From: letstalk@mackenzie.govt.nz
To: jsygrove@rationale.co.nz; Charmaine Duffell
Subject: Anonymous User completed Submission Form - Plan Change 25: Rural Lifestyle Zone
Date: Friday, 26 January 2024 4:14:50 pm

Anonymous User just submitted the survey Submission Form - Plan Change 25: Rural Lifestyle Zone with the responses below.

Full Name

B.D. & C.B. White

Contact person (if different from above)

Chris White

Email address

chris@greenstonefund.com

Postal Address

Phone number

Do you believe you could gain an advantage in trade competition through this submission?

No

The specific provisions of the proposal that my submission relates to are as follows:

Please see the Attached PDF submission and supporting docs

I support/oppose these provisions:
(include whether you support or oppose in full or in part)

Oppose. Please see the attached submission and supporting documents

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The reason(s) for my submission are:
(state in summary your reasons, and whether you seek any amendments)

Please see the attached submission and supporting documents

I seek the following decision from the Mackenzie District Council: (give precise details)

Please see the attached submission and supporting documents - Allow the development of 4 lots and 4 dwellings as a permitted activity at 158 Lyford lane - Connect Lyford Lane to the Twizel wastewater and water services based on majority feedback that Lyford Lane landowners have given. - we oppose Lyford Lane being a specific controlled area

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Do you wish to be heard in support of your submission?

I do

If others make a similar submission would you be prepared to consider presenting a joint case with them at any hearing?

I would

If you have any additional supporting information as part of this submission please attach it here.

https://s3-ap-southeast-2.amazonaws.com/ehq-production-australia/0ca0c062db6b43bb003524213719b9a0b8c932fd/original/1706218480/5899b697ef8532e89019b08398f33291_BD___CB_White_Submission_-_Plan_Change_25_-_Rural_Lifestyle_Zones_-_Jan_25_2024.pdf?1706218480

Mackenzie
DISTRICT COUNCIL

PLAN CHANGE 25 – RURAL LIFESTYLE ZONES

SUBMISSION ON PROPOSED PLAN CHANGE 25 TO THE MACKENZIE DISTRICT PLAN

FORM 5
UNDER CLAUSE 6 OF THE FIRST SCHEDULE OF THE RESOURCE MANAGEMENT ACT 1991

Details of Submitter

Full Name: *(Required)*	B.D & C.B. White
Contact Person: *(If different from above)*	Chris White
Email Address: *(Required)*	chris@greenstonefund.com
Postal Address: *(Optional)*	
Telephone Number: *(Required)*	
Fax *(Optional)*	N/A

Trade Competition

~~I could~~ / I could not *(delete one)* gain an advantage in trade competition through this submission.

If you have selected could, please answer the question below:

I am / I am not *(delete one)* directly affected by an effect of the subject matter that:

a. adversely affect the environment; and
b. does not relate to trade competition or the effects of trade competition.

Submission Details

The specific provisions of the proposal that my submission relates to are as follows:

Attached PDFs
Submission & Appendix Supporting documents

I ~~support~~/oppose these provisions:
(include whether you support or oppose in full or in part)

Please see Attached Submission and PDFs

The reason(s) for my submission are:
(state in summary your reasons, and whether you seek any amendments)

Please see Attached Submission and supporting documents AND PDFs

I seek the following decision from the Mackenzie District Council:
(give precise details)

Please see Attached Submission and supporting documents/PDFs

- Allow the development of 4 lots / 4 dwelling as permitted activity at 158 Lyford Lane
- Connect Lyford Lane to Twizel wastewater And water services based on feedback Lyford Lane Landowners have given.

☑ **I wish to be heard** in support of my submission.

☐ **I do not wish to be heard** in support of my submission.
(Tick one box)

If others make a similar submission I **would** / ~~would not~~ *(circle one)* be prepared to consider presenting a joint case with them ~~at any~~ hearing.

Signature of submitter or person authorised to sign on behalf of submitter
(A signature is not required if you make your submission by electronic means.)

25 January 2024

Date:

Please note that your submission (or part of your submission) may be struck out if the authority is satisfied that at least one of the following applies to the submission (or part of the submission):

- it is frivolous or vexatious;
- it discloses no reasonable or relevant case;
- it would be an abuse of the hearing process to allow the submission (or the part) to be taken further;
- it contains offensive language; or
- it is supported only by material that purports to be independent expert evidence, but has been prepared by a person who is not independent or who does not have sufficient specialised knowledge or skill to give expert advice on the matter.

Once the closing date for submissions has passed, Council will publicly notify all submissions received, prepare a summary of submissions, and will allow a period for further submissions in support of, or in opposition to, those submissions already made.

Council hearings for Plan Changes 23 to 27 will then be arranged to consider all submissions. Anyone who has made a submission and indicated that they wish to be heard will have the right to attend the hearings and present their submission.

If you have any questions regarding Plan Change 25 or the submission process, please do not hesitate to contact the Planning Department at 03 685 9010 or via email districtplan@mackenzie.govt.nz

January 25, 2024

Submission to Mackenzie District Council (MDC) on Plan Change 25 (PC 25)

B.D. and C.B. White submission on Plan Change 25 and the Rural Lifestyle Zone

We ask that this submission and all attachments be included in the record, and we wish to be heard at the hearing.

Background:

Our Twizel Lyford Lane location is Lot 23 DP 82708 or 158 Lyford Lane (Lot 23 / 158 Lyford). The property is approximately 37.83 hectares and located at the end of Lyford Lane, or the far east and north side of the Lyford Lane zone. We have owned this property since June 2000.

Outside of Lot 23/158 Lyford, we own five other properties in the Twizel township, all of which are connected to the current Twizel water supply and wastewater systems. We also own a 50% interest in another 12 Twizel residential sections that are connected to Twizel wastewater and water.

In short:

We ask that lot 23/158 Lyford can be developed to the same level of density as other neighbors in Lyford Lane, and compatible with historic development of Lyford Lane.

It makes no sense restricting development in the Lyford Lane zone, or designating it a Specific Control Area, if Lyford Lane is on town wastewater and water services. MDC has proposed adding these services.

As owners of Lot 23/158 Lyford Lane and having an interest in 17 additional properties in Twizel township, we believe there has not been enough public consultation and engagement among the wider Twizel community around the Lyford Lane water and wastewater connections. This concerns us greatly. We believe the public should have a full understanding of the existing compliant, or non-compliant, septic systems over the town's water supply. Compliance testing of these septic systems should be released to the broader Twizel community.

Through the MDC consultation and engagement of Lyford Lane landowners in 2023; 95% of owners expressed their wish to be connected to the Twizel water and wastewater network infrastructure. Table included further down this submission.

That all future residential building activity at 23/158 Lyford Lane be a permitted activity status (PER) when in a low-flood zone. Our site is outside the DPWZ and is in low-flood risk area as confirmed by experts.

If Lyford Lane is connected to Twizel wastewater and water then there sould be no constraints on future development at Lyford Lane zone.

We oppose that Lyford Lane now be a specific controlled area, and instead should be classified as general rural lifestyle zone.

Future development of Lot 23/158 Lyford:

In March 2006 we indicated and submitted to MDC our desire to develop our lot into 3-4 additional lots. Due to financial constraints and family health issues, we were unable to go ahead. However, due to a change in generational family ownership and desires we still have the same intent to minimally develop our 37ha into 4 lots for our future family needs. We consider that this original 2006 date falls before the period of time and would like the ability to be granted under the plan change 25 the ability to develop an additional 4 lots at our Lot 23/158 Lyford Lane address.

We respectfully request MDC allow the ability for Lot 23/158 Lyford to be developed into 4 future residential lots at this address. The lots would range from approximately 2.52ha, 2.67ha, 18.14ha, and 14.5ha. The lot size would fit well within the scope of existing lots and development in the Lyford Lane zone. We would also like wastewater and water connections to our boundary for these 4 lots.

Existing Lots at Lyford Lane

#Owners	Address	Last name	Valuation #	Hectares 2023	Hectares in 2000
1	Reserve	Mackenzie Properties		1.6892	
2	58 Lyford	Gaddigan	25320 00706	9.846	20
3	0 Lyford	Honeybone	25320 00928	2.9803	
4	65 Lyford	Shearer	25320 00705	11.7855	13
5	66 Lyford	Frank	25320 00704	1.554	1
6	86 Lyford	Richard Lake	25320 00707	4.4778	
7	107 Lyford Lane	Midgley	25320 00711	19.1728	22
8	108 Lyford	Denny (lester)	25320 00758	2.8145	21
9	0 Lyford	Lovelock	25320 00791	4.0526	
10	140A Lyford	Andrew	25320 00792	2.0515	
11	140B Lyford	Etheridge	25320 00969	1.9229	
12	0 Lyford	Hocken	25320 00708	14.8473	30
13	116 Lyford	Carly Oconnor	25320 00759	1.6776	
14	115 Lyford	Viv and Grant	25320 00752	3.0786	
15	147 Lyford	Ray&Sharon	25320 00710	3.6655	
16	187 Lyford	Louise Blue	25320 00795	6.9864	
17	186 Lyford	Aitchisen	25320 00796	4.9708	20.8
18	170 Lyford	Campbell Family	25320 00794	5.0172	
19	140C Lyford	Ray&Sharon	25320 00793	4.1903	
20	140D Lyford	Andrew Hocken	25320 00970	2.741	
21	158 Lyford	White	2532000709	37.9025	37.9025
			Average Lot	7.020204762	

Any future rural living node plans we have for Lot 23/158 Lyford Lane will be discrete and sit comfortably in the existing landscape setting. The broader landscape will be minimally affected, and the relevant objectives and policies of the District Plan and RMA will be upheld.

The main effects of lot 23/158 Lyford Lane development on the views and visual amenity will be stands of trees and an enhancement of the rural character of surrounding properties. For instance, there will be no visibility of our Lot 23/158 Lyford Lane property from any State Highway, or other significant land holding down Lyford Lane. We aim to screen and filter any visual effects of future house sites from any directly neighboring properties through further tree planting. Any activity we plan will be inconspicuous, visually contained and will preserve any existing visually sensitive parts of the current site

(of which we currently know of no outstanding natural landscapes). We have no problem getting affected party approval from any directly neighboring property with regards to future dwelling consent and siting concerns.

We do not believe given the historical nature of communicating to MDC, the landscaping/planting done to date, and intent to develop 3-4 lots on our Lot 23/158 Lyford property that this should be excluded from the current plan change 25.

We ask that the proposed plan 25 for Lyford Lane be amended to reflect our wish to develop 4 lots on Lot 23/158 Lyford Lane.

Additionally, to development of 158 Lyford:

Further, we note that our Lot 23/158 Lyford does not lie within the current and historical Twizel Community DWPZ, and future residential development should be allowed. We are approximately 500 meters from the DWPZ. We have not seen sufficient expert analysis to see why our Lot 23/158 Lyford is to now be included under any new and expanded water protection zones.

We are already connected to electricity at the boundary and in fact have laid electricity cabling from the corner of our lot to the existing farm buildings. We made sure to lay the cables with regards to future ease of connectivity and relative to future rural lifestyle lots planned within the property.

We have attached a sketch of the 4 future house sites at Lyford Lane. These are in an **existing low-flood** risk area and after 24 years of observation we are extremely comfortable that they have not flooded based on historical flooding since our mid 1980's home ownership in Twizel.

Please also know we plan to plant a significant number of trees and shrubs in these areas over the next few years as further mitigation measure to enhance these sites and minimize any impacts of flood events.

The ECan May 2023 technical report 'Twizel flood modelling investigation' states clearly in the 'summary' that ***'current development in the Lyford Lane area is predominantly in areas of little or no flooding'***. We agree, and further our Lot 23 has never flooded in 24 years and that any built structures would be built with foundations high enough to take flooding events into concern. This would be dealt with in a **permitted activity status** consenting application process for a dwelling.

We have already begun shelter belts on one side of the 5.33 hectare block we expect to develop and plan to plant rural style shelter belts and native vegetation to minimize any impact to existing neighbors if we choose to develop in the future.

Why allow development on Lyford Lane:

It is our opinion that the one Rural Residential zone in the Twizel area with the least visual, landscape and amenity impact is Lyford Lane. Lyford Lane is not visible from any highway or major road system. The area has no outstanding natural landscape features. Lyford Lane is the one area in Twizel where if properly designed (allowing for future growth and capacity) wastewater and water systems were installed the town could effectively hide significant dwelling growth from the general public's view. A long-term view should be taken to developing Lyford Lane as it is primarily hidden from view and has little to no negative impacts compared to other rural-residential zones in the town which are in broad view with significant day and nighttime detriment.

We believe the future dwelling numbers have been unfairly manipulated significantly downwards in recent expert reports for the Lyford Lane rural residential zone especially when compared to other zones around Twizel. It is our view, that if Lyford Lane was connected to the Twizel wastewater and fresh water supply, then future development should be allowed at a similar level to other rural residential zones in the district. By adding Lyford to the Twizel water and wastewater we take away the risks. Any issues of flooding and dwelling location can be mitigated by building platforms and foundation heights during a permitted consenting process.

Flooding:

We disagree with the Ecan 'Twizel flood modelling investigation' desktop flood analysis in several areas and several of their comments made in their March 2023 submission around plan change 21. They use wrong pictures in their report to describe the Twizel River. For example use a picture of the Ahuriri River at SH8 in Figure b-3 of their report and describe it as Twizel River flooding.

After plus 35,000 plus visits to our property over the last 24 years we should be considered as having an expert and intimate long-term knowledge of Lyford Lane zone. Given this long-term nature of our presence in the Lyford zone we disagree with this ECan flood analysis based on our 24 years of historical lived-experience for our Lot 23/158 Lyford Lane.

We also disagree with the ECan flood analysis of Lot 23/158 Lyford based on the expert Rob Hall (R.J. Hall) work where Mr. Hall spent many hours, multiple onsite visits, and his decades of expert analysis, which was ultimately provided, and we assume approved by MDC for eventual developing of the Lyford Lane zone. No one expert has spent more time at the Lyford Lane zone than Rob Hall.

While we are sympathetic to CRC, ECan and MDC we feel our own expertise should draw considerable weight in making conclusions here for Lot 23/158 Lyford and Plan Change 25. It is our observation that in the 24 years down Lyford Lane we have noticed no single home flood and Rob Halls expert work stands the test of time and analysis. Yet his analysis has been excluded/ignored. We do not know why.

With no evidence of homes ever flooding over the existence of the Lyford Lane zone, the primary issue of concern now for Lyford Lane should be adding Lyford Lane to the Twizel town services of water and wastewater networks. We believe this would fall under reasonable RMA objectives and requirements.

We believe it should be an MDC council priority, and the Twizel councilors representing Twizel ratepayers, to get this water and wastewater capital works done ASAP. The works should be paid for by the considerable millions in reserve contributions that have come out of the Twizel community the last several years from new developments (Four lakes, Merino Downs, The Drive, Tussock Bend). Twizel as the primary driver of new development and reserve contributions to the Mackenzie district should be the primary infrastructure recipient of these contributions. It is our belief that reserve contributions should primarily be spent in the town where they were derived.

We have attached in Appendix some of the Rob Halls (R.J. Hall) work, and note it also covers canal inundation and flooding events. His expert work should be used along with our knowledge as one of the longest and continuous owners down Lyford Lane when considering changes to Plan change 25. Desktop analysis is a worthy and cost-effective task, but is known to be flawed on many fronts, and should be taken into consideration with people who have spent decades on the actual ground.

Due to extensive planting along the Twizel River for Lot 23/158 Lyford, we have never seen any flood issues from this river area. This even goes against original assessments and the thought of this boundary being a high-flood risk area has diminished. In fact, the high-flood area from Rob Halls reports for our property has the least ground water and surface water from high rainfall events across the whole property.

The only flooding evidenced in the 'Twizel River area of Lyford Lane' is from backwardation of water from where the Fraser Stream and Twizel River meet downstream of our property. This area is approximately 882 meters from any proposed dwelling or existing structures on our lot 23/158 Lyford. We note there are 4 existing homes between our proposed sites and the confluence of the Fraser and Twizel watercourses where flooding occurs. There is no historical evidence that these four homes (Valuation # 25320-00970, 25320-0793, 25320-00969, and 25320-00792) have had any flooding. Flooding has never come close to our boundary or the four existing homes down Lyford Lane.

Historically the area of flooding we have seen consistently down Lyford Lane is along the Fraser River and Dry Stream areas between Glen Lyon Road and the first (Fraser) and second (Dry) bridges (and within the existing DPWZ). In just the last couple of years MDC has actually allowed the building of a new home (Honeybone property or 48 Lyford) in an area that we have seen flooded 4-5 times in the last 24 years. We assume this is because the Honeybone property is connected to the town's water supply and wastewater network, that this homes consenting was even allowed to pass through the consenting process and the eventual home to be built in a known high-flood area.

This home at 48 Lyford is located in a known High-flood risk location (in Rob Halls previous work and ECans) and leads us to believe and ask the question; If a home and lot are in a high flood area (as evidenced by us and other landowners down Lyford Lane, and known to MDC), BUT if connected to MDC services of wastewater and water then development in a high-flood risk area is ok? We can come to no other conclusion. In fact, the expert reports we have read suggest that if Lyford Lane was connected to water and wastewater, then further development down Lyford Lane would be sensible under the RMA and could indeed occur. Following MDC logic on connecting wastewater and water to 48 Lyford/Honeybone property, it would make sense that if the remainder of Lyford Lane lots are connected to water and wastewater services that further development should indeed proceed. Development, especially when located in a low-flood risk area like our Lot 23/158 Lyford proposed sites. We would like to ask if an expert analysis has been done with these parameters in mind? Can Lyford Lane with its minimal impacts comfortably and minimally sustain more dwelling and site development under the district plan once the Lyford Lane lots are connected to Twizel service of water and wastewater? This would be a worthy analysis that we would happily contribute dollars too.

It is the opinion of two engineering experts we have spoken with at Milwood Finlay Lobb and LandPro Ltd that if wastewater and water services are provided to Lyford Lane, then in fact sensible rural lifestyle development could progress further, and in fact would be most appropriate. This should be taken into consideration of Plan Change 25 and make sure we adhere to RMA guidelines for future development. The same experts agree that our 4 site locations at Lot 23/158 Lyford are in fact suitable for development and with minimal impact or risk to the Twizel township water supply.

Growth projections

There is not enough data provided by MDC on the proposed wastewater connectivity systems for us to approve and this effectively and currently blocks us from future development under your plan change 25 changes for Lyford Lane. We are being restricted by the submission deadline for Plan Change 25, yet we do not have enough information on MDC plans for wastewater and water for Lyford Lane.

MDC is thus dramatically impairing the future asset value of our Lot 23/158 Lyford land by undue and severe limitations of a proposed Special Lyford Zone and a lack of data around future building and connectivity to a wastewater and water solution.

We are waiting on MDC when it comes to this connectivity of wastewater and water proposal.

MDC allowed the development of Lyford Lane and the necessary approved current septic systems. Why are these septics not working or compliant today? It has never been easy to obtain consent to build down Lyford Lane when it comes to flooding and septic compliance. The zone and area is effectivity and efficiently enforced today by MDC staff in consenting. To add another layer of specific control zone seems overly taxing and not within the intent of the RMA.

Current Septic systems down Lyford Lane: We don't know if the current systems are compliant or non-compliant. Is the Twizel township now at risk or not because MDC allowed development down Lyford Lane?

MDC staff and the council had a 2023 meeting and voted to test the current homes down Lyford Lane. We would like to know the results of this testing. It should be made public.

History of Lyford Lane / Roading:

Lyford Lane in its initial form of 8-lots was in general easy to maintain. It was landowners who all 'chipped-in' with labor and money to maintain the roadway. It has naturally become harder to do this as more and more people move down the road, personalities clash and differ on solutions, and the $$$ that need to be contributed. There's a reason for councils to own infrastructure! Lyford Lane moves inch by inch closer to being fractious in how the roading infrastructure is maintained with each passing year. We would argue that if the council planned to run a wastewater reticulation system and water and this is laid on the existing Lyford Lane roadway, then MDC would and should own the road in its existing shape.

MDC should take ownership of the road as part of a broader infrastructure proposal for the Lyford Lane zone.

Thru our long-term observations and using standard traffic movements per day, we believe if a traffic counter was laid at the entrance of Lyford Lane, we would see plus 30,000 yearly vehicle movements entering Lyford Lane. It is unfathomable MDC are not required to take ownership of the road and key services down Lyford Lane given the current annual vehicle movements down this roadway.

Septic:

We were highly concerned as owners of other properties in Twizel township that are connected to the Twizel water supply that it seemed to be implied / admitted that some of the current septic systems over the town water supply are not compliant and have in fact infiltrated and contaminated our Twizel water supply.

We would like to continue to invest in Twizel and Lyford Lane for the long term. The May 23, 2023, meeting with MDC staff suggesting contaminated water in the township leaves us concerned about how MDC think about the long-term infrastructure needs and requirements for a safe and healthy Twizel. We believe Lyford Lane, by being connected to water and wastewater would take care of these issues, and hopefully we are progressing towards this outcome.

Future Growth:

- From page 21 of the 58-page Lyford Lane Waste Water Options Assessment PDF (January 2023) - Lyford Lane is going to have somewhere between 32 to 75 dwellings based on growth projections and the District Plan. Page 9 of the MDC presentation to us suggest the same. Yet it was decided to adopt a design population of 26 dwellings. This seems to be ignoring population growth and requirements in the scope of the reports design.

Growth of Lyford Lane since inception:

- In 2024, Lyford Lane
  - Only one lot is above 20-hectares (Lot 23/158 Lyford Lane).
  - Only two lots are in their original consented size (65 Lyford and 158 Lyford).
  - Every landowner has had the chance to sub-divide or purchase smaller lots than original development except 65 and 158 Lyford.
  - Minor intensification of Lyford Lane has occurred. Why would we stop development when it is the most suited Rural Residential zone in the Twizel regarding the least negative impacts.
  - The average lot size in 2024 excluding 158 Lyford is approximately 5.5 hectares.
  - To better think about the growth in Lyford Lane, today there are 20 lots and only 4 are larger than 10-hectares. **The original intent of Lyford Lane has diminished.** It is now truly a Rural-Residential Zone versus the original 'Rural/Lifestyle' intent of the original developer.
  - Excluding these 4 plus-10 hectares lots, the **average lot size down Lyford Lane is now approximately 3.7 hectares (versus 23-hecatres 20 years ago)** across the 17 remaining lots. 16 Of the lots average 3.7 hectares in size.

- 158 Lyford is not a high hazard area, based on our historical ownership and plus 35,000 visits to the property versus the evidence in the 'paid-for' ECan Twizel Flood Modelling Investigation.
- 'Modelling' and a single site visit are worthy exercises, and one supposes this must be done to get paid for an 'expert' opinion, but to us nothing beats 24 years and plus 35,000 visits to our 158 Lyford Lane property to assess our properties 'high' or 'low' flood-risks. We'll take our own expert opinion over software and a single site visit. At the very least our opinion should carry considerable weight versus software and single site visits.

Initial Wastewater discussion with MDC staff and their presentation:

There is a unfair distinction between being an existing landowner without a dwelling and one with a residential dwelling. We all pay rates down Lyford Lane, yet some of us are excluded from future pump systems in the initial MDC proposal unless connected at our expense. We are owners and not the original developer, and nor did we allow this significant development to occur where Lyford is now a residential rural zone.

- Notably 158 Lyford Lane and its 5-bay shed were excluded in the MDC and GHQ work.
- Yet we note the 4-bay shed at 86 Lyford Lane was not excluded and deemed an existing dwelling.
- 158 Lyford Lane has electricity to the buildings. We object to being excluded from existing dwellings and a future pump system when compared to 86 Lyford Lane.

Feedback - Lyford Lane residents to MDC in 2023 regarding connections to Twizel services:

Lyford Lane Land Owners response to MDC Waste-water Proposal

Owner	Rapid No	Fibre	Cable	Water	Own Road	Road to Council	More Development	Source
Grant & Tash Hocken, The Domain		Y	Y	Y	Y	Y	Y	Submitted
Anthony & Elizabeth Honeybon	48						Y	Submitted
Dwane & Gina Cadigan	58		Y	Y				Submitted
Nicola & Russell Frank	66		Y	Y	N			Submitted
Al Shearer & Steph Johnson	65	Y	Y				Y	Submitted
Melissa Wilson & Richard Lake	86	Y	Y	Y	Y			Phone call 26 June 2023
Grant Midgley & Steph Rathgen	107		Y	Y	Y			Phone call 25 June 2023
Hannah Denny	108			Y	N			Submitted
Caryl O'Connor	116	Y	Y	Y	Y			Email 26 June 2023
Grant & Viv Jarrold	115	Y	Y		Y		Y	Submitted
MacKenzie Properties		Y	Y		Y		Y	Grant Hocken submitted for their 3 properties
Anna Carr & Brent Lovelock	138A		Y		Y			Submitted
Andy & Aimee Reid	140A	Y	Y		Y			In person meeting 26 June 2023
Lois & Peter Etheridge	140B	Y	Y		Y		Y	Submitted
Sharon Corcoran & Ray Parker	140C	Y	Y	Y	Y		Y	Submitted
Andrew Hocken	140D	Y	Y		Y		Y	Grant Hocken submitted for their 3 properties
Sharon Corcoran & Ray Parker	147	Y	Y	Y	Y		Y	Submitted
White Family	158	Y	Y		Y		Y	Submitted
Dave & Sue Campbell	170	Y	Y	Y	Y		Y	Submitted
Doug & Pam Aitcheson	186A	Y	Y	Y	Y		Y	Submitted and email 25 June 2023
Gene & Margaret Bryce	187	Y	Y		Y			Email 26 June 2023
21 Lots		15	19	11	Yes 16	No 2	Yes 12	16 submissions

Note: where a cell is blank - owners have not stated yes or no
Y=Yes
N=No

The feedback from Lyford Lane engagement by MDC has been resounding. **The overwhelming majority (95%) of Lyford Lane landowners wish to be connected to the town's wastewater and water supply.**

We are asking to be adequately serviced by MDC in providing wastewater and water based on this consultation. We believe this falls under the RMA and its objectives.

Additionally, 16 of the 21 landowners when consulted said they also wanted the road to vest to council when it had their wastewater and water services under the road.

The most appropriate way to achieve the purpose of the Resource Management Act 1991 (RMA) is to connect Lyford Lane to the Twizel wastewater and water services. Thus, taking away future concerns on water safety to all the towns owners and citizens. The current plan changes for the 'Lyford special zone' and not accepting responsibility for the development of Lyford Lane is not acting under the intent of the RMA.

Historically, the Twizel community population and housing requirements have been severely underestimated, we believe Lyford Lane should be open to further development once connection to wastewater and water services to ensure there is sufficient development capacity for rural residential and rural lifestyle living around Twizel relative to population growth.

The one owner (Honeybone) down Lyford Lane that is already connected to town water and wastewater did not respond in the above table. **So, in effect we had 19 of 20 Landowners or 95% of landowners requesting water connection to the town supply when the wastewater is installed,** in order to save time and money.

Presentations made by MDC and expert analysis supplied to us:

Based on the May 23, 2023, presentation to Lyford Lane landowners and residents Titled – **'Lyford *Lane, Twizel Proposed Wastewater Scheme'***

- Page 4 of Lyford Lane Presentation – *The Water Services Act (2021), dictates that drinking water providers **must implement a high standard of care with regards to the protection of 'source water'.** In this context, MDC MUST investigate and **implement options for eliminating the discharge of domestic wastewater near a protected water source.***

- Page 9 of the Lyford Lane Presentation – ***Growth Projections:** The Lyford Lane Population based on growth projections is 32 dwellings, AND based on the District Plan is 75 dwellings down Lyford Lane.*

- On page 11 of the Lyford Lane presentation - you show a future demand for 26 dwellings. Our 158 Lyford Lane has 3 forecasted dwellings on this page. We note you exclude our current farm 5-bay shed as existing buildings.

- We have plans to develop one 5.33-hectare section of land with 2 dwellings and the MDC presentation excluded this section completely.

- We view Lyford Lane wastewater proposal as a wider Twizel issue and perhaps the whole township should be consulted given the **'extreme'** and **'almost certain'** risks of a damage to the town's water supply. **The words 'extreme' and 'almost certain' came from the risk assessment table in the *Twizel Drinking Water Safety Plan – Final PDF* — highlighted in red on page 85 of the 97-page PDF report.**

- Material provided to us by MDC; Indicate that Lyford Lane will have somewhere between 32 and **75 dwellings** based on future growth of Twizel. Are we deliberately ignoring MDC growth projections based on the District Plan and Growth Projections when planning for long-term infrastructure requirements for Lyford Lane?

Page 85 of the 97-page *'Twizel Drinking Water Safety Plan Cause 1.01'* *states that the **maximum risk** and it is **extreme** and **almost certain likelihood** that there is future contamination of the water catchment. This could cause major illness in all homes in the Twizel water scheme and within the township.*

Note on Page 1 of the *Lyford Lane Council report March 23* that was given to us in PDF.

- *Staff recommend that MDC 'approve in principle the servicing of Lyford Lane properties by pressure sewerage and the works be funded from reserves.*
- *'The **urgent need** for the (Lyford Lane) extension **due to septic tank discharges** occurring within the Twizel water catchment area.*
- *There is **material risk to the Twizel water supply due to wastewater discharge** over the Twizel water zone.*
- *It is **essential for this work to be undertaken as soon as possible from a public health perspective.***

Other:

The rural residential Twizel zones west and south of Twizel, RR1Z and RR2Z, are the appropriate hectare size.

MDC cites that a desktop analysis was done as to how many future developments could occur down Lyford Lane. It is mentioned in your plan change 25 document that six additional dwellings could be accommodated. But in previous work performed for MDC in the same year (2023) it was stated that Lyford Lane could accommodate 75-300 future dwellings based on similar rural residential density.

There is a significant difference in the expert work provided over 2023 and we believe because of the wastewater capex Lyford Lane is facing that MDC is deliberately trying to restrict development at Lyford Lane. We do not think this is the intent of the RMA, nor the existing development potential for Lyford Lane.

You also say that building down Lyford Lane is a non-complying activity unless a dwelling is connected to councils reticulated sewer network. We have not been given enough information to consider the costs and issues around connecting to this reticulated wastewater network.

We note we are outside the Twizel Water Supply Protection Area (TWSPA). The ECan desktop analysis was only a 1hr site visit to Lyford Lane, we consider this analysis flawed relative to our 24 years of analysis, and the 'expert' nature of the report is highly diminished given the exclusion of Rob Halls expert flood work.

We note in our feedback that 95% of Lyford Lane landowners want to be connected to town water and wastewater services.

