

**Officer Report for resource consents
RC-2024-0122 and RC-2021-0097-V10
Pursuant to Section 42A of the Resource Management Act)**

To Hearings Panel

From Dr Michael Durand

Consent Discharge permit; Change to conditions of combined discharge permit and land use consent

Date 12 August 2025

- **To discharge water contaminants (mixed landfill leachate and stormwater) from a retention pond to land; and**
- **To change condition 11 of RC-2021-0097-V10:**
 - **to enable any authorised discharge consents granted by the WCRC to contaminate groundwater or surface water outside of the site as a result of the exercise of consent RC-2021-0097, and**
 - **to update the application site's legal description.**

Activity type	Discharge
Activity subtype	Discharge of industrial and trade waste
Activity status	Section 88 application (RC-2024-0122): Discretionary Section 127 application (RC-2021-0097-V10): Discretionary
Applicant	Taylorville Resource Park Ltd
Site location	Taylorville Road
Grid reference(s)	42°26'40"S 171°15'46"E
Activity type	
Activity subtype	
Activity status	Discretionary
Recommendation	Decline

The recommendation in the staff report represents the opinion of the writers and it is not binding on the Hearing Commissioners. The report is evidence and will be considered along with any other evidence that the Hearing Commissioners will hear.

CONTENTS

Contents	2
Introduction.....	4
Purpose of report	4
Report Author	4
Involvement in applications	5
Code of Conduct	5
Information relied upon	5
Site, application, proposal and its context	6
Summary of site history	6
Proposal	7
Consent history – detail	11
Existing environment.....	13
Application process	16
Notification and Submissions	17
Notification	17
Submissions	17
Late part of submission from GDC.....	20
Parts of submissions that are out-of-scope	21
Statutory framework and relevant provisions	21
Status and application of RMA.....	21
Relevant RMA provisions	22
Relevant national policy statements	24
Relevant regulations	27
Relevant regional planning instruments.....	27
Assessment and advice.....	29
Scope and Procedural matters	29
Scope of s127 to change condition 11 of RC-2022-0091	29
Relevance of RC-2025-0081 and engagement of section 91	32
Assessment of Environmental effects and their significance	34
Adverse effect: Contamination of GDC municipal water supply	34
Adverse effects: Surface and groundwater contamination	40
Adverse effects: Adverse effects of groundwater mounding	42
Positive effect: Avoidance of pond overspill and uncontrolled discharge	43
Bond	43
Part 2 – Purpose and Principles	43
Recommendations	44
Conditions of Resource Consent (Section 108).....	44
Duration (Section 123)	44
Lapsing of consent (Section 125)	44
APPENDIX 1 – Application Documents.....	46
APPENDIX 2 – Evidence of Carl Steffens	47

APPENDIX 3 – Evidence of Duncan Grey 48
APPENDIX 4 – Late part of submission from GDC 49

INTRODUCTION

Purpose of report

1. This report is to provide advice to the Hearings Panel under s 42A of the RMA on resource consent applications made to the West Coast Regional Council by Taylorville Resource Park Ltd.

Report Author

2. My full name is Dr Michael Durand.
3. I hold an honours degree in Physical Geography from University of Plymouth (UK) and a PhD in Earth Sciences from the University of Wales, Aberystwyth (UK).
4. I have 19 years professional experience working in resource management in New Zealand, primarily in consenting of developments under the control of regional councils, the development of regional policy for the use of water and land, and nationally in environmental policy and regulatory design.
5. Between 2006 and 2012 I was a Consents Planner, Senior Consents Planner and Team Leader at Tasman District Council and Nelson City Council (both unitary councils), processing and managing teams processing applications for regional land use consents, water permits, discharge permits and coastal permits. Between 2012 and 2015 I was Senior Analyst at the Ministry for the Environment where I lead policy development and implementation of the Resource Management Amendment Act 2013 and contributed towards other RMA policy development.
6. From 2015 to 2020 I was the Consents Manager at Southland Regional Council, leading the regional council's consent processing and the making of approximately 900 delegated decisions on resource consent applications annually. I was involved in the development and implementation of the proposed Southland Water and Land Plan, which required farming land use consents for new dairy farms and expansions and intensifications of existing dairy farms. That work involved notification and substantive decisions on complex applications for contaminant discharges, pre-application advice and managing a team of planners processing these applications. At that time I was a member, and then Convenor, of the Consent Managers Group (an LGNZ special interest group for all regional consents managers). In that capacity I delivered training and played a leadership role in developing regional council's capability in processing farming land use consents.
7. From 2020 to 2023 I was a planning consultant at Pattle Delamore Partners Ltd. Since November 2023 I have been a planning consultant at Planz Consultants Ltd.
8. I have appeared as a planning witness before consent hearings and have been involved in many Environment Court mediations (where I carried Council delegation to settle appeals). I have also written about the RMA's practice and implementation in the form of technical guides for the Ministry for the Environment and the Energy Efficiency and Conservation Authority, and discussion pieces for planners, particularly on cognitive bias in planning and the implementation of the National Policy Statement for Freshwater Management 2020.
9. I am also an active Independent Commissioner and certified under the Ministry for the Environment's Making Good Decisions programme, act as an independent commissioner and am on decision-making panels at a number of regional and district councils.

Involvement in applications

10. I have been involved in the consent applications by Taylorville Resource Park Ltd since November 2023. I have been the lead planner for the West Coast Regional Council (WCRC) for that time.

Code of Conduct

11. While this is a Council hearing, I acknowledge that I have read and agree to comply with the Environment Court's Code of Conduct for Expert Witnesses, contained in the Environment Court Practice Note 2014.
12. My qualifications as an expert are set out above. Other than where I state that I am relying on the advice of another person, I confirm that the issues addressed in this statement of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Information relied upon

13. In the preparation of this report, I have relied on the following reports:
- a. Supplied with the lodged application:
 - i. Barkers document "Discharge Permit, Taylorville Resource Park, Taylorville Road - Lot 1-2 Deposited Plan 584105, Assessment of Environmental Effects and Statutory Analysis" dated 19 September 2024
 - ii. ENGEO document "Preliminary Hydrogeological Assessment" dated 19 September 2025
 - iii. Barkers document "S127 to RC-2021-0097, To vary consent condition 11, Taylorville Road - Lot 1-2 Deposited Plan 584105, Assessment of Environmental Effects and Statutory Analysis" dated 13 November 2024"
 - b. Supplied in response to further information requests from WCRC:
 - i. ENGEO document "Request For Information - 287 Taylorville Road, Coal Creek, Greymouth (Our reference: 026200.0000.001_07) dated 1 November 2024
 - ii. ENGEO document "Site Memorandum RC-2024-0122 and RC-2021-0097-V10 - RFI Response" dated 30 January 2025
 - iii. Bioresearches document "Memorandum, Taylorville Resouce [sic] Park S92 Response - Ecology" dated 7 February 2025
 - iv. ENGEO document "Site Memorandum "RC-2024-0122 and RC-2021-0097-V10 - RFI Response" dated 5 March 2025
 - v. ENGEO document "Site Memorandum "RC-2024-0122 and RC-2021-0097-V10 - RFI Response" dated 17 March 2025
14. In aggregate these documents include:
- a. an assessment of the environmental effects (AEE);
 - b. a statutory assessment;
 - c. a description of the environment;
 - d. a description of the activity;

- e. further information responses;
 - f. proposed consent conditions
 - i. for RC-2024-0122, some suggested conditions but not a full suite of conditions
 - ii. for RC-2021-0097-V10, proposed rewording of Condition 11
15. The above documents are attached to this report as Appendix 1.

SITE, APPLICATION, PROPOSAL AND ITS CONTEXT

Summary of site history

- 16. TRPL operates a landfill at Taylorville subject to resource consents originally granted by WCRC and GDC in 2021 (RC-2021-0097).
- 17. The site is adjacent to Taylorville Road (to the south) and No Name Creek (to the north and west). The proposed discharge location is within the footprint of TRPL's site, but outside of the areas developed into landfill cells to date.
- 18. The site and discharge locations, for orientation, are shown in Figures 1 and 2.

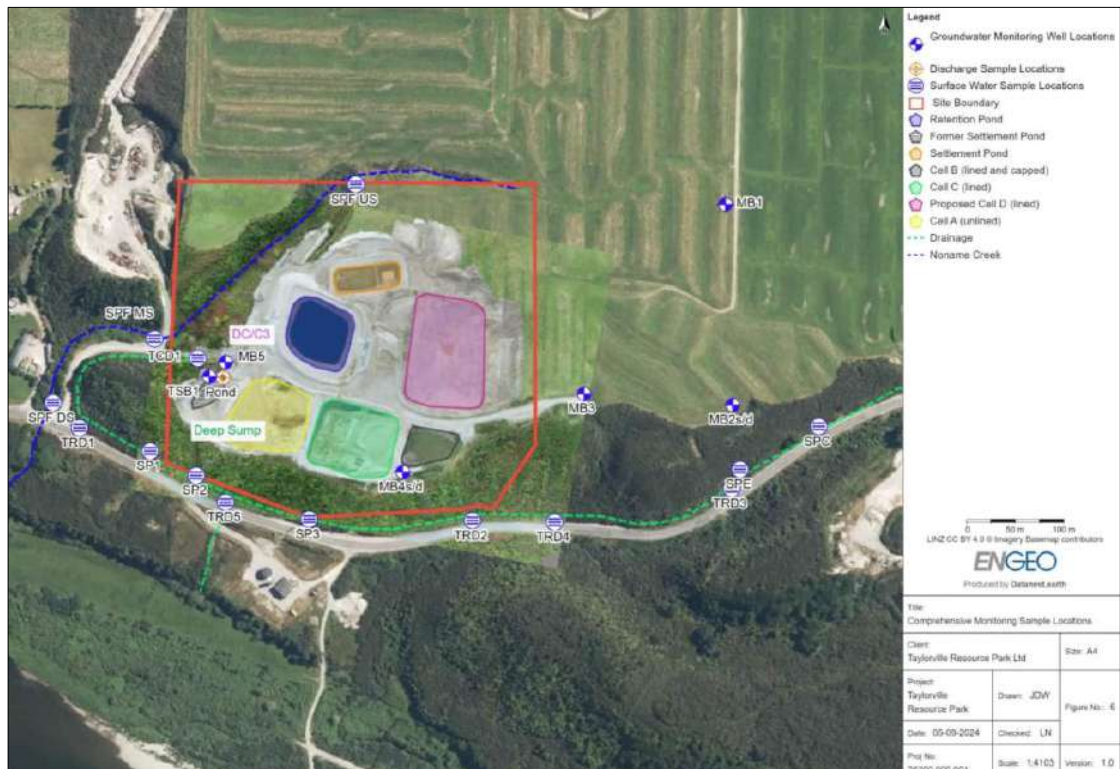




Figure 2. Discharge pit location

19. Despite its short lifetime, the site has a relatively complex history with various applications made to change the types of waste that may be received,¹ and to discharge leachate to land (refer to detail in paragraphs 40-55).²
20. Contrary to TRPL's expectations leachate has been generated in the cells, but TRPL does not hold a discharge permit to authorise any discharge of leachate. In addition, Condition 11 of RC-2021-0097 requires:

The Consent Holder shall ensure that there is no contamination of groundwater or surface water outside of the site (Secs 1-3 5-6 Pt Secs 4 & 8 SO 11520 Sec 1 SO 3935 Sec 1 SO 3934 Lots 1 3 DP 2432 Lots 1-5 DP 3265) as a result of the exercise of this consent.

21. Consequently, TRPL has sought to manage leachate on an interim basis by storing it on site in bespoke containment ponds until acquiring discharge permits to enable discharges to occur. The containment ponds now appear to be a medium to long term feature of the site's water management system.

Proposal

22. TRPL's current proposal to manage the water level in these ponds ("to create freeboard") by discharging water from them to a constructed pit on the site, from which water will soak into the ground.
23. The activity requires authorisation under the RMA, which has been sought by TRPL with the following applications:

¹ The current resource consents authorise the use of land for gravel extraction (required to create cells) and discharges of waste material to land. Currently authorised are "demolition waste (including cleanfill)", whole or shredded tyres, asbestos and coal tar or coal pitch plus other specific types of waste approved by WCRC on occasion.

² Until the current application, all earlier applications were either returned under s88 or withdrawn by TRPL before decisions were made.

- a. a section 88 application for a discharge permit for discharge to land, and
- b. a section 127 application to change Condition 11 of RM-2021-0097, as follows:

The Consent Holder shall ensure that there is no contamination of groundwater or surface water outside of the site (~~Secs 1 3 5 6 Pt Secs 4 & 8 SO 11520 Sec 1 SO 3935 Sec 1 SO 3934 Lots 1 3 DP 2432 Lots 1 5 DP 3265 Lot 1-2 DP584105~~) as a result of the exercise of this consent unless, and only to the extent that, a separate discharge permit has been obtained from the West Coast Regional Council.

24. The rationale for the current applications is expressed in the application as:

"the site operations include two large water treatment / retention devices with a combined capacity of approximately 15,000m³ for treated leachate and stormwater captured by the onsite operations. The devices are currently at capacity and with heavy rainfall predicted for the coming months, the applicant is seeking temporary consent to discharge water to land, to help in creating a freeboard within the retention pond. This will assist in avoiding any uncontrolled discharges."

- 25. The changes to the cited legal descriptions are administrative.
- 26. This short-term discharge permit, if exercised successfully, TRPL argues would enable the site to continue collecting and storing leachate in a controlled manner by retaining storage capacity in the retention ponds and only discharging leachate to land in a controlled manner. (Any discharge over land or from the base of the cells, controlled or otherwise, would currently be unauthorised.)
- 27. The scheme proposed by TRPL is described in some detail in the application documents and I rely on those descriptions here. In summary, the proposed scheme is to:
 - a. Construct, to the immediate east of the currently-developed site, a soakage pit of dimensions 20 m x 20 m and 2 m depth.
 - b. Pump contaminated water (comprising mixed leachate and stormwater) from the retention pond to the soakage pit, and allow it to soak into the ground.
 - c. Ensure the soakage pit does not overflow and that there is adequate freeboard maintained at all times (with a regime of inspections proposed).
 - d. Monitor groundwater levels in the immediate vicinity to ensure the extent and height of groundwater mounding does not create risks of springs forming and of heightened groundwater interacting with landfill cell linings and their material.
 - e. Monitor concentrations of contaminants in groundwater and surface water in the vicinity.
 - f. Pump water to the extent possible whilst operating within mounding and contaminant limits (though neither were defined in the application), with a view to creating freeboard in the main retention pond.

Volume and timing of discharge

28. The purpose of creating freeboard is expressed as being to ensure future leachate generated by rainfall can be held and an uncontrolled discharge therefore avoided.³ The total volume of water to be pumped into the soakage pit was initially stated as

³ I note the application was lodged in September 2024 with the express anticipation it would be granted quickly, with the effect that freeboard could be created in readiness for rainfall from late spring-2024 onwards (for the requested 6-month term).

up to 800 m³ per day, but following the close of submissions was revised downward to 300 m³ per day.⁴

29. Despite this upper limit proposed, there is an unresolved technical dispute between ENGEO and PDP over the rate of soakage likely to be achieved. Mr Steffens' (PDP) position is that the volume of soakage that might be achieved may be no higher than ~12 m³ per day, which I understand is less than the rate that new leachate and stormwater enters the retention pond during most rainfall events.
30. The potentially very low rate of discharge into the soakage area creates some scepticism that the proposal can succeed. It is not clear that the site and the system design and discharge can support a helpful rate of discharge, which brings into question the likelihood of success in creating freeboard in the retention pond.
31. Nevertheless, it is TRPL's position (and I agree) that the success or otherwise of the proposal is not the business of WCRC to consider, and rather it is the types and significance of adverse environmental effects that are for consideration.
32. There is also some uncertainty around the amount of freeboard intended to be created, how much freeboard is sufficient to adequately reduce the chance of an uncontrolled overflow, and the rate and overall volume of discharge that may achieve this – as well as the uncertainty over the rate of discharge that can be accommodated by the proposed soakage.
33. WCRC has sought through s92(1) requests clarity on these matters.

Contaminated water to be discharged

34. The water to be discharged has been sampled (most recently, before the applications were lodged) and contains the following contaminants.

⁴ Email K Ghisel to M Durand, 5 August 2025

Parameter	Sample Name		Guideline Values		
	Settlement Stage 2	Cell B/C	DGV ¹	AV ²	MAV ³
pH	8.1	<u>6.9</u>	7.7	7.0-8.5	
Total Alkalinity	340	310			
Bicarbonate	410	380			
Total Hardness	600	550		≤200	
Electrical Conductivity (mS/m)	<u>125.6</u>	<u>523</u>	10.7		
Dissolved Aluminium	0.016	0.22	0.055	≤0.1	1
Dissolved Calcium	220	196			
Dissolved Iron	0.05	0.51		≤0.3	
Dissolved Magnesium	11.6	15.6			
Dissolved Manganese	2.6	2.7	1.9	≤0.04	0.4
Dissolved Potassium	23	29			
Dissolved Sodium	36	34		≤200	
Chloride	19.6	89		≤250	
Total Ammoniacal-N	5.4	98	0.9	0.82	
Nitrite-N	0.053	0.37			0.912
Nitrate-N	<u>0.1</u>	<u>0.72</u>	0.092		11.3
Nitrite+Nitrate-N	0.154	0.94			
DRP	<0.004	<u>0.024</u>	0.009		
Sulphate	330	350		≤250	
cBOD5	3	11			
COD	84	114			
Dissolved Arsenic	<u>0.0125</u>	<u>0.96</u>	0.013		0.01
Dissolved Cadmium	<0.00005	<0.003	0.0002		0.004
Dissolved Chromium	<u>0.0065</u>	<u>0.22</u>	0.0033		0.05
Dissolved Copper	<u>0.0077</u>	<u>0.058</u>	0.0014	≤1	2
Dissolved Lead	<0.00010	0.0024	0.0034		0.01
Dissolved Nickel	0.0037	<u>0.016</u>	0.011		0.08
Dissolved Zinc	0.0037	<u>0.041</u>	0.008	≤1.5	

Notes:

All values reported in units of milligrams per litre (mg/L) unless stated otherwise

1. Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000) Default Guideline Values (DGV) for 95% Species Protection. Where no Toxicant DGV has been derived, values are for physical chemical (PC) stressors (based on MfE REC CX/L)

2. Taumata Arowai Aesthetic Values for Drinking Water Notice 2022, Aesthetic Values (AV)

3. Water Services (Drinking Water Standards for New Zealand) Regulations 2022, Health-based Maximum Acceptable Value (MAV)

Measures to monitor and control discharge

35. TRPL has proposed to monitor
 - a. the level of water in the soakage area and ensure pumping rates from the retention pond do not exceed the rate of soakage; and
 - b. contaminants in groundwater at a series of locations
36. No conditions to this effect have been suggested. However, in my opinion, if conditions to that effect are adequately drafted and include appropriate trigger values, limits, and actions to be taken if triggers and limits are exceeded, these may provide sufficient controls on the exercise of any consent granted.
37. I have not yet suggested a set of draft conditions with these elements included, and propose that the applicant's, WCRC's and GDC's experts caucus on conditions once evidence has been circulated.

Reporting procedures

38. No reporting system has been proposed.

Contingency measures

39. No contingency measures have been proposed, other than ceasing the discharge if monitoring limits or triggers are met or exceeded (pending on any limits, triggers and prescribed actions imposed in any consent granted, as referred to above).

Consent history – detail

History up the lodgement of this application

40. The site and consent history prior to the lodgement of RC-2024-0122 and RC-2021-0097-V10 is relevant, as it contextualises the present situation at the site and the justification for the current application.⁵
41. The site was established as a landfill facility under resource consent RC-2021-0097, which was granted on 6 August 2021 to “undertake earthworks, including land-based gravel extraction to construct, operate and rehabilitate a demolition fill site, Taylorville” (part 01) and “to discharge demolition waste to land, Taylorville” (part 02).
42. The application asserted that leachate would not be generated and stated that if leachate were generated it would be removed (16 July 2021 site assessment). The application stated that the proposal included “installation / creation of surface water and potentially leachate treatment systems (e.g. containment / settlement / treatment ponds)”. In processing that initial application WCRC sought, by section 92(1), information about leachate generation, to which TRPL replied:
- “the Davis Ogilvie report states potential leachate is highly unlikely, but, if possible, it will be captured by the cell/pit sump. From there it will be piped into the water management system (attached). Treatment can only be confirmed upon leachate detection. If there are leachate present, they will be collected via a Hydra-Vac Truck and taken to the appropriate dump site”.*
43. The resulting resource consent was explicit in prohibiting contamination of surface water and groundwater outside of the site as a result of the exercise of the consent (Condition 11 of RC-2021-0097). No discharge permit was either applied for or granted authorising leachate discharges, and none of the subsequent changes made to RC-2021-0097 (V1-V6) concerned leachate or its management.
44. Nevertheless, and contrary to TRPL’s and WCRC’s expectation, the landfill has produced leachate.
45. The leachate mixed with stormwater is sourced from the current landfill cells (with some stormwater also likely sourced from outside the cells but entering them over land):
- a. Cell A is an unlined cell authorised by RC-2021-0097 to hold “Fill material” (under condition 9) and “Fill material initially” (under condition 5).
 - b. Cells B and C are lined cells authorised by RC-2021-0097 to receive “asbestos”, “coal tar or coal pitch” and “other hazardous materials (if approved)” (under condition 5).
46. The design of the site’s water management system means that leachate from these cells is mixed with stormwater. A system of pipework, sumps, pumps and ponds

⁵ WCRC uses a consent numbering system where applications under s127 are given “V-” postfixes and, if variation applications are granted the amended consent is given the same “V” number. The current application is denoted “V10” because it is tenth application made to vary RC-2021-0097. The current version of the resource consent and its conditions is RC-2021-0097-V6. Applications V7, V8 and V9 were returned under s88 or withdrawn,

operate to take leachate and stormwater from the cells and store it in a series of retention ponds.

47. Since December 2023 TRPL has lodged a series of resource consent applications with WCRC to construct these storage ponds and manage leachate by seeking to discharge it to land:
 - a. RC-2021-0097-V7 and RC-2023-0157 (December 2023) which were incomplete and returned under section 88;
 - b. RC-2021-0097-V8 and RC-2024-0032 (March 2024) which were subject to a section 92(2) request and later withdrawn;
 - c. RC-2021-0097-V9 (September 2024) which was incomplete and returned under section 88; and
 - d. The current applications, RC-2024-0122 (September 2024) and RC-2021-0097-V10 (November 2024) which are subject to consideration in this report.
48. Over this time TRPL has continued to generate leachate in the cells and store it in constructed retention ponds. Approximately 15,000 m³ of leachate and stormwater combined is now held on site.
49. As well as making applications for discharges of leachate, TRPL has sought to widen the scope of waste the landfill may receive.
50. TRPL's March 2024 applications RC-2021-0097-V8 and RC-2024-0032 sought to change the landfill to a Class 3 site (WasteMinz classification), as well as to allow the discharges of collected and long-term future leachate off the site. The proposal at that stage was to discharge leachate to land adjacent to No Name Creek, where it would flow to the creek via a constructed wetland.
51. Those applications were withdrawn by TRPL in favour of a revised and fuller "long term" application planned to be lodged in the future (whose scope, at that time, was not clear).

Class 2 applications lodged in June 2025

52. Following on from earlier attempts to change the types of waste that may be received, TRPL has now lodged – during the submission period for the current application – further resource consent applications with WCRC and GDC:
 - a. for a suite of all the necessary consents to operate the site as a Class 2 (WasteMINZ classification) facility in the long term:
 - i. A range of land use and discharge permits from WCRC (RC-2025-0081)
 - ii. A land use consent from GDC (LUN3374-25)
 - b. to replace RC-2021-0097, as well as to replace RC-2024-0122 (the application under consideration here), should consent be granted.
 - c. lodged in June 2025, during the submission period of the current application.
53. Those applications are currently being reviewed by WCRC and GDC's consultants to determine whether any further information is required. Public notification has been requested.
54. Whilst processing of these applications is concurrent with the application under consideration here, the proposed activities are associated with the long-term operation of the site. The application for consideration here, for a relatively short-term discharge only, is distinct from the suite of Class 2 applications.

55. GDC has taken a different view and submits that (i) section 91 is engaged and (ii) that the currently hearing process should be suspended, for all the applications to be considered together. I have addressed that matter in paragraphs 158-168 of this report.

Existing environment

56. The AEE and accompanying documents describe the site and surrounding area. There is no dispute over the general elements of the site and its surroundings, and no need to repeat information here except to highlight matters of note or that require resolution.

Surface and groundwater environment

57. The immediate hydrological environment has the following features of note, whose significance is considered further in the evidence of Mr Steffens (refer also to Figure 2):
- a. Grey Tributary which flows from an approximate location slightly south of the Coal Creek WTP and flows parallel to the Grey River.
 - b. Noname Creek, beginning at the northern boundary of the site, flowing west, then south-west along the western site boundary, crossing Taylorville Road via a culvert prior to flowing into Grey Tributary.
 - c. Spring TCD1 situated at the western most extents of the site boundary.
 - d. The drain starting at TCD1 running along the western side of the access road to the property of Quadrello Holdings Ltd and then running west along the northern side of Taylorville Road to surface water sampling site TRD5. Further west, the flow direction of this drain varies. (Mr Steffens understands that there is a flow divide at the approximate location of SP3 with flow to the east toward TRD5 and flow to the west toward TRD2. West of TRD2, all flow is to the east (the road climbs to the east from TRD2)).
 - e. Numerous culverts are marked as blue arrows where flow from the northern roadside drain crosses to the southern side of Taylorville Road.
 - f. Surface water channels on the lower terrace south of Taylorville Road, to the east of the Grey River water treatment plant.
 - g. A drain running along the southern side of Taylorville Road beginning around the location of surface water sampling location SPA.
58. Groundwater is expected to flow across the site from east to west (generally). The matter of groundwater flow has been the subject to dispute between TRPL's and WCRC's groundwater experts, because the direction and rate of flow is relevant to the downstream receiving environment for discharged water and contaminants. I consider that the extent to which there is (or will be) groundwater flow to the south, southwest, northwest or north from the discharge location has not been adequately resolved. Additionally, there is a risk raised by Mr Steffens that any excessive groundwater mounding, caused by the proposed discharge, could alter the direction of groundwater flow across parts of the site. Groundwater flow direction therefore remains an area of uncertainty.
59. Any daylighting or over land flow of water from the site will likely be intercepted by the road side drains or No Name Creek.
60. TRPL argues that any water daylighting at the road cuts would be intercepted by these road side drains, and the collected water would follow the drains and culverts downslope to the west. They argue intercepted water would not soak under the road

enough to create any meaningful contamination of land or water on the south side of the road. However Mt Steffens has been concerned there is not adequate data to rule out such an occurrence.

61. TRPL argues that daylighting in or around No Name Creek is more likely, as they consider that groundwater flow predominantly north-west from the point of discharge.
62. In such a case, the discharged water would eventually reach the Grey River via the current path of No Name Creek.
63. There are no bores, dwellings or other sensitive land uses in the immediate vicinity, except as noted below.

Proximity of Grey District Council municipal water supply intakes

64. Grey District Council operates water supply intakes for the water supply GRE001 approximately 500 m from the location of the proposed discharge.⁶ The Coal Creek water Treatment Plant (WTP) is immediately adjacent.
65. The supply provides drinking water to approximately 9700 residents in Greymouth, Cobden, Dobson, Kaiata, Stillwater, Taylorville, Rapahoe and Rūnanga. The supply is registered under section 55 of the Water Services Act 2021.⁷ I understand these are the sole water intakes for supply to these settlements.
66. The bores are within gravels of the Grey River margins and water sourced from them is considered likely to the (predominantly) shallow groundwater connected hydraulically to the river.
67. Despite this, the possibility of other sources of water influencing bores has not been ruled out. TRPL has not been able to access the intake bores for sampling and testing.
68. The water supply intakes are a particularly sensitive part of the environment.

Leachate in soil or groundwater

69. For the purposes of this consent application, the environment includes the landfill as consented and those materials in cells that are authorised. The question arises as to the status of any leachate in groundwater (on or off the site) and whether its mobilisation by the proposed discharge should be taken into account.
70. As described above, RC-2021-0097 was granted on the basis that leachate was not going to be produced by the landfill and that if it were, it would be removed directly from the cells and disposed of elsewhere. Condition 11 (now sought to be changed) prohibited the contamination of land and/or water outside of the site from any source as a result of the exercise of the consent, but did not impose a blanket prohibition on the generation of leachate. I understand that such contamination likely has occurred and is likely to still be occurring.
71. The context for this situation is that:
 - a. Cell A was constructed and filled without any lining, with the cell dug through the overlying gravels and into the underlying mudstone.
 - b. Leachate accumulating in Cell A is likely to have already been discharged into land and/or groundwater within the site.

⁶ <https://hinekorako.taumataarowai.govt.nz/publicregister/supplies/view/?id=5b9d6070-949a-ec11-b400-000d3ad2337d>

⁷ <https://www.legislation.govt.nz/act/public/2021/0036/latest/LMS374736.html>

- c. Groundwater moves through the gravels and mudstone from approximately east to west (most likely).
 - d. This groundwater flow is likely to have outside of the site, having been mobilised by groundwater flow.
 - e. The site's other cells are lined and may or may not also be leaking.
72. Submitters have raised suspicions that non-consented materials have been deposited in the landfill cells, but no evidence was produced to substantiate those claims. However, it is well known that TRPL received significant volumes of greenwaste which was discharged into Cell B and created biological activity that produced odour discharges, and would also have created leachate.
73. My understanding of the hydrogeological evidence is that the proposed discharge, because it will contribute water to the groundwater, could flow in such a manner that it could intercept contaminants discharged from the base of the cells and mobilises these, to eventually daylight in one of the site's surrounding waterbodies.
74. This poses a series of questions about the status of the "existing environment":
- a. *Is leachate in soil or groundwater outside the site part of the existing environment?* Condition 11 prohibits this (unless the leachate were not a "contaminant" – which is a fanciful suggestion), so leachate in groundwater outside the site is not part of the existing environment.
 - b. *Is leachate in soil or groundwater within the site part of the existing environment?* Whilst the current resource consent does not prevent this, the application was made with the assertion that it would not occur. Contamination of this sort was not accounted for in the decision making on RC-2021-0097, and if it were, it would have been recognised that groundwater flows would intercept and transport the leachate outside of site. Therefore, in my view leachate in soil or groundwater within the site is not part of the existing environment in a legal sense.
 - c. *Should mobilisation of leachate in groundwater be assessed under s 104(1)(a)?* Section 104(1)(a) requires consideration of the effect of *allowing the activity* (as opposed to the effect of the discharge in isolation), which includes the effect of mobilising contaminants not in the discharge. Those contaminants are, however, not legally part of the environment.
 - d. *Should mobilisation of leachate in groundwater be assessed under s 104(1)(c)?* Section 104(c) requires the consent authority to "have regard to [...] any other matter the consent authority considers relevant and reasonably necessary to determine the application. In reality, contaminants are likely to be present in groundwater within the site as a result of the operation of the landfill. If these are mobilised offsite, then in my view this is a "relevant and reasonably necessary" matter to have regard to in determining the application. Mr Steffens has considered that in his evidence.

