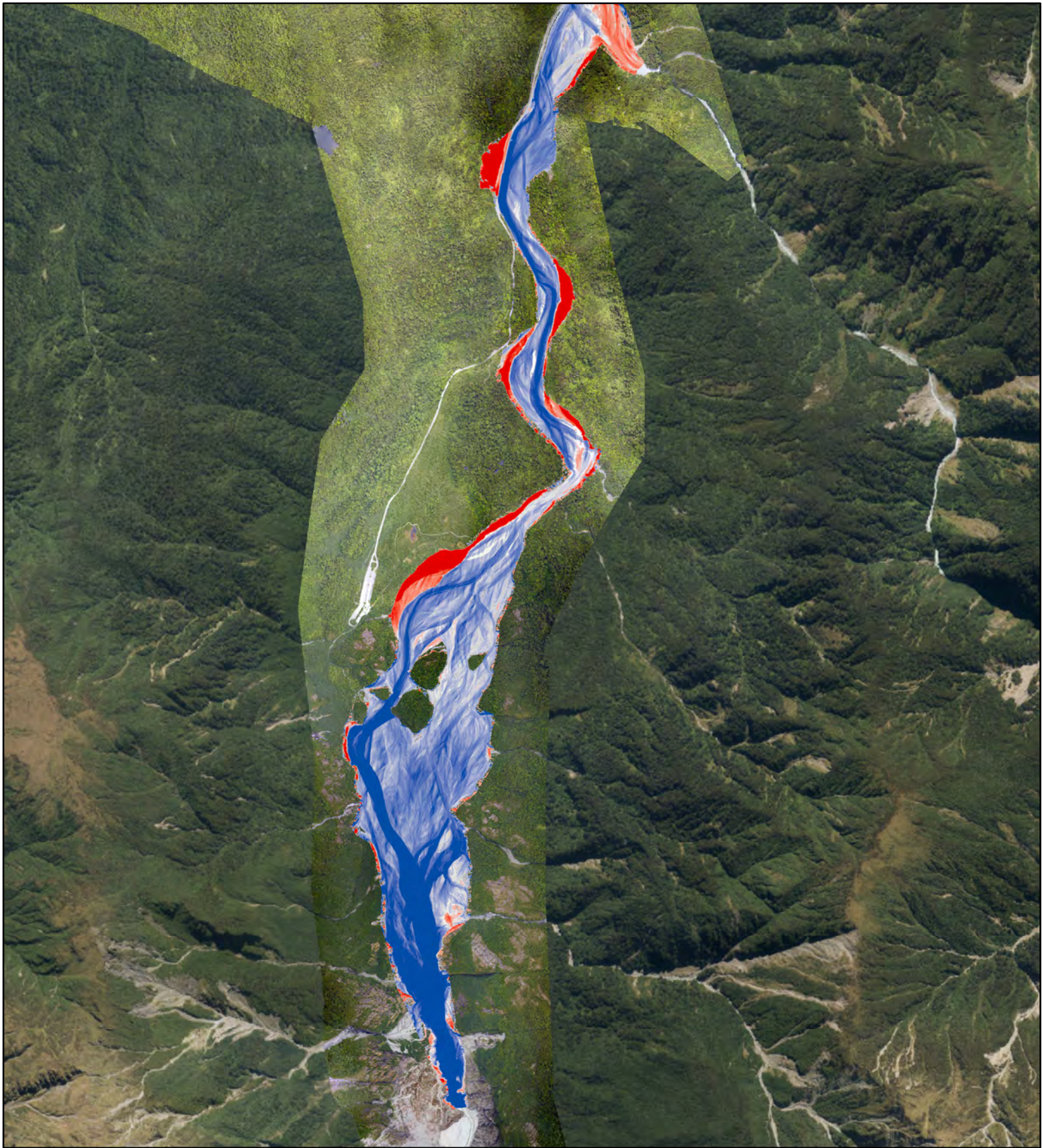
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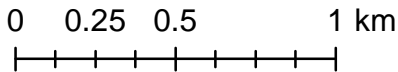
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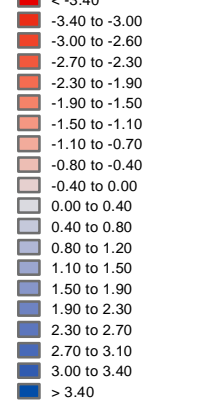
**Waiho River
Change Detection Analysis**



Legend

2016-2024

Elevation Difference (m)



TITLE **Bed Level Change Detection
Glacier to Callery Confluence
Change in Bed Level 2016-2024
(84% Threshold)**

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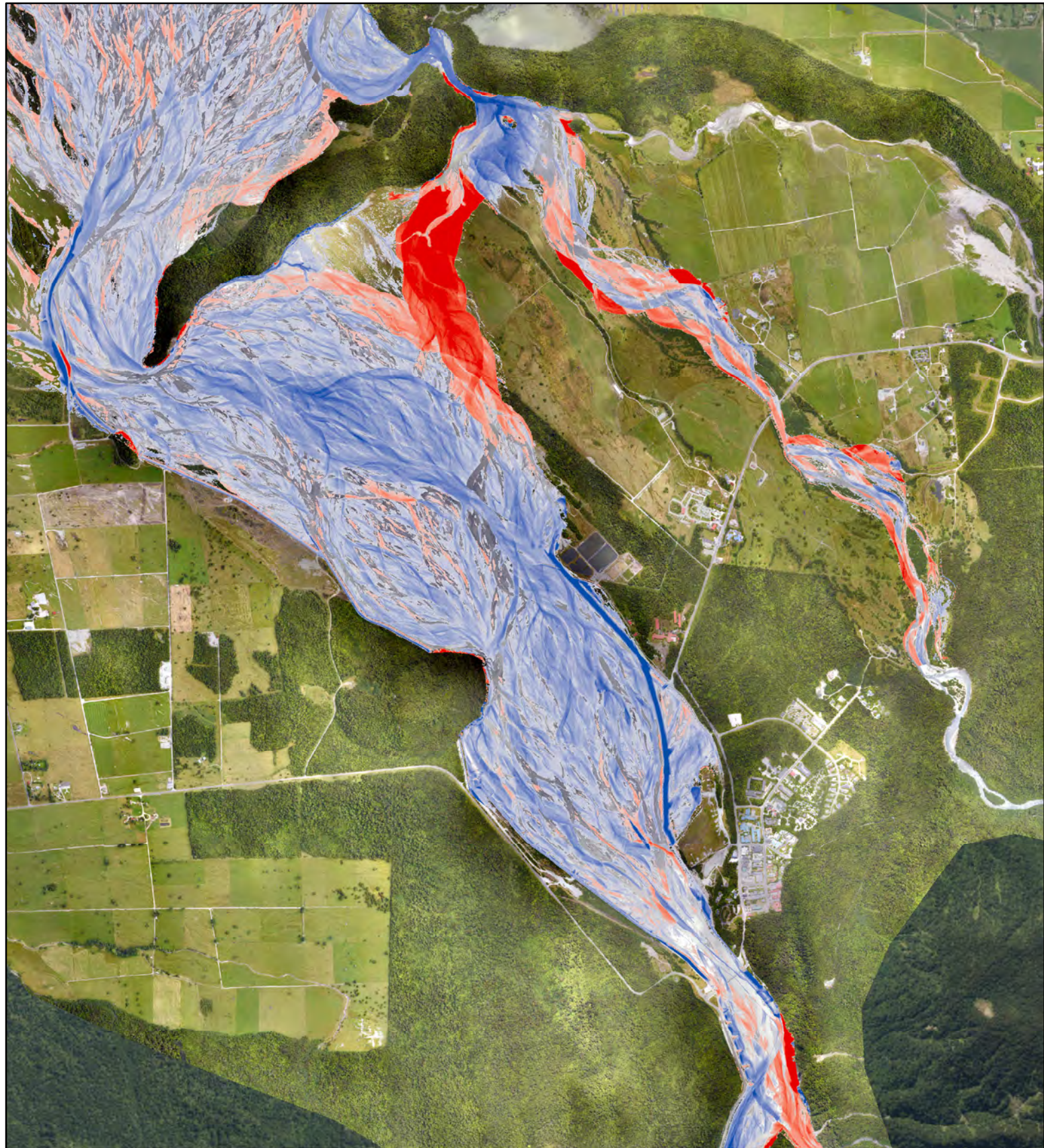
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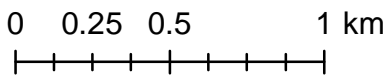
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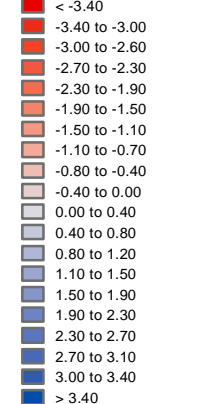
Waiho River Change Detection Analysis



Legend

2016-2024

Elevation Difference (m)



TITLE Bed Level Change Detection
Callery to Waiho Loop
Change in Bed Level 2016-2024
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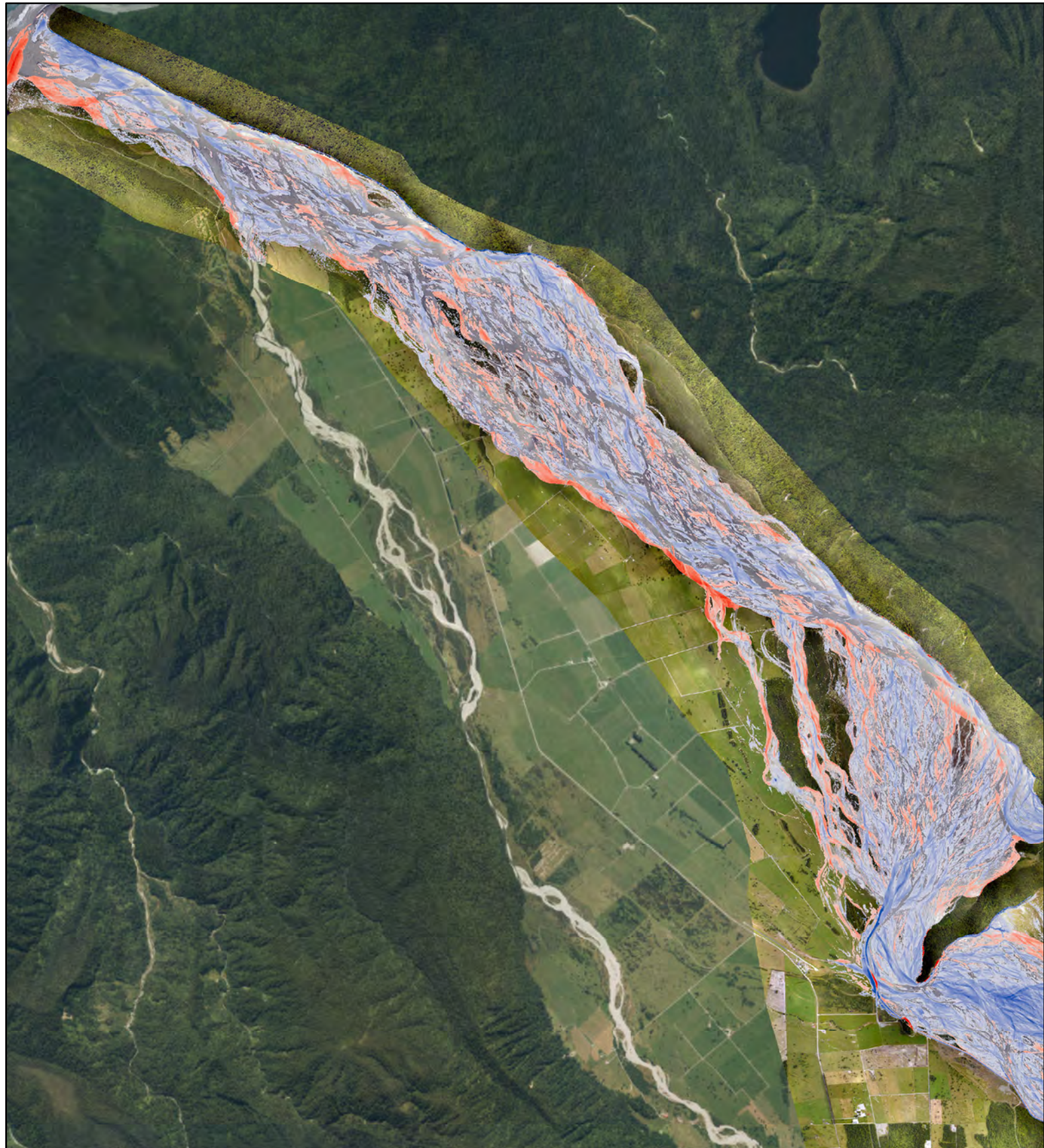
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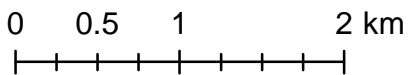
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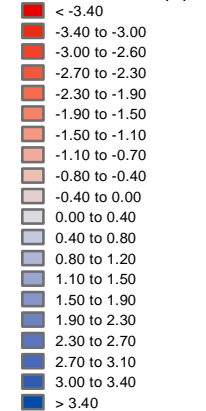
**Waiho River
Change Detection Analysis**



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2016-2024

Elevation Difference (m)



TITLE Bed Level Change Detection
Waiho Loop to Mouth
Change in Bed Level 2016-2024
(84% Threshold)

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4.1. SUB-REACH CHANGE ANALYSIS

4.1.1. CROSS-SECTIONAL CELLS ANALYSIS

For the 2019-2023 GCD analysis, the calculated mean bed level and volumetric change within cross-sectional cells is provided in Table 4-1. The longitudinal pattern of erosion and deposition, as well as a cumulative total volume change based on these units is also presented overleaf in Figure 4-1.

This analysis quantifies the downstream patterns of channel adjustment mapped in the GCD results maps and described in Section 4.2.

**Table 4-1 – Summary of 2019-2023 GCD bed level and volume change
(rounded to nearest 1000 m³)**

	Cross Section / Cells	Mean Bed Level (m)		Net volume (m ³)		Reach net volume change (m ³)	
		Change	Error (m)	Change	Error (%)		
Upper Valley	XS0-XS1	-4.1	±0.23	-339,000	6		
	XS1-XS2	-1.2	±0.16	-210,000	14		
	XS2-XS3	0.7	±0.17	196,000	26		
	XS3-XS4	0.2	±0.16	17,000	118		
	XS4-XS5	-2.1	±0.24	-162,000	12		-498,000
Transport Reach	XS5-XS6	-0.5	±0.21	-28,000	43		
	XS6-XS7	0.5	±0.18	30,000	41		
	XS7-XS8	0.6	±0.19	36,000	33		
	XS8-XS9	1.3	±0.20	54,000	16		
	XS9-XS10	0.3	±0.17	9,000	67		101,000
Callery Confluence to End of Helipad Bank	XS10-XS11	-1.5	±0.27	-99,000	19		
	XS11-XS12	-0.9	±0.19	-32,000	21		
	XS12-XS13	-0.2	±0.18	-6,000	134		
	XS13-XS14	0.8	±0.22	25,000	27		
	XS14-XS15	1.1	±0.24	60,000	23		-52,000
End of Helipad Bank to Waiho Loop	XS15-XS16	1.1	±0.20	91,000	19		
	XS16-XS17	1.0	±0.20	275,000	20		
	XS17-XS18	0.9	±0.19	258,000	23		
	XS18-XS19	0.7	±0.19	103,000	25		
	XS19-XS20	0.6	±0.17	294,000	27		
	XS20-XS21	0.7	±0.18	373,000	27		
	XS21-XS22	0.4	±0.17	163,000	44		1,557,000
	XS22-XS23	0.8	±0.17	199,000	21		

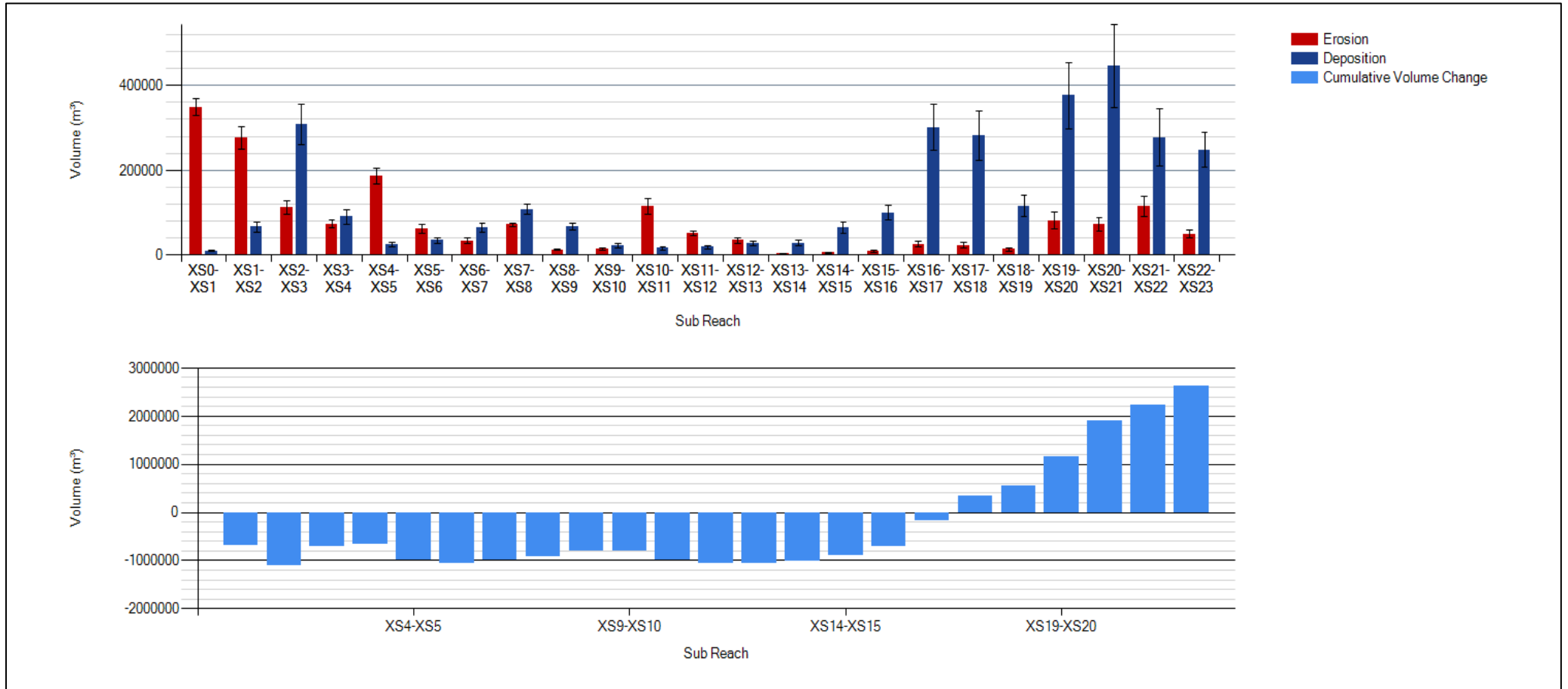


Figure 4-1 - 2019-2023 GCD summary of erosion and deposition and cumulative volume change between XS1 to XS23

For the 2023-2024 GCD analysis, the calculated mean bed level and volumetric change within cross-sectional cells is provided in Table 4-2. The longitudinal pattern of erosion and deposition, as well as a cumulative total volume change based on these units is also presented overleaf in Figure 4-2.