The effects of flooding from a canal burst or hydro inundation can be offset by foundation height of any dwellings. This is how we have been able to build down Lyford Lane in the last 20 years. Our nearest boundary (for Lot 23/158 Lyford) to the canal is approximately 2.85km from the canal. Any canal burst and the subsequent water would be dispersed greatly over this 2.85km. The duration would also be short. The Rob Hall expert report also talks about the true left bank of the Twizel River being lower and would therefore take 2/3rds of the water coming from the Twizel River down the true left bank side. Our historical evidence suggest this to be true. It is also worth noting that any high rainfall event in the Twizel Ricer catchment is caught on the upside of the Pukaki/Ohau Canal where the Twizel River flows into Lake Poaka. The Lake Poaka area also has an area that ponds in high rainfall because the Twizel River culvert flowing under the canal only accepts a given amount of water. By design the amount of water that can flow downstream of the canal is capped because of the river watercourse running under the canal and culverts a specific size.

Any future measuring of water heights and volume in the Twizel River catchment should come from the bottom of the Puakaki/Ohau canal culvert as we have noticed in years past, that the height gauge is capturing water on the upside of the canal. An accurate reading would be to measure the Twizel River below the canal culvert.

What is ignored in the Twizel Flood modelling investigation expert reports is that the expert with the most hours and history down Lyford Lane, Rob Hall, is that his flood reports and work have been excluded. A glaring and obvious omission as his work has stood the test of time for the Lyford Lane zone and dwellings built to date in low-flood risk areas.

Our own experience of 24 years owning Lot 23 is that the Twizel River along the whole length of our boundary has never broken the banks in any of the flood event. In fact, the true left bank of the Twizel river opposite our boundary is where the water flows, and this has been completely ignored in all the desktop modelled water depth scenarios in the Twizel Flood modelling investigation report. We find this ECan report severely flawed based on our 24 years of experience and the expert Rob Halls work. One specific area they say does not flood, is actually inaccurate as the Twizel River overflows and into the Bendrose Stream at the bottom of our 158 Lyford properties south/east boundary, flooding this

property to the east of the river significantly. This is missed in the Twizel Flood modelling investigation report. Along with other Lyford lanowners and local farmers we have brought this flooding location concern to the attention of ECan employees over site visits the last decade.

Future Population Growth:

We believe it is important to comment on Twizel's historic and future population growth in order to account for appropriate level of Rural Lifestyle Zones and development. We believe the MDC are unfortunately underestimating the future growth of Twizel by several thousand people living here by 2050.

Anyone who believes that Twizel's population will be below 5000 by 2050 will be wrong. Using the average population growth rate of Twizel from the last 3 official NZ census results you get to a population north of 5,500 by 2050. A more than 3-fold growth in base population by 2050 from the 2022 population. Additionally

- It is also worth remembering the high number of tourists visiting Twizel every month, and that the Twizel population has many large swings with holidays, rowing, etc.
- Planning for major infrastructure should consider more than base population growth as the reality is the demands on Twizel's infrastructure is significantly higher given tourism excesses.
- Aging demographics and the growth of Christchurch city will also place high demands in Twizel's future growth.
- Twizel is heading towards major development in the Salmon and *Solar Industries.*

Twizel will be one of NZ's fastest growing towns between now and 2050. Our infrastructure planning and designs should reflect the growth prospects of Twizel. This would be in keeping with RMA requirements.

The wastewater proposal and plan put to Lyford Lane residents by MDC was built on ignoring appropriate future growth of population. We have spoken to existing and past MDC councilors and staff who agree that MDC have unfortunately underestimated Twizel growth for over two decades.

The wastewater MDC proposal scope and limitations were rather massaged to meet the 'design demand' that is not in keeping with RMA objectives around growth and further development.

The 'design demand' or as we like to think of it.... future capacity .... of the wastewater system should reflect projected growth down Lyford Lane that is not unduly manipulated downwards in a future dwelling number.

The expert report by GHD on Lyford Lane in January of 2023, report says based on the district plan and zone we could see 75-300 dwellings down Lyford Lane. And in foot note 4 'A reasonable expectation has been defined as a majority of land parcels above 4 hectares being subdivided into multiple parcels with a minimum area of 2 hectares each. Lyford Lane is capable of 75 future dwellings according to this 2023 report.

Based on this our 158 Lyford could possibly have 18 future dwellings.

This GHD report and in essence the 'wastewater design' MDC are directly trying to impact future dwelling development down Lyford Lane by proposing to install a wastewater system that is not built for future growth of this rural residential zone. Shortcutting the area's future needs.

With a Lyford Lane connection to wastewater and water most issues go away, and Lyford Lane should not see a restricted area of living and building, and all activity should be PER / Permitted Activity Status versus the unfair and restrictive Discretionary and non-complying activity status being proposed.

As disclosed previously in our wastewater submission and feedback Lyford Lane is not an area of Outstanding Natural landscape or beauty and has no direct line of sight with any major roadways or highways. Development should be allowed. We encourage MDC to listen to the majority consensus of Lyford Lane landowner's feedback.

Productivity of 158 Lyford Lane as a LUC 3 soil classification:

In our period of farming Lot 23 / 158 Lyford Lane, we typically run 220-352 Stock Units. Gross profit is somewhere typically between $15-$25,000 annually. We also have leased the property for less than this annually. The property is not economically viable as a farm or productive producer of commodities or produce for the areas economy or needs.

158 Lyford Lane is currently classed at HPL – LUC Class 3 soils

LUC 3 - Defined as 'Moderate limitations, restricting crop types and intensity of cultivation, suitable for cropping, viticulture, berry fruit, pastoralism, tree crops and forestry.'

We believe that our 158 Lyford Lot 23 land is not currently large enough or productive enough for the local economy to exclude the property from future sub-division under the National Policy Statement for Highly Productive Land 2022.

We also take the view that the National Policy for Highly Productive Land is around stopping 'new developments' in 'proximity' to our major food and population centers.

We believe our 158 Lyford Lane should be excluded from the LUC3 classification around land development as we are an existing plus 20-year development and produce little to no food on a scale that is intended under the National Policy Statement.

We believe through extensive reading that the inclusion of LUC3 was very a last minute 'policy addition' to the statement and the current National party and their coalition partners, plan to remove LUC3 soils from the National Policy Statement for Highly Productive Land 2022. So, by extension, our lot 23 / 158 Lyford is unfairly caught up in the MDC plan change 25 submission process, and yet this LUC3 is likely to be removed in the future.

From our lawyer:

There's also a broader question as to whether LUC 3 soils should be included at all in the National Policy Statement, either in terms of the interim protections or through mapping, on the basis that LUC3 soils are at the lower end of what are considered to be prime soils and do not share the same productive value as LUC 1 and 2 soils.

While LUC classification is a useful tool for providing an initial indication of the productive capacity of land, it doesn't take into consideration a range of other factors relevant to whether land can realistically be utilised for primary production, including:

- Whether the land forms part of a geographically cohesive area;
- Proximity of the site to conflicting land uses (and any potential for reverse sensitivity effects);
- Susceptibility to the effects of climate change, or other natural hazards; and
- The economic viability of utilising the land for productive land uses.

In many cases the NPS-HPL is operating exactly as intended - to prevent ad hoc loss of highly productive land. However, the interim definition is leading to perverse outcomes and preventing development of much needed housing on fragmented farmland that is already unviable for primary production.

Extract from MDC website:

Section 8 – Twizel Rural Residential Zones:

Hocken Lane Rural–Residential Zone is not at present serviced by reticulated sewage disposal. ***Part of the zone falls within the Twizel Water Supply Protection Area,*** *which denotes the area where contamination of* ***groundwater must be prevented to protect Twizel's community water supply.*** *It* ***is imperative that ground and surface water quality is protected from the effects of any additional development, where that development has the potential to cause adverse effects.***

Extract from MDC website:

Section 13 – Subdivision, Development, October 2017

Regarding Development:

Issue 3 – Costs of Infrastructure It is recognized that development facilitated by subdivision adds incrementally to demands on the infrastructure of the district. The Plan's rules need to be designed to require each new development to contribute a fair and reasonable sum towards the cost of that demand ***unless it is replacing an existing development.*** *A fair and reasonable share of costs needs to recognize: • That to manage and develop land (a natural resource) in an orderly and efficient way, it is* ***appropriate to install public utility services*** *(a physical resource)* ***for whole catchments in anticipation of development.*** *• That there is a need to provide for people and communities economic and social wellbeing by equitable sharing of costs of utility services over time.*

5 - *To require that* ***water supplies to subdivided allotments are of a sufficient capacity*** *and of a* ***drinkable standard.***

6 - *To require upon subdivision that* ***all new lots be provided with a means of connection to a reticulated water supply system,*** *where water from such a system is available.*

en followed by intensification or changes in land use that subsequently increases the demand for water usage. Where the proposed subdivision creates new allotments, and where the users will require water for human consumption, then that ***supply must be potable and reliable.***

Notwithstanding regular monitoring and testing programmes, ***individual wells run higher risks*** *of contamination. The* ***water resource can be better managed if a public supply system is installed*** *wherever practicable.* ***Having as many water users as is possible connected to the public water supply system increases the efficiency of use of the whole system,*** *including management of both the natural water resource and the physical resources involved in water supply.*

The design of stormwater systems and ***the capacity of existing systems must be adequate*** *to achieve satisfactory disposal. It is the responsibility of the person who changes the existing land and water surfaces to investigate the effects of the proposal and if any adverse effects will or could result from the subdivision of land, then mitigating measures must be carried out.*

Disposal and proper treatment of sanitary sewage is a matter of vital importance. This is *Section 13 – Subdivision, Development and Financial Contributions October 2017 13-8 Mackenzie District Plan particularly significant in terms of the protection of the quality of the surface and groundwaters and that of receiving waters. Adequate treatment of sewage effluent requires adequate provision for treatment works and means of disposal for the waste waters generated in the system. In the urban areas where density of development precludes individual disposal systems,* ***it is a Council function to provide sewage treatment and reticulation ensuring a safe means of disposal of the large quantities of urban sewage, treating it and discharging the wastewater.*** *In rural areas where connection is impracticable, care must be exercised to ensure the individual treatment plant does not cause pollution of any adjoining waterways or the underground aquifers, that could affect the quality of the district's or a locality's water supply. Subdivision for new industrial activities has to anticipate trade waste disposal needs which are often much higher than most other land use activities.*

The supply of electric power and telecommunications to all sectors of the community can readily be regarded as an essential service. *It includes any upgrading or establishment of a system to service an area, and supply to individual users of sites created upon subdivision. The provision of reticulated supplies will of necessity involve reticulation systems which can be either above or below ground, as well as (in some cases) substation structures. The widespread use of electric power means a provision of power lines and their associated structures. However, with appropriate planning, adverse effects of overhead lines can be mitigated to a certain degree, while for most properties in the residential, rural-residential, town centres and special conservation areas, provision of new reticulation is required to be by underground reticulation.*

GHD 'Lyford Lane' Report 2023 to MDC

Supporting Docs to the
B.D & C.B White Submission
on Plan Change 25

Lyford Lane

Wastewater Feasibility Options Study

Mackenzie District Council

19 January 2023

→ The Power of Commitment

Executive Summary

Lyford Lane is a private road located to the north-west of the Twizel township. There are currently several properties located on Lyford Lane which discharge partially treated domestic wastewater to ground through onsite septic systems. A number of these properties are located over Twizel's Drinking Water Protection Zone (DWPZ) and all the properties are located within Twizel's Source Water Risk Management Area (SWRMA) Zone 2. All properties on Lyford Lane are within the Source Water Risk Management Areas (SWRMA) Zone 2 for Twizel's drinking water supply. The DWPZ was developed in 2008 by hydrogeological studies. The SWRMA Zone 2 was determined in 2022 in the development of Twizel's Drinking Water Safety Plan.

Domestic wastewater discharges to ground within the DWPZ or the SWRMA Zone 2 have the potential to introduce direct contamination at source and therefore undermines the safety of the aquifer for drinking water, albeit that discharges into the DWPS are considered to have a higher likelihood of contaminating the drinking water source than discharges outside of the DWPS but within the SWRMA.

The Water Services Act (2021) dictates that drinking water providers must implement a high standard of care with regards to the protection of source water. In this context MDC must investigate options for eliminating the discharge of domestic wastewater above a protected water source. The water source in this case is the aquifer beneath the town. Therefore, in order to protect the town supply from contamination, the aquifer requires protection from any potential contamination.

GHD undertook a site visit on the 15th of September 2022 to understand site characteristics and identify design constraints that may impact the potential design solutions. Key site features included the Frasers Stream bridge crossing and the Dry Stream bridge crossing.

High level desktop reviews were undertaken to provide insight to the site characteristics within the project area. The outcomes of the reviews were as follows:

- Several geotechnical hazards were identified which provide additional difficulties and risk with construction:
    - Course alluvial deposits are located in the ground below the project area. This makes directional drilling very difficult as larger rocks will damage drill equipment.
    - The site is extremely flat. The entrance to Lyford Lane where the nearest council service is located is approximately 480 mRL. Most of the dwelling on Lyford Lane are at approximately 470 mRL.
    - Erosion risks may be present within 10 m of waterways.
- The groundwater table is likely to be shallow and within 1 – 2 m of the ground surface.
- The flood risk review found that all identified routes could have flood risk issues based on waterway flows. This is particularly of concern for the Frasers and Dry Stream bridge crossings.
- The ecological review identified the project area to be a spawning habitat for the Canterbury Galaxias in the Frasers Stream and tributaries, as well as providing habitat to other freshwater species. Consideration in both the construction phase and permanent solutions will be required to ensure there are no adverse environmental impacts on the waterways and local aquatic life.

Gravity systems were not considered as the site is located on very flat ground, which would require deep sewers and/or numerous network pump stations. The site is located above rocky ground, making excavation difficult and/or expensive. The high groundwater table also introduces a risk of infiltration to pipework.

Improving onsite treatment systems were not considered for a several reasons, mainly:

- High groundwater table – introduces complexities and costs with disposal systems,
- Inadequately treated discharge – systems will be self-managed by the property owner. Failure to adequately maintain systems will result in contaminated discharge,
- Depth and proximity of existing drinking water supply wells – there are several existing domestic supply wells within the DWPZ and SWRMA. Depth and proximity of existing drinking water supply wells – there are several existing domestic supply wells within the DWPZ (and therefore within the SWRMA Zone 2). These are relatively shallow (10 – 17 m deep) and there is risk of hydraulic connection between discharges and well points.

- Storage of blackwater – There is inherent risk of storing between 10 – 20,000 L of domestic waste at each property within the DWPZ or the SWRMA Zone 2. Failure events will result in discharge of contaminants within the DWPZ or the SWRMA Zone 2.

Two main options for the installation of low-pressure reticulation systems were investigated as part of this feasibility study: connection of all properties within the DWPZ to the wastewater network (Option 1), or connection of all properties on Lyford Lane (ie all Lyford Lane properties within the SWRMA Zone 2) to the wastewater network (Option 2). The former requires the connection of seven existing dwellings whereas the latter requires the connection of 13. Consideration has been given to future development in both cases in line with MDC growth projections and district plan. A sub-option to Option 2, Option 2.1, was investigated where the cost of the pressure sewer system for the 13 existing dwellings is covered by MDC, and cost for future dwellings is covered by the future property owner.

Option 1 requires the installation of a DN50 pipe for 1.2 km along Lyford Lane to connect all properties within the DWPZ. Option 2 requires the installation of a DN63 for 1.4 km along Lyford Lane to connect all properties on Lyford Lane. Option 2 also requires two additional pipes to account for the delineation in development along Lyford Lane, where the road splits into two. This requires the installation of a further 600 m of DN50 pipe. A number of additional non-return valves and flushing valves will be required as part of Option 2. Both options will need to navigate the river crossings by fixing pipeline to the bridges. Odour control units will also be required at the downstream location due to odour/septicity issues. The main differences between the two options are:

- Cost – Option 1 is expected to cost around $ 628,000, Option 2 is expected to cost approximately $ 1,416,000 and Option 2.1. expected to cost $ 1,028,000 (all excluding GST). The current assumption is that MDC will own and operate the pump system. Careful consideration and consultation will be required with property owners to determine the best ownership model for this area. This has the potential to significantly impact costs. For Option 2.1, the cost of the pressure sewer system for the existing 13 dwellings is covered by MDC, and cost for future dwellings is covered by the future property owner.
- Complexity – Option 2 requires the installation of 800 m of additional pipeline. The pressure systems become more difficult to operate within the intended design parameters (sufficient head, sufficient self-cleansing velocities) with increased pipe length and size. As such, the design may require further regular maintenance requirements such as flushing of lines. The length and diameter also increase odour and septicity concerns which are difficult to avoid due to the length requirement of the solution.
- Public buy-in – Option 2 will require greater buy-in from the affected residents. Some residents may see it as unnecessary to install reticulation when they are both not over the DWPZ, and already have a functioning and consenting onsite septic system. This is less relevant with the ownership model of Option 2.1 (refer Section 4.3).

An unweighted criteria analysis was undertaken to evaluate the suitability of the options with the criteria agreed by MDC. The complexities of operation associated with Option 2 reduced both the level of service and reliability. However, Option 2 had the greatest environmental and ecological benefit, whereas Option 1 was only considered satisfactory in this case, as discharge of domestic waste to ground continues within the SWRMA Zone 2.

Deliverability and operational risks inherently increase with the additional complexities in the design for Option 2.

Cost uncertainty was considered high in both cases due to the unknowns around the ownership model for the pressure sewer system, however, the smaller Option 1 capital cost would lessen the extent of cost uncertainty for this option.

	Option 1	Option 2	Option 2.1.
Capital Costs (excluding GST)	$ 628,000	$ 1,416,000	$ 1,028,000
Life Cycle Operating Costs (excluding GST)	$ 1,400	$ 3,400	$ 3,400

While Option 1 potentially offers some cost and project benefits, it still presents a potential risk to the Twizel drinking water supply. Option 2.1 however presents a lower risk in this respect and is therefore is recommended as the preferred solution.

However, it is recommended that consultation is undertaken with the residents of Lyford Lane to understand their position as this may impact both the ownership model and the extent of the network. These factors may alter the basis for the recommendations made in this report.

2. Background

2.1 Site characteristics

2.1.1 Project location

Lyford Lane is a private road located to the north of Twizel, off Glen Lyon Rd. There are 13 existing dwellings on Lyford Lane. Five of which are located within the DWPZ, two are partially.1 within the DWPZ, and the other six are not located within the DWPZ. An overview of the project is shown in Figure 1. Details of the individual properties are provided in Table 2 in Section 2.1.4.

The project objectives include providing wastewater solutions to either all properties along Lyford Lane (blue shaded area in Figure 1), or just the properties along Lyford Lane that are within the DWPZ (where the red border overlaps the blue shaded area in Figure 1).

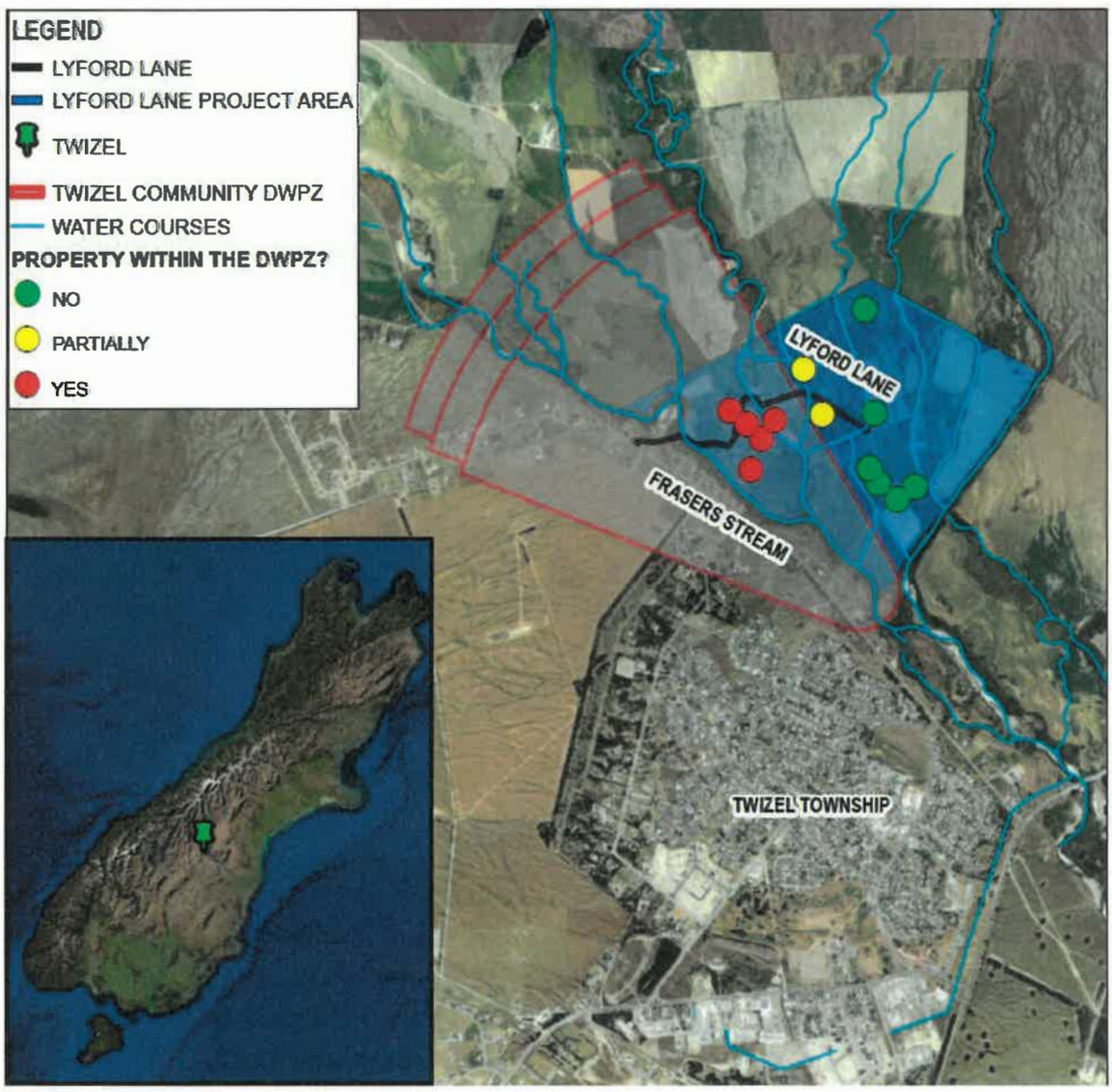


Figure 1 *Lyford Lane Wastewater Investigation Overview*

[1] Defined as a portion of the property to the boundary being above the DWPZ.

ii. **Mahinga Kai** – to maintain vital, healthy mahinga kai populations and habitats capable of sustaining harvesting activities.

iii. **Kaitiakitanga** – to promote collaborative management initiatives that enable the active participation of Ngai Tahu in freshwater management.

It is noted that the existing management method of discharging treated domestic wastewater to ground (in most cases) goes against the key principle of maintaining and protecting water bodies, because, in this case, there is likely a direct hydraulic connection between the aquifers and surrounding streams (Section 2.1.3.2).

It is understood that for the one pressure sewer installed on Lyford Lane, consultation was undertaken with Te rūnanga o Arowhenua and Te rūnanga o Waihao who both approved the system as it aligned with their core interests of eliminating the discharge of treated domestic wastewater to ground. The Aoraki Environmental Consultancy is an agency owned by Te rūnanga o Arowhenua and typically facilitates consultation between rūnanga and government processes.

2.2.2 Current and future drinking water management

The current management of the Twizel DWPZ is split between MDC and ECAN. In this context MDC manage the allocation of the DWPZ, and the utilities and infrastructure above which including Twizel's drinking water supply. ECAN manage environmental activities such as discharge of contaminants to air, land and water and in this context, discharge of treated domestic wastewater to land.

Recent legislation for the Drinking Water Standards for New Zealand was updated to improve the quality of drinking water. One of the objectives of the Water Services Act 2021 is to "…enable risks to source water to be properly identified, managed, and monitored". This report seeks to identify the extent of the risk to drinking water and provide solutions for ongoing management of domestic wastewater discharges for Lyford Lane. This feasibility study can be used to inform required capital works under the proposed Three Waters Reform.

2.3 Growth projections

The magnitude and location of growth projections for Twizel will impact the applicability of design options for Lyford Lane, particularly for:

i. Connection to the reticulation network from Lyford Lane, and

ii. Conveyance to the wastewater treatment plant.

This section will discuss the growth projection parameters relevant to the Lyford Lane wastewater feasibility study. This feasibility study will not investigate the impact on Twizel's wastewater treatment plant.

MDC have determined spatial plans (Mackenzie District Council, 2021) for the development of its settlements. For Twizel, this has been set out as displayed in Figure 8.

Lyford Lane

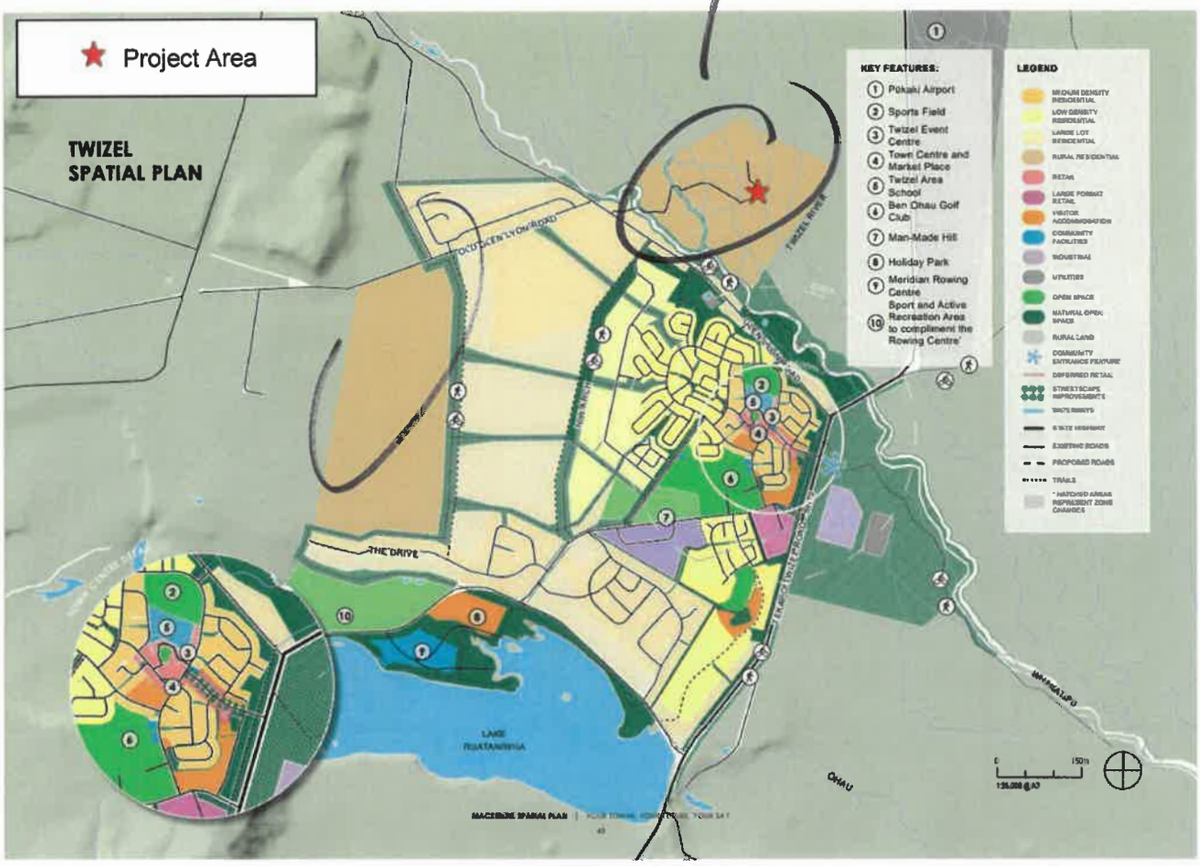


Figure 8 ***Twizel Spatial Plan***

The project area for this feasibility study, Lyford Lane, is located north of Twizel in a 'Rural Residential' zone. This category is defined by having 0.5 – 2 dwellings per hectare. The total area of properties within Lyford Lane assigned as 'Rural Residential' is approximately 150 hectares. This equates to an expected capacity of between 75 – 300 dwellings. The area of 'Rural Residential' land which overlaps the DWPZ is approximately 50 ha. This reduces the expected capacity to between 25 – 100 dwellings. These estimations have however been calculated based solely on the zoned area and district plan detail. There are currently only 19 sections with a total of 13 dwellings. This equates to approximately 0.09 dwellings per hectare which is significantly less than the district plan guidelines of 0.5 – 2 dwellings per hectare. Basing future network demand on the district plan guidelines is expected to significantly overestimate the design requirement.

Twizel's future population growth projections are detailed in Figure 9 (Mackenzie District Council, 2020). With reference to Figure 9, by 2050 the projected population is expected to increase to between approximately 2,900 and 3,700. The recommended value as defined by MDC is 3,395 at 2050. This equates to an average increase in population size of 3 % per year (231 % increase to 2050 based on the 2022 population).

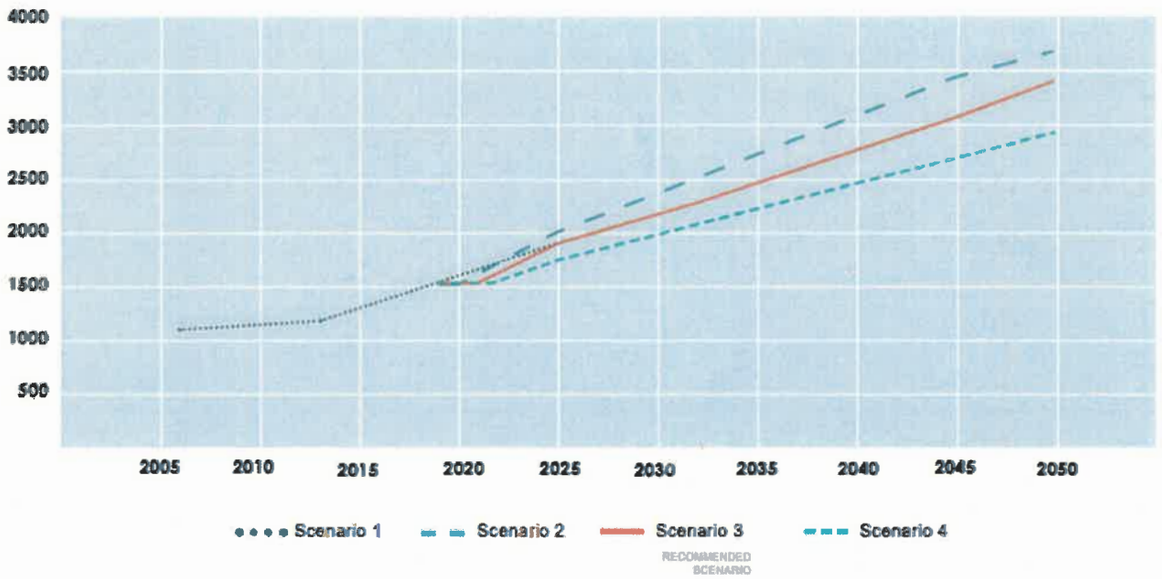


Figure 9 *Twizel Population Growth Projections*

There are clear differences between estimating future population based on the district plan and based on growth projections. The district plan alone overestimates population increase and therefore network requirements, where the growth projections provide a more modest estimation. However, the number of dwellings forecasted through growth projections are greater than what would be expected through reasonable subdivision of the lots based on existing property sizes. Therefore, a reduction[4] will be applied to the growth projections to reach the design demand.