Ecological environment

75. The immediate ecological environment of relevance is the water bodies surrounding the site. Of these, No Name Creek is most relevant and has ecological values as set out in the AEE. Mr Duncan Grey has considered the ecological environment in his evidence (Attached here as Appendix 4).

Application process

76. The application was lodged in its first iteration on 23 September 2024, for two activities:
- RC-2024-0122 – a short-term discharge permit application (received under s88 on lodgement); and
 - RC-2021-0097-V9 (September 2024) – to change condition 11 of RC-2021-0097, and which was incomplete and returned under section 88.
77. Following lodgement, the sequence of processing milestones has included:
- Application RC-2024-0122 was subject to section 92(1) request on 21 October 2024.
 - RC-2021-0097-V10 to change Condition 11 of RC-2021-0097 under s 127 was lodged 18 November 2024 and received for processing (and processing of the applications was re-started)
 - RC-2024-0122 and RC-2021-0097-V10 were then subject to a technical review by Carl Steffens (Pattle Delamore Partners) and a section 92(1) further information request.
 - In response to the further information request and following a series of meetings held between TRPL and WCRC, TRPL supplied a series of five memoranda between November 2024 and March 2025.
78. In summary, these further information requests, written responses and various meetings were to address:
- the purpose, volume and duration of the proposed discharge
 - whether the existing consent RC-2021-0097 prohibits contamination of land by the proposed discharge
 - the credibility of various technical assessments made
 - the reasons for preferential use of data from some parts of the site and not others
 - the reliability of modelling results and other predictions made
 - suitability of the site for the proposed discharge, including whether the desired ground soakage can be achieved
 - the pathway and ultimate destination of leachate and its contaminants once discharged
 - whether the water supply intake is hydraulically connected to the discharge
 - whether the Greymouth water supply may be contaminated by the discharge
79. I have considered that these matters are critical to resolve, in particular because adjacent environment is particularly sensitive to risks posed by contaminants in groundwater if they reach the water supply intake.
80. “The application” subject to consideration in this report is RC-2024-0122 (lodged September 2024) and RC-2021-0097-V10 (lodged November 2024), comprising the documents in paragraph 13 combined.
81. A decision to limited notify the application, notification (9 May) and close of submissions (8 July) followed.
82. For completeness I also record here that in July WCRC suggested to TRPL that the water quality data for the retention pond water is now old (collected and analysed

before lodgement of the application prior to September 2024). WCRC asked whether any newer monitoring data has been collated, and if it had, suggested this be made available to WCRC for consideration.⁸ TRPL confirmed newer samples had been collected and were being analysed, but at the time of writing this had not been shared with WCRC.

NOTIFICATION AND SUBMISSIONS

Notification

83. The applications were given limited notification on 9 May 2025 to:
- Grey District Council
 - Sewell Peak Farms Ltd
 - Quadrello Holdings Ltd
 - Adrian Van Dorp and Christine June Mehrtens of 173 Taylorville Road, Coal Creek
 - Te Rūnanga o Ngāti Waewae
84. At the time of notification, a 20-working day submission period applied (closing 9 June 2025) but WCRC decided to extend the submission period to 40 working days after a request was received from Grey District Council.^{9,10}
85. Submissions closed on 8 July 2024.

Submissions

86. Submissions were received as summarised below.

Te Rūnanga o Ngāti Waewae¹¹

PO Box 37, Hokitika

Oppose application – seeks it to be declined

Wishes to be heard

Key points:

- Importance of existing Condition 11 of RC-2021-0097 is stressed;
- Requests clarification of legality of change to Condition 11;
- Asks whether limited notification was appropriate
- Suggests there is
 - lack of specific hydrogeological data;

⁸ Aside from updating the information in the application, WCRC considered the apparent threat of an uncontrolled pond overflow justified the need for recent data to be available

⁹ TRPL refused to agree to the extension of the submission period. However, WCRC determined that special circumstances warranted this extension of time for submissions, by reason of the scale and complexity of the application. WCRC also determined that the interests of the community in achieving an adequate assessment of the effects of the proposal would be better served by a 40 working-day submission period than by a 20 working-day submission period.

¹⁰ On 4 July Grey District Council requested a further extension of the submission period by an additional 10 working days. The request was to extend the timeframe by more than double the limit in section 97, so under section 37A(5), any extension would be subject to TRPL's agreement. TRPL did not agree to the extension.

¹¹ Chairman: Francois Tumahai; Address for service: Philippa Lynch, Poutini Environmental.

- absence of robust monitoring of existing groundwater effects;
- absence of detail on waste types from which leachate is derived;
- lack of justification for water management system design;
- lacks detail of the design of the discharge system
- Suggests monitoring for further contaminants of leachate should occur (e.g. PFAS, VOCs and PAHs)
- Seeks assurance that the water management system was designed by a suitably qualified person;
- Seeks understanding of how the system compares to current best practice;
- Expresses concern that that modelling predictions are compromised by uncertainties;
- Seeks that mounding issues are addressed;
- Seeks clarification of whether the modelling takes into account influence of unlined Cell A;
- Suggests a trial or pilot using a tracer could address uncertainties;
- Considers further ecological investigations and assessments are required;
- Seeks further information on an uncontrolled discharge;
- Suggests the loss of freeboard over time was foreseeable;
- Seeks clarification on alternative treatments and methods of discharge;
- Notes the absence of draft conditions in the AEE

Quadrello Holdings Ltd¹²

PO Box 227, Greymouth Hokitika

Oppose application – seeks it to be declined

Does not wish to be heard

Key points:

- Concerned about
 - groundwater runoff from above their site, overflow of surface water and flooding
 - design construction and location of leachate retention pond
 - damage and compromise to cell linings
- Alleges that
 - the ‘upper pond’ has been full in the past and
 - leachate has already been discharged to land and through their property
 - ‘toxic waste’ has been illegally received

¹² Contact Person: Peter Haddock

- Suggests the landfill is in a poor location that affects their property values
- Does not have faith or trust in the site operators
- If consent is granted, conditions requests “stringent conditions with real time monitoring” and data made available to “all parties”

Adrian van Dorp and Christine June Mehrrens¹³

173 Taylorville Road

Oppose application – seeks it to be declined

Wishes to be heard

Key points:

- The nature of the landfill leachate sought to be discharged (including heavy metals, organic compounds and pathogens) mean the proposal is contrary to the purpose of sustainable management in the RMA and the National Policy Statement for Freshwater Management 2020
- Leachate requires careful management (e.g. new types of waste received may produce additional leachate or leachate with different contaminants present). Containment of leachate will be difficult given the rainfall situation at the site;
- They have made 99 odour complaints to WCRC. The history of odours suggests poor site management;
- There is an absence of adequate information; the RMA is not a ‘no risk’ statute but there is considerable uncertainty with too great a potential for harm to be caused;
- Effects on aquatic life will be contrary to the RMA and the NPSFM;
- It is not appropriate to rely on the Grey River for dilution;
- Further expansion of the landfill may not be appropriate or safe;
- Consent should be declined;
- If consent is granted, conditions should include controls on waste acceptance, stormwater management and monitoring.

Grey District Council¹⁴

Oppose application – seeks it to be declined

Wishes to be heard

Key points:

- The Applicant’s evidence and assessment of effects is insufficiently certain for granting a resource consent, especially where there is potential risk to the Grey District drinking water supply and other potential adverse effects

¹³ Contact Person: Antoinette Besier (Barrister and Solicitor – Tasman Law Ltd)

¹⁴ Contact Person: Geraldine Biggs / Jonathan Sylvester (Lawyers – Corcoran French)

- The applications are fundamentally at odds with the existing consents
- “Recognises that a long term solution is needed”
- “The new applications ([RC-2025-0081 – lodged since notification of the current applications] will enable the Applicant’s activities that give rise to leachate to be considered. GDC requests that these consents are deferred and heard alongside the new applications by a panel of hearing commissioners. It is illogical for the application for a discharge permit and variation to be considered in isolation from the current (and proposed) operations that have given rise (and will give rise) to the creation of contaminated water in the first place.”
- A precautionary approach is required for assessing these applications.
- The proposed activities are inconsistent with the National Environmental Standards for Sources of Human Drinking Water 2007.
- The variation application should be considered as a new activity and a full assessment of the environmental effects of the landfill activities undertaken.
- A piecemeal approach to the consent applications is unhelpful has prevented a comprehensive consideration of the cumulative effects of the totality of the activities. Deferral of these consent applications so that they can be heard alongside the latest applications will enable that.
- The conditions on RC-2021-0097 are not appropriate for controlling the contaminants that are in fact being discharged in contravention of Condition 11.
- These consents should not be used to create a precedent for enabling further discharge activities where they are creating risk to the water supply
- The assessment of alternatives is inadequate
- Abatement notices issued in the past are a “red flag” for potential unanticipated adverse effects

87. There was no submission from Sewell Peak Farms Ltd.

88. Except where out of scope (see paragraphs 95-98) the substance of the submissions is considered later in this report as appropriate.

Late part of submission from GDC

89. Following the close submissions there was short conversation by email between Kirsten Ghisel (for TRPL), Jonathan Sylvester (for GDC) and myself. The essence of the exchange was GDC’s position that “deferral of the temporary discharge and s127 applications [the current applications] should occur so that they can be heard alongside, what is referred to as the comprehensive application [the long-term, Class 2 landfill applications, RC-2025-0081 and LUC3374-25, which were lodged by TRPL during the submission period].”

90. For GDC, Mr Sylvester asked that his email be considered as part of GDC’s submission and is attached to this report (Appendix 5).

91. Technically, this part of the submission was received after the close of the submission (i.e. is late), but only slightly so, and the matters covered were already part of GDC’s submission.

92. The Panel will need to make a decision on whether this material can be accepted as part of GDC's submission and whether it can be received late.
93. I note that none of this exchange has been made available to the other parties (until its attachment to this report). However, I do not think that the other parties are prejudiced by not seeing this material until now, nor do I see any issues with the material from GDC being received late as part of their submission.
94. Consequently, my recommendation is to receive the email from Mr Sylvester (on behalf of GDC) as a late part of their submission.

Parts of submissions that are out-of-scope

95. In my opinion the following aspects of the submissions are out of scope for consideration.
96. Submissions relating to possible future activities:
 - a. Concerns relating to further expansion of the landfill (Adrian van Dorp and Christine June Mehrtens)
 - b. That a long-term solution to the landfill's issues is needed (Grey District Council)
 - c. Consideration should be given to the activities that create leachate (Grey District Council)
 - d. A comprehensive consideration of the cumulative effects of the totality of the activities has not been possible (Grey District Council)
97. Submissions relating to other activities and their possible non-compliances with existing consents or permitted activity rules:
 - a. Odour has been generated and complaints have been made (Adrian van Dorp and Christine June Mehrtens)
 - b. Conditions of RC-2021-0097 are not appropriate (Grey District Council).
 - c. Concerns about damage to, and compromise of, the cell linings (Quadrello Holdings Ltd)
 - d. The 'Upper pond' has been full in the past (Quadrello Holdings Ltd)
 - e. Leachate has already been discharged from the ponds to land through their property (Quadrello Holdings Ltd)
98. Property values
 - a. The landfill affects surrounding property values (Quadrello Holdings Ltd).

STATUTORY FRAMEWORK AND RELEVANT PROVISIONS

Status and application of RMA

99. The RMA has been subject to frequent amendments, including three amendments since this application was lodged (October 2024, March 2025 and April 2025).¹⁵ Of note here, and significant among these amendments, was the October 2024 amendment¹⁶ to insert section 104(2F) and (2G) as follows:¹⁷

¹⁵ Lodgement date: 23 September 2024

¹⁶ <https://www.legislation.govt.nz/act/public/2024/0043/latest/LMS962882.html>

¹⁷ <https://www.legislation.govt.nz/act/public/1991/0069/latest/DLM234355.html>

- (2F) *When considering an application and any submissions received, a consent authority must not have regard to clause 1.3(5) or 2.1 of the NPSFM 2020 (which relates to the hierarchy of obligations in the NPSFM 2020).*
- (2G) *Subsection (2F) applies despite subsection (1)(b)(iii) and any other provision of this Act.*
100. Legislation usually does not have retrospective effect,¹⁸ but these provisions were meant to apply to applications lodged (but undecided) before the amendments received Royal assent.¹⁹ This is as stated in Schedule 12, Part 7, Clause 43 of the RMA:²⁰
- 43 *Specified provisions relating to NPSFM 2020*
- The specified provisions²¹ relating to the NPSFM 2020 apply to an application for a resource consent that is lodged with a consent authority—*
- (a) *on or after commencement; or*
- (b) *before commencement if the consent authority has not, before commencement, served notice of its decision on the application.*
101. In effect this means that the application must be considered without regard to clause 1.3(5) (the hierarchy of obligations in Te Mana o te Wai) and clause 2.1 (the objective of the NPSFM).
102. Policies 1-5 of the NPSFM must still be given due consideration, as well as other provisions of the NPSFM. The relevant provisions and their application are outlined further below.
103. The relevant text of the RMA is the version as at 5 April 2025.²²

Relevant RMA provisions

104. For completeness, below is an outline of the relevant provisions of the RMA and brief advice as to their relevance here.
105. A fuller discussion and advice on identified issues is provided later.
- a. *Section 41D – Striking out submissions:* Parts of submissions are out of scope, as identified above. However none of the submissions (or their parts) meet the thresholds required to be struck out.
- b. *Section 91 – Deferral pending application for additional consents:* GDC's submission outlines that submitter's case for a deferral of this hearing under the grounds in s91(1)(a) and (b). Contrary to their submission, I do not consider the criteria for engaging section 91 are met. This is addressed in full below.
- c. *Sections 91A-C – Processing suspension:* Applicants may suspend processing of notified applications by up to 130 working days, minus any time that has

¹⁸ <https://www.legislation.govt.nz/act/public/2019/0058/latest/DLM7298195.html>

¹⁹ The Resource Management (Freshwater and Other Matters) Amendment Bill as reported from the Primary Production Committee showed amendments to the NPSFM provisions to make it clear the provisions would apply to applications already lodged – refer to amendments made to Clause 41 of:

<https://www.legislation.govt.nz/bill/government/2024/0047/13.0/LMS962947.html>

²⁰ <https://www.legislation.govt.nz/act/public/1991/0069/latest/DLM242515.html>

²¹ Schedule 12, Part 7, Clause 39 states: 39 *Interpretation. In this Part, unless the context otherwise requires,— [...] specified provisions relating to the NPSFM 2020 means— (a) section 92(2A); and (b) section 104(2F) and (2G); and (c) clause 2(2A) and (2B) of Schedule 4.*

<https://www.legislation.govt.nz/act/public/1991/0069/latest/DLM242515.html>

²² <https://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html>

already been excluded under time periods “on hold” (e.g. while further information is supplied).

- d. *Section 92(1) and 92(2) – Requesting and commissioning information:* Further information has been requested and further request can be made. Time exclusions for requests made under s 92(1) are not available. Requests for commissioning of reports under s92(2) are at the applicant’s discretion.
- e. *Section 99 and 99A – Pre-hearing meetings:* To my knowledge, there have been no pre-hearing meetings and none that involved WCRC.
- f. *Section 104 – Consideration of applications:* Matters to be addressed under section 104 are considered in detail below.
- g. *Section 104B – Determination of applications for discretionary or non-complying activities:* The application is for a discretionary activity so may be granted or reused, and conditions may be imposed subject to sections 108 and 108AA.
- h. *Section 104G – Consideration of activities affecting drinking water supply source water:* The proposed discharge is in the same catchment as the source water for GDC’s Greymouth water supply, and is adjacent to the water supply intakes. There is a dispute over whether the discharge is to the same sub-catchment and whether the discharge is upstream of the supply intakes, so therefore whether the water supply can be, or is likely to be, affected. This is addressed in detail in below.²³
- i. *Section 105 – Matters relevant to certain applications:* The applicant has considered possible alternative methods and locations of discharge, but in my view this assessment is inadequate. Reasons for this are explained further below.
- j. *Section 107 – Restriction on grant of certain discharge permits:* Section 107’s terms are relevant to the discharge, in particular if after reasonable mixing there is any significant effect on aquatic life. The principle concern around the application, that the discharge may affect the Greymouth drinking water supply, is outside of the scope of section 107.
- k. *Section 108 and 108AA – Conditions of resource consents:* If consent is granted, conditions may be imposed. I suggest that the applicant’s, WCRC’s and GDC’s experts are directed to caucus on conditions once evidence has been circulated.
- l. *Section 108A – Bonds:* A bond to be required to secure performance of the consent conditions relating to any effect (including long term effects that might occur following the expiry of the consent). TRPL did not proposed a bond. However, GDC submitted that, if granted, conditions include “a significant bond” to secure conditions relating to water quality and to monitoring. This includes the funding of a potable water alternative and for remediation of GDC’s water supply system “should contamination be identified.” The degree of contamination that would engage the bond, and the bond amount, were not suggested in GDC’s submission. I will address the matter of a possible bond further below.
- m. *Sections 123 and 125 – Duration and lapse of consent:* The requested term of the consent is 6 months. A lapse date was not suggested, and the usual 5-year lapse date would seem to be inappropriate considering the applicant’s expressed urgency to commence the discharge. If consent is granted, I suggest

²³ Refer also to the Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007.

the term to be for 6 months and the that the consent lapses if not exercised within 3 months of being granted.

Relevant national policy statements²⁴

National Policy Statement for Freshwater Management 2020 (NPSFM)

106. The NPSFM applies, as per clause 1.5, “to all freshwater (including groundwater) and, to the extent they are affected by freshwater, to receiving environments (which may include estuaries and the wider coastal marine area).”
107. The NPSFM has relevant preliminary provisions (Part 1) and policies (Part 2). As outline above, recent amendments to the RMA mean that the Objective of the NPSFM (clause 2.1) and the hierarchy of obligations (clause 1.3(5)) are out of scope for consideration under section 104.
108. The hierarchy of obligations is to prioritise:
 - (a) *first, the health and well-being of water bodies and freshwater ecosystems*
 - (b) *second, the health needs of people (such as drinking water)*
 - (c) *third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.*
109. Despite these exclusions regard must still be had to the NPSFM under section 104. Notably this includes having regard to:
 - a. Clause 1.3: the six principles of Te Mana o te Wai – Mana whakahaere, Kaitiakitanga, Manaakitanga, Governance, Stewardship and Care and respect.
 - b. Clause 1.6: Best information, which states:
 - (1) *In giving effect to this National Policy Statement, local authorities must use the best information available at the time, which means, if practicable, using complete and scientifically robust data.*
 - (2) *In the absence of complete and scientifically robust data, the best information may include information obtained from modelling, as well as partial data, local knowledge, and information obtained from other sources, but in this case local authorities must:*
 - (a) *prefer sources of information that provide the greatest level of certainty; and*
 - (b) *take all practicable steps to reduce uncertainty (such as through improvements to monitoring or the validation of models used).*
 - (3) *A local authority:*
 - (a) *must not delay making decisions solely because of uncertainty about the quality or quantity of the information available; and*
 - (b) *if the information is uncertain, must interpret it in the way that will best give effect to this National Policy Statement.*

²⁴ Not relevant are:

National Policy Statement for Renewable Electricity Generation

National Policy Statement on Electricity Transmission

National Policy Statement on Urban Development

National Policy Statement for Greenhouse Gas Emissions from Industrial Process Heat

National Policy Statement for Highly Productive Land

110. WCRC has attempted to ensure that the best information has been put forward in the application, by peer reviewing and critiquing the applicant's conclusions. This is consistent with clause 1.6(2)(b) to "take all practicable steps to reduce uncertainty." This process of reviewing and critiquing has, at each stage, lead TRPL to supply amended technical assessments with new conclusions. I have taken this iterative process as beneficial and progressive towards making the best information available to submitters and to the Panel for assessment.
111. My understanding of the information available is that it:
- Is not complete
 - Is uncertain
 - Includes data from modelling
 - Does not include data from trials (for example trials with inert tracers, as suggested in the submission of Te Runanaga o Ngāti Waewae)
 - Must be interpreted in a way that will best give effect to the NPSFM.
112. Clause 1.6(3)(a), that WCRC must not delay in making a decision by reason of uncertainty, is relevant. Since the application is for a discretionary activity, the RMA provides for it to be granted or declined on consideration of the information available. I consider that WCRC's assessment process has been robust, with a great deal of information and justification requested of TRPL.
113. This has been, principally, with a view to understanding the potential for adverse effects on the Greymouth water supply. In my view this is an effect falling within parts (b) and (f) of section 3:
- In this Act, unless the context otherwise requires, the term effect includes—*
- any positive or adverse effect; and*
 - any temporary or permanent effect; and*
 - any past, present, or future effect; and*
 - any cumulative effect which arises over time or in combination with other effects—regardless of the scale, intensity, duration, or frequency of the effect, and also includes—*
 - any potential effect of high probability; and*
 - any potential effect of low probability which has a high potential impact.*
114. Section 104(6) and (7) provides for the application to be declined on the basis of "inadequate" information.
115. The policies of the NPSFM relevant to this application are:
- Policy 1: Freshwater is managed in a way that gives effect to Te Mana o te Wai.*
 - Policy 2: Tangata whenua are actively involved in freshwater management (including decision-making processes), and Māori freshwater values are identified and provided for.*
 - Policy 3: Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.*
 - Policy 5: Freshwater is managed (including through a National Objectives Framework) to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all*

other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.

- e. Policy 9: The habitats of indigenous freshwater species are protected.*
- f. Policy 15: Communities are enabled to provide for their social, economic, and cultural well-being in a way that is consistent with this National Policy Statement.*

New Zealand Coastal Policy Statement

- 116. A recent judgment has highlighted the need to ensure the NZCPS is given due regard in consent decisions, even where activities seeking consent are outside of the CMA or the coastal environment area.²⁵
- 117. If consent is granted it seeks likely that contaminants in the water discharged may ultimately enter coastal waters.
- 118. The significance of this effect seems likely to be small. I do not consider that this will engage Policy 3 (to use a precautionary approach if effects are uncertain but potentially significantly adverse). There are no relevant aquaculture activities that could be affected, so Policy 8 is not engaged. There is no evidence that allowing the discharge will indigenous taxa or ecosystems in the coastal environment, so I do not believe that Policy 11 is engaged. Policy 21, to improve coastal environment water quality, is designed to be implemented via plans rather than individual consent decisions, so I do not consider this to be engaged here.
- 119. Policy 23 (Discharge of contaminants) likely is relevant. The policy is:

In managing discharges to water in the coastal environment, have particular regard to:

 - 1. the sensitivity of the receiving environment;*
 - 2. the nature of the contaminants to be discharged, the particular concentration of contaminants needed to achieve the required water quality in the receiving environment, and the risks if that concentration of contaminants is exceeded; and*
 - 3. the capacity of the receiving environment to assimilate the contaminants; and:*
 - 4. avoid significant adverse effects on ecosystems and habitats after reasonable mixing;*
 - 5. use the smallest mixing zone necessary to achieve the required water quality in the receiving environment; and*
 - 6. minimise adverse effects on the life-supporting capacity of water within a mixing zone.*
- 120. All the other policies of the NZCPS I consider are out of scope.
- 121. The application does not include an assessment against these policies of the NZCPS.

²⁵ Environmental Law Initiative v Canterbury Regional Council [2024] NZHC 612

Relevant regulations²⁶

Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007 (NES-SHDW)

122. Regulation 7 of the NES-SHDW may be relevant and is considered in detail in paragraphs 192-194.

Water Conservation Orders

123. The National Water Conservation (Grey River) Order 1991 is not relevant as it applies only to the Grey River upper catchment in the Araura River, Blue Grey River and Lake Christabel.

Relevant regional planning instruments

124. West Coast Regional Land and Water Plan is relevant.
125. West Coast Regional Air Quality Plan (RAQP) is not relevant as there is no discharge to air proposed.
126. Regional Coastal Plan for the West Coast is not relevant as there is no part of the activity to occur in the coastal marine area.²⁷

West Coast Regional Land and Water Plan (WCRLWP)

127. The WCRLWP has been operative since May 2014 and was last updated in 2021. The only plan change, Plan Change 1, pre-dates the operative status of the WCRPS.
128. The policies and objectives I consider to be relevant to consideration of the application are:

Objective 3.2.2: To protect water bodies from inappropriate use and development by maintaining and where appropriate enhancing their natural and amenity values including natural character and the life supporting capacity of aquatic ecosystems.

Objective 3.2.3: To maintain or where appropriate enhance the spiritual and cultural values and uses of significance to Poutini Ngāi Tahu.

Policy 3.3.1: In the management of any activity involving water to give priority to avoiding, in preference to remedying or mitigating:

- (1) Adverse effects on:
 - (a) The habitats of threatened species identified in Schedule 7A;
 - (b) Water supply values identified in Schedule 7B;

²⁶ Irrelevant regulations are listed here for completeness with reasons:

Resource Management (National Environmental Standards for Freshwater) Regulations 2020 – no regulation is engaged by the proposal.

Resource Management (National Environmental Standards for Storing Tyres Outdoors) Regulations 2021 – there is no storage of tyres as part of the proposal

Resource Management (Marine Pollution) Regulations 1998 - Marine pollution regulations are relevant only to activities in the CMA

Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 – the take of water from the retaining pond is not intended to be captured by these regulations

Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 – no activity is within scope

Resource Management (National Environmental Standards for Air Quality) Regulations 2004 – there is no discharge to air

²⁷ The New Zealand National Coastal Policy Statement is relevant, despite the absence of coastal activities

- (c) *Spiritual and cultural values and uses of significance to Poutini Ngāi Tahu identified in Schedule 7C;*
- (d) *The significant natural character of wetlands, and lakes and rivers and their margins;*
- (e) *Outstanding natural features and landscapes;*
- (f) *Significant indigenous vegetation and significant habitat of indigenous fauna assessed in accordance with Policy 9.2 of the West Coast Regional Policy Statement;*
- (g) *Existing public access to and along lakes and rivers;*
- (h) *Significant historic heritage;*
- (2) *Adverse effects which cause or exacerbate flooding, erosion, land instability, sedimentation or property damage;*
- (3) *Adverse effects on existing lawful uses including regionally significant infrastructure.*

Policy 3.3.7: In the management of any activity involving water, to avoid, remedy, or mitigate adverse effects on:

- (a) *Water quality;*
- (b) *Amenity values;*
- (c) *Indigenous biological diversity;*
- (d) *Intrinsic values of ecosystems;*
- (e) *The natural character of wetlands, and lakes and rivers and their margins, not described in 3.3.1(1)(d); and*
- (f) *Historic heritage not described in 3.3.1(1)(h).*

Objective 8.2.1: To maintain or enhance the quality of the West Coast's water.

Policy 8.3.5: When considering applications for resource consents to discharge contaminants to water to have regard to:

- (a) *The nature of the discharge and the sensitivity of the receiving environment to adverse effects;*
- (b) *The financial implications, and the effects on the environment of the proposed method of discharge when compared with other options;*
- (c) *The current environmental mitigation technology and the likelihood that the proposed method can be successfully applied;*
- (d) *The cumulative effects of discharges of contaminants and the assimilative capacity of the water body and actual or potential effects in the coastal marine area;*
- (e) *Any relevant industry codes of practice or guidelines relating to the management of potential discharges; and*
- (f) *The best practicable option for the treatment and disposal of sewage effluent, including the use of land disposal or wetland treatment.*

Objective 10.2.1: To sustain existing uses of the West Coast's groundwater, by protecting water quantity and quality and avoiding depleting surface water flows.

Objective 13.2.1: To ensure that the adverse effects from the discharge of liquid contaminants into or onto land, on water and soil quality, social, cultural, and amenity values, and human health are avoided, remedied, or mitigated.

Policy 13.3.1: To ensure that the discharge of liquid contaminants into or onto land is of a nature or at a rate that does not exceed the ability of the land to assimilate the contaminant, and does not result in soil contamination.

Objective 15.2.1: To ensure that the adverse effects from the discharge of hazardous substances into or onto land, on water and soil quality, social, cultural, and amenity values, indigenous flora and fauna, and human health are avoided, remedied, or mitigated.

Policy 15.3.1: To avoid inappropriate disposal or discharge of hazardous substances to land.

Policy 15.3.2: To recognise, where appropriate, relevant industry codes of practice or guidelines relating to the management of hazardous substances and potential associated discharges.

Objective 16.2.1: To avoid, remedy, or mitigate risks to the environment presented by discharges from contaminated land, including risks to human health, social, cultural, and amenity values, and soil and water quality.

129. These policies and objectives are addressed below where relevant to the effects of the proposed discharge.

Confirmation of rules assessment

130. The proposed activities are subject to section 15.
131. Consent for the discharge is required under Rules 71 and 91 of the Regional Land and Water Plan as a discretionary activity.
132. The proposed change to condition 11 of RC-2021-0097 is discretionary under section 127.
133. Overall, resource consent is required as a **discretionary activity**.
134. There are no regulations in any NES that triggers the need for resource consent.

ASSESSMENT AND ADVICE

SCOPE AND PROCEDURAL MATTERS

Scope of s127 to change condition 11 of RC-2022-0091

135. GDC and Te Rūnanga o Ngāti Waewae raise the question of whether the requested change to Condition 11 of RC-2022-0091 is within the scope of changes that can be made under section 127. Te Rūnanga o Ngāti Waewae stated that they take comfort in this condition, as it provides a level of protection towards water outside of the site. GDC stated:²⁸

71. *The Applicant now seeks to materially change the activity to allow this [contamination] and enable future discharges. Section 127*

²⁸ GDC submission paragraph 71-72

cannot be used for what is essentially a new activity, without a thorough reconsideration of the conditions of the whole activity

72. *GDC consider that the variation application should therefore be treated as a new activity under s 104 of the RMA. The proposed temporary consent and variation of Condition 11 are integral to the activities for which the Applicant seeks consents under its June 2025 Applications. They involve the construction of the soakage area and enabling leachate discharges.*

136. This matter was considered in some detail early in this consent process. I have set out this analysis here.

Current Condition 11

137. The current text of Condition 11 is:

The Consent Holder shall ensure that there is no contamination of groundwater or surface water outside of the site (Secs 1-3 5-6 Pt Secs 4 & 8 SO 11520 Sec 1 SO 3935 Sec 1 SO 3934 Lots 1 3 DP 2432 Lots 1-5 DP 3265) as a result of the exercise of this consent.

138. In its current form the condition prohibits contamination of groundwater or surface water outside of the site.

Proposed change

139. The application seeks to change Condition 11 as follows:

140. *The Consent Holder shall ensure that there is no contamination of groundwater or surface water outside of the site (~~Secs 1-3 5-6 Pt Secs 4 & 8 SO 11520 Sec 1 SO 3935 Sec 1 SO 3934 Lots 1 3 DP 2432 Lots 1-5 DP 3265~~ Lot 1-2 DP584105) as a result of the exercise of this consent unless, and only to the extent that, a separate discharge permit has been obtained from the West Coast Regional Council.*

Effect of Condition 11 if amended

141. I have interpreted the proposed change to Condition 11 as still prohibiting contamination of surface water and groundwater to occur outside of the site unless all of the following all apply:

- a. A separate application for a discharge permit is made (in this case, meaning application RC-2024-0122); and
- b. The application assesses the actual and potential effects on the environment of allowing the activity, including the contamination of surface water and/or groundwater outside of Lot 1-2 DP584105; and
- c. The consent authority grants the separate discharge permit; and
- d. As a result of exercising the separate discharge permit, surface water and/or groundwater outside of Lot 1-2 DP584105 is contaminated; and
- e. The contamination that occurs is only to the extent authorised by the separate discharge permit.

