BEFORE THE INDEPENDENT HEARINGS PANEL FOR PROPOSED MACKENZIE DISTRICT PLAN CHANGE 28

IN THE MATTER OF of the Resource Management Act 1991

AND

IN THE MATTER OF the Mackenzie District Plan Review, Stage 4: Plan Change 28 –Contaminated Land, Hazardous Substances, Natural Hazards and Hydro Inundation
Variation 1 to Plan Change 26
Variation 1 to Plan Change 27

STATEMENT OF EVIDENCE BY RICHARD MATTHEWS

09 MAY 2025

FOR GENESIS ENERGY LIMITED SUBMITTER # 46 (PC28), and FURTHER SUBMITTER # 5 (PC28)

EXECUTIVE SUMMARY

1. The submissions and further submissions made by Genesis in respect of Mackenzie District Plan Change 28 ("**PC28**") seek to ensure that the operation of the existing nationally significant Tekapo Power Scheme is not compromised or adversely affected by development occurring in the vicinity of the existing scheme infrastructure.

2. My evidence addresses the matters where I recommend changes to PC28 in response to the submissions, further submissions and the Section 42A Reports ("s42A Report") on PC28.

3. I consider that Table 1 in the REG Chapter should not include reference to the HAZS Chapter provisions, as requested by Genesis submission 46.05. REG activities will typically require the storage and use of hazardous substances (such as transformer oils) and the management of those substances is appropriately provided for under existing legislative instruments such as the HASNO Act.

4. Applying additional controls to Renewable Electricity Generation, which often require storage of hazardous substances for batteries, transformers, and other operational necessities, contradicts the intention of the REG chapter which seeks to provide for these activities.

5. The Genesis Tekapo Power Scheme involves some storage and use of hazardous substances, such as transformer oils, which are a necessary and integral part of the operation of the scheme. The storage and use of these hazardous substances is appropriately managed through the HSNO Act, HSW Act, Health and Safety at Work (Major Hazard Facilities) Regulations 2016, and the Health and Safety at Work (Hazardous Substances) Regulations 2017.

6. I support the intent of the Hydro Inundation chapter and in particular Objective HI-O1 and Policy HI-P1. These seek to "*minimise risk to human health and property*" (Objective HI-O1) and to avoid changes to existing land use activities that may increase the "*likelihood or scale of harm to people or property*" (Policy HI-P1), the key focus in my opinion being the risks to people of hydro inundation. In my opinion, this is consistent with the Building (Dam Safety) Regulations 2022 which address implementation matters relating to classification of dams and dam safety assurance required under sections 134 to 148B of the Building Act 2004.

7. I have proposed a change to Rule HI-R1 and a new Rule HI-R1A to address the Population at Risk from hydro inundation as a key part of implementing the dam safety regulations and ensuring that the Hydro Inundation chapter rules consider all activities that could result in increased risks to people where those activities could adversely affect the ongoing operation of the Tekapo Power Scheme.

8. I consider that the proposed change to Rule HI-R1 and the new Rule HI-R1A to manage the risks of hydro inundation on people and property are the most appropriate and are a more effective and efficient way to achieve the outcomes sought in the objectives and policies for the Hydro Inundation chapter.

INTRODUCTION

9. My name is Richard John Matthews. I hold the qualifications of Master of Science (Hons) degree specialising in Chemistry and have been working on resource consent applications (and their former descriptions under legislation prior to the commencement of the Resource Management Act 1991) since 1979 and advising on Regional and District Plan provisions since 1991.

10. I am a partner with Mitchell Daysh Limited, a specialist environmental consulting practice with offices in Auckland, Hamilton, Tauranga, Napier, New Plymouth, Nelson, and Dunedin. Mitchell Daysh Limited was formed on 1 October 2016, as a result of merger between Mitchell Partnerships Limited and Environmental Management Services.

11. I have more than forty years' experience as a resource management adviser, initially in the local government sector. My first role in the local government sector was as a water quality scientist assessing water quality in the Waikato River and its catchment, subsequently becoming Resource Consents Manager for the Waikato Regional Council.

12. Since 1999 I have been in private practice with the environmental consulting practice, Mitchell Partnerships Limited (now Mitchell Daysh Limited). I have been involved in many resource management projects within New Zealand, including several resource consent application processes and Regional and District Plan reviews.

13. I have been providing planning and resource consent advice to Genesis Energy Limited ("**Genesis**") with respect to their electricity generation activities since 1999 and prepared applications for regional resource

consents to enable the continued operation the Tekapo Power Scheme ("**Tekapo PS**"). I am familiar with the Tekapo PS operations, the resource consents applicable to the scheme and the Operative Regional and District Plan provisions relevant to the Tekapo PS. I have also been involved in preparing submissions and evidence for various consent applications under the Mackenzie District Plan ("**MDP**") and on changes to the MDP.

Code of Conduct

14. While acknowledging that this hearing is not before the Environment Court, I acknowledge that I have read the Environment Court's Code of Conduct for Expert Witnesses contained within the Environment Court Practice Note 2023 and I agree to comply with it. In particular, unless I state otherwise, this evidence is within my sphere of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

Scope of Evidence

15. My evidence discusses the Genesis Submissions (submitter ID 46 (PC28) and Further Submissions (submitter ID 05 (PC28) on MDP PC28 Review Stage Four with respect to the matters addressed in: the s42A Report (prepared by Meg Justice) for Plan Change 28: Contaminated Land, Hazardous Substances, Natural Hazards and Hydro Inundation.

16. My evidence focuses on the proposed provisions of Plan Change 28, in particular Topic 3 – Hazardous Substances Chapter and Topic 5 – Hydro Inundation Chapter.

GENESIS ENERGY LIMITED BACKGROUND AND SUBMISSIONS

17. The Genesis submissions on the proposed changes to the Mackenzie District set out the background to Genesis' interests in the Mackenzie District.

18. Genesis is an electricity generator and energy retailer with approximately 1900 megawatts of installed generation capacity and approximately half a million retail customers. The Genesis electricity generation profile comprises a range of energy sources. Genesis seeks to play its role in decarbonising the New Zealand economy and is making changes toward the goal of net-zero carbon by 2050, including reducing generation emissions by 36%.

19. Genesis owns and operates the Tekapo PS or "**the scheme**", which is a part of the nationally significant combined Waitaki Hydro Scheme identified in the

Canterbury Regional Policy Statement ("**CRPS**") and is "Regionally Significant Infrastructure" as defined in the CRPS.

20. The combined Waitaki Power Scheme (which comprises the Tekapo Power Scheme operated by Genesis and the Waitaki Power Scheme operated by Meridian Energy Limited) is referred to as the "Waitaki Hydro Scheme" in the CRPS and the "Waitaki Power Scheme" in the MDP. I refer to the combined scheme incorporating both the Genesis and Meridian activities as the "Waitaki Power Scheme" in the remainder of this evidence as appropriate.

21. The operation and maintenance of the Tekapo PS is reliant on the provisions in the District Plan being appropriate and ensuring that the scheme is not compromised or adversely affected by development occurring in the vicinity of the existing scheme infrastructure.

22. I have read the s42A Report relevant to PC28. I do not propose to repeat the matters addressed in those reports other than to focus on the aspects addressed in the Genesis submissions and further submissions and to highlight particular points where I do not agree with the s42A report author.

TOPIC 3 HAZARDOUS SUBSTANCES

23. The Introduction to the Hazardous Substances chapter notes that risks associated with hazardous substance use and its storage can pose potential risks for human and ecological health are "*primarily managed by the HSNO Act, HSW Act, Health and Safety at Work (Major Hazard Facilities) Regulations 2016, and the Health and Safety at Work (Hazardous Substances) Regulations 2017*".

24. The Genesis submission points 46.06 – 46.12 support the Hazardous Substances objectives O1 and O2, policies P1 and P2 and Rules R1 – R4. As part of PC28, Variation 1 to Plan Change 26 introduced a new line to Table 1 in the Renewable Electricity Generation ("**REG**") chapter to specify that the Hazardous Substances provisions HAZS-O2, HAZS-P1, HAZS-P2, HAZS-R1 and HAZS-R2 apply to REG activities.

25. Genesis submission point 46.05 requested that Table 1 in the REG chapter excludes reference to the Hazardous Substances chapter on the basis that the risks of hazardous substances are already managed through other legislation and that applying additional controls to Renewable Electricity Generation, which often require storage of hazardous substances for batteries, transformers, and other operational necessities, contradicts the intention of the REG chapter which seeks to provide for these activities.