**Table 4-2 – Summary of 2023-2024 GCD bed level and volume change
(rounded to nearest 1000 m³)**

	Cross Section / Cells	Mean Bed Level (m)		Net volume (m ³)		Reach net volume change (m ³)
		Change	Error (m)	Change	Error (%)	
Upper Valley	XS0-XS1	8.2	±0.28	804,000	3	1,760,000
	XS1-XS2	2.8	±0.25	560,000	9	
	XS2-XS3	1.3	±0.21	308,000	17	
	XS3-XS4	0.5	±0.18	58,000	39	
	XS4-XS5	0.5	±0.19	30,000	41	
Transport Reach	XS5-XS6	0.5	±0.22	26,000	46	118,000
	XS6-XS7	0.8	±0.22	40,000	30	
	XS7-XS8	0.6	±0.28	21,000	46	
	XS8-XS9	0.9	±0.26	24,000	32	
	XS9-XS10	0.2	±0.17	7,000	76	
Callery Confluence to End of Helipad Bank	XS10-XS11	-0.1	±0.14	-2,000	286	-9,000
	XS11-XS12	-0.8	±0.19	-8,000	23	
	XS12-XS13	0.2	±0.21	4,000	130	
	XS13-XS14	-0.1	±0.16	-1,000	198	
	XS14-XS15	-0.1	±0.16	-2,000	265	
End of Helipad Bank to Waiho Loop	XS15-XS16	-0.3	±0.20	-12,000	67	123,000
	XS16-XS17	0.0	±0.17	-2,000	1732	
	XS17-XS18	0.4	±0.16	66,000	46	
	XS18-XS19	0.4	±0.18	33,000	51	
	XS19-XS20	0.1	±0.16	23,000	265	
	XS20-XS21	0.0	±0.13	-13,000	317	
	XS21-XS22	0.1	±0.15	28,000	153	
	XS22-XS23	0.2	±0.16	29,000	85	

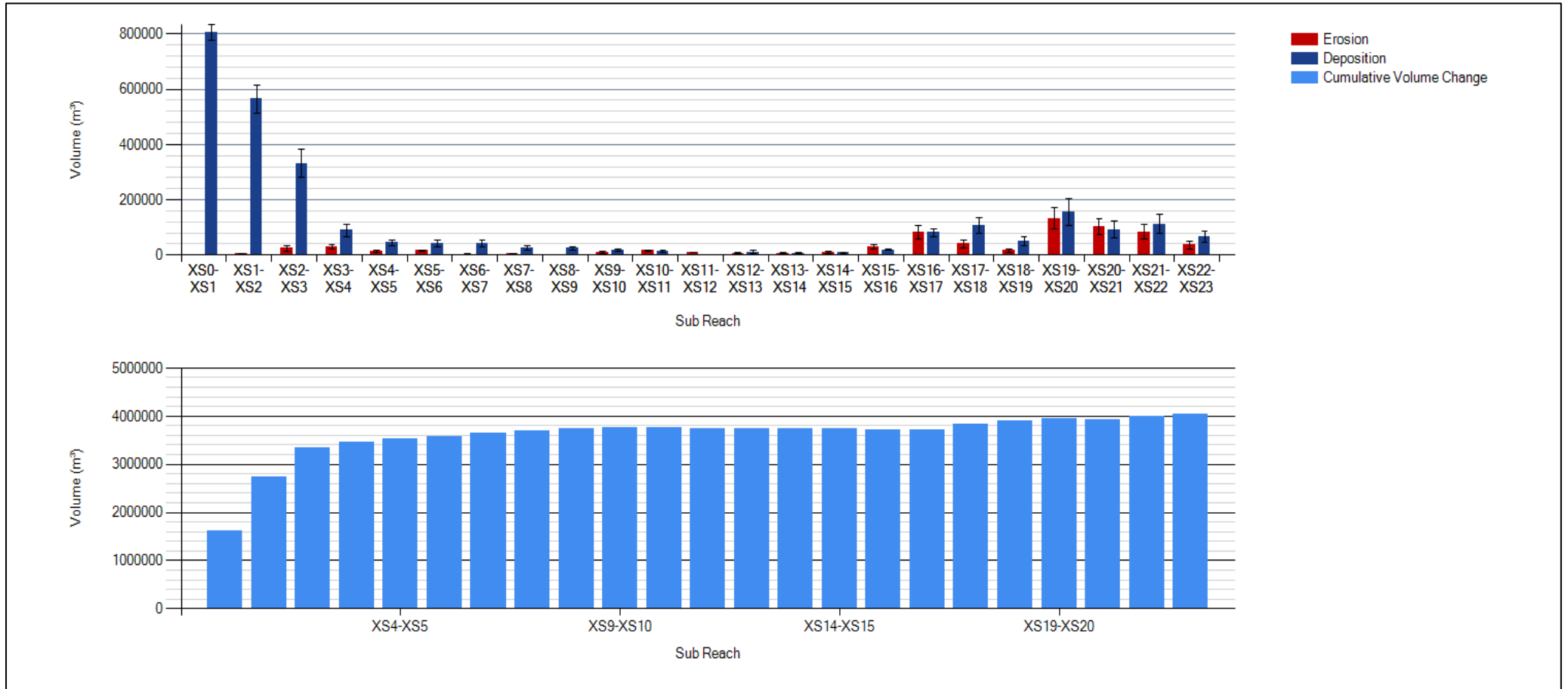


Figure 4-2 - 2023-2024 GCD summary of erosion and deposition and cumulative volume change between XS1 to XS23

4.1.2. CROSS-SECTION MEAN BED LEVEL ANALYSIS

To compare with historic cross-sectional survey data, a basic mean bed level analysis has also been carried out at each of the historic cross section survey locations.

Unlike the 2-dimensional analysis carried out using the LiDAR with the GCD tools, no adjustment has been made with the 2019, 2023 or 2024 datasets in order to account for the water surface for the cross-sectional analysis, so the results have a greater degree of uncertainty and will slightly overestimate the overall mean bed level for these surveys. However, considering the water surface only covers a small area of the active channel, the overall conclusions and trends are considered representative.

A summary of the changes in mean bed level from 1983 to 2024 is presented in Table 4-3 on the following page with plots showing the cumulative change from 1983 for each surveyed cross section presented in Appendix A.

Table 4-3 - Summary of Mean Bed Level based at historic cross section locations

	Mean Bed Level (m)														MBL Change (m)		
	1983	1990	1993	1999	2002	2008	2011	2012	2014	2015	2016	2019	2023	2024	2019 to 2023	2023 to 2024	1993 to 2024
XS1			245.5	253.0		253.1				250.7	250.6	253.8	250.3	256.2	-3.5	6.0	10.7
XS2	226.0	229.4	229.5	234.5		234.0				233.3	233.6	235.1	234.1	235.8	-0.9	1.7	6.2
XS3	212.8	214.0	214.6	216.3		216.4				217.2	217.3	217.6	217.6	217.9	0.0	0.3	3.3
XS4	205.2		206.8	207.8		207.6				207.8	207.5	208.6	208.8	209.1	0.2	0.3	2.3
XS5	195.8	196.1	196.0	195.9	195.9	195.7				196.0	196.3	198.4	196.2	196.1	-2.2	-0.1	0.1
XS6	185.4	185.3	184.9	185.3	185.3	184.7				185.4	185.0	186.8	186.3	187.0	-0.6	0.7	2.1
XS7	173.5	172.5	173.3	175.0	175.0	175.5				174.9	175.0	176.2	176.6	176.9	0.4	0.3	3.7
XS8	163.6	163.5	164.8	166.4	166.4	167.2				167.0	167.3	168.2	168.7	169.3	0.5	0.6	4.6
XS9	157.4	157.2	159.2	161.7	162.1	162.0				162.3	162.5	163.8	163.7	164.2	-0.1	0.5	5.0
XS10	152.8		154.2	158.0	158.0	158.3	160.2	160.1	159.5	159.4	159.4	159.6	159.5	159.6	-0.2	0.1	5.3
XS11	149.9	151.4	152.5	155.0	154.8	155.7	157.8	157.3	156.7	156.3	156.8	157.2	156.5	156.3	-0.7	-0.2	3.8
XS12			150.0	152.6	153.1	153.3	155.0	154.4	154.4	154.2	154.2	154.9	154.1	154.1	-0.9	0.0	4.1
XS13	145.7	145.1	145.9	148.9	148.4	149.1	150.6	150.0	150.5	149.9	150.5	150.5	150.5	150.2	0.0	-0.3	4.4
XS14			143.6	146.3	145.9	146.6	147.6	146.8	147.8	147.7	148.0	147.6	147.9	148.1	0.3	0.2	4.5
XS15			141.2	143.2	143.4	143.7	144.5	144.5	144.9	144.6	145.1	144.7	145.2	145.0	0.5	-0.2	3.8
XS16			137.7	139.2	139.6	139.8	140.2	140.2	140.5	140.5	140.9	140.9	141.4	142.5	0.5	1.1	4.9
XS17			133.1	134.3	134.4	134.6	135.2	135.2	135.6	135.7	136.0	136.2	136.5	136.7	0.3	0.2	3.6
XS18			127.8	128.7	128.9	129.2	129.7	129.7	129.8	129.8	130.1	130.7	131.0	131.1	0.2	0.1	3.3
XS19	123.6		124.0	124.3	124.6	124.8	125.2	125.3	125.2	125.3	125.6	126.5	126.6	127.0	0.1	0.4	3.0
XS20	116.9		117.1	117.4	117.4	117.9	118.3	118.4	118.5	118.8	118.7	119.1	117.7	117.0	-1.4	-0.7	-0.1
XS21	109.1		109.1	109.2	109.2	109.4	109.5	109.6	109.6	109.7	109.7	109.9	109.9	109.9	0.0	0.0	0.9
XS22	101.4		100.9	101.0	101.0	101.0	101.0	100.8	100.9	101.0	100.9	101.7	101.6	101.5	-0.1	-0.1	0.6
XS23	93.4		94.5	94.5	94.7	95.0	95.0	94.9	95.0	95.1	95.1	95.7	95.7	95.8	0.0	0.1	1.3

4.1.3. 500M CELLS ANALYSIS

A longitudinal analysis of volume changes was also undertaken along the entire length of the Waiho River, dividing the river into 500 m cells starting at the glacier and working downstream. In total the river is divided into 47 longitudinal budget cells, representing the full 23.5 km centreline length.

A summary for the 2019-2023 GCD analysis of the erosion and deposition changes for each of these units as well as a cumulative total volume change is provided in Figure 4-3 overleaf.

A summary for the 2023-2024 GCD analysis of the erosion and deposition changes for each of these units as well as a cumulative total volume change is provided in Figure 4-4 on page 34.

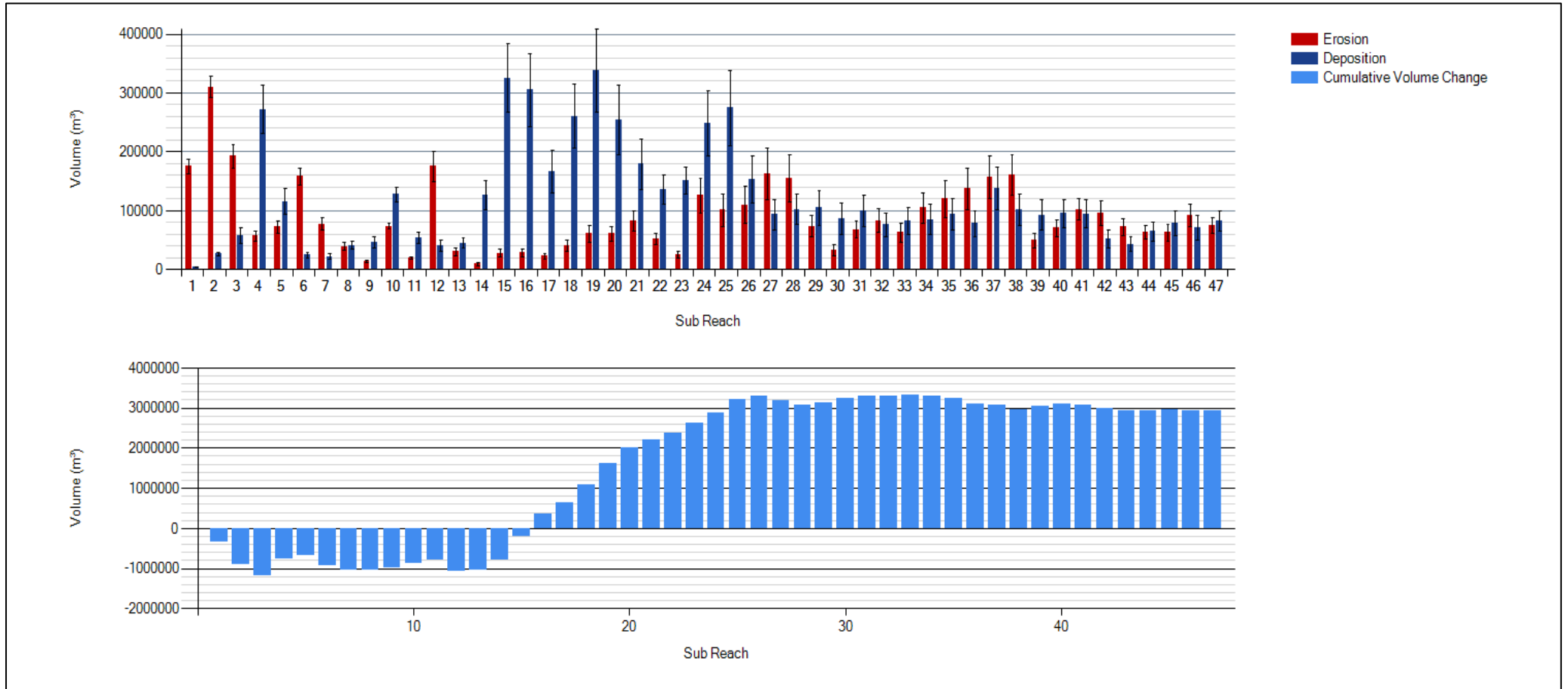


Figure 4-3 – 2019-2023 GCD summary of erosion and deposition and cumulative volume change for the entire Waiho based on 500 m cells

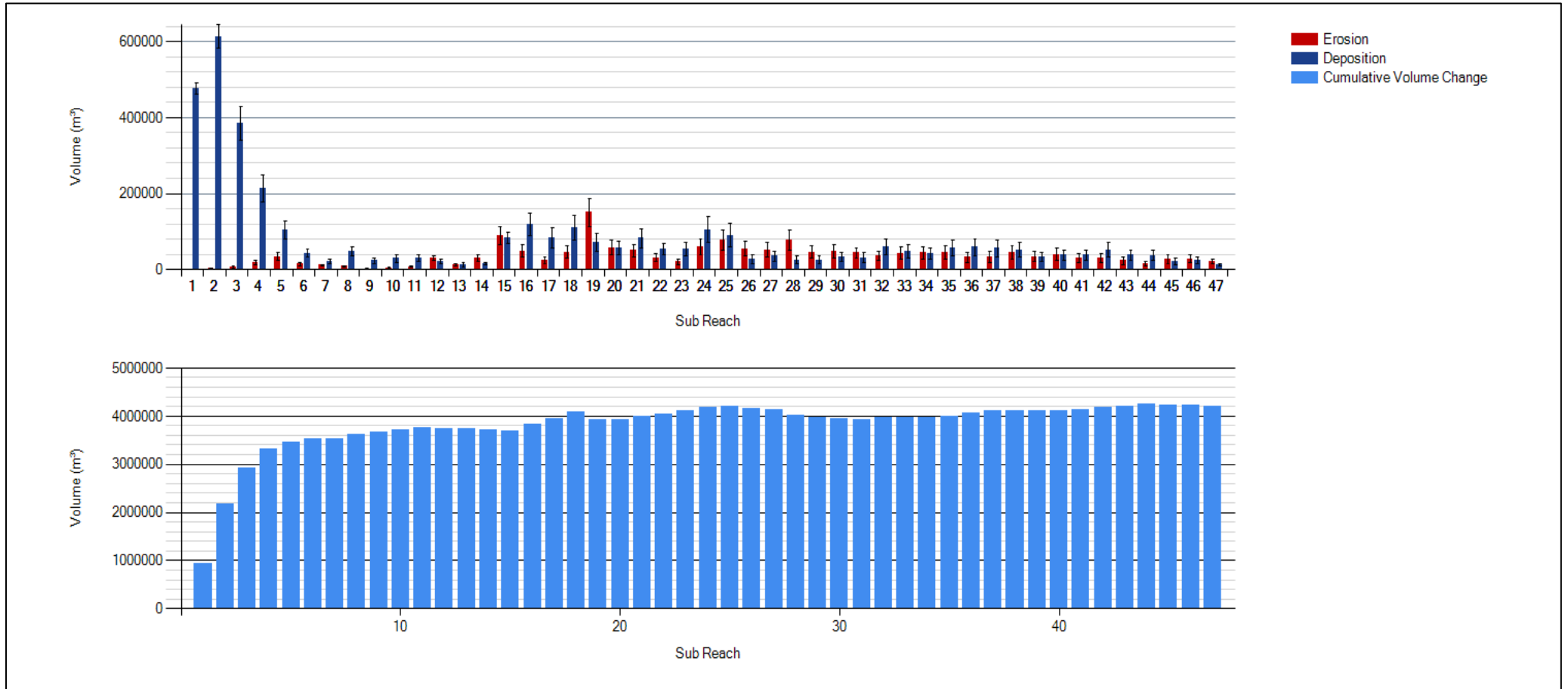


Figure 4-4 - 2023-2024 GCD summary of erosion and deposition and cumulative volume change for the entire Waiho based on 500 m cells

4.2. BROADSCALE PATTERNS OF BED-LEVEL CHANGE

4.2.1. WAIHO RIVER

The Waiho area of interest includes the entire active channel from the Franz Josef glacier terminus down to the Tasman Sea. As shown by all three GCD analyses (Table 4-4), this river experiences very large volumetric change (erosion and deposition), in the order of millions, at all four GCD time scales (7.5 months, and 3, 4 and 7.5 years).

Table 4-4 – Summary of volume differences within the Waiho AOI for each GCD analysis

	Volume Erosion (million m ³)	+ - Error (million m ³)	Volume Deposition (million m ³)	+ - Error (million m ³)	Net Volume Difference (million m ³)	Average Volume Difference (million m ³ per year)
2016 – 2019	3.68	0.88	6.68	1.54	3.00	1.00
June 2019 – June 2023	4.13	0.79	5.61	1.26	1.48	0.37
June 2023 – Jan 2024	1.67	0.57	3.85	0.81	2.18	3.49
2016 – 2024	3.60	0.87	10.76	2.07	7.16	0.95

The net volumetric difference for all four analyses show that, overall the river bed is experiencing long term aggradation, with a potential increase in rate of aggradation in the most recent survey period, although it is important to note that the short time period between surveys may result in an exaggeration of the annual rate of increase.

4.2.2. TATARE STREAM

The Tatare area of interest starts where the Tatare Stream exits the Southern Alps range-front and ends just downstream of the Waiho Loop where it joins the Waiho. The Tatare Stream shows greater variation between analyses than the Waiho (Table 4-5).

Table 4-5 - Summary of volume differences within the Tatare AOI for each GCD analysis

	Volume Erosion (million m ³)	+ - Error (million m ³)	Volume Deposition (million m ³)	+ - Error (million m ³)	Net Volume Difference (million m ³)	Average Volume Difference (million m ³ per year)
2016 – 2019	0.37	0.06	0.37	0.09	0.01	0.00
June 2019 – June 2023	0.44	0.08	0.08	0.02	-0.36	-0.09
June 2023 – Jan 2024	0.03	0.01	0.35	0.10	0.32	0.10
2016 – 2024	0.50	0.09	0.50	0.13	0.00	0

The net volume change fluctuates between all three possible states – relatively in balance (2016-19), degradational (2019-23) and aggradational (2023-24).

In the 2019-23 analysis, the -0.36 million m³ net volume change is evident in the extensive bank erosion, and channel incision between the range front and Waiho Loop.

In the 2023-24 analysis, the aggradation is less a reflection of the state of the Tatare but rather the influence that the Waiho River is having through its avulsion into the Tatare Stream above the Waiho Loop. The 0.32 million m³ of net volume change is for the most part a product of the sediment brought in by the Waiho depositing above, through and downstream of the Tatare cut in the Waiho Loop. The avulsion is discussed in detail in Section 4.3.5.

4.3. REACH-BASED CHANGE ANALYSIS

In this section, more detailed analysis of bed level change is provided at a reach-based scale with the inclusion of the avulsion area. This analysis has been based on the Waiho divided into separate reaches defined as the upper valley (XS0 – 5), transport reach (XS5 – 10), Callery confluence (XS10 – 15), fan (XS15 – 22) and valley train (cells 22 – 47) (Figure 4-5).



Figure 4-5 - Waiho reaches

Summaries of the mean bed level change and net volume change within each of these reaches across all four time periods / GCD analyses are provided in Table 4-6 to Table 4-10 below, and subsequent discussions in Section 4.3.1 to Section 4.3.6.

Table 4-6 – Upper valley: mean bed level change and net volume change

	Mean bed level change (m)	Net volume change (million m ³)
2016-19 (3 years)	1.38	1.10
2019-23 (4 years)	-1.28	-0.5
2023-24 (7.5 months)	2.61	1.76
2016 to 2024 (7.5 years)	2.50	2.37

Table 4-7 - Transport reach: mean bed level change and net volume change

	Mean bed level change (m)	Net volume change (million m ³)
2016-19 (3 years)	-0.30	-0.18
2019-23 (4 years)	0.40	0.10
2023-24 (7.5 months)	0.58	0.12
2016 to 2024 (7.5 years)	0.16	0.06

Table 4-8 – Callery confluence to helipad bank: mean bed level change and net volume change

	Mean bed level change (m)	Net volume change (million m ³)
2016-19 (3 years)	-0.18	-0.04
2019-23 (4 years)	-0.14	-0.05
2023-24 (7.5 months)	-0.18	-0.01
2016 to 2024 (7.5 years)	-0.35	-0.09

Table 4-9 - Waiho fan: mean bed level change and net volume change

	Mean bed level change (m)	Net volume change (million m ³)
2016-19 (3 years)	0.36	0.98
2019-23 (4 years)	0.76	1.56
2023-24 (7.5 months)	0.10	0.12
2016 to 2024 (7.5 years)	0.94	2.65

Table 4-10 – Valley train: mean bed level change and net volume change

	Mean bed level change (m)	Net volume change (million m ³)
2016-19 (3 years)	0.22	1.47
2019-23 (4 years)	0.07	0.36
2023-24 (7.5 months)	0.03	0.11
2016 to 2024 (7.5 years)	0.25	1.93

The volumetric change summarised by reach (including the avulsion extent) for each GCD analysis have been provided in Figure 4-6 overleaf.