142. In the case of the current proposal, the amendment to Condition 11 would authorise contamination of surface water and/or groundwater only to the extent authorised by the granting of RC-2024-0122.

143. This would mean that:

- a. the adverse effects of contamination of groundwater and surface water outside of the site, including adverse effects on any person and in the environment, would be assessed through the processing of RC-2024-0122. That application is a discretionary resource consent application that seeks to discharge contaminants to land where they may enter water; and
- b. conditions of any consent RC-2024-0122 granted could place limits on the groundwater and surface water contamination outside of the site, or the effects of contamination occurring outside of the site, for example by:
 - i. defining or limiting contaminant species to be discharged
 - ii. limiting contaminant load discharged
 - iii. limiting contaminant concentrations in the discharge
 - iv. limiting contaminant concentrations in surface water or groundwater at the site boundary and/or at sites beyond the boundary
 - v. monitoring for and limiting the extent of environmental changes at sites beyond the boundary

Scope of section 127 RMA

- 144. Section 127 states that consent holders “may apply to a consent authority for a change or cancellation of a condition of the consent.”²⁹ None of the caveats or other parts of s127 in themselves restrict the current application from being made.
- 145. However, there is a long standing requirement for consent authorities to be satisfied that an application is truly one for a change of condition(s) and is not an application for an activity that is materially different in nature.³⁰ In making this assessment the consent authority should compare any differences in the adverse effects likely to follow from the varied proposal with those associated with the activity in its original form.

Is contamination of land and water outside of the site a materially different activity?

- 146. The contamination of land and water outside of the site:
 - a. is an activity that was not authorised by RC-2021-0097; and
 - b. creates effects that were not authorised by RC-2021-0097.
- 147. Any straightforward assessment of the proposal would identify the proposed activity as “new,” as it is not currently occurring and is proposed (the discharge of leachate to land).
- 148. However, TRPL has applied for a bespoke discharge permit which is being considered here alongside the application under s 127, and whose express purpose is to authorise this new discharge and its effects. This application for a new discharge permit (and the associated the assessment of the discharge’s effects) is central to the consideration of whether the proposed change to Condition 11 would authorise a materially different activity.
- 149. In my view,
 - a. the application to change Condition 11 is not, in itself, an application for a materially different activity, and

²⁹ <https://www.legislation.govt.nz/act/public/1991/0069/latest/DLM235220.html>

³⁰ *Body Corporate 97010 v Auckland CC* [2000] 3 NZLR 513

- b. if granted, the new condition would not, in itself, authorise a materially different activity or materially different effects.
- 150. In addition, no changes have been sought to the underlying activity – i.e. the operation of the landfill under RC-2021-0097.
- 151. Rather, the activity of discharging leachate to land and the associated effects on groundwater are subject to a separate resource consent application and assessment. The discharge and its effects could only occur if these were authorised by this separate discharge permit.

Is the change Condition 11 of RC-2022-0091 within scope of s 127?

- 152. In my view the change sought to Condition 11 is within scope of s 127. This is because the change would not, on its own, enable any additional, new, or different activity and would not provide for any contamination of water or land to occur outside of the site. Rather, the responsible discharge and effects could only occur if also authorised by a separate resource consent.
- 153. This fact differentiates this application under s 127 from others which might, in themselves, seek to change the scope of a consented activity and its effects.

Submissions

- 154. GDC submits that “section 127 cannot be used for what is essentially a new activity, without a thorough reconsideration of the conditions of the whole activity.”
- 155. It is not abundantly clear what is meant by “for what is essentially a new activity”. In my assessment, the new activity is subject to a new application (RC-2024-0122) and contamination of land and groundwater can only occur if that application is granted.
- 156. It is also not clear to me how “a thorough reconsideration of the conditions of the whole activity” would assist nor why this is necessary. The application is to discharge leachate to land and is not to change any part of the rest of the activity (which I assume means the landfilling activity as a whole). The manner in which the discharge is proposed to occur and its effects are not dependent on changes being made to the operation of the site or its conditions.
- 157. For these reasons I do not agree with GDC’s submissions on s 127 and do not consider this application should be treated as a new activity in the sense meant by GDC. A new application for a discharge permit has been made and is being assessed here. In my assessment, the proposal would not be assessed any more thoroughly, and the scope for managing adverse effects would not be appropriately broad, if TRPL was required to make a new application for RC-2021-0097 with the additional leachate discharge now proposed. Rather, the same effects and policy framework would be in scope for assessment.

Relevance of RC-2025-0081 and engagement of section 91

- 158. As described earlier, RC-2025-0081 and LUC3374-25 were lodged during the submission period on the current application. These new applications are clearly stated as being for a full suite of the necessary resource consents to enable the long-term operation of the site as a Class 2 facility. The applications are to replace all resource consents held by TRPL.
- 159. To the WCRC, the applications are for:
 - a. Use of land for earthworks (including gravel extraction)

- b. Discharges of stormwater to land
 - c. Discharges of water and contaminants to water (leachate to surface water via water management system)
 - d. Discharges of water and contaminants to water (leachate to groundwater directly from current and future cells)
 - e. Discharges of water and contaminants to land (leachate from current and future cells)
 - f. Discharge of Class 2 waste material and cleanfill to land (to landfill) (including the discharge of waste material to land (cleanfill inc. demolition waste etc. – Cells A, B, C)
 - g. Discharge to organic material to land (compost source material)
 - h. Discharge of contaminants to air (landfill and composting operations)
160. Those applications will be determined on their own terms.
161. GDC has noted these concurrent applications and submits that:
- “73. GDC submits therefore that WCRC should defer the hearing of this application so that this application can be heard together and jointly with the June 2025 Applications pursuant to ss 91, 102 and 103 of the Act.”*
 - [...]*
 - “74. Good resource management practice requires that all resource consents for a project are carefully identified from the outset, and applications for them all should generally be made so they can be considered together or jointly.*
 - “75. There is also significant uncertainty about the future management of onsite leachate by the Applicant and its long-term adverse effects. Deferring the current application to enable a joint hearing process for all consents before both consenting authorities would enable all relevant information to be considered across the various related consents. This would enable greater certainty in the decision making to achieve the best planning outcome.”*

Section 91

162. Section 91 provides for the deferral of processing of an application in specified circumstances:³¹
- A consent authority may determine not to proceed with the notification or hearing of an application for a resource consent if it considers on reasonable grounds that—*
- (a) other resource consents under this Act will also be required in respect of the proposal to which the application relates; and*
 - (b) it is appropriate, for the purpose of better understanding the nature of the proposal, that applications for any 1 or more of those other resource consents be made before proceeding further.*
163. Both limbs must be satisfied before a determination under s 91 can be made, and even if both are satisfied then the consent authority “may” determine not to proceed.

³¹ <https://www.legislation.govt.nz/act/public/1991/0069/latest/DLM233881.html>

164. The scope of s 91 is relatively narrow as it applies only where further resource consents will be required *for a proposal*.
165. In the case of the current applications RC-2024-0122 and RC-2022-0091-V10, these are for a particular proposal – what is expressed to be a one-off and short-term water management project to create freeboard in the site retention ponds.
166. “The proposal” is not to continue operation and associated activities at the landfill site, as these are already consented. At the outset of the application process and when the applications were received under s88 (and specifically under Schedule 4(2)(1)(e)), it was determined that no other resource consents were required.
167. GDC’s submission is that it is good practice if “all resource consents for a project are carefully identified from the outset”. I agree entirely. However, in my view the submission misunderstands or mis-states the “project” as being something more than short-term discharge of leachate to create freeboard in the retention pond. The submission considers the project that should be considered here is the long-term operation of the site and all associated activities, whether or not these are already consented, seeking consent here, or seeking new consents via RC-2025-0081.

Should section 91 be engaged?

168. I do not consider the criteria for engaging section 91 are met. Section 91 should not be engaged to defer processing of this application.

ASSESSMENT OF ENVIRONMENTAL EFFECTS AND THEIR SIGNIFICANCE

Adverse effect: Contamination of GDC municipal water supply

169. The risk posed by the proposed discharge to GDC’s drinking water supply GRE001 has been central to the assessment of the application undertaken to date. Mr Steffens has concluded that “the effect of the proposed discharges to off-site groundwater quality is highly likely to be less than minor.”³² However, he has also noted the following:
 52. *My concerns regarding effects to off-site groundwater quality are related to potential effects on the Coal Creek community drinking-water supply [GRE001]. Based on information provided previously by the applicant and ENGEO, I consider there are no private drinking-water supplies at risk from the proposal due to the expected groundwater and surface water flow paths. However, based on the presence of the GDC public supply in close proximity of the site, I did not consider the ENGEO Preliminary Hydrogeological Assessment adequately addressed the risk to this drinking-water supply.*
 53. *Prior to the submission of this short-term consent application, I had suggested that the best way to address risks to the GDC supply is to carry out a drilling and groundwater monitoring and sampling investigation on the GDC land to the south of the site. This recommendation was provided in a PDP letter dated 24 May 2024 to WCM Services (then acting for TRPL), relating to a previous consent application to vary RC-2021-0097-V8 and allow for operation of the landfill under Class 3 Managed Fill guidelines. This application has since been withdrawn. The same recommendation was made in my letter to WCRC dated 26 September 2024, where I provided my expert opinion on the potential or actual impacts of the TRPL landfill leachate management on groundwater, surface water and human drinking-water*

³² Evidence of Carl Steffens, paragraph 62.

sources including the GDC Coal Creek community water supply. I am aware a copy of this letter was provided to TRPL and ENGEO.

54. *I consider it is unfortunate that the potential effects on groundwater quality relating to this short-term consent application are being assessed based on an uncertain modelling approach and theoretical assumptions relating to the geology between the site and the southern side of Taylorville Road, particularly given the significance of the public water supply.*
170. His evidence continues to suggest theoretical pathways by which the discharge could contaminate the water supply source water. To date these pathways have not been ruled out by TRPL by on-site assessments and instead, as Mr Steffens has described, TRPL has preferred to rely on modelling assessments.
171. There is a range of planning provisions that should be considered when assessing effects this discharge could have on the source water for GRE001.
- a. RMA section 3 – Meaning of effect
 - b. RMA section 104G – effects on registered drinking water supplies
 - c. Regional planning instruments – particularly the WCRLWP
 - d. National planning instruments – in particular the NPSFM
 - e. The NES-SHDW
172. These are each considered below.
173. Of relevance as context and an “other matter” under s 104(1)(c), is the report of the Report of the Havelock North Drinking Water Inquiry³³ which the Panel may wish to have regard to.

RMA section 3 – Meaning of effect

174. Section 3 states that “unless the context otherwise requires, the term effect includes (f) any potential effect of low probability which has a high potential impact.”
175. Concern for, and sensitivity about, contamination of drinking water supplies has heightened since the contamination incident in Havelock North in 2016.
176. In this context the avoidable contamination of a water supply, especially with contaminants derived from landfill leachate, could be perceived by the water users as a “high impact” even if water safety parameters are comfortably met.

Application of section 104G

177. The water supply is registered in accordance with section 55 of the WSA.³⁴
178. Section 104G states that:
- When considering an application for a resource consent, the consent authority must have regard to—*
- (a) *the actual or potential effect of the proposed activity on the source of a drinking water supply that is registered under section 55 of the Water Services Act 2021; and*
 - (b) *any risks that the proposed activity may pose to the source of a drinking water supply that are identified in a source water risk*

³³ <https://www.dia.govt.nz/Government-Inquiry-into-Havelock-North-Drinking-Water>

³⁴ <https://hinekorako.taumataarowai.govt.nz/publicregister/supplies/view/?id=5b9d6070-949a-ec11-b400-000d3ad2337d>

management plan prepared in accordance with the requirements of the Water Services Act 2021.

179. Under parts (a) and (b), regard must be had to effects on *the source* of a drinking water supply. In my view this is distinct from assessments of effects on the supplied water itself. Of note is work done, for example, by MfE on the establishment of source protection zones to help prevent contamination of source water.³⁵ It is not clear whether GDC has established source protection zones around water supply source water.
180. Nevertheless, the proposed discharge may reach the source water for water supply GRE001. My understanding of Mr Steffen's evidence is that the chance of this has not been ruled out by evidence.
181. Under part (b) of s 104G, regard must be given to risks posed to source water "that are identified in a source water risk management plan." A source water risk management plan³⁶ is part of a water safety plan,³⁷ which is required to be held at all times by a registered drinking water supplier.³⁸
182. I have not been able to obtain a copy of GDC's water safety plan for supply GRE001, so I cannot comment on risks to source water identified in that plan.
183. If a source water risk management plan for GRE001 exists, this should be made available GDC so that the Panel can fulfil its obligations under s 104G to have regard to it and the risks to the water supply that it identifies.

Report of the Havelock North Drinking Water Inquiry

184. Of notable context here are the recommendations of the Havelock North Inquiry, which led to the development of the Water Services Act 2021 and accompanying changes to the RMA to introduce section 104G. These developments provide extra protection to water supply source water and the supplies themselves despite the prior existence of the NES-SHDW (refer below).
185. The Inquiry identified six fundamental principles of drinking water safety for New Zealand:

Principle 1: A high standard of care must be embraced

Unsafe drinking water can cause illness, injury or death on a large-scale. All those involved in supplying drinking water (from operators to politically elected representatives) must therefore embrace a high standard of care akin to that applied in the fields of medicine and aviation where the consequences of a failure are similarly detrimental to public health and safety. Vigilance, diligence and competence are minimum requirements and complacency has no place.

Principle 2: Protection of source water is of paramount importance

Protection of the source of drinking water provides the first, and most significant, barrier against drinking water contamination and illness. It is of paramount importance that risks to sources of drinking water are understood, managed and addressed appropriately. However, as pathogenic microorganisms are found everywhere, complete protection is impossible and further barriers against contamination are vital.

³⁵ <https://environment.govt.nz/assets/Publications/Files/technical-guidelines-drinking-water-source-protection-zones.docx>

³⁶ <https://www.legislation.govt.nz/act/public/2021/0036/latest/LMS374721.html>

³⁷ <https://www.legislation.govt.nz/act/public/2021/0036/latest/LMS374706.html>

³⁸ <https://www.legislation.govt.nz/act/public/2021/0036/latest/LMS374704.html>

Principle 3: Maintain multiple barriers against contamination

Any drinking water system must have, and continuously maintain, robust multiple barriers against contamination appropriate to the level of potential contamination. This is because no single barrier is effective against all sources of contamination and any barrier can fail at any time. Barriers with appropriate capabilities are needed at each of the following levels: source protection; effective treatment; secure distribution; effective monitoring; and effective responses to adverse signals. A “source to tap” approach is required.

Principle 4: Change precedes contamination

Contamination is almost always preceded by some kind of change and change must never be ignored. Sudden or extreme changes in water quality, flow or environmental conditions (for example, heavy rainfall, flooding, earthquakes) should arouse particular suspicion that drinking water might become contaminated. Change of any kind (for example, personnel, governance, equipment) should be monitored and responded to with due diligence.

Principle 5: Suppliers must own the safety of drinking water

Drinking water suppliers must maintain a personal sense of responsibility and dedication to providing consumers with safe water. Knowledgeable, experienced, committed and responsive personnel provide the best assurance of safe drinking water. The personnel, and drinking water supply system, must be able to respond quickly and effectively to adverse monitoring signals. This requires commitment from the highest level of the organisation and accountability by all those with responsibility for drinking water.

Principle 6: Apply a preventive risk management approach

A preventive risk management approach provides the best protection against waterborne illness. Once contamination is detected, contaminated water may already have been consumed and illness may already have occurred. Accordingly, the focus must always be on preventing contamination. This requires systematic assessment of risks throughout a drinking water supply from source to tap; identification of ways these risks can be managed; and control measures implemented to ensure that management is occurring properly. Adequate monitoring of the performance of each barrier is essential. Each supplier's risk management approach should be recorded in a living WSP which is utilised on a day to day basis.

186. The Inquiry recommended that:

“the six fundamental principles of drinking water safety be recorded and promulgated to the industry and used to inform all recommended reforms, as well as the operation of the entire drinking water system.”

187. These principles are, in my view, an “other matter” under s 104(1)(c) since they are highly relevant to the proposal and can be meaningfully used to guide decision making, especially since it appears GDC has not established source protection zones around GRE001 and may not have a Water Safe Plan for the supply.
188. I note it has not yet been established with a high level of certainty that the discharge is outside of, or otherwise will not reach, source water for GRE001.
189. If there is a chance, other than a negligible chance, that the source water for GRE001 would be affected by this discharge, then I would make the following comments:

- a. On Principle 1 (A high standard of care must be embraced) – a decision to grant the consent would not be consistent with the principle of embracing a high standard of care.
 - b. On Principle 2 (Protection of source water is of paramount importance) – a decision to grant the consent would be inconsistent with the principle of ‘paramount importance’ being given to the protection of source water.
 - c. On Principle 3 (Maintain multiple barriers against contamination) – granting consent would remove source protection as one of the suite of barriers. It is not clear to me what other barriers are in place (e.g. pre-supply treatment) and whether these alone are sufficient to protect water supplies sufficiently
 - d. On Principle 5 (Suppliers must own the safety of drinking water) – GDC should focus their response to this application by
 - i. providing access to source water for investigative analyses to be undertaken as to its origins,
 - ii. supplying a copy of their Water Safety Plan (if one exists) to the hearing for consideration, and
 - iii. if consent is granted, by providing access to land around the water supply intakes to enable monitoring bores to be installed and operated by TRPL.
 - e. On Principle 6 (Apply a preventive risk management approach) – granting consent to enable contamination of source water would not be consistent with the principle of preventing contamination of source water.
190. I stress that these comments are made in the context of source water for GRE001 being impacted by this discharge. It seems to me that the degree of effect is not relevant to the application of these principles since they are to protect source water (above all else), embrace a high standard of care, maintain multiple barriers against contamination and make decisions that are preventive in their management of risks.
191. None of the principles give allowances to contaminate source water to any degree (e.g. to contaminate it only up to a limit, only on a temporary basis, or if treatment can remove the contaminants).

Application of NES-SHDW

192. The NES-SHDW regulation 7 may be relevant to the application because the water supply currently meets health quality criteria but the discharge:
- “has the potential to affect a registered drinking-water supply that provides no fewer than 501 people with drinking water for not less than 60 days each calendar year.”³⁹
193. Regulation 7 requires that “a regional council must not grant a water permit or discharge permit for an activity that will occur upstream of an abstraction point [...] if the activity is likely to:
- (a) *introduce or increase the concentration of any determinands in the drinking water, so that, after existing treatment, it no longer meets the health quality criteria; or*

³⁹ <https://www.legislation.govt.nz/regulation/public/2007/0396/latest/DLM1106901.html>

- (b) *introduce or increase the concentration of any aesthetic determinands in the drinking water so that, after existing treatment, it contains aesthetic determinands at values exceeding the guideline values.*⁴⁰

194. The meaning of “meets the health quality criteria” is given in the NES-SHDW regulation 5,⁴¹ and refers to table A1.3 in Appendix 1 of the Drinking-water Standard. Whilst the application AEE noted the proximity of GRE001,⁴² no assessment was made against the Drinking-water Standard or the NES-SHDW. Instead TRPL has relied on their assessment that the NES-SHDW does not apply, as the discharge is not “upstream” of the water supply.

Application of regional plan policy provisions

195. Significant among regional policy provisions relevant to water supplies is Policy 3.3.1 of the WCRLWP:

Policy 3.3.1: In the management of any activity involving water to give priority to avoiding, in preference to remedying or mitigating:

(1) *Adverse effects on:*

(b) *Water supply values identified in Schedule 7B;*

[...]

(3) *Adverse effects on existing lawful uses including regionally significant infrastructure.*

196. Implementation of the policy is predicated on the following applying:

- a. That the activity seeking consent “involves water” – in this case it does, as the discharge is of water with entrained contaminants and the potentially affected resource is source water for a municipal water supply
- b. That a “water supply value” identified in Schedule 7B is implicated⁴³ or regionally significant infrastructure is implicated – in this case GRE001 is listed as a water supply value in Schedule 7B and the water supply network as a whole is regionally significant infrastructure that is lawfully established and used.
- c. That there is an adverse effect on that water supply value (meaning, as per section 3, an adverse effect that may be *potential*, or one of *low probability but high impact*), or an adverse effect on the use of the infrastructure.
- d. That a decision can be made to avoid that adverse effect.

197. In my view, all of the above apply to this application.

198. If this is considered to be the case by the Panel, then their decision must “give priority to avoiding” adverse effects on the water supply. In my view that priority can only be given by refusing consent.

Conclusion of assessment of contamination of GDC municipal water supply

199. The application faces multiple barriers to approval. In summary these are:

- a. That site assessments and analyses have not shown that the discharge is
 - i. outside of the source area for GRE001, or

⁴⁰ <https://www.legislation.govt.nz/regulation/public/2007/0396/latest/DLM1106947.html>

⁴¹ <https://www.legislation.govt.nz/regulation/public/2007/0396/latest/DLM1106943.html>

⁴² AEE section 3.1

⁴³ Whilst referred to as “values”, the items in Schedule 7B are listed water supply intakes and their locations

- ii. that contaminants will not reach the source water
 - b. The risk the discharge poses to source water needs to be understood but this is not yet the case
 - c. Effects for consideration include potential effects of low probability but high impact
 - d. A “high impact” effect could include the effect contamination of a water supply has on community water users, even if the contaminants themselves are within guideline values or at safe levels.
 - e. Regard must be had to the content of a Water Safety Plan (the source water risk management plan component), but this has not yet been possible (possibly because no Water Safety Plan exists)
 - f. An “other matter” (s 104(1)(c)) to give regard to includes the principles of drinking water safety identified by the Havelock North Drinking Water Inquiry, in particular to protect source water (above all else), embrace a high standard of care, maintain multiple barriers against contamination and make decisions that are preventive in their management of risks.
 - g. The regional plan gives priority to avoiding effects on water supplies.
200. On balance these findings bring me to conclude that it is not appropriate for me to recommend granting resource consent to the proposal as it currently stands and on the information available presently. I would need to revisit that conclusion if information was before the hearing showing that the discharge is outside of the source area for GRE001 or that the source water cannot be affected.

Adverse effects: Surface and groundwater contamination

201. Aside from the potential effect of the discharge on water supply GRE001, there is a broader risk that the discharge will adversely affect groundwater quality and surface water quality. Mr Steffens has concluded:
- 64.3. *The highest concentrations of contaminants in pond or leachate samples to date exceed health-based drinking water MAV criteria for dissolved manganese, arsenic and chromium. In addition, concentrations of many parameters without health-based drinking water MAV's are significantly elevated. There are also multiple instances where concentrations have exceeded ecological and drinking water aesthetic criteria.*
 - 64.4. *Assuming significant quantities of water can be discharged, concentrations will decrease in the surrounding environment with increasing distance from the discharge due to natural processes in the Pleistocene outwash deposits, including dispersion, retardation, attenuation and dilution. The RISC5 modelling carried out by ENGEO is consistent with these assumptions, although I don't consider the modelling to date has been suitably reliable.*
202. I also note his assessment of the quality of the water proposed to be discharged, which was:
- 23. *[...] I note the Preliminary Hydrogeological Assessment shows only a single sample was collected from the settlement pond (31 July 2024) and there are other sample results prior to July 2024 (presented in Appendix 5 of the Preliminary Hydrogeological Assessment) that show significantly higher concentrations of parameters in leachate.*
203. As noted above, TRPL was asked whether more recent water quality assessments had been undertaken and if so to supply these for WCRC's consideration. That has

not occurred by the time of preparing this report. Consequently there is (currently) no option but to assess the proposal on the basis of the sampling results provided to date.

204. The extent to which attenuation of contaminants will occur in the groundwater is in dispute. Mr Steffens has concluded:

63.2 [...] I am not currently at the point where I consider the modelling can be relied upon and for this to occur I would need further confirmation that the entire contaminant mass modelled by ENGEO is transferred into the model and remains in the model during the full simulation period.

205. The relevant objective and policy of the WCRLWP are:

Objective 8.2.1: To maintain or enhance the quality of the West Coast's water.

Policy 8.3.5: When considering applications for resource consents to discharge contaminants to water to have regard to:

- (a) *The nature of the discharge and the sensitivity of the receiving environment to adverse effects;*
- (b) *The financial implications, and the effects on the environment of the proposed method of discharge when compared with other options;*
- (c) *The current environmental mitigation technology and the likelihood that the proposed method can be successfully applied;*
- (d) *The cumulative effects of discharges of contaminants and the assimilative capacity of the water body and actual or potential effects in the coastal marine area;*
- (e) *Any relevant industry codes of practice or guidelines relating to the management of potential discharges; and*
- (f) *The best practicable option for the treatment and disposal of sewage effluent, including the use of land disposal or wetland treatment.*

206. As it stands the proposal is arguably not consistent with Objective 8.2.1, although virtually any discharge of any contaminant to land, where residual contaminants enter water, would fail on that basis. I cannot see that a blanket prohibition of contaminant losses to water was the intention behind Objective 8.2.1. Rather, I have interpreted it as requiring a boarder maintenance or improvement in water quality across whole freshwater management units.

207. In that sense the granting of consent likely does not seriously threaten attaining objective 8.2.1.

208. In regard to Policy 8.3.5, I make the following comments:

- a. Under subpart (a) the receiving environment does not appear to be particularly sensitive to adverse effects, with the express exception of the proximal GDC waster supply GRE001.
- b. Under subparts (b) and (f), TRPL was asked to provide assessments of possible alternative discharge locations and methods, but these were dismissed on financial and practicality grounds. Whether the proposed discharge is the BPO has not been shown with any detailed analysis.
- c. On subpart (c) my understanding is that further treatment of the water prior to discharge could be achieved (for example by the use of flocculants) but this has not been proposed.

209. Rather than rely on attenuation it would be appropriate, if consent were granted, for conditions to place limits on concentrations of contaminants that may be present in the discharged water. An option that would enable the discharge to occur within the policy framework and suitably manage risk (including risk to the water supply) would be to grant consent with conditions that:
- a. Discharge may only occur if:
 - i. Samples of retention pond water are taken and analysed at frequent intervals
 - ii. Analytes include, in particular
 - a. dissolved metals and
 - b. other contaminants of potential environmental and human health concern, such as PFAS, PFOS, VOCs and hydrocarbons
 - iii. Dissolved metals, PFAS and PFOS are undetectable in the samples.
210. A sampling regime of this sort could provide assurance to TRPL and the community that surface water, groundwater and the GRE001 water supply will not be contaminated by the discharge. It could also provide a pathway for the granting of consent to manage water levels in the retention pond, despite the assessment above on the potential effect on GRE001.

Adverse effects: Adverse effects of groundwater mounding

211. I have noted the conclusion of Mr Steffens that:
- 64.1 *I consider groundwater mounding may be a limiting factor for the proposal and the available information indicates it may not be feasible to discharge significant quantities of water from the ponds to ground at the site. If consent is granted, it will be important to control the activity so that mounding does not reach the surface and create surface flooding and runoff.*
 - 64.2 *I consider the potential scale of mounding could change local groundwater flow directions and cause the discharge to reach receptors at closer distances than the assumed modelling carried out by ENGEO. This could potentially cause discharges of contaminants at the head of Noname Creek and directly south of the discharge location via seeps in the Taylorville Road cutting. This would mean there is less distance for contaminants to attenuate prior to discharging compared to the scenario modelled by ENGEO.*
212. My understanding is that mounding and related effects can, however, readily be controlled by the use of groundwater monitoring bores and conditions that restrict mounding to levels that will ensure surface flows and runoff do not occur, and that changes in groundwater flow directions are avoided.
213. The appropriate maximum height of mounding relative to the unaffected groundwater levels will need to be assessed and determined by groundwater technical experts.
214. This outcome would ensure the discharge is consistent with the relevant WCRLWP policies and objectives:
- Objective 13.2.1: To ensure that the adverse effects from the discharge of liquid contaminants into or onto land, on water and soil quality, social, cultural, and amenity values, and human health are avoided, remedied, or mitigated.*

Policy 13.3.1: To ensure that the discharge of liquid contaminants into or onto land is of a nature or at a rate that does not exceed the ability of the land to assimilate the contaminant, and does not result in soil contamination.

Positive effect: Avoidance of pond overspill and uncontrolled discharge

215. Whilst not assessed or quantified in the AEE, it is worthwhile to note that granting the resource consent would enable management to some extent of freeboard in the landfills retention ponds (subject to a discharge being possible under the mounding and contaminant discharge controls). This in turn would assist in avoiding an uncontrolled discharge from an overtopping pond.

BOND

216. The RMA provides in section 108A for a bond to be required to secure performance of consent conditions. Such a bond may continue for a specified time beyond the expiry of a consent if the consent authority considers that an adverse effect may continue or arise beyond the consent's expiry.
217. GDC has suggested a bond is held by the Grey District Council (though no value was specified) for the purpose of supplying alternate potable water to the communities supplied by GRE001: Greymouth, Cobden, Dobson, Kaiata, Stillwater, Taylorville, Rapahoe and Runanga. Depending on the quality of the discharge and on whether the discharge affects source water, a bond may be appropriate. At this stage it appears to me that contamination of the water supply, though an unlikely event, is more than a negligible risk and carries with it a significant impact.
218. The application documents contain no assessment of a bond and WCRC has not requested further information or analysis from TRPL of any bond, a bond amount or a bond duration.
219. A bond could be used to cover the performance of the discharge permit conditions during the life of the consent and beyond its expiry as allowed for in s 108A. However, since no analysis has been conducted to date it is not clear to me whether a bond is appropriate, what value a bond might have, and how long it would remain in effect. If the Panel is of a mind to grant consents, my advice is that further information and advice should be sought on the suitability of a bond, its duration and value before a decision to grant the consent is made.

PART 2 – PURPOSE AND PRINCIPLES

220. The Court of Appeal considered the application of Part 2 under section 104 in *R J Davidson Family Trust v Marlborough District Council*.⁴⁴ That decision found it is necessary to consider Part 2 in making decisions on consent applications, where it is appropriate to do so. Whether it is "*appropriate*" depends on the planning documents in question.
221. The Court of Appeal stated that consent authorities should continue to undertake a meaningful assessment of the objectives and policies of the relevant plan. Where those documents have been prepared having regard to Part 2 of the RMA, and with policies designed to achieve clear environmental outcomes, consideration of Part 2 is not likely to be necessary as "*genuine consideration and application of relevant plan considerations may leave little room for Part 2 to influence the outcome*". The

⁴⁴ *R J Davidson Family Trust v Marlborough District Council* [2018] NZCA 316, [2018] 3 NZLR 283.

consideration of Part 2 is not prevented, but it cannot be used to justify an application that is otherwise not supported by objectives and policies.