26. The s42A author (paragraph 307) does not agree with removing reference to the HAZS Chapter provisions in Table 1 of the REG Chapter on the basis that if REG facilities require the storage of hazardous substances for batteries, transformers, and other operational necessities, then it is appropriate to apply HAZSR1, which requires the hazardous substances activity to be outside of a high flood hazard area.

27. The Genesis Tekapo PS activities are located within the Flood Hazard Assessment Overlay area which is not surprising given that they comprise hydro electricity generation facilities located in, on or adjacent to water bodies in the District. It is also likely that some (if not all) the infrastructure is located in a High Flood Hazard Area, given the functional and operational need for the Tekapo PS infrastructure to be located there.

28. The Tekapo PS also involves some storage and use of hazardous substances, such as transformer oils, which are a necessary and integral part of the operation of the scheme. The storage and use of hazardous substances associated with the Tekapo PS is appropriately managed through the HSNO Act, HSW Act, Health and Safety at Work (Major Hazard Facilities) Regulations 2016, and the Health and Safety at Work (Hazardous Substances) Regulations 2017, with these being the primary management controls as acknowledged in the Introduction to the Hazardous Substances chapter.

29. Applying rules HAZSR1 and R2 to REG activities (via Table 1) would mean that activities associated with the Waitaki Power Scheme (which includes the Tekapo PS) that are permitted or controlled under the REG chapter rules may require a discretionary activity consent under the HAZS Chapter rules.

30. I consider that Table 1 in the REG Chapter should not include reference to the HAZS Chapter provisions, as requested by Genesis submission 46.05. REG activities will typically require the storage and use of hazardous substances (such as transformer oils) and the management of those substances is appropriately provided for under existing legislative instruments such as the HSNO Act.

31. Alternatively, the Hazardous Substances line Table 1 could be amended to exclude activities related to the Waitaki Power Scheme as follows:[1]

[1] I note that this exclusion could also apply to the Opuha Hydro Scheme if appropriate.

Topic	*Plan Provisions that Apply to Activities Managed in this Chapter*
...	
...	
...	
Hazardous Substances ***other than in relation to any activities within the existing footprint, operating easement, or core sites of the Waitaki Power Scheme.***	*HAZS-O2, HAZS-P1, HAZS-P2, HAZS-R1, HAZS-R2,*
...	

32. Alternatively, Rules HAZS-R1 and R2 could be amended as follows:

HAZS-R1	*Use and/or Storage of Hazardous Substances, Excluding a Major Hazard Facility*	
All Zones	*Activity Status: PER*	...
	Where: *It is located outside a High Flood Hazard Area****, or*** ***It is located within the within the existing footprint, operating easement, or core sites of the Waitaki Power Scheme***.	...
HAZS-R2	*New Major Hazard Facilities and Additions or Alterations to Existing Major Hazard Facilities*	...
...	...	...
GRUZ	*Activity Status:* ***PER*** ***Where:*** ***7. The activity is located within the within the existing footprint, operating easement, or core sites of the Waitaki Power Scheme***.	***Activity status when compliance is not achieved with R2.7****: DIS*
...	...	...

TOPIC 5 HYDRO INUNDATION

33. Genesis submission points 46.22 and 46.23 supported the objective and policy for the Hydro Inundation chapter as notified. I agree with those submissions.

34. Objective HI-O1 "Hydro Inundation Hazard" is as follows:

Development in the Hydro Inundation Hazard Overlay minimises risks to human health and property from hydro inundation, and avoids reverse sensitivity effects on hydro electricity generation activities.

35. Policy HI-P1 "Development in Hydro Inundation Hazard Areas" is as follows:

Avoid, as far as practicable, changes to existing land use activities in the Hydro Inundation Hazard Overlay that may increase the likelihood or scale of harm to people or property from hydro inundation, or the potential for reverse sensitivity effects. Where it has been demonstrated that avoidance is not practicable, minimise the potential for harm.

36. In the objective and the policy, the direction is to "*minimise risk to human health and property*" (Objective HI-O1) and to avoid changes to existing land use activities that may increase the "*likelihood or scale of harm to people or property*" (Policy HI-P1).

37. In both the objective and policy, a key focus is on the effects of hydro inundation on people. In my opinion, this is consistent with the Building (Dam Safety) Regulations 2022 which address implementation matters relating to classification of dams and dam safety assurance required under sections 134 to 148B of the Building Act 2004.

38. The Regulations apply to large dams and canals,[2] including those on the Waitaki Power Scheme and is a legal requirement for dam owners. The objective of the Regulations is to "*help ensure that classifiable dams are well*

[2] Under the Building Act, "dam" means:
(a) an artificial barrier, and its appurtenant structures, that—
(i) is constructed to hold back water or other fluid under constant pressure so as to form a reservoir; and
(ii) is used for the storage, control, or diversion of water or other fluid; and
(b) includes—
(i) a flood control dam; and
(ii) a natural feature that has been significantly modified to function as a dam; and
(iii) a canal; but
(c) does not include a stopbank designed to control floodwaters.

operated, maintained and regularly monitored, and that potential risks of dam incidents and failures are reduced" (MBIE, 2024).[3]

39. Under the Regulations, dam owners must:

a. Determine if their dam is "classifiable." A dam is classifiable if it is 4 metres or higher and stores 20,000 cubic metres or more of water or other fluid.

b. For all classifiable dams, conduct a Potential Impact Classification ("**PIC**") to determine the potential impact of a hypothetical dam failure on the community, environment, and infrastructure. The PIC can be classified as either Low, Medium, or High. The PIC must be audited and certified by a Recognised Engineer before being submitted by the dam owner to the appropriate regional authority (acting as the Regulator) for approval.

c. Review the PIC status for dams with a Low PIC every five years, to ensure the PIC remains accurate, especially if there is increased development downstream or modifications to the dam are made.

d. For dams with a Medium or High PIC:

1. Prepare a certified Dam Safety Assurance Programme ("**DSAP**"). This includes regular inspections, maintenance, and monitoring to ensure the dam's safety. The DSAP must be audited and certified by a Recognised Engineer and submitted by the dam owner to the appropriate regional authority for approval.

2. Implement the DSAP to ensure that a dam operated, maintained and manages safely in accordance with the procedures outlined in the DSAP.

3. Prepare a certified Annual Compliance Certificate to demonstrate ongoing adherence to dam safety standards outlined in the DSAP. The Annual Compliance Certificate must be audited and certified by a Recognised Engineer.

40. Importantly, a key PIC requirement relates to the "*estimated population at risk and the estimated potential loss of life*" (Regulation 9(1)(d)). "P*opulation*

[3] MBIE (2024). Guide to complying with the Dam Safety Regulations. Ministry of Building, Innovation and Employment.

at Risk" is defined in Regulations as "*the number of people likely to be affected by an uncontrolled release of all or part of the stored water or other fluid due to a failure of the dam, assuming that no person takes any action to evacuate*." In my opinion, this is consistent with minimising risk to human health as sought under Objective HI-O1 and avoiding changes that may increase the likelihood or scale of harm to people as in Policy HI-P1.

41. As described in the attached Damwatch Memo (Appendix 1),[4] the New Zealand Dam Safety Guidelines prescribe performance criteria (primarily for floods and earthquakes) which a dam or canal must be able to safely withstand. These performance criteria are linked not just to PIC but also to a life safety metric, measured by the Population at Risk and/or Potential Loss of Life.[5] Figure 3 in the Damwatch Memo (from the New Zealand Dam Safety Guidelines) shows the recommended Inflow Design Flood that a dam must be able to safely pass and that it is a function of both PIC and the Population at Risk downstream of the dam.

42. The New Zealand Dam Safety Guidelines do not directly form part of the Dam Safety Regulations. However, the Guidelines outline recommended practice for large dam owners in NZ and also form part of the reference material used by Recognised Engineers to perform their certification functions under the Regulations. Figure 3 referenced above is therefore not a direct legislative requirement but it identifies a "pathway" for dam owners to manage risk as required by the Regulations.

43. I understand that the provisions now included in the proposed Hydro Inundation chapter were traversed during the PC13 process with the intent being to strike the balance between safety/reverse sensitivity matters and the ability of landowners to use their land. That said, there have been significant changes to the dam safety regime since PC13 was completed in 2018 and the present consideration of PC28.

44. In particular, the Building (Dam Safety) Regulations 2022 came into force in May 2024 and the New Zealand Dam Safety Guidelines were adopted in 2024. In my opinion, these changes mean that it is appropriate and timely to review the Hydro Inundation provisions (and the rules in particular) to ensure they

[4] Damwatch Memo – Background on Waitaki power Scheme and Hydro Hazard Mapping" dated 10 April 2025. This memo is also included as Appendix 3 "Background on Waitaki Power Scheme and Hydro Hazard Mapping" in the s42A Report Part A.