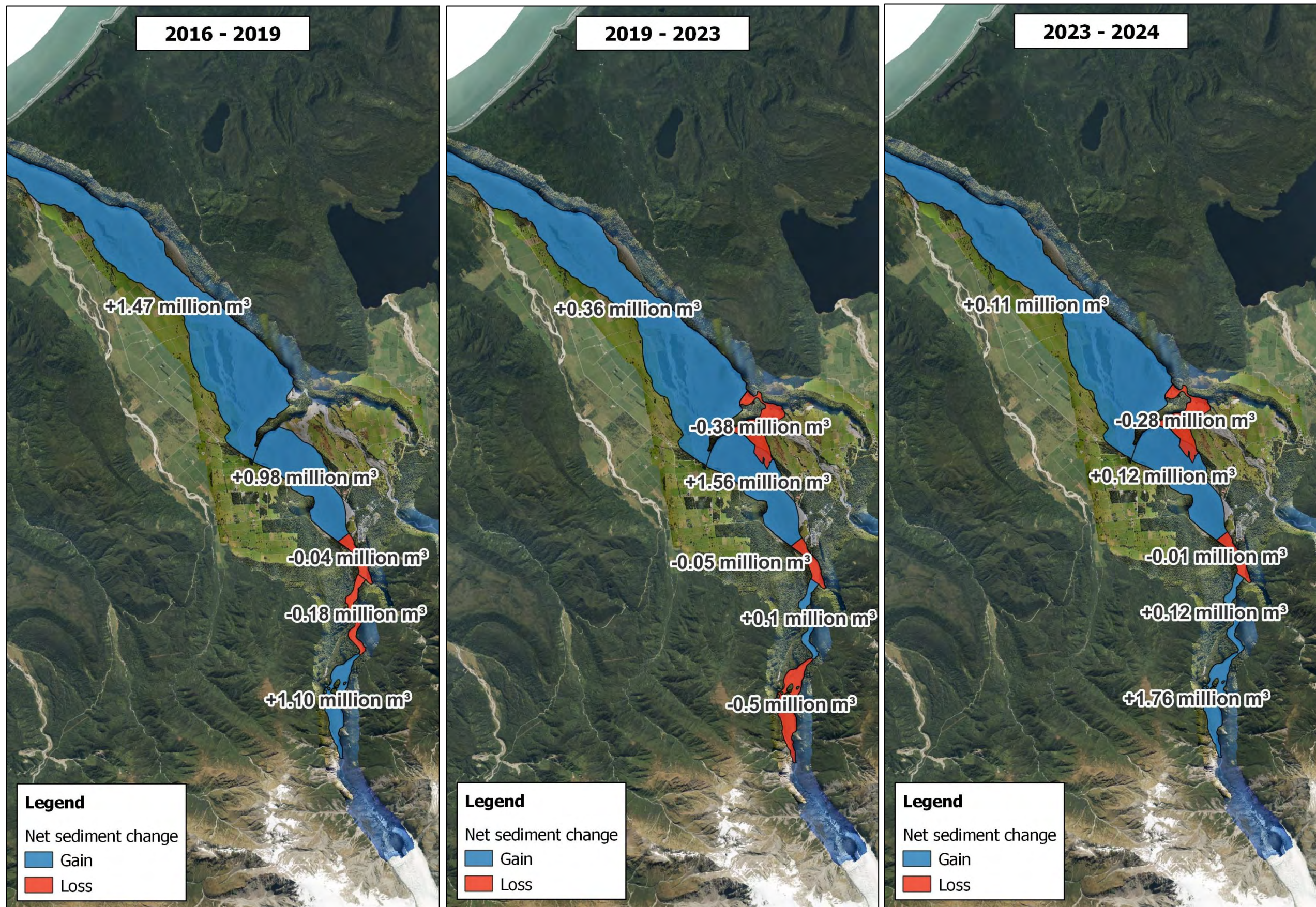


Figure 4-6 – GCD results summarised by reach for each of the three periods of analysis.

4.3.1. UPPER VALLEY

The 3.3 km long upper Waiho valley has undergone significant change between all four LiDAR surveys, capturing pronounced periods of aggradation and incision, which are indicative (perhaps at the extreme end) of the fluctuating nature of sediment movement through this reach.

Plots of cross-sectional data between 2016 and 2024 at 500 m and 1500 m from the upper extent of the LiDAR surveys – locations shown in Figure 4-7 – are provided in Figure 4-8 and Figure 4-9, respectively.



Figure 4-7 – Locations of cross-sectional profiles

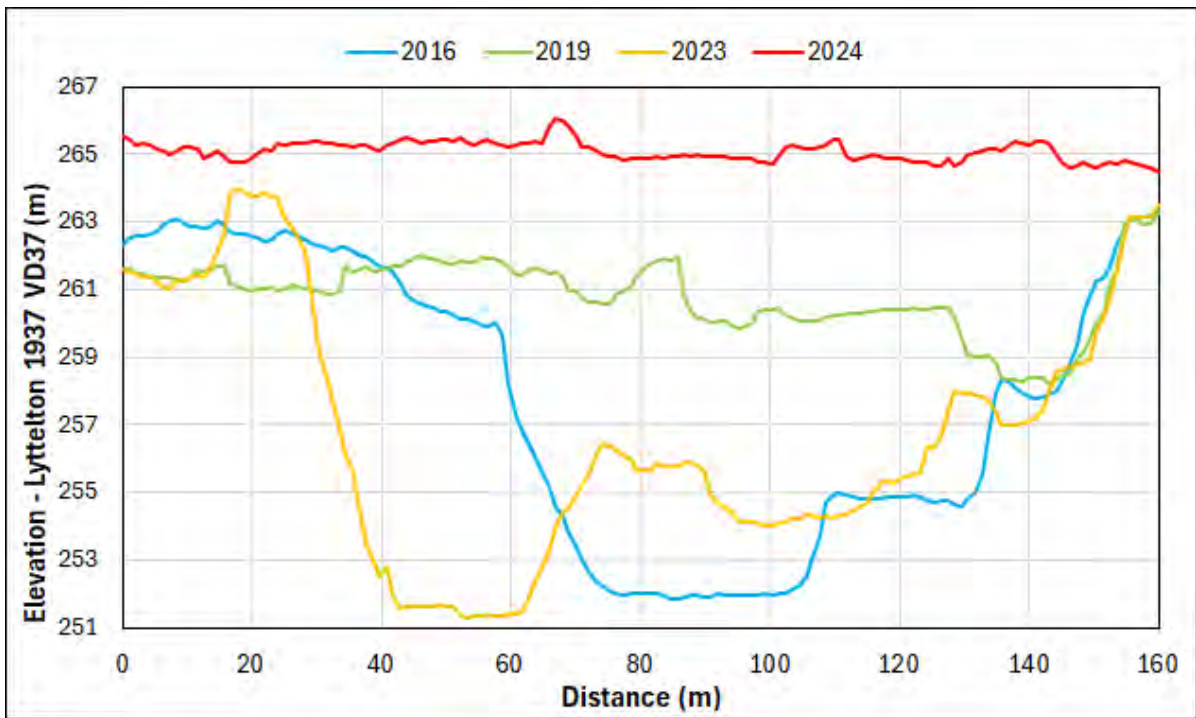


Figure 4-8 – Cross section 500m downstream from the upper extent of the LiDAR surveys.

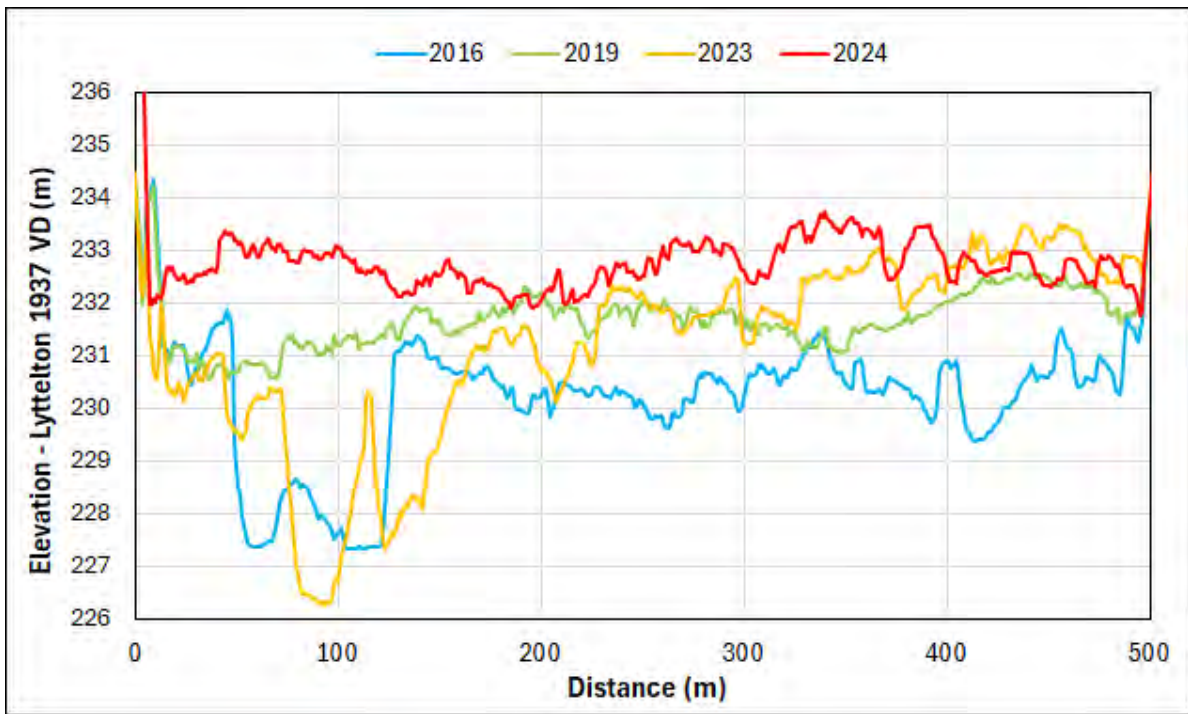


Figure 4-9 – Cross section 1,500m downstream from the upper extent of the LiDAR surveys.

These cross-sectional plots show these distinct changes in volume as the river alternates between deep incision (2016 and 2023) and massive aggradation between (2019 and 2024). Short term fluctuations are a result of the episodic nature sediment supply, with sudden aggradation likely due to weather events, and then incision as the river cuts back down between events.

Incision

- The 2016 and 2023 LiDAR surveys have captured degradational phases in this valley, where the main river channel has incised deeply into the valley floor. The 2016 and 2023 DEMs show the channel to be up to ~10 m deep in places in the upper part of the valley. With the 2019-23 GCD analysis showing a net volume loss of 0.5 million m³ of sediment.

Aggradation

- In March 2019 and January 2024, multiday weather events triggered significant supplies of sediment into the upper Waiho valley. The 2016-19 and 2023-24 GCD results show that the valley floor aggraded by approximately 1.10 million and 1.76 million m³, respectively, following these events. This amounts to an average vertical increase in bed level of approximately 1.38 m and 2.61 m across the entire valley floor, respectively.
- Live streamed photos from a fixed camera operated for the Franz Josef Glacier Guides and Department of Conservation (DoC) provide valuable insight into how the bed level can change drastically as a result of weather events. Imagery of the upper valley before and after the prolonged 6-day double event in January 2024 show the sudden increase in bed level Figure 4-10 and Figure 4-11 as captured by the 2023-24 GCD analysis. Of note, hydrological analysis (Section 6.2) indicates that this event was considerably smaller than that of the 2019 March event which produced a similar sized sediment pulse.

Franz Josef Glacier 2024-01-15 11:12:28

Pre-Jan2024 weather event



Franz Josef Glacier 2024-02-09 13:49:39

Post-Jan2024 weather event



Figure 4-10 – Fixed camera 6 images from before and after the January 2024 event. The orange lines have been added for reference.



Figure 4-11 - Fixed camera 7 images from before and after the January 2024 event. The orange lines have been added for reference, and the 500 m XS discussed above has been marked by the red dashed line.



Figure 4-12 – Fixed camera 8 images from before and after the January 2024 event with the 1500 m XS discussed above marked by the red dashed line.

Despite these periods of degradation shown by the 2016 and 2023 LiDAR surveys, cross sections surveyed since 1983 show that the general long-term trend is one of aggradation – see plots of XS1 to XS4 in Appendix A.

The infrequency of LiDAR and cross-section surveys makes it difficult to determine the rate at which sediment exits the upper valley and impacts downstream fan aggradation and requires additional data collection. Ongoing monitoring of the fixed camera imagery will assist understanding of sediment pulse frequency, incision rates, and the potential relationship between pulse magnitude and fan aggradation (noting that this excludes sediment supply from the Gallery).

4.3.2. TRANSPORT REACH

The 2.7 km stretch of river between the downstream end of the upper Waiho valley and the confluence with the Callery is the narrowest reach along the main Waiho stem.

Mean bed levels from cross sections 7 to 9 show a general increasing trend within this reach (on average 0.1 to 0.2 m per year), with slightly larger increases in the 90s and since 2016 (see appendix A) which corresponds with the upper valley cross section MBL changes. The 2019-23 and 2023-24 GCD results also support this increasing trend, with the reach undergoing a net volume change of 0.10 million m³ between 2019 and 2023, and 0.12 million m³ between 2023 and 2024, and average vertical bed level changes of 0.13 and 0.93 m per year, respectively.

Whilst the bed is slowly aggrading through this reach, it is also being actively widened, with each GCD analysis showing progressive erosion of banks which is providing additional sediment supply to that coming from the valley above. The most notable bank failure occurred across a 250 m stretch along the Glacier Access Road between 2016 and 2019, as commented by Gardner and Brasington (2019).

4.3.3. CALLERY CONFLUENCE TO CROSS SECTION 15

Like the upstream “transport” reach, this section of river between the Callery confluence and cross section 15 (adjacent to the heliport) is one of the narrower parts of the main Waiho River. Bed levels through this reach undergo short term fluctuations within a long term aggradational trend, as shown by the mean bed level plot of the SH6 bridge cross section which is surveyed by Waka Kotahi - NZTA at 6-monthly intervals (Figure 4-13).

These short-term fluctuations are perhaps an indication of the episodic nature of sediment delivery from the two upstream subcatchments - the 77 km² Waiho and the 92 km² Callery. A fixed camera similar to what is located in the Upper Waiho valley could be installed looking upstream towards the riverbed beneath the Callery bridge so as to provide an indication of the frequency of sediment pulses from the Callery, and if there is a relationship between these and the short-term fluctuations in bed level in this reach.

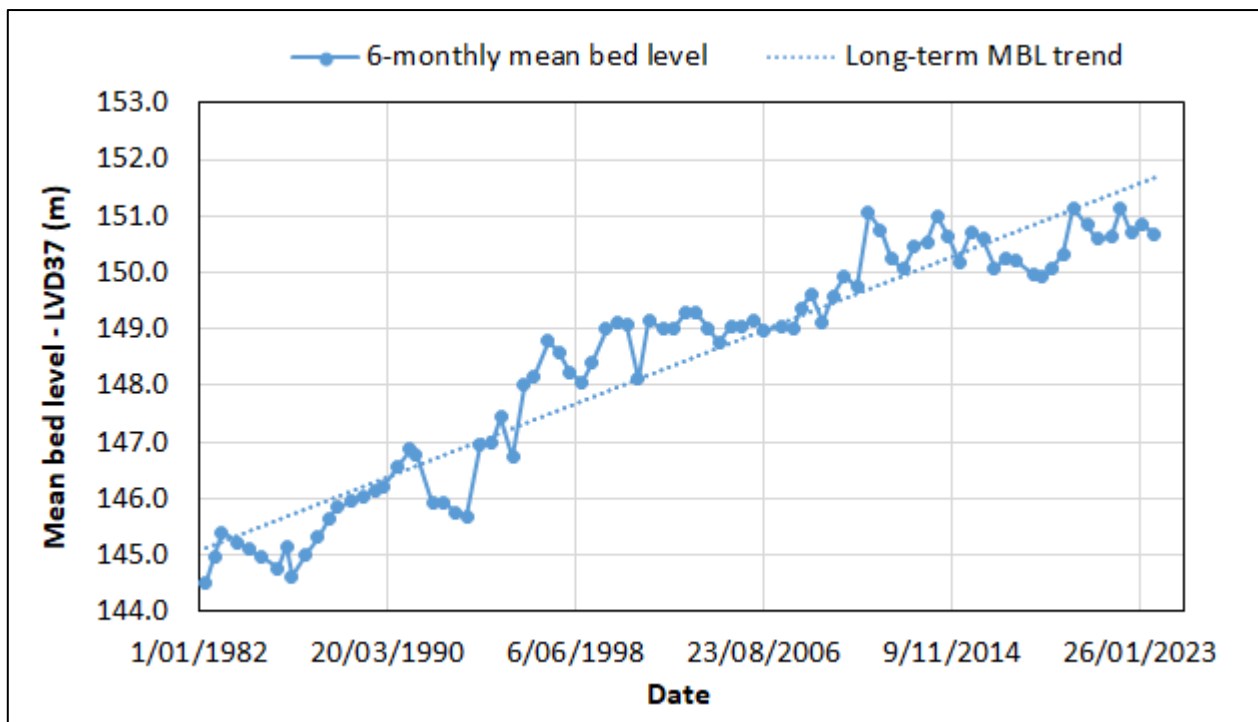


Figure 4-13 – Mean bed levels (MBL) survey at 6-monthly intervals at the SH6 Bridge cross section. Data provided by WSP – Waka Kotahi.

Despite the long-term aggradation trend at the SH6 bridge, all three GCD analyses and MBL plots from cross sections 11 to 13 (Appendix A), have captured degradational phases in this reach, with each analysis showing a net loss of sediment, albeit at a very small scale relative to the rest of the Waiho (0.01 to 0.05 million m³; Table 4-8).

It is important to reinforce here that whilst a short term trend of degradation has been captured in recent surveys at this locations, it is very evident from inspection of the long term mean bed level recordings at the State Highway 6 bridge as well as the cross-section surveys which go back to 1993 in this reach indicate that this is not uncommon behaviour for this reach, where the bed levels appear to stay relatively stable for a decade or so at a time and then rapidly increase over several years. The long-term trend for this reach is very clearly aggradational.

However, inspection of each DEM of difference reveals that this net loss of sediment is largely attributed to erosion of the true right bank just downstream of the confluence (all three GCDs), as well as an incised channel extending downstream from the Callery (2019-23), and incised channels downstream of the SH6 bridge (2016-19) which are indicative of the intense scour which took out the bridge in the March 2019 event, and have since filled in. A comparison of the 2016, 2019, 2023, and 2024 LiDAR elevation data at a cross section 400 m downstream of the SH6 bridge shows that even with this net degradation, the Waiho River remains elevated several metres higher than the land to either of side it (Figure 4-14).

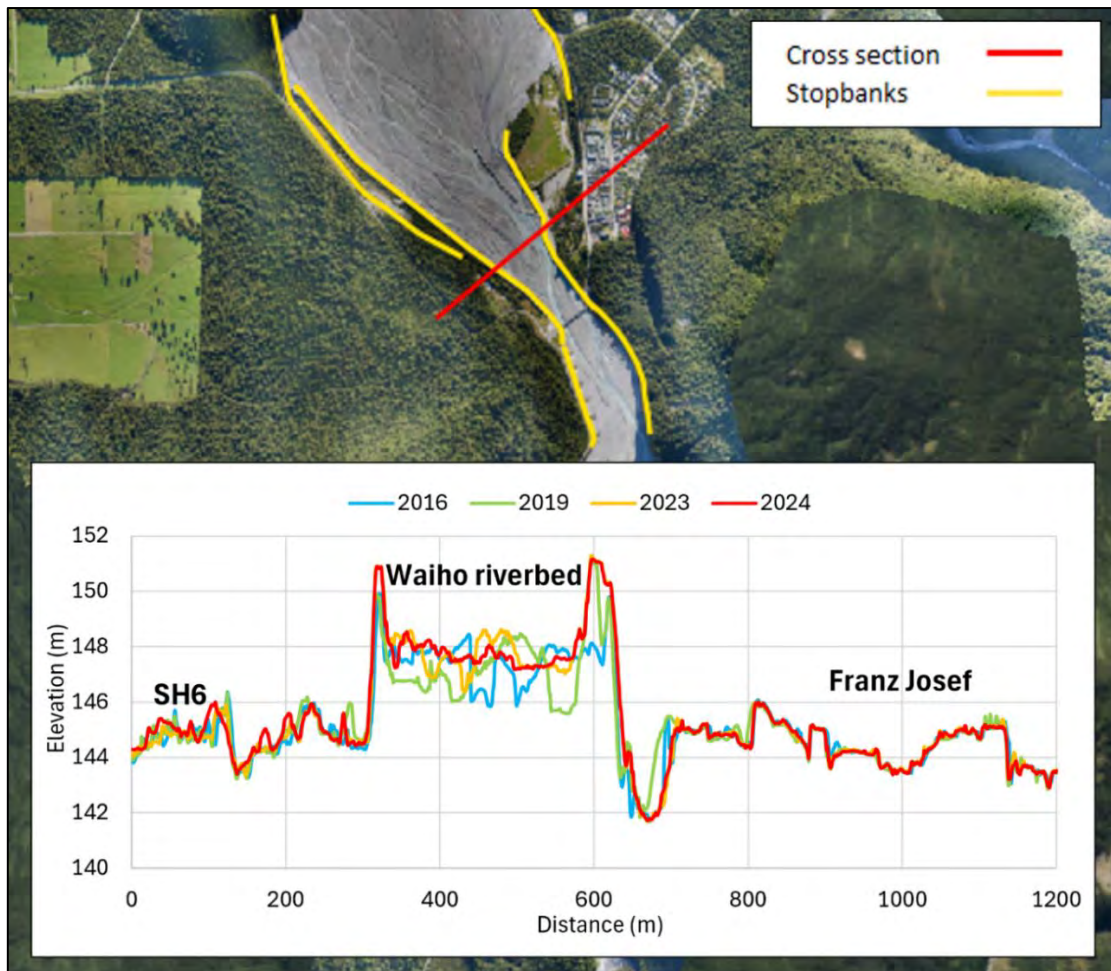


Figure 4-14 – Comparison of 2016, 2019, 2023 and 2024 elevation data at a cross section of the Waiho river bed 400m downstream of the SH6 bridge.