222. In light of this judgment, Part 2 of the RMA is required to be considered when determining an application for resource consent, but the objectives and policies still hold significant weight, and in most cases (unless the plan has not been prepared in accordance with Part 2), will largely be determinative unless the consent authority has doubt as to whether the planning documents have been prepared in a manner that appropriately reflects Part 2.
223. In this case I am satisfied that, with respect to the activity being considered, the policy documents give effect to Part 2. I have therefore made no specific Part 2 assessment.

RECOMMENDATIONS

224. Having had regard to those matters in sections 104, 104B, 104G and 107, it may be possible to grant consent. However, on the information currently available and for the proposal as it is currently designed, I recommend refusing the resource consent.
225. The applicant's assessment under section 105 is deficient, but this failure is not in itself a barrier to granting consent.

Conditions of Resource Consent (Section 108)

226. Section 108 of the RMA enables the consent authority to impose conditions subject to those restrictions specified in Section 108 and Section 108AA.
227. In my opinion, the consent conditions are best developed prior to the hearing through expert caucusing. My recommendation is that the applicant's, WCRC's and GDC's experts are directed to caucus on conditions once evidence has been circulated.

Duration (Section 123)

228. Section 123 of the RMA details the possible durations of resource consent. The applicant has sought a consent duration of 6 months, which I consider to be appropriate.

Lapsing of consent (Section 125)

To give certainty to the community water supply users, if consent is granted I recommend a lapse period of 3 months.

Recommended by:  Date: 12 August 2025

Name: Michael Durand
Consultant Consents Officer



Reviewed by: _____ Date: 12 August 2025

Name: Selva Selvarajah Technical Advisor Regulatory & Policy West Coast Regional Council

APPENDIX 1 – APPLICATION DOCUMENTS

Discharge Permit

Taylorville Resource Park

Taylorville Road - Lot 1-2 Deposited Plan 584105

Assessment of Environmental Effects and Statutory Analysis

19 September 2024

B&A

Urban & Environmental

Prepared for:
Taylorville Resource Park

APPLICATION FOR RESOURCE CONSENT

Office Use Only



FORM 1: ADMINISTRATION

Notes

- You must **fully** complete both this administration form and all related activity forms. Provide as much detail as you can.
- You must pay the required initial fee (as stated on page 9 of this form) when you submit your consent application forms, or your application will be returned to you.**
- Failure to provide the required information and payment will delay the processing of your application. If you do not provide adequate information then we will not be able to process your application, and will return it to you.
- Remember to sign and date all forms. A signature is not required if you email or submit your application by electronic means.

If you need any further help, please phone a member of the Consents team on **(03) 768 0466 or 0508 800 118.**

Office use only

Application Number:

Initial Fee Paid:

\$ _____

Date Initial Fee Paid:

Contact details

Applicant details

For **individuals**, you must provide the full names of all individuals (such as John Robert Smith and Mary Jane Williams).

For **companies and other incorporated entities** you must provide the company name and you must also provide the name of a person or persons who will represent your company and be responsible for the application.

For **partnerships, groups and unincorporated entities** (such as private or family trusts or unincorporated societies) we must have the details of all authorised partners, trustees, members or officers. We may also request a copy of your society's rules to verify your status as a formal body or society.

Full name/s of applicant/s This is the name/s that the consent will be issued to. We will not accept applications made in the name of unregistered companies.				
Applicant's postal address				
Applicant's residential address If different from postal address				
Primary contact person/s				
Email address				
Phone number/s	Home:		Business:	
	Mobile:		Fax:	

Partnership / Groups / Unincorporated entity details

For **partnerships, groups or unincorporated entities** (such as private or family trusts or unincorporated bodies or societies) you must provide details of all authorised partners, trustees or members. Any consent granted will then include these names, and all individuals will be legally responsible for the consent and any associated costs. Should these persons change, then you must notify us.

Name of person: Status (such as partner, member or trustee): Residential address:	
Name of person: Status (such as partner, member or trustee): Residential address:	
Name of person: Status (such as partner, member or trustee): Residential address:	
Name of person: Status (such as partner, member or trustee): Residential address:	

Include details of any further partners/trustees/members on a separate page if necessary.

Application consultant/agent details (if applicable)

Name/company name				
Contact person				
Postal address				
Email address				
Phone number/s	Home:		Business:	
	Mobile:		Fax:	

Who should we send application correspondence to?

☐

Applicant

☐

Consultant/Agent

Have you discussed this application with a West Coast Regional Council staff member:

☐

Yes

☐

No

Name of staff member(s):

--

Consultation

Please list the persons that you believe to have an interest in, or that may be affected by, the proposal.

Affected Party name/s				
Postal address				
Email address				
Phone number/s	Home:		Business:	
	Mobile:		Fax:	
Affected Party name/s				
Postal address				
Email address				
Phone number/s	Home:		Business:	
	Mobile:		Fax:	
Affected Party name/s				
Postal address				
Email address				
Phone number/s	Home:		Business:	
	Mobile:		Fax:	

Have you discussed your proposal with your neighbours and other parties who may be affected, eg, Fish & Game, Department of Conservation, Iwi, New Zealand Transport Agency, user groups and interest groups:

☐ Yes ☐ No

If yes, who was consulted (Attach any correspondence if appropriate):

--

Do they have any concerns:

--

How can these concerns be met:

--

Location

Property address / Location:	
Legal description / Site description:	
Name of closest road/street or nearest settlement/town	
Map reference (NZTM):	

Territorial Authority in which the activity will be located

☐ Buller ☐ Grey ☐ Westland

Note: West Coast Regional Council can help you create a base map to assist with your location plan. Please call us on (03) 768 0466 or 0508 800 118 during office hours for assistance, or call in to our office at 388 Main South Road, Paroa, Greymouth.

If the owner and/or occupier of the activity site differ from the applicant please provide their names and contact details

Owner name/s				
Postal address				
Email address				
Phone number/s	Home:		Business:	
	Mobile:		Fax:	

Occupier name/s				
Postal address				
Email address				
Phone number/s	Home:		Business:	
	Mobile:		Fax:	

Resource consents sought

Provide a brief description of the activity to which your application(s) relates

[illegible]

Tick the type/s of resource consent/s you are seeking from the West Coast Regional Council.

If you are replacing any existing or previous consents, please state the existing or previous consent number(s) in the space below, and complete the Section "Value of Consent Holder Investment".

Remember that for each consent application you must complete the relevant 'activity form'.

☐ Coastal permit For activities that are within the coastal marine area (CMA).	Previous Consent Number/s
☐ Discharge permit For activities outside the CMA that may discharge contaminants into the air, water and onto or into land.	Previous Consent Number/s
☐ Land use For activities and structures outside the CMA that are on land, or in, on or over a river or lake bed.	Previous Consent Number/s
☐ Water For activities outside the CMA that involve the abstraction, impoundment (damming), diversion and/or use of ground, geothermal or surface water.	Previous Consent Number/s

Are related consents required from other authorities?

7

Yes

1

No

If **yes**, please provide details.

Consent required

Consent authority (such as district council, DoC, NZHPT)

Date applied for

Date granted

Should your application/s be granted, do you have a consent term or expiry date you would prefer for your consent/s?

Yes

No

If **yes**, provide details:

1

Months

7

Years

Provide information to demonstrate that the degree of adverse environmental effect of the activity is likely as a result of this application. The following information requirements were introduced by the Resource Management Amendment Act 2013 and took effect on 3 March 2015. These are mandatory requirements for all applications. The sections require varying degrees of familiarity with the RMA and documents produced under the RMA. If you need any further help, please phone a member of the Consents team.

Related permitted activities

List any activities that are part of your proposal and are permitted (allowed without resource consent) under the Regional Air Quality Plan, the Regional Coastal Plan for the West Coast and the Regional Land and Water Plan.

Provide information that shows how each permitted activity will comply with the conditions of the relevant rule.

Other activities

Describe any other activities related to your proposal that you think the West Coast Regional Council may need to be aware of.

Part 2 of the RMA

Part 2 of the RMA is attached at the end of this document.

Provide an assessment of your proposed activity/activities against the matters set out in Part 2.

Other policies, rules and requirements

Assess your proposal against any relevant provisions of:

- national environmental standards
- other regulations
- national policy statements
- the West Coast Regional Policy Statement (RPS)
- Regional Air Quality Plan, the Regional Coastal Plan for the West Coast and the Regional Land and Water Plan

Please complete an assessment of environmental effects in the detail that corresponds with the scale and significance of the effects that the activity may have on the environment (This may be covered by the appropriate activity form(s)).

Advice Note: Please attach a separate sheet(s) if required.

Schedule 4 of the RMA is attached at the end of this document.

Value of Consent Holder investment

Please complete this section only if your application is to renew an existing consent

Important: You must complete this question if your application is intended to replace a currently operative resource consent, and this application will be lodged with the West Coast Regional Council at least 3 months before that consent expires.

1. Provide an assessment of the value of your investment. You need to:
 - specify the value of investment of the activities/infrastructure that are reliant on the resource consent/s you are applying for here. This must be the 'book value' of the investment (not the replacement value).

☐	< \$10,000	☐	\$1 Million to \$5 Million
☐	\$10,000 to \$50,000	☐	\$5 Million to \$50 Million
☐	\$50,000 to \$250,000	☐	>\$50 Million
☐	\$250,000 to \$1,000,000		

- include evidence that supports the assessment.

Application fees

Initial Fee

- You will be charged the West Coast Regional Councils full actual and reasonable costs for processing this application.
- The minimum estimated initial fee is required to be paid when you submit your application. For simple consents that are processed quickly the initial fee is likely to cover your full costs.
- For complex proposals that exceed the initial fee, you will generally receive an invoice monthly. A final invoice will be sent to you after you receive the final decision on your application.

Please refer to the table below for the **minimum estimated initial fee** required for your application (updated 25 August 2023).

Description	Minimum estimated initial fee \$ excluding GST	Minimum estimated initial fee \$ including GST
RESOURCE CONSENTS		
Land use consent and associated consents for dry bed gravel extraction	\$930	\$1,069.50
Land use consent and associated consents for river protection works	\$1,500	\$1,725
Discharge permits for dairy effluent discharges	\$1,500	\$1,725
Land use consent	\$1,500	\$1,725
Land use consent and associated consents for land based alluvial gold mining operations	\$2,240	\$2,576
Coastal permits	\$1,500	\$1,725
All other resource consents	\$1,500	\$1,725
CONSENT ADMINISTRATION		
Application for a change or cancellation of consent conditions	\$750	\$862.50
Application for a Certificate of Compliance or an Existing Use Certificate	\$750	\$862.50
Application to extend the lapsing period for a consent	\$750	\$862.50
Transfer of consents from the consent holder to another (payable by the person requesting the transfer)	\$185	\$212.50
Request for a change to consent holders name (payable by the person requesting the change)	\$185	\$212.50
TRANSFER EXISTING WATER PERMIT BETWEEN SITES WITHIN A CATCHMENT		
Non-notified	\$185	\$212.50

Payment can be made in the following ways:

- at the West Coast Regional Council Office by cash or cheque
- by electronic banking using the details below:

WEST COAST REGIONAL COUNCIL

WESTPAC BANK ACCOUNT NUMBER:

0	3	0	8	4	6	0	1	2	1	5	0	0	0	0	
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	--

Bank Branch Number Account Number Suffix

Payer particulars – **Name of applicant**

Payer reference - **RCAPPLN**

Payer particulars (max 12 characters)

Payer code (max 12 characters)

Payer reference (max 12 characters)

--	--	--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--	--	--

Declaration

"I/the applicant, hereby certify that, to the best of my knowledge and belief, the information given in this application is true and correct. I/the applicant, agree to pay all actual and reasonable costs incurred by the West Coast Regional Council in processing the consent application/s regardless of whether or not the application is granted. I/the applicant, also agree to pay 10% penalty interest on amounts not paid within 30 days of the due date. This also applies to any subsequent compliance monitoring charges relating to the resource consent.

Signature of applicant or applicant's agent

Date

--	--

Print Name (BLOCK CAPITALS)

--

A signature is not required if the application is made by electronic means.

Final checklist

Have you?

Please tick

- ☐ Filled in all parts of this form.
- ☐ Completed and attached all related activity forms.
- ☐ Included a sketch or location map that shows us exactly where your activity will take place.
- ☐ Attached any written approvals obtained from parties potentially affected by your proposal.
- ☐ Supplied a detailed assessment of environmental effects.
- ☐ Paid the required deposit/fee.

Important information – please read carefully

Official information

The information you provide with your application is public information. It is used to help process your resource consent application and assess the impact of your activity on the environment and other people.

Your information is held and administered by the West Coast Regional Council in accordance with the Local Government Official Information and Meetings Act 1987 and the Privacy Act 1993. This means that your information may be disclosed to other people who request it in accordance with the terms of these Acts. It is therefore important you let us know if your application includes trade secrets, commercially sensitive material or any other information you consider should not be disclosed.

Consent holder costs – Ongoing responsibilities

If your application is granted, the Consent Holder has a legal obligation to comply with any conditions of the consent. Consent conditions will be monitored. Monitoring will incur additional fees which will be charged to the Consent Holder. Please contact us if you have any queries regarding your deposit/fee or processing costs or the monitoring charges for your activity.

Consultation

Consultation with other parties who may be interested in or affected by your activity is encouraged. This involves discussing your activity with others who may have some concerns, listening to what others have to say, considering their responses and deciding what will be done.

More information

For more information on the application process or resource consents, visit our website at www.wcrc.govt.nz or phone the Consents team on (03) 768 0466 or 0508 800 118.

Form updated 25 August 2023



THE WEST COAST
REGIONAL COUNCIL

388 Main South Road, Paroa, Greymouth 7805
PO Box 66, Greymouth 7840
Telephone (03) 768 0466
Toll Free 0508 800 118
Facsimile (03) 768 7133
Email info@wcrc.govt.nz
Website www.wcrc.govt.nz

Part 2 of the Resource Management Act 1991

Purpose and principles

5 Purpose

- (1) The purpose of this Act is to promote the sustainable management of natural and physical resources.
- (2) In this Act, *sustainable management* means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—
- (a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
 - (b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and
 - (c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.

6 Matters of national importance

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:

- (a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development;
- (b) the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development;
- (c) the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna;
- (d) the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers;
- (e) the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga;
- (f) the protection of historic heritage from inappropriate subdivision, use, and development;
- (g) the protection of protected customary rights.

7 Other matters

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to—

- (a) kaitiakitanga:
- (aa) the ethic of stewardship;
- (b) the efficient use and development of natural and physical resources:
- (ba) the efficiency of the end use of energy;
- (c) the maintenance and enhancement of amenity values;
- (d) intrinsic values of ecosystems;
- (e) [Repealed]
- (f) maintenance and enhancement of the quality of the environment;
- (g) any finite characteristics of natural and physical resources;
- (h) the protection of the habitat of trout and salmon;
- (i) the effects of climate change;
- (j) the benefits to be derived from the use and development of renewable energy.

8 Treaty of Waitangi

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall take into account the principles of the [Treaty of Waitangi](#) (Te Tiriti o Waitangi).

Schedule 4

Information required in application for resource consent

1 Information must be specified in sufficient detail

Any information required by this schedule, including an assessment under clause 2(1)(f) or (g), must be specified in sufficient detail to satisfy the purpose for which it is required.

2 Information required in all applications

- (1) An application for a resource consent for an activity (the *activity*) must include the following:
 - (a) a description of the activity;
 - (b) a description of the site at which the activity is to occur;
 - (c) the full name and address of each owner or occupier of the site;
 - (d) a description of any other activities that are part of the proposal to which the application relates;
 - (e) a description of any other resource consents required for the proposal to which the application relates;
 - (f) an assessment of the activity against the matters set out in Part 2;
 - (g) an assessment of the activity against any relevant provisions of a document referred to in section 104(1)(b).
- (2) The assessment under subclause (1)(g) must include an assessment of the activity against—
 - (a) any relevant objectives, policies, or rules in a document; and
 - (b) any relevant requirements, conditions, or permissions in any rules in a document; and
 - (c) any other relevant requirements in a document (for example, in a national environmental standard or other regulations).
- (3) An application must also include an assessment of the activity's effects on the environment that—
 - (a) includes the information required by clause 6; and
 - (b) addresses the matters specified in clause 7; and
 - (c) includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

3 Additional information required in some applications

An application must also include any of the following that apply:

- (a) if any permitted activity is part of the proposal to which the application relates, a description of the permitted activity that demonstrates that it complies with the requirements, conditions, and permissions for the permitted activity (so that a resource consent is not required for that activity under section 87A(1));
- (b) if the application is affected by section 124 or 165ZH(1)(c) (which relate to existing resource consents), an assessment of the value of the investment of the existing consent holder (for the purposes of section 104(2A));
- (c) if the activity is to occur in an area within the scope of a planning document prepared by a customary marine title group under section 85 of the Marine and Coastal Area (Takutai Moana) Act 2011, an assessment of the activity against any resource management matters set out in that planning document (for the purposes of section 104(2B)).

4 Additional information required in application for subdivision consent

An application for a subdivision consent must also include information that adequately defines the following:

- (a) the position of all new boundaries;
- (b) the areas of all new allotments, unless the subdivision involves a cross lease, company lease, or unit plan;
- (c) the locations and areas of new reserves to be created, including any esplanade reserves and esplanade strips;
- (d) the locations and areas of any existing esplanade reserves, esplanade strips, and access strips;
- (e) the locations and areas of any part of the bed of a river or lake to be vested in a territorial authority under section 237A;
- (f) the locations and areas of any land within the coastal marine area (which is to become part of the common marine and coastal area under section 237A);
- (g) the locations and areas of land to be set aside as new roads.

5 Additional information required in application for reclamation

An application for a resource consent for reclamation must also include information to show the area to be reclaimed, including the following:

- (a) the location of the area;
- (b) if practicable, the position of all new boundaries;
- (c) any part of the area to be set aside as an esplanade reserve or esplanade strip.

Assessment of environmental effects

6 Information required in assessment of environmental effects

- (1) An assessment of the activity's effects on the environment must include the following information:
 - (a) if it is likely that the activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for undertaking the activity;
 - (b) an assessment of the actual or potential effect on the environment of the activity;
 - (c) if the activity includes the use of hazardous substances and installations, an assessment of any risks to the environment that are likely to arise from such use;
 - (d) if the activity includes the discharge of any contaminant, a description of—
 - (i) the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and
 - (ii) any possible alternative methods of discharge, including discharge into any other receiving environment;
 - (e) a description of the mitigation measures (including safeguards and contingency plans where relevant) to be undertaken to help prevent or reduce the actual or potential effect;
 - (f) identification of the persons affected by the activity, any consultation undertaken, and any response to the views of any person consulted;
 - (g) if the scale and significance of the activity's effects are such that monitoring is required, a description of how and by whom the effects will be monitored if the activity is approved;
 - (h) if the activity will, or is likely to, have adverse effects that are more than minor on the exercise of a protected customary right, a description of possible alternative locations or methods for the exercise of the activity (unless written approval for the activity is given by the protected customary rights group).
- (2) A requirement to include information in the assessment of environmental effects is subject to the provisions of any policy statement or plan.
- (3) To avoid doubt, subclause (1)(f) obliges an applicant to report as to the persons identified as being affected by the proposal, but does not—
 - (a) oblige the applicant to consult any person; or
 - (b) create any ground for expecting that the applicant will consult any person.

7 Matters that must be addressed by assessment of environmental effects

- (1) An assessment of the activity's effects on the environment must address the following matters:
 - (a) any effect on those in the neighbourhood and, where relevant, the wider community, including any social, economic, or 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 value, 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.
- (2) The requirement to address a matter in the assessment of environmental effects is subject to the provisions of any policy statement or plan.

6

Discharge Permit Application To Discharge Contaminants to Land

Please answer all questions fully. You should discuss your application with Council officers before completing this form.

Show the location of the diversion and adjoining properties on your map on Form 1. Include design plans and details with this application.

Part A: General

1. What is the source of the contaminant (eg. sewage treatment, industry, water treatment, rural activity, solid waste etc.)?

From a retention pond

2. Describe the contaminant including, where appropriate, the physical and chemical content.

Please see attached AEE

3. Is the contaminant treated in any way before being discharged?

Yes ☒ No ☐

If Yes, describe treatment. Please see attached AEE

4. What is the location of the discharge? Lot 112 DP 584105

5. For liquid contaminants, what method of discharge will be used (eg. spray irrigation, soakage, etc.)?

6. Describe the soils, topography and vegetation cover of the land onto which the discharge will be made:

Please see attached AEE

7. What is the total area of land on to which the discharge is to be made: hectares

What is the area of land over which the discharge is made each day: hectares

Part A: General (Continued)

8. **Discharge Rate Information** *Please see attached AEE*

Maximum flow rate: litres per second or cubic metres per second

Maximum daily discharge rate: cubic metres

Is the discharge: continuous ☐ or intermittent ☐ ?

What will be the maximum discharging period? hours per day
 days per week
 weeks per year

9. For animal manure, what is the source of the manure? *NA*

Cows ☐ Pigs ☐ Poultry ☐ Other, specify:

How many animals in your herd?

What maximum herd size are you planning?

What is the volume of waste produced daily?

If you have treatment ponds, how many do you have?

What are their dimensions?

..... metres long, metres wide, metres deep

10. For septic tanks, what is the source of waste? *NA*

Multiple dwelling ☐ Motel/Restaurant ☐ Park/Recreation facility ☐

Other, specify:

Is the waste: toilet and hand washing? ☐ toilet, bathroom and kitchen waste? ☐

Other, specify:

What is the estimated number of people using the facility per day?

Please provide details of your design, design calculations, soils, percolation tests and site plan which justify your choice of septic tank size, type and layout.

.....

11. Does the discharge also involve:

Please see attached AEE

Outlet structure? Yes ☐ No ☐

Diversion? Yes ☐ No ☐

Discharge to air? Yes ☐ No ☐

Discharge to water? Yes ☐ No ☐

If you answered Yes to any of 11 above, a separate consent application may be required.

Part B: Assessment of Effects on the Environment

Where your discharge could have a significant adverse effect on the environment a more detailed environmental assessment is required in accordance with the Fourth Schedule of the Resource Management Act 1991.

1. Comment on the possible effect the discharge may have on the drainage capacity, fertility, ground or surface water of or near the site:

Please see attached AEE

2. Within the vicinity of the discharge are there any: Please see attached AEE

Yes No

(1) Water bodies, ground water or ground water bore?

☐ ☐

(2) Water abstractions?

☐ ☐

(3) Obvious signs of biota (eg. fish, eels, insect life, aquatic plants)?

☐ ☐

(4) Areas where food is gathered (eg. watercress, fish, kaimoana, blackberries)?

☐ ☐

(5) Wetlands (eg. swamp areas)?

☐ ☐

(6) Recreational activities carried out (eg. swimming, fishing, canoeing)?

☐ ☐

(7) Areas of particular aesthetic or scientific value (eg. archaeological sites)?

☐ ☐

(8) Areas or aspects of significance to iwi?

☐ ☐

If you have answered yes to any of the above, describe what effects your discharge may have and the steps you propose to take to mitigate these.

.....

.....

.....

.....

.....

(Continue on a separate page if necessary)

3. What alternative methods of disposal or discharge locations have you considered?

Please see attached AEE

4. Why did you choose the proposed method of disposal and location point?

Please see attached AEE



Part B: Assessment of Effects on the Environment (continued)

5. How will the equipment controlling the discharge be operated and maintained to prevent equipment failure, and what measures will be implemented to ensure that the effects of any malfunction are remedied?

Please see attached AEE

6. What, if any, monitoring do you propose to carry out to ensure that the discharge does not have any adverse effect?

Please see attached AEE

B&A Reference:

CH025279

Status:

Final Revision

Date:

19 September 2024

Prepared by:



Kerstin Ghisel

Senior Associate, Barker & Associates Limited

Reviewed by:



Karl Cook

Director, Barker & Associates Limited

Contents

1.0	Applicant and Property Details	5
2.0	Introduction and Background	6
2.1	Introduction	6
2.2	Background	6
3.0	Site Context	7
3.1	Site Description	7
3.2	Onsite Water Management System	9
3.3	Surrounding Locality	10
4.0	Proposal	11
4.1	Proposed Changes to Conditions	13
5.0	Reasons for Consent	13
5.1	Regional Land and Water Plan (RLWP)	13
5.2	Section 127 of the Resource Management Act 1991	14
5.3	Resource Management (National Environmental Standards for Freshwater) Regulations 2020	14
5.4	National Environmental Standard for Sources of Human Drinking Water	14
5.5	Activity Status	15
6.0	Public Notification Assessment (Sections 95A, 95C and 95D)	16
6.1	Assessment of Steps 1 to 4 (Sections 95A)	16
6.2	Section 95D Statutory Matters	17
6.3	Land Excluded from the Assessment	17
6.4	Assessment of Effects on the Wider Environment	18
6.5	Summary of Effects	21
6.6	Public Notification Conclusion	21
7.0	Limited Notification Assessment (Sections 95B, 95E to 95G)	21
7.1	Assessment of Steps 1 to 4 (Sections 95B)	21
7.2	Section 95E Statutory Matters	22
7.3	Assessment of Effects on Persons	22
7.4	Limited Notification Conclusion	23
8.0	Consideration of Applications (Section 104)	24
8.1	Statutory Matters	24
9.0	Alternatives to the Proposed Discharge to Land	24
10.0	Effects on the Environment (Section 104(1)(A))	25
11.0	Regional and District Plan and Statutory Documents (Section 104(1)(B))	26
11.1	National Policy Statement For Freshwater Management 2020	26
11.2	Objectives and Policies of the West Coast Regional Policy Statement (2020)	27
11.3	Objectives and Policies of the Regional Land and Water Plan	30
11.4	Summary	32
12.0	Part 2 Matters	33
13.0	Other Matters (Section 104(1)(C))	33

13.1	Record of Title Interests	33
13.2	Non-Statutory Documents	34
13.3	District Plans	35
14.0	Section 105 Discharge and Coastal Permits	36
15.0	Section 107 Discharge Permit Restrictions	36
16.0	Conclusion	37

Appendices

Appendix 1	Record of Title and Interests
Appendix 2	RC-2021-0097-V3
Appendix 3	Hydrogeological Assessment (Engeo)
Appendix 4	Rules Assessment

1.0 Applicant and Property Details

To:	West Coast Regional Council
Site Address:	Taylorville Road
Applicant Name:	Taylorville Resource Park Limited
Address for Service:	Barker & Associates Ltd Level 3, 61 Cambridge Terrace Christchurch Central City Christchurch 8013 Attention: Kerstin Ghisel
Legal Description:	Lot 1-2 Deposited Plan 584105 contained within Record of Title 1097679 (refer to Record of Title as Appendix 1)
Site Area:	19.342 ha
Site Owner:	Taylorville Resource Park Limited
Regional Plan:	Regional Land and Water Plan (RLWP)
District Plans:	Operative Grey District Plan Proposed Te Tai o Poutini Plan
GDP Zoning:	Rural Environmental Area
Locality Diagram:	Refer to Figure 1
Brief Description of Proposal:	Temporary discharge from retention pond to land, via a soakage area
Summary of Reasons for Consent:	RLWP: Discretionary Activity

2.0 Introduction and Background

2.1 Introduction

This report addresses the relevant matters under the RMA for an application for a resource consent under s88 of the Resource Management Act 1991 (the Act) and a change to conditions of a consent under s127 of the Act for an existing landfill activity at Lot 1-2 DP 584105 at Taylorville.

2.2 Background

The application site, which is known as the 'Taylorville Resource Park', is a demolition and clean fill disposal facility. Consents granted for activities on the site are outlined below.

2.2.1 Regional Consents

The onsite operations were original consented by the WCRC in August 2021, involving the following consents:

- RC-2021-0097-01 Land Use Consent - To undertake earthworks, including land-based gravel extraction to construct, operate and rehabilitate a demolition fill site, Taylorville.
- RC-2021-0097-02 Discharge Permit - To discharge demolition waste to land, Taylorville.

Consent was granted for a 20 year term from August 2021. Subsequent variations to the above consents have allowed asbestos and coal tar contaminated material to also be accepted in two lined cells. Consent conditions also allow for 'other hazardous materials' at the discretion of the West Coast Regional Council (WCRC). The latest variation (RC-2021-0097-V3) is subject to the consent conditions outlined at Appendix 2.

2.2.2 District Consents

Land use resource consent was obtained from the Grey District Council in 2022 (reference LU3084/22) to undertake discharge of demolition waste to land which does not comply with the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESC) 2011.

3.0 Site Context

3.1 Site Description

The application site is located to the west of the township of Taylorville and approximately 3.5km east of Greymouth. The application site is legally described as Lot 1-2 DP 584105 and is contained within one Record of Title (1097679) and the overall area is over 19ha. The application site is positioned on the northern side of Taylorville Road (Figure 1). The Grey River is located to the south of the application site and is the source of water for the GDC water treatment plant on the opposite side of Taylorville Rd.

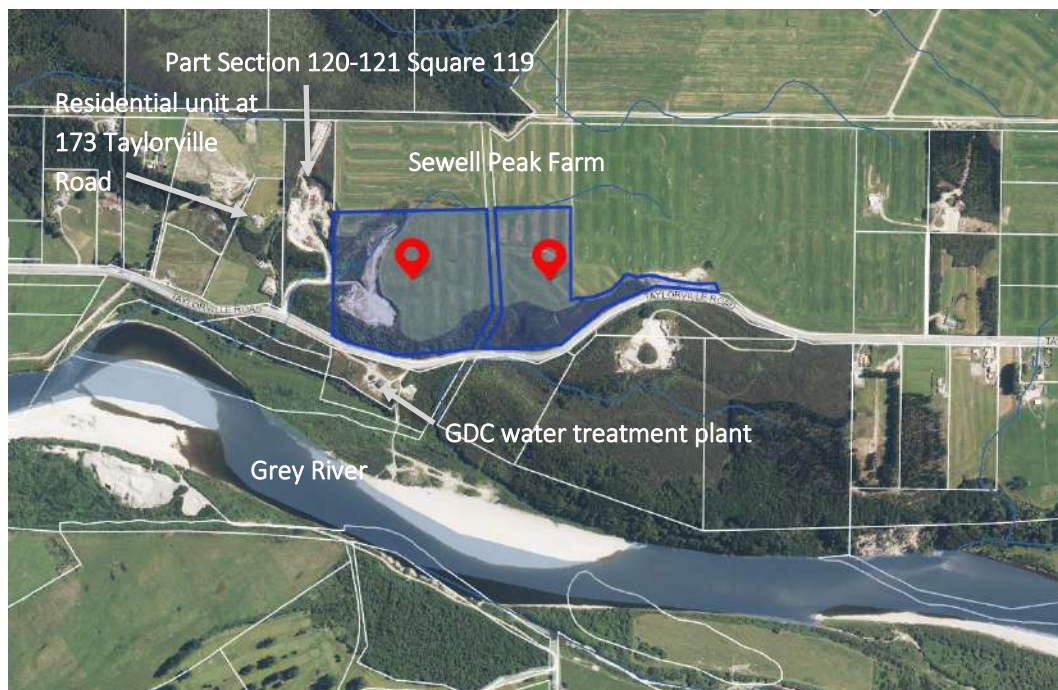


Figure 1: Application site outlined in blue (Source: EMaps)

The application site is located in a flat to gently undulating area between Mount Buckley and Cobden Hill, on the northern side of the Grey River. The local topography dips gently to the southwest with an average grade of approximately 1.6% (1:64). The application site is located between the floodplain of the Grey River and the channel of Noname Creek, which forms a downstream tributary of the Grey River and flows through the eastern portion of the application site (Figure 2).