[5] Potential loss of life is defined in the Regulations as the number of people expected to lose their life as a result of an uncontrolled release of all or part of the stored water or other fluid due to a failure of the dam.

are consistent with the dam safety regulatory regime and that they still achieve the intended effect with respect to reverse sensitivity matters while appropriately taking into account risks to people as provided for in the present dam safety regime.

45. In my opinion, Objective HI-O1 and Policy HI-P1 (as supported by submissions from Genesis and others) mean that the Hydro Inundation Chapter should address the Population at Risk from hydro inundation as a key part of implementing the dam safety regulations relating to the use of the PIC for the structures.

46. My subsequent paragraphs address that matter in relation to the proposed rules in the chapter.

OCCUPIED BUILDINGS

47. Genesis submission point 46.24 supports in part the provision that new occupied buildings in the General Rural Zone ("**GRUZ**") within the Hydro Inundation Hazard Overlay, are only permitted activities where these buildings do not raise the Potential Impact Classification ("**PIC**"), as this recognises the increased reverse sensitivity towards the presence and operation of the Waitaki Power Scheme.

48. The submission also noted that activities that may impose requirements to change operational or management practices are not limited to those that raise the PIC between "Low, Medium and High." For example, where an activity causes an increase in or change to a population at risk, there may be impacts on the Waitaki Power Scheme even where the PIC does not increase between the low, medium, or high categories. Changes within each PIC classification can also affect the Scheme.

49. Genesis noted that the changed requirements can include changes in Emergency Response Plans and potential changes in performance criteria as well as implications for scheme upgrades that may not be technically feasible or financially viable. The relief sought by Genesis seeks to ensure that increases in the safety management requirements for a hydroelectricity scheme not associated with changes in the PIC level are also appropriately captured.

50. As described in Section 3.4 of the Damwatch Memo, development within the Hydro Inundation area has the potential to (a) increase the PIC of the structures and (b) where the PIC is already high, increase the population at risk which then may increase the performance and management demand on

the asset and the dam owner. Figure 3 of the Damwatch Memo shows by way of example, how an increase in Population at Risk changes the recommended flood that the dam must be able to pass.

51. Also in Section 3.4, the Damwatch memo states that "*Reverse sensitivity effects can still affect High PIC dams and canals, even though an increase in development does not result in an increase in PIC category*." Developments which increase the number of people present downstream of a dam or canal, and within dam or canal breach flood inundation areas (i.e. cause the Population at Risk to increase), therefore have the potential to increase the performance requirements, even for High PIC dams. This may include people who are not just living or working but also people undertaking recreation activities (for example, camping).

52. As stated in Section 3.4 of the Damwatch memo, "*Any such increase in performance requirements for the dam or canal are likely to be greater than the original design load conditions and therefore significant upgrade works may be required. This could also result in a significant investment by the owner of the dam or canal being required as well as the potential for significant operational downtime of the hydroelectric generation assets while upgrade works are implemented*."

53. Specific examples of where a change to the PIC could result in an increase in performance requirements for a dam or canal are provided in the Damwatch memo in relation to Meridian assets in section 3.7 (emphasis added):

"*In terms of reverse sensitivity effects, developments in these three areas would not change the PIC, as High is the highest PIC category. However, for the reasons outlined previously in Section 3.4, <u>any future developments which increase the number of people in these areas (i.e. the Population at Risk), have the potential to increase the performance requirements that the associated dam must safely withstand</u>*."

"*Additionally, when more people live in a dam or canal breach flood inundation zone, the complexity of emergency action planning and preparedness become more challenging due to the increased evacuation needs and potential constraints associated with access and transport to safe evacuation points*."

54. For Genesis Tekapo PS assets, an example of where this issue could arise is where a section of canal that has a High PIC due to potential impact on a farm station and its inhabitants. If the landowner constructs a new occupied

building on their property within the Hydro Inundation area, there may be an increase in Population at Risk. The PIC is already high so Rule HI-R1 (1) is not triggered, but the Population at Risk increases. Depending on the size of the increase in Population at Risk, increased performance requirements may be triggered, for instance as outlined in Figure 3 of the Damwatch Memo.

55. In paragraph 288, the s42A report author notes that Rule HI-R1 is largely a rollover of the current rule that applies in the GRUZ from the Operative District Plan which was imposed by the Environment Court, that the rule has been implemented effectively over the past 7 (approximately) years and that she is not aware of any situations where activities have resulted in requirements for the hydro-electric scheme operators to increase their safety management requirements as a result of this rule.

56. While it may be the case that the rules have been implemented effectively to date, as I state above, I consider that it is appropriate and timely to review the Hydro Inundation provisions to ensure they are consistent with the dam safety regulatory regime and that they still achieve the intended effect with respect to reverse sensitivity matters while appropriately taking into account risks to people. I also note that development opportunities have been somewhat limited during the 2018 – 2025 period (for example, through Covid related effects). I also consider that the previous rules may not necessarily be appropriate in future as people seek to further develop their land. I also consider it important to ensure that any potential risks associated with increasingly serious climate events are adequately planned for.

57. In paragraph 289, the s42A report author states that she does not consider the relief sought by Genesis to be appropriate as a permitted activity condition as it would require applicants to demonstrate that their new occupied building will not increase the safety management requirements for a hydroelectricity scheme. I agree with that statement. However, the wording I propose below addresses that aspect by referring to the Population at Risk which the PIC assessment required by Rule HI-R1 requires in any case. The assessment of population at risk would be no more difficult to provide in relation to a proposed development than provision of the PIC.

58. The original Genesis submission 46.24 proposed expanding Rule HI-R1, to include developments which would "*increase the safety management requirements*". The purpose of this proposal was to capture the types of scenarios discussed above and in the Damwatch Memo where increased performance requirements are imposed despite no change in PIC. It is clear from the Damwatch Memo that an increase in Population at Risk for a High

PIC dam or canal, has the potential to increase the performance requirements for the dam or canal, and therefore the potential to result in a significant investment requirement by the asset owner.

59. To clarify the intent of the Genesis submission, rather than the wording proposed in the submission, I consider that the wording of Rule HI-R1(1) should be amended as follows:

*It is demonstrated that the building, will not raise the Potential Impact Classification (Low, Medium, High) under the Building Act 2004**, or where the Potential Impact Classification is already Medium or High, will not increase the Population at Risk** in a manner that would lead to a requirement to cease to operate, upgrade, modify, or replace the hydro-electricity related structures or to significantly alter the operation of an affected portion of a hydroelectricity scheme;*

TOPIC 5 HYDRO INUNDATION – OTHER ACTIVITIES

60. In paragraph 290, the s42A report author states that she does not agree with Genesis' submission seeking a new rule that applies to all activities within the GRUZ and within the HI Overlay, essentially because the rules that apply to the GRUZ are a roll-over of the MDP rules imposed by the Environment Court, and that the rule framework is appropriate. She notes that the definition of "occupied building" is not limited to residential units and captures a broad range of activities including any building: in which people reside, occupy or work on a permanent or regular basis; and includes residential units, home occupations, factory farming, wintering barns, herd homes and dairy sheds. As I have noted above, I consider that while I accept that the rules are largely a roll-over of the Operative Plan rules, it is appropriate and timely to review the Hydro Inundation provisions because of the dam safety regulatory regime that has been established since those rules were first adopted.

61. The "population at risk"[6] for assessment of the PIC does not only include people inside buildings; it is also required to take into account people on foot, in vehicles, or in other structures that do not fall under the definition of "*occupied building*". This can include activities and developments such as campsites (including freedom camping areas), toilet blocks, cycleways, carparks, and picnic areas. These sorts of activities result in temporary populations that need to be considered by dam owners when assessing and

[6] Under the Dam Safety Regulations, "population at risk" means the number of people likely to be affected by an uncontrolled release of all or part of the stored water or other fluid due to a failure of the dam (assuming that no person takes any action to evacuate).

considering the population at risk and, as a consequence, can trigger a step change in performance requirements for the dam or canal.

62. I am aware that a freedom campsite area, including a toilet block, has previously been developed within the Hydro Inundation area and that this resulted in an increase of the PIC of a section of the Tekapo Canal, until the campsite was subsequently dis-established. The camping area did not include any "occupied buildings" and therefore did not trigger the Operative Plan rules, nor would it trigger the Proposed Plan HI rules (including the Residential Visitor Accommodation Rule HI-R3).

63. The present Hydro Inundation rules do not relate to activities other than new occupied dwellings, residential units, or residential visitor accommodation, so do not apply to the types of activity I identify above that can contribute to an increase in the population at risk.