Table 3 details the population projections using the different methods, including the adopted design populations. Although a typical design life for wastewater systems would be 100 years, projections are only accurate to 2050 and extrapolating beyond this would be unreliable. The design life will therefore only assess projected demands to 2050. Note that the population size is estimated as per NZS4404:2010 (2.5 – 3.5 people per dwelling).

Table 3 *Estimated projected dwellings number for Lyford Lane*

Design Solution	Existing Population (Dwellings)	Design Population Based on Growth Projections (Dwellings)	Design Population Based on the District Plan (Dwellings)	Adopted Design Population (Dwellings)
All properties in Lyford Lane	39 (13)	96 (32)	225 (75)	78 (26)
Only properties within the DWPZ	21 (7)	63 (21)	75 (25)	30 (10)

75!

[4] This is based on a reasonable expectation of subdivision within the area. A reasonable expectation has been defined as a majority of land parcels above 4 ha being subdivided into multiple parcels with a minimum area of 2 ha each.

4.1.5 Challenges

The following challenges are associated with this option:

- For future development, this option relies on the installation of septic tanks and disposal systems for properties outside the DWPZ. There may be additional costs for MDC in consenting and regulation for these properties.
- This solution does not remove discharge of domestic waste within the SWRMA Zone 2 (refer Section 2.1.3.2).

4.2 Option 2 – Reticulate all properties on Lyford Lane

4.2.1 Description

This solution provides low pressure wastewater reticulation to all properties in Lyford Lane and therefore avoid wastewater discharges to ground within both the DWPS and the SWRMA from these properties. An overview of the pipe alignment and key infrastructure is shown in Figure 14. Also shown are the assumed future residential properties for the Lyford Lane area (see Section 2.3). The system is designed for use of a grinder pump pressure system as described in Section 4.1.1.1.

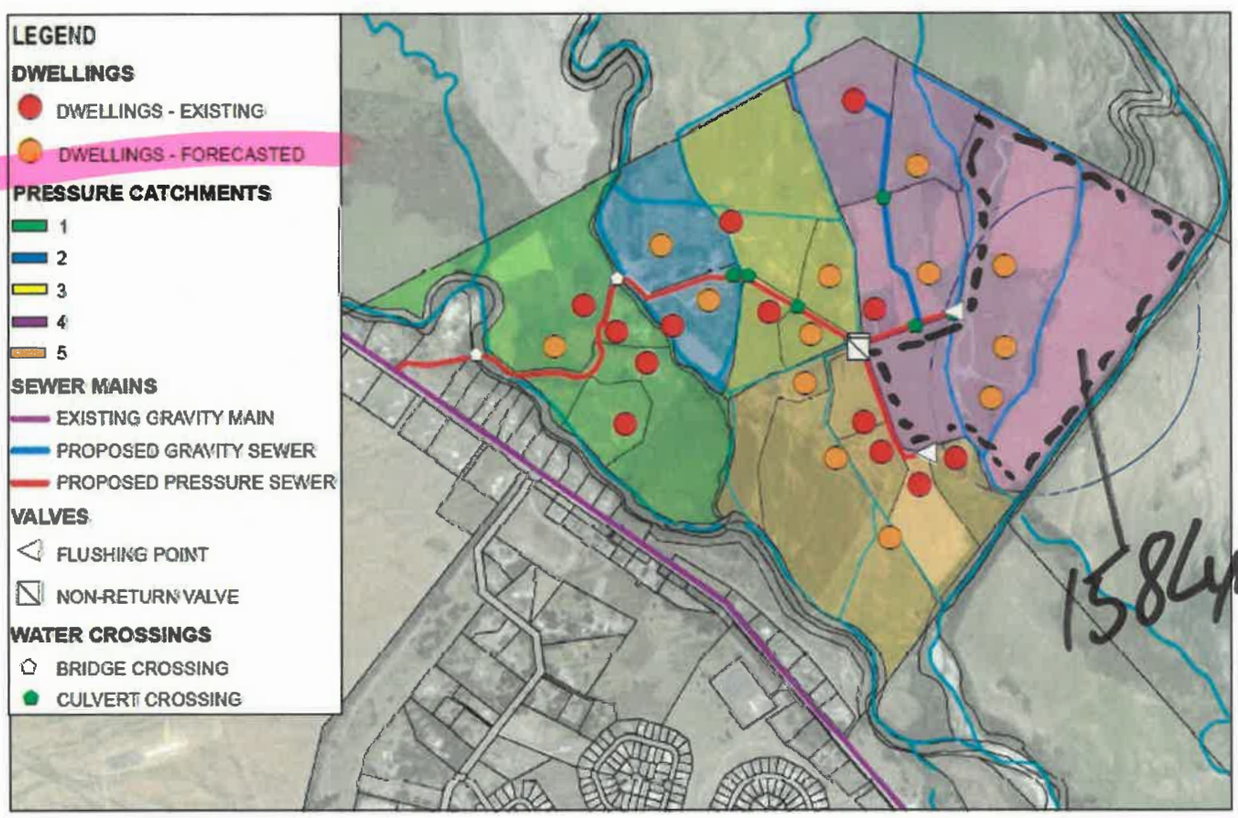


Figure 14 ***Option 2: Wastewater connection for all properties on Lyford Lane***

Refer to Appendix B for detailed overview drawings.

⊃ 3 forecasted for 158 Lyford / Lot 23

Further maintenance advice can be found in Water New Zealand Pressure Sewer Guidelines, Part D.

The odour control unit has been assumed to require one full replacement per year and is able to be done by the MDC maintenance contractor. This has been scaled to reflect the increased load for Option 2.

4.2.4 Benefits

This option can provide the following benefits:

- This option eliminates all discharge of domestic wastewater to ground in Lyford Lane for both the DWPZ and the SWRMA Zone 2:
    - This removes the use of septic tanks and thus the risk of contamination of the drinking water supply as a result of domestic discharge from properties on Lyford Lane.
    - This removes the consenting requirement (both from MDC and ECAN) for domestic discharge to ground for future developments.

4.2.5 Challenges

The following challenges are associated with this option:

- This option has the highest capital cost ($ 1,416,000 excluding GST, compared to $ 628,000 excluding GST). This assumes that MDC own and operate the pump systems. The assumption of the ownership model has potential to significantly impact the cost estimation and subsequently the preferred option. The ownership model will need consideration and consultation with effected residents to confirm this assumption.
- This option will require the most buy-in from residents in Lyford Lane. Some residents may see it as unnecessary to install reticulation when they are both not within the DWPZ, and already have a functioning and consented onsite septic system. This is particularly of note when referencing the potential ownership models (Section 4.1.1.1).
- As the rate and location of development may differ from the assumptions made in this report, managing optimal functionality of the system may prove difficult. This is exacerbated by the requirement of pressure zones and greater pipe lengths. Regular monitoring will be required to ensure that the system operates as intended.
- Self-cleansing velocities are only just achieved in both cases. Due to the complexities of the system and potential inaccuracies in the high-level analysis, maintenance requirements (manual flushing at the flushing points) may increase.
- Without mitigation, there will be greater odour and septicity issues when compared with Option 1. There will be further costs associated with this if installing odour treatment.

4.3 Option 2.1. – Reticulate all properties on Lyford Lane (Cost adaption)

Option 2 assumes that MDC pay for both existing and future pump systems. An alternative to Option 2 is that MDC does not fund the installation of the pressure sewer system for all future dwellings on Lyford Lane, but that future dwellings will need to meet the full cost of installing a pressure sewer system to gain consent approval. Note that detail of what properties are existing and what are forecasted are shown in Figure 14.

The difference between Option 2 and Option 2.1. is the exclusion of boundary kits and pump units for the latter option. Refer to Appendix D for the cost estimation for detail.

There is no difference to the design of the system with this sub option. This section therefore presents a comparison of costs between Option 2 (Section 4.2) and Option 2.1 (Section 4.3), as shown in Table 11.

5.4 Summary of Options

Option 1 provides a design solution which eliminates domestic wastewater discharge within the DWPZ, whereas Option 2 provides a design solution which eliminates domestic wastewater discharge for all properties in Lyford Lane (discharges are eliminated in both the DWPZ and SWRMA Zone 2). Option 2.1 provides an adaption to the ownership model shown in Option 2.

The key differences between the options from the criteria analysis are:

- There is a significantly greater capital cost associated with Option 2. This is largely due to the additional cost of pump units per property. The future demand (refer Section 3.2) was assumed as 10 dwellings (7 existing) for Option 1, and 26 (13 existing) for Option 2. Considerations to the ownership model may alter this value (refer Section 4.1.1.1).
    - The cost for Option 2 does reduce with the ownership model discussed in Option 2.1 (refer Section 4.3), where the cost of the pressure sewer system for the existing 13 dwellings is covered by MDC, and cost for future dwellings is covered by the future property owners.
- As Option 2 requires a significantly greater pipe distance for the network, and there are greater concerns around septicity and odour issues than for Option 1. Careful planning will be needed to mitigate this.
- Due to the complexities of the system, Option 2 will also require closer monitoring and optimisation as development occurs. This has not been included in operational costing.
- Option 2 will require greater buy-in from the affected residents. Some residents may see it as unnecessary to install reticulation when they are both not within the DWPZ, and already have a functioning and consented onsite septic system. This is less relevant with the ownership model discussed in Option 2.1 (refer Section 4.3).
- Option 1 does not fully eliminate the discharge of domestic wastewater to ground in Lyford Lane:
    - Although this option does remove discharge of domestic wastewater within the DWPZ, discharge still occurs within the SWRMA Zone 2. Therefore, there is still risk of contamination to the aquifer if Option 1 is chosen. The magnitude of this risk must be determined by the water service provider.
    - This would likely not completely satisfy Iwi/Māori interests and some other local stakeholders; however, it is recommended early consultation occurs to understand their exact perspective on the matter.
- Both options are considered environmentally sustainable from an operations perspective.
- The delivery of the project for Option 1 will be inherently simpler due to the simpler network, lower number of effected dwellings, shorter pipe lengths, and lower number of water crossings.

6. Recommendations

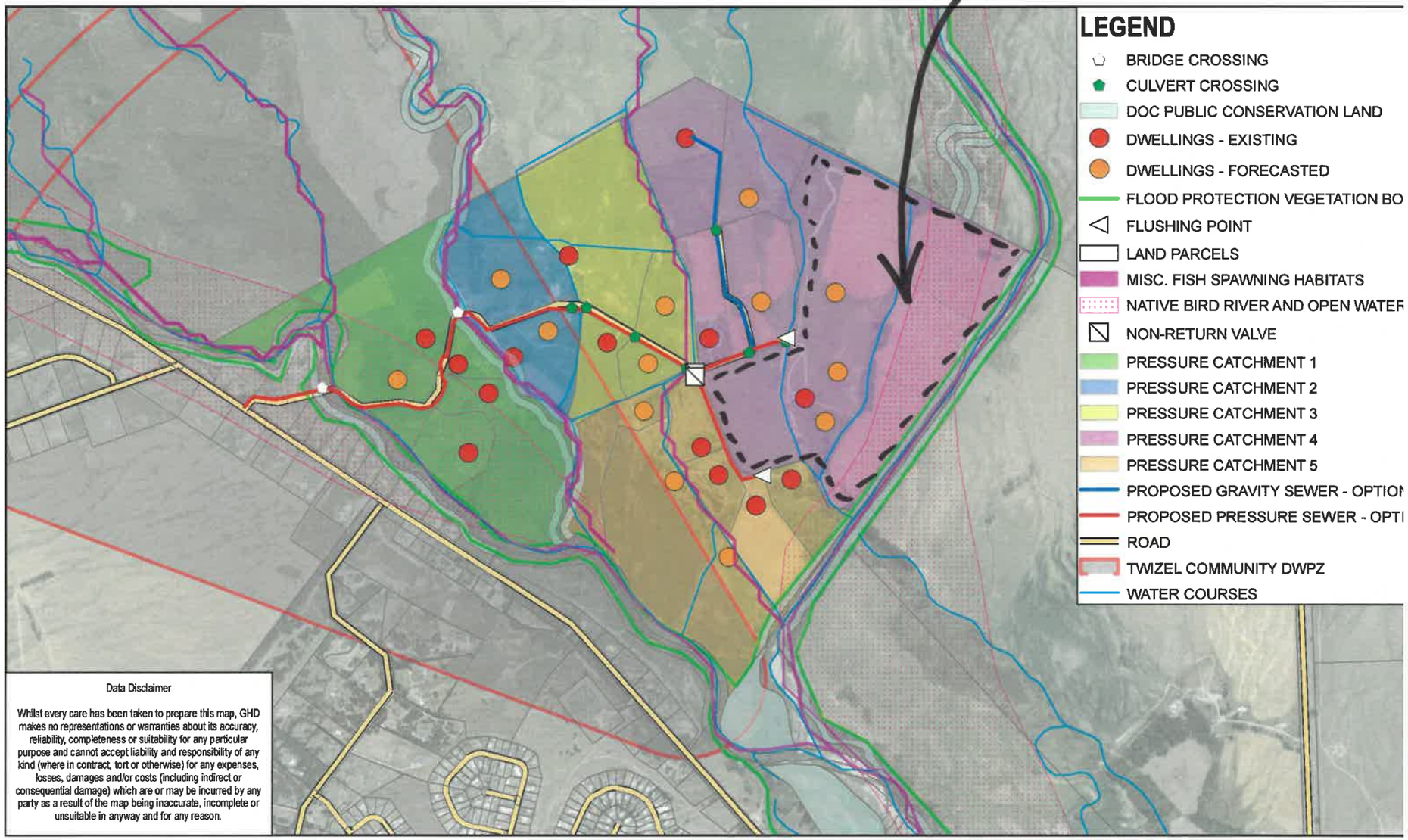
This study investigated the feasibility of wastewater pressure systems for Lyford Lane to minimise the risk of drinking water contamination from the discharge of domestic wastewater to ground. The unweighted criteria assessment carried out for each option indicated a favourable outcome for Option 1, due to it being the smallest extent and the lowest capital cost option.

The residual risk of contamination of the drinking water supply from wastewater discharges outside of the DWPZ, but within the SWRMA Zone 2, can be considered to outweigh the cost and project benefits offered by Option 1.

We therefore recommend that Option 2.1 be progressed as the preferred solution.

There remain uncertainties around the ownership model of the system, however, which may impact the option selection. It is recommended that consultation is firstly undertaken with affected residents.

Lot 23 158 Lyford Lane 37ha.



Data Disclaimer

Whilst every care has been taken to prepare this map, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (where in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in anyway and for any reason.

Paper Size ISO A4

0 100 200 300 400

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: NZGD 2000
Grid: NZGD 2000 New Zealand Transverse Mercator

GHD

MACKENZIE DISTRICT COUNCIL
LYFORD LANE
WASTEWATER FEASIBILITY OPTION ASSESSMENT

Project No. 1
Revision No. A
Date 1

OPTION 2 OVERVIEW

FIG

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Print date: 19 Jan 2023 - 14:38

Data source: Eagle Technology, Land Information New Zealand.

Table 21 *Hydraulic Analysis for Option 2 (All properties on Lyford Lane) – Existing Demand*

Zone No.	Conn. To Zone	No. Pumps in Zone	Accumulated Pumps in Zone	**Max Velocity (mps) Low**	Length Of Main (m)	**Pipe Size (mm)**	Accum Friction Loss (m)	Static Head (m)	**TDH H**	**Accumulat Retentior Time Downstrea (Hr)**
1	1	4	13	**0.69**	752	**63**	12.99	4	**16.99**	**4.30**
2	1	1	9	**0.61**	334	**63**	17.44	5	**22.44**	**2.76**
3	2	2	8	**0.59**	320	**63**	21.41	6	**27.41**	**2.97**
4	3	2	2	**0.64**	268	**50**	25.04	7	**32.04**	**6.12**
5	3	4	4	**0.82**	349	**50**	31.58	10	**41.58**	**3.99**

Table 22 *Hydraulic Analysis for Option 2 (All properties on Lyford Lane) – Future Demand*

Zone No.	Conn. To Zone	No. Pumps in Zone	Accumulated Pumps in Zone	**Max Velocity (mps) Low**	Length Of Main (m)	Pipe Size (mm)	Accum Friction Loss (m)	Static Head (m)	**TDH H**	**Accumulat Retentior Time Downstrea (Hr)**
1	1	5	26	**0.93**	752	**63**	24.21	4	**28.21**	**2.15**
2	1	3	21	**0.84**	334	**63**	32.94	5	**37.94**	**1.18**
3	2	4	18	**0.79**	320	**63**	40.19	6	**46.19**	**1.32**
4	3	7	7	**0.92**	268	**50**	50.24	7	**57.24**	**1.75**
5	3	7	7	**0.92**	349	**50**	53.28	10	**63.28**	**2.28**

Zone 4 is 158 Lyford

Lyford lane, MDC Proposed Wastewater Scheme

- PowerPoint
- Council meeting
- Follow Up Correspondence Oct. 26 2023

Supporting Docs to the B.D & C.B. White submission on Plan Change 25

Lyford Lane, Twizel
Proposed Wastewater Scheme

OUR PLACE

Mackenzie
DISTRICT COUNCIL

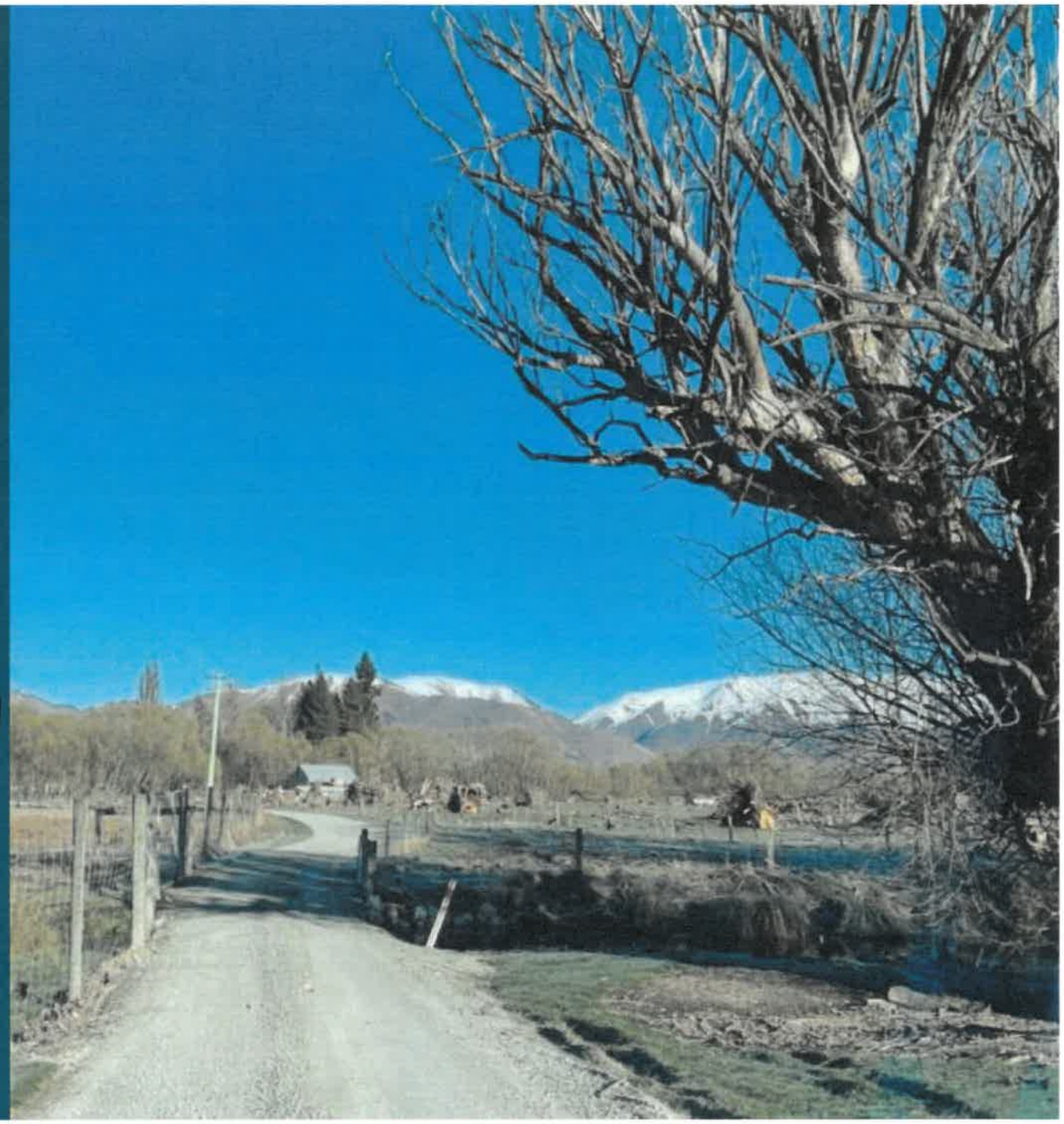
Consultation with Lyford Lane owners and residents – 23 May 2023

OUR PLACE

Mackenzie
DISTRICT COUNCIL

Why extend the wastewater network into Lyford Lane?

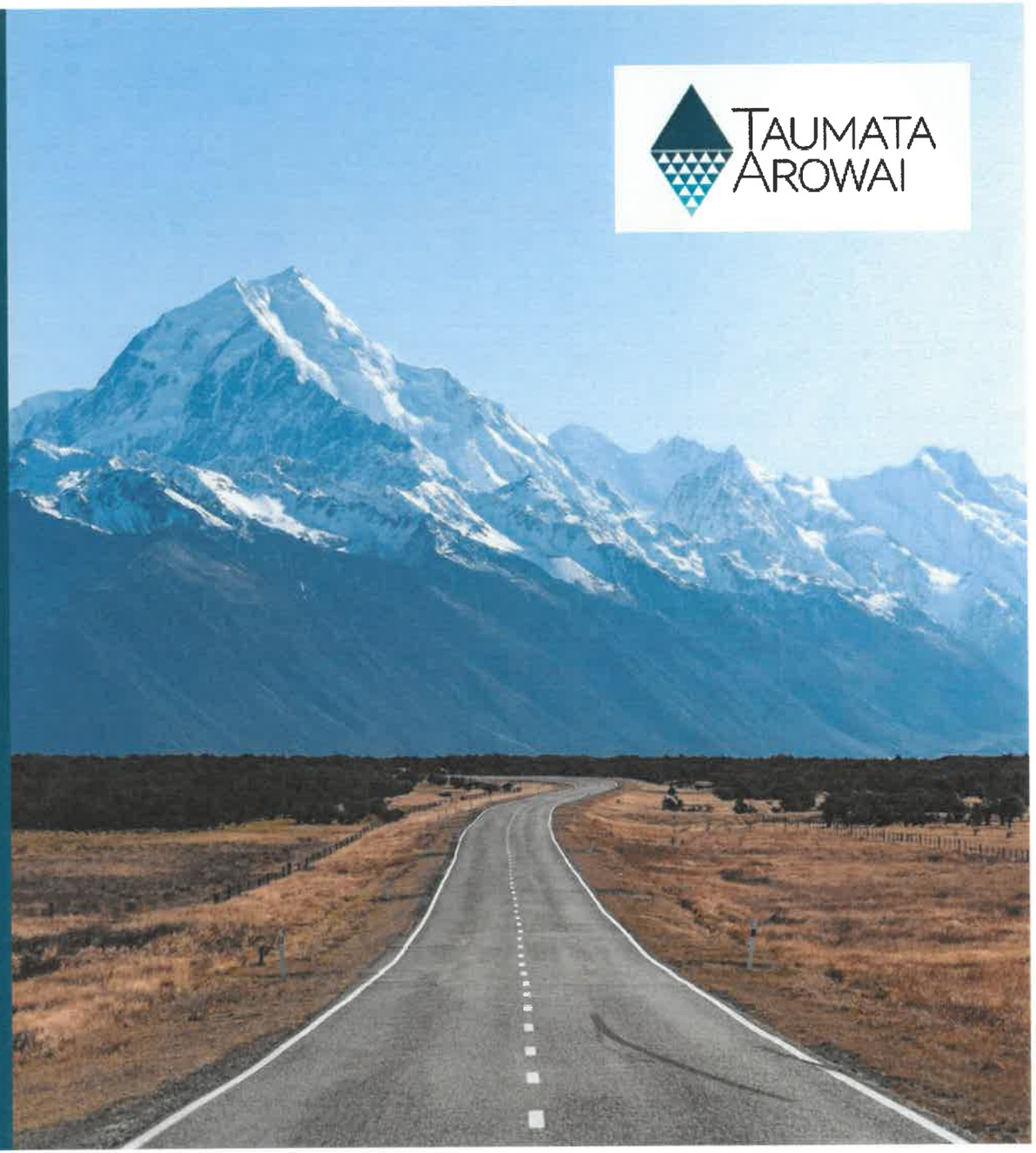
Domestic wastewater discharges to ground within the Lyford Lane development area have the potential to introduce direct contamination at the source of Twizel's water supply and therefore puts the safety of the aquifer for drinking water at risk.



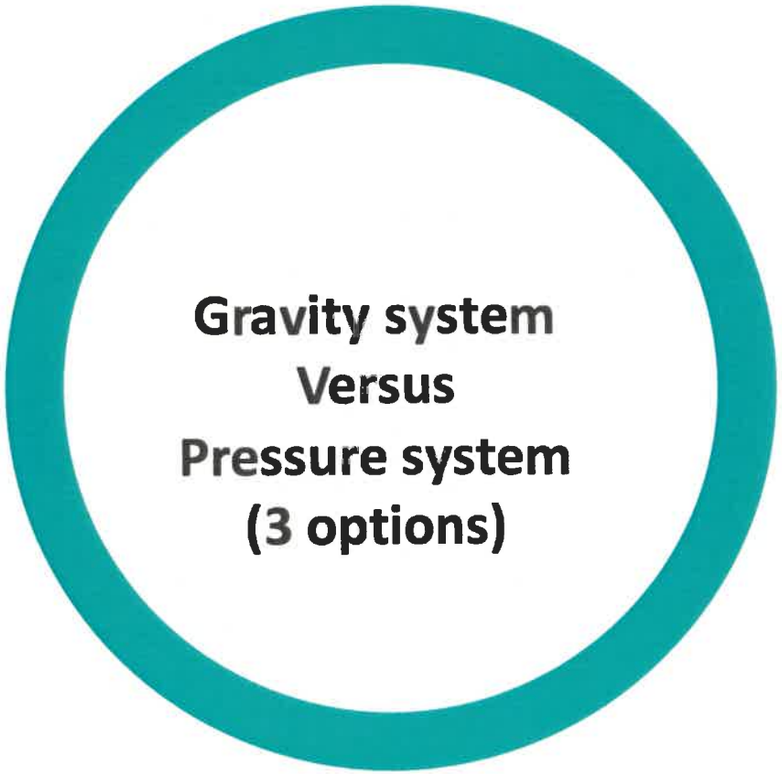
Why Now?

New Regulatory Requirements

The Water Services Act (2021), dictates that drinking water providers must implement a high standard of care with regards to the protection of source water. In this context, MDC must investigate and implement options for eliminating the discharge of domestic wastewater near a protected water source.



Options Assessed



Gravity Sewer - As the site is located on very flat ground, it would require deep sewers and/or numerous network pump stations. The site is located above rocky ground, making excavation difficult and/or expensive. The high groundwater table also introduces a risk of infiltration to pipework.

Pressure Sewer - Pressure sewer networks do not need to be laid to grade, can be shallower and will be smaller in diameter, thus causing less disruption during construction. They also have a lower financial and carbon cost. Being under pressure, they prevent the ingress of groundwater, common in gravity sewers.

Accordingly, the gravity option was ruled out.

Growth Projections

Forming the basis of the hydraulic design and future connection charges.

Design Solution	Existing Population (Dwellings)	Design Population Based on Growth Projections (Dwellings)	Design Population Based on the District Plan (Dwellings)	Adopted Design Population (Dwellings)
All properties in Lyford Lane	39 (13)	96 (32)	225 (75)	78 (26)
Only properties within the DWPZ	21 (7)	63 (21)	75 (25)	30 (10)

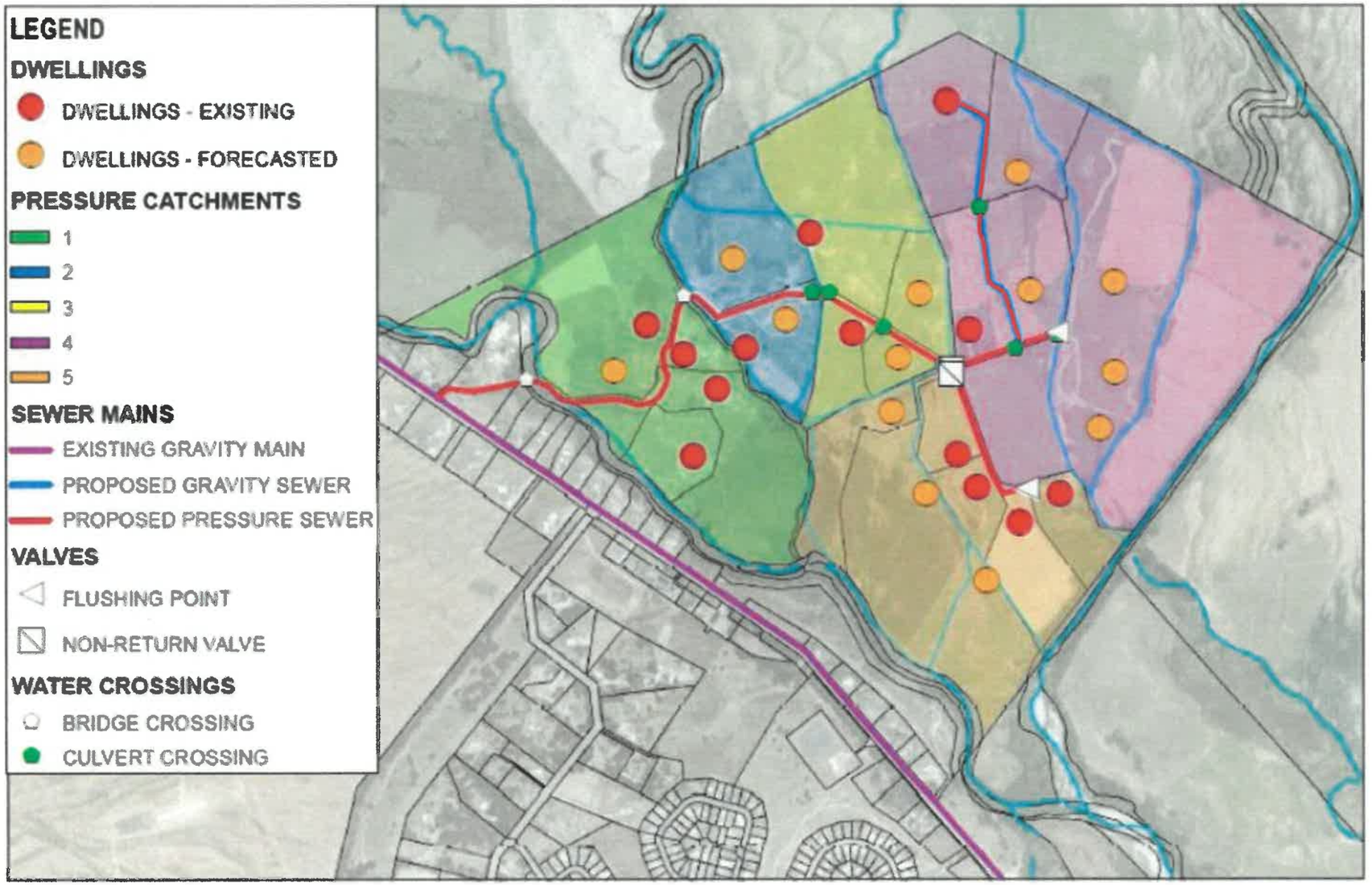
The proposal that has been recommended to Council is that the 13 owners of existing dwellings will not be required to meet the capital cost of on-site or off-site infrastructure. All new dwelling owners, up to a maximum of 26, will be required to make a capital contribution to the off-site costs of the pressure sewer reticulation network, and meet the full cost of all on-site infrastructure.