4.3.4. WAIHO FAN (HELIPAD BANK TO WAIHO LOOP)

The Waiho fan between cross section 15 and the Waiho Loop has been aggrading since the 1990's, as shown by the cumulative mean bed level plots (XS15 to 21, excluding XS20 – discussed below) in Appendix A. The GCD analyses support this trend, with mean bed levels and net volume change through this reach increasing in each analysis (Table 4-9).

This ongoing aggradation has led to the Waiho fan surface reaching a similar elevation to that of the Tatare fan surface, which has allowed the Waiho to spill over into the Tatare above the Waiho Loop. As the Waiho has begun to carve out a channel into the Tatare, it has incised down into its own bed, which has actually drawn the MBL at XS20 down in both 2023 and 2024 to below the MBL peak in 2019.

4.3.5. AVULSION CHANNEL AND TATARE STREAM

The avulsion reach starts at the upper extent of incision on the Waiho fan surface and ends at the toe of the fan forming downstream of the Tatare cut in the Waiho Loop (Figure 3-4).

February 2023

In February 2023, a small to medium sized flood event resulted in the Waiho breaking out (avulsing) across the Tatare fan surface and establishing a channel into the Tatare Stream above the Waiho Loop. The 2019-23 GCD indicates that during this February event and over the next four months, up to the June 2023 LiDAR survey, 0.51 million m³ of sediment was eroded as the avulsion path developed between the two rivers (Table 4-11).

Table 4-11 – 2019-23 and 2023-24 volume erosion and deposition, and net change, in the avulsion sub-reach AOI.

	Volume Erosion (million m ³)	+/- Error (million m ³)	Volume Deposition (million m ³)	+/- Error (million m ³)	Net Volume Difference (million m ³)
2019-23	0.51	±0.07	0.13	±0.03	-0.38
2023-24	0.70	±0.09	0.42	±0.10	-0.28

During this time there was only 0.13 million m³ of deposition between the top of the avulsion channel and just downstream of the Tatare cut in the Loop. Presumably in that initial February weather event, a lot of the finer sediment that makes up the Tatare fan surface (compared to that of the Waiho fan) was flushed through the Loop by the high discharge of a combined Waiho-Tatare and onto the longitudinal valley train to the sea. Then, because the main channel of the Waiho wasn't flowing down the avulsion during the months leading up to the June 2023 LiDAR survey there wasn't as much deposition compared to what is shown in the 2023-24 GCD analysis after the avulsion channel had experienced 95 % of the Waiho's flow and further deepening and widening (Table 4-5 and Figure 4-9).

January 2024

In January 2024, the avulsion underwent rapid development during a similar sized weather event to February 2023.

- The avulsion channel deepened and widened, and the incision point in the Waiho fan surface extended upstream towards the Treatment Ponds by approximately 500 m (Figure 4-15) as around 0.7 million m³ of sediment was eroded by an estimated 95% of the Waiho River flow.
- A fan began to form at the downstream end of the channel where it joins the Tatare (and just above the cut through the Loop) and another just downstream of the cut in the Loop. Due to the deep water flowing through these two areas and the cut itself, there is greater uncertainty in the 0.42 million m³ estimate of sediment deposition.

This greater volume of erosion down the avulsion channel to that of downstream deposition is indicative of the high stream power through the avulsion reach (steep gradient and large Waiho discharge) and therefore it's capacity to erode the finer sediment in the Tatare fan surface.

Additionally, between the 2023 and 2024 surveys, the point of incision at the top of the avulsion channel has migrated rapidly (~500 m) upstream towards the Treatment Ponds. This incision point acts like a knickpoint in the Waiho's longitudinal profile as it marks a distinct discontinuity in the bed elevation and slope, as the avulsion channel is at a much steeper grade to the main Waiho fan surface. Therefore, this upstream progression will continue (in addition to the downstream deposition in the Tatare) as the Waiho adjusts its form to create a smooth longitudinal profile through this reach (and down to the fan forming downstream of the Tatare cut in the Waiho Loop).

At the moment the rate that the incision is progressing upstream is occurring faster than the deposition in the Tatare as shown by the ratio of erosion to deposition in both the 2019-23 and 2023-24 analyses (Table 4-11). This is also evident in the long section plot through the avulsion comparing the 2019, 2023 and 2024 bed elevations. Figure 4-16 shows how the river in the 2024 DEM has incised down past the 2019 and 2023 bed surfaces between 400 and 2000 m along the long profile, and then only between 2140 and 2500 m has it begun to aggrade higher than the previous year's surfaces. Based on the current rate at which the incision point is migrating upstream, it could reach the treatment ponds within a year, however, it is unlikely to stop there. Depending on how fast the downstream end of the avulsion aggrades (a product of both the Waiho and Tatare borne sediment) progression could continue upstream with consequence for the Link bank, heliport, SH6 Bridge, and potentially the Franz Josef township.



Figure 4-15 – Comparison of the 2019-23 and 2023-24 GCD DEMs of difference in the avulsion sub-reach, with yellow arrows used to indicate the lateral erosion, and upstream migration of the incision.

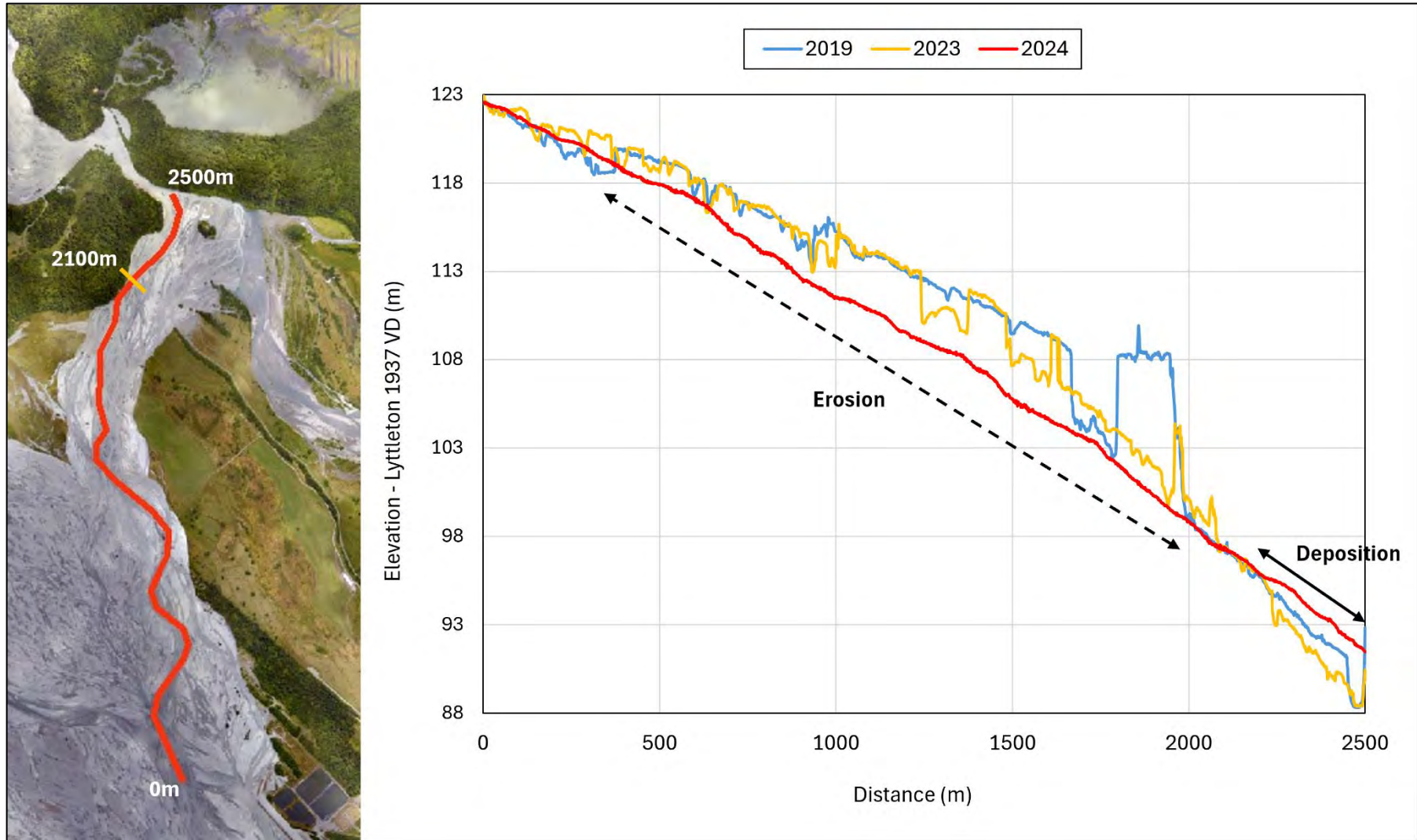


Figure 4-16 – Long section profile along the 2024 main channel down the avulsion, compared with the 2019 and 2023 elevation data. The orange line at 2100 m (on the image) marks the transition from erosion to deposition.

4.3.6. VALLEY TRAIN TO SEA

In the 2016-19 GCD analysis, this 13 km reach of river was net aggradational, with a net increase in sediment storage of 1.47 million m³. Both the 2019-23 and 2023-24 analyses have followed this trend, recording net increases in sediment storage of 0.36 million and 0.12 million m³, respectively; whilst exhibiting active reworking of the braidplain as shown by the abundance of change down this reach in the DEMs of difference figures.

Of note is the fact that the bulk of the material has been deposited in this reach between 2016 and 2019, potentially indicating that the 2019 event was a significantly larger event than other events in this period and had sufficient energy to transport sediment all the way down into this reach.

The increase in sediment volumes entering this reach is likely to result in increased pressure on adjacent farmland due to the river naturally wanting to increase in width in order to accommodate the increased sediment volumes within the river. This is already evident on site with the river already trying to increase in width and create new braids channels as shown in Figure 4-17.



Figure 4-17 – Photo of new braid channels forming downstream of the Waiho Loop (8/2/2024)

The 2023-24 analysis exhibits higher uncertainty in bed level and volume changes compared to prior analyses (2016-19, 2019-23). This is attributed to urgently requested data collection following a recent weather event whereby water levels were still high during the 2024 LiDAR survey.

5. DISCUSSION

5.1. WAIHO FAN AGGRADATION AND SHAPE

The GCD analyses and cross-sectional mean bed level plots show that the Waiho fan is in a long term aggradational trend, with the bed level increasing on average by 0.16 m per year. This trend is likely to continue at the current rate, if not faster, as sediment supply to the fan is likely to increase as a result of a warming climate and the transition into the positive phase of the sub Oscillation (IPO) increasing the intensity and frequency of flood events on the West Coast.

- Under all representative climate change pathways (RCPs; climate change projections) except 2.6, winter rainfall and flood flows increase in Westland prior to 2100 (Collins, 2021). Further, as the climate warms, there will be less snowfall and more rainfall than hitherto, meaning that storm runoff levels will increase (Beagley et al., 2023). Additionally, the increase in temperatures at high levels will lead to a reduction in rock faces reinforced by permafrost. This in turn will lead to an increase in the frequency of rockfalls and landslides, which causes increase in sediment supply to rivers.
- The IPO is believed to have switched to a positive phase around 2020, with fluctuations between positive, negative, and neutral phases since 2016 (Beagley et al., 2023). In a positive phase, New Zealand receives stronger west to southwest winds, which means that West Coast is wetter than average, experiencing more extreme rainfall and therefore more frequent and intense flooding than average (Griffiths et al., 2009; McKerchar & Henderson, 2003; Thompson, 2006; Wratt et al., 2022). The long-term record shows oscillations over decadal timescales (Figure 5-1).

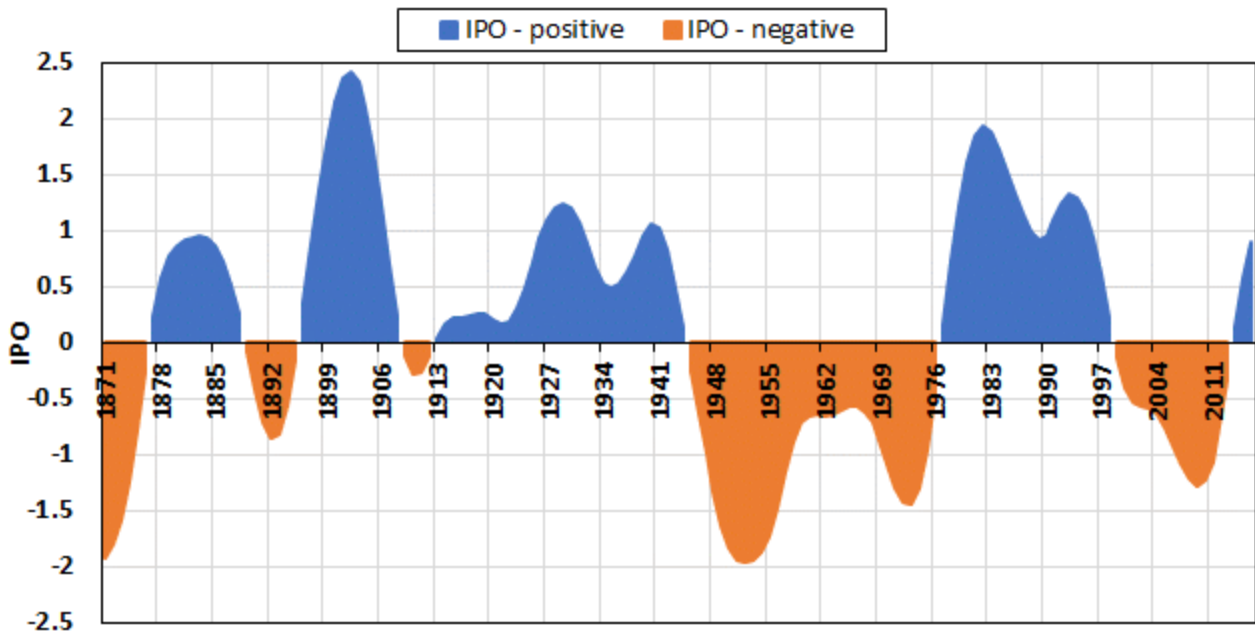


Figure 5-1 - Positive and negative phases of the IPO between 1871 and 2016.

As rainfall event intensity and frequency increase, so too will the mobilisation of sediment as well as the frequency of mass movement events such as shallow landslides (Jakob & Owens, 2021). This will result in an increase in both the volume of sediment entering river systems, and the frequency of these supply events.

As the fan surface continues to aggrade, the capacity of the stopbanks which confine the Waiho River through this reach will reduce and therefore will require ongoing upgrades if the level of service is to be maintained. Additionally increased channel activity across the fan surface as the river moves sediment across it, may lead to increased pressure on the stopbanks and therefore increase their likelihood of failure.

The aggradation has also been slowly changing the overall shape of the Waiho fan within the confines of the stopbanks. By overlaying aerial imagery from 2016, 2019, 2023 and 2024 with the 1 m and 5 m contours from the LiDAR surveys we have been able to identify the changing shape of the fan and the effect this is having on the main channel alignment and therefore the impact on the stopbanks and avulsion channel.

In each consecutive survey, as the fan aggrades (as shown in the GCD and MBL analyses) the true right side of the contours on the active riverbed begin to shift downstream.

- In 2016 and 2019, the general shape of these contours encourage the main channel to flow to the true left and down through the gap between Rata Knoll and the southern end of the Waiho Loop (Figure 5-2). This is largely due to the pronounced curvature of the contours in the lower part of the fan which funnels the flow to the left.
- In 2023, the contours on the true right downstream of Canavan's Knob have extended past those on the left, and created fall to the true right towards the Tatare fan (Figure 5-3). The curvature of the contours (across the entire lower fan) that serve to funnel flow to the left in 2016 and 2019, is no longer obvious. However, the main fall is still to the left, as highlighted by the main channel alignments extracted from the Sentinel Imagery (Figure 5-3).
- Additionally, throughout 2023, there was a temporary bund in front of the heliport stopbank and at times extending downstream of it, which encouraged the main channel to extend down the true left side of the river bed where it then deflected off (and on occasion wrapped around) Canavan's Knob before continuing down towards the Rata Knoll/Waiho Loop gap.
- In 2024, perhaps in response to the rapidly developing avulsion (as well as the fan surface aggradation), there has been a fundamental shift in the shape of the fan (Figure 5-3). From Canavan's Knob down, a majority of the flow is now directed towards the true right and into the avulsion channel.
- However, this will not prevent the main channel from flowing to the true left. The braided nature of the Waiho means it's constantly shifting sediment around and adjusting its channel alignment. In February 2024, the main channel switched back to the true left, wrapping around Canavan's Knob and then flowing down the true left and through the Rata Knoll and Waiho Loop gap, whilst still providing some flow down the avulsion channel.

The impact of this 2024 change in fan shape across the active riverbed is that in future it is more likely than in the past to encourage the main flow to the true right, which will further develop the avulsion and also facilitate the aggradation occurring along the true right active river bed between the downstream end of the Heliport stopbank and Canavan's Knob. This places increased pressure on the Heliport, Link and Havill's stopbanks. It may also place more pressure along the Rubbish Dump stopbank, as flow down the true left may tend to wrap around Canavan's Knob and run along this stopbank.



Figure 5-2 - July 2016 and April 2019 fan shapes shown by 1 and 5m contour lines.