64. I therefore agree with Genesis submission point 46.25 seeking a new rule that applies to other activities. I consider that rule should read as follows (with the amendments I discuss above with respect to the occupied building rule HI-R1):

HI-R1A	***All Other Activities (except as provided for by Rules HI-R1, R2 and R3)***	
GRUZ within the Hydro Inundation Hazard Overlay	***Activity Status: PER*** ***Where:*** ***1. It is demonstrated that the activity will not raise or change the Potential Impact Classification (Low, Medium, High) under the Building Act 2004, or where the Potential Impact Classification is already Medium or High, will not increase the Population at Risk in a manner that would lead to a requirement to cease to operate, or to a requirement to upgrade, modify, or replace the hydroelectricity related structures or to significantly alter the operation of an affected portion of a hydroelectricity scheme; or*** ***2. The activity is required by the owner/operator of the hydroelectricity scheme to***	***Activity status when compliance is not achieved with R1A.1-R1A.2: DIS***

	undertake maintenance of any dam, canal, or any associated structures.	

SECTION 32AA ASSESSMENT

65. In terms of s32AA, my recommended amendment to Rule HI-R1 and proposed Rule HI-R1A will, in my opinion, improve the efficient administration of the MDP and will assist with the effective management of hydro inundation risks in the District and will result in better hydro inundation risk management and a reduction in the potential risks people within the Hydro Inundation hazard area. The proposed changes are consistent with the Evaluation of objectives – Hydro Inundation in the original s32 Assessment[7] except that the proposed rules more appropriately give effect to Objective HI-O1 "*Development in the Hydro Inundation Hazard Overlay minimises risks to human health and property from hydro inundation, and avoids reverse sensitivity effects on hydro electricity generation activities*" in that they recognise the range of activities that can be at risk in the overlay area and that they enable risks to human health and property to be minimised.

66. The proposed changes are also consistent with the Evaluation of proposed policies, rules and other methods – Hydro Inundation in the original s32 Assessment except that the proposed rules more appropriately give effect to Policy HI-O1 "*Avoid, as far as practicable, changes to existing land use activities in the Hydro Inundation Hazard Overlay that may increase the likelihood or scale of harm to people or property from hydro inundation, or the potential for reverse sensitivity effects. Where it has been demonstrated that avoidance is not practicable, minimise the potential for harm*" in that they recognise the range of activities that can increase the likelihood or scale of harm to people or property from hydro inundation and provide a mechanism for managing those effects.

67. Overall, I consider that the proposed additions to the provisions for managing the risks of hydro inundation on people and property are the most appropriate and are a more effective and efficient way to achieve the outcomes sought in the objectives and policies for the Hydro Inundation chapter.

[7] Mackenzie District Plan: Plan Change 28: Section 32 Report Part A: Contaminated Land, Hazardous Substances, Natural Hazards and Hydro Inundation, Variation 1 to Plan Change 26 and Variation 1 to Plan Change 27, dated 5 November 2024.

Appendix One: **Damwatch Memo – Background on Waitaki power Scheme and Hydro Hazard Mapping" dated 10 April 2025.**

Memo

To:	Meridian Energy Ltd (Meridian)
From:	Damwatch Engineering Ltd (Damwatch)
CC:	File
Date:	10 April 2025
Subject:	**Background on Waitaki Power Scheme and Hydro Inundation Hazards**

1 Purpose of this Memo

The purpose of this memo is to provide background and technical explanation on the following topics:

1) Dam Safety in relation to the Waitaki Power Scheme (WPS or Waitaki Scheme)
2) Overview of Potential Impact Classification (PIC) of dam and canals
3) Discussion of PIC and the likelihood of dam or canal failure
4) Potential Effect of Developments on PIC
5) Rationale for developing the Hydro Inundation Hazard Overlay
6) History of development of the Hydro Inundation Hazard Overlay
7) Discussion on areas affected by Proposed Plan Change 28
8) Commentary on mitigation measures for dam or canal failure

This information and technical explanation is provided for use by Mackenzie District Council (MDC) in development of a Section 42A report[1] related to proposed Plan Changes 28 and 30 to the Mackenzie District Plan (the District Plan).

2 Background

MDC has prepared the following proposed plan changes to the Mackenzie District Plan.

- Plan Change 28 – Hazards and Risks, Historic Heritage and Notable Trees (dated 5 Nov 2024)
- Plan Change 30 – Special Purpose Zones (dated 5 Nov 2024)

Plan Change 28 introduces a spatial overlay in the Mackenzie District Plan that identifies the Hydro Inundation mapping associated with the potential release of flood flows arising from an unlikely breach of any of the Waitaki Power Scheme dams or canals in the Mackenzie District. This mapping is a continuation of existing work and mapping which commenced in 2013 which has been done in the district, and which sits over parts of the rural zone.

The proposed Plan Changes would introduce Objectives, Policies and Rules into the District Plan that acknowledge the potential consequences of such a failure and manage development accordingly to reduce the potential impacts on people and structures.

Following receipt of submissions on the proposed Plan Changes, many of which query and seek further information on the basis for the Hydro Inundation Hazard Overlay, MDC requested that

[1] A Section 42A report under the Resource Management Act is created before a hearing or decision on a resource consent application or plan change. It includes an evaluation of the application or submission, considering relevant statutory requirements and policies.

Meridian Energy (Meridian) provide a technical explanation of the topics, listed in Section 1 above. Alongside technical memoranda already relied on by MDC in the preparation of its proposed Plan Changes, this memorandum has been written for use by MDC in preparation of its Section 42A report under the Resource Management Act 1991. Meridian has engaged Damwatch Engineering (Damwatch) to provide this information and technical explanation.

3 Discussion

The following sub-sections provide discussion on the topics listed in Section 1.

3.1 Dam Safety in relation to the Waitaki Power Scheme

The Waitaki Power Scheme

The Waitaki Power Scheme consists of eight power stations spread between Lake Tekapo and Lake Waitaki (Figure 1). Substantial infrastructure, including large dams and canals, contain and convey water to support hydro electricity generation that meets local, regional and national needs.