Option 2.1 –
13 only Properties funded by MDC

No of pumps - 13
Future demand - 26
Total Length - 2,023m
GHD Estimate - $1,028k

(Assumes new building owners fund future connections and pumps).

Preferred Option of MDC



Not the case of future demand: Yet we dispute your future demand based on your own report 32 & 75 dwellings down Lyford Lane:

Proposed Project Funding (of Preferred Option 2.1)

Estimated Construction Costs (excluding professional fees)

After some value engineering, based on recent pressure sewer installations in the Canterbury region, (including Waimakariri and Selwyn District), the cost estimate for the Lyford Lane pressure sewer scheme is in the order of $790,000.

This is made up of $550,000 for the main pressure sewer pipe network and a further $240,000 for the supply and installation of the on-site tanks, pumps and pipework to connect the existing private properties.

Next Steps

- We are looking for your feedback on the proposal by the end of May, to be incorporated into a report back to Council in June 2023.
- Should Council agree to proceed with the report recommendations to build a wastewater scheme, work would start on the detailed design. This would include selecting the pipeline route, engaging with owners on the best location of the wastewater pump unit as well as the detailed hydraulic design.

May 23rd
Wks Meeting

gave us till
June 9th 2023

We have been waiting for a district Plan for how long? Yet we remain patient & try to work with MDC

Roll out timeframe

- Report back to Council in late June 2023
- Decision on preferred approach expected by July/August 2023
- Prepare design and tender by October/ November 2023
- Construction Jan – May 2024
- Completion June 2024

7.3 LYFORD LANE WASTEWATER FEASIBILITY STUDY

Author: John Mackie, Engineering Manager (Acting)

Authoriser: David Adamson, GM, Operations, Planning and Regulatory Services

Attachments: 1. Lyford Lane WW Options Assessment (under separate cover)

PURPOSE OF REPORT

This report addresses the proposed extension of the Twizel Wastewater scheme to the Lyford Lane area.

STAFF RECOMMENDATIONS

That the Mackenzie District Council:

a) Receives the report on the wastewater extension for Lyford Lane.
b) Recognises the urgency of these works in providing a further barrier to contamination of the Twizel water supply.
c) Approves in principle the servicing of the Lyford Land properties by pressure sewerage and the works be funded from reserves.
d) Approve engagement to be undertaken on the extension of the Twizel Wastewater network to service Lyford Lane, Twizel.
e) Notes that this engagement and subsequent decisions will be reported back to Council by 30 June 2023.

EXECUTIVE SUMMARY

This paper addresses the proposed extension of the Twizel Wastewater scheme to the Lyford Lane area. In particular this paper considers:

- The urgent need for the extension due to septic tank discharges occurring within the Twizel water catchment area.
- The preferred wastewater system for servicing Lyford Lane.
- The cost of the works and funding mechanisms; and
- Community consultation and the next steps towards delivery of the project.

The Lyford Lane rural residential area is not currently served by reticulated wastewater, and the current residents discharge wastewater to ground following on-site treatment. Nine systems lie within the Drinking Water Protection Zone (DWPZ) for Twizel and as such, create material risk to the raw water quality that is treated prior to supply. This issue sits within Twizel Waters Safety Plan.

It is essential for this work to be undertaken as soon as possible from a public health perspective. While Twizel's water treatment plant has the ability to treat contaminated water a multiple barrier approach is essential to guaranteeing water quality under all conditions. If this work does not proceed prior to setting up of the water entities, it may be delayed in the transition and therefore not proceed for several years.

A feasibility study has been completed examining options for extending the Council's wastewater network to service the properties. The study was completed by GHD and recommends a pressure sewer system as the most appropriate system. A pressure sewer system comprises of small package pumping stations in each property connecting to small diameter flexible pipelines in the road that convey the wastewater to the discharge point. This is similar to the system that serves the North-West Arch part of Twizel and one property in Lyford Lane. Honeybone Property

A pressure system is materially less expensive, more resilient to flood risk and other natural hazards and provides flexibility to adapt to different future scenarios than a traditional gravity system.

Pressure systems are used extensively elsewhere in the country with the North-West Arch area in Twizel being the largest area in the district served by this system. Pressure systems collect and store raw sewage from each connected household in a small below ground storage and pumping tank, located on each property. The property's effluent accumulates in this tank until sufficient quantities trigger the macerating pump which grinds the effluent into slurry. The slurry is pumped into the Council's pressure sewer main on the road reserve and conveyed under pressure via flexible, small diameter PE pipes. A parallel paper on a district wide Pressure Sewer Policy for Council consideration addresses the policy questions relating to use of this system type.

As it is proposed to extend the existing Wastewater network, a decision will be required to extend the rating district.

On approval from Council, staff will refine the design and forecast costs of the scheme, prepare targeted engagement material. Council has already finalised the policy for pressure sewerage systems.

Necessary engagement would then be undertaken to enable Council to consider extension of the scheme by June 2023. Works could then commence in the latter part of 2023.

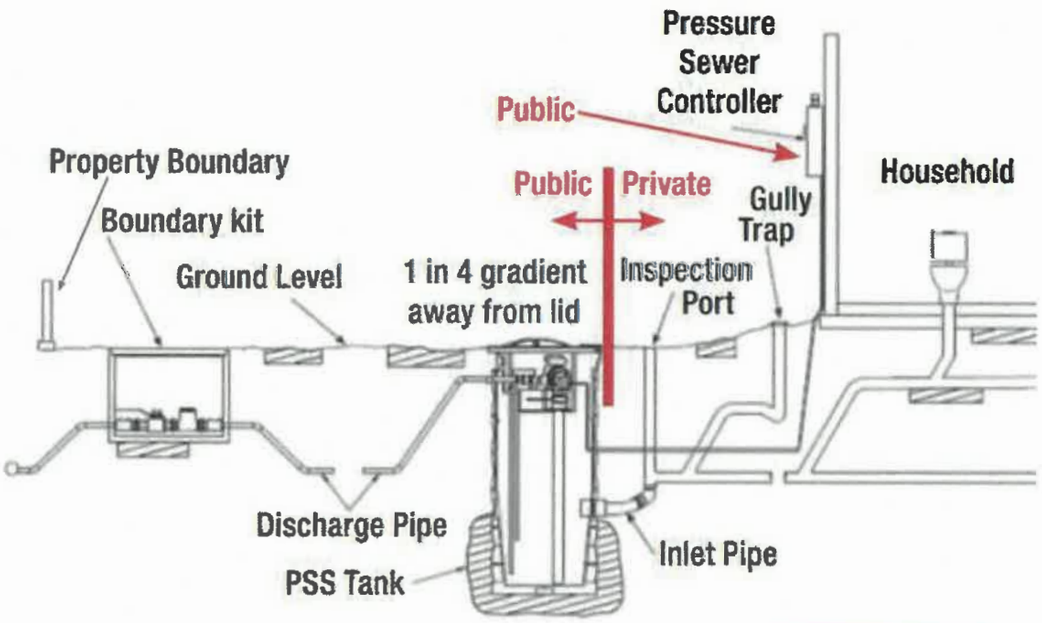
OPTIONS FOR SERVICING LYFORD LANE

Lyford Lane is a 19-lot rural residential subdivision, located to the north of Twizel. Of these properties, nine lie in or partly over the Twizel drinking water protection zone. In the GHD report, a traditional gravity reticulation with pumping stations to convey all wastewater to Twizel, was assessed and ruled out at this location for a number of reasons.

- gravity sewer systems are susceptible to inundation which may cause sewer spills to the environment in heavy rain or flooding events, highly un-desirable in a sensitive drinking water protection zone.
- the excessive cost of a gravity system which would require substantial pumping capacity to discharge into the Twizel gravity network.
- gravity system has less seismic resilience than a pressure sewer network.
- the construction of a gravity system is more disruptive on the community.
- the construction of a gravity system has a higher carbon cost and environmental impact.

The only appropriate system type is a pressure sewer system, with individual pump units installed in each of the existing wastewater unit.

Figure One: General Layout of the Pressure Sewer System



The estimated cost to provide a pressure sewer system to service all of Lyford Lane is in the order of $550,000, plus a further $240,000 to provide the tanks, pumps and pipework on private property for the existing nine dwellings that are located over (or partially over) the Twizel drinking water protection zone. A feasibility study has been completed by GHD into the options for servicing the area (Appendix B) and confirmed a pressure sewer system as the preferred option. The proposed system is lower cost, adaptable to future expansion, eliminates the risk of infiltration, is resilient to land movement and requires minimal maintenance.

FINANCIAL IMPLICATIONS

Capital Cost Estimate.

The cost estimate for the Lyford Lane pressure sewer scheme is in the order of $790,000 (including a suitable contingency). This is made up of $550,000 for the main pressure sewer network and a further $240,000 for the supply and installation of the on-site tanks, pumps and pipework to connect the nine existing private properties. A rounded total of $790.000.

Funding and Financing

The estimated cost of the scheme extension is $550,000 for the mains and related works within the road corridor and further $240,000 or more to supply and install the pumping units, electrical work and lateral to each of the twelve existing properties with on-site treatment systems.

There are currently 19 sections within the Lyford Lane development and a total of 13 existing dwellings (and one property with no dwelling). While the operative District Plan would permit up to 75 dwellings within this 150-hectare zone, the growth projections from the GHD report are more conservative and suggest that a design growth figure of 26 dwellings by 2050 to be more realistic.

Their projections are based on population growth forecasts and the current configuration relating to lot sizes.

26 dwellings has been the basis of the scheme design.

Funding of work and extension to rating district

Staff recommend that Council fund the on-site infrastructure for the existing 12 dwellings in Lyford Lane on the basis that the owners have, what was thought to be an appropriate, consented solution. Through no fault of their own, the water regulatory landscape and risk appetite has changed. However, any future new building consent for a new dwelling or subdivision application, would need to meet the full cost of installing a pressure sewer system, to gain consent approval.

The Revenue and Financing Policy confirms that capital expenditure to upgrade or build new assets is funded firstly from other sources (e.g., subsidies, grants, fundraising, financial contributions) and then borrowing. It is recommended that Council funds this project from reserves.

Council is required under the Council's Significance and Engagement Policy to engage with the community in relation to this proposal. Subject to Council approval, the next steps are for staff to refine the accuracy of the cost estimate and prepare material for engagement. Note that this debt will transfer to the new water entity.

Council will also need to engage with the one property owner who has installed their own system to ensure equity to all. Honeybone Property

LEGAL

Although this project does not appear in any year of the Council's 2021-2031 LTP, Council can decide to undertake this project without amending the LTP first.

As per Section 97(1)(a) of the Local Government Act 2002 (LGA) the scale of the Council's wastewater activity, compared to a $790,000 project to reticulate an additional 26 properties (and currently only 12-13 properties) is not considered a significant change to the level of service for this activity as a whole.

Regarding Council's Significance and Engagement Policy, September 2021, it rates as low so triggers the need to inform and comment. This level of engagement will be more than adequately covered by the targeted engagement proposed.

The rates changes are simply a matter to be addressed in the Annual Plan, and there are no other factors arising in this situation that suggest an LTP amendment would be required.

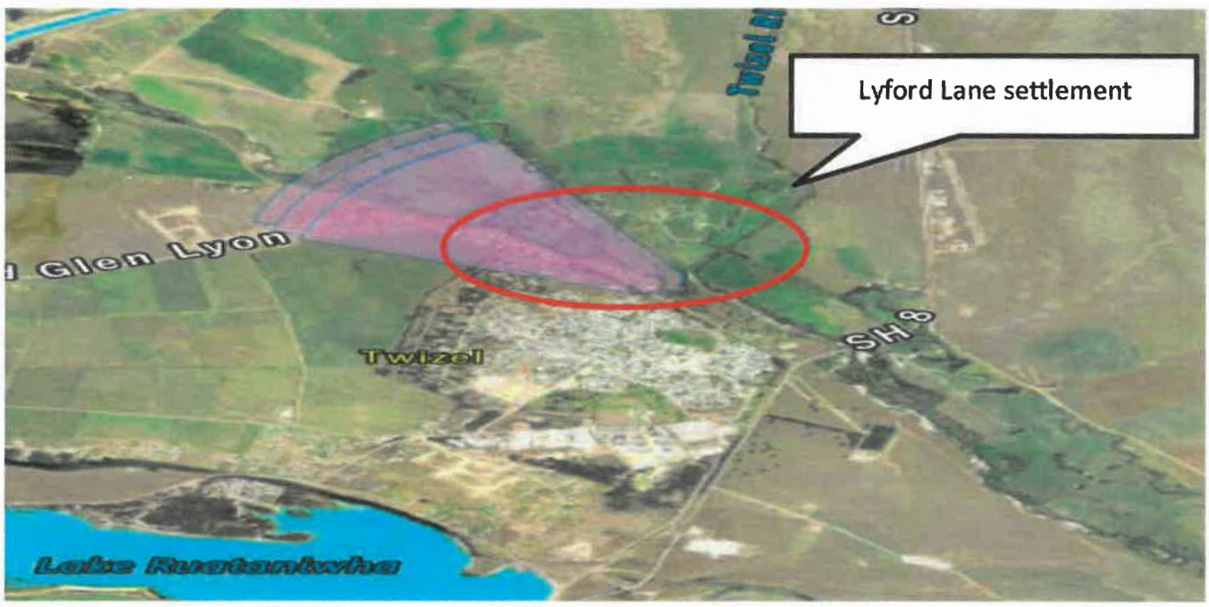
As this work is not in the LTP it may need approval from the DIA as part of the water reform programme. Staff will engage with the DIA in parallel to the engagement with the affected residents.

DECISION MAKING PROCESS AND NEXT STEPS

The following process is proposed:

A	Approval, in principle, the system type, policy and direction to engage as a matter of significance	This meeting
B	Refine Policy, Preliminary Design and related forecast costs. Prepare engagement material	April 2023

C	Undertake engagement on Lyford Lane	April and May 2023
D	Council considers community feedback and make any decisions as appropriate on the policy and scheme extension proposal.	June 2023
E	If approved, delivery of capital works	Commence Q4, 2023 and complete in 2024



Mackenzie
DISTRICT COUNCIL

26.10.2023

Dear Property Owner,

SUBJECT: LYFORD LANE SERVICES

I refer to previous correspondence and discussions regarding Councils desire to provide wastewater service to the properties in Lyford Lane to add another level of protection to the Twizel water supply. I also refer to the outcome of Council's consultation where the property owners expressed a desire for the area to be serviced by not only wastewater but also for Council to look at the provision of water, fibre and to take over the road.

Our feedback

The council considered these matters and concluded.

- Due to the public health benefits of the wastewater Council is keen to pursue at the communities cost noting that once installed the properties will be liable for the district's sewerage Infrastructure charge and the district's sewage treatment charge.
- Council has no objection to providing the properties in Lyford Lane with a connection to the Twizel water supply and its capital cost would be spread across those properties being connected. Prior to work on this progressing, a binding agreement between the owners and Council would need to be reached. Once installed the asset would be vested in Council and Council would maintain, renewal and replace as required as per any other component of the Twizel water supply. Note that properties would be liable for the district's water infrastructure charge and the district's water treatment charge once the service has been installed. Council would need to work with the owners if the agreement to proceed was not unanimous.
- Council has also no objection to transferring the road to Council provided that prior to transfer the property owners bring the road up to Councils standards at their costs including any creation of necessary road reserve. Once transferred there will be no additional rates.
- Regarding fibre, this is not a service the Council provides, and Council suggests the discussion regarding fibre servicing be taken up with fibre providers such as Alpine or Enable.

The timing of progressing the wastewater services is likely to be early in the next financial year, July to December 2024. There are several reasons for this delay and the two main ones are Councils need to determine the new government's intentions for 3 waters and the need to make provision for this expenditure in its long-term plan.

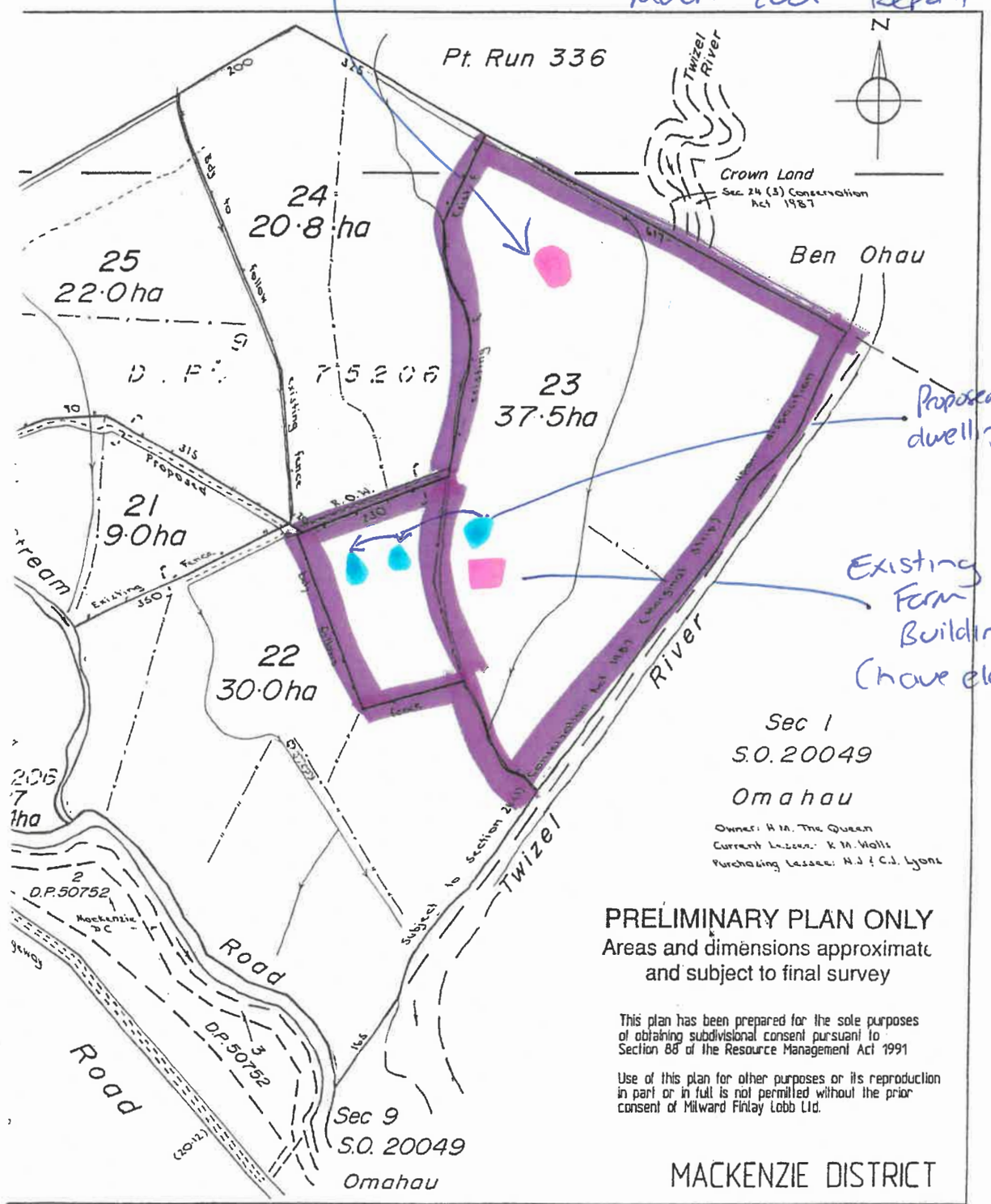
Maps

- Location of proposed house sites for Lot 23/158 Lyford
- Previous and original low and high-risk flood zones. Original sized lots
- Proposed lot 1, 2 at 158 Lyford Lane

Supporting docs
to B.P. & C.B. White

Submission
on Plan Change 25

Location of the Proposed House Site in Rob Hall March 2001 Report



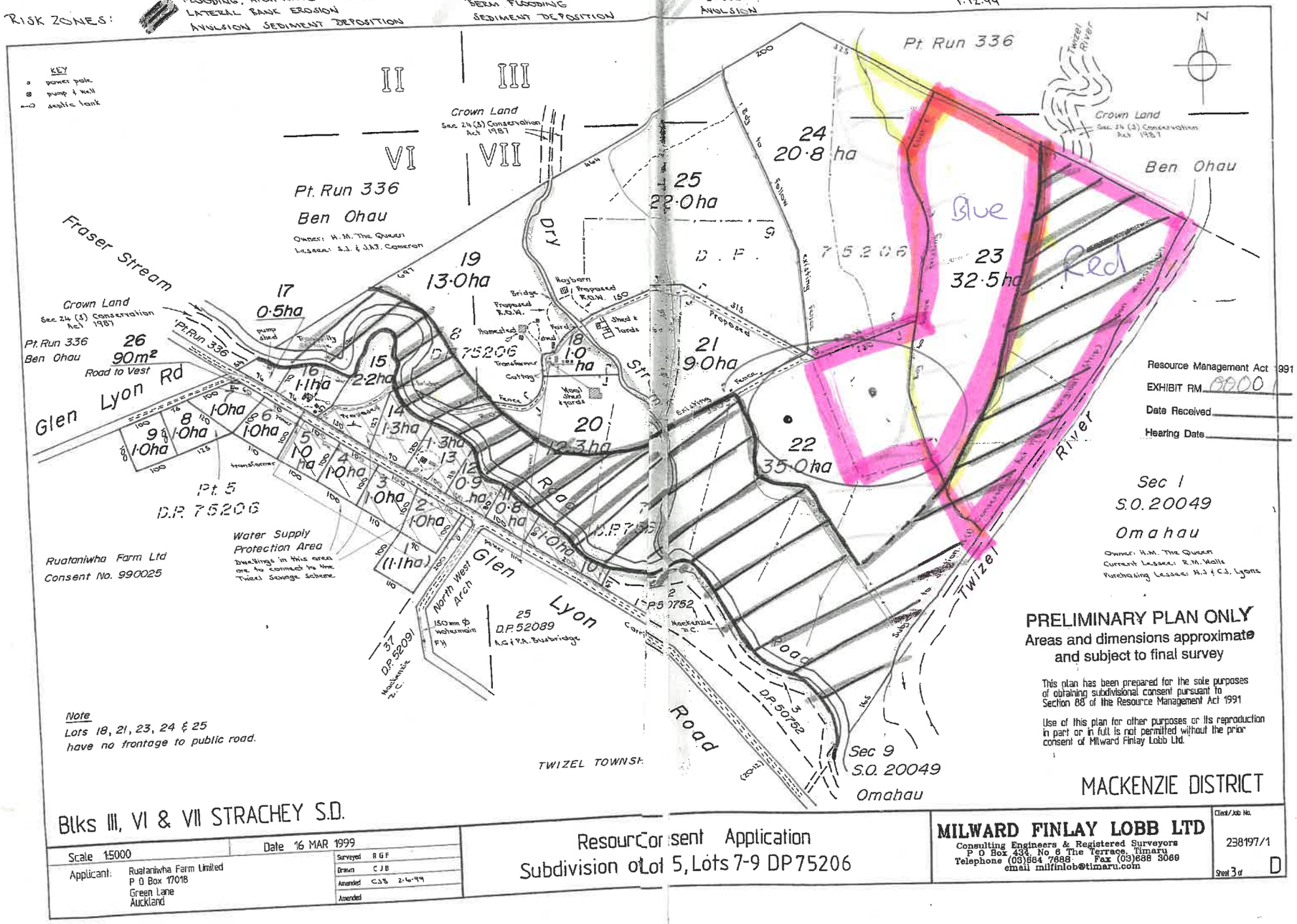
Consent Application
Pt Lot 7, Lots 8&9 DP 75206

MILWARD FINLAY LOBB LTD
Consulting Engineers & Registered Surveyors
P O Box 434, No 6 The Terrace, Timaru
Telephone (03)684 7888 Fax (03)688 3069
email milfinlob@timaru.com

Client/Job No. 238197/1
Sheet of D2

RISK ZONES: FLOODING, HIGH WATER TABLES, LATERAL BANK EROSION, AVULSION SEDIMENT DEPOSITION — LATERAL BANK EROSION, BERM FLOODING, SEDIMENT DEPOSITION — REDUCED RISK OF AVULSION

R.J. HALL KERORT 1.12.99



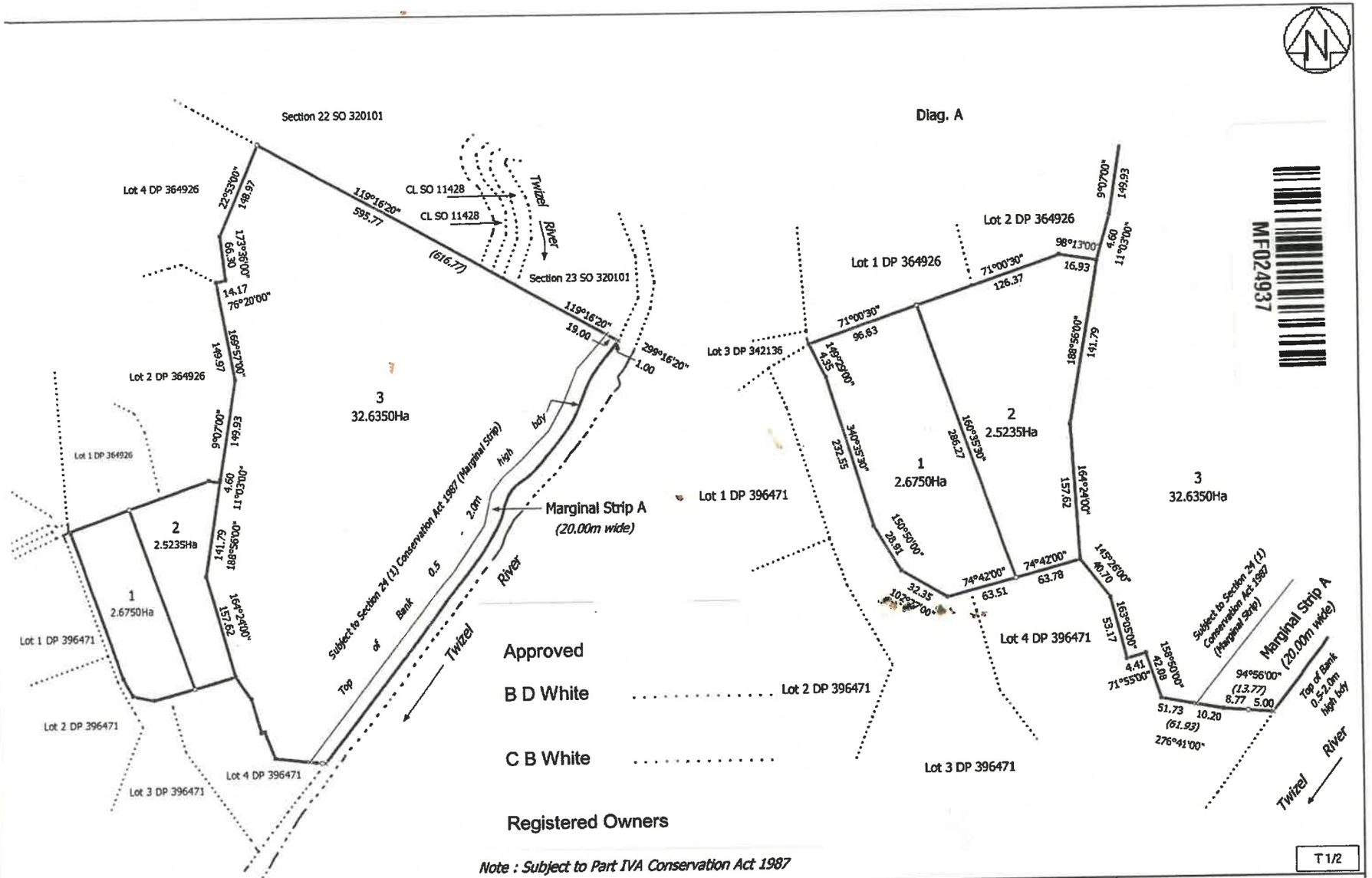
Blks III, VI & VII STRACHEY S.D.