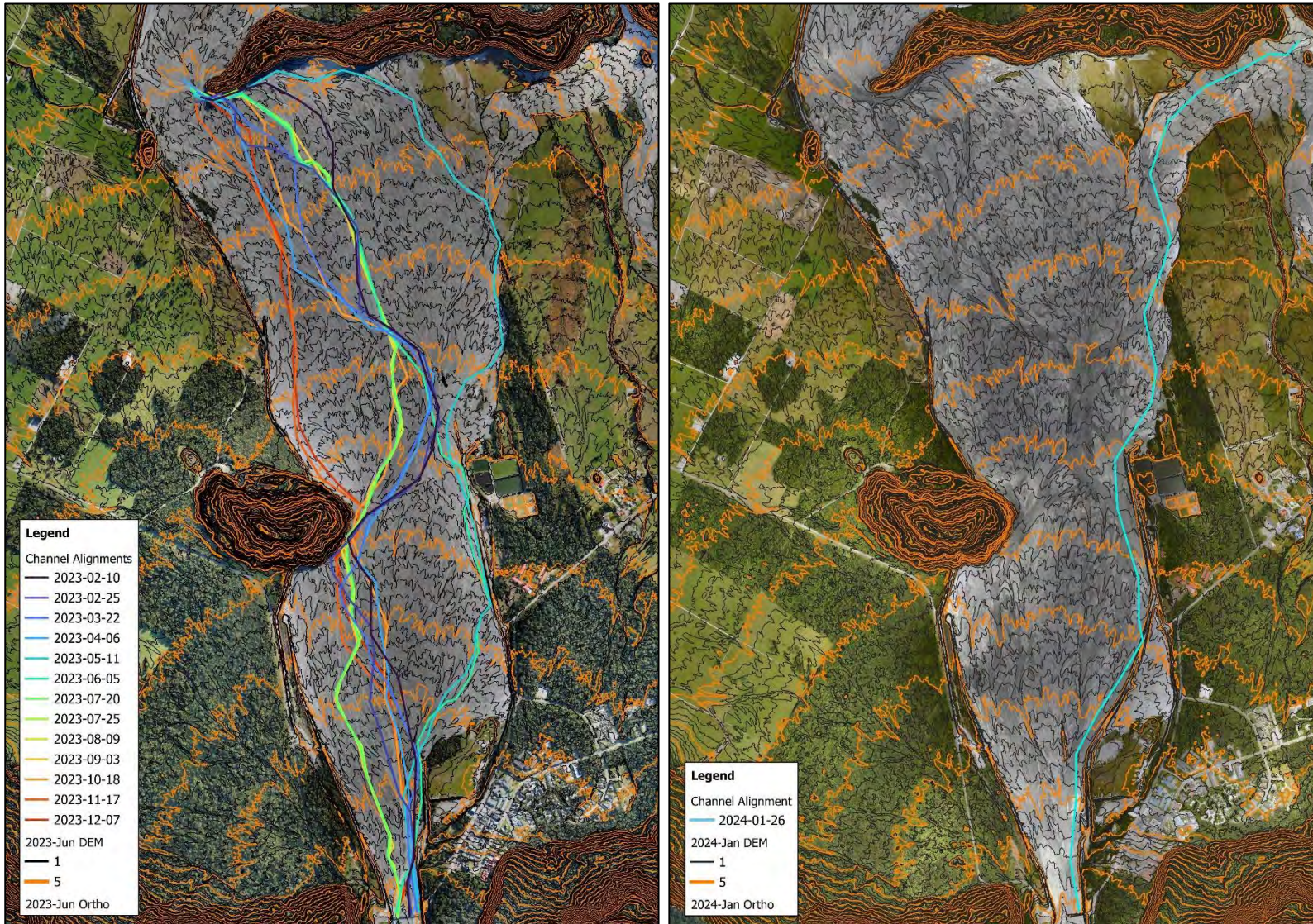


Figure 5-3 - June 2023 and January 2024 fan shapes shown by 1 and 5 m contour lines, with channel alignments taken from Sentinel satellite imagery.

5.2. AVULSION DEVELOPMENT

In early February 2023, a prolonged eight-day period of rainfall which included two different weather systems (Appendix C) resulted in the Waiho River partially avulsing into the Tatare Stream above the Waiho Loop. Around 0.51 million m³ of farmland was eroded as the river carved out a channel down into the Tatare.

Over the next ten months, both monitoring sites recorded higher than the average monthly rainfall totals for March, April, May, September, and October (Appendix C) indicating that river levels were likely higher than normal throughout these months, which would have contributed to the portion of the Waiho which continued to flow down the avulsion channel during this time.

In January 2024, another prolonged period of rainfall (six days) also involving two weather system (Appendix C) resulted in 95% of the Waiho River flowing into the Tatare above the Loop, deepening and widening the avulsion channel.

Statistically neither of these events were particularly large in comparison to some of the significant events the area has experienced, as recorded by the Waiho Rv @ Douglas Hut rainfall monitoring site (Table 5-1). Some examples of larger (prolonged) events with significantly higher ARIs (Table 5-2) than the Jan and Feb avulsion events, for 1 to 6-day maximum rainfall totals include:

- December 1984: airstrip and hotel flooded on the true right.
- December 1995: SH6 bridge damaged.
- January 2013: Wanganui Rv SH6 bridge damaged.
- March 2019: SH6 bridge and Milton's stopbank destroyed.
- February 2022: no reported damage or at least known to these authors.

Table 5-1 – Maximum rainfall total ARIs for a range of durations recorded by the Waiho Rv at Douglas Hut site (1983 – 2024; Gumbel; calendar year).

Event	1hr	2hr	3hr	6hr	12hr	1 day	2 day	3 day	6 day
Feb-23	1.0	1.1	1.1	1.4	1.2	1.2	1.5	1.5	2.4
Jan-24	1.0	1.0	1.0	1.0	1.1	1.5	1.8	1.4	2.3

Table 5-2 – Maximum rainfall total ARIs for 1, 2, 3, and 6-day durations during some of the significant weather events on record at the Waiho Rv at Douglas Hut site (1983 – 2024; Gumbel; calendar year)

Event	1 day	2 day	3 day	6 day
Dec-1984	3.5	3.8	10.7	25.0
Dec-1995	12.6	65.1	35.2	21.6
Jan-2013	14.0	9.7	6.2	7.6
Mar-2019	8.2	18.1	9.4	4.5
Feb-2022	32.3	22.9	33.3	15.9

The ARIs recorded by the Douglas Hut site for the February 2023 and January 2024 are all between 1.0 and 2.4 years. These are not significant.

This indicates that the current elevation and shape of the fan is such that it didn't require a large/significant weather event (and therefore large flow) to trigger the start of the avulsion in February 2023 nor to rapidly accelerate it in January 2024. This is problematic for a number of reasons:

- Low recurrence interval events such as those in Feb 2023 and Jan 2024 are likely to occur once a year, or at least every two years.
- A warming climate and a transition into the positive phase of the IPO are likely to increase the frequency and intensity of flood events.

Therefore, weather event occurrence (and intensity) will continue at, if not increase from, the current frequency, which means that the avulsion is likely to continue to develop at its current pace if not faster when there is flow down it.

The implication of this development is that it is highly likely that within a year, the incision at the top of the avulsion channel will have migrated upstream to the Treatment Ponds, undermining them. The incision is also likely to continue to migrate upstream beyond the ponds, with consequences for the SH6 and bridge, Heliport, and potentially the Franz Josef township.

Additionally, increased flood event frequency and intensity is likely to lead to increased sediment supply, which will accelerate the deposition occurring in the Tatare at the downstream end of the avulsion, and the backfilling up towards the Tatare SH6 bridge. Davies (2024) has calculated how long it may take for this backfilling to occur.

- The Tatare valley between the range front and Waiho Loop has a surface area of around 1 million m² with an average depth of about 5 m, giving a volume of around 5 million m³.
- Based on its catchment area and the average annual uplift, annual sediment supply from the Tatare catchment is around 0.28 million m³ per year.

At this supply rate, Davies (2024) has estimated that the Tatare valley could be infilled in about two decades. However, the Tatare SH6 bridge is likely to be threatened by the rising river bed sooner than this, perhaps within a decade.

Morphological modelling would provide greater certainty on how the avulsion will develop including the upstream progression of the incision point, and infilling of the Tatare valley.

6. CONCLUSIONS

Four LiDAR surveys have been conducted of the Waiho River in 2016, 2019, 2023 and 2024, allowing for a detailed comparison of each dataset to be undertaken. Analysing these surveys in conjunction with the historic cross section survey data adds valuable perspective to the ever changing riverscape.

The following conclusions can be drawn from the analysis discussed in this report:

BROAD SCALE ANALYSIS

- Analysis shows that whilst the rates of deposition fluctuate from year to year and are likely event based, the trend is strongly depositional, with 7.16 million m³ accumulating within the Waiho River system between June 2016 and January 2024 averaging at a rate of 0.95 million m³ per year.
- Rates of aggradation between June 2023 and January 2024 are approximately double the long-term average rates with 2.18 m³ depositing over this 7.5 month time period equating to a rate of 3.49 million m³ per year (the majority of this buildup is in the Upper Valley however). It is important to note that the short time period between surveys may result in an exaggeration of the annual rate of increase as deposition is likely strongly linked to specific weather events noting that in the 2019 to 2023 periods, the rates of deposition were only 0.37 million m³ per year.
- Analysis of the Tatare Stream shows fluctuation between periods of erosion and deposition, although over the 2016 to 2024 period it is showing as more or less to be in equilibrium. However, this has been influenced in the past year by an influx in sediment from the Waiho River via the avulsion. This build-up of sediment at the Tatare Cut has the potential to disrupt sediment transport through the Tatare Cut, potentially causing the sediment to back up and hence cause the bed levels in the stream to aggrade over time.

REACH BASED ANALYSIS

Upper Valley

- There is a strong overall aggradational trend in the Upper Valley over the 2016 to 2024 period, however this has fluctuated between aggradational and degradational phases.
- In total, 2.37 million m³ has deposited in this reach since 2016, however 1.76 million m³ of this has been deposited in the period from June 2023 to Jan 2024.
- Following significant deposition between 2019 and 2023, there was a period of degradation with 0.5 million m³ being lost from the reach.
- Short term fluctuations are a result of the episodic nature of sediment supply, with sudden aggradation likely due to weather events, and then incision as the river cuts back down between events.
- Fixed camera imagery indicates that the January 2024 event was the principal driver of this 2024 sediment supply, and it is likely that the March 2019 event (statistically bigger) was also a principal driver of the 2019 supply.

Transport Reach

- Apart from a period of degradation from 2016 to 2019, this reach is showing as generally aggradational indicating supply is now exceeding its transport capacity.
- Whilst the bed is slowly aggrading through this reach, it is also being actively widened, with each GCD analysis showing progressive erosion of banks which is providing additional sediment supply to that coming from the valley above.
- Analysis of the cross-section surveys in this reach indicate that a similar bed level trend last occurred around the 1990's which also corresponds to a positive IPO cycle when sediment supply generally increases.

Callery Confluence to Helipad Bank

- This reach is showing as slightly degradational over the entire period from 2016 to 2024 as well as for each survey period.
- Inspection of the long term mean bed level recordings at the State Highway 6 bridge as well as the cross-section surveys which go back to 1993 in this reach indicate that this is not uncommon behaviour for this reach, where the bed levels appear to stay relatively stable for a decade or so at a time and then rapidly increase over several years. It is very clear from historic data that the long-term trend for this reach is aggradational.
- It is impossible to predict when bed levels will begin to increase again within this reach, however this will occur when the sediment supply from upstream exceeds the transport capacity.

Waiho Fan

- The Waiho Fan has aggraded over all survey periods with a total of 2.65 million m³ accumulating on the fan over the 2016 to 2024 period.
- Comparison of the rates of aggradation on the fan indicate that the rate of aggradation is reasonably constant between the 2016-19 and 2019-23 analyses, whilst in the 2023-24 analysis, the rate has slightly decreased. This decrease is likely a reflection of the shorter time period (7.5 months compared to 3 and 4 years) and is likely to increase over the coming years by the increased volumes of sediment in the upper Waiho valley transferring downstream onto the fan.
- This ongoing aggradation has led to the Waiho fan surface reaching a similar elevation to that of the Tatara fan surface, which has allowed the Waiho to spill over into the Tatara upstream of the Waiho Loop.

Valley Train

- 1.93 million m³ of material has deposited within this reach between the 2016 and 2024 surveys, with the majority of this material being deposited between 2016 and 2019, likely following the 2019 flood event.
- Increasing bed levels within this reach are likely to continue to put pressure on the adjacent farmland with the river wanting to naturally widen as volumes of sediment increase within the reach.

AVULSION

- The avulsion of the Waiho River into the Tatare River is a major event resulting in significant and rapid geomorphic change in the river systems.
- Two events in February 2023 and then in January 2024 have resulted in erosion in the order of 1.2 million m³ with large volumes of deposition also remaining in the Tatare system (0.55 million m³).
- Neither of these two events were statistically significant. The occurrence and rapid development of the avulsion is the result of the current fan setting and bed levels in the river.
- Analysis shows that the January 2024 event has resulted in significantly more erosion than the February 2023 event despite being of a similar size, indicating that the upstream migration of the avulsion channel is accelerating and is likely to continue to accelerate in future events due to the increased stream power from the steeper slope.
- The treatment ponds are now at imminent at risk of being undermined by the incision extending upstream from where the Waiho has cut (avulsed) into the Tatare fan and carved out a channel down into the Tatare Stream.
- In the 7.5 months between LiDAR surveys, this knickpoint (start of the incision) has migrated approximately 500 m towards the ponds, with only a further 500 m separation remaining to the ponds.
- At current rates of progression, we can expect the treatment ponds to be threatened within one year, however this is likely dependant on the magnitude and frequency of flood events.
- It is likely that the knickpoint will continue to migrate upstream past the treatment ponds which may impact the Heliport, SH6 and bridge, and potentially the Franz Josef township.
- The Waiho has now established a definite channel into the Tatare Stream upstream of the Loop, which it has widened and deepened since June 2023. It has also started to deposit sediment immediately upstream, in, and downstream of the Tatare cut in the Waiho Loop.
- There is potential for both Tatare and Waiho borne sediment to infill the Tatare Stream towards the SH6 bridge. The rate of this infilling will depend on the frequency and intensity of weather events and therefore sediment supply.
- The fan forming immediately downstream of the Tatare cut in the Loop may serve to push water to the true left, potentially increasing erosion along the true left bank below the Waiho Loop.
- Morphological modelling would provide greater certainty on how the avulsion will develop including the upstream progression of the incision point, and infilling of the Tatare valley.

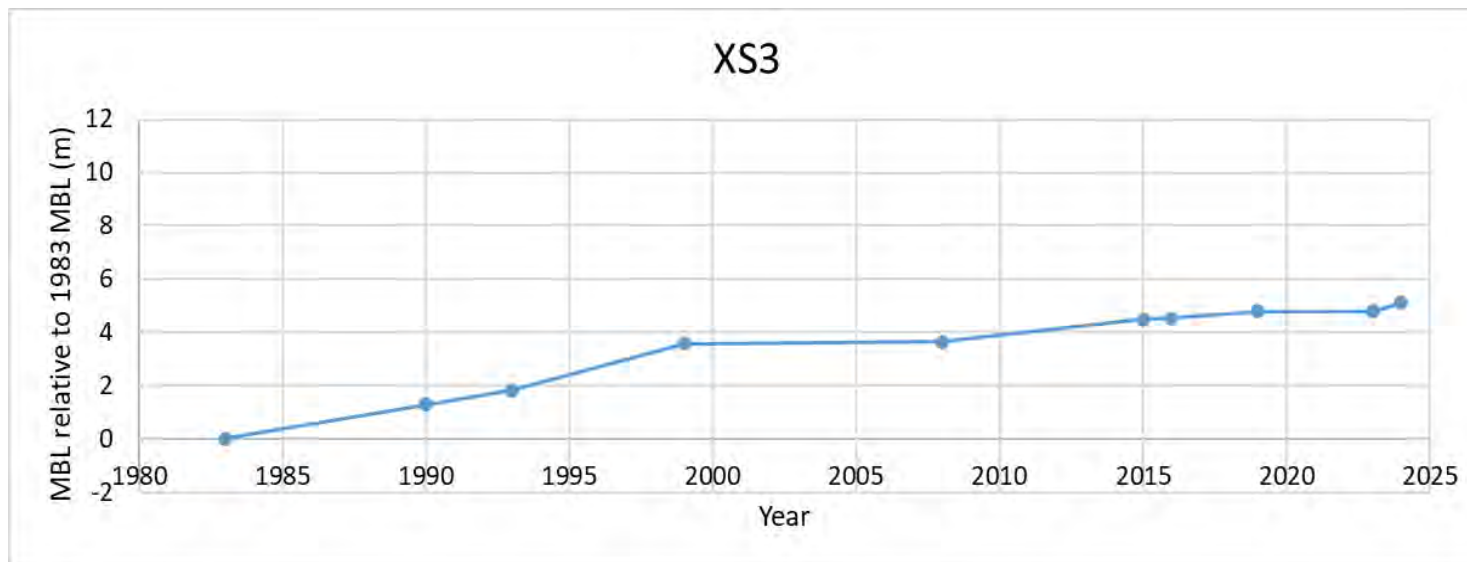
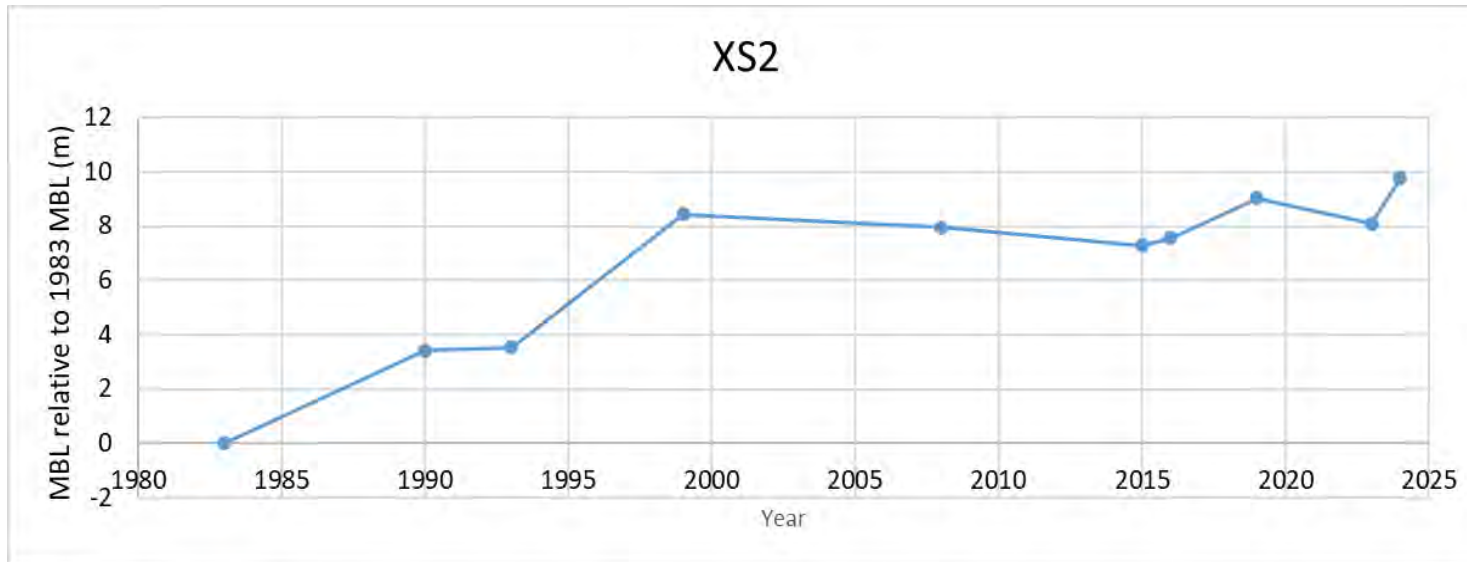
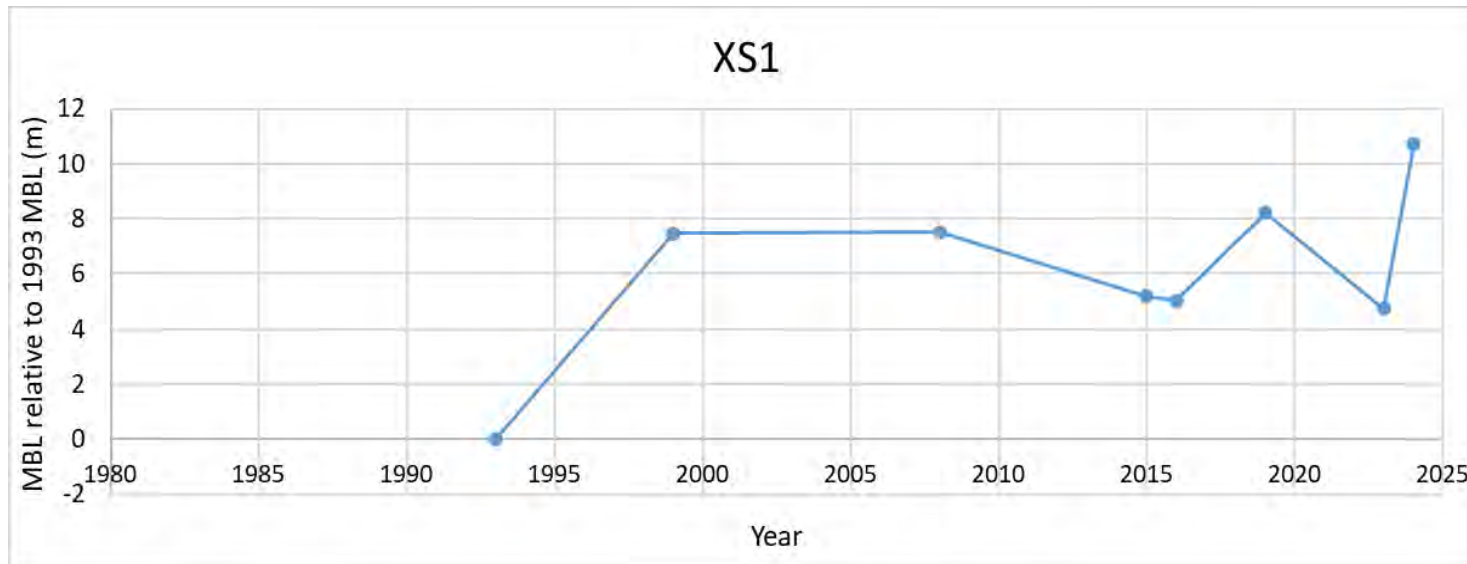
GENERAL