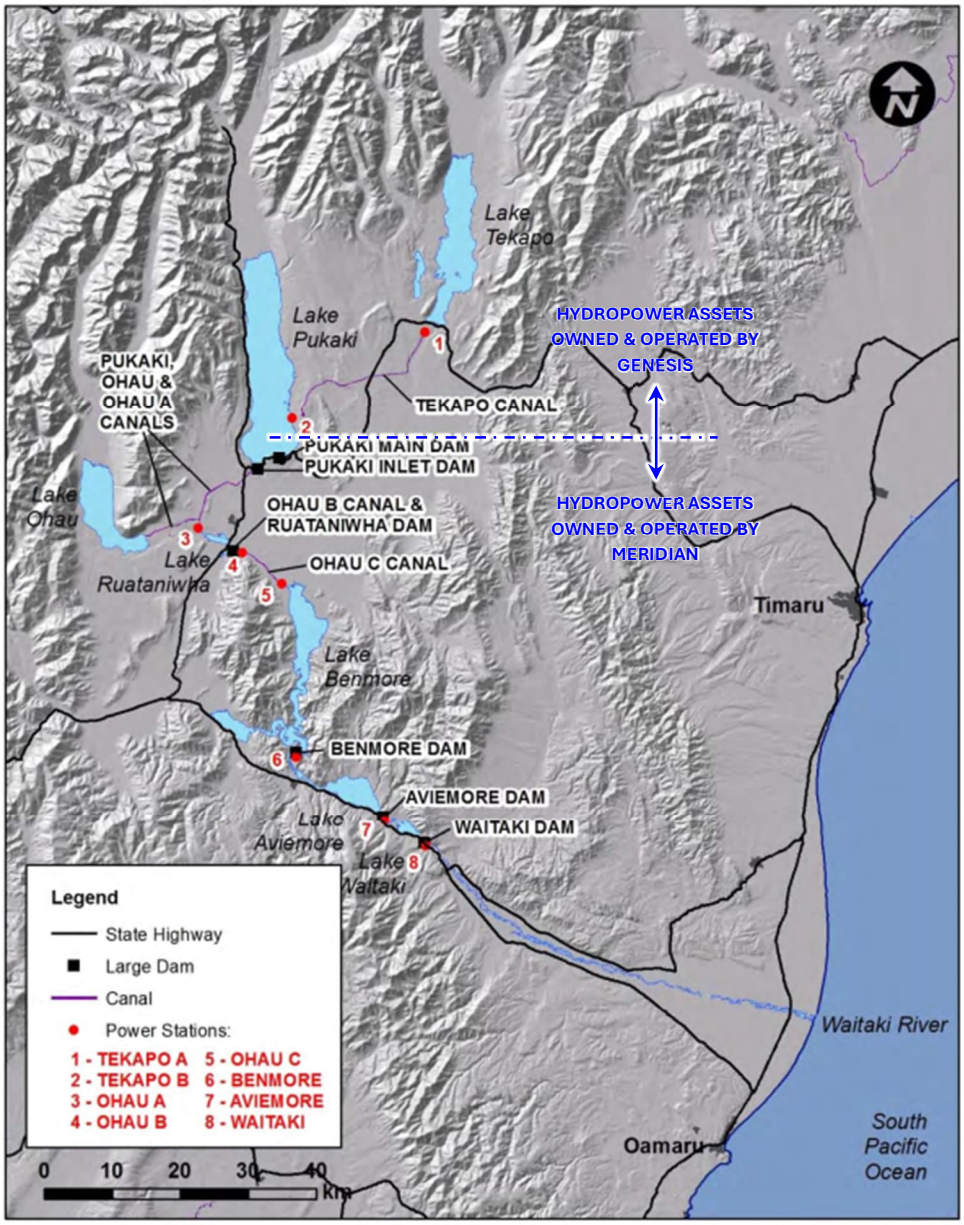


Figure 1: Waitaki Power Scheme layout map

Meridian Energy (Meridian) and Genesis Energy (Genesis) own and operate the hydropower generation assets associated with the Waitaki Power Scheme. These include the assets shown on Figure 1. Tekapo A and B Power Stations and Tekapo Canal are owned and operated by Genesis. All other dams, canals and power stations shown on Figure 1 are owned and operated by Meridian.

Building (Dam Safety) Regulations 2022

Large dams and canals, including those on the Waitaki Power Scheme, are primarily governed by the Building (Dam Safety) Regulations 2022, which are regulations made under the Building Act 2004. It is a legal requirement for dam owners to comply with these Regulations. The objective of the Regulations is to "*help ensure that classifiable dams are well operated, maintained and regularly monitored, and that potential risks of dam incidents and failures are reduced*" (MBIE, 2024)[2].

The Regulations require dam owners to:

- Determine if their dam is "**classifiable**". A dam is classifiable if it is 4 metres or higher and stores 20,000 cubic metres or more of water or other fluid.
- For all classifiable dams, conduct a **Potential Impact Classification** (PIC) to determine the potential impact of a hypothetical dam failure on the community, environment, and infrastructure. The PIC can be classified as either Low, Medium, or High. The PIC must be audited and certified by a Recognised Engineer[3] before being submitted by the dam owner to the appropriate regional authority (acting as the Regulator) for approval.
- For dams with a Low PIC:
  - Dams with a Low PIC have less stringent requirements under the Building (Dam Safety) Regulations 2022 than Medium or High PIC dams. Low PIC dams only require their PIC status to be reviewed every five years to ensure the PIC remains accurate, especially if there is increased development downstream or modifications to the dam are made.
- For dams with a Medium or High PIC:
  - Prepare a certified **Dam Safety Assurance Programme** (DSAP). This includes regular inspections, maintenance, and monitoring to ensure the dam's safety. The DSAP must be audited and certified by a Recognised Engineer and submitted by the dam owner to the appropriate regional authority for approval.
  - Implement the DSAP to ensure that a dam operated, maintained and manages safely in accordance with the procedures outlined in the DSAP.
  - Prepare a certified **Annual Compliance Certificate** to demonstrate ongoing adherence to dam safety standards outlined in the DSAP. The Annual Compliance Certificate must be audited and certified by a Recognised Engineer.

The New Zealand Dam Safety Guidelines

The New Zealand Dam Safety Guidelines, published by the New Zealand Society on Large Dams (NZSOLD), complement the Building (Dam Safety) Regulations 2022. While the regulations set the minimum legal requirements, the guidelines provide detailed, industry-recommended practices for dam safety management. The guidelines are structured into seven detailed modules that address specific areas of dam safety, covering aspects such as PIC assessment methods, dam design and analysis, construction and commissioning, dam safety management including dam operation, maintenance and monitoring, emergency preparedness and life cycle management.

[2] MBIE (2024). Guide to complying with the Dam Safety Regulations. Ministry of Building, Innovation and Employment.
[3] A Recognised Engineer must be a Chartered Professional Engineer (CPEng) who also meets the qualifications and competencies for dam safety specified in the Recognised Engineer Competency Framework (prepared by Engineering New Zealand). Recognised Engineers are registered and assessed by Engineering New Zealand.

Dam owners are recommended to use the guidelines in conjunction with the legal requirements of the Building (Dam Safety) Regulations to ensure a robust dam safety management system. The guidelines are periodically updated to incorporate advances in knowledge and technology, ensuring that dam safety practices remain current and effective.

Meridian's Dam Safety Policy and Dam Safety Assurance Programme

Meridian's commitment to the safety of the system of large dams and canals associated with the Waitaki Power Scheme is stated in its Dam Safety Policy and Dam Safety Assurance Programme (DSAP).

Meridian's Dam Safety Policy

Meridian's Dam Safety Policy articulates the company's commitment to meeting dam safety objectives in respect of:

- New Zealand and international industry practice;
- Public safety;
- The protection of third party property, public infrastructure and the environment;
- The protection of asset value; and
- Meridian's goals and values.

Meridian is committed to meeting its asset management obligations in a manner that is demonstrably world class.

Meridian's Dam Safety Assurance Programme

The DSAP complies with the requirements of the Building (Dam Safety) Regulations and is in general accordance with industry recommended practices of the New Zealand Dam Safety Guidelines.

The purpose of the DSAP is to capture the effective procedures Meridian has in place to meet its dam safety commitments. The DSAP includes the following elements:

- Dam and Reservoir Operation and Maintenance
- Surveillance and Monitoring
- Inspection, Maintenance, and Testing of Appurtenant Structures and Gate and Valve Systems
- Annual Dam Safety Reviews
- Comprehensive Dam Safety Reviews
- Emergency Planning and Response
- Identifying and Managing Dam Safety Issues
- Risk Management

3.2 Overview of Potential Impact Classification of Dams and Canals

Potential Impact Classifications (PIC)

As outlined previously in Section 3.1, the Building (Dam Safety) Regulations require all "classifiable" dams and canals to be assigned a PIC of either Low, Medium or High.

The PIC of a dam or canal represents the potential impact that a hypothetical failure of the dam or canal could have on the community, critical or major infrastructure, historical or cultural places, and the natural environment.

The PIC is used to guide the necessary safety measures and regulatory requirements for dam owners. The principle is that a dam or canal with a "High" or "Medium" PIC, whose failure would cause significant damage or endanger a significant number of people, should be designed, constructed, managed, operated and maintained to a proportionately higher standard than a Low PIC dam or canal whose failure would result in relatively minor damage and with little to no impact on people. Internationally, this is well-established industry practice for dam safety management.

It should be noted that the PIC of a dam:

- Only considers the consequences of a hypothetical dam or canal failure, and no account is taken of the likelihood of that failure
- Does not, in any way, provide an indication of the physical condition or structural integrity of a dam or canal.

PIC Assessment Methodology

The procedures to determine the PIC of a dam or canal are outlined in the Building (Dam Safety) Regulations, and require consideration of the impact of a hypothetical dam or canal failure flood on:

- Life safety (i.e. the number of people who could be affected by a dam failure as well as estimating the potential loss of life that could occur).
- Community buildings and facilities
- Historical or cultural sites
- Critical or major infrastructure
- Natural environment

The PIC assessment process typically involves the following three steps:

- **Dam-Break Flood Hazard Assessment***:* Evaluate the potential flood hazards resulting from a dam or canal breach, and development of dam or canal breach flood inundation maps.
- **Consequence Assessment***:* Determine the potential impacts of the dam or canal breach flood on life safety, community buildings, historical or cultural places, critical or major infrastructure, and the natural environment.
- **Potential Impact Classification***:* Assign a PIC level (Low, Medium, or High) based on the assessed consequences.

The New Zealand Dam Safety Guidelines provide further detail and guidance on methods to conduct a PIC assessment.

3.3 PIC and the likelihood of dam or canal failure

The likelihood of failure of a well-designed, constructed and operated dam or canal is generally considered to be very low. Dam failures are often described as very low probability but high consequence events.