Noname Creek flows in a southwest direction approximately 15m from the north-northeast boundary of the site. The creek also receives water from the fill operation located on the adjacent landholding to the west of the application site. Noname Creek runs through a culvert under Taylorville Road and discharges into an unnamed tributary/wetland on the south side of the road, before joining with the Grey River approximately 350m westward (downstream) of the confluence with the wetland. Downstream of the site, the Grey River meanders westward in a wide channel for approximately 7km before discharging onto the Tasman Sea.

The western portion of the application site (approximately 12.5ha) has been developed with three waste cells (Cells A–C), with one cell (Cell D) identified for a future development (Figure 2). Cell B is closed and capped; Cells A and C are active.



Figure 2: Layout of application site

As noted above, regional consent reference RC-2021-0097-V3, allows for the disposal to land of demolition waste (including cleanfill), asbestos, coal tar and coal pitch, shredded tyres, and other hazardous materials approved by the Consent Authority (Figure 3).

Cell	Aerial Extent	Approximate Depth	Approximate Volume	Received Materials	Cell Construction
Cell A	5,000 m ²	~10–15 m (to mudstone)	~40,000–60,000 m ³	Demolition waste (including cleanfill), whole or shredded tyres	Unlined cell.
Cell C	6,400 m ²	10 m	37,000 m ³	Demolition waste (including cleanfill), whole or shredded tyres, asbestos, coal tar and coal pitch, other approved hazardous materials	Cell is lined with geomembrane underlain with geofabric.

Figure 3: Cell descriptions and received material types (Source Engeo Hydrogeological Assessment)

The site operations also include two large water treatment / retention devices with a combined capacity of approximately 15,000m³ for treated leachate and stormwater captured by the onsite operations (Figure 4).



Figure 4: Retention pond

3.2 Onsite Water Management System

Stormwater Management

Stormwater management at the application site is currently primarily focused on the diversion of clean water from the waste cells and mitigation measures to prevent sediment loading in stormwater. Stormwater that falls on the operational areas (e.g., roadways) is directed via roadside swales towards undisturbed areas of the application site for infiltration through the permeable gravels. Stormwater that falls on or immediately adjacent to Cell A, Cell C, the retention pond, and settlement pond is directed into the cell / pond to prevent erosion and scouring of the cell / pond bunding. Stormwater that falls onto Cell B (closed and capped with 1,500mm of gravel and low-permeability, compacted silts, proposed upgrades include the installation of an impermeable membrane cap) runs off the cell surface due to the contouring of the cap.

Leachate Management

Leachate from Cell A is captured via a sump installed west of the cell. The sump was installed into an excavation that extended below the base of Cell A, into the underlying mudstone, to provide a preferential flowpath for Cell A leachate. As Cell A is unlined, the sump could potentially be receiving groundwater that intersects with the base of Cell A. Water from the sump is then pumped via a submersible pump on a float switch into the first stage of the lined settlement pond. The daily flow from Cell A is estimated to be on the order of 100 – 150m³/day.

Leachate from the lined Cell B and Cell C is collected via sumps and risers installed in the cells and pumped (using a submersible pump on a float switch in the sumps) west through a GM700 hydrogen sulphide scrubbing system. As Cell B has been capped, no leachate has been observed flowing from this cell for the past 18 months; however, it is possible that negligible amounts may be generated. From the scrubbing system, the leachate is piped to a pumping station near the western site boundary and into the first stage of the lined settlement pond. The daily flow from Cells B and C are estimated to be on the order of 15 – 20m³/day.

The first stage of the settlement pond has a capacity of approximately 2,700m³, allowing for an approximate residence time of 135-180 days. Following settlement in Stage 1, the water decants

over a baffle into stage two, which has a capacity of approximately 1,300m³. Stage 2 is equipped with a float switch that, when triggered, pumps the water to a flocculation system that includes two tubes of poly-aluminium chloride and three sealed and baffled containers for additional removal of sediment and insoluble metals. The treated water decants to the retention pond for storage.

Water from the retention pond is piped through a siphon system to draw water through an additional treatment stage comprising two pumice pods and an additional baffled container that feeds into the DC/C3 sump. The DC/C3 sump has a cutoff valve, which is currently preventing off-site discharges of water from the retention pond. In the interim, water from the retention pond and D3/C3 are being directed back to the settlement pond for on-site recirculation.

3.3 Surrounding Locality

The immediate adjoining neighbour to the north and east is a dairy farm (Sewell Peak Farm). The immediately adjoining neighbour to the west (legally described as being Part Section 120-121 Square 119) has a regional discharge permit (RC-2019-0024-01) for the discharge of demolition waste and cleanfill to land.

The closest residential unit to the application site is located to the west at 173 Taylorville Road, which is approximately 170m east of the application site's western boundary.

The Grey District Council's water treatment plant is located opposite the application site, on the southern side of Taylorville Road (Lot 1 Deposited Plan 343801) (Figure 5). This networked public drinking water supply (GRE001) is located approximately 430m south of the application site. The supply provides drinking water to approximately 10,000 people in the area. The source of the water supply (RC01092.3) is a subsurface infiltration system that takes water from the Grey River for treatment and distribution from bores located 320m - 420m to the south-southeast from the application site.



Figure 5: Grey District Council's water treatment plant

Noname Creek flows in a southwest direction approximately 15m from the north-northeast boundary of the site. The creek also receives water from the property to the west that includes a filling operation located 100m west of the site. The creek is located approximately 60m from the

fill operation. The creek runs through a culvert under Taylorville Road and discharges into an unnamed tributary / wetland on the south side of the road before joining with the Grey River approximately 350m westward (downstream) of the confluence with the wetland.

Grey District Council's waste management centre, 'McLean's Pit Landfill and Recycling Centre' is located approximately 900m (as the crow flies) to the north of the application site, at 142 McLeans Pit Road.

4.0 Proposal

This report relates to an application for resource consent under s88 of the Act for a temporary discharge (for a period of six months) from the existing onsite retention pond to land, via a proposed soakage area. This report also addresses a s127 application to vary condition 11 of RC-2021-0097-03.

As noted earlier, the site operations include two large water treatment / retention devices with a combined capacity of approximately 15,000m³ for treated leachate and stormwater captured by the onsite operations. The devices are currently at capacity and with heavy rainfall predicted for the coming months, the applicant is seeking temporary consent to discharge water to land, to help in creating a freeboard within the retention pond. This will assist in avoiding any uncontrolled discharges. The proposed discharges are likely to contain contaminants exceeding the permitted activity standards outlined in Rule 67(a) of the 'Regional Land and Water Plan'.

Attached at Appendix 3 is a Hydrogeological Assessment which has been prepared by Engeo. The purpose of that report, is to provide a summary of hydrogeological investigation works undertaken to date and assess potential effects on the environment from a short-term discharge of treated waters to land.

On-site soakage area

The proposed works include the development of an on-site soakage area and the discharge to land of water from the retention pond. Engeo have modelled for a 10m x 10m soakage area, with a maximum depth of 2m, to accommodate a rainfall event of 50mm (approximately equivalent to the 1-hour peak of a 2% AEP storm event for this location). Water would be pumped from the retention pond at a flow that is no greater than the infiltration capacity of the basin. They have modelled for a maximum discharge of 800m³ of water per day (~9 L/s).

To avoid scour, the soakage area will be lined with a geofabric, suitably-sized pipework will be used to reduce the flow velocity to less than 1.3m/s (MBIE, 2020), and, if necessary, the outlet will be manifolded to discharge at more than one point in the area.

Monitoring

The pumping equipment, pipework, and discharge area will be monitored at least three times daily (morning, mid-day, afternoon during the discharge period) to monitor the water level in the retention pond and ensure that there are no leaks in the system or scour/overtopping in the discharge area. Discharges will preferably be taken during dry weather with little to no surface precipitation, to create freeboard in the retention pond; however, discharging may be required during wet weather as a contingency measure.

The applicant will also undertake a monitoring programme for groundwater and surface water at the application site. Monitoring will be undertaken on a monthly basis during discharges to the soakage area and quarterly thereafter, with a review after one year of monitoring. As a component of this programme, the applicant is in the process of installing six additional monitoring bores at locations upgradient and around the site to further assess and monitor groundwater quality. The proposed bores will be established in the following locations (Figure 6):

- Approximately 20m downgradient of the discharge area;
- Southwest of Cell A;
- Between the discharge area and Noname Creek; and
- Intermediate between the discharge area and boundary wells.



Figure 6: Groundwater flow path and proposed monitoring bore locations (Source: Engeo Report)

Based on the current availability of drilling subcontractors, we anticipate that the new monitoring bores will be installed in September/October 2024, prior to the arrival of the plume. Once the new monitoring bores have equilibrated, the applicant will also be undertaking aquifer testing, to establish a site-specific hydraulic conductivity.

Adaptative Discharge

Based on the inferred seepage velocity of the plume (0.5 m/d) changes in water quality will likely be detectable at the bore nearest the discharge area approximately one month after the commencement of discharges. Consequently, it is proposed that an initial two-week discharge duration is followed by the collection and analysis of groundwater samples from the nearest bore at intervals of four weeks, five weeks, and six weeks (following commencement). After receipt of

the results from the post-commencement monitoring, Engeo will ensure the RISC5 model will be calibrated to identify if the effects of the discharges are likely to differ from those detailed within their report and/or if modifications to the proposed discharges (e.g., flow rate) are needed.

4.1 Proposed Changes to Conditions

Due to the proposed temporary discharge from the existing onsite retention pond to land, via a soakage area, the applicant requires changes to consent condition 11 of RC-2021-0097-03, which currently reads:

- The Consent Holder shall ensure that there is no contamination of groundwater or surface water outside of the site (Secs 1-3 5-6 Pt Secs 4 & 8 SO 11520 Sec 1 SO 3935 Sec 1 SO 3934 Lots 1 3 DP 2432 Lots 1-5 DP 3265) as a result of the exercise of this consent.

It is proposed to reword it as follows:

- The Consent Holder shall ensure that there is no contamination of groundwater or surface water outside of the site (~~Secs 1-3 5-6 Pt Secs 4 & 8 SO 11520 Sec 1 SO 3935 Sec 1 SO 3934 Lots 1 3 DP 2432 Lots 1-5 DP 3265~~ Lot 1-2 DP584105) as a result of the exercise of this consent, unless a separate discharge permit has been obtained from the West Coast Regional Council.

5.0 Reasons for Consent

A rules assessment against the provisions of the Regional Land and Water Plan ('RLWP') is attached at Appendix 4. The proposal relates to a temporary discharge from the existing onsite retention pond to land, via a soakage area, which daylights via Noname Creek and a roadside drain, and may ultimately discharge to the Grey River.

Consent is required for the matters outlined below.

5.1 Regional Land and Water Plan (RLWP)

18.1 Activities on Land

- The proposed earthworks associated with the construction of the soakage area is classified as a **Permitted Activity** under Rule 3 of 18.1.1 'Permitted Activities on Land'.

18.4 Discharges to Water

- Rule 71 'Discharge of any contaminant, or water to water, not complying with Rules 63 to 70' outlines that unless permitted by Rules 63, 64, 65, 66, 67, 68, 69 or 70 the discharge of any contaminant or water to water is a discretionary activity. The proposal activity is not captured under any of these rules and is therefore a **Discretionary Activity** under Rule 71.

18.5 Discharges to Land

- Rule 91 'Discharges to land discretionary activity Rule' outlines that any discharge of contaminants into or onto land is a discretionary activity, unless it is permitted by Rules 72 to 86, or controlled by Rules 87 to 90. The proposal activity is not captured under any of these rules and is therefore a **Discretionary Activity** under Rule 91.

5.2 Section 127 of the Resource Management Act 1991

The proposal involves changes to the conditions of regional resource consent RC-2021-0097-03.

Section 127 of the Act allows for the change or cancellation of a condition or conditions of resource consent (other than a condition as to the duration of the consent).

Sections 88 to 121 of the Act apply to the consideration of the application, with all necessary modifications, as if:

- a) the application was for resource consent for a discretionary activity; and
- b) the references to the resource consent and the activity were references only to the change or cancellation of a condition and the effects of the change or cancellation respectively.
- c) For the purposes of determining who is adversely affected by the change or cancellation of condition, a local authority must consider, in particular, every person who:
- d) made a submission on the original application; and
- e) may be affected by the change or cancellation of condition.

The main point to consider when assessing whether an application should be processed as a section 127 change of conditions or a new application, is whether the proposed change in conditions will result in a “fundamentally different activity” or “an activity having materially different adverse effects” to those that lawfully exist or that were assessed under the original application.

In this instance, the proposed changes to conditions are required to facilitate the temporary discharge to land associated with an approved landfill activity on the site. It is considered suitable for condition 11 to be amended as consent is also being sought in parallel for the discharge to land.

Pursuant to section 127 of the Act, resource consent is required for a **discretionary** activity.

5.3 Resource Management (National Environmental Standards for Freshwater) Regulations 2020

Resource consent is not required under the provisions of the National Environmental Standard Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (‘NESFW’), as the proposed soakage area will be located over 100m from Noname Creek.

5.4 National Environmental Standard for Sources of Human Drinking Water

The National Environmental Standard for Source of Human Drinking Water (NES-SDW) sets the requirements for protecting sources of human drinking water from becoming contaminated. The NES-SDW requires regional councils to ensure that effects of activities on drinking water sources are considered in decisions on resource consents and regional plans.

Under the NES-SDW regional councils are required to:

- Decline discharge or water permits that are likely to result in community drinking water becoming unsafe for human consumption following existing treatment; and
- Place conditions on relevant resource consents that require notification of drinking water suppliers if significant unintended events occur that may adversely affect sources of drinking water.

The proposed discharges will not be occurring within, or in close proximity to the protection zone for any water supply well as there are no consented groundwater takes mapped on the West Coast GIS website¹ within 1km downgradient of the site. The closest downgradient bore to the application site is located at 2 Sids Road, Coal Creek, which is approximately 1.3km to the west of the application site's western property boundary (Figure 7).



Figure 7: Down gradient bores (Source: West Coast Maps)

It is noted under the RLWP that the take and use of surface water from the Grey River, downstream of the Clarke River confluence, is a permitted activity at Rule 39 at 18.3.1 'Permitted Activities', however, condition (d) outlines that the Council needs to be informed in writing of the location, expected rate and frequency of the take prior to the take occurring and contact details of the person taking. In addition to this, the take and use of groundwater is a permitted activity at Rule 44 at 18.3.1 'Permitted Activities' but again condition (g) outlines that the Council needs to be informed in writing of the location, expected rate and frequency of the take prior to the take occurring and contact details of the person taking. The taking and use of surface water and/or groundwater for a community water supply is a controlled activity at Rules 52 and 53 at 18.3.2 'Controlled Takes, Uses, Diversions and Damming of Water'. Consequently, the WCRC would be aware of all water takes from both surface water and groundwater through the requirement to comply with the conditions associated with outlining the Council to location, expected rate and frequency of any take prior to it occurring.

5.5 Activity Status

Overall, this application is for a **discretionary activity**.

¹ <https://gis.westcoast.govt.nz/WestMaps/>

6.0 Public Notification Assessment (Sections 95A, 95C and 95D)

6.1 Assessment of Steps 1 to 4 (Sections 95A)

Section 95A specifies the steps the council is to follow to determine whether an application is to be publicly notified. These are addressed in statutory order below.

6.1.1 Step 1: Mandatory public notification is required in certain circumstances

Step 1 requires public notification where this is requested by the applicant; or the application is made jointly with an application to exchange of recreation reserved land under section 15AA of the Reserves Act 1977.

The above does not apply to the proposal.

6.1.2 Step 2: If not required by step 1, public notification precluded in certain circumstances

Step 2 describes that public notification is precluded where all applicable rules and national environmental standards preclude public notification; or where the application is for a controlled activity; or a restricted discretionary, discretionary or non-complying boundary activity.

In this case, the applicable rules do not preclude public notification, and the proposal is not a controlled activity or boundary activity. Therefore, public notification is not precluded.

6.1.3 Step 3: If not required by step 2, public notification required in certain circumstances

Step 3 describes that where public notification is not precluded by step 2, it is required if the applicable rules or national environmental standards require public notification, or if the activity is likely to have adverse effects on the environment that are more than minor.

As noted under step 2 above, public notification is not precluded, and an assessment in accordance with section 95A is required, which is set out in the sections below. As described below, it is considered that any adverse effects will be no more than minor.

6.1.4 Step 4: Public notification in special circumstances

If an application is not required to be publicly notified as a result of any of the previous steps, then the council is required to determine whether special circumstances exist that warrant it being publicly notified.

Special circumstances are those that are:

- Exceptional or unusual, but something less than extraordinary; or
- Outside of the common run of applications of this nature; or
- Circumstances which make notification desirable, notwithstanding the conclusion that the adverse effects will be no more than minor.

It is considered that there is nothing noteworthy about the proposal as it relates to the discharge of water to land, which is provided for under the RLWP subject to conditions. It is therefore considered that the application cannot be described as being out of the ordinary or giving rise to special circumstances.

6.2 Section 95D Statutory Matters

In determining whether to publicly notify an application, section 95D specifies a council must decide whether an activity will have, or is likely to have, adverse effects on the environment that are more than minor.

In determining whether adverse effects are more than minor:

- Adverse effects on persons who own or occupy the land within which the activity will occur, or any land adjacent to that land, must be disregarded.

The land to be excluded from the assessment is listed in section 6.3 below.

- Adverse effects permitted by a rule in a plan or national environmental standard (the 'permitted baseline') may be disregarded.

In this case the regional plan permits the discharge of water to water if it can comply with all the conditions associated with Rule 67. This proposal cannot comply with condition (a) as the discharge is likely to contain contaminants exceeding this standard.

- Trade competition must be disregarded.

This is not considered to be a relevant matter in this case.

- The adverse effects on those persons who have provided their written approval must be disregarded.

No persons have provided their written approval for this proposal.

The sections below set out an assessment in accordance with section 95D, including identification of adjacent properties, and an assessment of adverse effects.

6.3 Land Excluded from the Assessment

In terms of the tests for public notification (but not for the purposes of limited notification or service of notice), the adjacent properties to be excluded from the assessment are shown in Figure 8, and include:

- North and West – Lot 3-4 Deposited Plan 584105
- East – Part Section 120-121 Square 119
- South – Section 2-3 Survey Office Plan 338671, Lot 1 Deposited Plan 343801, Lot 4 Deposited Plan 2432

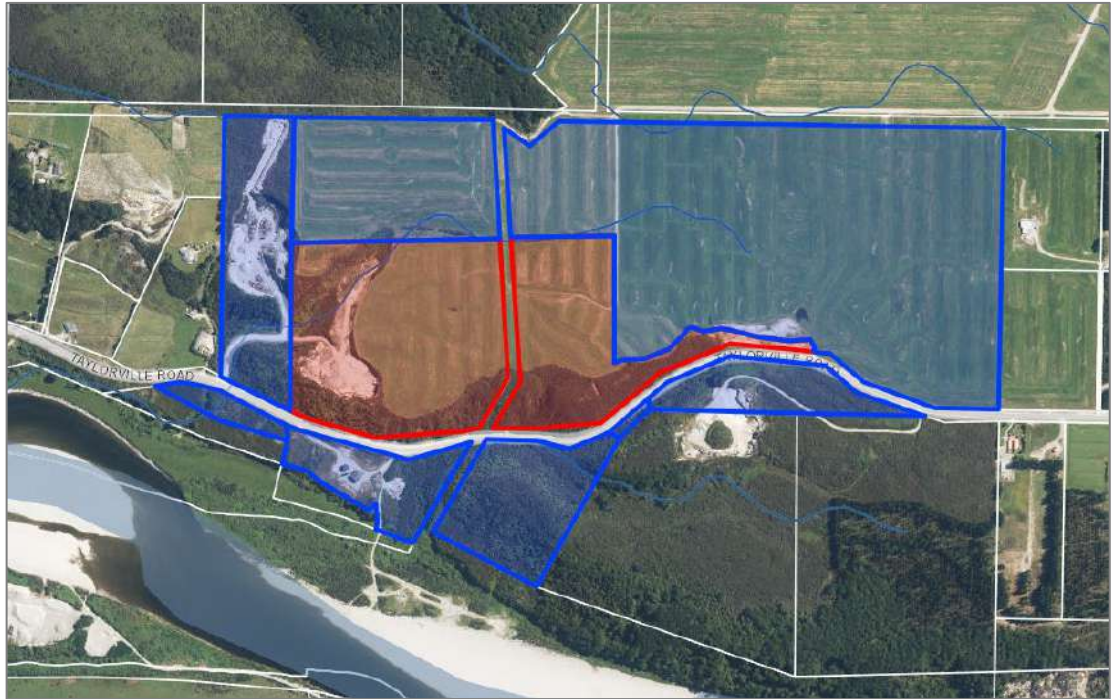


Figure 8: Adjacent properties (coloured in blue) in relation to application site (coloured in red) (Source: Emaps)

6.4 Assessment of Effects on the Wider Environment

The following sections set out an assessment of wider effects of the proposal, and it is considered that effects in relation to the following matters are relevant:

- Effects on groundwater quantity;
- Effects on groundwater quality;
- Effects on surface water quality and aquatic ecosystems;
- Effects on the quality and safety of human and animal drinking water; and
- Effects on Tangata Whenua Values.

These matters are set out and discussed below.

6.4.1 Effects on groundwater quantity

Engeo have advised that the proposed discharge from the retention pond to land will contribute approximately 800m³ of treated water to the unconfined aquifer. Based on the results of their Hantush model, this will result in a maximum mounding of 0.55m directly below the discharge area, with a perturbation of the water table elevation extending approximately 250m from the source; however, the effect is minor (<0.01 m) beyond approximately 75m. It is possible that the change in hydraulic head below the discharge area may result in an increase of the groundwater flowrate; however, this effect will likely not persist beyond the mounding area or have an effect that it outside the range of natural variability.

The absolute potential radius for any effect on groundwater quantity is limited due to seepage outflow where the contact between the unconfined Gravel 1 aquifer and underlying Kaiata Formation is exposed. Following the derived groundwater flow gradient as illustrated within Figure

4 of the Engeo report, the maximum potential flowpath in the unconfined aquifer before daylighting is approximately 420m.

Consequently, any potential adverse effects relating to groundwater quantity is considered to be less than minor.

6.4.2 Effects on groundwater quality

Engeo outline within their report that the application site is located at the westernmost extent of the Pleistocene glacial outwash deposits (e.g. Gravel 1). The contact between Gravel 1 and the mudstone (Kaiata Formation) is located on the exposed slope, approximately 10m above the surrounding ground level. Groundwater that daylights will be captured in the drain that runs around the site's western property boundary and along Taylorville Road. Any water that does infiltrate to ground will be confined by the alignment of Noname Creek. Consequently, Engeo confirm that there is no hydraulic connection between the application site and off-site Holocene aquifer and the effect of the proposed discharges to off-site groundwater quality is likely to be less than minor.

6.4.3 Effects on Surface Water Quality and Aquatic Ecosystems

The only surface water near this application site is Noname Creek which is located over 100m away from the proposed soakage area within the site. Engeo calculated the load of contaminants in the proposed discharges and the dilution factor in Noname Creek and the Grey River (i.e., assuming an undiluted discharge into the receiving waterbody). Contaminant loading was calculated based on the maximum concentrations detected in samples collected from the water treatment system and the maximum discharge rate (800m³ of water per day). Furthermore, to be conservative, Engeo used the low flow of 0.02m³/s and 80m³/s for Noname Creek and the Grey River, respectively.

Based on the loading calculations, a direct discharge to Noname Creek would potentially result in an exceedance of one or more of the assessment criteria. However, the creek is located at least 100m away from the proposed discharge area and 310m away along the inferred direction of groundwater flow. Any contaminants in the discharges will be diluted significantly in groundwater prior to entering Noname Creek and it is highly unlikely that the diluted concentrations will exceed the range of natural variability or analytical error.

Direct discharge to the Grey River would result in concentrations of contaminants that are orders of magnitude below any of the assessment criteria. We further note that, based on local topography (e.g., ridge on south side of Taylorville Road) and infrastructure (Taylorville Road), discharging in the Grey River above the GRE001 abstraction would be a practical impossibility.

Based on the calculated load of contaminants and resulting concentrations in the receiving waterbodies, the effect of the proposed discharges to surface water quality is highly likely to be less than minor.

As noted earlier in Section 6.4.2, Engeo have confirmed that discharging into the Grey River above the GRE001 abstraction would be a practical impossibility. Consequently, the proposal is unlikely to have any potential adverse effects on surface water quality and aquatic ecosystems.

6.4.4 Effects on the quality and safety of human and animal drinking water

The proposed stormwater discharges will not occur in close proximity to any bore used for drinking water. Engeo assessed the potential effects on households who receive potable water from the networked public drinking water supply (GRE001) and calculated the load of contaminants in the proposed discharges and the dilution factor in the Grey River (i.e., assuming the proposed discharges go directly to the river). Engeo note that GRE001 is oblique to the water flow direction with no apparent hydraulic connectivity. Furthermore, the contaminant loading was calculated based on the maximum concentrations detected in samples collected from the water treatment system and the maximum discharge rate, and to be conservative (Engeo used the anticipated low flow of 800m³/s).

Direct discharge to the Grey River would result in concentrations of contaminants that are orders of magnitude below any of the assessment criteria. Engeo conclude, based on local topography (e.g. ridge on south side of Taylorville Road) and infrastructure (Taylorville Road), discharging into the Grey River above the GRE001 abstraction would be a practical impossibility. Based on modelled maximum concentrations to the nearest receptor, the effect of the proposed discharges to receptors (human or ecological) are highly likely less than minor.

In summary, any potential adverse effects in regards to the quality and safety of human and animal drinking water is considered to be less than minor.

6.4.5 Effects on Tangata Whenua Values

The application site is not listed as a site of significance to Ngāi Tahu, nor is it located within a Statutory Acknowledgement Area, a silent file, or within an archaeological site. Furthermore, there are no Heritage New Zealand sites or New Zealand Archaeological Association sites registered on the property. Consequently, there are no specifically identified cultural values associated with this site. However, below the site there is groundwater aquifers that may have cultural value to Ngāi Tahu.

The following is noted in regards to avoiding any potential adverse effects on Tangata Whenua values:

- All works will be subject to the ESCP, which will assist in preventing contaminant and sediment discharge from the application site;
- The Engeo report concludes that based on modelled maximum concentrations to the nearest receptor, the effect of the proposed discharge to receptors (human or ecological) are highly likely to be less than minor; and
- The discharge will be for a short term, involves a comprehensive monitoring programme and an adaptive approach will be taken.

Taking the above into account, it is considered that the proposal will not cause any significant effects on natural resources including water (waterways, waipuna (springs), groundwater, wetlands); mahinga kai; indigenous flora and fauna; cultural landscapes and land and they will therefore be adequately protected.

6.5 Summary of Effects

Overall, it is considered that any adverse effects on the environment relating to this proposal will be less than minor.

6.6 Public Notification Conclusion

Having undertaken the section 95A public notification tests, the following conclusions are reached:

- Under step 1, public notification is not mandatory;
- Under step 2, public notification is not precluded;
- Under step 3, public notification is not required as it is considered that the activity will result in less than minor adverse effects; and
- Under step 4, there are no special circumstances.

Therefore, based on the conclusions reached under steps 3 and 4, it is recommended that this application be processed without public notification.

7.0 Limited Notification Assessment (Sections 95B, 95E to 95G)

7.1 Assessment of Steps 1 to 4 (Sections 95B)

If the application is not publicly notified under section 95A, the council must follow the steps set out in section 95B to determine whether to limited notify the application. These steps are addressed in the statutory order below.

7.1.1 Step 1: Certain affected protected customary rights groups must be notified

Step 1 requires limited notification where there are any affected protected customary rights groups or customary marine title groups; or affected persons under a statutory acknowledgement affecting the land.

The above does not apply to this proposal.

7.1.2 Step 2: If not required by step 1, limited notification precluded in certain circumstances

Step 2 describes that limited notification is precluded where all applicable rules and national environmental standards preclude limited notification; or the application is for a controlled activity (other than the subdivision of land).

In this case, the applicable rules do not preclude limited notification and the proposal is not a controlled activity. Therefore, limited notification is not precluded.

7.1.3 Step 3: If not precluded by step 2, certain other affected persons must be notified

Step 3 requires that, where limited notification is not precluded under step 2 above, a determination must be made as to whether any of the following persons are affected persons:

- In the case of a boundary activity, an owner of an allotment with an infringed boundary;
- In the case of any other activity, a person affected in accordance with s95E.

The application is not for a boundary activity, and therefore an assessment in accordance with section 95E is required and is set out below.

Overall, it is considered that any adverse effects on persons will be less than minor, and accordingly, that no persons are adversely affected.

7.1.4 Step 4: Further notification in special circumstances

In addition to the findings of the previous steps, the council is also required to determine whether special circumstances exist in relation to the application that warrant notification of the application to any other persons not already determined as eligible for limited notification.

In this instance, having regard to the assessment in section 6.1.4 above, it is considered that special circumstances do not apply.

7.2 Section 95E Statutory Matters

If the application is not publicly notified, a council must decide if there are any affected persons and give limited notification to those persons. A person is affected if the effects of the activity on that person are minor or more than minor (but not less than minor).

In deciding who is an affected person under section 95E:

- Adverse effects permitted by a rule in a plan or national environmental standard (the 'permitted baseline') may be disregarded;
- Only those effects that relate to a matter of control or discretion can be considered (in the case of controlled or restricted discretionary activities); and
- The adverse effects on those persons who have provided their written approval must be disregarded.

These matters were addressed in section 6.2 above, and no written approvals have been sought.

Having regard to the above provisions, an assessment is provided below.

7.3 Assessment of Effects on Persons

Adverse effects in relation to the proposed discharges on persons are considered below. Wider effects were considered in section 0 above, and considered to be less than minor.

7.3.1 Adjacent Properties

Any adverse effects on persons at adjacent properties are considered to be less than minor for the following reasons:

- The proposal will not result in any potential adverse flooding effects. Engeo note that while it is possible that the change in hydraulic head below the discharge area may result in an increase of the groundwater flowrate, this effect will likely not persist beyond the mounding area or have an effect that it outside the range of natural variability.