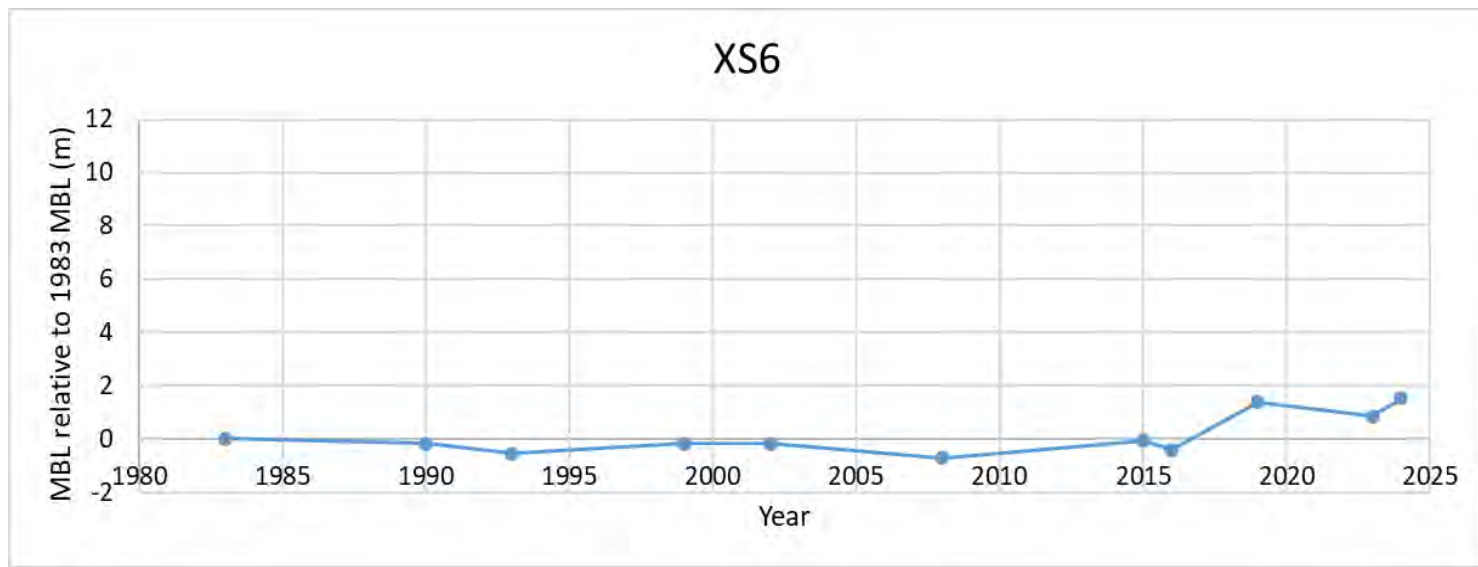
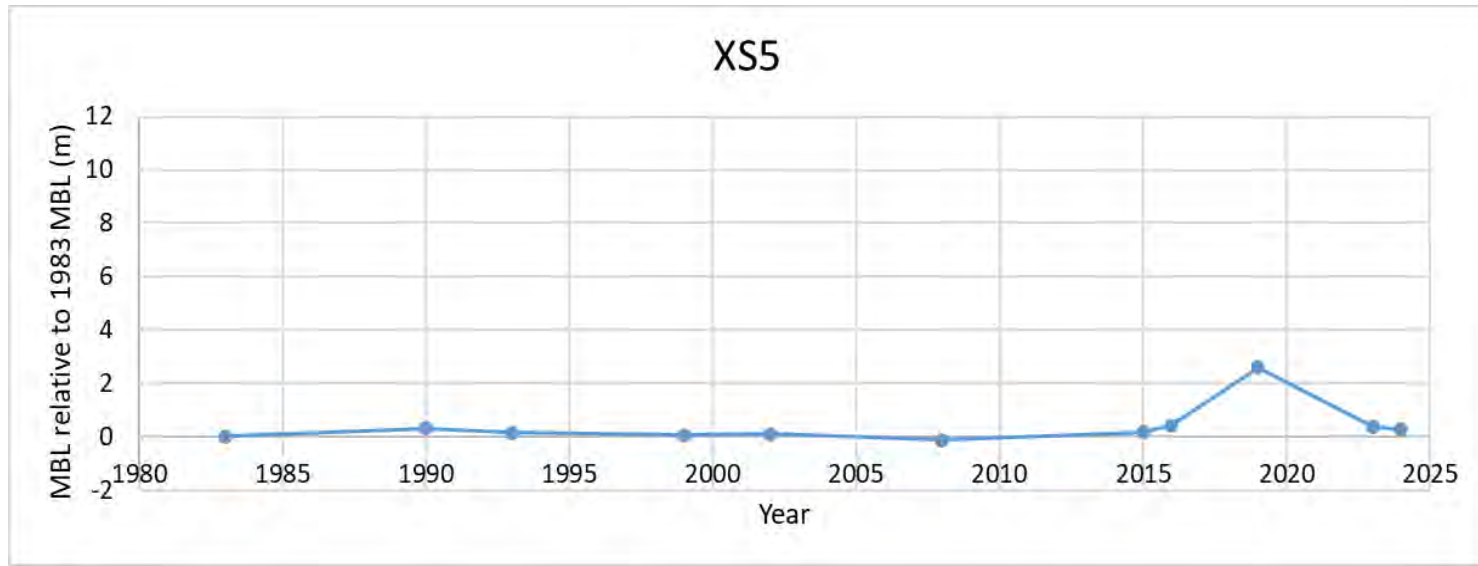
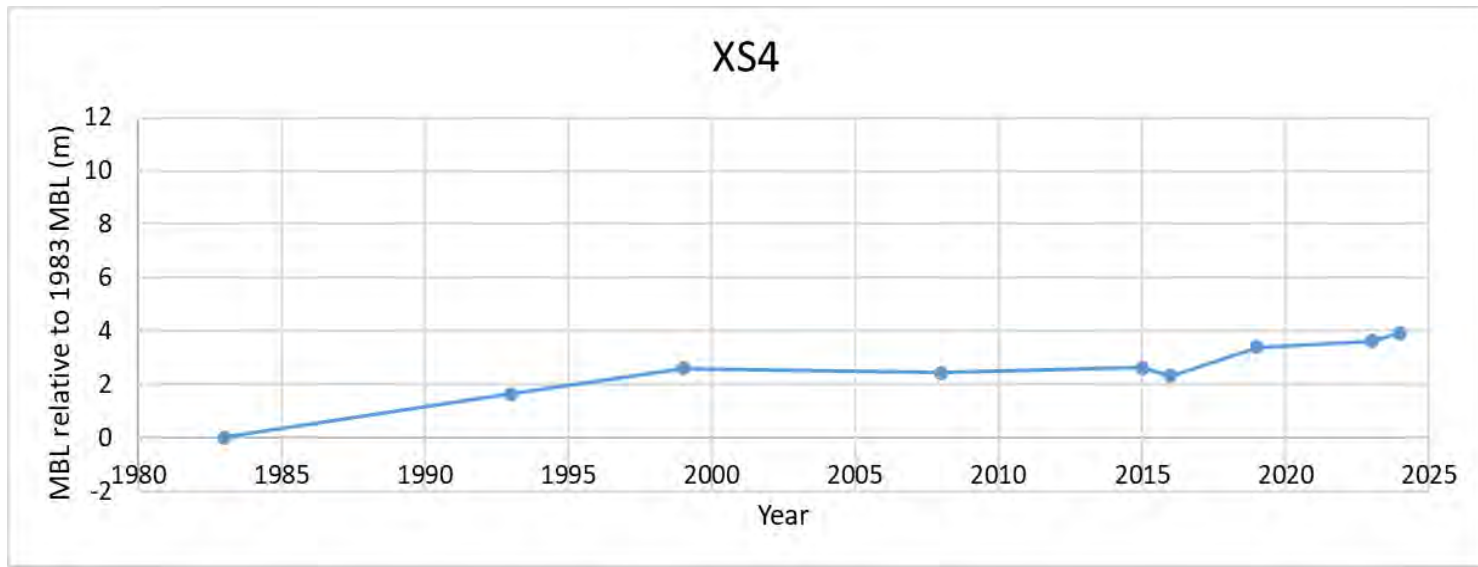
- No information on sediment volumes is currently collected in the Callery subcatchment which makes up a significant proportion of the overall Waiho catchment. Fixed camera imagery looking upstream at the Callery bridge may provide some insight into sediment supply from this river, at a relatively low cost.

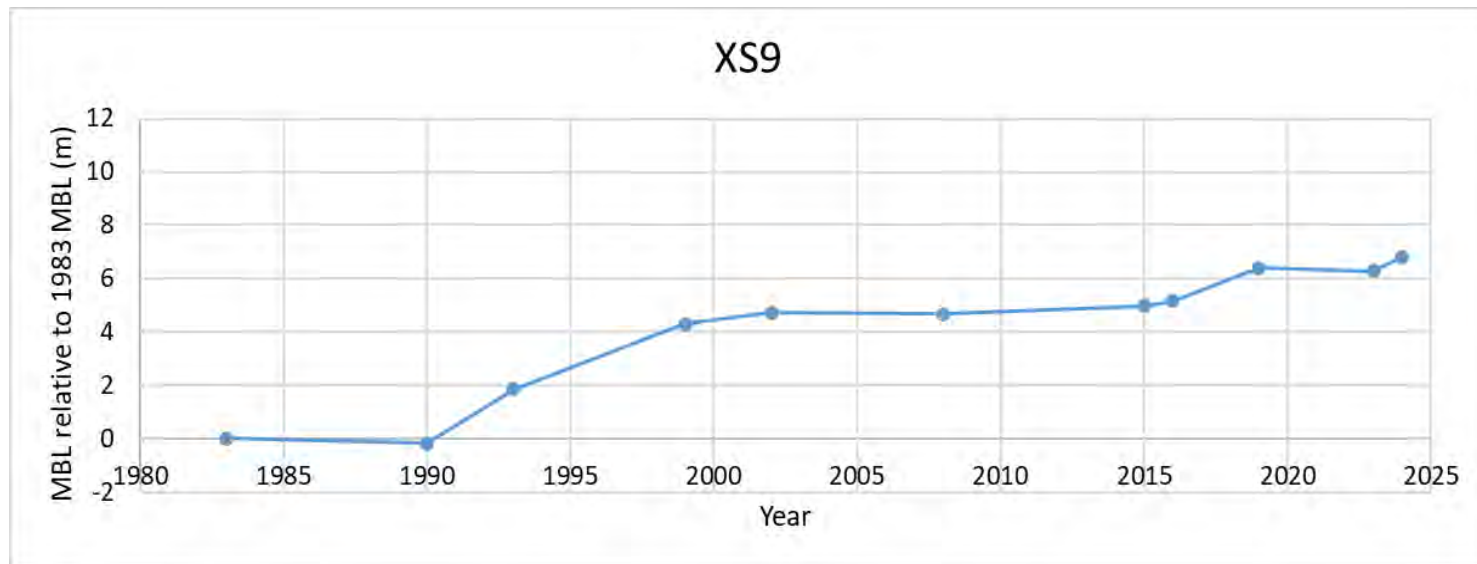
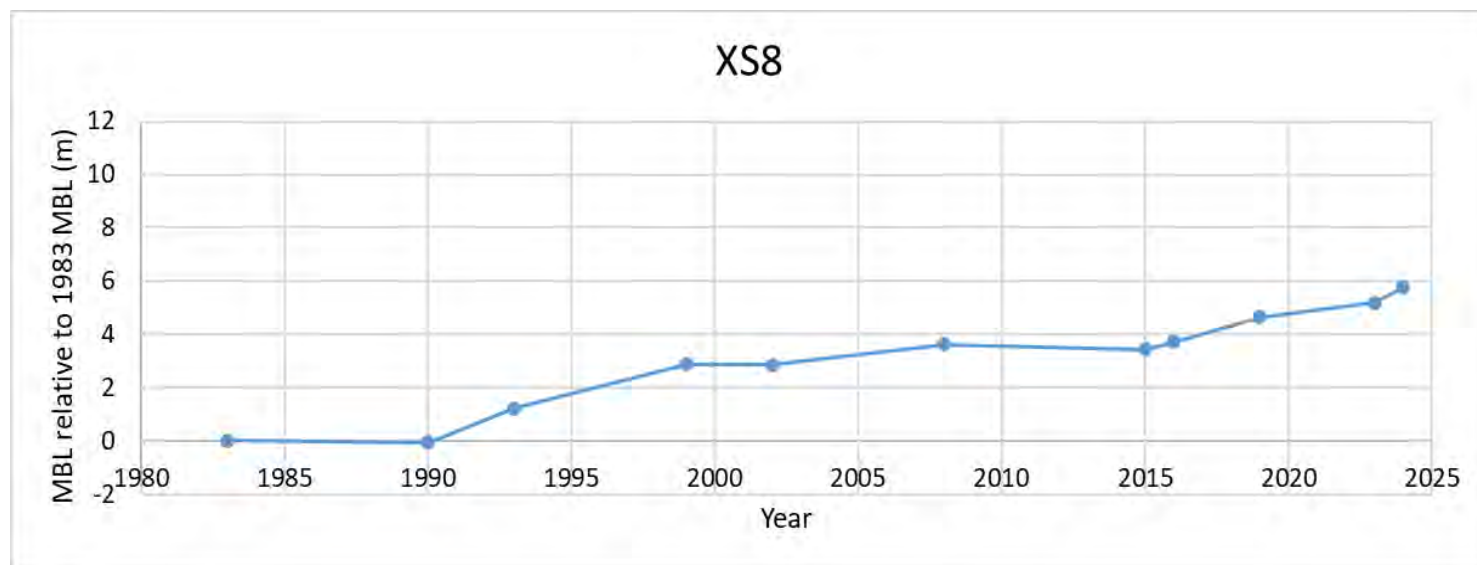
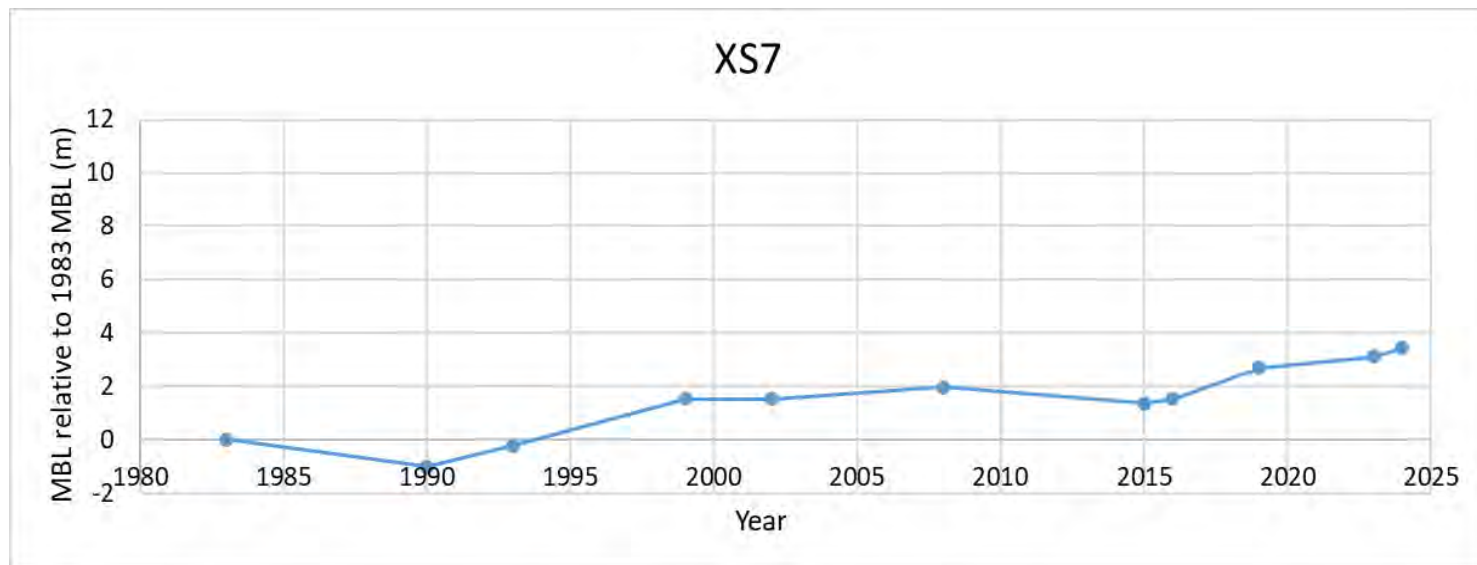
- A warming climate and a transition into the positive phase of the Interdecadal Pacific Oscillation is likely leading to increased weather event frequency and rainfall intensities, and as a result increased sedimentation from both the Callery and Upper Waiho subcatchments.
- Aggradation on the fan is likely to continue and may lead to increased pressure on the existing stopbanks. The Havill Wall stopbank is likely to be under significant pressure, but the true left stopbanks including the unlined section of the Rubbish Dump stopbank and the Milton's and others bank are likely to be under increased pressure as the fan continues to aggrade.

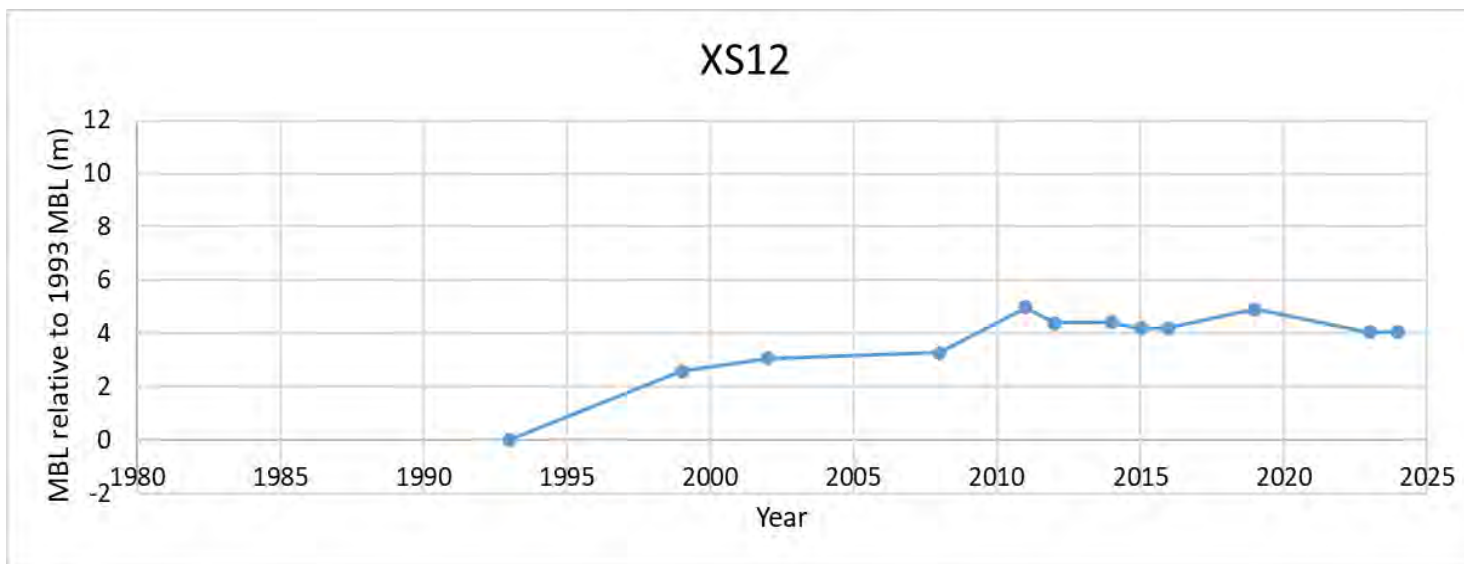
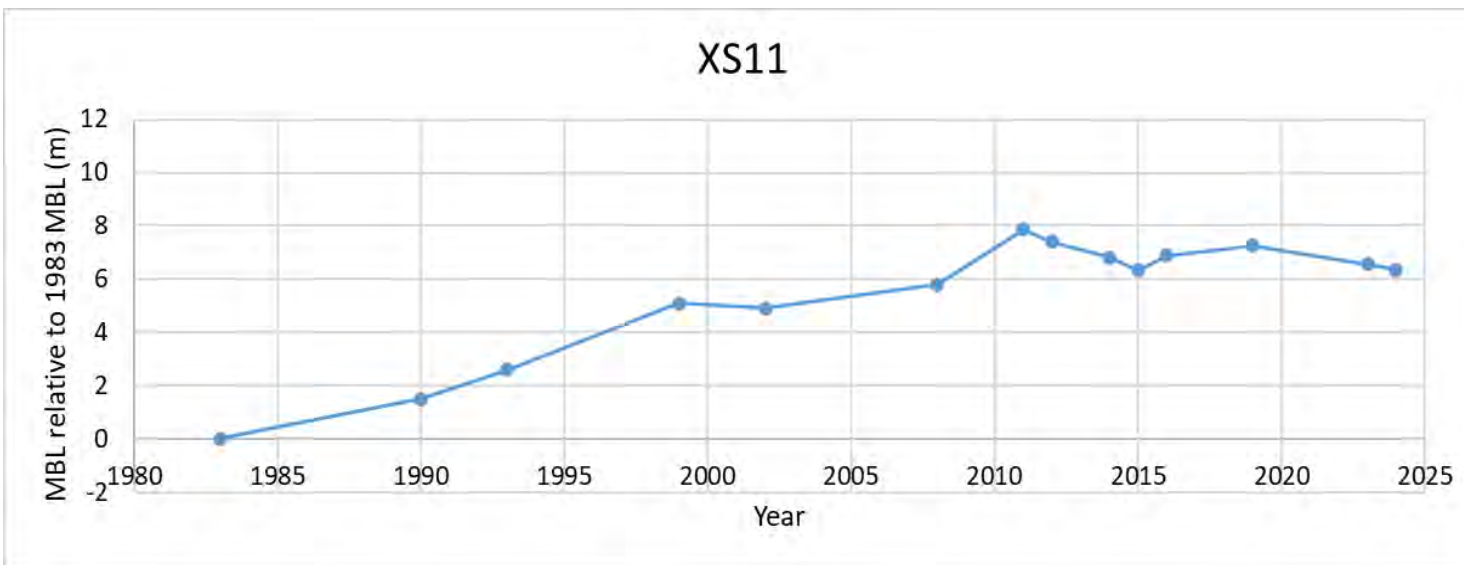
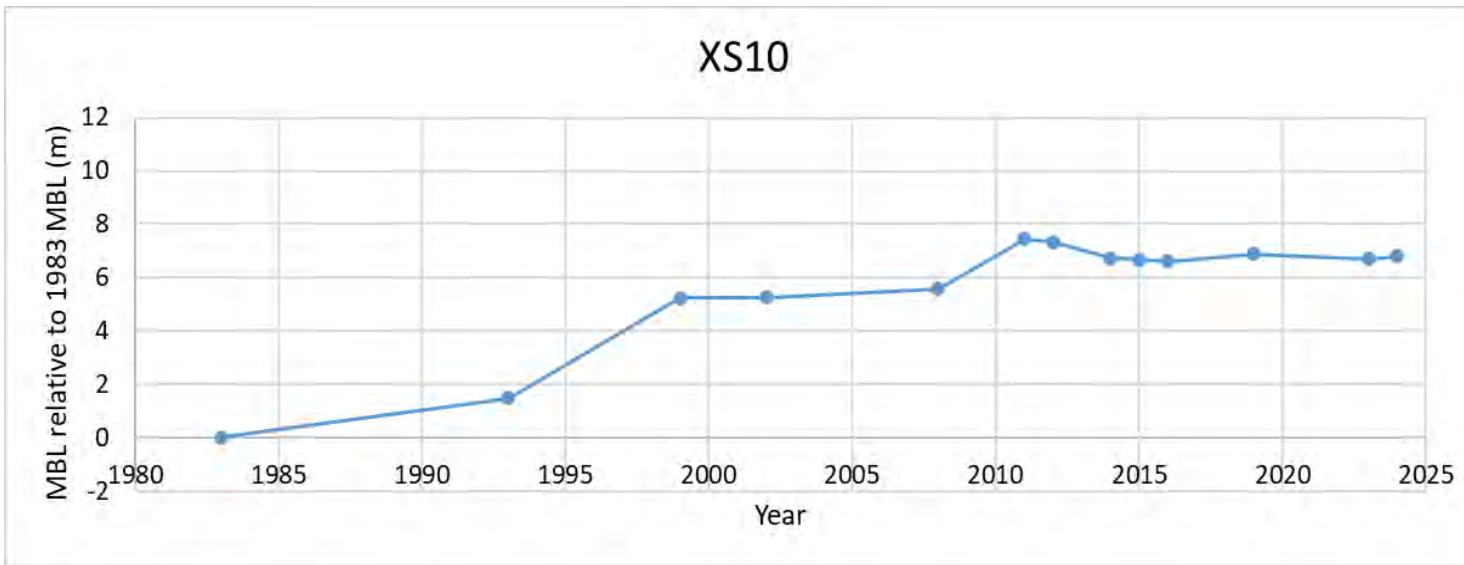
7. REFERENCES