Scale 1:5000	Date 16 MAR 1999	Surveyed RGF	Resource Consent Application Subdivision of Lot 5, Lots 7-9 DP 75206
Applicant: Ruataniwha Farm Limited P O Box 17018 Green Lane Auckland		Drawn CJB Amended CJB 2-6-99 Amended	

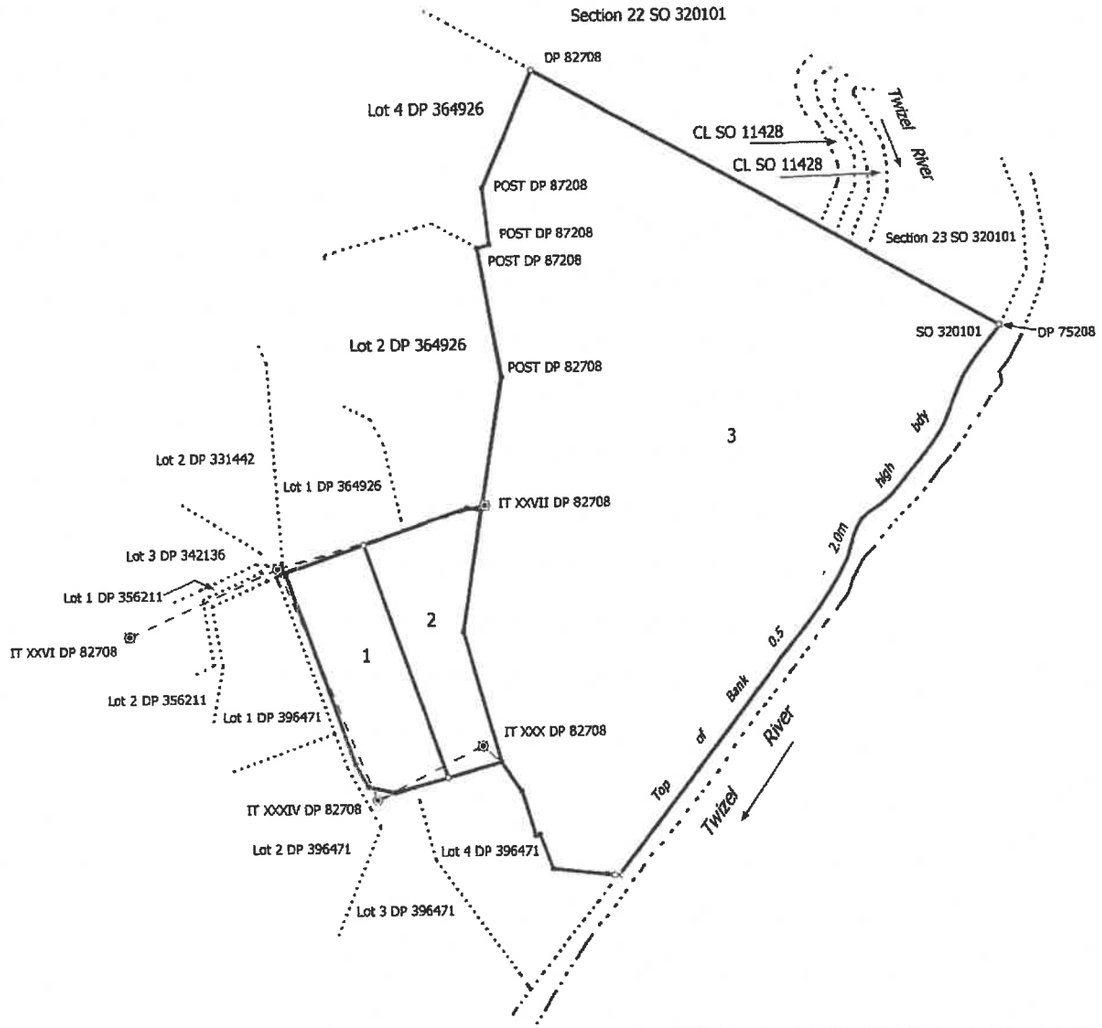
MILWARD FINLAY LOBB LTD
Consulting Engineers & Registered Surveyors
P O Box 434 No 6 The Terrace, Timaru
Telephone (03)684 7688 Fax (03)688 5069
email milfinlob@timaru.com

Client/Job No. 238197/1

Sheet 3 of D

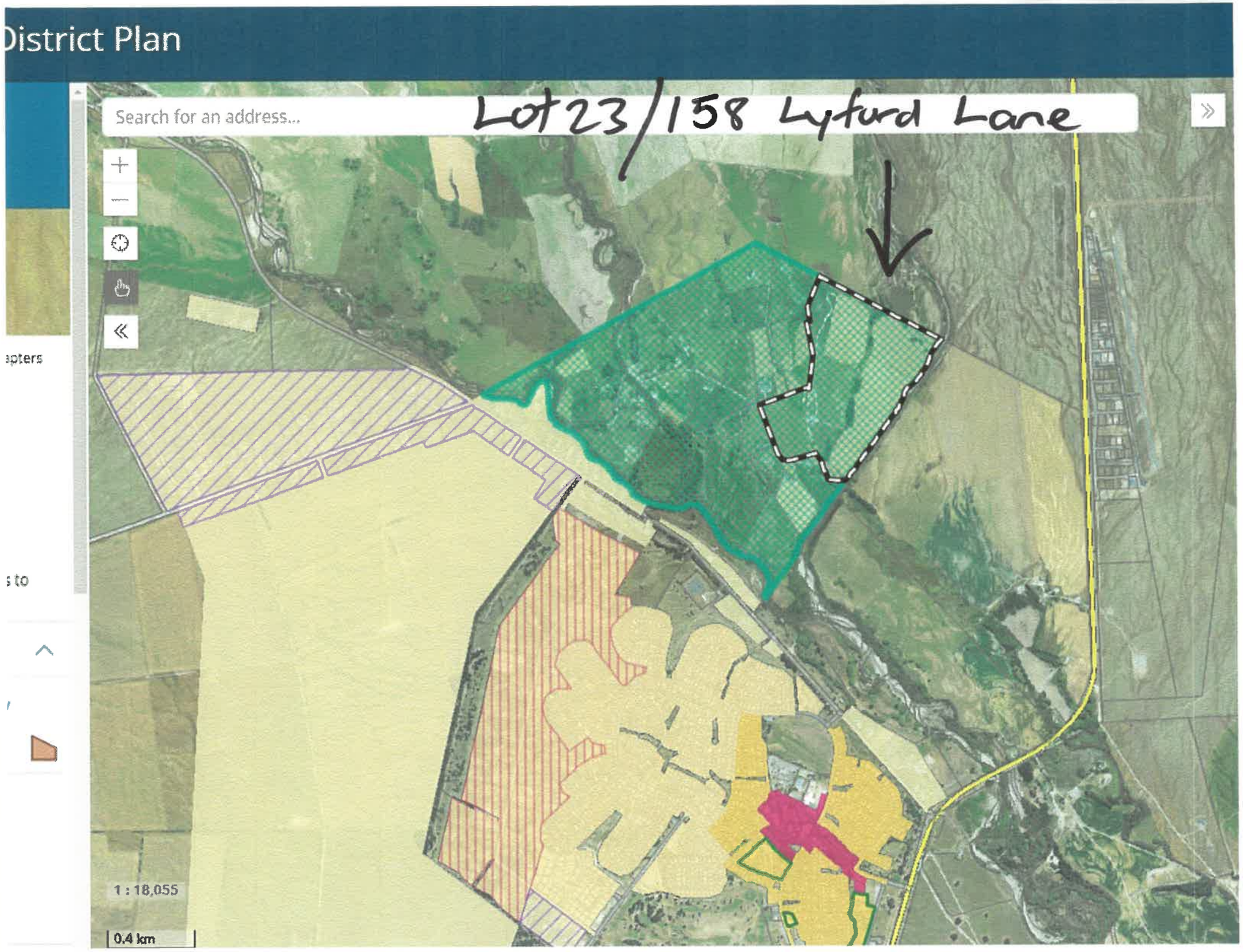


District: Canterbury itally Generated Plan rated on: 03/08/2009 11:09am Page 1 of 2	Lots 1 & 2 Being Subdivision of Lot 23 DP 82708	Surveyor: Andrew Scott Rabbidge Firm: Milward Finlay Lobb Ltd	Digital Survey Plan LT 420627



S 1/2

District: Canterbury itally Generated Plan rated on: 03/08/2009 09:08am Page 1 of 2	Lots 1 & 2 Being Subdivision of Lot 23 DP 82708	Surveyor: Andrew Scott Rabbidge Firm: Milward Finlay Lobb Ltd Survey Date: 28/05/2009	Digital Survey Plan LT 420627


District Plan
Search for an address...
Lot 23/158 Lyford Lane
1 : 18,055
0.4 km

Previous Application to Sub divide Lot 23 DP 82708 or 158 Lyford Lane

Supporting Docs to the B.D. & C.B. White Subsmission on Pkn Charge 25

MACKENZIE DISTRICT COUNCIL

APPLICATION FOR SUBDIVISION CONSENT

RESOURCE MANAGEMENT ACT 1991

To: Mackenzie District Council
PO Box 52
FAIRLIE

Phone: (03) 685-8514
Fax: (03) 685-8533

I/We B D & C B White
(Full Name)

Of [redacted]
(Postal Address of Applicant)

apply for the resource consent described below.

1. Names and address of the owner and occupier of the land to which the application relates other than the applicant are:

Not applicable

2. This application relates to the following site:

Street Address:	Hocken Lane, Twizel
Legal Description:	Lot 23 DP 82708
Certificate of Title: *(please attach copy)*	CB 47D/386
Valuation Number:	25320/709

3. Description of Proposed Activity:

This is a Discretionary Activity to subdivide the existing title into three rural allotments, as detailed in the attached report.

4. Additional resource consents required in relation to this application:

	Granted	Applied For	To be applied for	N/A
Water Permit				N/A
Discharge Permit			√	
Land Use Consent				N/A
Other				N/A

5. I/We provide the following information in support of this application to satisfy the requirements of Section 88 (2) of the Resource Management Act 1991:

   √ An Assessment of Environmental Effects *(see attached explanatory notes)*. **This is compulsory and should be relevant to the scale of the proposal.**

   √ Information required demonstrating compliance with rules, policies and objectives of the District Plan *(see attached explanatory notes)*.

   X Signed affected persons approval forms or a list of names and addresses of all adjoining landowners and occupiers with a plan showing the locations of these properties (where applicable)

6. I/We attach a scaled and uniquely numbered site plan showing (where applicable):
   - The position of all new boundaries
   - The areas of all new allotments
   - The locations and areas of new reserves to be created, including any esplanade reserves and esplanade strips
   - The locations and areas of any existing esplanade reserves, esplanade strips and access strips
   - The locations and areas of any land part of the bed of a river or lake, to be vested in the Crown or local authority under Section 237A of the Resource Management Act 1991
   - The locations and areas of land to be set aside as new road √

7. I/We enclose the required deposit fee of: *(See schedule of fees and charges)* $500.00

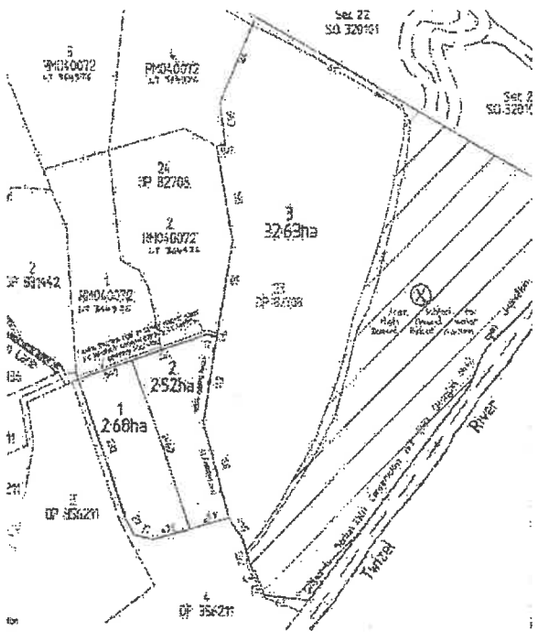
8. Address for Service of Applicant:

B D & C B White
c/- Milward Finlay Lobb Limited
P O Box 434
Timaru

Telephone No(s): 03 684 7688
Fax No(s): 03 688 3069
Email: admin@mflnz.co.nz

R G Finlay for B D & C B White

14/3/06
Date



B D & C B WHITE

SUBDIVISION CONSENT APPLICATION AND ASSESSMENT OF ENVIRONMENTAL EFFECTS

FILE NUMBER 285797/1

MARCH 2006

APPENDICES

Appendix 1	Zone Plan
Appendix 2	Copy of DP 82708
Appendix 3	Title
Appendix 4	Locality Plan
Appendix 5	Existing Consent Notices (8)
Appendix 6	Flood Risk Assessment
Appendix 7	Right of Way Access Maintenance Agreement
Appendix 8	Flood Risk Assessment for Original Subdivision (1999)

1 INTRODUCTION

This report has been prepared in accordance with the requirements of Section 88 and the Fourth Schedule to the Resource Management Act 1991 and describes the application for subdivision consent, submitted on behalf of B D & C B White.

2 PROPERTY DETAILS

2.1 Location
Glen Lyon Road and Hocken Lane
Twizel

2.2 Legal Description
Lot 23 DP 82708

2.3 Certificate of Title
CT CB 47D/386

2.4 Total Area
37.8300 hectares

2.5 Valuation Reference
25320/709

2.6 Registered Owners
B D & C B White

3 RESOURCE CONSENT SOUGHT

Consent is requested to carry out a fee simple subdivision of three rural allotments.

4 ZONING

In terms of Council's Operative District Plan, the whole of the subject land is zoned Rural.

5 SUITABILITY OF THE SITE

In accordance with Issue 1 of Section 12, Subdivision Rules, Mackenzie District Council's Operative District Plan (Page 12-1), the suitability of the site has been assessed as follows.

The development area is situated on open country, which falls slightly from Hocken Lane. The allotments are considered large enough in area to give adequate scope for buildings, drainage systems, accesses etc within the allotment boundaries.

The development site is situated within easy driving distance from Twizel township and the development of this area is likely to have a positive effect so far as Twizel's commercial infrastructure is concerned.

A report for the flood risk for this site has been prepared by Mr R J Hall a Civil and Environment Engineering Consultant and recognised expert in these matters.

A copy of that report is enclosed and the areas identified to varying flood risk have also been shown on the enclosed plan of proposed subdivision.

This indicates that there is varying degree of flood risk over the property but nonetheless the allotments all have areas clear of possible flood risk so far as possible future building is concerned.

In dealing with this particular aspect, we believe suggest it would be appropriate for Council to impose a consent notice to ensure that future buildings be positioned outside the identified area shown as shown on the attached plan as area X.

All Lots will share a common access from Hocken Lane.

Allotments boundaries have been established to ensure that it is possible to achieve compliance with the 20 metre yard requirements specified in Council's Operative District Plan Rules for Rural Subdivisions.

In addition to this, allotment dimensions and areas have been considered in regard to Environment Canterbury's separation distances for drainage system and water supply bores on each site. All of the allotments have minimum dimensions in excess of 96.7 metres and this is considered to provide sufficient scope for compliance with required separation distances.

11 ASSESSMENT MATTERS

In considering whether or not to grant consent or impose conditions, the Council shall have regard to, but not be limited by, the following assessment matters for the respective standards or matters:

12 Allotment Size and Dimensions

As shown on the enclosed plan, the allotments vary in size from 2.52 hectares to 32.63 hectares.

Access to the three Lots will be via reciprocal rights of way. These continue to Glen Lyon Road over the area locally known as Hocken Lane.

13 Subdivision Design

Allotments have been established to achieve good shape and this will ensure that there is adequate scope within each of the allotments to achieve building areas, drainage systems and water supply bores as necessary, while still meeting the yard requirements for buildings and the separation requirements for drainage systems and water supply bores.

There are no significant topographical features which would pre-determine allotment boundaries.

14 Property Access

The subject title has no legal frontage to Glen Lyon Road, but it has access via rights of way, which continue to Glen Lyon Road over the area locally known as Hocken Lane.

15 Potential Construction Effects

The only construction which would take place on the site as a result of the proposed subdivision would be the formation of individual accesses.

That work is considered to be relatively minor in nature and construction effects such as noise, dust, stormwater runoff during construction, are likely to be very short term and can be mitigated by a short construction period.

16 Esplanade Provision

There are no significant waterways within the land subject to this application. In any event, the existing certificate of title is subject to Part IV (A) of the Conservation Act 1987. This therefore provides for public access along any waterways over 3 metres in width, which may exist within or adjoining the subject land.

Accordingly no further action is required in respect of esplanade provisions.

17 Natural and Other Hazards

The proposed subdivision deals with land which would be best described as an old river plain built up by the natural weathering of the mountains further to the west.

The allotments have been examined by Mr R J Hall Consulting Engineer and his assessment of the flood risk is attached.

That report confirms that subject to establishing elevated building platforms, the flood risk can be mitigated to an acceptable level.

It is suggested that consent notices be registered against the titles to the effect that:

"At the time of application for building consent for habitable dwellings, confirmation shall be provided to Council that floor levels and building positions have been established to mitigate flood risk as indicated in the Flood Risk Assessment prepared by R J Hall, attached to this document."

18 Water Supply

In dealing with water supply in this locality there are two options available. These are as follows:

(a) Individual wells and pumps on each allotment
(b) Collection of roof water from future buildings

Domestic water can be obtained by individual wells and pumps as necessary. We understand that ground water levels in this area are high and there is no apparent difficulty in achieving satisfactory water supply.

As previously indicated, where water is abstracted from the ground solely for domestic purposes, this is covered by Environment Canterbury's General Authorisation but it is noted that a well permit is still required.

Some care will need to be taken with the positioning of future wells to ensure the necessary separation from drainage systems but it would be anticipated that the water supply would be obtained as a first step in carrying out any building on the sites, and then the drainage areas can be positioned to achieve the required separation if necessary by positioning these some way clear of the buildable areas.

It is anticipated that future owners would therefore drill individual wells as necessary or would rely on the collection of rainwater previously referred to.

19 Stormwater Disposal

Given the size of the allotments and the relatively free draining nature of the soils in this locality, it is not anticipated that there would be any difficulty in disposing of surface runoff from roofs and hard stand areas within each of the allotment boundaries. (Refer to Paragraph 9).

20 Sanitary Sewage Disposal

As previously indicated, the subject land is situated some 700 metres north east of Twizel township, which is the closest reticulated and treated sewage system.

Given the size of the allotments, it is considered that the most satisfactory method of dealing with sewage from future dwellings is by way of individual treatment systems contained within each of the allotments.

It will be necessary for those to meet the requirements of Environment Canterbury and those requirements are referred to later in this application under the subheading Assessment of Environment Canterbury's Requirements. (Refer to Paragraph 9).

We believe that it would be appropriate for Council to consider imposing consent notices on each of the allotments to the effect that future drainage systems and wells for water supply purposes are to comply with the requirements of Environment Canterbury and the Mackenzie District Council.

(Refer to possible conditions of consent at the end of this report).

21 Energy Supply and Telecommunications

As part of the earlier subdivision, easements were provided over an aerial line from Glen Lyon Road through to the subject land.

In order to achieve compliance with Council's conditions of consent relating to subdivisions in this locality, it is suggested that a condition be imposed that before the issue of a 224(c) certificate, the applicant confirm that arrangements have been made for the supply of electricity to each of the allotments.

Easements have been provided for telecom services via the existing right of way and it is anticipated that the new allotments would connect to those services.

Accordingly no further action is contemplated in regard to this.

22 Land for Open Space and Recreation

Given the fact that this is rural subdivision, and given the size of the allotments, it is considered that there would be no expectation by future section owners for Council owned recreation areas in this locality.

Accordingly no further action is considered to be warranted in regard to this.

23 Vegetation Protection

The whole of the subject land is generally open in nature.

There are no significant stands of native trees or vegetation which would warrant special attention for conservation purposes.

24 Easements

As previously indicated, existing easements will be automatically brought down on the new allotments where these are already in favour of the current title.

No further easements appear to be necessary.

Any easements needed will be provided for as necessary on the final survey plan.

25 Building Location and Flood Risk Areas

The block does not contain any buildings.

Future buildings would need to be positioned within each allotment to achieve the required minimum setback from boundaries, ie 20 metres separation for dwellings and 6 metres separation for accessory buildings. It is considered because of the size of the allotments, those setback requirements can be easily achieved after taking into account any further limitations which may be imposed by wells and drainage systems on any of the adjoining allotments and flood risk.

26 Residential Activities - Discretionary Activities - Financial Contribution

There are no financial contributions necessary for this subdivision.

27 Design within 20 Metres of Transmission Lines

There are no high voltage transmission lines passing through the subject land.

28 ASSESSMENT OF ENVIRONMENT CANTERBURY REQUIREMENTS

28.1 Water Supply

In terms of Environment Canterbury's Transitional District Plan, we understand that it is permitted to take water from the ground for domestic and stock purposes without a consent, but a well permit is required.

It should be noted that there is no piped water supply system in this locality. The possibility of providing for a joint venture water supply system has been considered but this is likely to present some problems in establishment with the distances to other allotments involved, and the multitude of owners in the locality. For this reason,

it is considered that either individual wells on each site or the collection of rain water from roof areas if the preferred option.

In terms of Environment Canterbury's Natural Resources Regional Plan, the taking and using of water in small quantities from ground water is covered under Rule WQN 13. This provides for water to be taken as a permitted activity subject to meeting the various conditions 1-7 as specified in that Rule. This provides for water to be taken at a rate of up to 5 litres per second with a maximum take per day of 10 cubic metres per property.

This also requires the bore from which the ground water to be taken to have been lawfully established.

Any bore for water supply purposes is to meet WQL 36 and WQL 38.

28.2 Sewer Drainage

In terms of Environment Canterbury's General Authorisation contained within the Transitional Regional Plan because two of the allotments are less than 4 hectares, discharge consents will be required.

As previously indicated, allotments have been intentionally increased in area and dimension to ensure required separation between septic tank effluent disposal areas and possible future water supply bores.

In terms of Environment Canterbury's Natural Resources Regional Plan, the discharge of contaminants onto the land from individual on site sewage systems is covered under Rule WQL 8. This provides for complying systems to be a permitted activity subject to meeting the conditions set out in that Rule under 1-23.

It is confirmed that there is no piped sewage system in this locality. The closest piped and treated system is at Twizel some 2 kilometres to the west.

It appears that it should be possible to achieve most of the conditions set out in Rule WQL 8 and the size of the allotments and their dimension is considered to be sufficient to achieve complying separation distances between sewage discharge areas and possible future water supply bores.

However, given that ground water levels in this locality are likely to be shallower than 6 metres, discharge consents will be required for at least that reason.

While accepting that ideally discharge consents would be obtained as part of this subdivision process, this is not considered to be practical because of the uncertainty about the size, position, type of system to be installed, and timing of the installation. We suggest that consent notices be registered against each of the titles indicating the compliance with both Mackenzie District Council's Bylaws and Environment Canterbury's requirements would be required for future drainage systems on each of the allotments.

28.3 Stormwater Discharge

In terms of Environment Canterbury's Transitional District Plan, we understand that it is permitted to discharge stormwater onto the ground.

There is no piped stormwater drainage system in this locality.

In terms of Environment Canterbury's Natural Resources Regional Plan, the discharge of stormwater is covered under Rule WQL 5.

This provides for stormwater discharge to be a permitted activity from the roof area of buildings where the roof area of the building does not exceed 400 square metres.

Stormwater discharge from hard stand areas is also a permitted activity subject to meeting the various conditions 1-9. Given the indication of ground water levels from bores in this area, (over 30 metres) it is considered that there would be no difficulty in achieving a stormwater discharge from hard stand areas which meets the various Rules under WQL 5.

It can therefore be reasonably concluded that no discharge should be necessary for stormwater disposal.

28.4 Earthworks

Earthworks is covered under Environment Canterbury's Policy SCN 5 and also under Rule WQL 40.

In reference to Policy SCN 5, this identifies priority areas for land over 900 metres in altitude and land with slope greater than 25 degrees and soft rock and loess metalled slopes greater than 20 degrees.

The subject land does not fall within that category.

In terms of Rule WQL 40 contained under Regional Council's Natural Resources Regional Plan, the earthworks involved in this proposal will be confined to minimal shaping of the ground to achieve drive on accesses to the allotment. It is considered that this would not be within the requirements relating to a restricted discretionary activity or a non complying activity in terms of that Rule given the depth to ground water, and the volume of material likely to be shifted.

In constructing accesses, it is anticipated that these would generally follow the ground contours and would have minimal if any effect on any minor swales which may lie within the subject land. This would ensure that cross country flows within those swales is not significantly affected by the proposal.

It can therefore be reasonably concluded that no consent is required so far as earthworks are concerned.

This deals with the matters which could reasonably relate to Environment Canterbury's requirements so far as this subdivision is concerned.

29 SUMMARY

The layout and design of the proposal is in accordance with the rules applicable to subdivisions within the Rural Zone.

The proposal has been considered in terms of its scale and significance and the relevance of the various matters identified in terms of paragraph 2 of the Fourth Schedule to the Resource Management Act 1991.

These are:

(a) Any effect on those in the neighbourhood and, where relevant, the wider community including any socio-economic and cultural effects.

(b) Any physical effect on the locality, including any landscape and visual effects.

(c) Any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity.

(d) Any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual, or cultural, or other special value for present or future generations.

(e) Any discharge of contaminants into the environment, including any unreasonable emission of noise and options for the treatment and disposal of contaminants.

(f) Any risk to the neighbourhood, the wider community, or the environment through natural hazards or the use of hazardous substances or hazardous installations.

Where these are considered to be relevant, they have been addressed in the forgoing information.

30 POSSIBLE CONDITIONS OF CONSENT

In order to meet the various matters raised in this application, it is considered that the following conditions may be considered to be appropriate by Council in granting consent to this proposal.

1 **Flood Risk**
That a consent notice be issued by Council in respect of the allotments on this subdivision requiring that buildings be located outside of the areas shown as X shown on the attached plan.

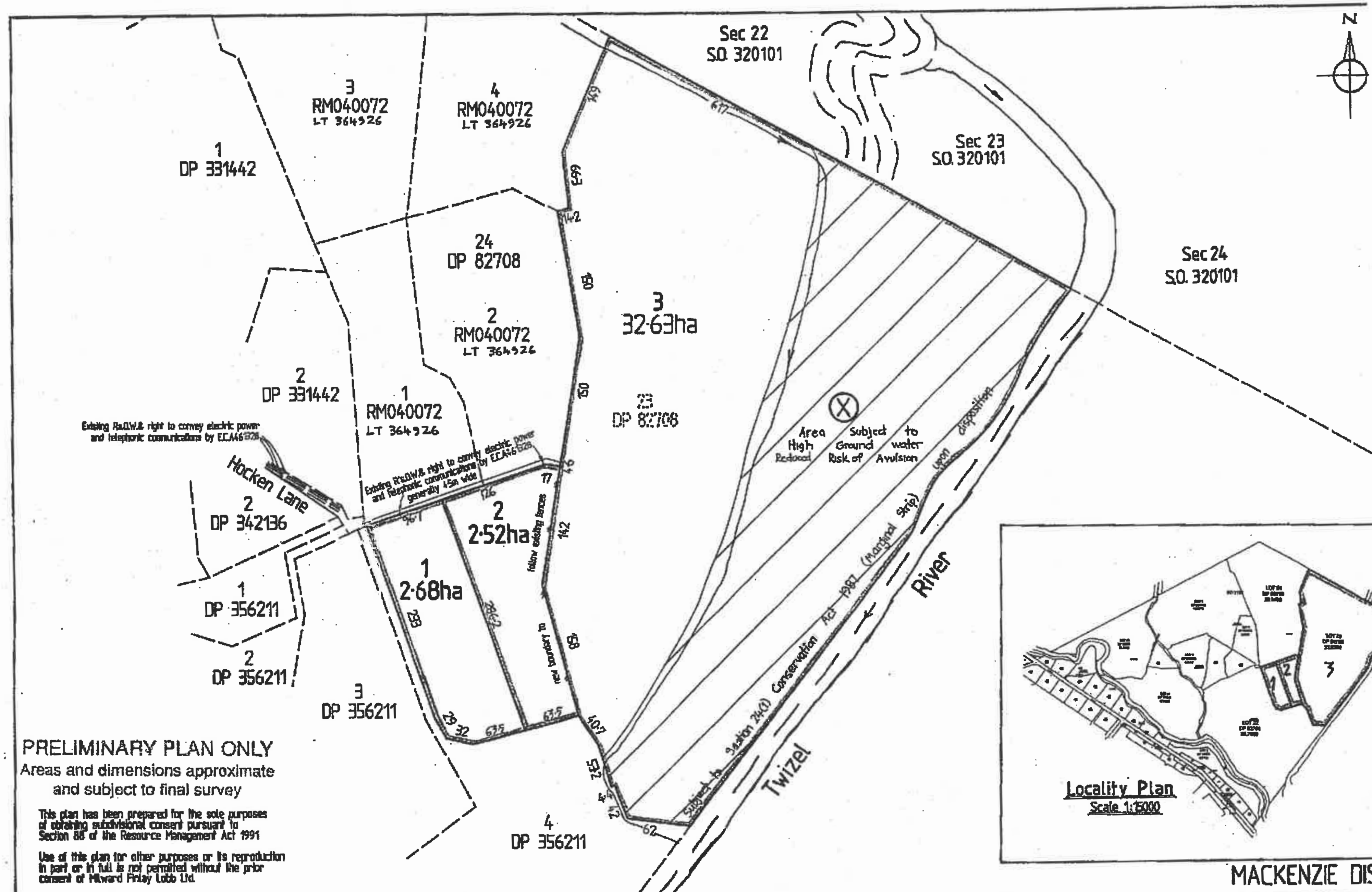
2 **Drainage Systems and Water Supply Wells**
That consent notices be registered against each of the allotments to the effect that the requirement of Environment Canterbury and the Mackenzie District Council be met in regard to separation distances of water supplies and drainage systems, and the standard of effluent treatment and on site disposal. This requirement to be met at the time that building consent applications are made in respect of dwellings on the allotments.

3 That the proposal proceeds generally in accordance with the submitted plan and application.

We request that the application be considered as a discretionary activity.