As outlined in Section 3.2 above, dam-break and PIC assessments only consider the consequences of a hypothetical dam or canal failure. No account is taken of the likelihood of that failure occurring. The PIC therefore does not provide an indication of the risk posed by the dam, where risk is commonly defined as:

- *Risk* (of dam failure) = *likelihood* (of dam breach occurrence) x *consequence* (of the dam breach)

There is no requirement under the Building (Dam Safety) Regulations and industry-recommended practices outlined in the New Zealand Dam Safety Guidelines, to determine the likelihood (and hence

the risk) of a dam or canal breach. Instead, the PIC of the dam is used to set the appropriate criteria which should be applied for dam design, construction and post-construction operation, maintenance and monitoring. This is a legal requirement of the Building (Dam Safety) Regulations and applies irrespective of the likelihood of the dam or canal breach occurring.

Rather than requiring that likelihood of a failure be determined, the Building (Dam Safety) Regulations and the New Zealand Dam Safety Guidelines promote a "standards-based approach" to dam safety engineering. This is the approach in which risks are controlled by following established rules and minimum standards for defining design parameters and loads, structural capacity and defensive design measures commensurate with the structure's PIC. Post construction DSAPs provide an overarching framework for managing dam safety risks through the operational phase of a dam or canals lifecycle.

3.4 Potential Effect of Developments on PIC

Background

New developments constructed downstream of a dam or canal, and within a dam or canal breach flood inundation zone, can increase the potential consequences of a hypothetical dam or canal breach. This, in turn, may require a dam or canal to be reclassified into a higher PIC category, even if there is no change to the dam or canal.

For example, a dam or canal that was designed and constructed as a Low PIC structure might need to be reclassified as having a Medium or High PIC due to new development in the downstream dam or canal breach flood inundation zone which occurs after the dam or canal was commissioned.

Once a dam or canal is reclassified, it may not meet the design, inspection and maintenance requirements for its new PIC and the owner would need to bring the dam into compliance with the Building (Dam Safety) Regulations and recommendations of the New Zealand Dam Safety Guidelines.

This concept is sometimes referred to in the dam safety industry as "hazard creep" or "reverse sensitivity".

Impacts on the Dam Owner

Changes to a higher PIC can cause the regulatory requirements for dam safety management and associated dam performance criteria to become more onerous. Raising these dam safety requirements and performance criteria can have significant implications for the owner of a dam or canal.

In terms of dam safety management, the biggest change in owner requirements results from a change in PIC from Low to Medium, or Low to High. Owners of Medium and High PIC dams are required to carry out more rigorous monitoring and surveillance, dam safety reviews, inspections, maintenance, testing of appurtenant structures and gates and valves, and preparation of emergency action plans and systems for identifying and managing dam safety issues. These activities are required to be documented in a Dam Safety Assurance Plan (DSAP) with the DSAP audited annually by a Recognised Engineer. The DSAP also requires the emergency action plans to be coordinated with the local civil defence organisations.

In terms of changes to the dam performance criteria, the dams and canals must be able to safely withstand greater structural loading conditions (primarily floods and earthquakes). These are likely to be greater than the original design load capacity and therefore significant upgrade works may be required. This could result in a significant investment by the owner of the dam or canal being required

as well as the potential for significant operational downtime of the hydroelectric generation assets while upgrade works are implemented.

In summary, it is important to Meridian that it is aware of any developments located within the dam or canal breach flood inundation zones downstream of its dams or canals. Such developments will change the consequences of a hypothetical dam or canal failure flood and may therefore have an impact on the PIC for the dam or canal.

Example of Reverse Sensitivity Effects on Meridian Hydropower Assets

An example of recent developments downstream of the true left bank of the Ohau Canal in the Mackenzie District, outlines how the PIC of this structure has changed over time. With reference to Figure 2, the following points describe how the PIC changed for this section of canal over time:

- The Ohau Canal was first constructed in the early 1970s as part of the Waitaki Power Scheme. No developments were downstream of the canal embankments at that time (Figure 2a).
- In 2005 and 2011, a PIC assessment was carried out for the canal. A Low PIC was determined for the left bank of the canal. At that time, there were no known developments downstream of the canal embankments.
- In 2014, the PIC assessment was reviewed, and a Medium PIC was determined due to two residential building developments in the subdivision area near Flanagan Lane (Figure 2b).
- In 2021 and 2024, the PIC assessment was reviewed, and a High PIC was determined due to further residential building developments in the subdivision area near Flanagan Lane (Figure 2c).

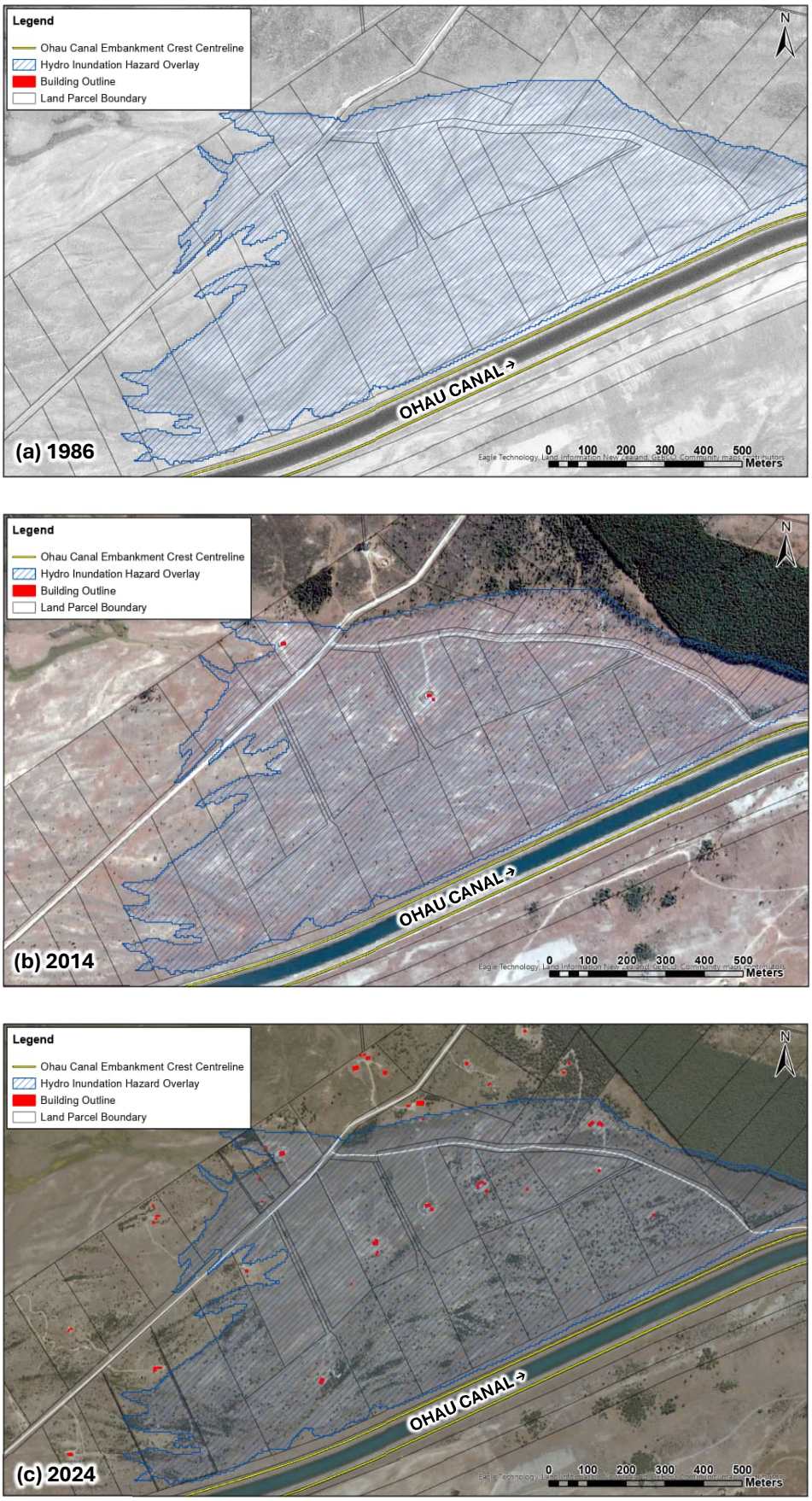


Figure 2: Aerial photographs captured (a) 1986 (b) 2014 and (c) 2024 showing changing developments downstream of the true left bank of the Ohau Canal

Effect of Developments on Dams and Canals with a High PIC

Reverse sensitivity effects can still affect High PIC dams and canals, even though an increase in development does not result in an increase in PIC category.

The New Zealand Dam Safety Guidelines prescribe performance criteria (primarily for floods and earthquakes) which a dam or canal must be able to safely withstand. These performance criteria are linked not just to PIC but also to a life safety metric, measured by the Population at Risk[4] and/or Potential Loss of Life[5]. For example, Figure 3 from the New Zealand Dam Safety Guidelines shows the recommended Inflow Design Flood (IDF) that a dam must be able to safely pass. From Figure 3, the IDF is a function of both PIC and the Population at Risk downstream of the dam.