- Engeo confirm there is no hydraulic connection between the application site and the off-site Holocene aquifer and any potential adverse effects of the proposed discharges to off-site groundwater quality is likely to be less than minor.
- Any discharge water that may intersects the catchment of Noname Creek will undergo significant dilution and the resulting concentrations of contaminants will have less than minor effects.
- The proposed discharge will be short-term nature and, due to the proposed monitoring programme of both groundwater and surface water as outlined within the Engeo report, any potential adverse effects on surface water quality and aquatic ecosystems is considered to be less than minor.
- The proposed soakpit area will be located over 100m from Noname Creek, which is the closest surface waterbody to the application site. Any discharge water that intercepts the catchment of Noname Creek will undergo significant dilution and the resulting concentrations of contaminants will have less than minor effects. Furthermore, the proposed discharge will be short-term in nature and due to the proposed monitoring programme of both groundwater and surface water as outlined within the Engeo report, any potential adverse effects on surface water quality and aquatic ecosystems is considered to be less than minor.
- Engeo have confirmed that discharging into the Grey River above the GRE001 abstraction would be a practical impossibility.

7.3.2 Summary of Effects

Taking the above into account, it is considered that any adverse effects on persons at the aforementioned properties will be less than minor in relation and therefore it is considered, that there are no adversely affected persons in relation to this proposal.

7.4 Limited Notification Conclusion

Having undertaken the section 95B limited notification tests, the following conclusions are reached:

- Under step 1, limited notification is not mandatory;
- Under step 2, limited notification is not precluded;
- Under step 3, limited notification is not required as it is considered that the activity will not result in any adversely affected persons; and
- Under step 4, there are no special circumstances.

Therefore, it is recommended that this application be processed without limited notification.

8.0 Consideration of Applications (Section 104)

8.1 Statutory Matters

Subject to Part 2 of the Act, when considering an application for resource consent and any submissions received, a council must, in accordance with section 104(1) of the Act have regard to:

- Any actual and potential effects on the environment of allowing the activity;
- Any relevant provisions of a national environmental standard, other regulations, national policy statement, a New Zealand coastal policy statement, a regional policy statement or proposed regional policy statement; a plan or proposed plan; and
- Any other matter a council considers relevant and reasonably necessary to determine the application.

As a discretionary activity, section 104B of the Act states that a council:

- (a) may grant or refuse the application; and
- (b) if it grants the application, may impose conditions under section 108.

9.0 Alternatives to the Proposed Discharge to Land

The applicant has considered alternatives for the discharge required from the retention pond and below is an assessment of alternatives for completeness.

Reticulated Network

The application site is not connected to the reticulated stormwater/wastewater network and consequently, there are no opportunities for the proposed discharge to go directly into the reticulated network.

Trucking to GDC WWTP

Another alternative which was considered was removing a portion of the water within the retention pond and trucking and discharging it to the Grey District Council's Wastewater Treatment Plant (WWTP). The two key issues with this option are feasibility of transporting the water to the WWTP and capacity at the WWTP.

The TRP water treatment systems collect rainwater that falls on the active waste cells, settlement pond, and retention pond, and area comprising of approximately 16,500m². During a 50mm/day storm event, this amounts to 825m³ of water that has to be added to the capacity of the settlement and retention ponds. Based on the volume of a standard sucker truck (e.g. 3–5m³), this amounts to 164-274 truck movements for each event. Furthermore, two companies have been identified within Greymouth that own sucker trucks; each company with one truck in its fleet. As such, the local availability of sucker trucks would limit the operations to approximately 15 – 20 truck movements per day, which would not be adequate for anything greater than a 5mm/day rainfall event. Additionally, the introduction of large volumes of fresh water would have a significantly disruptive effect on operations at the WWTP. According to the GDC Group Manager Operations (Aaron Haymes) at the Greymouth WWTP, who has confirmed that they cannot accept the

application site's discharges. As such, removal via sucker truck to the WWTP is not considered feasible.

In addition to the above, it is noted that the rules within the Operative Grey District Plan for non-rural activities within the Rural Environmental Area are limited to a permitted maximum number of 20 heavy vehicle trips per day. The applicant's approved land use resource consent from the Grey District Council did not seek resource consent to breach this permitted activity rule.

Discharge to Surface Water Bodies

Other alternatives which were considered included discharging the water directly to a nearby surface water feature. Due to the very low flow in the roadside drain ($0.001 - 0.002\text{m}^3/\text{s}$), this is not considered a suitable receiving environment. This is because the flows from the discharge would exceed the capacity of this drain and the receiving waters would not be able to dilute contaminant concentrations so it would have a greater effect on the water quality within the drain.

Another alternative considered is discharging into Noname Creek. To assess the potential effects on water quality in the creek, Engeo calculated the load of contaminants in the proposed discharges and the dilution factor in the creek (i.e., assuming that the proposed discharges go directly to the creek). Contaminant loading was calculated based on the maximum concentrations detected in samples collected from the water treatment system and the maximum discharge rate. To be conservative, Engeo used the anticipated low flow of $0.02\text{m}^3/\text{s}$. Based on estimates of diluted concentrations, direct discharge to Noname Creek would likely result in an exceedance of one or more of the assessment criteria. While it is highly unlikely that this water is being used as a source of potable water, there is potential for an effect to ecological health. As such, discharge to Noname Creek is not deemed a suitable alternative to the proposed discharge to land.

Conclusion

Based on the review summarised above, no feasible alternative currently exists to the proposed temporary discharge.

10.0 Effects on the Environment (Section 104(1)(A))

Having regard to the actual and potential effects on the environment of the activity resulting from the proposal, it was concluded in the assessment above that any wider adverse effects relating to the proposal will be less than minor and that no persons would be adversely affected by the proposal.

In terms of planned further works the applicant is continuously exploring options to improve the water management system at the site. Current planned upgrades include the installation of an aeration fountain in Stage 2 of the settlement pond (anticipated completion in September 2024) and assessing the feasibility of reconfiguring the sequence of the treatment train to allow for flocculation prior to Stage 1 of the settlement pond. As the process is improved and revised, this report will be updated to reflect the current water management practices on-site.

Furthermore, it is considered that the proposal will also result in positive effects including managing the discharge from the retention pond in a controlled manner and avoid the uncontrolled overtopping of the pond. Furthermore, the proposed monitoring programme will provide an opportunity for groundwater and surface water quality at the site to be further monitored.

Overall, it is considered that when taking into account the positive effects, any actual and potential adverse effects on the environment of allowing the activity are acceptable.

11.0 Regional and District Plan and Statutory Documents

(Section 104(1)(B))

11.1 National Policy Statement For Freshwater Management 2020

It is noted that the new Government, has agreed to replace the National Policy Statement for Freshwater Management 2020 (NPS-FM) and work on the replacement was due to commence at the end of last year². Notwithstanding this, below is an assessment against the NPS-FM for completeness.

The National Policy Statement for Freshwater Management 2020 sets out the objectives and policies for freshwater management under the Resource Management Act 1991. The objective of the policy statement is as follows:

The objective of this National Policy Statement is to ensure that natural and physical resources are managed in a way that prioritises:

a) first, the health and well-being of water bodies and freshwater ecosystems

b) second, the health needs of people (such as drinking water)

c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

Fifteen policies support this objective, with the following being of relevance to the proposal:

- Policy 1: Freshwater is managed in a way that gives effect to Te Mana o te Wai.
- Policy 2: Tangata whenua are actively involved in freshwater management (including decision-making processes), and Māori freshwater values are identified and provided for. The application site is not located within a statutory acknowledgement area, rūnanga sensitive area or silent file area.
- Policy 3: Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.
- Policy 5: Freshwater is managed (including through a National Objectives Framework) to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.
- Policy 15: Communities are enabled to provide for their social, economic, and cultural wellbeing in a way that is consistent with this National Policy Statement.

² <https://www.beehive.govt.nz/release/government-takes-first-steps-towards-pragmatic-and-sensible-freshwater-rules>

It is considered that the proposal is consistent with the relevant provisions of the NPS:FM for the reasons outlined as follows:

- The effects on the receiving waterbody, being groundwater, have been assessed as no more than minor because there is no hydraulic connection between the application site and the off-site Holocene aquifer.
- The nearest bore to the application site is located over 1.3km to the west of the application site and no drinking supply wells being identified as being affected by the proposal. Furthermore, the proposal includes treatment and monitoring to ensure that the discharge quality is of an acceptable level;
- The WTP to the south of the application site will also be unaffected due to the location separation and water gradient, along with the positioning of the intakes within the Grey River;
- A monitoring program will be implemented as part of this discharge application to monitor both groundwater and surface water at the application site and the nearby Noname Creek;
- The proposal will enable the continued operation of a landfill facility, whilst not degrading the receiving waterbody and drinking water supply providing opportunities to benefit the social economic and cultural well-being of the local community.

11.2 Objectives and Policies of the West Coast Regional Policy Statement (2020)

Below is an assessment against the relevant objectives and policies within Chapter 6 and 8 of the West Coast Regional Policy Statement (RPS). Consideration has also been given to other objectives and policies within the RPS, including Chapters 7 and 7A, however for the reasons that there are no direct effects on any indigenous biodiversity, that ecosystems will be protected from treatment of the discharge and dilution, and there will be no additional impacts on natural character beyond the current landfill operation.

11.2.1 Chapter 6 - Regionally Significant Infrastructure (RSI)

Chapter 6 outlines that there is a need to recognise the social, economic, and environmental benefits that accrue locally, regionally and nationally from the establishment and continued operation of regionally significant infrastructure (RSI), which is defined within the RPS to include 'public or community solid waste storage and disposal facilities'.

The key objective of this chapter is to enable the safe, efficient and integrated development, operation, maintenance, and upgrading of regionally and nationally significant infrastructure. This objective is supported by a number relevant policies which seek to:

- Policy 1 - Provide for the development, operation, maintenance and upgrading of new and existing RSI...
- Policy 4 - Recognise that RSI important to the West Coast's wellbeing needs to be protected from the reverse sensitivity effects arising from incompatible new subdivision, use and development, and the adverse effects of other activities, which would compromise the effective operation, maintenance, upgrading, or development of the infrastructure.
- Policy 5 - When considering any adverse environmental effects of RSI that cannot be avoided, remedied or mitigated, other than effects on indigenous biological diversity, decision-makers

must have regard to any offsets and compensation proposed which benefit the natural environment or the community affected.

- Policy 8 - Land use and infrastructure should be integrated to avoid as much as practicably possible the constraints through the lack of supporting infrastructure; unsustainable demands being placed on infrastructure to meet new growth; and significant adverse effects on existing land uses.

Comments:

The proposal will be supporting the above objectives and policies for the following reasons:

- Having resilient regionally significant infrastructure is important for the region and the application site, which currently operates as a landfill, assists in providing for the social and economic wellbeing of the West Coast.
- Enabling the temporary discharge of water from the retention pond to land via a new soakage area will enable the continued operation of the site as a landfill activity.

11.2.2 Chapter 8 – Land and Water

- Objective 1 - The life-supporting capacity of freshwater is maintained or improved.
- Objective 2 - Provide for a range of land and water uses to enable the economic, social and cultural wellbeing of West Coast communities while maintaining or improving water quality and aquatic ecosystems.
- Objective 3 - Determine allocation of water within environmental controls.
- Objective 4 - Identify and protect the significant values of wetlands and outstanding freshwater bodies.
- Objective 5 - Achieve the integrated management of water and the subdivision, use and development of land within catchments, recognising the interconnections between land, fresh water, and coastal water, including by managing adverse effects of land and water use on coastal water quality.

The policies seek to:

- Policy 1 - Adverse effects on fresh and coastal water quality and aquatic ecosystems arising from:
 - Subdivision, use or development of land;
 - Discharges of contaminants to water and to land in circumstances which may result in contaminants entering water;
 - Water use and take; and
 - Activities in, or on, water including damming and diversion, will be avoided, remedied or mitigated, to ensure that water quality and aquatic ecosystems are maintained or improved.
- Policy 2 - To give effect to Objective 2 of Chapter 3, the adverse effects of subdivision, use and development on Poutini Ngāi Tahu cultural values will be avoided, remedied or mitigated taking into account the following matters:

- A preference by Poutini Ngāi Tahu for discharges to land over water where practicable;
- The value of riparian margin vegetation for water quality and aquatic ecosystems; and
- Effects on the sustainability of mahinga kai, and protection of taonga areas.
- Policy 3 - To give effect to Objective 2 of Chapter 3, manage land and water use in a way that avoids significant adverse effects (other than those arising from the development, operation, maintenance, or upgrading of RSI and local roads) and avoids, remedies or mitigates other adverse water quality effects on sites that are significant to Poutini Ngāi Tahu, including the following:
 - Estuaries, hāpua lagoons, and other coastal wetlands; and
 - Shellfish beds and fishing areas.
- Policy 4 - Until priority frameworks for water take and use are developed through the FMU processes and added to a regional plan, consent applications will be processed on a “first-come, first served” basis, and in making decisions, the following matters must be considered:
 - The reasonably foreseeable future requirements for domestic and community water supply needs, stock drinking, and firefighting;
 - The degree of community, regional or national benefit from the take, use, damming or diversion of water;
 - Any adverse environmental effects from the take, use, damming or diversion of water will be avoided, remedied or mitigated including where applicable by applying provisions of the regional plan;
 - Applying rates of take, volume limits and residual flows at the point of take to ensure that there is enough water for the purpose of the take, and to maintain or improve water quality and aquatic ecosystems;
 - The extent to which the proposal maximises the efficient allocation and efficient use of water; and
 - The reasonable needs of other water users.
- Policy 5 - Maintain or improve water quality within freshwater management units.
- Policy 6 - Identify the significant values of wetlands and outstanding freshwater bodies in regional plans and protect those values.
- Policy 7 - Encourage the coordination of urban growth, land use and development including the provision of infrastructure to achieve integrated management of effects on fresh and coastal water.
- Policy 8 - Provide for the social, economic and cultural wellbeing derived from the use and development of land and water resources, while maintaining or improving water quality and aquatic ecosystems.
- Policy 9 - Implement the National Policy Statement for Freshwater Management including the National Objectives Framework.

Comments:

The proposal will be supporting the above objectives and policies for the following reasons:

- The proposed installation of the soakage areas will be located away from Noname Creek which is the closest surface waterbody. Furthermore, the proposal is a discharge to land instead of a discharge to Noname Creek.
- Engeo have confirmed within their report that the effect of the proposed discharges to receptors (human or ecological) are highly likely to be less than minor as any contaminants in the proposed discharges will be significantly diluted in groundwater prior to entering Noname Creek and it is highly unlikely that the diluted concentrations will exceed the range of natural variability or analytical error.
- The proposal is short in duration and consent is only being sought for a period of 6 months.
- The pumping equipment, pipework, and discharge area will be monitored at least three times daily (morning, mid-day, afternoon) to monitor the water level in the retention pond and ensure that there are no leaks in the system or scour / overtopping in the discharge area.
- The proposal also involves the implementation of a monitoring programme to assist in monitoring the quality of groundwater and surface water at the application site to ensure any potential adverse effects remain at less than minor.
- The proposed discharge into a soakage area within the application site has been confirmed by Engeo that discharging into the Grey River above the GRE001 abstraction would be a practical impossibility.
- Enabling the temporary discharge of water from the retention pond to land via a new soakage area will enable the continued operation of the site as a landfill activity which is an important facility for the West Coast Region and assists in providing for the social and economic wellbeing of those working and living within the area.

11.3 Objectives and Policies of the Regional Land and Water Plan

11.3.1 3 - Natural and Human Use Values

- Objective 3.2.1 - To provide for the sustainable use and development of land and water resources.
- Objective 3.2.2 - To protect water bodies from inappropriate use and development by maintaining and where appropriate enhancing their natural and amenity values including natural character and the life supporting capacity of aquatic ecosystems.
- Policy 3.3.1 In the management of any activity involving water to give priority to avoiding, in preference to remedying or mitigating:
 - Adverse effects on:
 - The habitats of threatened species identified in Schedule 7A;
 - Water supply values identified in Schedule 7B;
 - Spiritual and cultural values and uses of significance to Poutini Ngāi Tahu identified in Schedule 7C;

- The significant natural character of wetlands, and lakes and rivers and their margins;
- Outstanding natural features and landscapes;
- Significant indigenous vegetation and significant habitat of indigenous fauna assessed in accordance with Policy 9.2 of the West Coast Regional Policy Statement;
- Existing public access to and along lakes and rivers;
- Significant historic heritage;
- o Adverse effects which cause or exacerbate flooding, erosion, land instability, sedimentation or property damage;
- o Adverse effects on existing lawful uses including regionally significant infrastructure.
- Policy 3.3.7 - In the management of any activity involving water, to avoid, remedy, or mitigate adverse effects on:
 - o Water quality;
 - o Amenity values;
 - o Indigenous biological diversity;
 - o Intrinsic values of ecosystems;
 - o The natural character of wetlands, and lakes and rivers and their margins, not described in 3.3.1(1)(d); and
 - o Historic heritage not described in 3.3.1(1)(h).
- Policy 3.3.8 - To recognise Poutini Ngāi Tahu's interests by promoting opportunities for their involvement in resource consent processing.

11.3.2 10 – Groundwater

Objective 10.2.1 - To sustain existing uses of the West Coast's groundwater, by protecting water quantity and quality and avoiding depleting surface water flows.

Comments:

It is recognised that groundwater is an important resource to many West Coast communities, where it serves a number of recognised uses, including domestic and public water supply, stock drinking water, irrigation and industrial uses. This water is largely accessed from shallow aquifers. High rainfall on the West Coast assists recharge of these aquifers. There is often a hydrological connection between surface water and groundwater. Furthermore, the effects of inappropriate land, water use and development on groundwater quantity and quality are often long term, and in some cases may be permanent.

In this case, the discharge will be treated and while having levels exceeding background concentrations of contaminants will be discharged to land and protect water quality.

11.3.3 14 - Solid Contaminants

- Objective 14.2 - To ensure that the adverse effects from the discharge of solid contaminants into or onto land, on water and soil quality, social, cultural and amenity values, and human health are avoided, remedied or mitigated.
- Policy 14.3 - To ensure that solid waste disposal facilities are sited, designed, constructed and managed to avoid, remedy, or mitigate any adverse effects on the environment

Comments:

It is acknowledged that if not properly managed, solid waste disposal facilities may generate harmful environmental effects, such as the contamination of groundwater and surface water. The proposal will mitigate potential adverse effects through the treatment and dilution of the discharged water, along with the proposed monitoring programme and the review of the groundwater samples, which will be undertaken at intervals of four weeks, five weeks, and six weeks from the nearest bore to the discharge area.

11.3.4 15 – Hazardous Substances

- Objective 15.2 - To ensure that the adverse effects from the discharge of hazardous substances³.
- into or onto land, on water and soil quality, social, cultural, and amenity values, indigenous flora and fauna, and human health are avoided, remedied, or mitigated.
- Policy 15.3.1 - To avoid inappropriate disposal or discharge of hazardous substances to land.
- Policy 15.3.2 - To recognise, where appropriate, relevant industry codes of practice or guidelines relating to the management of hazardous substances and potential associated discharges.

Comments:

It is acknowledged that the disposal of hazardous substances in the West Coast Region can be an issue of concern. Avoiding uncontrolled or inappropriate discharges of hazardous substances to land involves the provision of alternatives for safe collection, storage, treatment, and disposal. If not properly managed the discharge of hazardous substances may result in harmful environmental effects such as the contamination of the site where the activity is carried out, or contamination of water. The proposed mitigation measures included within this application will ensure that any potential adverse effects can be appropriately avoided, remedied, or mitigated.

11.4 Summary

It is considered that the proposed discharge is appropriate in terms of the objectives and policies of the RPS and RLWRP.

³ Defined as “is, unless expressly provided otherwise by regulations, any substance--

(a) With one or more of the following intrinsic properties: (i) Explosiveness: (ii) Flammability: (iii) A capacity to oxidise: (iv) Corrosiveness: (v) Toxicity (including chronic toxicity): (vi) Ecotoxicity, with or without bioaccumulation; or (b) Which on contact with air or water (other than air or water where the temperature or pressure has been artificially increased or decreased) generates a substance with any one or more of the properties specified in paragraph (a) of this definition.”

12.0 Part 2 Matters

Section 5 of Part 2 identifies the purpose of the RMA as being the sustainable management of natural and physical resources. This means managing the use, development and protection of natural and physical resources in a way that enables people and communities to provide for their social, cultural and economic well-being and health and safety while sustaining those resources for future generations, protecting the life supporting capacity of ecosystems, and avoiding, remedying or mitigating adverse effects on the environment.

Section 6 of the Act sets out a number of matters of national importance including (but not limited to) the protection of outstanding natural features and landscapes and historic heritage from inappropriate subdivision, use and development.

Section 7 identifies a number of “other matters” to be given particular regard by Council and includes (but is not limited to) Kaitiakitanga, the efficient use of natural and physical resources, the maintenance and enhancement of amenity values, and maintenance and enhancement of the quality of the environment.

Section 8 requires Council to take into account the principles of the Treaty of Waitangi.

Overall, as the effects of the proposal are considered to be less than minor, and the proposal accords with the relevant RLWP’S objectives and policies, it is considered that the proposal will not offend against the general resource management principles set out in Part 2 of the Act.

13.0 Other Matters (Section 104(1)(C))

13.1 Record of Title Interests

The Record of Title for the site are subject to a number of interests (refer Appendix 1). None of these are anticipated to affect the resource consent application as discussed in Table 1 below:

Table 1: Record of Title interests

Interest	Comment
Land Covenant in Covenant Instrument 12630203.5	Relates to a no objection and support of activities and development on the application site.
12630203.3 Consent Notice pursuant to Section 221 Resource Management Act 1991	Relates to the following: • Site being used for either farming and landfill activities and not residential development. • Prior to the construction of any building, a minimum storage of 20,000l of water for fire-fighting purposes is required. • At the time of constructing any building development, a stormwater disposal system needs to be designed and consented. • Prior to the construction of a residential unit a sewage disposal system has to be designed and constructed. • The site is not serviced by way of electricity or telecommunications.

Interest	Comment
12630203.2 Consent Notice pursuant to Section 221 Resource Management Act 1991	This relates to the NESCS on the application site. The NESCS is administered by the district council and is not applicable to this application.

13.2 Non-Statutory Documents

13.2.1 Paetae Kotahitanga ki Te Tai Poutini Partnership Protocol

This agreement is for a partnership between Council and iwi, however, as it informs the way in which Council make resource consent decisions, we have had regard to this. With regard to consent processing, the partnership document notes that the practice of granting retrospective consents for unlawful activities or breaches of consent conditions is not consistent with a Treaty partnership approach to resource management, as the ability of Poutini Ngāi Tahu to influence the activity is greatly diminished, and undesirable consent holder/applicant behaviour is rewarded. In this case, Taylorville Research Park has been operating for many years and is subject to many previous regional and district consents. We are not aware of any previous objection by iwi to these applications or approvals.

The Partnership also states that Council will support the development of iwi management plans. These will inform the development of Council policies, planning frameworks and resource consent decisions. In this participation agreement the parties agree that acting in accordance with iwi management plans is a primary means by which a Treaty partnership approach to resource management can be achieved.

13.2.2 Iwi Management Plans

In addition to the Partnership Protocol, the RMA requires that Council take into account any relevant planning document recognised by an iwi authority and lodged with the council. There are two iwi management plans relevant to this application site, Te Rūnanga o Makaawhio Pounamu Management Plan and Ngāti Waewae Pounamu Resource Management Plan. These are considered below:

These iwi management plans address how Te Runanga o Ngāi Tahu can best look after pounamu allowing for on-going use and ensuring its sustainability for the future. This application relates to an existing Taylorville Resource Park and the iwi management plans are of limited specific relevance to the proposal. The iwi management plans require the use of accidental discovery protocol which will be adopted for the application site. Therefore, the application is considered to be consistent with the iwi management plans.

13.3 District Plans

13.3.1 Grey District Plan

Under the provisions of the Grey District Plan (GDP) the application site is located within the Rural Environmental Area. The rural environments of the Grey District contain extensive resources, including indigenous forest, exotic forest, farmland, minerals, rivers, lakes, buildings and infrastructure. They are all used to a greater or lesser extent to provide social, economic and cultural wellbeing of the community.

13.3.2 Proposed Te Tai o Poutini Plan

The Proposed Te Tai o Poutini Plan (PTTPP) is the combined District Plan for the Buller, Grey and Westland District Councils. It will replace the current individual district plans. The PTTPP sets out the objectives, policies, rules and methods to manage land use activities and subdivision across the districts. The hearing on the PTTPP commenced in October 2023 and it is envisaged hearings will be held through to November 2024.

The application site is zoned 'General Rural' within the PTTPP, which recognises that rural land is an important resource as it underpins the social and economic well-being of the West Coast/Te Tai o Poutini. Furthermore, the rural area is a dynamic environment, influenced by changing farming practice and by a wide range of productive activities.

Under the PTTPP, the application site is not located within the following areas:

- Site of significance to Maori;
- Aotea Management Area;
- Contain any notable trees, Historic Heritage Items and Areas or Archaeological Areas; or

Furthermore, the application site is not subject to any hazard or risk overlays or any natural environment overlays.

The site is located within the 'Pounamu Management Area', which are meant to be given priority as areas of protection and 'Poutini Ngāi Tahu'⁴ whānui access, including through the use of local planning instruments.

⁴ Means the members of the two Ngāi Tahu hapū from the West Coast/Tai o Poutini - Ngāti Waewae and Ngāti Mahaki.

14.0 Section 105 Discharge and Coastal Permits

Under section 105(1) of the Act, in addition to the matters in section 104(1) of the Act, a consent authority must have regard to:

- the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and
- the applicant's reasons for the proposed choice; and
- any possible alternative methods of discharge, including discharge into any other receiving environment.

As noted within the report, any potential adverse effects of the discharge are considered to be less than minor. Furthermore, other alternatives have been considered but have been ruled out for the reasons outlined at section 9.0. A discharge to land is required, as there is no reticulated stormwater network available to receive the discharges from the retention pond.

15.0 Section 107 Discharge Permit Restrictions

Under section 107 of the Act, unless there are exceptional circumstances, or the discharge is temporary, or it is associated with maintenance work, a consent authority cannot grant a discharge permit that would have following effects:

- if, after reasonable mixing, the contaminant or water discharged (either by itself or in combination with the same, similar, or other contaminants or water), is likely to give rise to all or any of the following effects in the receiving waters:
 - the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - any conspicuous change in the colour or visual clarity;
 - any emission of objectionable odour;
 - the rendering of fresh water unsuitable for consumption by farm animals;
 - any significant adverse effects on aquatic life.

The proposed discharge from the retention pond to land will be designed to ensure that it does not give rise to the above effects. Furthermore, for the reasons outlined within this report (i.e. the short-term duration sought and proposed monitoring programme) the proposed discharge from the retention pond to land is not considered to give rise to the above effects.

16.0 Conclusion

The proposal involves an application for resource consent under s88 for a temporary discharge from the existing onsite retention pond to land, via a proposed soakage area at the application site, which is legally described as Lot 1-2 DP 584105. The proposal also addresses a s127 application to vary condition 11 of RC-2021-0097-03.

Based on the above report it is considered that:

- Public notification is not required as adverse effects in relation to groundwater quality and quantity and surface water quality are considered to be less than minor. There are also positive effects including managing the discharge from the retention pond in a controlled manner and avoid the uncontrolled overtopping of the pond. Furthermore, the proposed monitoring programme will provide an opportunity for groundwater and surface water quality at the site to be further monitored.;
- Limited notification is not required as the proposed discharges will be significantly diluted in groundwater prior to entering Noname Creek and it is highly unlikely that the diluted concentrations will exceed the range of natural variability or analytical error;
- The proposal accords with the relevant RLWP objectives and policies; and
- The proposal is considered to be consistent with Part 2 of the Act.

It is therefore concluded that the proposal satisfies all matters the consent authority is required to assess, and that it can be granted on a non-notified basis.