Prepared by: R G Finlay
Licensed Cadastral Surveyor
Milward Finlay Lobb Limited

7 March 2006

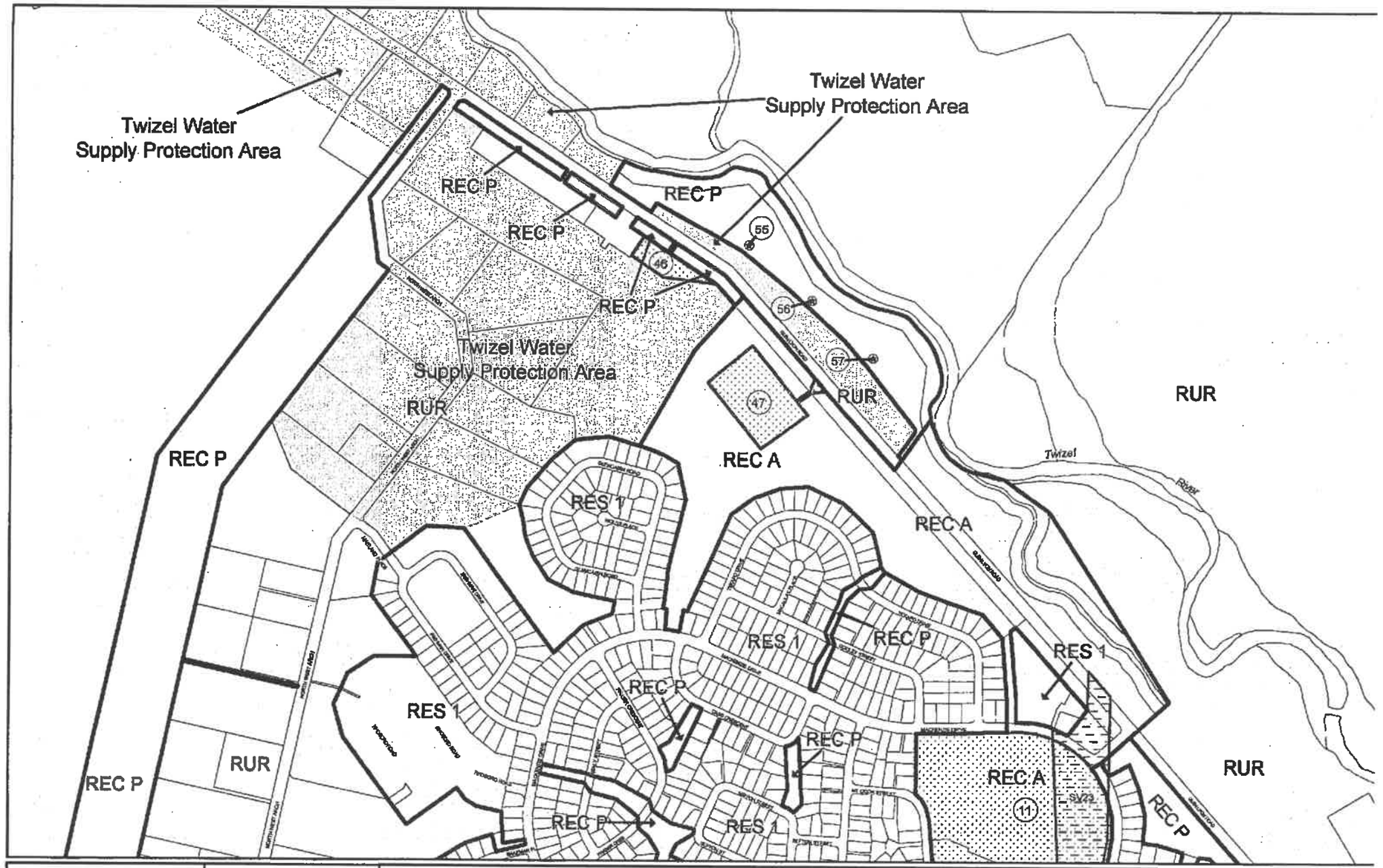


PRELIMINARY PLAN ONLY
Areas and dimensions approximate and subject to final survey

This plan has been prepared for the sole purposes of obtaining subdivisional consent pursuant to Section 88 of the Resource Management Act 1991

Use of this plan for other purposes or its reproduction in part or in full is not permitted without the prior consent of Milward Finlay Lobb Ltd.

Scale 1:3000	Date: October 2005	Resource Consent Application Subdivision of Lot 23 DP 82708
Applicants: B D & C B White 7 Maryburn Road Twizel	Surveyed B D R Drawn B D B Amended Amended	**MILWARD FINLAY LOBB LTD** Consulting Engineers & Registered Surveyors P O Box 434, No 8 The Terrace, Timaru Telephone (03)684 7586 Fax (03)688 3069 email admin@mflnz.co.nz


Twizel Water Supply Protection Area
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SV23
Twizel
Zones
IND Industrial
REC A or P Recreation A or P
RES 1 or 2 Residential 1 or 2
RUR Rural
SERVICE Service
TA Traveller's Accomodation
TOURIST Tourist
VC Village Centre
Designations
(refer Appendix A)
54
22
Transit State Highway Designations
Lakeside Protection Area
SV12 Scenic Viewing Areas
23 Sites of Natural Significance
Notations
G15 Geopreservation Sites
T33 Protected Trees
H12 Heritage Items
900m Contour Line
High Voltage Power Line
District Boundary
Zone Boundary
33
33 51 33
52
Location Diagram
N
0 60 120 180m
Scale 1:6000 @ A3
Twizel
Map No 51
Date : May 2004

APPENDIX I

ECan

- Twizel Flood Modelling Investigation
- Submission to Plan Change 21

Supporting Docs to the B.D & C.B. White Submission on Plan Change 25

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

TECHNICAL REPORT Science Group

Twizel flood modelling investigation

Report No. R23/23
ISBN 978-1-99-002786-4

Summary

Background
Twizel township is located near the confluence of the Twizel River, Fraser Stream, and Dry Stream. Knowledge about the flood hazard to the township and surrounding areas of development is currently limited to a small number of historic flood observations. This study provides more detailed information on the likely extent and magnitude of flooding associated with large flood events in the Twizel River catchment.

What we did
This study used a combined one-dimensional/two-dimensional (1D/2D) hydraulic computer model to estimate flood extent, depths, velocity, and flood levels for 20, 50, 100, 200, and 500 year Average Recurrence Interval (ARI) flood events.

What we found
Based on all modelled ARI scenarios, no significant flooding is likely in the Twizel township. Most surface runoff in the township is constrained along roads. Some flooding beyond roads could be expected near Fraser Crescent and Mackenzie Drive, and near Mount Cook Street and the Twizel Area School. Water depths in these areas range from no flooding to approximately 400 mm of water in a 500 year ARI scenario.

All modelled scenarios show ponding upstream of State Highway 8 (SH8) from the Twizel River. The depth of ponding can exceed 2 m in the 500 year ARI scenario. The bridge and culverts beneath SH8 do not have capacity to convey the flows for any of the modelled scenarios and overtopping of the road occurs. River overflows and overtopping of SH8 are also likely to cause flooding downstream of SH8.

In the Lyford Lane area, flooding mainly occurs from overflows at the confluence of the Twizel River, Fraser Stream, and Dry Stream. Current development is predominantly in areas of little or no flooding. Modelling shows water depths are greatest in the area at the confluence of Fraser Stream and Dry Stream.

What does this mean?
Maps showing the extent and depth of flooding will assist land use planning in the area. Flood water depths and velocities will allow appropriate floor levels for buildings and extensions to be determined. The results of this modelling study could also be used in the future to analyse existing and/or any proposed flood protection works, and for emergency planning purposes.

How we have considered climate change
To allow for climate change to 2100, current design peak flow estimates have been increased by 30%. On grid rainfall has been increased across a nested storm event using a varying growth factor, based on data from the NIWA High Intensity Rainfall Depth Surfaces - estimates of high intensity rainfall for a range of return periods and event durations. Future modelling studies should incorporate any updated national climate change guidance.

2.2 Flooding history

There is limited historic flood information for the Twizel area. The following flood event information was summarised from the NIWA Historic Weather Events Catalogue (https://hwe.niwa.co.nz/) unless stated otherwise.

2.2.1 January 1994 South Island flooding

Photographs from this event are shown in Appendix A. A frontal westerly event from 7 to 9 January 1994 associated with orographic rainfall in the Southern Alps caused flooding in alpine rivers (Brown, 2002). Rainfall peaked on 8 January when 190 mm was recorded at Franz Josef Glacier. In the Twizel study area, a total of 35.2 mm was recorded at site Twizel 2 (ECan site 402103) across 8 and 9 January. The Twizel River peaked at 80.3 m^3/s on 9 January, measured at the Twizel River at Lake Poaka site (ECan site 71117).

2.2.2 May 2009 South Island and lower North Island storm (model calibration event)

Detailed information exists for the May 2009 event including photographs (Appendix B), observations from Environment Canterbury Staff (Figure B-1), recordings from various gauging sites, and observations from other external sources (i.e., media). At the event peak, water was observed lapping over the SH8 Twizel River bridge. A small (approximately 300 mm diameter) culvert beneath the highway (east of the bridge) was unable to carry breakout flows. Water was also unable to flow along the road and into the streams located to the east of the bridge and hence water backed up at this location. Water entered two sheds upstream of SH8, causing some damage.

The Fraser Stream flowed across Glen Lyon Road at the Fraser Stream Ford at depths estimated to be greater than 0.5 m. In the Lyford Lane area, where Fraser and Dry Streams converge, surface water was reported surrounding buildings. No buildings were reported as being affected by flooding in this area. Most of the flooding was from Fraser Stream and some minor overflows from the Twizel River. Most of the flooding from Fraser Stream occurred in the vicinity of the entrance road to Ruataniwha Station, with flooding occurring between the true left bank and the high terrace located adjacent to Glen Lyon Road, and between the true right bank of Fraser Stream and the Dry Stream channel.

2.3 Rainfall data

The location of the main rainfall recorders in the catchment are shown in Figure 2-2, with information relating to the rainfall recorders summarised in Table 2-1. The only rainfall sites in the study area that are currently operational are located at Pukaki Airport and the Meridian Substation, recording at sub-daily and sub-hourly resolution, respectively. Nearby recorders at Ōmarama Stream and the Ahuriri River provide additional records in similar geographic conditions.

Table 2-1: Summary of rainfall data for the Twizel area

Site Name	Site Number	River basin	Elevation (m)	Start date	End date
Lake Pukaki M. w. d.	201102	Pukaki River	556	1/9/1969	1/4/1985
Lake Pukaki No 1	401101	Pukaki River	506	1/12/1952	1/2/1972
Pukaki Aero Raws	009504	Twizel River	473	31/1/2000	-
Pukaki Aerodrome Aws	402104	Twizel River	461	12/2/2008	-
Rhoborough Downs	401001	Dry Stream	551	1/1/1914	31/12/1916
Twizel	402101	Fraser Stream	457	1/2/1972	1/7/1986
Twizel 2	402103	Twizel River	457	31/10/1988	17/12/2003
Twizel Substation	402102	Twizel River	451	28/02/1985	1/1/1992
Twizel at Meridian Substation	402001	Twizel River	412	21/10/2015	-
Ōmarama Stream At Dunstan Peaks	495810	Ōmarama Stream	582	4/12/2007	-
Ahuriri at sth. Diadem	494711	Ahuriri River	610	19/11/1992	-

2.4 River flow data

Water level/flow data is collected for the Lake Poaka catchment (Site 71117; Environment Canterbury). This is currently the only continuous (and rated) water level recorder in the catchment. This site is summarised in Table 2-2 and the location of this site is shown in Table 2-2.

Table 2-2: Flow data for the Twizel River at Lake Poaka site

Site	Site Number	Catchment area (km^2)	Start date	End date	Mean flow (m^3/s)	Maximum flow
Twizel River at Lake Poaka	71117	121	03/07/1986	-	2.55	158.0 m^3/s (17/5/2009)

3 Methodology

This floodplain investigation used a coupled one-dimensional/two-dimensional (1D/2D) rain-on-grid hydrodynamic computer model to simulate flood events and determine river and floodplain water levels, depths, flood extent, flow patterns, and flow velocities. The methodology included:

- Compilation of historic flood event information (Section 2.2)
- Estimation of flood hydrology/design flows (Section 3.1)
- Construction of a computational hydraulic model (Section 3.2 and Section 3.3)
- Validation of the hydraulic model and sensitivity analyses (Section 3.5)
- Modelling of design flood events (Section 3.6)

3.1 Flood hydrology

A study by Tonkin & Taylor (2017) produced flood frequency flow estimates for the Twizel River at Lake Poaka. The flood flow estimates were based on 17 years of flow record and used the Extreme Value Type 1 biennial frequency distribution. Refer to Tonkin & Taylor (2017) for further information on how the flows were derived.

No flood frequency flow estimates were available for Dry Stream and Fraser Stream. Mean annual flood flows were therefore derived using the Regional Flood Estimation (RFE) method (Griffiths *et al.*, 2011). A mean annual flood factor of 0.94 was back calculated and used based on Tonkin & Taylor (2017) derived flood frequency estimates.

The mean annual flood flows were then scaled to produce flood flow estimates using growth factors derived from Tonkin & Taylor (2017).

Based on projected increases in 6-hour rainfall (Table 2-3), 30% was added to the flood flow estimates adopted from Tonkin & Taylor (2017) and derived using the RFE method to account for the future effects of climate change. As stated in Section 2.5, it is unclear what impact increased rainfall depths in the Twizel River, Dry Stream, and Fraser Stream catchments will have on peak flood flows. However, based on previous studies, flood flow increases are likely to be in the order of 30%.

Table 3-1 shows design flows used in the modelling for the Twizel River, Dry Stream, and Fraser Stream.

How is it possible to get 30% more water thru the culverts at canal for these water courses

Table 3-1: Twizel River sub-catchment design peak flood flows (including +30% to account for climate change)

Sub-catchment	Area (km^2)	Mean Annual Flood (m^3/s)	20 year ARI	50 year ARI	100 year ARI	200 year ARI	500 year ARI
Twizel River	121	78	195	247	286	325	377
Fraser Stream	78	53	132	167	194	220	256
Dry Stream	43	32	79	101	116	133	143

Lake Poaka site, two of these events had approximately equal or greater average recurrence interval rainfall over the Twizel township (based on HIRDS), in May 2009 and December 2010. This suggests that a high intensity rainfall event (e.g., 100 year ARI) event along Ben Ōhau Range could coincide with a similar magnitude rainfall event within the study area (however, the absolute rainfall depth along the mountain range would still be higher than within the study area). This modelling exercise therefore matched design flows with the corresponding ARI rainfall event for the design flood events (i.e., 100 year ARI river flows were matched with a 100 year ARI local rainfall).

This model used HIRDS (version 4) to obtain rainfall estimates for the model domain. HIRDS rainfall estimations were compared across the model domain and revealed minimal spatial variation. Based on the HIRDS data (Site name: Twizel; Site ID: H40211), a 24-hour nested storm event was constructed, including a varying growth factor to account for the HIRDS RCP8.5 2081-2100 climate change scenario (based on storm duration and ARI). A 24-hour storm duration was used to ensure that peak flooding occurs throughout the study area before the model run is complete. This duration is comparable to previous flood events in the catchment. The benefit of a nested rainfall event is that rainfall depth for all possible storm durations (e.g., 10 minute - 24 hour) are captured throughout the model run. The rainfall events for this model are shown in Figure 3-5.

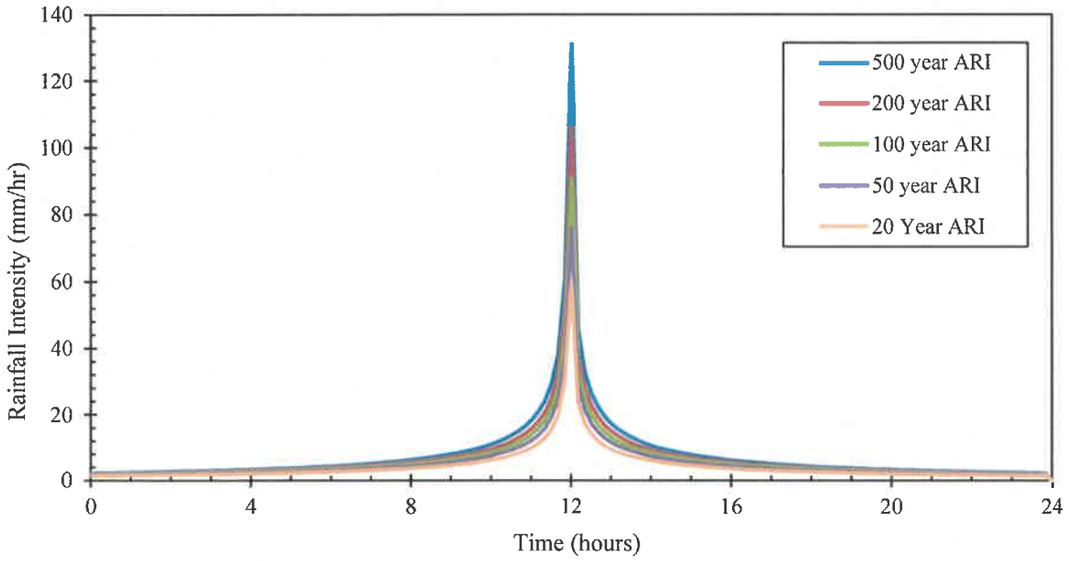

Figure 3-5: Time series of rainfall used in model design runs

3.4 Combined 1D/2D model

The Mike Hydro 1D model and Mike 21FM 2D model were linked to form a combined 1D/2D Mike Flood model. This allowed overflows between the 1D river channels and the 2D floodplain.

Any overflow between a river channel and the adjacent floodplain was determined based on the ground levels specified in the 2D model grid (i.e., water will only flow out of the river channel if the water level in the river channel is greater than the 2D model grid cell ground level 'linked' to that river channel location).

3.5 Model validation

To provide confidence in the model predictions, it is important to calibrate and/or validate the model with historic flood events. As there is only limited information for historic flood events at Twizel, the model was validated using the 17 May 2009 flood event.

3.5.1 Flows

Flows for the May 2009 flood event were extracted from the Twizel River at Lake Poaka flow gauge (Figure 3-6).

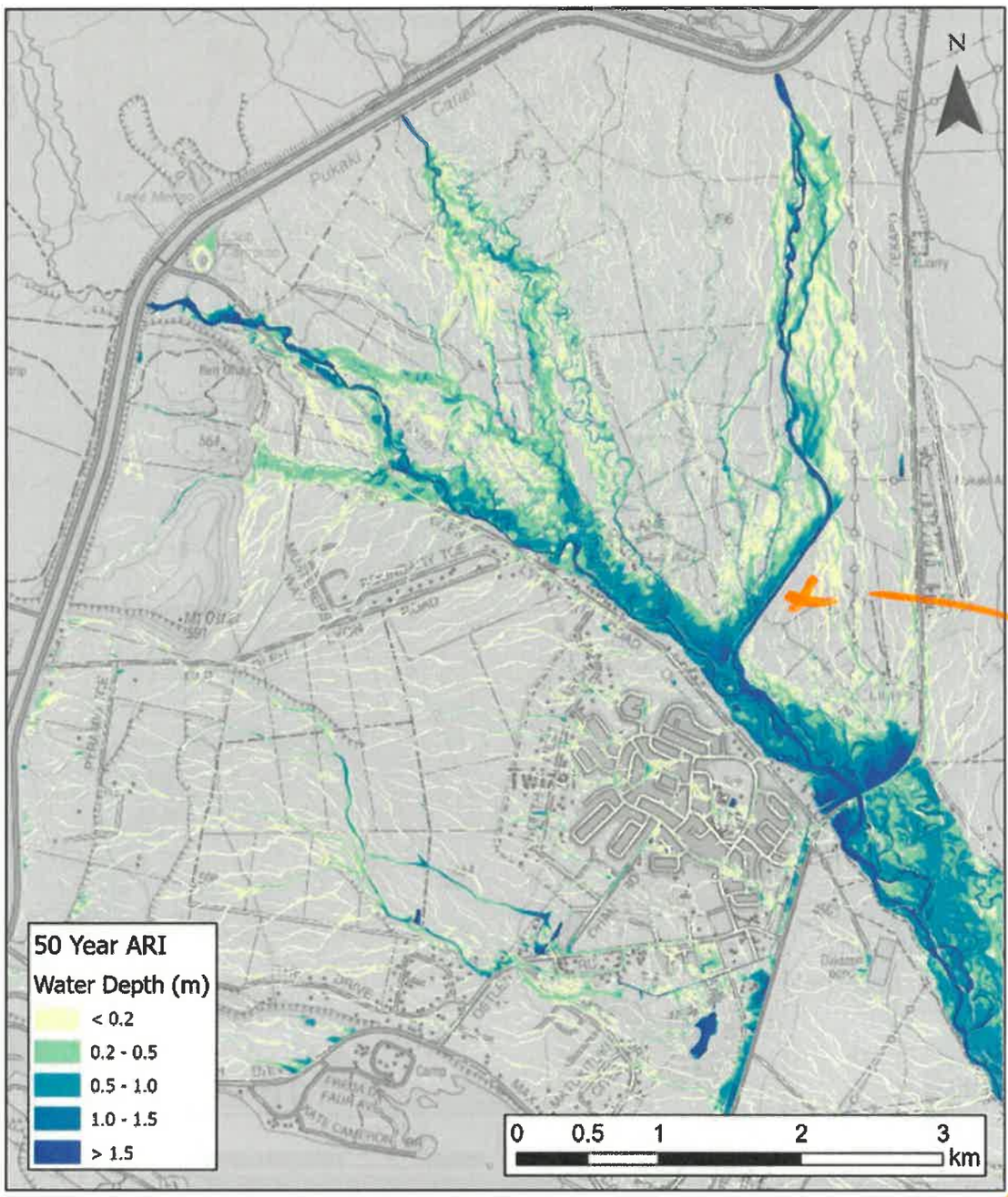

Figure 3-15: Maximum modelled water depths for a 50 year ARI flood event

Look at contour map

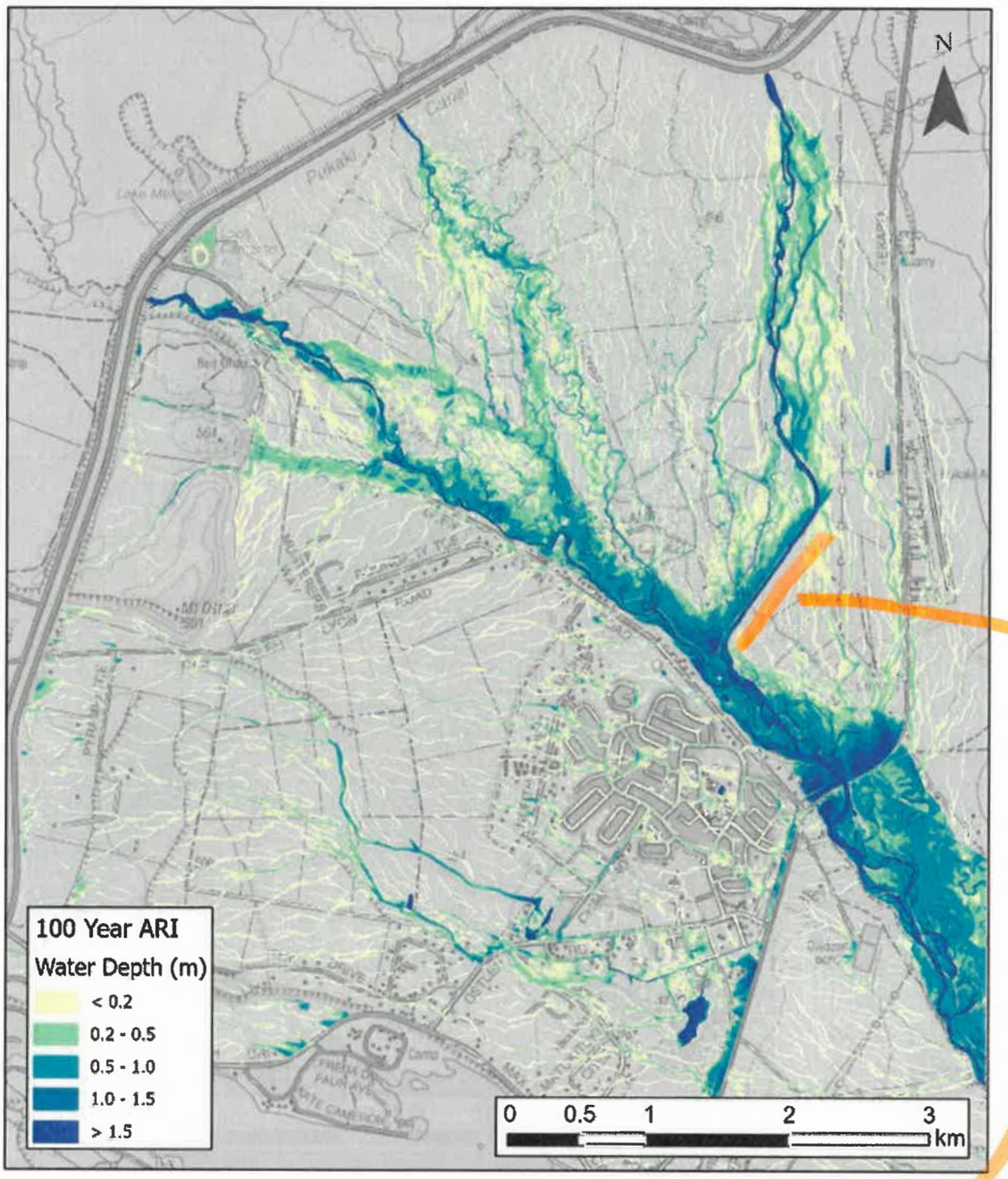

Figure 3-16: Maximum modelled water depths for a 100 year ARI flood event

No Water??

4 Results and Discussion

The model shows that even during relatively frequent ARI events (i.e., 20 and 50 year), ponding occurs upstream of the SH8 bridge. Complete maps of modelled water depths can be referred to in section 3.6.2. The depth of ponding can exceed 2 m in the 500 year ARI scenario. Based on additional model runs, not included in this report but carried out during model development (e.g., omitting on-grid rainfall), only small overflows into this area are required to produce substantial ponding depths. Once water levels exceed the SH8 road crown, the relative increase in ponded water depths in less frequent events is small, due to most additional water overtopping the road.

Design model results do not show substantial flooding or areas of high hazard flooding in Twizel township. During large magnitude events, most flooding occurs along roads, with some flooding occurring near Fraser Crescent and Mackenzie Drive, and near Mount Cook Street and the Twizel Area School. Water depths in these areas range from no flooding to approximately 400 mm of water in a 500 year ARI scenario.

Areas of high hazard exist in the Lyford Lane area, particularly along Dry Stream, Fraser Stream, and their confluence. Lyford Lane is the only accessway for the area and has considerable vegetation cover which could contribute to channel blockages (e.g., fallen trees). Any channel blockage or bridge washout is likely to impede access to dwellings during a significant flood event. The model does not account for the impacts of groundwater, and it is possible that water depths may be greater than modelled based on differences in infiltration and spring fed water sources. Despite this, the model results are suitable for proactively avoiding development in high hazard areas and estimating flood depths to assist in quantifying mitigation approaches, such as raised floor levels.

Sensitivity tests show that in general, the model is not particularly sensitive to floodplain infiltration rates. Most differences in maximum modelled water depth across a range of scenarios are less than 0.1 m, with the difference in water depth in some areas increasing up to 0.3 m. Across the sensitivity tests, the greatest differences in maximum water depth tend to be at the confluence of channels, and the area upstream of the SH8 bridge. The model tends to be more sensitive at a 20 year ARI scenario compared to a 500 year ARI scenario, particularly in scenarios with partial bridge blockage and increased channel and floodplain roughness. While absolute changes in maximum modelled water depth are comparable for most sensitivity tests, the relative changes in depth are greater for a 20 year ARI scenario.

Due to the inherent uncertainties associated with hydraulic modelling it is important that the model results are used in conjunction with other information (e.g., historic flood photographs, more recent ground level data), and assessed by a suitably qualified expert when being used to establish site specific flood conditions.

4.1 Model assumptions and limitations

Bales and Wagner (2009) outline some of the uncertainties associated with hydraulic modelling using LiDAR data. These uncertainties include:

- Model inputs (e.g., stopbank breach locations and sizes, flow magnitude and hydrograph shape, roughness values, energy loss parameters, and climate change projections).
- Topographic data (e.g., LiDAR data and estimated submerged riverbed levels). The model uses a fixed bed level which cannot account for scour and aggradation due to high-energy flood flows.
- Hydraulic model assumptions (e.g., simplification of equations by depth-averaging, as well as averaging topography and flow behaviour over a 5 m x 5 m grid cell for computational efficiency).
- The model has a fixed bed level and does not simulate changes in bed levels due to scour, erosion, or aggradation - all processes that will occur during large flood events.

- The model has been based on limited recorded flow data and was only validated against the May 2009 flood event. Consequently, some uncertainties exist in the predicted extent and depth of flood water for all modelled scenarios.

- Most bank levels have been extracted from LiDAR. In heavily vegetated areas, the heights may be interpolated and therefore may not be accurate. This could have an impact on when, and where, overflows to the floodplain occur.

4.2 Data required to better calibrate the model

Model results could be improved by obtaining detailed survey levels of all the stopbanks along the watercourses – particularly where dense vegetation has potentially distorted the measured LiDAR ground levels. Additional monitored water level/flow recorders and/or rainfall gauges in the Twizel River catchment would also enable the rainfall distribution and/or flood flows to be estimated more accurately.

A lack of information from previous flood events limits any further validation and calibration of the model. Flood information also needs to be gathered during and/or immediately after large flood events. This information would ideally include:

- Photographs of flood inundation, along with the time that the photographs were taken.
- Pegging, or marking the peak water levels.
- Cross section profiles or topographical data (e.g., LiDAR data).

5 Conclusions

Acknowledging inherent uncertainties, the modelling:

- Indicates there is good agreement between the modelled and observed flooding for the May 2009 validation event.
- Provides insight into how flood waters are likely to behave, such as locations where fluvial flooding or road overtopping occurs, for a range of flood magnitudes.
- Provides insight into the extent and depth of flooding that could be expected in and around Twizel for flood events of varying magnitudes.
- The modelling is fit for purpose based on testing for sensitivity to river flow, channel and floodplain roughness, floodplain infiltration, and bridge blockages.

6 Recommendations

The modelling results should be used in conjunction with historic flood information and practical, scientific judgement. The model could also be used for a range of other studies, such as to assess flood alleviation engineering options, and analyse the impact of river channel aggradation.

Possible future improvements to the model include:

- Reassessing model results when additional flow and water level data becomes available for other large flood events (as well as further climate change information). This would provide confidence in the design flows, and better calibration of the hydraulic model. Measured water level/flow data for the tributaries (i.e., Fraser Stream, Dry Stream) and downstream of the confluence (i.e., at SH8 bridge) would also enable a better calibration of the model, and more confidence in the flows used for design flood events.
- Surveying all riverbanks to better define the overflows.
- Measuring infiltration rates and gathering higher resolution surface roughness estimates.

9 References

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Rob Hall Omitted? Why?