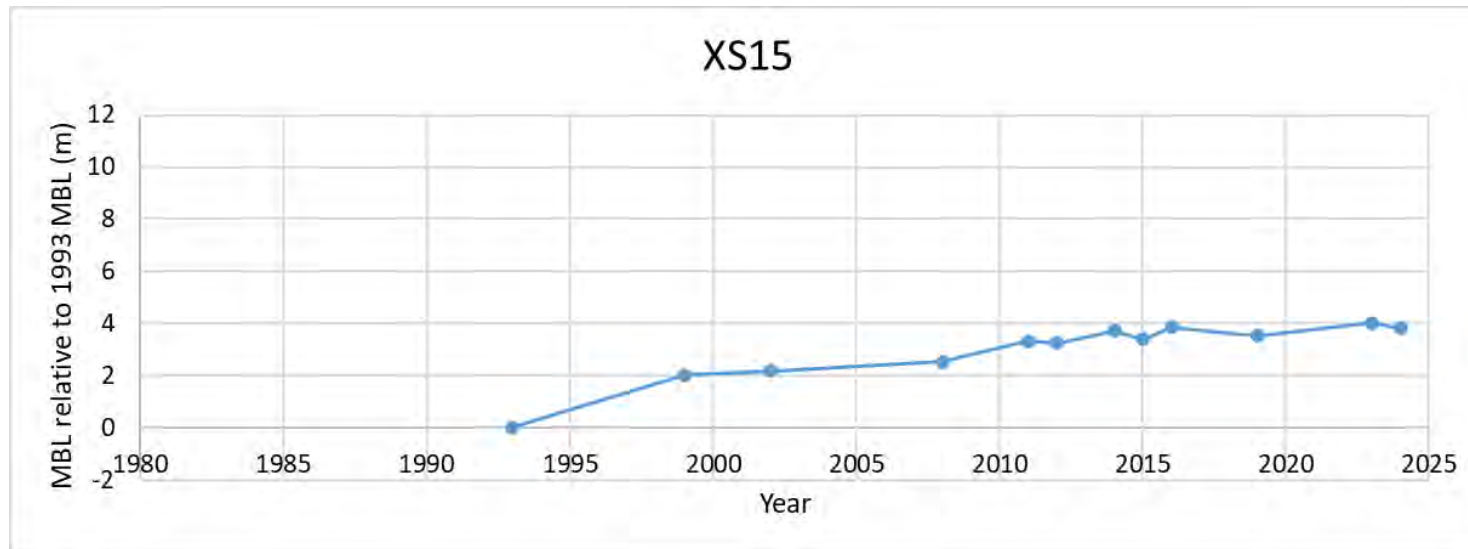
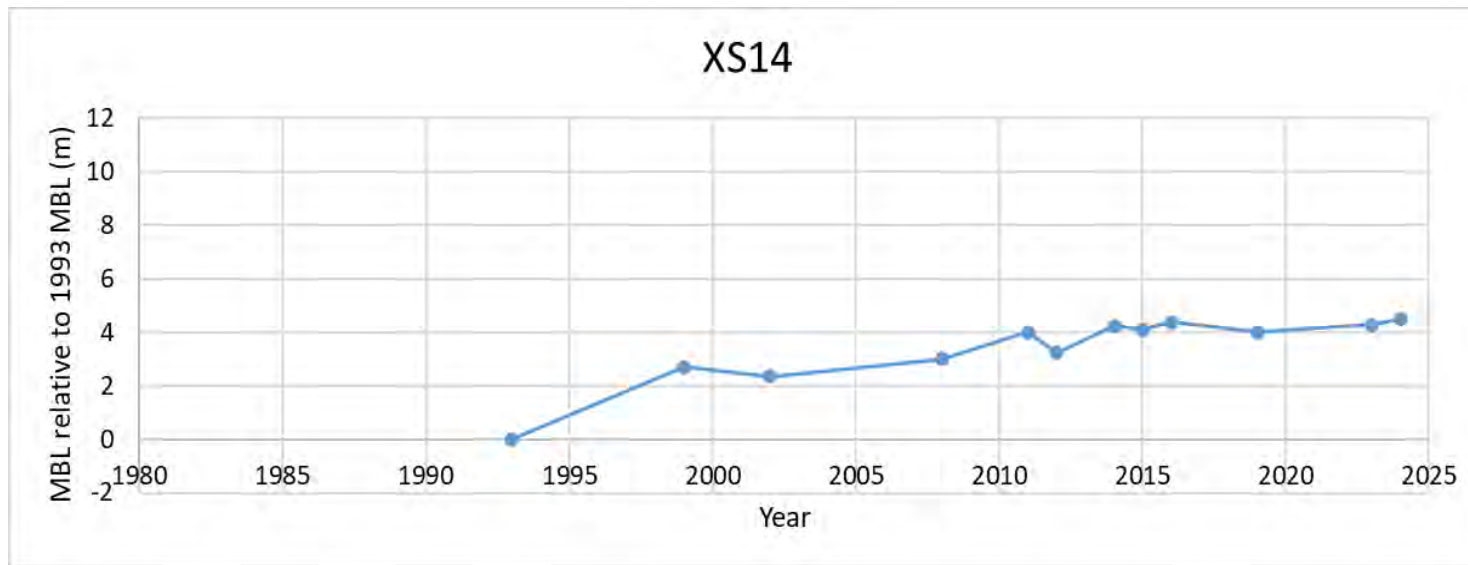
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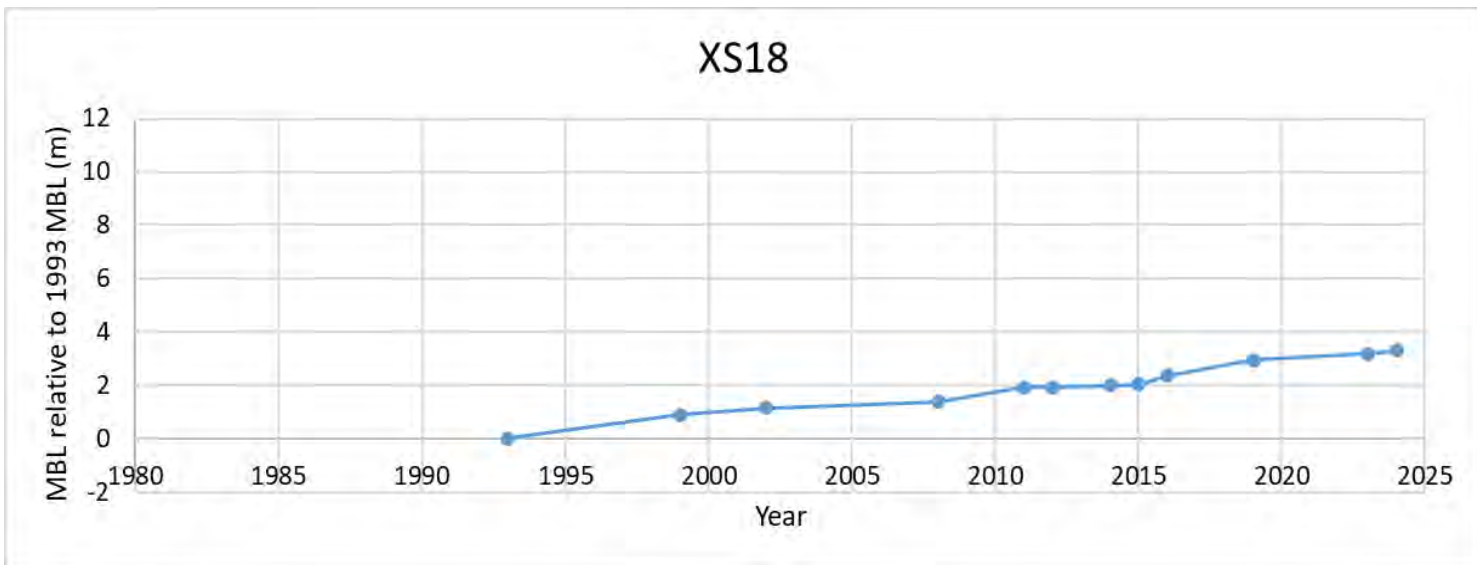
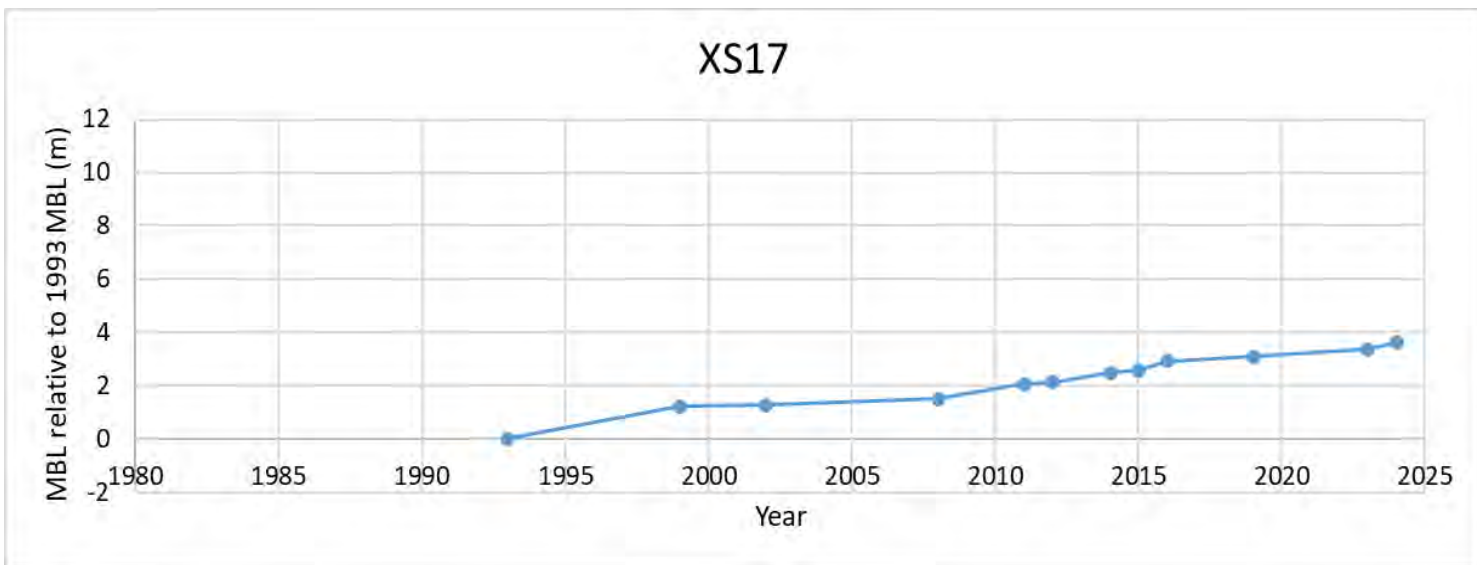
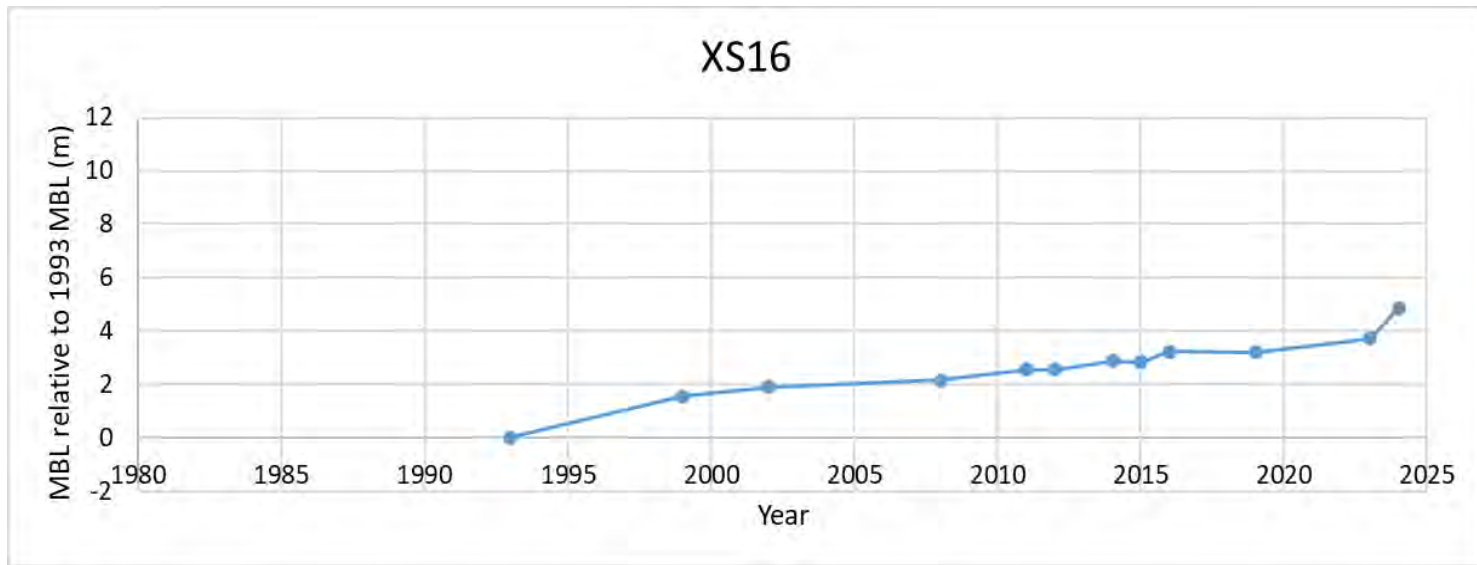