Appendix 1

Record of Title



Urban & Environmental



RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD
Search Copy



R.W. Muir
Registrar-General
of Land

Identifier **1097679**
Land Registration District **Westland**
Date Issued 25 January 2023

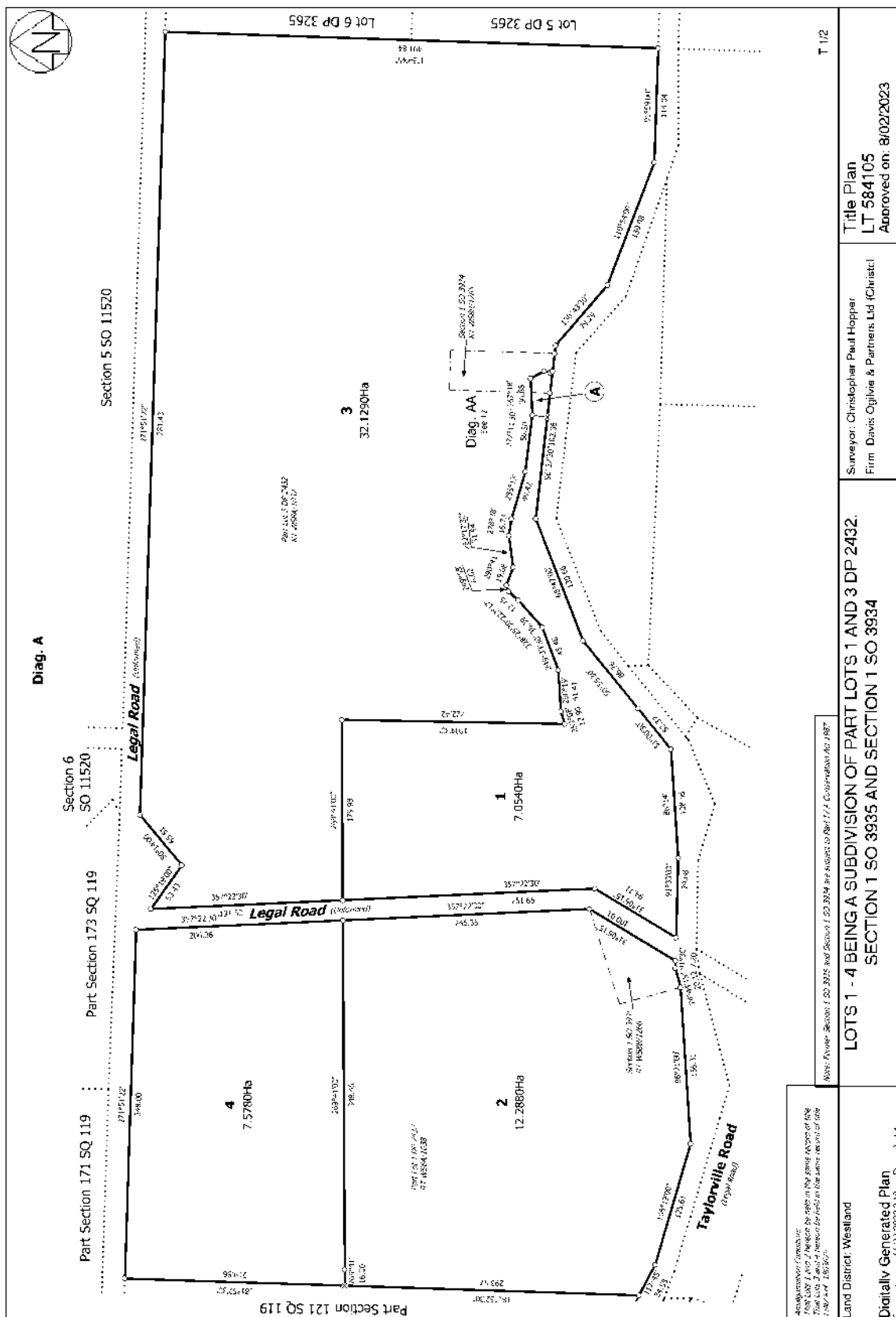
Prior References

WS8A/1037 WS8A/1038 WS8B/1265
WS8B/1266

Estate Fee Simple
Area 19.3420 hectares more or less
Legal Description Lot 1-2 Deposited Plan 584105
Registered Owners
Taylorville Resource Park Limited

Interests

Subject to Section 8 Coal Mines Amendment Act 1950 (affects part Lot 1 DP 584105 formerly Lot 3 DP 2432)
Subject to Section 8 Atomic Energy Act 1945 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934 and part Lot 2 DP 584105 formerly Section 1 SO 3935)
Subject to Section 3 Geothermal Energy Act 1953 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934 and part Lot 2 DP 584105 formerly Section 1 SO 3935)
Subject to Section 3 Petroleum Act 1937 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934 and part Lot 2 DP 584105 formerly Section 1 SO 3935)
Subject to Section 6 Mining Act 1971 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934 and part Lot 2 DP 584105 formerly Section 1 SO 3935)
Subject to Section 8 Mining Act 1971 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934)
Subject to Section 5 Coal Mines Act 1979 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934 and part Lot 2 DP 584105 formerly Section 1 SO 3935)
Subject to Section 261 Coal Mines Act 1979 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934 and part Lot 2 DP 584105 formerly Section 1 SO 3935)
Subject to Part IV A Conservation Act 1987 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934 and part Lot 2 DP 584105 formerly Section 1 SO 3935)
Subject to Section 241(2) Resource Management Act 1991 (affects DP 584105)
12630203.2 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 25.1.2023 at 8:27 am
12630203.3 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 25.1.2023 at 8:27 am
Subject to a right of way over part Lot 1 DP 584105 marked A on DP 584105 created by Easement Instrument 12630203.4 - 25.1.2023 at 8:27 am
The easements created by Easement Instrument 12630203.4 are subject to Section 243 (a) Resource Management Act 1991
Land Covenant in Covenant Instrument 12630203.5 - 25.1.2023 at 8:27 am



Appendix 2

RC-2021-0097-V3



Urban & Environmental

RC-2021-0097-V3 Consent Conditions

- (1) The deposition/discharge shall be carried out in general accordance with the details contained in the consent application and the applications to change or cancel consent conditions received 23 March 2022, and 4 July 2022 and 29 September 2022 submitted to the Consent Authority, except where inconsistent with these conditions.
- (2) The Consent Holder shall supply any agent or contractor working under this consent with a copy of the consent.
- (3) Any person working under this consent shall have a copy of the consent conditions on site and present it to an officer of the Consent Authority upon request.
- (4) Any refuelling, lubrication or mechanical repairs shall be undertaken in such a manner so as to ensure that no spillages of hazardous substances onto the land surface or into water occur. If a fuel spillage in excess of 20 litres occurs, the Consent Holder shall inform the Consent Authority immediately.
- (5) The Consent Holder shall only deposit fill material initially in the area outlined in red and labelled Dump Cells Stage 1,2,3 on the attached aerial photograph labelled Annexure 1 "RC-2021-0097 Application Area" or asbestos and coal tar or coal pitch only in the areas labelled Existing Lined ACM Cell and New Application Area Lined ACM Cell on the attached aerial photograph titled RC-2021-0097 Annexure 3. Variation September 2022. Should an "Expansion of Fill Area Report" be supplied to and approved by the Consent Authority then filling may occur within the wider area outlined in maroon on the attached aerial photograph.
- (6) The "Expansion of Fill Area Report" required by Condition 5 shall contain the following as a minimum:-
 - The location, size and approximate development time for any new cells to accept fill material;
 - The base material present and the porosity of that material;
 - How the leachate system will be extended into the new areas;
 - Type and location of monitoring and sediment control for the new areas to be developed.
- (7) The Consent Holder shall:
 - Ensure all works are undertaken in such a manner so as to minimise soil erosion and to avoid slope instability;
 - Ensure the works do not cause or exacerbate flooding of another person's property, erosion, land instability, sedimentation or property damage;
 - Ensure that surface water is diverted around the fill site, as far as practicable.
- (8) In addition to Condition 7, the Consent Holder shall install an appropriate sediment pond in the approximate location and constructed in the manner detailed in the attached annexure titled "Infrastructure Consultants Water Management Structure July 2021".
- (9) Only demolition waste (including clean fill) and whole or shredded tyres, but not including the disposal of asbestos or other hazardous materials may be disposed of in the location

identified in Annexure 1. Asbestos and other hazardous materials approved by the Consent Authority can only be disposed of in the dedicated, lined cells identified in Annexure 3.

(10) The volume of deposited demolition waste shall not exceed a maximum volume of 30,000m³ per calendar year.

(11) The Consent Holder shall ensure that there is no contamination of groundwater or surface water outside of the site (Secs 1-3 5-6 Pt Secs 4 & 8 SO 11520 Sec 1 SO 3935 Sec 1 SO 3934 Lots 1 3 DP 2432 Lots 1-5 DP 3265) as a result of the exercise of this consent.

(12) Notwithstanding Condition 11 the Consent Holder shall install and maintain a groundwater monitoring bore in the approximate location identified in the annexure title "Infrastructure Consultants Water Management Structure July 2021" and attached to this consent. The Consent Holder shall monitor that groundwater bore annually for the following parameters:

- Groundwater level
- pH
- Turbidity
- Conductivity
- BOD
- Nitrate Nitrogen
- Ammoniacal Nitrogen
- Chloride
- Manganese
- Zinc (total)
- Iron
- Chromium IV (total)
- Copper (total)
- Lead (total)
- Arsenic (total)
- Aluminium (total)
- Cadmium (total)
- Mercury (total)
- Benzo(A)pyrene

(13) The Consent Holder shall conduct annual surface water monitoring at the locations identified on the annexure titled "Sewell Peak Farm Sampling Areas June 2021 – For Infrastructure Consultants" and attached to these consents. The Consent Holder shall monitor for the following parameters:

- pH
- Conductivity

- Turbidity
- Dissolved oxygen
- BOD
- Nitrate Nitrogen
- Ammoniacal Nitrogen
- Chloride
- Dissolved reactive phosphorus
- Zinc
- Chromium
- Arsenic
- Lead
- Aluminium
- Manganese

(14) Macroinvertebrate monitoring shall be undertaken at the request of the Consent Authority.

(15) When material is received for deposition onsite:

- The volume of all material shall be recorded before deposition;
- For each load, delivery documentation shall include confirmation that the material is consistent with what is consented;
- The delivery documentation shall clearly identify:
 - The contractor delivering the material;
 - The physical address of the original source of the material;
 - That the material is not contaminated.

(16) The Consent Holder shall undertake an inspection of the site and the material which has been deposited at least once every 30 days or before any deposited material is covered, whichever is the lesser. Confirmation that the material deposited is consistent with what is consented is to be documented for each inspection undertaken.

(17) Should the inspection undertaken in accordance with Condition 16 indicate materials deposited on site are not consistent with what is consented, these should be removed from the site immediately and deposited at an appropriate facility that is authorised to receive such material and the actions recorded.

(18) All documentation and information recorded regarding consented materials delivered to the consent holder's site, and regarding site inspections, is to be retained by the Consent Holder and provided in an electronic format to the Consent Authority on request.

(19) The management on site shall include:

- The site shall be surrounded by fencing and lockable gates to prevent, as far as practicable, the unauthorised deposition of material;

- All entrances to the site shall be securely locked when the site is not supervised unless monitored in a way that can identify responsibility for any deposition/discharge that is contrary to these consent conditions.
- Notwithstanding Condition 19 b) all entrances to the site shall be securely locked at the completion of each day's deposition/discharge activities.

(20) The Consent Holder shall compile and supply the Consent Authority with an annual monitoring report at intervals no greater than 12 months. As a minimum the report shall include the following information:

- A summary of all monitoring results obtained in accordance with the conditions of these consents supported by analysis and discussion by a suitably qualified person;
- The effectiveness of any treatment method in meeting the compliance limits of the consents;
- The environmental implications of any significant trends in monitoring data gathered with respect to the consented activities;
- Any incidences or problems experienced with achieving consent compliance;
- The summary of any complaints received and any mitigation measures that were adopted;
- Any maintenance works needed, proposed or that have been undertaken to ensure compliance with consent conditions;
- (g) Any modifications to more effectively control the quality of the discharge; and
- (h) Adverse effects from the discharge and the steps taken or proposed to be taken to correct or mitigate these effects.

(21) At the completion of filling activities the fill material shall be compacted, covered with a suitable growing medium and grassed, as soon as practicable.

(22) Pursuant to Section 128 of the Resource Management Act 1991, the Consent Authority may review the conditions of this consent by serving notice within a one month period of each anniversary of the date of commencement of the consent for any of the following purposes:

- To deal with any adverse effect on the environment which may arise from the exercise of this consent and which it is appropriate to deal with at a later stage.
- To require the Consent Holder to adopt the best practicable option to remove or reduce any adverse effect on the environment.

Appendix 3

Hydrogeological Assessment (Engeo)



Urban & Environmental



ENGEO Limited
124 Montreal Street, Sydenham
Christchurch 8023
(03) 328 9012
www.engeo.co.nz

Project Number 26200.000.001

Preliminary Hydrogeological Assessment

287 Taylorville Road, Coal Creek, Greymouth

Submitted to:
Taylorville Resource Park Limited
P.O. Box 2103
Washdyke
Timaru

Contents

1	Introduction	1
2	Site Setting.....	3
2.1	Site Location	3
2.2	Geological Setting	5
2.3	Hydrological Setting	7
3	Water Management System	9
3.1	Stormwater Management.....	9
3.2	Leachate Management	10
4	Comprehensive Water Quality Monitoring Results	10
4.1	Assessment Criteria	12
4.2	Water Quality Analytical Results	12
5	Proposed Discharge to Land	14
6	Assessment of Effects on the Environment.....	16
6.1.1	Input Parameters	16
6.1.2	RISC5 Modelling Results	18
6.1.3	RISC 5 Model Limitations / Considerations	19
6.2	Effects on Off-Site Groundwater Quality	19
6.3	Effects on Groundwater Quantity	21
6.4	Effects on Surface Water Quality	21
7	Proposed Monitoring Programme.....	22
8	Alternatives to the Proposed Discharge to Land	23
9	Planned Further Works	23
10	Limitations.....	24
11	References.....	25

Tables

Table 1:	Cell Descriptions and Received Material Types
Table 2:	Modelled Contaminants of Concern
Table 3:	Indicative Concentrations in the Surface Water

Figures

Figure 1:	Overarching Site Plan
Figure 2:	Local Features
Figure 3:	Site Depositional Sequence
Figure 4:	Hydrological Setting
Figure 5:	Local Topography
Figure 6:	Comprehensive Monitoring Sample Locations
Figure 7:	Contaminant Classification Decision Tree
Figure 8:	Topography and Gravel Contacts near Noname Creek
Figure 9:	Existing Water Management Systems
Figure 10:	Inferred Groundwater Flow Path and Proposed Monitoring Bore Locations

Appendices

Appendix 1:	Supporting Geological Information
Appendix 2:	TRP On-Site Water Management Layout
Appendix 3:	Odour Filter Specifications
Appendix 4:	Flocculant Specifications
Appendix 5:	Summary of Laboratory Analytical Results
Appendix 6:	Laboratory Report (July 2024)
Appendix 7:	Hantush Modelling Results
Appendix 8:	RISC5 Modelling Results

ENGEO Document Control:

Report Title	Preliminary Hydrogeological Assessment – 287 Taylorville Road, Coal Creek			
Project No.	26200.000.001	Doc ID	04	
Client	Taylorville Resource Park Limited	Client Contact	Bruce Tinnelly	
Distribution (PDF)				
Date	Revision Details / Status	Author	Reviewer	WP
05/09/2024	Issued to Client	LN / JW	DR	HO
11/09/2024	Revised to reflect client comments	LN	DR	HO
19/09/2024	Revised to reflect planner comments	LN	DR	DF

SQEP Certifying Statement

I certify that the site has been assessed in accordance with current New Zealand Regulations and guidance documents and that this report has been prepared in general accordance with the Ministry for the Environment's Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand, 2021.

I am considered by ENGEO Limited to be a suitably qualified and experienced practitioner (SQEP) able to certify reports pursuant to the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011, based on the company's definition of a SQEP as given below.



Dave Robotham

19 September 2024

ENGEO Limited requires that a SQEP has the following Qualifications / Experience:

- Tertiary science or engineering qualification relevant to environmental assessment.
- A minimum of ten years of relevant experience.
- Registration with a professional body that assess and certifies environmental professionals in the competency criteria of training, experience, professional conduct, and ethical behaviour.

1 Introduction

ENGEO Ltd was requested by Taylorville Resource Park Limited (TRPL) to undertake a Preliminary Hydrogeological Assessment at the Taylorville Resource Park, located at 287 Taylorville Road, Coal Creek, (herein referred to as 'the site', shown in Figure 1). This work has been carried out in accordance with our signed agreement dated 12 June 2024. The purpose of the assessment is to provide a summary of hydrogeological investigation works undertaken to date and assess potential effects due to a short-term discharge of treated waters to land.

The site covers approximately 12.5 hectares (ha) in a generally rural area located approximately 3.5 km east of Greymouth township. The site currently operates as a disposal facility under resource consent RC-2021-0097-V3, which was granted by the West Coast Regional Council (WCRC) on 6 August 2021 and amended on 7 October 2022. The site has been developed with three waste cells (Cells A, Cell B, Cell C); additionally, one cell (Cell D) is planned for development.

Cell B is closed and capped; Cells A and C are active (refer Table 1). RC-2021-0097-V3 allows for the disposal to land of demolition waste (including cleanfill), asbestos, coal tar and coal pitch, shredded tyres, and other hazardous materials approved by the Consent Authority. The materials received in each of the disposal cells are summarised in Table 1.

Table 1: Cell Descriptions and Received Material Types

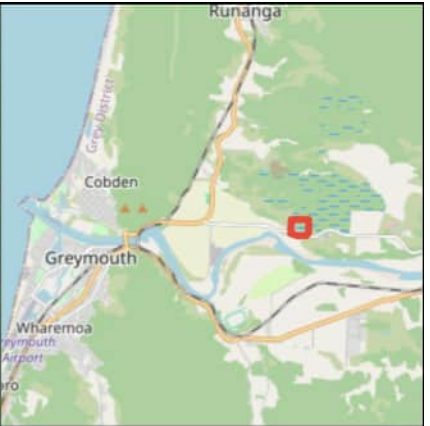
Cell	Aerial Extent	Approximate Depth	Approximate Volume	Received Materials	Cell Construction
Cell A	5,000 m ²	~10 – 15 m (to mudstone)	~40,000 – 60,000 m ³	Demolition waste (including cleanfill), whole or shredded tyres	Unlined cell.
Cell C	6,400 m ²	10 m	37,000 m ³	Demolition waste (including cleanfill), whole or shredded tyres, asbestos, coal tar and coal pitch, other approved hazardous materials	Cell is lined with geomembrane underlain with geofabric

Condition 11 of RC-2021-0097 states that:

“The Consent Holder shall ensure that there is no contamination of groundwater or surface water outside of the site (Secs 1-3 5-6 Pt Secs 4 & 8 SO 113520 Sec 1 SO 3935 Sec 1 SO 3934 Lots 1 3 DP 2342 Lots 1-5 DP 3265) as a result of the exercise of this consent.”

TRPL received an abatement notice from WCRC (dated 4 May 2023) relating to offsite discharges that were odorous and contained elevated concentrations of heavy metals.

The site operations include two large water treatment / retention devices with a combined capacity of ~15,000 m³ for treated leachate and stormwater captured by the operations. The devices are currently at capacity, with heavy rainfall predicted in the coming months. TRPL is seeking consent to discharge water to land, to create freeboard in the retention pond and avoid uncontrolled discharges. Based on laboratory analytical results, the proposed discharges contain contaminants exceeding the permitted activity standards outlined in Rule 67(a) of the West Coast Regional Land and Water Plan (RLWP) (WCRC, 2020).



Legend

 Site Boundary

0 50 m 100 m
LINZ CC BY 4.0 © Imagery Basemap contributors

ENGEO
Produced by [Datanest.earth](https://www.datanest.com/)

Title: Overarching Site Plan		
Client: Taylorville Resource Park Ltd		Size: A4
Project: Taylorville Resource Park	Drawn: LN	Figure No.: 1
Date: 24-07-2024	Checked: -	
Proj No: 26200.000.001	Scale: 1:3968	Version: draft

As such, a change on Condition 11 of RC-2021-0097 may be required under Section 127 of the Resource Management Act (RMA) and consent will be required under the following Rules in the RLWP:

18.4 Discharges to Water

- Rule 71 'Discharge of any contaminant, or water to water, not complying with Rules 63 to 70' outlines that unless permitted by Rules 63, 64, 65, 66, 67, 68, 69, or 70 the discharge of any contaminant or water to water is a discretionary activity. The proposal activity is not captured under any of these rules and is therefore a Discretionary Activity under Rule 71.

18.5 Discharges to Land

- Rule 91 'Discharges to land discretionary activity Rule' outlines that any discharge of contaminants into or onto land is a discretionary activity, unless it is permitted by Rules 72 to 86, or controlled by Rules 87 to 90. The proposal activity is not captured under any of these rules and is therefore a Discretionary Activity under Rule 91 of the RLWP.

The objectives of this assessment are to characterise the geology of the site and surrounds, summarise the site hydrology and ambient water quality (groundwater and surface water), and assess the potential effects on off-site receptors (human and ecological) due to discharges of contaminants to water and to land where it might enter water. We note that investigation works are ongoing, and this report will be updated and revised as additional information comes available. However, this report is considered to provide an adequate assessment of the effects related to the proposed, short-term discharges.

2 Site Setting

2.1 Site Location

The site is located in a flat to gently undulating area between Mount Buckley and Cobden Hill, on the northern side of the Grey River, at an elevation of approximately 44 m reduced level (RL). The local topography dips gently to the southwest with an average grade of approximately 1.6% (1:64). The nearest townships are Greymouth (~3.5 km east) and Dobson (~3.5 km west).

A filling operation is located adjacent to the western site boundary (refer Figure 2 appended). The operation is authorised (RC-2019-0024-01) to receive cleanfill and demolition material. Surrounding properties to the north and east are agricultural / pastoral in use. Two residences are located less than 250 m west of the site. The nearest recorded water bore is located approximately 1.3 km west (2 Sids Road). There are no consented groundwater takes on file with the WCRC within 1 km downgradient of the site.

A networked public drinking water supply (GRE001) is located approximately 430 m south of the site. The supply provides drinking water to approximately 10,000 people in the area. The water supply (RC01092.3) comprises three bores (located 320 m to 420 m south-southeast of the site) that abstract from a subsurface infiltration system that takes water from the Grey River for treatment and distribution.



Legend

- Recorded Groundwater Bores
- Filling Operation (RC-2019-0024-01)
- GDC Infiltration System
- Site Boundary

0 100 m 200 m

LINZ CC BY 4.0 © Imagery Basemap contributors

ENGEO

Produced by DatanestEarth

Title:		
Local Features		
Client:		Size: A4
Taylorville Resource Park Ltd		
Project:	Drawn: JDW	Figure No.: 2
Taylorville Resource Park		
Date: 10-09-2024	Checked: LN	
Proj No:	Scale: 1:10718	Version: 1.0
26200.000.001		

2.2 Geological Setting

The site and surrounds are underlain by the Paleogene (33 – 55 myr) Kaiata Formation (Rapahoe Group), comprising brown, carbonaceous mudstone. An array of generally north-south trending faults have been mapped to the north and east of the site; however, no faults have been identified in the Kaiata Formation within 1.7 km of the site.

The thickness of the Kaiata Formation has not been directly investigated at the site; however, the approximate thickness has been assessed based on a published geology (Rattenbury & Isaac, 2012) and geological cross-section drawn for an area approximately 4 km north of the site (Ballance, 2009). The Kaiata Formation overlies the Brunner Coal Measures, which outcrop approximately 4.5 km to the east. Based on published field measurements, the bedding within the Kaiata Formation dips approximately 15° – 20° to the west-southwest. Assuming some offset to the line of strike and an apparent dip of 10°, the depth at the site to the Kaiata Formation – Brunner Coal Measures contact is on the order of 700 m below the ground surface. Supporting documentation is provided in Appendix 1.

During the Middle- to Late-Pleistocene (last approximately 100,000 years), intervals of glaciation resulted in erosion of the mudstone surface and the deposition of 14 m – 19 m of glacial outwash. The outwash deposits generally comprise sandy gravel with varying quantities of fines (e.g., silts and clays).

Based on existing borehole information, three layers of outwash deposits have been identified at the site (refer Figure 3). The oldest deposit (Gravel 3) comprises a gray, small to medium gravel. This deposit has been identified on the eastern portion of the site in contact with the mudstone (~13 – 17 m below ground level [bgl]). Above the Gravel 3 lies a 3 - 4 m thick layer of claybound gravel (Gravel 2). The youngest gravel formation (Gravel 1) is a small to medium gravel, which overlies the claybound gravel and extends across the site. Due to the abrupt transition between the gravel layers, it is inferred that these contacts represent disconformities between depositional sequences.

Following deposition of the surficial gravel, the area was downcut due to erosion along the alignments of the Grey River and tributaries. The gravel deposits in the river channel were eroded away and Holocene fluvial deposits have been deposited on the erosional surface of the mudstone.

Figure 3: Site Depositional Sequence

Photo 1: Inferred Gravel 3 extents (green) over the Kaiata Mudstone (yellow)

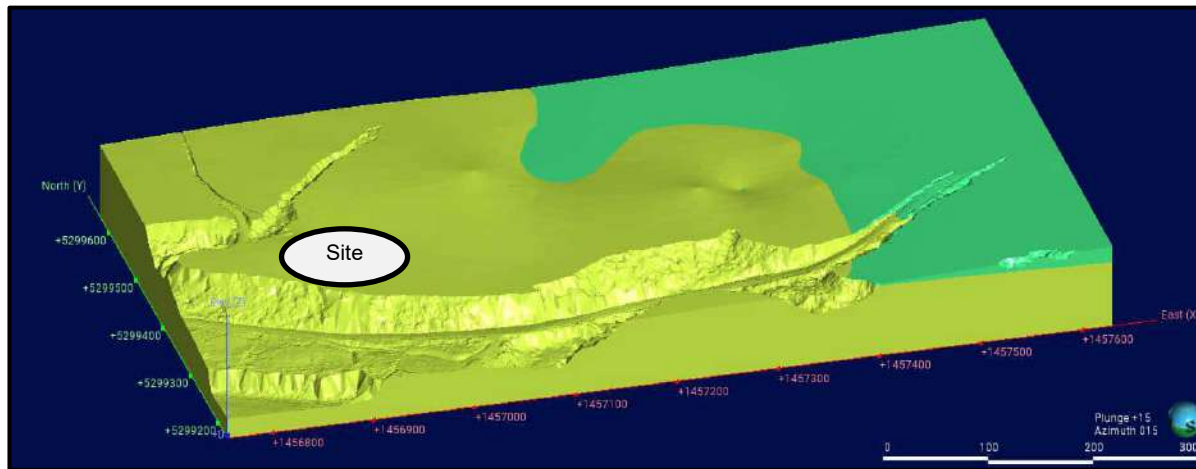
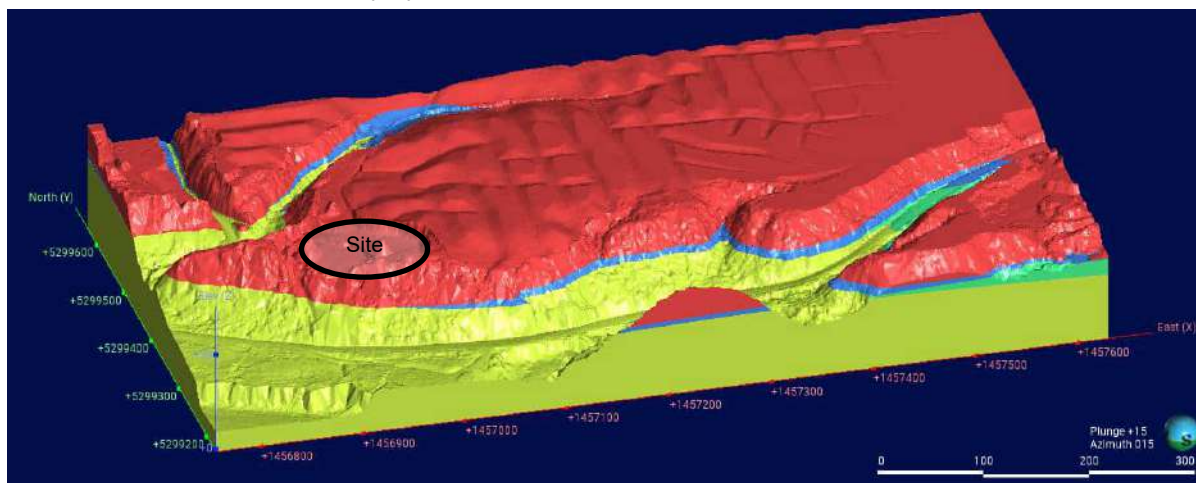


Photo 2: Inferred Gravel 2 extents (blue)



Photo 3: Inferred Gravel 1 extents (red)



Source: LINZ data service (West Coast LiDAR 1 m DEM).

2.3 Hydrological Setting

The site is located between the floodplain of the Grey River and the channel of Noname Creek, which forms a downstream tributary of the Grey River (refer Figure 4). Downstream of the site, the Grey River meanders westward in a wide (~300 m) channel for ~ 7 km to discharge in the Tasman Sea. The site is understood to be outside of the normal tidal influence zone; however, no specific backwater study has been completed as part of this assessment.

Noname Creek flows in a southwest direction approximately 15 m from the north-northeast extent of the operations. The creek also receives water from the fill operation located 100 m west of the site. It runs through a culvert under Taylorville Road and discharges into an unnamed tributary / wetland on the south side of the road before joining with the Grey River approximately 350 m westward (downstream) of the confluence with the wetland at an elevation of approximately 1 m RL. (refer Figure 5 below).

Based on flow readings in the Grey River collected at the Dobson monitoring point (~3.5 km upstream of the site) by WCRC, the river flow ranges from approximately 80 m³/s in dry weather to 1,750 m³/s following high rainfall events, with seasonal long-term median flows ranging from 165 m³/s to 320 m³/s. No flow readings have been collected from Noname Creek; however, based on observations made by ENGEO on 31 July 24, the flow rate is on the order of 0.02 – 0.03 m³/s. Noname Creek is spring-fed; as such, it is inferred that the flow rate is generally stable with transient high flow following high rainfall events.

Depth to groundwater measurements were collected on 30 July 24 from six on-site monitoring bores (MB1, MB2s, MB2d, MB3, MB4d, and TSB1). The depth to groundwater ranged from 4.48 m (TSB1) to 12.4 m (MB4d) below the top of the well casing. The depth to groundwater was subtracted from the surveyed elevation at the top of the well casing to derive the elevation of the water table (in RL). Based on the calculated groundwater elevations, the general groundwater flow direction is towards the west-southwest (247°) with a gradient of 0.0018 m/m. The hydraulic conductivity of the gravel(s) has not yet been characterised; however, based on published estimates (Fetter, 2021) aquifer testing undertaken by ENGEO in sites with similar deposits, it is inferred that the horizontal conductivity is in the order of 84 m/d.

The median annual rainfall is 2,800 – 3,000 mm NIWA, (2024), of which approximately 1,000 mm infiltrates to ground (Westerhoff, 2018). It is inferred that infiltrated water encounters the water table and then flows laterally with groundwater in the gravel deposits. Daylighting groundwater can be observed in a drain on the western end of the site and at several (~10) locations on the southern flank of the site, along Taylorville Road. The discharge points could not be directly observed due to heavy ground cover; however, it is inferred that groundwater is emerging from either the gravel deposits and / or at the mudstone contact.

Daylighting groundwater accumulates in a drain that runs around the western property boundary and along Taylorville Road. The drain also receives water from springs, creeks, and surface runoff from uphill of the site and along a 1 km length of Taylorville Road. Based on observations made by ENGEO on 31 July 24, the water in the drain is generally stagnant with minimal flow (0.001 – 0.002 m³/s) in some areas. The water in the drain is piped under the road to the unnamed tributary / wetland on the south side of Taylorville Road, before joining with the Grey River approximately 550 m downstream.



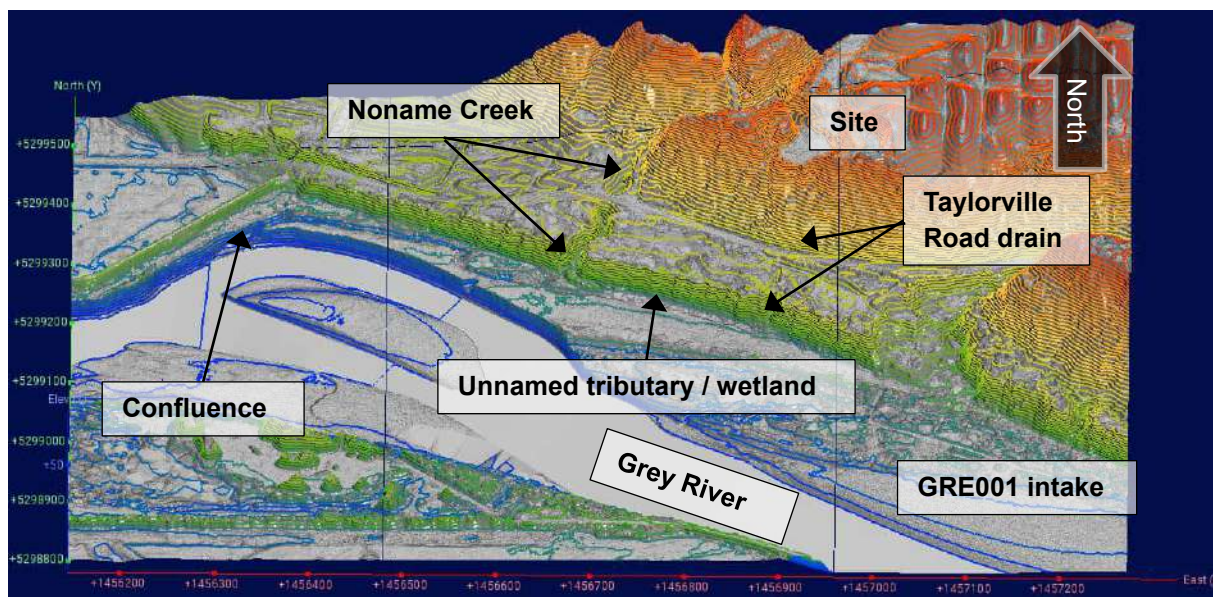
- Legend**
- Groundwater Monitoring Well Locations
 - Inferred Groundwater Level Contours (RL)
 - Inferred Groundwater Flow Direction
 - GDC Infiltration System
 - Site Boundary

0 50 m 100 m
LINZ CC BY 4.0 © Imagery Basemap contributors

ENGEO
Produced by Datanest Earth

Title: Hydrological Setting		
Client: Taylorville Resource Park Ltd		Size: A4
Project: Taylorville Resource Park	Drawn: JDW	Figure No.: 4
Date: 05-09-2024	Checked: LN	
Proj No: 26200.000.001	Scale: 1:3968	Version: 1.0


RC01092-3

Figure 5: Local Topography

Source: LINZ data service (West Coast LiDAR 1 m DEM). Note 3x vertical exaggeration.