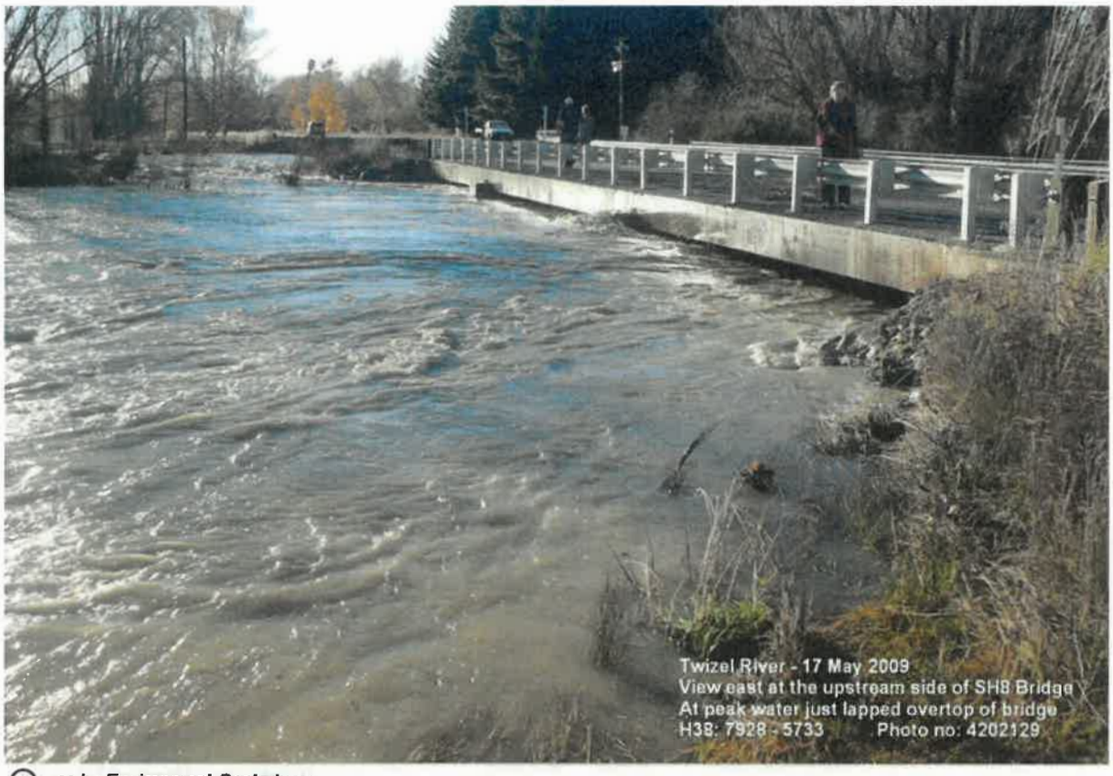


Figure B-2: Twizel River looking downstream at SH8 bridge May 2009

Figure B-3: Twizel River looking north-west from SH8 May 2009

Not Twizel R
Ahuriri River.
exports not picked this up

Appendix B. May 2009 Flood Observations

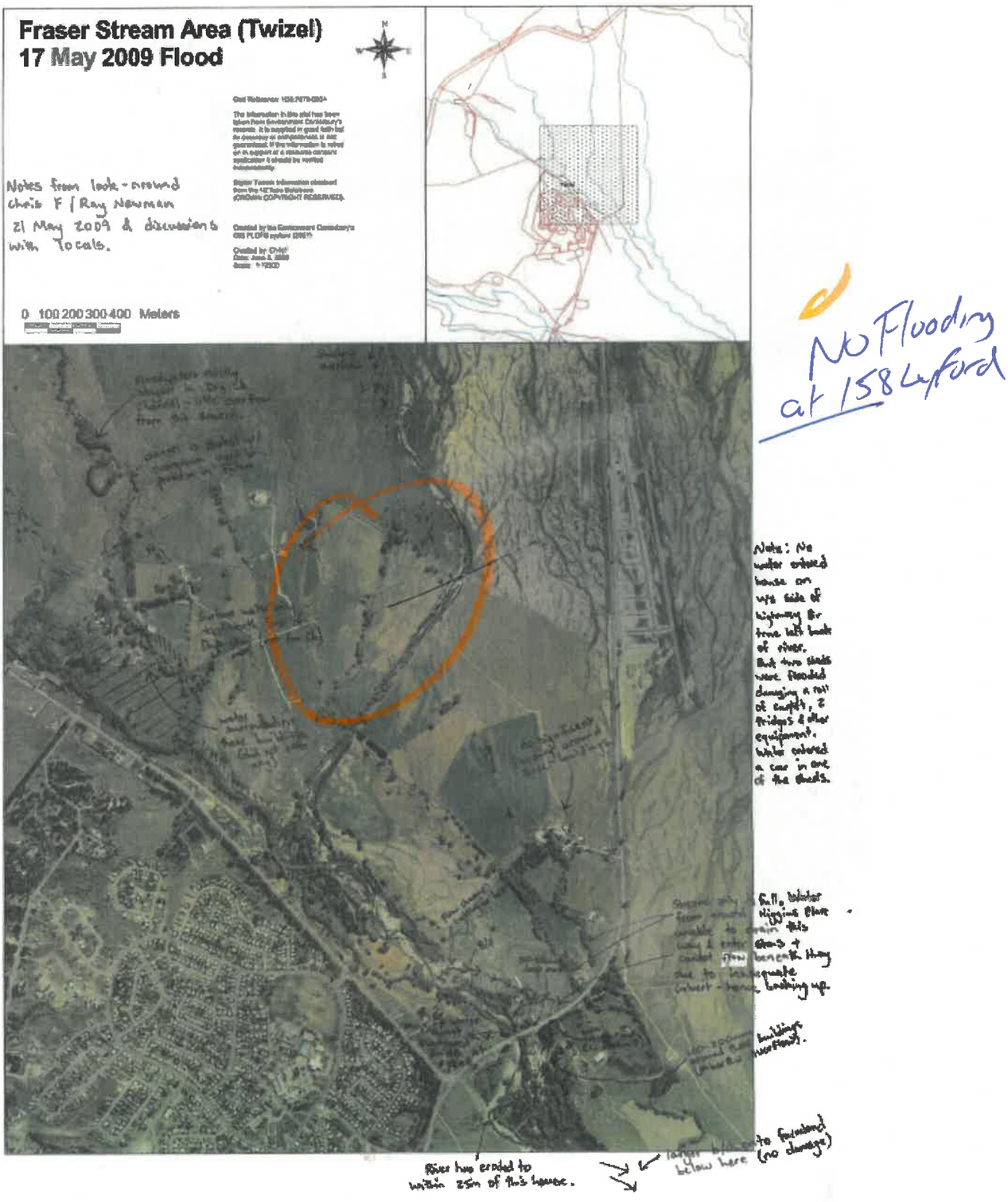
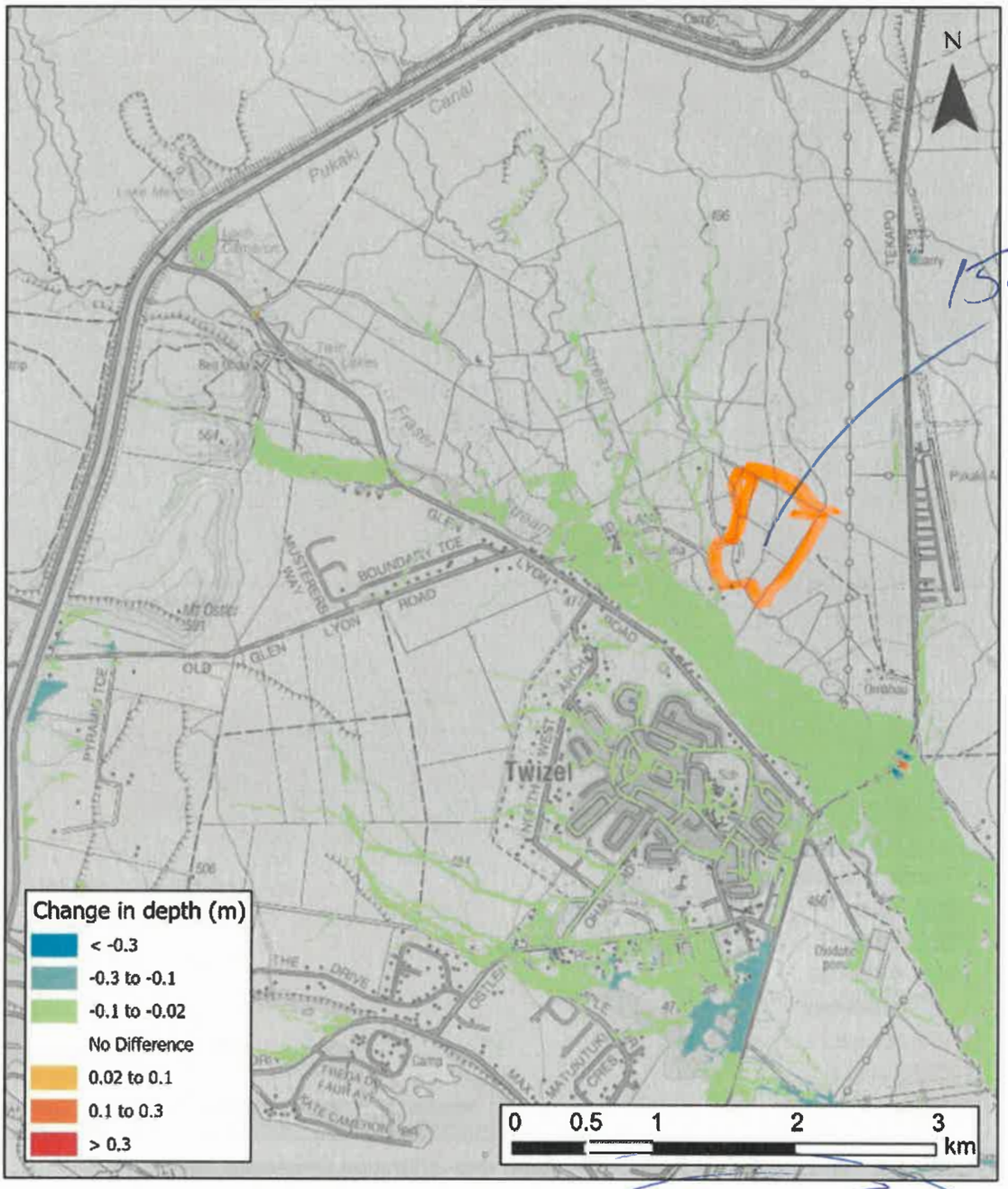


Figure B-1: Environment Canterbury observations from May 2009 flooding



158 Lyford Lane

Figure D-5: Change in maximum water depth with infiltration increased, 500 year ARI

BEFORE THE HEARINGS PANEL
FOR PROPOSED PLAN CHANGE 21 TO THE MACKENZIE DISTRICT PLAN

UNDER	the Resource Management Act 1991 (RMA)
IN THE MATTER	of Proposed Plan Change 21 to the Mackenzie District Plan

---

LEGAL SUBMISSIONS ON BEHALF OF THE CANTERBURY REGIONAL COUNCIL

10 March 2023

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WYNN WILLIAMS

MAY IT PLEASE THE PANEL

Introduction

1 Canterbury Regional Council (**CRC** or **Regional Council**) made a submission on Mackenzie District Council's (**MDC**) proposed Plan Change 21 (**PC21**) primarily in order to ensure that PC21 gives effect to the Canterbury Regional Policy Statement (**CRPS**).

2 The Regional Council's position is that to assist plan users, further integration between PC21 and the CRPS and other relevant instruments can be achieved, consistent with the RMA.

3 The Regional Council lodged a submission (summarised further in Ms Hollier's evidence):

(a) supporting MDC in seeking to improve the clarity of the Operative District Plan (**ODP**) and proposing amendments that seek to give effect to the CRPS and national direction;

(b) seeking amendments to the ODP's definition of "high flood risk" or alternatively, adding a standard to the Large Lot Residential Zone (**LLRZ**) in order to prevent development within areas subject to significant inundation in Twizel;

(c) seeking the addition of an advice note referring to the need to obtain authorisations under the CRC Flood Protection and Drainage Bylaw 2013 (**Bylaw**) in some circumstances;

(d) seeking amendments to some of the residential zone chapters (adding additional standards and explanation) in relation to connections to sewers and discharge of waste/stormwater in Twizel, Kimbell and Albury; and

(e) seeking some amendments to the provisions for the General Industrial Zone (**GIZ**) as they apply in Twizel, regarding setbacks and relevant matters of control.

4 The Regional Council has filed evidence from the following experts:

(a) Oliver Hermans, Flood Hazard Scientist at CRC; and

(b) Alanna Hollier, Planner at CRC.

5 Mr Hermans and Ms Hollier will be present at the hearing to answer any questions that the Hearings Panel may have.

The Regional Council's interest in PC21

6 As summarised in Ms Hollier's evidence, the CRC has a number of functions relating to the integrated management of natural resources, and is required to prepare and administer the CRPS,[1] to which a district plan (including PC21) is required to give effect.[2]

7 The purpose of CRC's participation in PC21 is to assist MDC in achieving alignment between the relevant planning instruments, where possible.

8 The intention behind CRC's submission is to assist MDC in giving effect to the CRPS, but also to assist with minor amendments that CRC considers could enhance the provisions of PC21 to be as user-friendly as possible (and reduce the duplication of effort for plan users in making enquiries with both the CRC and MDC when planning a development, for example).

Scope matters

9 At the outset, I note that there were two matters raised in CRC's submission which were identified within the section 42A report as being out of the scope of PC21 and the submissions lodged on PC21.

10 This related to the amendments sought in CRC's original submission to the definition of "high flood risk" in the ODP,[3] and the addition of a further subdivision rule in the ODP.[4]

11 The CRC accepts that these matters are outside the scope of PC21, as they relate to provisions that are not otherwise amended by PC21 (and therefore do not address a change to the status quo advanced by the proposed plan change[5]).

12 However, the CRC's submission did provide alternative relief for both relevant submission points, which it continues to pursue. Scope for each of the amendments sought will be dealt with in turn under the relevant topic heading below.

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1 Evidence of Alanna Hollier, dated 3 March 2023, at [13].

2 RMA, s 75(3).

3 CRC original submission (57), at [11].

4 CRC original submission (57), at [41].

5 *Palmerston North City Council v Motor Machinists Ltd* [2013] NZHC 1290 at [90], endorsing the approach of William Young J in *Clearwater Resort Ltd v Christchurch City Council* HC Christchurch AP34/02, 14 March 2003.

Residential zones regarding wastewater infrastructure

13 Given its functions in relation to the control of the use of land for the purpose of the maintenance and enhancement of the quality of water in water bodies,[6] the CRC has a particular interest in the provisions of PC21 that provide additional development capacity in areas where there is the potential for on-site wastewater discharges to occur.

14 As currently framed, the provisions of PC21 allow for further development to occur in the areas of Twizel, Kimbell and Albury, as a permitted activity. This creates an expectation for plan users that they are able to further intensify in those areas (within the limits set by the district plan), given that "people and communities can order their lives by [the district plan] with some assurance".[7]

15 Whether further development can actually occur within those areas will depend on a method of wastewater disposal being achieved, including whether a development is connected to a sewer (where available), or whether a resource consent is able to be obtained from the CRC for that wastewater discharge.

16 The intention of the CRC's submission was to include provisions and statements that make this potentially limiting factor apparent to plan users, and to align any resource consent requirements across both CRC and MDC's planning documents, in order to streamline processes for both councils and the plan users.

17 Based on the section 42A report, it appears that MDC and CRC are aligned in their intention. The section 42A report notes that it is the intention that all development in Twizel and Fairlie is intended to be connected to MDC's reticulated sewer network, but considers this is best addressed through the subdivision provisions.[8]

18 However, as addressed in the evidence of Ms Hollier, not all intensification occurs through subdivision, and therefore relying on these provisions alone to achieve the relief sought may not be sufficient.[9] Providing a direct link between the development that is permitted and the requirement to connect to the sewer through the particular provisions

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6 RMA, s 30(1)(c)(ii).

7 *Westfield (New Zealand) Ltd v North Shore City Council* [2005] NZSC 17, at [10].

8 Section 42A report, dated 17 February 2023, at [49].

9 Evidence of Alanna Hollier, dated 3 March 2023, at [31]-[34].

that enable intensification would ensure that the outcome sought is achieved.

19 In respect of Kimbell and Albury, where reticulated sewerage is not available, the section 42A report recommended that CRC's submission was adopted in part by including a new servicing standard.[10]

20 CRC agrees with the intent of these changes (as it is aligned with the intent of CRC's submission points), but suggests some further amendments to improve the clarity of the provisions (and to ensure that stormwater is also captured). The intent behind the suggested amendments is set out in the evidence of Ms Hollier.[11]

21 CRC seeks that these servicing standards are applicable to any activity requiring a discharge permit from CRC.

22 The section 42A report also does not address the additional relief sought in CRC's submission in the form of policies and the introduction to the zone chapters. CRC continues to consider that these amendments are necessary in order to provide guidance both to MDC and to plan users when implementing the servicing standard recommended to be added to PC21.

23 For these reasons, CRC requests that the provisions of PC21 are amended as set out in Appendix 1 of the evidence of Ms Hollier.[12]

Scope for this change

24 While CRC accepts that its initial relief sought, the addition of a restricted discretionary rule to the subdivision chapter of the ODP, is outside the scope of PC21, it considers that MDC has scope to make the changes requested in Appendix 1 as:

(a) The relevant matters were reasonably and fairly raised in CRC's original submission,[13] such that the amendments now proposed would not be unanticipated by any person;

(b) The proposed amendments fall within the ambit of the plan change, as the amendments are addressing the purpose of PC21

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10 Section 42A report, dated 17 February 2023, at [50].

11 Evidence of Alanna Hollier dated 3 March 2023, at [46]-[56].

12 Evidence of Alanna Hollier dated 3 March 2023, at Appendix 1.

13 CRC original submission (57), at [40]-[46].

and relate to provisions which are sought to be newly introduced to the ODP as part of PC21.

Management of flood inundation risk

25 CRC acknowledges that the natural hazards chapter is yet to be reviewed as part of the ODP review process. CRC looks forward to working closely with MDC on this part of the process to assist MDC in giving effect to the CRPS and ensuring consistency with other relevant regional plans.

26 However, CRC considers that an amendment to the provisions of PC21 as notified is necessary ahead of the natural hazard chapter review, to prevent the further development enabled by PC21 occurring in areas subject to high hazard risk.

27 As demonstrated by the evidence of Mr Hermans, based on modelling conducted by the CRC, the area between Glen Lyon Road and the Twizel River is at risk of significant flooding. The model's outputs indicate that parts of this area would be subject to flooding which would meet the criteria for a high hazard area under the definition of the CRPS.[14]

28 In addition, due to modelling uncertainties, it is possible that the model is underpredicting overflows from the stream toward the area of floodplain directly below the terrace.[15] This means that areas that are not currently modelled as reaching the "high hazard" criteria in the CRPS, may in reality be subject to floods that do reach this level.

29 Notably, whilst it is acknowledged there are modelling uncertainties, the evidence is that the modelling may underestimate the hazard, not overestimate it.

30 The evidence of Ms Hollier sets out the CRPS provisions relevant to development in a high hazard area, which seek to avoid new subdivision, use or development of land within high hazard areas.[16]

31 CRC's concern in this respect is a result of the staged review process of the ODP, in that the PC21 provisions that enable further development

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14 Evidence of Oliver Hermans, dated 3 March 2023, at [24].

15 Evidence of Oliver Hermans, dated 3 March 2023, at [18] and [20].

16 Evidence of Alanna Hollier, dated 3 March 2023, at [62].

will likely have legal effect (and therefore be able to be relied on by plan users seeking to further intensify), ahead of any provisions that seek to restrict development in areas subject to natural hazards, as part of that stage of the ODP review.

32 While the ODP provisions do have some protection through the form of activities that are subject to the ODP definition of "high flood risk", this does not include the same depth requirement as the CRPS definition, so does not capture areas where floodwaters may pond. Therefore, there are areas that are not subject to the ODP definition of high flood risk, which may meet the definition of high hazard area under the CRPS.[17]

33 It is also noted that section 6(h) of the RMA, which provides for "the management of significant risks from natural hazards" as a matter of national importance, was inserted into the RMA in April 2017, which was after the current ODP provisions had been developed.

34 In light of this information, CRC considers that an additional restriction on development in the area below the relevant terrace is necessary, in order to give effect to the CRPS and Part 2 of the RMA. While the section 42A officers placed weight on the majority of lots along Glen Lyon Road already having residential dwellings on them,[18] CRC submits that the potential for sites to be further developed cannot be excluded in future. It is consistent with a precautionary approach to ensure that PC21 does not allow for this outcome, even if it may be unlikely.

35 For these reasons, CRC considers that the additional standard sought (as set out in Appendix 1 to the evidence of Ms Hollier) is the most efficient and effective way to avoid new development in areas that could be subject to high flood hazard risk.

Scope for this change

36 While CRC accepts that the amendment initially proposed in its submission (to amend the definition of "High Flood Risk" in the ODP) is outside the scope of PC21, it considers that scope is available to make the requested changes for the following reasons:

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17 Evidence of Alanna Hollier, dated 3 March 2023, at [61].

18 Section 42A report, dated 17 February 2023, at [304].

(a) The relief now sought was specifically raised as alternative relief within the submission itself,[19] ensuring that any person would be aware of the potential for this amendment to be made;

(b) The relief directly relates to the subject matter of PC21, which allows additional development than what would be permitted under the ODP in the relevant areas;

(c) The relief sought (being the addition of a further standard for development) is in relation to a new zone chapter (so it addresses a change to the status quo).

Advice note referring to the Flood Protection and Drainage Bylaw 2013

Relationship between bylaw and district plan

37 The Regional Council is responsible for the administration of the Bylaw. The purpose of the Bylaw is to "manage, regulate and protect flood protection and flood control works (including drainage networks) belonging to or under the control of the Canterbury Regional Council from damage or misuse", and "only controls activities that may affect the integrity or effective operation and maintenance of the flood protection and flood control works."[20]

38 The RMA does not specifically provide for the relationship between bylaws and district / regional plans. Bylaws are not one of the listed matters that district plans must give effect to, or not be inconsistent with.[21]

39 However, bylaws made by a local authority are secondary legislation for the purposes of the Legislation Act 2019.[22]

40 Bylaws are an important regulatory tool that sit alongside district and regional plans to manage activities with particular effects. Bylaws cover a wide range of activities (as provided for in the Local Government Act 2002) that in some instances are not within the functions of a council to control under the RMA.

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19 CRC original submission (57), at [12].

20 CRC Flood Protection and Drainage Bylaw 2013 (as amended 2018), cl 3.

21 RMA, s 75.

22 Local Government Act 2002, s 161A.

41 Territorial authorities have the function of the control of any actual or potential effects of the use, development or protection of land including for the purpose of the avoidance or mitigation of natural hazards.[23]

42 While a bylaw may not be specifically listed as being required to be taken into account when preparing a district plan, it is submitted that it has a similar effect to "management plans and strategies prepared under other Acts", which the territorial authority is required to "have regard to" when preparing or changing a district plan.[24]

43 Arguably, as secondary legislation, a bylaw has more legal force than a management plan or strategy, and therefore should be considered through a district plan process.

Reasoning for the inclusion of advice note

44 As noted by Ms Hollier, the Bylaw provides additional requirements on activities that are commonly managed through a District Plan's zone chapters. This includes planting or growing vegetation, constructing or locating structures, and dumping or depositing any thing.[25]

45 This requirement may not be immediately apparent to a plan user looking at the District Plan, as in some circumstances the PC21 provisions permit activities that may require an authorisation under the Bylaw.

46 These activities being permitted means they are not likely to come before MDC for assessment at all (unless a certificate of compliance is applied for), and therefore there will be no opportunity for MDC to alert plan users that their activities may also require authorisation under the Bylaw.

47 An advice note is valuable in order to alert plan users to this additional requirement. It would not impose any additional consenting requirements, and simply notifies plan users as to the existence and potential application of the Bylaw.

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23 RMA, s 31(1)(b)(i).

24 RMA, s 74(2)(b).

25 Evidence of Alanna Hollier dated 3 March 2023, at [84].

48 While the section 42A report authors have suggested any such advice note would be best located within the natural hazards chapters,[26] the CRC's evidence is that the focus of the Bylaw is not about protecting land use activities from flood hazards (as would be expected to be the focus of the natural hazards chapters), but managing adverse effects of activities (including those permitted under district plans) on the flood mitigation infrastructure and works.[27] An advice note within the relevant zone chapters would be appropriate as it is these activities that may have an effect on the infrastructure sought to be protected.

49 As demonstrated by the evidence of Ms Hollier, the addition of an advice note would also be consistent with a number of the objectives and policies of the CRPS.[28]

50 For these reasons, in order to achieve consistency and clarity across both regional and territorial regulatory instruments, the CRC seeks the addition of an advice note as set out in Appendix 1 to the evidence of Ms Hollier.

51 This relief was sought in the CRC's submission, and is within the scope of PC21 as it seeks amendments to the chapters which are entirely new to the ODP (and would not be unanticipated when considering the purpose of PC21).

Industrial zone and reverse sensitivity

52 The changes sought by CRC intended to protect the amenity of residential-zoned land adjoining Twizel's GIZ, particularly in relation to air quality, consistent with the provisions of the CRPS.

53 At the outset, based on the section 42A report it appears that the section 42A officers have recommended an amendment that largely gives effect to CRC's submission point. However, there is a difference between the narrative text and the suggested amendment – the narrative text refers to a 30 metre setback, whereas the amendment itself is for a 50 metre setback (as requested by CRC). CRC wishes to clarify that it continues to seek the 50 metre setback.

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26 Section 42A Report, dated 17 February 2023, at [305].

27 Evidence of Alanna Hollier, dated 3 March 2023, at [85].

28 Evidence of Alanna Hollier, dated 3 March 2023, at [90]-[91].

54 Further, the section 42A report appeared to accept CRC's submission in respect of GIZ-R1, but not GIZ-R2. CRC considers that for consistency the same setback should be provided in respect of both rules, as without it, any "heavy industrial activity" could locate anywhere within the GIZ as a permitted activity without being subject to any standards or matters of discretion.[29]

55 As noted by the CRC's submission and the evidence of Ms Hollier, activities subject to GIZ-R2 may still be incompatible with residential land uses and may still require resource consent under the Canterbury Air Regional Plan.[30]

56 CRC continues to consider that the matters of control (as set out in Appendix 1 to the evidence of Ms Hollier) are appropriate, and ensure that residential amenity is maintained.

57 For these reasons, CRC seeks that the amendments proposed in Appendix 1 to the evidence of Ms Hollier are adopted by MDC.

Scope for the requested changes

58 This relief is similar to that sought in the CRC's original submission,[31] and is within the scope of PC21 as it seeks amendments to the chapters which are entirely new to the ODP (and would not be unanticipated when considering the purpose of PC21).

Conclusion

59 CRC reiterates that the amendments it proposes are to fulfil its intent of ensuring clarity and consistency between the relevant planning and regulatory documents in the region.

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29 Evidence of Alanna Hollier, dated 3 March 2023, at [103].

30 Evidence of Alanna Hollier, dated 3 March 2023, at [104].

31 CRC original submission (57), at [63] and [64].

60 The provisions of PC21 are required to give effect to the CRPS. While on the whole this is achieved, there are further suggested amendments that could be made to achieve greater alignment.

Dated this 10th day of March 2023

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K T Dickson

Counsel for Canterbury Regional Council

Rob Hall – R.J. Hall Expert

- Bio and work experience
- Flood reports for Lyford Lane 1999 and 2001

Supporting docs to the
B.D & C.B White
Submission on
Plan Change 25

Curriculum Vitae: Robert James Hall

Qualifications:

MIPENZ (Civil) CPEng IntPE (NZ) No. 19621
ME (Natural Resources) Lincoln University, N.Z.
BE (Civil). University of Canterbury, N.Z.
NZCE (Civil)
Surface Water Hydrology Course (University N.S.W., Kensington. Aust.)

Professional Associations:

Member of the Institution of Professional Engineers of New Zealand.
Member of New Zealand Society of Large Dams.
Member of Structural Engineers Society of New Zealand.
Member of the New Zealand Geomechanics Society.
Member of N.Z. Society of Coastal Sciences and Engineering.
Member of N.Z. Hydrological Society

Experience:

Twenty six years experience with Catchment Authorities and Regional Government in New Zealand including the investigation, design, promotion and management of river and catchment control schemes and the development of flood plain management strategies. This latter work included development and promotion with the affected communities of the Glenavy Camp and Blandswood Hazard Management Plans, the Orari - Waihi - Temuka, Levels Plains, Pleasant Point, Temuka Township and Ashburton Township Flood Plain Management Plans and preliminary work on the Ashburton Rural Flood Plain Management Plan.

Completed an assessment of flood hazards to Fairlie Township and developed mitigation strategies. Carried out hydraulic modelling of the Arowhenua Floodplain situated to the west of Temuka between the Temuka and Opihi Rivers. Experience in the design, construction and management of detention dams for urban and rural flood protection and the design of irrigation storage dams. Twenty five years experience in the development and operation of flood warning systems and procedures.

At various times provided site inspection services during construction for project designers (Ormond Stock and Associates, Holmes Consulting, Arrow International, viz Fonterra Clandeboye, Timaru Piazza, Retirement Villages, Countdown Supermarket, Timaru Hospital upgrades, Timaru DC office rebuild, and for construction companies Eberts, Fletcher EQC, G.J.Gardiner, Versatile, Jennian Homes, Total Span. Peer review of Waimate Stadium, dairy sheds,

dairy barns. Expert evidence to the Environment Court in 2016 relating to the effects of dam break surges on structural integrity of residential buildings lying within the dam break surge corridor. Transmission Line Section NZED 1970's: Design checks on lattice steel transmission line towers and substation structures, design checks on steel monotube structures and steel box section substation line termination structures and load and deflection proof testing of same (Halfway Bush South Dunedin 220 KV double circuit line, Redcliffs substation, Taradale).

Carry out building risk classifications on buildings (domestic and industrial) following the September 2010 Greendale earthquake in Christchurch and suburbs, and following the 2011 earthquakes. Provide earthquake damage repair Strategies for Fletchers EQR for Mid and South Canterbury. Earthquake damage reports for Insurers and private individuals arising as a consequence of the Canterbury earthquakes. Undertake IEP's for clients. Structural design of residential and commercial properties, including farm bridge designs, provide bridge designs to Timaru District Council for pedestrian and cycle use. Design hydraulic structures for irrigation infrastructure. Provide peer review services to Waimate District Council and Timaru District Council on request for compliance with NZ Building Act. Provide dangerous building assessments for Waitaki District Council. Provide subfloor framing designs for residential buildings subject to occasional flood flows. Foundation designs and design checks and reviews on request to Builders and Building Contractors in South Canterbury and Otago.

Designed pump drainage works for Queenstown Lakes District Council, prepared an assessment of flood hazard and the design of a flood warning system and associated procedures for Fletcher, Dillingham, Ilbau Consortium, Manapouri Power Station new tailrace project.

Completed a review of flood mitigation procedures (establishing floor heights for new dwellings) in Riversdale for the Southland District Council and Environment Southland (2014). Report on scale and nature of flood and sediment related hazards to Franz Josef township and environs from the Waiho River, and Te Anau from the Upukerora River.

Providing investigation and design input to a number of irrigation storage dams (large dams, low PIC, NZ Building Act) in collaboration with GeoSolve and Terra MDC Ltd. in Otago and Canterbury, and routinely peer reviewing dam break and dam design reports for Goldie & Partners in mid and north Canterbury.

Designed siphons for abstraction of water out of manmade water courses i.e. canals [Irishmans Creek Station, Tekapo – Pukaki hydro canal, Morrisons property, RDR, and for irrigation purposes and for auxiliary spillways for detention dams (Hawkes Bay Catchment Board).

Provide engineering advice on river management and erosion protection measures for the Central Plains Irrigation Scheme Rakaia River intake and their Waimakariri River intake the latter by review of Opus International Ltd design proposals, provide river management advice to the NZ Defence Force for the Kahutarawa River at Linton Military Camp through subconsultancy with URS / AECOM, review Opus International designs for river protection works on the Waitaki River for SH 1 at Glenavy.