PIC	Incremental Population at Risk	IDF (1 in T AEP)
Low	No limit	1 in 100 to 1 in 1,000 AEP [1,2]
Medium	No limit	1 in 1,000 to 1 in 10,000 AEP [1,2]
High	0	1 in 10,000 AEP
	1-10	1 in 10,000 AEP to average of 1 in 10,000 AEP and PMF peak discharge [3]
	11-100	Average of 1 in 10,000 AEP and PMF peak discharge, to PMF [3]
	> 100	PMF

Source: New Zealand Dam Safety Guidelines (2024 edition), published by the New Zealand Society of Large Dams
Note: AEP = Annual Exceedance Probability; PMF = Probable Maximum Flood; IDF = Inflow Design Flood

Figure 3: Recommended minimum Inflow Design Floods based on PIC and PAR

Developments which increase the number of people living or working downstream of a dam or canal, and within dam or canal breach flood inundation areas (i.e. cause the Population at Risk to increase), therefore have the potential to increase the performance requirements, even for High PIC dams.

Any such increase in performance requirements for the dam or canal are likely to be greater than the original design load conditions and therefore significant upgrade works may be required. This could also result in a significant investment by the owner of the dam or canal being required as well as the potential for significant operational downtime of the hydroelectric generation assets while upgrade works are implemented.

[4] Population at Risk is defined in the New Zealand Dam Safety Guidelines as "*the number of people likely to be affected by an uncontrolled release of all or part of the stored water or other fluid due to a failure of the dam, assuming that no person takes any action to evacuate*".

[5] Potential Loss of Life is defined in the New Zealand Dam Safety Guidelines as "*the number of people expected to lose their life as a result of an uncontrolled release of all or part of the stored water or other fluid due to a failure of the dam*". While Population at Risk is an estimate of the total number of people in a dam or canal breach inundation zone, Potential Loss of Life estimates take additional factors into account such as the severity of the floodwaters (i.e. depth, velocity and time of arrival) and consideration of population density across different time scenarios (e.g. daytime versus nighttime). Any estimate of Potential Loss of Life has a high degree of uncertainty due to various factors such the amount of warning time, the responsiveness of people to evacuate when warned, the presence of suitable evacuation routes, historical patterns of human activity and the limitations of predictive models.

3.5 Rationale for developing the Hydro Inundation Hazard Overlay

Introduction to the Hydro Inundation Hazard Overlay

While the Waitaki Power Scheme dams and canals are managed under recommended industry practice dam safety assurance programmes (refer Section 3.1), there remains very low residual risk that a dam or canal failure could occur. While the likelihood of a structural failure is very low (as outlined in Section 3.3), the consequences can be serious for people, property and the environment.

Potential areas of inundation that could occur following failure of large dams and canals associated with the Waitaki Power Scheme are mapped in the District Plan as the Hydro Inundation Hazard Overlay. This overlay is available from the following webpage hosted by MDC:

- https://mackenzie.isoplan.co.nz/review/property/1510646/1289189/5204023/5064124/0/109
  - *Click Stage 4 Changes > PC28 & Variations > Natural Hazard > Hydro Inundation Hazard Overlay*

The Hydro Inundation Hazard Overlay provides MDC with an awareness of the potential dam or canal breach flood hazard zones which would be impacted in the unlikely event of failure of any of the large dams or canals associated with the Waitaki Power Scheme. It also enables MDC to consider the appropriateness of any future development with respect to safety of people and property, and the 'reverse sensitivity' impacts that developments or changes in land use might have on Meridian and Genesis Energy's existing dam and canal assets.

3.6 History of development of the Hydro Inundation Hazard Overlay

Hydro Inundation Hazard Overlay Prepared for Plan Change 13

The Hydro Inundation Hazard Overlay was originally prepared between 2014 to 2016 for Plan Change 13 to the Mackenzie District Plan. The final hazard areas are shown on Drawings 6/3434/1/6504 Sheet No. 21 to 29 prepared by Opus International Consultants[6].

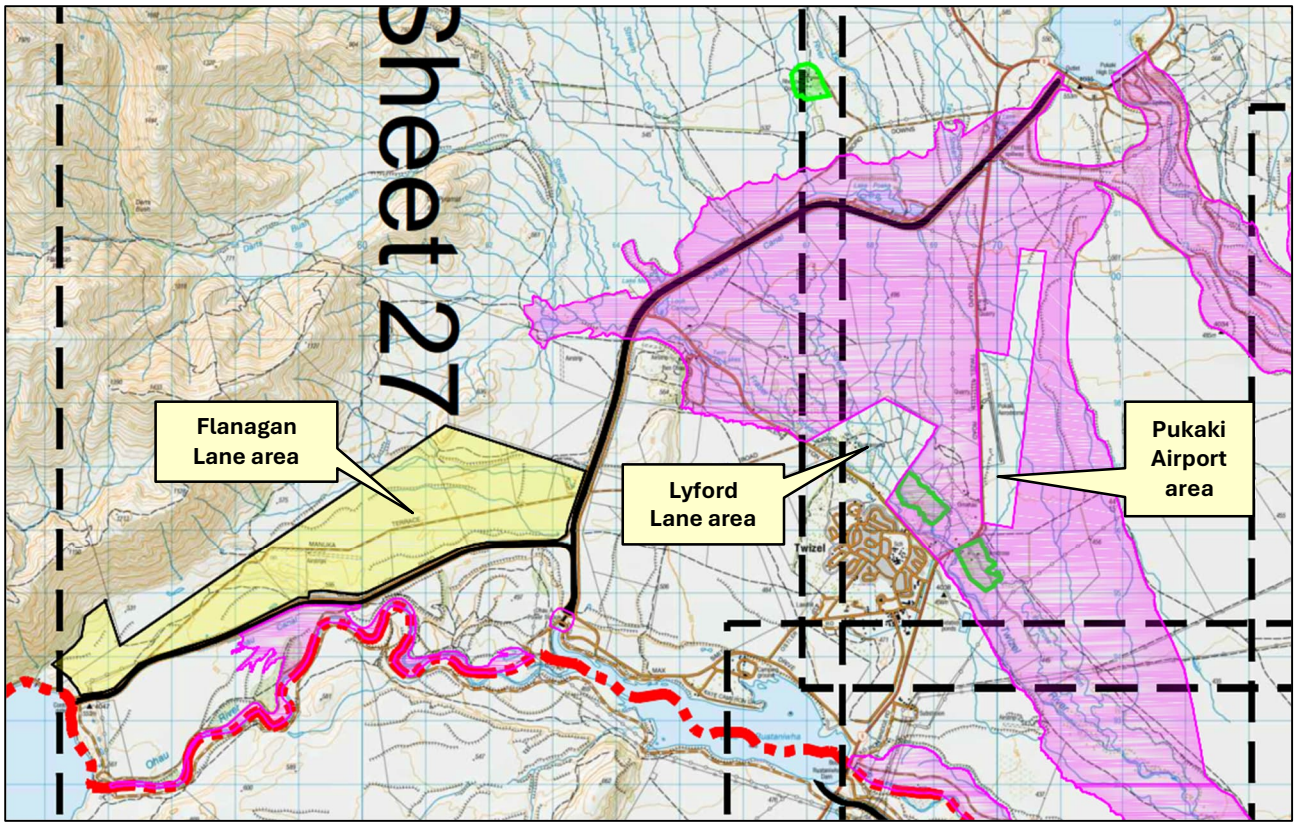
This overlay was developed using all previous dam or canal breach flood hazard information compiled for Meridian Energy and Genesis Energy at that time. These included:

- Comprehensive dam breach flood hazard maps for a hypothetical breach of the Pukaki Dam (prepared by Works Consultancy Services in 1990)
- Broad scale dam breach flood hazard maps for a hypothetical breach of the Pukaki Inlet Dam (prepared for Meridian Energy by Damwatch in 2014)
- Broad scale canal breach flood hazard maps for hypothetical breaches of the Ohau A, Ohau B and Ohau C Canals (prepared by a joint Damwatch and Opus study in 2005)
- Detailed canal breach flood hazard maps pertaining to specific hypothetical breach scenarios for the Tekapo Canal (prepared for Genesis Energy by Opus in 2013)
- Detailed canal breach flood hazard maps pertaining to specific hypothetical breach scenarios for the Pukaki and Ohau Canals, and Ruataniwha Dam (prepared for Meridian Energy by Damwatch in 2013)

The flood hazard areas defined for all hypothetical canal and dam breach locations and scenarios from the past studies listed above were integrated together to produce the composite Hydro Inundation Hazard Overlay for the Mackenzie Basin.