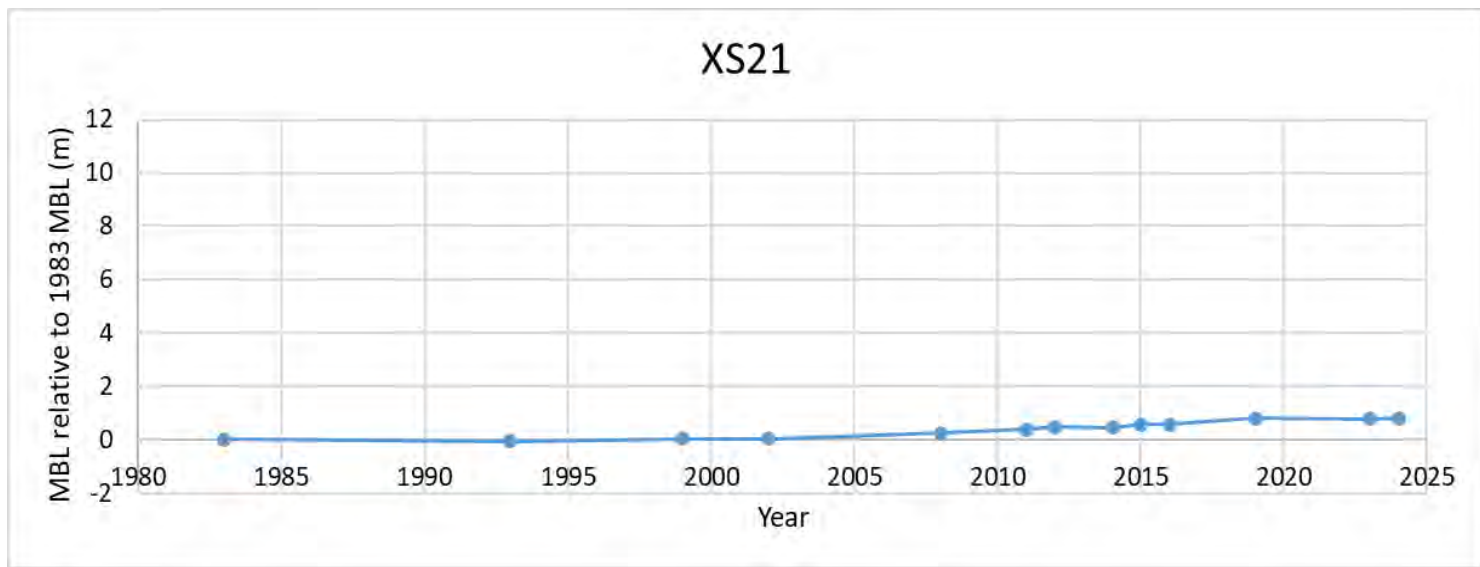
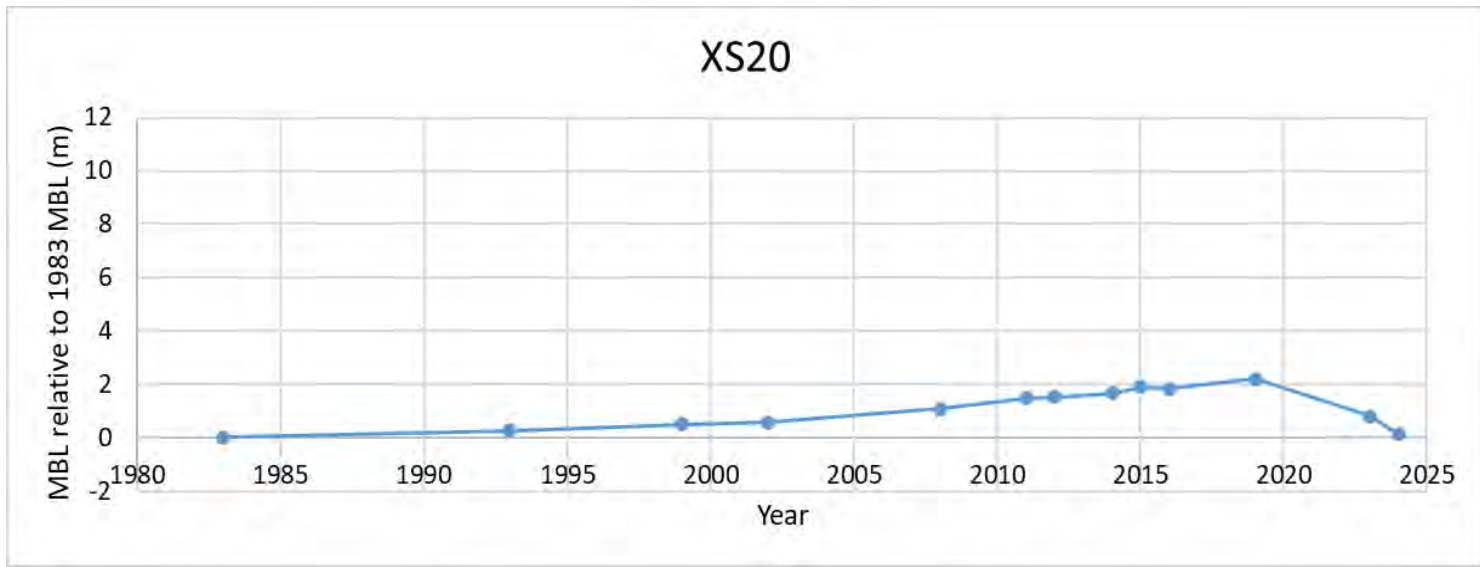
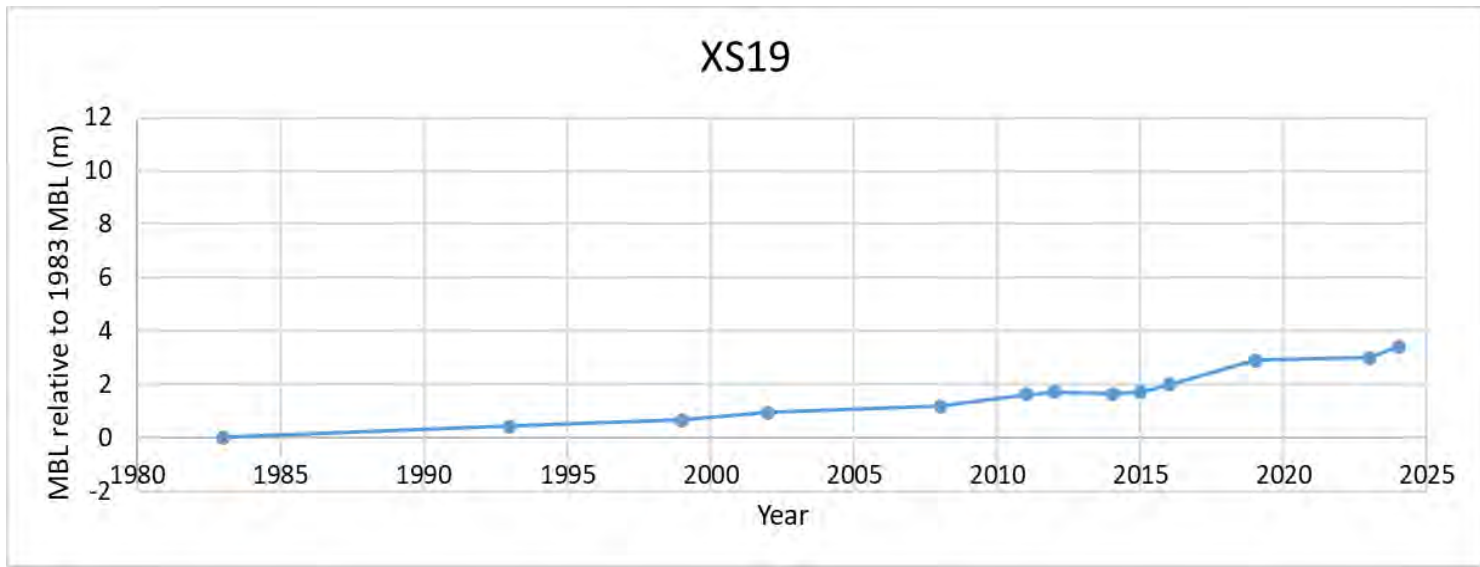


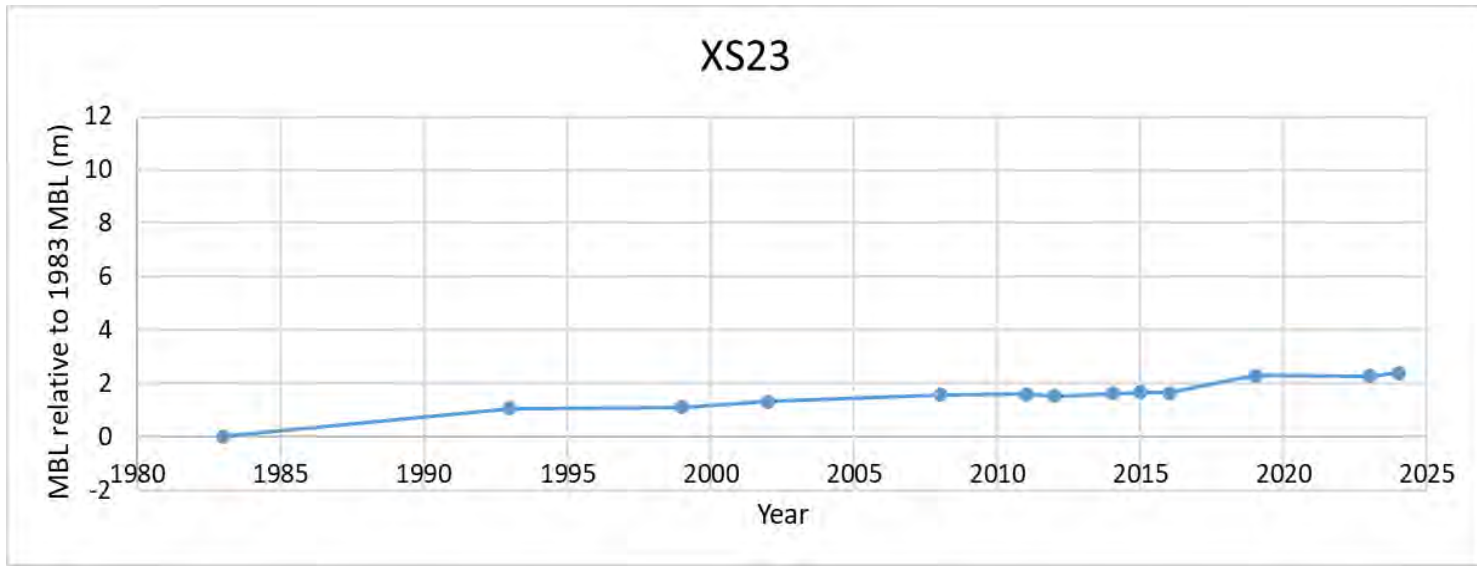
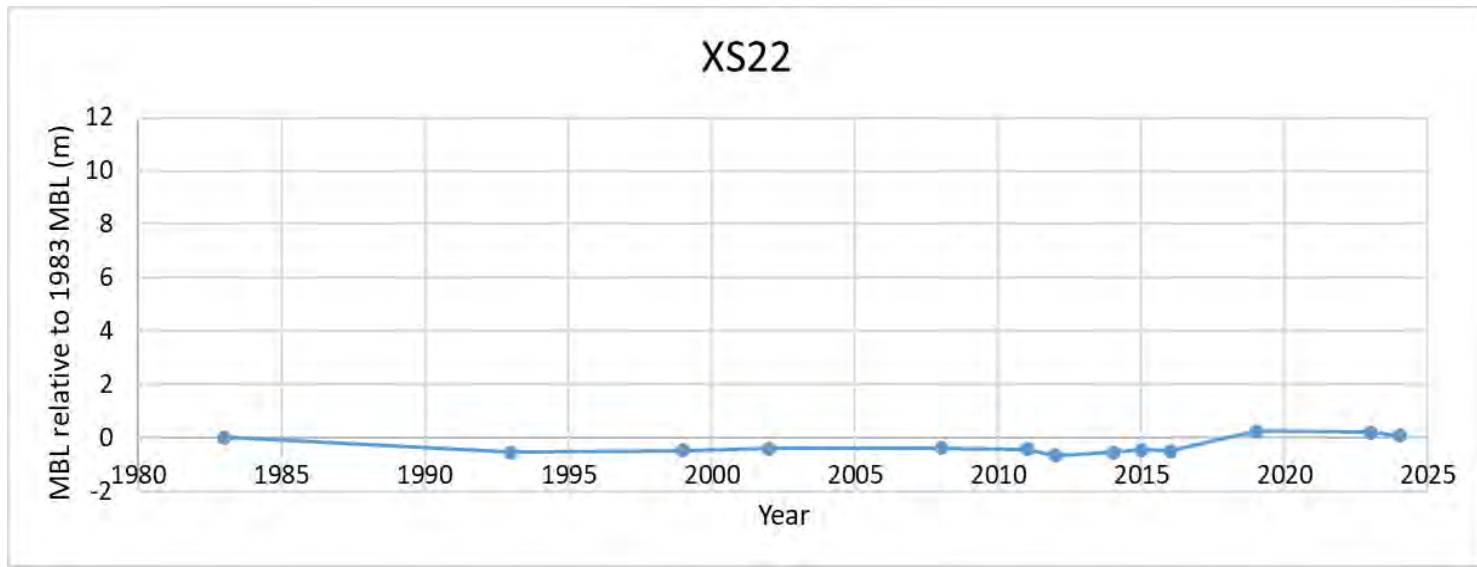








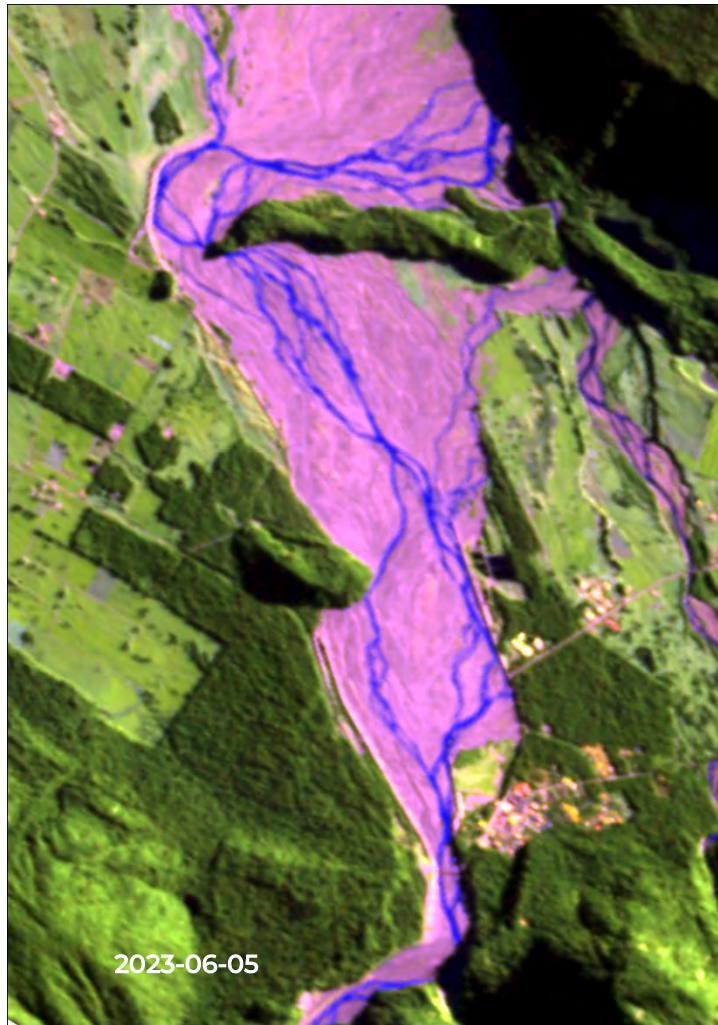
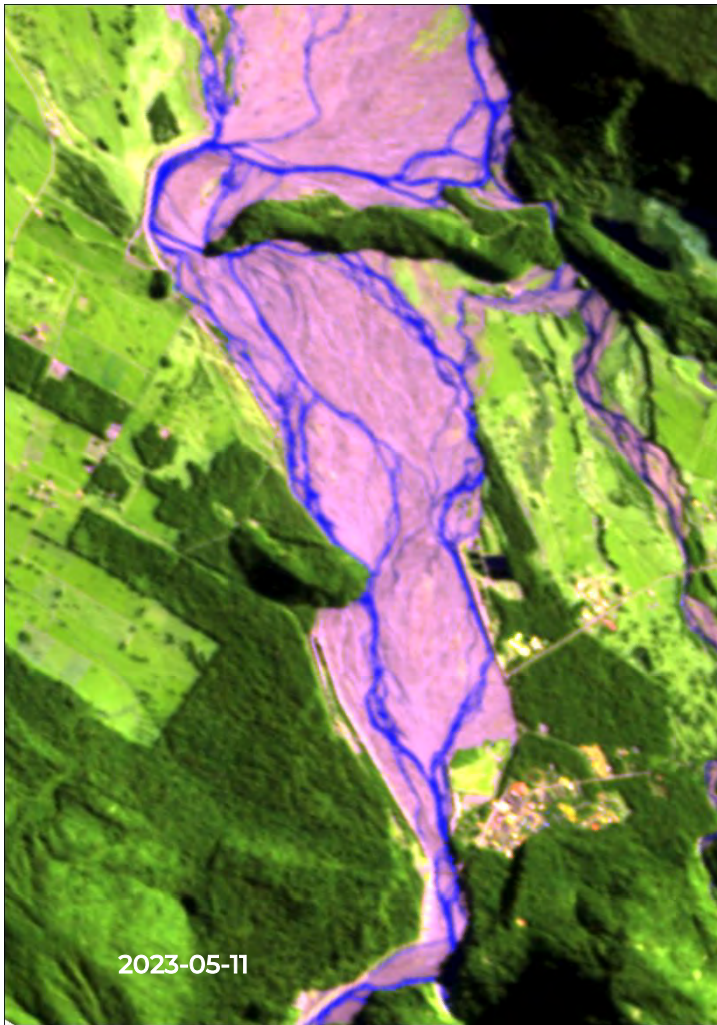


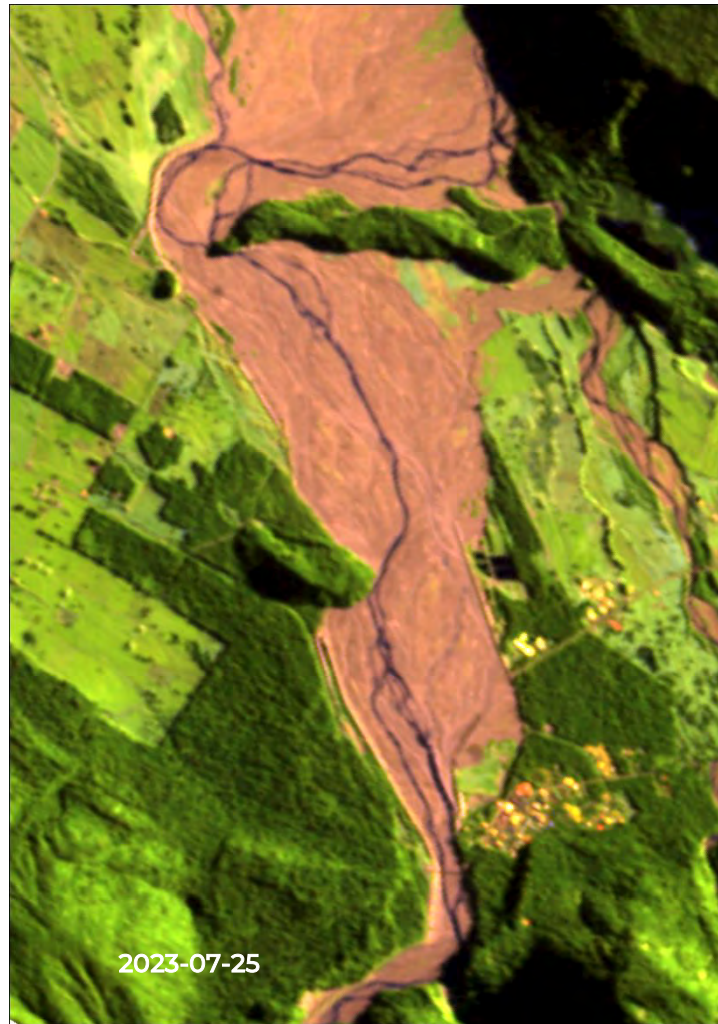


APPENDIX B: SENTINEL HUB SATELLITE IMAGERY



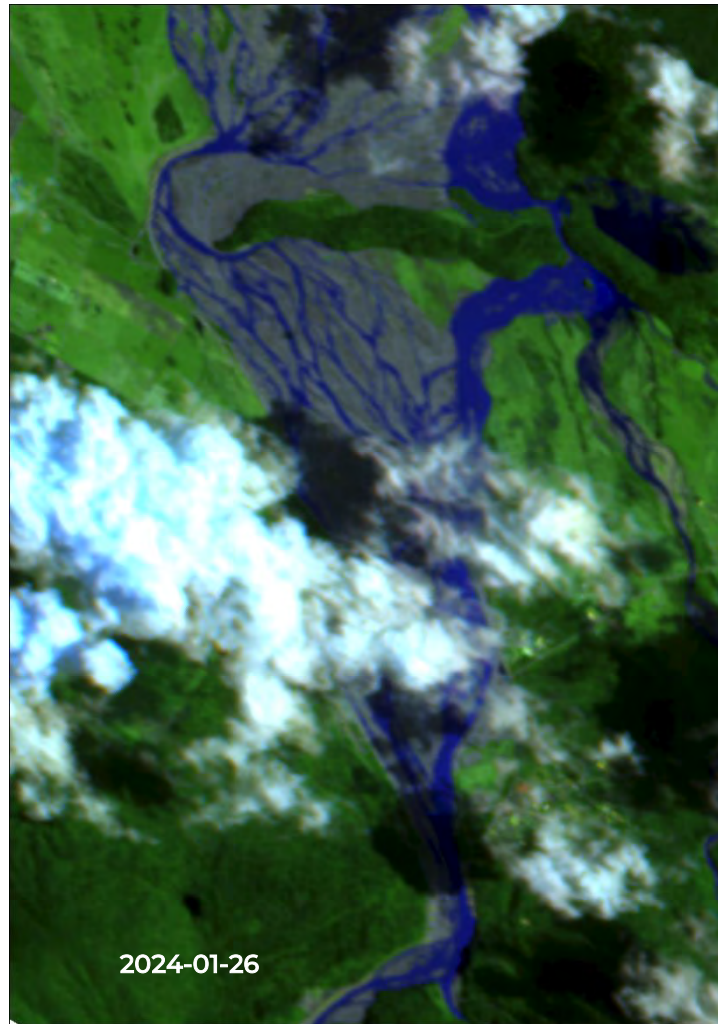












APPENDIX C: HYDROLOGICAL ANALYSIS

Daily rainfall totals (mm) at the SH6 and Douglas Hut monitoring sites. The shading differentiates between the events in period of rainfall. The totals include all of the daily totals shown in each column.

February event 2023				January event 2024			
Month	Day	SH6	Douglas	Month	Day	SH6	Douglas
January	30 th	38.5	45.5	January	18 th	88.0	121
	31 st	3.0	7.0		19 th	211.0	255
February	1 st	27.5	28		20 th	10.0	13
	2 nd	143.0	194.5		21 st	5.5	5.5
	3 rd	90.0	125		22 nd	99.0	138
	4 th	7.2	7.5		23 rd	49.0	55.5
	5 th	164.8	210				
	6 th	21.5	28.5				
	7 th	11.5	10				
	TOTAL	507.0	656.0		TOTAL	462.5	588.0

Monthly rainfall totals (mm; rounded to nearest whole number) recorded at both sites, and compared to the long term (LT) mean for each site. Monthly totals shaded blue exceed the LT mean, and shaded orange do not.

	2023											2024
	F	M	A	M	J	J	A	S	O	N	D	J
SH6 - 2023/24	542	595	518	817	173	177	194	555	502	262	543	732
SH6 - LT mean	421	362	390	464	380	400	381	429	474	439	524	516
Douglas - 2023/24	706	718	614	1054	273	211	267	756	738	405	627	884
Douglas - LT mean	411	424	418	479	471	383	411	556	607	539	643	574