Relevant Projects

- Flood risk and geotechnical assessments for subdivision proposals at Barrytown , Franz Josef, Levels Plains, Twizel, Bobs Cove, Queenstown, Poison Creek, Queensbury, Mt. Pisa Estate, Cromwell, and Lowburn.
- Flood mitigation options for Woodbank Estate, Hanmer. And various subdivisions on Levels Plains, Pleasant Point, Lowburn, Bobs Cove, Queenstown,
- Engaged by Ministry for the Environment to assist in a Flood Risk Management Review of Marlborough District Councils emergency management functions.
- Stormwater management Gleniti Subdivision, Timaru and rural runoff control options for the north eastern side of Temuka.
- Flood hazard assessment for food store, Winchester South Canterbury.
- In conjunction with GHD assessed and made recommendations on the flood management provisions for the Oceania Gold Fossickers Creek Tailing impoundment structure, Reefton.
- Assisted in the compilation of an Environmental Management Strategy covering waste water and stormwater management and disposal for the New Zealand Dairies Ltd. Studholme dairy factory.
- Waiho River Future Management: report to West Coast Regional Council (2012); co-authored a paper in 2013 issue of Nez Zealand Journal of *Hydrology Recent Behaviour and Sustainable Future Management of the Waiho River Westland New Zealand* (Tim Davies, Blair Campbell, Bob Hall, Chris Gomez) Journal of Hydrology New Zealand Vol 52, No. 1 2013.

- Completed a review of flood mitigation procedures (establishing floor heights for new dwellings) in Riversdale for the Southland District Council and Environment Southland (2014).
- Draft Asset Management Plan for the Lower Waitaki River Control Scheme for Environment Canterbury
- Annual review and reporting on the performance of the Mt. Albert Station, Makarora River bunds
- Design of an avalanche bund on Kitchener Stream, Aoraki Mount Cook for DOC.
- Design check on bridge waterways for DOC in Aoraki Mt Cook National Park
- Provided advice on river morphology to DOC, Aoraki Mt.Cook National Park for the realignment of the Tasman River valley road.
- Peer Review of Central Plains Irrigation Scheme Rakaia River intake as sub-consultant to URS.
- Design irrigation intake river protection measures for Central Plains Water Rakaia and Waimakariri River intakes
- Design and peer review river protection works for NZTA Ahuriri River SH 8, and Waitaki River SH 1.
- Various on-going structural design engagements

Special Interests:

River, floodplain and coastal morphology and processes, hydrology, hydraulic modelling of rivers and floodplains, natural hazard assessments and active involvement with community groups associated with particular flood related hazards, and river and coastal processes, urban and rural stormwater management, investigation, design and construction overview of irrigation storage dams and flood detention dams. Structural design of single and two storied residential and commercial buildings including farm buildings in timber, concrete, reinforced concrete block and steel including appropriate dimensioning for localised effects associated with extreme wind, heavy snow and flood event loadings

R.J. Hall.
MIPENZ (Civil) CPEng Int PE (NZ) No. 19621
R.J.Hall Civil & Environmental Consulting Ltd

Date: 15 May 2017

Employment Record

2011 – Present	Established R.J.Hall & Associates Ltd, Civil and Geotechnical engineering consultancy
2007 - 2011	Merged R.J.Hall Civil & Environmental Consulting Ltd. with GHD and managed GHD's Timaru office and continue to provide civil and environmental engineering consultancy services.
1995 to Oct 2007	Established and ran R.J.Hall Civil & Environmental Engineering Consulting Ltd. in Timaru.
1989 - 1995	Regional Structures and Hazards Planning Manager and Principal Manager (Timaru), Canterbury Regional Council.
1987 - 1989	Chief Engineer to the South Canterbury Catchment Board. Day to day administration of the Board's engineering operations associated with water and soil conservation and flood hazard mitigation activities. Flood warning systems manager.
1987	Senior Rivers and Drainage Engineer for Marlborough Catchment Board. Investigation, design and review of catchment, river and drainage schemes, administration of works programmes and flood warning systems.
1986	Assistant Chief Engineer, Bay of Plenty Catchment Commission. Day to day administration of the Commission's engineering functions including the management of extensive land drainage systems (pumped and gravity) and flood control systems.
1981 - 1986	Chief Engineer, Waitaki Catchment Commission. Management of the Commission's engineering functions associated with soil conservation, river management, hazard mitigation and policy development. Flood warning systems manager.
1975 - 1981	Design Engineer, Hawkes Bay Catchment Board. Structural and hydraulic design of flood mitigation works (stopbanks, detention dams, urban stormwater systems), land drainage systems (pumped and gravity), river morphology studies, hydrological studies, lake and wetland studies, major earthworks investigations, quality control, specification writing and contract supervision.

1974 - 1975	Investigations and Design Engineer, New Zealand Electricity Department. Substation foundation contract supervision, transmission line design and construction supervision, steel box girder terminal structure. Commissioning tests (load - strain - deflection). Special foundation design.
1973 - 1974	University of Canterbury School of Engineering. Civil Engineering Cadet (NZED). Majored in structural design and hydraulics. Vacation employment encompassed the development of seismic resisting support systems for high voltage switching gear, transformer anchorage and retrofitting of such systems.
1971 - 1973	Engineering Officer, New Zealand Electricity Department, Transmission Line Design. Specialised in special foundations for HV transmission line system (river crossings, monotubes), lattice steel tower design checks, deflection and pre-camber computations for steel box monotube towers.
1968 - 1971	Engineering Officer Cadet, New Zealand Electricity Department. Transmission line route selection and surveys.

File Copy.

R.J. Hall MIPENZ

Civil and Environmental Consulting Ltd.

78 Beverley Rd
Timaru

Phone : (03) 6888952
Fax : (03) 6848807

File Ref White / 01

2 March 2001

C.White
c/o B.White
314 Chelmsferd St.
Invercargill

Dear Sir

Re : Flood Risk Assessment : Lot 23 DP 75200 (Hocken Subdivision, Twizel)

I have examined Lot 23 DP 75200 for the purposes of establishing recommended floor levels for your proposed residential dwelling such that it would comply with Sec 7 (j) (ii) of the Mackenzie District Councils Proposed District Plan (September 1999). I refer you to a report prepared by R.J.Hall Civil & Environmental Consulting Ltd. (1 December 1999) that accompanied the subdivision application lodged by Milward Finlay Lobb on behalf of F.Hocken, developer. This report explains the broad nature of flood risk within the subdivision at the 1 / 500 yr flood risk level and zones the area according to varying degrees of flood related effects. The report concluded that the whole of the subdivision was likely to be exposed to flood waters and consequential flood related effects in a 1 / 500 year event.

The site that you have chosen for your proposed dwelling is located near a drainage channel (M/R : H38 786 595). In order to satisfy the requirements of Section 7 (j) (ii) of the MacKenzie District Council Proposed District Plan it will be necessary to elevate the floor level above the surrounding ground. I would recommend that this could best be accomplished by constructing an elevated compacted gravel platform on which to erect the dwelling. This will require the stripping of all topsoil and wet or otherwise unsuitable material from platform footprint and then compacting the gravel platform to the required height. Compaction of the gravel should be undertaken using conventional compaction plant (e.g. 5 Tonne or heavier, vibratory roller, 6 passes minimum, lifts of 200 mm maximum loose). Compaction relying on construction plant wheel or track pressures will not be acceptable.

The site chosen for your proposed dwelling is within the area identified in the 1 December 1999 Report as an area where high ground water levels may be present and where there is an attendant risk of an avulsion from the Twizel River. The zoning adopted in that report was used

It is considered that these measures if fully implemented will satisfy the requirements of Section 7 (j)(ii) of the Mackenzie District Councils Proposed District Plan (1999) and the requirements of Section 36 (1) of the Building Act 1991.

Yours faithfully

R.J.Hall
R.J.Hall Civil & Environmental Consulting Ltd.

c.c. Mackenzie District Council.

Landonline Pre-Validation Report

Generated for bhanlin001 on 2006-01-10 16:30:50

*** The following rules are preventing the Submission of the Survey Dataset:

Y015 - Fatal - *[Failure] Survey data has been modified that could affect the definition of parcel boundaries. At least one parcel needs to be re-linked to confirm the boundary definition of the survey, and Plan Generation needs to be re-performed if a Digital Survey plan is required for this survey.

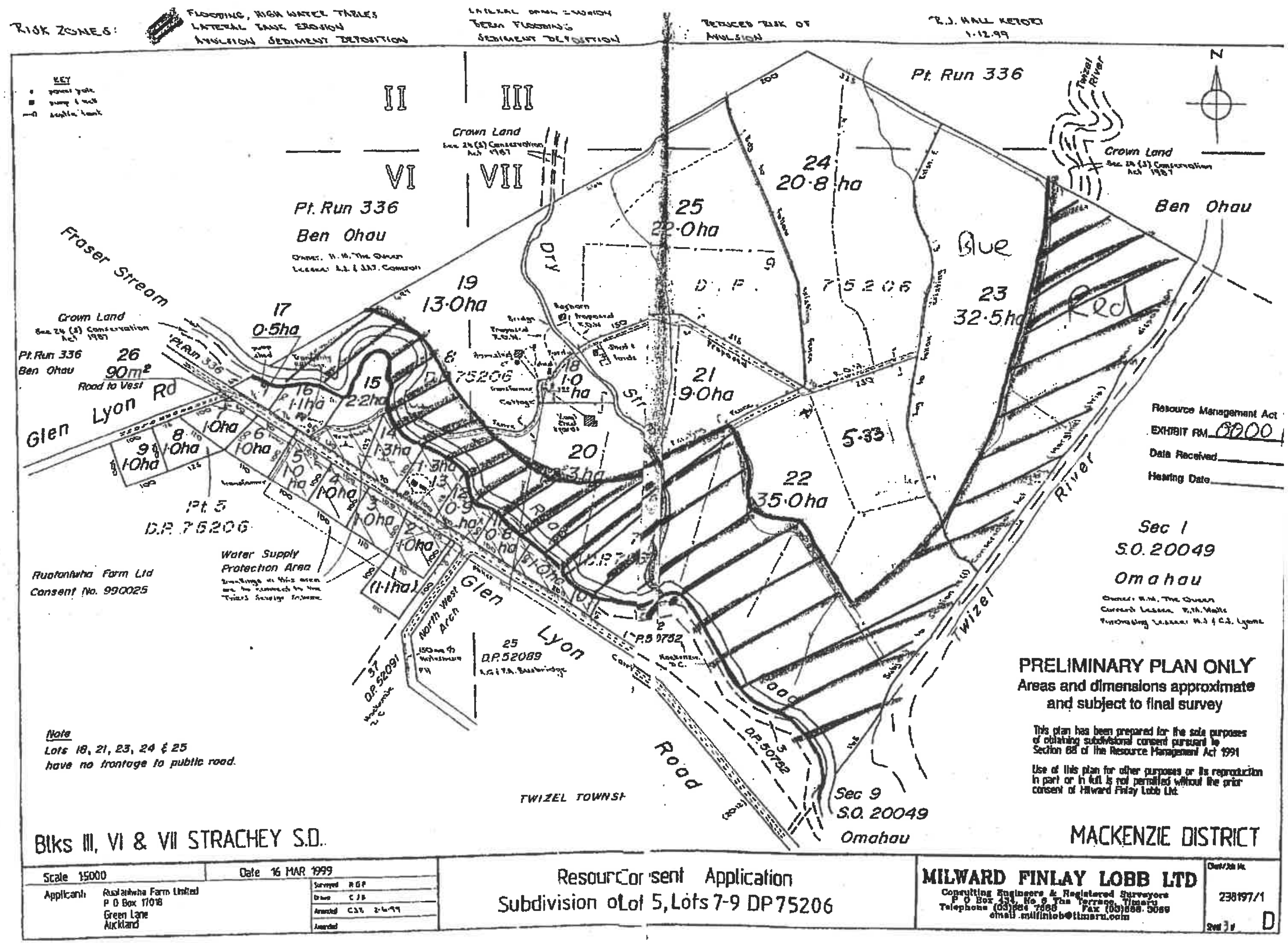
Y021 - Fatal - A graphic of this survey has not been generated/attached. Either generate a Digital Plan Diagram or attach an appropriate Plan Graphic supporting document.

Y023 - Fatal - A graphic of this survey has been changed but not been regenerated. Ensure a Digital Plan Diagram is regenerated.

NOTE: None of the survey business validation rules have been executed as at least one of the rules which ensure the base integrity of the captured survey data has failed.

*** The following rules are compliant with Landonline data:

Y001 - Compliant - All required mark details have been populated.
Y002 - Compliant - All required observation details have been populated.
Y003 - Compliant - All required parcel details have been populated.
Y004 - Compliant - There are no manadtory missed marks to include in the survey.
Y005 - Compliant - New parcels and underlying parcels exist for this survey dataset.
Y006 - Compliant - All existing parcels referenced by the survey dataset are registered in Landonline.
Y007 - Compliant - All parcels with topology definition referenced by the survey dataset have boundary definitions.
Y008 - Compliant - All marks referenced by the survey dataset have coordinates.
Y009 - Compliant - All new parcels referenced by the survey dataset have been appropriately linked.
Y010 - Compliant - All boundary observations referenced by the survey dataset have been included in the definition of new parcel boundaries.
Y011 - Compliant - A survey date has been specified for this survey dataset.
Y012 - Compliant - At least two marks have been linked to Landonline marks.
Y013 - Compliant - All marks linked to underlying marks in Landonline have been appropriately linked.
Y014 - Compliant - The number of plan reference points for this survey dataset is between 1 and 20.
Y016 - Compliant - All the marks in the survey dataset are linked to an observation, boundary dimension or boundary line.


RISK ZONES:
FLOODING, HIGH WATER TABLES
LATERAL BANK EROSION
AVULSION SEDIMENT DEPOSITION
REDUCED RISK OF AVULSION
R.J. HALL KETORI 1.12.99
KEY
power pole
pump & well
septic tank
Pt. Run 336
Ben Ohau
Crown Land
Sec 24 (3) Conservation Act 1987
Twizel River
Fraser Stream
Dry
Glen Lyon Rd
Road to Vest
North West Arch
Glen Lyon Road
Twizel River
Twizel Townsh
Sec 1
S.O. 20049
Omahau
Sec 9
S.O. 20049
Omahau
Pt 5
D.P. 75206
Ruataniwha Farm Ltd
Consent No. 990025
Water Supply Protection Area
Note
Lots 18, 21, 23, 24 & 25
have no frontage to public road.
26 90m²
17 0.5ha
19 13.0ha
15 2.2ha
16 1.1ha
20 3ha
21 9.0ha
22 35.0ha
23 32.5ha
24 20.8ha
25 22.0ha
18 1.0ha
5.33
Blue
Red
D.P. 75206
D.P. 52089
D.P. 52091
D.P. 50792
Resource Management Act
EXHIBIT RM 0000
Date Received
Hearing Date
PRELIMINARY PLAN ONLY
Areas and dimensions approximate
and subject to final survey
This plan has been prepared for the sole purposes of obtaining subdivisional consent pursuant to Section 88 of the Resource Management Act 1991
Use of this plan for other purposes or its reproduction in part or in full is not permitted without the prior consent of Milward Finlay Lobb Ltd.
MACKENZIE DISTRICT
Blks III, VI & VII STRACHEY S.D.
Scale 1:5000
Date 16 MAR 1999
Applicant: Ruataniwha Farm Limited P O Box 11018 Green Lane Auckland
ResourCe Consent Application
Subdivision of Lot 5, Lots 7-9 DP 75206
MILWARD FINLAY LOBB LTD
Consulting Engineers & Registered Surveyors
238197/1
D

R.J. Hall MIPENZ

Civil and Environmental Consulting Ltd.

78 Beverley Rd
Timaru

Phone : (03) 6888952
Fax : (03) 6848807

File Ref : F Hocken / 01

1 December 1999

R.Finlay
Milward Finlay Lobb
P O Box 434
Timaru.

Dear Russell

Flood Risk Assessment Report : Proposed Subdivision Pt. Lot 5, Lots 7 - 9 DP 75206
Glen Lyon Rd, Blk III, VI & VII Strachey SD.
Applicant : Ruataniwha Farm Ltd., (F.Hocken).

Attached please find my report on the flood and associated risk on the land incorporated in the proposed subdivision and recommended mitigation measures that could be undertaken to enable parts of the area covered by the proposed subdivision to be used for residential dwellings. If you require clarification on the contents of this report please feel free to contact me at your earliest convenience. Thank you.

Yours faithfully

R.J Hall
Civil & Environmental Engineering Consultant.

Report : Flood Risk Assessment Proposed Subdivision
Pt. Lot 5, Lots 7, 8 and 9 Blk III, VI, VII, Strachey S.D.
Glen Lyon Road, Twizel.

R.J.Hall
Civil & Environmental Engineering Consultant

1 December 1999

Contents

1.0 Preamble.

The proposed subdivision lies to the north east of Glen Lyon Road, Twizel and is bounded in the west by the Frazer Stream and to the east, the Twizel River. A third water course of reasonable proportions, Dry Stream bisects the roughly triangular block of land lying between the Frazer Stream and the Twizel River. These three watercourses merge near the south eastern corner of the proposed subdivision to form the apex to the triangle. A cursory assessment of flood risk associated with the proposed subdivision was made by P.Lees (1999). That report concluded that the whole of the area enclosed in the proposed subdivision was vulnerable to flooding from the three watercourses described above and " If development of this area is anticipated, the siting and structural design of any proposed dwellings should be approached with a great deal of caution." In arriving at this conclusion based on anecdotal evidence and his own knowledge of the area he considered that break outs from the Twizel river in particular "could result in significant water velocities, transportation and subsequent deposition of gravels from the river bed and scouring of surrounding lands ". No attempt was made to quantify either the areas which he considered could be affected in this manner, nor the likely velocities and depths involved and hence no attempt was made to ascertain what categories of risk were involved in the manner required in Section 6 (e) (i) and (ii) of the Mackenzie District Council Proposed District Plan September 1999.

The purpose of this assessment is to endeavor to quantify the nature, scale and distribution of flood and associated risk in the proposed subdivision area an provide some direction the type of mitigation measures which could be employed in order to enable parts of the area to be used for residential purposes (dwellings).

2.0 Mackenzie District Plan

Section 6, Residential Zone Rules, subsection (e)(i) prohibits the erection of habitable residential buildings within areas of " High Flood Risk " whilst subsection (e)(ii) permits habitable residential buildings in areas of "Low Flood Risk " provided floor levels are set a minimum of 150 mm above the 0.2 % annual exceedance probability flood level (i.e. a 500 year return period flood). "High Flood Risk and Low Flood Risk " are defined in Section 2 as respectively those areas where the product of flood depth and velocity equal or exceed 1 (i.e. unity) or are less than 1 in the 0.2 % AEP flood event. In order therefore to ascertain if the proposed subdivision is suitable for habitable residential dwellings an assessment needs to be made of the extent of potential flooding in a 0.2 % AEP event and the likely distribution of velocities and depths associated with such flooding. Secondly the Plans reference is to flood events with the prescribed probability of occurrence based on the qualifying statement in brackets which forms part of subsections 6(e)(i) and (ii).

Rob Hall Flood Report
Civil & Environmental Consultant

3.0 Summary

The area enclosed and forming the proposed subdivision is in essence is part of the Frazer Stream, Twizel River fan and incorporates an inter-fan depression. The construction of the Pukaki - Ohau Canal which passes to the north of the proposed subdivision has effectively restricted the area of the remnant fan that these watercourses have access to in times of flood. The culverts beneath the canal are considered sufficiently large to pass the 500 year floods although the heading up required in such an event and the associated up-stream ponding which occurs will effectively reduce peak flows by an estimated 10 % so that the 500 year peak discharge downstream of the culverts will be 90 % of that approaching the culverts on the upstream side. Topography in the area where the Twizel River emerges from its culvert is such that the true left berm is lower than the true right berm. This effect diminishes as the stream progresses downplain but is considered sufficient to encourage approximately two thirds of the out of channel spill in the 500 year event to disperse away from the true left bank towards SH 8 in the vicinity of the Twizel airport, the balance spilli south west towards the Frazer - Twizel confluence.

The Frazer stream is effectively bounded on its true right bank by a high terrace and as a consequence out of channel spill from this channel is predominantly to the south east to merge with that spilling from the Twizel River and Dry Stream. The passage of these flood spills down plain across the proposed subdivision in the 500 year event can be expected to cover sufficient area to warrant the assumption that the whole of the area of the subdivision could be affected to a greater or lesser extent. Initially flow is likely to be confined to old swales etched into the surface by water during the evolution of the alluvial fans which comprise this area. As flood spills increase towards their respective peaks these flow paths could surcharge spill and hence coalesce.

Those area immediately adjacent to the water courses can be expected to erode during floo events in events of a much lesser intensity than the 500 year event and as a consequence regard needs to be had for the risks associated with this type of flood induced action. The possibility exists for avulsions to occur during or as a consequence of large floods with return periods less than the 500 year event and again regard should be had for the risks associated with such occurrences. The potential exists also for the occurrence of high intensity localised storms (e.g. summer convective storms) although the flooding which is to be expected from such events is considered likely to be less severe than that associate with 500 year events on the major watercourses in the area. These events will be of a relatively short duration typically up to 1 hour and have the potential to surcharge the swale but will clear relatively quickly. Provisions made to mitigate flooding from the major watercourses are expected to ensure that the effects of these short duration events are equally mitigated. To the west of Dry Stream across to the Twizel river is an area where groundwater emergence and wet ground conditions occur, these conditions being most noticeable following persistent rain. These conditions will inhibit the losses which normally occur during rainstorms and as a consequence will tend to exacerbate surface flooding effects during any rainstorms where high antecedent rainfall conditions have occurred.

Rob Hall Canal Breach

In addressing the flood potential of the site it is also necessary to evaluate the risks associated with the Pukaki - Ohua Canal arising from catastrophic failure of that structure up-plain from the subdivision. It is considered that such failure is most likely to arise from movement on the Osler Fault where it crosses the canal alignment near the Frazer Stream. making this assumption it is necessary also to ascribe a probability of movement on a scal sufficient to destabilize the structure sufficiently to induce failure. It is assumed that movement on the fault is most likely to arise from sympathetic movement induced by an earthquake on the Alpine Fault rather than the Osler Fault in isolation. The actual risk though for the subdivision must modify this probability of occurrence to allow for release t either side of the canal and for failure to occur at points along the canal which will not res in canal breach flood waters reaching the subdivision. The probability for movement on th Alpine Fault has been obtained from Yetton M. D. (1998).

Having determined the scale of potential flood releases either from the rivers or the failure the canal an assessment is then made on the likely depths and velocities of these floodwate across the proposed subdivision, the use of these values to determine the scale of flood risl required by the Plan and consideration of surface erosion and sediment transport potential these floodwaters. Finally a strategy can be developed incorporating a combination of both avoidance and mitigation measures to enable habitable residential building to be erected in areas designated as Low Flood Risk. Any areas which cannot meet the Low Flood Risk criteria of the Plan must be excluded as potential sites for dwellings.

4.0 Conclusions

4.1 The whole of the proposed subdivision is subject to inundation to varying degrees from flood spill from either or all of the following Frazer Stream, Dry Creek or the Twizel River in a 0.2 % AEP flood event.

4.2 The whole of the proposed subdivision is subject to the risk of surface flooding in short duration high intensity localised rainstorms with an AEP of 0.2 %.

4.3 The natural (active) banks of the Frazer Stream, Dry Creek and Twizel River are vulnerable to stream bank erosion during and as a consequence of flood flows generally with an AEP of 20 %. The extent to which such erosion is likely is proportionately greater for the Frazer Stream and Twizel River than for Dry Creek because of the likely size and duration of events on these two watercourses relative to Dry Creek.

4.4 In times of major flood events probably with AEP in excess of 2 % and or where aggressive channel aggradation or channel obstruction occurs in lesser events major channel re-alignment is possible (avulsion). It is opined that where such phenomena

occur they are most likely to be confined to the low lying berm areas immediately adjacent to the present watercourses.

4.5 In a 0.2 % AEP flood event on the three watercourses a 10 % reduction in flood pea can be expected to occur as the flood hydrograph is routed through storage on the upstream side of the Pukaki - Ohau Canal. Furthermore it is estimated that out of channel spill from the Twizel river in the 0.2 % AEP event will be proportionately greater to the true left than to the true right estimated conservatively at 2/3 to 1/3 respectively.

4.6 Under normal channel conditions it is estimated in a 0.2 % AEP event that the proportion of flow retained in the confines of the active stream channels will be in the order of a 20 % AEP flood flow for each of the three watercourses, the balance being spilt onto each channels flood plains.

4.7 The following flood flows have been estimated for the three watercourses considered using Twizel River hydrometric records and synthetic flood estimation techniques with 10 % routing effects incorporated

AEP (%)	Frazer Stm. (cumec)	Dry Ck. (cumec)	Twizel R. (cumec)
20 (5 year)	35	20	50
0.2 (500 year)	88	41	119

4.6 The estimated flood spills into the proposed subdivision in a 0.2 % AEP event is assessed as follows

Frazer Stream (cumec)	Dry Creek (cumec)	Twizel River (cumec)	Combined Flow (cumec)
53	21	23	97 **Adopt 100 cumec**

4.7 The estimated peak outflow from the Pukaki - Ohau Canal during catastrophic failure to the true right wall only is estimated at 240 cumec (3.5 m cubic metres in 1.5 hrs. : Method - Allen P.H.[1995]). Allowing for 30 % loss to existing stream channels and a further 30 % peak reduction over the flood plain prior to arrival of the surge into the proposed subdivision through floodplain storage dispersal and attenuation residual peak flow is estimated at 113 cumec.

4.8 The probability of 0.2 % AEP event generated flood spill into the proposed subdivisic in the next 50 years estimated at 10 %.

4.9 The probability of catastrophic failure of the Pukaki - Ohau Canal generating a 115 cumec flood surge in the proposed subdivision in the next 50 years is estimated at 10 to 15 %.

4.10 On the assumption that in a 0.2 % AEP event flood waters will be confined on the floodplain to between 1 / 3 to 1 / 2 of any contour arc centered on the Frazer Stream and Twizel River confluence, bounded by the true right bank of the Frazer Stream and similarly the Twizel River and that uniform flow occurs then the following average flow parameters could be expected in the proposed subdivision

Velocity (m / s)	Velocity Head (m)	Depth (m)	Static Depth (m)	Risk Parameter (Velocity x Depth
0.6 to 0.7	0.02	0.19 to 0.22	0.21 to 0.24	0.12 to 0.14

Note : localised effects could elevate flows or cause localised accelerations to occur in the absence of avulsion, which could increase the risk parameter above thos determined by analysis. It is considered unlikely that risk parameters values in excess of 0.6 will occur in such circumstances likely. Where avulsions occur the risk parameter may well exceed 1.0. Static depth refers to " stalled flow " i.e. the conditions prevailing upstream of a flow obstruction where ponding is evident.

4.11 Depths, velocities, static depths and risk parameters for the catastrophic canal failure scenario will be comparable to those determined for the 0.2 % AEP natural flood event.

4.12 Except where deep soils occur, the risk of scour arising and destabilizing building foundations in the proposed subdivision is considered minimal because of the limited depth and associated low velocity of the floodwaters on the floodplain combined wit scour resistance of paved and grassed surfaces in combination with dense sandy gravel subsoil profiles. Bare soil areas particularly if located in swales where flood waters concentrate may experience erosion but this will be limited in depth by the gravel subsoil. These comments do not apply where deep (i.e. greater than 600 mm) of silts or sandy silts exist over the underlying gravels or in area vulnerable to lateral stream bank erosion or avulsion.

4.13 Active sediment transport and deposition over the greater part of the proposed subdivision in areas away from the active watercourses of the Frazer Stream, Dry

Creek and Twizel River and where stream bank erosion and avulsion is unlikely is expected to be limited to fine suspended sediment. At active stream bank erosion sit and the areas immediately downstream plus those areas where an avulsion occurs th erosion, transport and deposition of coarse fractions ranging from coarse sand through gravel to cobbles is possible in addition to the fine sediments previously described.

4.14 Differentiation between areas at risk from erosion, deposition, avulsion and where elevated risk parameters are likely and / or excessive ground saturation (high water tables) can arise versus areas where such risks are minimal is considered possible and reasonable on the basis of the field evaluations, knowledge of the flood propensity of the area, and the assumption and calculations undertaken as part of thi assessment.

Appended to this report is a copy of the proposed subdivision plan marked up to define four separate zones associated with varying degrees of risk to flooding, erosion, deposition, avulsion and high groundwater - excessively wet ground conditions. Those areas cross hatched in red or blue are areas where the constructio of dwellings could only proceed on a case by case basis having particular regard to the vulnerability of a particular site to any or all of the constraints referred to above. These physical constraints need to be well understood and quantified and acceptable engineering solutions developed sufficient to meet the requirements of the Building Act 1991. Where this cannot be demonstrated no habitable residential dwellings should be permitted i.e. it must be assumed in the absence of such site specific information and engineering design solutions that such areas have a status comparab to " High Flood Risk " under the Plan.

Those areas edged in pink outside the red and blue cross hatched areas are areas where active stream bank erosion is considered likely and should be avoided. This areas is the riparian margins of Dry Creek. The subdivision proposal requires the provision for land to be set aside along this watercourse for public access purposes i.e. esplanade provisions of Part IV (A) Section 24 of the Conservation Act 1987. A set back of not less than 20 m from the landward edge of each side of the esplanac reserve is recommended to minimize the risk of foundation instability to habitable residential dwellings arising from active stream edge erosion and associated slumpin

It is considered that the balance of the proposed subdivision area is suitable for the erection of habitable residential dwellings provided careful consideration is given on a site by site basis to ensure that the requirements of Section 6 (e)(ii) and the relevant requirements of the Building Act 1991 can be met in full. In this regard it is suggested that mitigation measures such as (but not limited by) pole housing, buildings positioned over groundline basement garages and compacted gravel foundation pads could be considered to provide the necessary compliance's required

in the Resource Management Act 1991 and the Building Act 1991 for the purposes of this subdivision application.

5.0 References.

5.1 Allen P.H. (1995) " Dam Break Mechanisms " NZSOLD Newsletter No. 31, January 1995.

5.2 Yetton M.D., Wells W., and Traylen N.J. (1998) "The Probability and Consequences of the next Alpine Fault Movement " EQC Research Report 95 / 193.

5.3 Lees P.(1999) Canterbury Regional Council correspondence to Milward Finlay Lobb. File No. AD5T - 0002, Ref 99099. " Flood Hazard Assessment - Proposed Subdivision, Ruataniwha Station, Glen Lyon Road, Twizel. Subdivision of Pt. Lot 5 and Lots 7 - 9 DP 75206."