[6] Available online at: https://www.mackenzie.govt.nz/__data/assets/pdf_file/0020/514208/Appendix-U-Flood-Hazard-Inundation-Maps.pdf

The 2016 version of the Hydro Inundation Hazard Overlay excluded areas at the Pukaki Airport, Lyford Lane and Flanagan Lane locations shown on Figure 4.



Source: Opus Drawing 6/3434/1/6504 (Rev R4) Sheet No. 21

Figure 4: Excerpt of Waitaki Hydro Inundation Hazard Overlay prepared for Plan Change 13

Site Specific Maps prepared for Farm Base Areas

In 2017, Meridian Energy requested Damwatch to prepare site-specific dam-break flood hazard maps for the following four sites.

- Bendrose Farm Base Area
  - Refer map "Potential Dam-Break Flood Hazard at Bendrose Station", dated 05/10/2017
- Omahau Downs Farm Base Area
  - Refer map "Potential Dam-Break Flood Hazard at Omahau Downs", dated 05/10/2017
- Black Forest Station Farm Base Area
  - Refer map "Potential Dam-Break Flood Hazard at Black Forest Station", dated 05/10/2017
- Ben Ohau Farm Base Area
  - Refer map "Potential Dam-Break Flood Hazard at Ben Ohau Station", dated 05/10/2017

Hydro Inundation Hazard Overlay Prepared for Proposed Plan Change 28

The Hydro Inundation Hazard Overlay is included in proposed Plan Change 28 and can be viewed at the weblink provided previously in Section 3.5.

It is understood that the Hydro Inundation Hazard Overlay included in proposed Plan Change 28 is unchanged from the version produced in 2016, but now covers the missing areas shown in Figure 4 at Pukaki Airport, Lyford Lane and Flanagan Lane.

3.7 Discussion on areas affected by Proposed Plan Change 28

Table 1 summarises which Waitaki Power Scheme dam or canal breach inundation zones the Pukaki Airport, Lyford Lane and Flanagan Lane areas are located in. This table also summarises the current PIC of those dams or canals.

Table 1 – Summary of dam or canal contributing to the Hydro Inundation Hazard Overlay at Pukaki Airport, Lyford Lane and Flanagan Lane areas

Area	Dam or Canal Contributing to Waitaki Hydro Inundation Hazard Overlay	Potential Impact Classification (PIC) of Dam or Canal
Flanagan Lane	Ohau Canal, true left bank	High
Pukaki Airport	Pukaki Inlet Dam	High
	Pukaki Canal, true left bank	High
Lyford Lane	Pukaki Inlet Dam	High
	Pukaki Canal, true left bank	High

*Notes: * PIC sourced from Damwatch (2024) report "Dam Classification Certificates for Meridian Energy Dams and Canals"*

Table 1 indicates that the Pukaki Airport, Lyford Lane and Flanagan Lane areas are affected by dams or canals which currently have a High PIC. In terms of reverse sensitivity effects, developments in these three areas would not change the PIC, as High is the highest PIC category.

However, for the reasons outlined previously in Section 3.4, any future developments which increase the number of people in these areas (i.e. the Population at Risk), have the potential to increase the performance requirements that the associated dam must safely withstand.

Additionally, when more people live in a dam or canal breach flood inundation zone, the complexity of emergency action planning and preparedness become more challenging due to the increased evacuation needs and potential constraints associated with access and transport to safe evacuation points.

3.8 Commentary on mitigation measures for dam or canal failure

As outlined in Sections 3.1 previously, dam owners are required, through the Building (Dam Safety) Regulations and industry-recommended practices outlined in the New Zealand Dam Safety Guidelines, to take actions to keep their dams safe and reduce the risk of dam or canal failure. This is the fundamental dam safety objective of the New Zealand Dam Safety Guidelines:

- *"People, property and the environment, present and future, should be protected from the harmful effects of a dam failure or an uncontrolled release of the reservoir contents"*

Measures must be taken by dam and canal owners to achieve an appropriate level of safety, which is commensurate with a dam or canal's PIC. These measures are prescribed in the DSAP for a dam or canal, as previously outlined in Section 3.1.

This approach means that dam owners are required to prioritise investments directly into the dam or canal assets, and asset management programmes, to ensure the structural integrity and safety of those assets.

There is no precedent, either nationally or internationally, that the author is aware of regarding the construction of infrastructure downstream of an engineered dam or canal to mitigate the

consequences of dam failure (e.g. stopbanks to deflect dam-break flood waters away from development). There would be engineering challenges involved in designing such infrastructure to withstand dam-break floods which are typically an order of magnitude more damaging than natural flood hazards. Further, infrastructure that is not regularly used is more likely to degrade over time, due to lack of maintenance, and potential issues which could affect its performance may not be identified and addressed.

For these reasons, dam owners prioritise investments directly into the safety of the dam or canal assets, rather than focusing on downstream infrastructure which attempts to mitigate the consequences of dam failure.

4 Summary

The memorandum provides background and technical explanation on the topics listed in Section 1 and related to proposed Plan Change 28 to the Mackenzie District Plan.

It is understood that the information in this memo will be provided to MDC to assist in their development of a Section 42A report related to proposed Plan Change 28.

Document history and status

Issue no.	Issue date	Description	Prepared by	Reviewed by	Approved by
1	20/03/25	Issue 1	BV	GW	DCE
2	01/04/25	Issue 2	BV	GW	DCE
3	10/04/25	Issue 3	BV	GW	DCE

Appendix Two: Summary of Proposed Changes

Plan Change 28 Changes Recommended (Richard Matthews, 09 May 2025)

1. Hazardous Substances

Either:

Topic	*Plan Provisions that Apply to Activities Managed in this Chapter*
…	
…	
…	
~~***Hazardous Substances***~~	~~***HAZS-O2, HAZS-P1, HAZS-P2, HAZS-R1, HAZS-R2,***~~
…	

Alternatively, amend Table 1 as follows:

Topic	*Plan Provisions that Apply to Activities Managed in this Chapter*
…	
…	
…	
Hazardous Substances ***other than in relation to any activities within the existing footprint, operating easement, or core sites of the Waitaki Power Scheme.***	*HAZS-O2, HAZS-P1, HAZS-P2, HAZS-R1, HAZS-R2,*
…	

Alternatively, amend Rules HAZS-R1 and R2 as follows:

HAZS-R1	*Use and/or Storage of Hazardous Substances, Excluding a Major Hazard Facility*	
All Zones	*Activity Status: PER*	…
	Where: *It is located outside a High Flood Hazard Area****, or***	…

	***It is located within the within the existing footprint, operating easement, or core sites of the Waitaki Power Scheme*.**	
HAZS-R2	*New Major Hazard Facilities and Additions or Alterations to Existing Major Hazard Facilities*	*...*
...	*...*	*...*
GRUZ	*Activity Status: **PER*** ***Where:*** ***7. The activity is located within the within the existing footprint, operating easement, or core sites of the Waitaki Power Scheme*.**	***Activity status when compliance is not achieved with R2.7**: DIS*
...	*...*	*...*

2. Hydro Inundation – Occupied Buildings

Amend Rule HI-R1(1) as follows:

*It is demonstrated that the building, will not raise the Potential Impact Classification (Low, Medium, High) under the Building Act 2004**, or where the Potential Impact Classification is already Medium or High, will not increase the Population at Risk** in a manner that would lead to a requirement to cease to operate, upgrade, modify, or replace the hydro-electricity related structures or to significantly alter the operation of an affected portion of a hydroelectricity scheme;*

3. Hydro Inundation – Other Activities

Insert a new Rule HI-R1A):

HI-R1A	***All Other Activities (except as provided for by Rules HI-R1, R2 and R3)***	
GRUZ within the Hydro Inundation Hazard Overlay	***Activity Status: PER*** ***Where:*** ***1. It is demonstrated that the activity, will not raise or change the Potential Impact Classification (Low, Medium, High) under the Building Act 2004, or where the***	***Activity status when compliance is not achieved with R1A.1-R1A.2: DIS***

	Potential Impact Classification is already Medium or High, will not increase the Population at Risk in a manner that would lead to a requirement to cease to operate, or to a requirement to upgrade, modify, or replace the hydroelectricity related structures or to significantly alter the operation of an affected portion of a hydroelectricity scheme; or ***2. The activity is required by the owner/operator of the hydroelectricity scheme to undertake maintenance of any dam, canal, or any associated structures.***	