Some water from the unnamed tributary / wetland may infiltrate into the Holocene Gravels and encounter groundwater that will discharge into the Grey River. Based on the flow direction in the Grey River (inferred groundwater flow direction), water from the drain will daylight at *least* 250 – 300 m downstream of the intake for GRE001.

The hydraulic conductivity of the mudstone has not yet been characterised; however, based on published estimates (Freeze, 1979) the inferred horizontal conductivity ranges from 0.9 m/d to 9×10^{-4} m/d, with a ratio of horizontal to vertical conductivity of 10:1 (Domenico, 1990). Considering the likely relative hydraulic conductivities between the gravel and the mudstone, it is inferred that groundwater flow is predominantly in the gravel deposits with only minor horizontal flow in the mudstone and negligible vertical infiltration.

3 Water Management System

3.1 Stormwater Management

Stormwater management at the site is primarily focused on the diversion of clean water from the waste cells and mitigation measures to prevent sediment loading in the stormwater. Stormwater that falls on the operational areas (e.g., roadways) is directed via roadside swales towards undisturbed areas of the site for infiltration through the permeable gravels. Stormwater that falls on or immediately adjacent to Cell A, Cell C, the retention pond, and settlement pond (refer Appendix 2) is directed into the cell / pond to prevent erosion and scouring of the cell / pond bunding. Stormwater that falls onto Cell B (closed and capped with 1,500 mm of gravel and low-permeability, compacted silts, proposed upgrades include the installation of an impermeable membrane cap) runs off the cell surface due to the contouring of the cap.

3.2 Leachate Management

Details of the leachate management system are provided in Appendix 2. Leachate from Cell A is captured via a sump that was installed west of the cell. Anecdotal information provided by the site manager indicates that the underlying mudstone layer slopes towards the sump. The sump was installed into an excavation that extended below the base of Cell A, into the underlying mudstone, to provide a preferential flowpath for Cell A leachate. As Cell A is unlined, we infer that the sump is also receiving groundwater that intersects with the base of Cell A. Water from the sump (herein, “Deep Sump”) is then pumped via a submersible pump on a float switch into the first stage of the lined settlement pond. The daily flow from Cell A is estimated to be on the order of 100 - 150 m³/day.

Leachate from the lined Cell B and Cell C is collected via sumps and risers installed in the cells and gravity fed through a GM700 hydrogen sulphide scrubbing system, (refer to Appendix 3 for specifications). As Cell B has been capped, no leachate has been observed flowing from this cell for the past 18 months; however, it is possible that negligible amounts may be generated. From the scrubbing system, the leachate is piped to a pumping station near the western site boundary and into the first stage of the lined settlement pond. The daily flow from Cell B / C is estimated to be on the order of 15 – 20 m³/day.

The first stage of the settlement pond has a capacity of ~2,700 m³, allowing for an approximate residence time of 135 – 180 days. Following settlement in Stage 1, the water decants over a baffle into stage two, which has a capacity of ~1,300 m³. Stage 2 is equipped with a float switch that, when triggered, pumps the water to a flocculation system that includes two tubes of poly-aluminium chloride and three sealed and baffled containers for additional removal of sediment and insoluble metals, (refer to Appendix 4 for further information). The treated water decants to the ~ 14,000 m³ retention pond for storage.

Water from the retention pond is piped through a siphon system to draw water through an additional treatment stage comprising two pumice pods and an additional baffled container that feeds into the DC/C3 sump. The DC/C3 sump has a cutoff valve, which is currently preventing off-site discharges of water from the retention pond. In the interim, water from the retention pond and D3/C3 are being directed back to the settlement pond for on-site recirculation.

It is intended that future discharges will be pumped past DC/C3 to a geobag and into a staggered polishing zone / wetland that will slow the flow of water prior to the final discharge in the roadside drain.

4 Comprehensive Water Quality Monitoring Results

A comprehensive monitoring round was undertaken at the site on 30 – 31 July 2024 to better characterise background / ambient concentrations of contaminants of concern (COC), potential source area(s), and likely effect(s) to off-site receptors. Water samples were collected from the following locations (refer Figure 6):

- On-site groundwater monitoring bores (MB1, MB2s, MB2d, MB3, MB4d, TSB1). We note that two monitoring bores (MB4s and MB5) were dry on the day of sampling.
- Daylighting groundwater from the drain on the western end of the site (TCD1) and springs along Taylorville Road (SP1 – SP3, SPE)
- Surface water in Noname Creek (SPFUS, SPFMS, SPFDS)
- Surface water in the drain along Taylorville Road (TRD1 – TRD5)

- Locations in the water treatment system including the Cell A sump, leachate outlet from Cell A, leachate outlet from Cell B / C, the second stage of the settlement pond, and the discharge from the retention pond (DC / C3)
- The former sediment pond

All samples were collected in general accordance with methodology and QA / QC procedures in the National Environmental Monitoring Standard (NIWA 2019). Groundwater samples were collected using a low flow method after field parameters (temperature, pH, dissolved oxygen) stabilised. All samples were placed into laboratory supplied containers and placed in a chilled container for transport to Hill Laboratories under a standard chain of custody for the following determinands:

- General water quality indicators (e.g., pH, electrical conductivity [eC], alkalinity, hardness, chemical oxygen demand [COD]).
- Anions and cations (e.g., Cl⁻, SO₄²⁻, Na⁺).
- Nitrogen species as nitrogen (i.e., Nitrite-N, Nitrate-N, Ammoniacal-N).
- Total and dissolved heavy metals (arsenic, cadmium, chromium, copper, lead, nickel, and zinc).

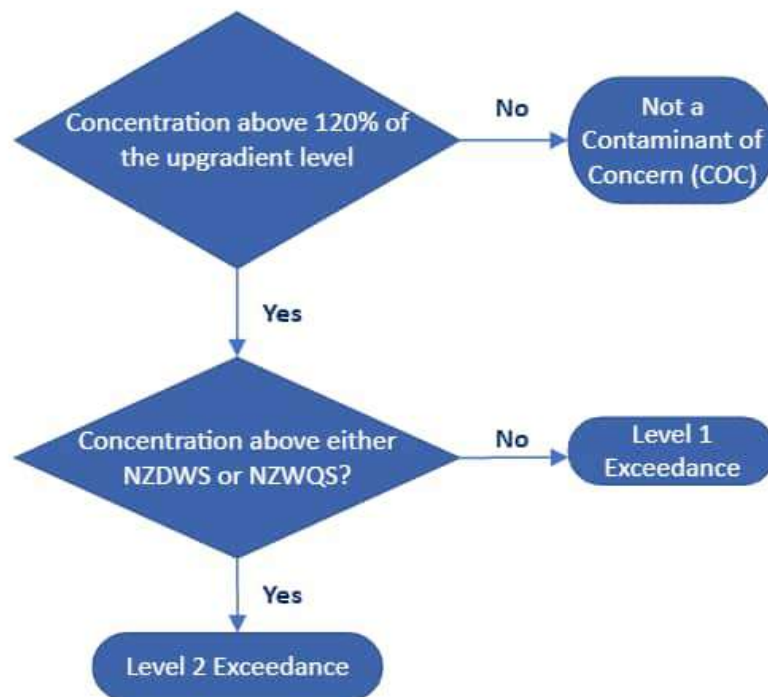
4.1 Assessment Criteria

All samples were assessed relative to the following criteria:

- New Zealand Drinking Water Standards (MoH, 2018) to assess for potential risk to the potable water supply at GRE001. Where derived, we have used the human health-based maximum acceptable value (MAV); if no MAV has been derived, we used the guideline value (GV) based on aesthetic effect (e.g., taste, odour).
- The Guidelines for Fresh & Marine Water Quality (NZWQS) (Commonwealth of Australia, 2024) to assess for potential risk to aquatic receptors. Where derived, we have used the toxicant default guideline values (DGV); if no DGV has been derived, we used the guidelines for physical and chemical (PC) stressors. We note that an ecological assessment is currently underway; however, no information is yet available to assess the sensitivity of species in the receiving environment. As a conservative measure, we have assessed against the values for 80%, 90%, and 95% level of protection.

4.2 Water Quality Analytical Results

Water analytical results were tabulated and reviewed to identify exceedances of the assessment criteria and determinands concentrations in samples collected at upgradient / upstream locations. The concentrations at upgradient / upstream locations were used to develop the trace concentrations (defined as 120% of the background concentrations). Several of the determinands exceeded the assessment criteria in samples collected at upgradient / upstream locations; as such we classified downstream / downgradient concentrations using the decision tree in Figure 7 below.

Figure 7: Contaminant Classification Decision Tree

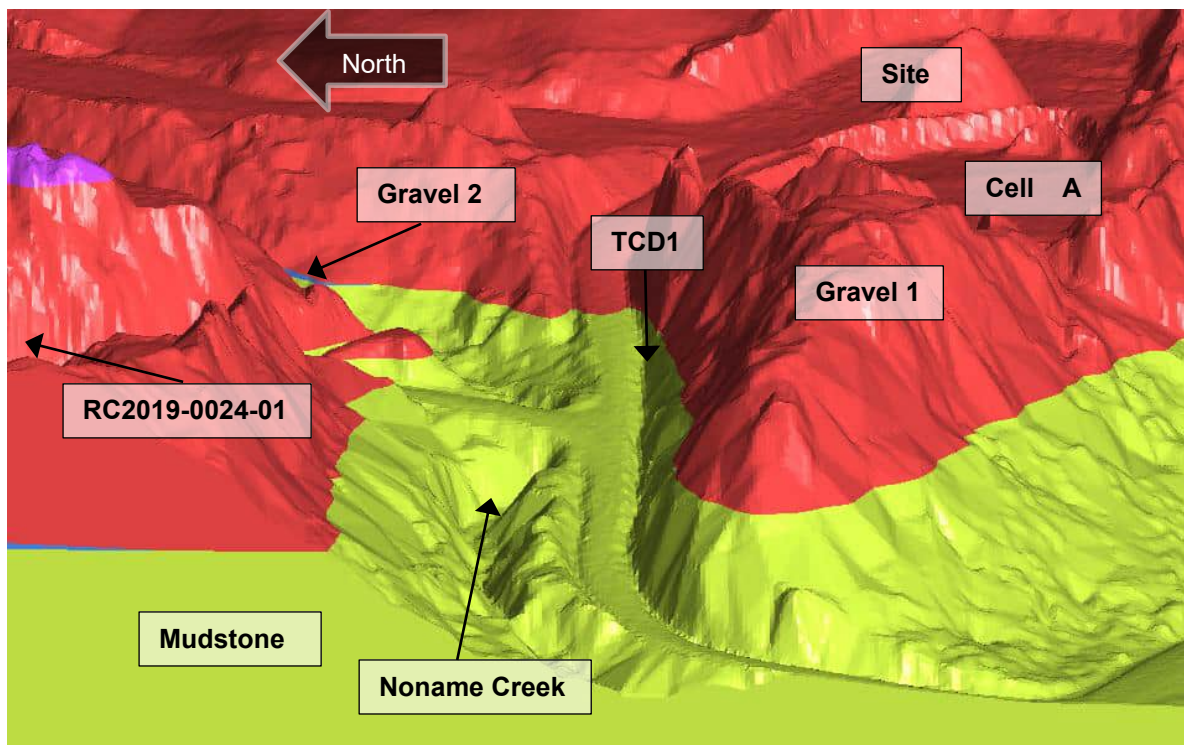
Analytical results (current and historical) and a summary of exceedances are provided in Appendix 5; the laboratory report is provided in Appendix 6.

Based on the findings of the July 2024 monitoring round:

- Water in the treatment system contains elevated levels / concentrations of total hardness, electrical conductivity, total iron, dissolved manganese, ammoniacal-N, sulphate, and dissolved and total metals (arsenic, chromium, copper, and zinc)
- Water samples collected from daylighting groundwater and the monitoring bores generally contained concentrations that were below trace (background / ambient) levels, with the exception of the sample collected at location TSB1. We note that concentrations at TSB1 differ significantly from those in samples collected from the Cell A leachate and other locations in the water treatment system (e.g., concentrations of total hardness, ammoniacal-N, sulphate). As such, these Level 1 Exceedances are not obviously the result of site operations and may be due to differing natural geochemistry.
- Water samples collected from daylighting groundwater and the monitoring bores contained concentrations that exceeded the NZDWS (total iron, dissolved aluminium and / or manganese) and concentrations that exceeded one or more of the NZWQS; however, concentrations were generally near or below the trace levels, indicating that Level 2 Exceedances may be due to background / ambient water quality and operations are unlikely to be significantly degrading groundwater.

- Samples collected from the drain locations contained several Level 1 Exceedances (derived from the upstream drain location, TRD3) and Level 2 Exceedances; however, they were generally below the trace concentrations for groundwater. Based on field observations, the drain receives water from daylighting groundwater, creeks, and surface runoff from uphill of the site and along a 1 km length of Taylorville Road. As such, while the site operations may contribute to changes in water quality, there are likely multiple sources for the Level 1 / Level 2 exceedances in the drain samples.
- Samples collected from mid and downstream locations in Noname Creek contained several Level 1 Exceedances. Additionally, the levels of electrical conductivity exceeded the NZWQS PS stressor criteria. The alignment of the creek runs between the site and the fill operations on the adjacent property (RC2019-0024-01). We have requested monitoring data for samples collected at the adjacent operations from WCRC. In the absence of off-site monitoring data, it is inferred that the Level 1 / Level 2 Exceedances in Noname Creek samples may be all or partially due to off-site activities. We further note that, based on site topography (refer Figure 8), the gravel formation appears discontinuous between the site operations and the drain; as such, the changes in water quality in Noname Creek are not obviously the result of site operations.

Figure 8: Topography and Gravel Contacts near Noname Creek

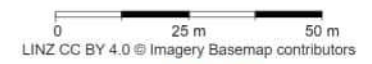


5 Proposed Discharge to Land

The proposed works include the development of an on-site soakage area at least 100 m away from Noname Creek (refer Figure 9) where water from the retention pond will be discharged to land. We have modelled for a 10 m x 10 m soakage area with a depth of at least 2 m, to accommodate a rainfall event of 50 mm (approximately equivalent to the 1-hour peak of a 2% AEP storm event for this location).



- Legend**
- Post-settlement leachate piping
 - Proposed Soakage Pit
 - Site Boundary
 - Retention Pond
 - Former Settlement Pond
 - Settlement Pond
 - Cell B (lined and capped)
 - Cell C (lined)
 - Cell A (unlined)



ENGEO
Produced by **Datanest.earth**

Title: Proposed Water Management System		
Client: Taylorville Resource Park Ltd		Size: A4
Project: Taylorville Resource Park	Drawn: JDW	Figure No.: 9
Date: 29-08-2024	Checked: LN	
Proj No: 26200.000.001	Scale: 1:1417	Version: 1.0

Water would be pumped from the retention pond at a flow that is no greater than the infiltration capacity of the basin. We have modelled for a maximum discharge of 800 m³ of water per day (~9 L/s). To avoid scour, the soakage area will be lined with a geofabric, suitably-sized pipework will be used to reduce the flow velocity to less than 1.3 m/s (MBIE, 2020), and, if necessary, the outlet will be manifolded to discharge at more than one point in the area.

The duration of discharge is anticipated to be six months. Discharges will preferably be taken during dry weather with little to no surface precipitation, to create freeboard in the retention pond; however, discharging may be required during wet weather as a contingency measure.

6 Assessment of Effects on the Environment

The primary transport pathway is infiltration to the water table followed by migration to the west-southwest with groundwater flow. There are no users of groundwater at this site or within 1 km downgradient of the site; however, groundwater daylights in the drain that runs around the western property boundary and in springs along Taylorville Road. From the drain, receptors may come into contact with the water either in the drain or the receiving environment (unnamed tributary / wetland and the Grey River). The potential effects of the proposed discharge have been considered along with measures for avoiding, remedying or mitigating adverse effects.

Effects on On-Site Groundwater Quality Contaminant fate and transport modelling was undertaken using RISC5 software to assess for the migration of contaminants in groundwater that daylights either in the drain that runs around the western property boundary or in springs along Taylorville Road.

6.1.1 Input Parameters

The input parameters selected in the model were based on published values and conservative proxy values. A summary of the parameters and source material are presented below.

Source Area Characteristics

In our model, we have assumed no attenuation in the vadose zone; as such, the source area has been modelled as mounded discharge water below the groundwater table. Hantush (Hantush, 1967) formulated a well-known approach for evaluating groundwater mounding. The Hantush method provides analytical solutions for the development of transient groundwater mounds below a rectangular recharge source with a consistent infiltration rate. To facilitate the application of the Hantush method, the United States Geological Survey (USGS) developed an open-source spreadsheet analytic tool. This spreadsheet tool was used for analytical modelling to determine the groundwater mounding that could potentially occur from the discharge to ground at the proposed soakage area.

The analytical model uses various parameters to estimate groundwater mounding these parameters include recharge rate (infiltration rate), recharge duration, specific yield, horizontal hydraulic conductivity (K-value), soakage pit size, and aquifer thickness. Assumption and limitations of the Hantush analytical model includes:

- The model shown does not account for dissipation in water level.
- The model assumes steady state and does not account for transient conditions.

The input values used for the analytical models were determined as follows:

- Recharge rate: The recharge rate (8 m/d) was calculated based on the size of the area and the maximum discharge rate (refer Section 5).
- Specific yield: The specific yield (0.13) was determined from the literature (Fetter, 2021).
- Horizontal hydraulic conductivity (K_h): The horizontal hydraulic conductivity (84 m/d) was determined from the literature (ibid).
- Soakage area size: The soakage area dimensions (10 m x 10 m) were based on the area required to accommodate the maximum discharge rate at the inferred recharge rate.
- Infiltration duration: To be conservative, we estimated for discharges from a 50 mm rainfall event (one hour peak for the 2% AEP [50-year ARI]).
- Aquifer thickness: The aquifer thickness was assumed to be 8.0 m below the soakage area.

The Hantush model calculates the groundwater mounding heights from the centre of the soakage area in two directions, orientated parallel to the width and length of the soakage area. The groundwater mounding is estimated from the centre of infiltration and at the distances from the edge of the soakage area. Hantush modelling results are provided in Appendix 7.

Based on the output of the Hantush model highest modelled groundwater mounding occurs in the centre of the soakage area, with a mounding height of 0.55 m.

To be conservative, in our RISC5 model we have assumed a source area of 10 m perpendicular to the flow direction and a height of 1 m, with a pulse duration of 6 months.

Aquifer Characteristics

The hydraulic gradient (0.0018 m/m) was calculated using the measured groundwater elevation at BH1 and TSB1. Dispersivity was calculated by the model (Gelhar, 1985). As a conservative measure, the model was run using a fraction organic carbon (foc) of 0.001 g/g.

Chemical Characteristics

The source area concentrations were derived from the highest concentrations detected in samples collected from locations in the water treatment system in July 2024. To simplify the model, we model only contaminants with concentrations that exceed one or more of the health-based assessment criteria (MAV or DGC, refer Section 4.1) including:

Table 2: Modelled Contaminants of Concern

Contaminant of Concern	[Max] (mg/L)	[Max] Sample ID	NZDWS	NZWQS 95%	NZWQS 90%	NZWQS 80%
Total aluminium	0.21	Settlement Stage 2	0.1	0.055	0.08	0.15
Total manganese	2.6	Cell B/C	0.4	1.9	2.5	3.6
Total ammoniacal-N	16.1	Cell B/C	0.82	0.9	1.43	2.3
Nitrate-N	0.34	Cell B/C	11.3	0.092	0.092	0.092
Total arsenic	0.05	Cell B/C	0.01	0.013	0.42	1.4
Total chromium	0.0164	Cell B/C	0.05	0.0033	0.006	0.04
Total copper	0.178	Cell B/C	2	0.0014	0.0018	0.0025
Total lead	0.00057	Settlement Stage 2	0.01	0.0034	0.0056	0.0094
Total nickel	0.0037	Settlement Stage 2	0.08	0.011	0.013	0.017
Total Zinc	0.056	Settlement Stage 2	1.5	0.008	0.015	0.031

Note: Refer Appendix 6 for full laboratory results and criteria references.

In our model, we have assumed no degradation along the flowpath.

Receptor Characteristics

To be conservative, we have modelled to a hypothetical well that is located 310 m downgradient of the soakage area, directly on the flowpath of the plume, and with a screen that intersects the water table. This will give a maximum concentration for groundwater daylighting in the drain that runs around the western property boundary or in springs along Taylorville Road.

An input summary is provided in Appendix 8a.

6.1.2 RISC5 Modelling Results

Based on the modelling results (refer Appendix 8b), contaminants in discharges to the soakage area will generally be attenuated through dilution / dispersion in the unconfined aquifer. Very low concentrations of aluminium, ammoniacal-N, manganese, and nitrate-N may reach the point of discharge (hypothetical well), with the concentration maximum in 1.6 years. The highest modelled concentrations are for aluminium and nitrate-N; however, these concentrations are negligible (0.00031 mg/L and 0.00050 mg/L, respectively) and below the range of natural variability or analytical error. A concentration graph is included in Appendix 8c.

6.1.3 RISC 5 Model Limitations / Considerations

There are limitations to the RISC5 modelling results. Significant limitations are discussed, and likely implications are discussed below:

- RISC5 assumes a homogenous, isotropic aquifer. As such, it will not account for the presence of the mudstone or variability in the gravel (e.g., differences in the quantity of fines). To compensate our model, we assumed a screened interval that spanned the depth of the saturated water column; however, the model may underestimate concentrations slightly due to restricted dispersion along the z-axis. Based on the very low concentrations detected at the hypothetical well, this limitation does not alter the findings of the model or the conclusions of our assessment.
- We have derived groundwater flow contours based on the dataset available; however, we acknowledge that this dataset does not include any locations between the flow path and Noname Creek and it does not allow us to assess for seasonal variability in the flow direction. To compensate for this uncertainty, the soakage area was located roughly equidistant between Noname Creek and the edge of the site along Taylorville Road. It is assumed that any discharge water that intersects the catchment of Noname Creek will undergo significant dilution along the 200 m flowpath and the resulting concentrations will have a less than minor effect. Additionally, we have considered a potential variability of 45° in the flow direction (225° – 270°) without any potential receptors nearer to the source area (refer Figure 10). As such, this limitation does not alter the findings of the model or the conclusions of our assessment.
- The model does not account for the influence of site features (i.e., the settlement / retention pond, Cell D excavations) on the flow path or contaminant concentrations. None of these features have been constructed to a depth that will intersect with groundwater and the settlement / retention ponds are lined; as such, they should not significantly influence the plume. However, in Cell D, which is presently unlined, surface water may accumulate and infiltrate to ground. This may increase dispersion along the flowpath, but it will likely also dilute concentrations. As such, this limitation does not alter the findings of the model or the conclusions of our assessment.

Based on modelled maximum concentrations to the nearest receptor, the effect of the proposed discharges to off-site groundwater quality is highly likely to be less than minor.

6.2 Effects on Off-Site Groundwater Quality

Based on published geology of the area (refer Appendix 1), the site is located at the westernmost extent of the Pleistocene glacial outwash deposits (E.g., Gravel 1). As shown in Figure 8, the contact between Gravel 1 and the mudstone (Kaiata Formation) is located on the exposed slope, approximately 10 m above the surrounding ground level. Groundwater that daylights will be captured in the drain that runs that around the western property boundary and along Taylorville Road. Any water that does infiltrate to ground will be confined by the alignment of Noname Creek.

As such, there is no hydraulic connection between the site and off-site Holocene aquifer and the effect of the proposed discharges to off-site groundwater quality is highly likely to be less than minor.



- Legend**
- Proposed Monitoring Well Locations
 - Proposed Soakage Pit
 - Inferred Range of Potential Flowpath

0 50 m 100 m
LINZ CC BY 4.0 © Imagery Basemap contributors

ENGEO

Produced by Datanest.earth

Title:
Inferred Groundwater Flow Path and Proposed
Monitoring Bore Locations

Client: Taylorville Resource Park Ltd		Size: A4
Project: Taylorville Resource Park	Drawn: JDW	Figure No.: 10
Date: 11-09-2024	Checked: LN	
Proj No: 26200.000.001	Scale: 1:2813	Version: 1.0

6.3 Effects on Groundwater Quantity

The proposed discharges will contribute a maximum of 800 m³ / day of treated water to the unconfined aquifer. Based on the results of the Hantush model, this will result in a maximum mounding of 0.55 m directly below the discharge area, with a perturbation of the water table elevation extending approximately 250 m from the source; however, the effect is minor (< 0.01 m) beyond approximately 75 m. It is possible that the change in hydraulic head below the discharge area may result in an increase of the groundwater flowrate; however, this effect will likely not persist beyond the mounding area or have an effect that it outside the range of natural variability.

The absolute potential radius for any effect on groundwater quantity is limited due to seepage outflow where the contact between the unconfined Gravel 1 aquifer and underlying Kaiata Formation is exposed. Following the derived groundwater flow gradient shown in Figure 4, the maximum potential flowpath in the unconfined aquifer before daylighting is approximately 420 m.

As such, the effect of the proposed discharges to groundwater quantity is highly likely to be less than minor.

6.4 Effects on Surface Water Quality

To further assess potential effects on surface water, we have calculated the load of contaminants in the proposed discharges and the dilution factor in Noname Creek and the Grey River (i.e., assuming an undiluted discharge into the receiving waterbody). Contaminant loading was calculated based on the maximum concentrations detected in samples collected from the water treatment system (refer Table 2) and the maximum discharge rate (refer Section 5). To be conservative, we used the low flow of 0.02 m³/s and 80 m³/s for Noname Creek and the Grey River, respectively.

Diluted concentrations are shown in Table 3.

Based on the loading calculations, a direct discharge to Noname Creek would potentially result in an exceedance of one or more of the assessment criteria. However, the creek is located at least 100 m away from the proposed discharge area and 310 m away along the inferred direction of groundwater flow. Any contaminants in discharges will be diluted significantly in groundwater prior to entering Noname Creek and it is highly unlikely that the diluted concentrations will exceed the range of natural variability or analytical error.

Direct discharge to the Grey River would result in concentrations of contaminants that are orders of magnitude below any of the assessment criteria. We further note that, based on local topography (e.g., ridge on south side of Taylorville Road) and infrastructure (Taylorville Road), discharging in the Grey River above the GRE001 abstraction would be a practical impossibility.

Based on the calculated load of contaminants and resulting concentrations in the receiving waterbodies, the effect of the proposed discharges to surface water quality is highly likely to be less than minor.

Table 3: Indicative Concentrations in the Surface Water

Contaminant of Concern	[Max] (mg/L)	Noname Cr (mg/L)	Grey River (mg/L)	NZDWS	NZWQS 95%	NZWQS 90%	NZWQS 80%
Total aluminium	0.21	0.066	2.4 x 10 ⁻⁶	0.1	0.055	0.08	0.15
Total manganese	2.6	0.82	3.0 x 10 ⁻⁵	0.4	1.9	2.5	3.6

Contaminant of Concern	[Max] (mg/L)	Noname Cr (mg/L)	Grey River (mg/L)	NZDWS	NZWQS 95%	NZWQS 90%	NZWQS 80%
Total ammoniacal-N	16.1	5.07	1.9×10^{-4}	0.82	0.9	1.43	2.3
Nitrate-N	0.34	0.11	3.9×10^{-6}	11.3	0.092	0.092	0.092
Total arsenic	0.05	0.02	5.8×10^{-7}	0.01	0.013	0.42	1.4
Total chromium	0.0164	0.0052	1.9×10^{-7}	0.05	0.0033	0.006	0.04
Total copper	0.178	0.056	2.1×10^{-6}	2	0.0014	0.0018	0.0025
Total lead	0.00057	0.0012	6.6×10^{-9}	0.01	0.0034	0.0056	0.0094
Total nickel	0.0037	0.018	4.3×10^{-4}	0.08	0.011	0.013	0.017
Total Zinc	0.056	0.066	6.4×10^{-7}	1.5	0.008	0.015	0.031

Notes: Values in **bold** exceed one or more of the assessment criteria.

7 Proposed Monitoring Programme

The pumping equipment, pipework, and discharge area will be monitored *at least* three times daily (morning, mid-day, afternoon) to monitor the water level in the retention pond and ensure that there are no leaks in the system or scour / overtopping in the discharge area.

We propose a monitoring programme of groundwater and surface water at the site. As a component of this programme, TRPL is in the process of installing six additional monitoring bores at locations upgradient and around the site to further assess and monitor groundwater quality. On-site bores will be located in the following locations (refer Figure 10):

- Approximately 20 m downgradient of the discharge area;
- Southwest of Cell A;
- Between the discharge area and Noname Creek; and
- Intermediate between the discharge area and boundary wells.

Based on the inferred seepage velocity of the plume (0.5 m/d) changes in water quality will likely be detectable at the bore nearest the discharge area approximately one month after the commencement of discharges. We propose an initial two-week discharge duration followed by the collection and analysis of groundwater samples from the nearest bore at intervals of four weeks, five weeks, and six weeks (following commencement).

After receipt of the results from the post-commencement monitoring, the RISC5 model will be calibrated to identify if the effects of the discharges are likely to differ from those in Section 6 and / or if modifications to the proposed discharges (e.g., flow rate) are needed.

Based on the current availability of drilling subcontractors, we anticipate that the new monitoring bores will be installed in September / October 2024, prior to the arrival of the plume. Once the new monitoring bores have equilibrated, we will also be undertaking aquifer testing, to establish a site-specific hydraulic conductivity.

The RISC5 model will be updated with new information to assess for likely changes to the assessment of effects. WCRC will be provided with an updated hydrogeological report.

8 Alternatives to the Proposed Discharge to Land

We have assessed potential alternatives to the proposed discharge to land. The site is not connected to the reticulated stormwater / wastewater network. As such, discharge directly to the reticulated network is not possible.

Another alternative would be removing the water via sucker truck and discharging to the Grey District Council (GDC) Wastewater Treatment Plant (WWTP). The water treatment systems capture rainwater that falls on the active waste cells, settlement pond, and retention pond, and area comprising ~16,500 m². During a 50 mm / day storm event, this amounts to 825 m³ of water that in being added to the capacity of the settlement and retention ponds. Based on the volume of a standard sucker truck (3 – 5 m³), this amounts to 164 – 274 truck movements for each event.

We have identified two companies in Greymouth that own sucker trucks; each company with one truck in its fleet. As such, the local availability of sucker trucks would limit the operations to approximately 15 – 20 truck movements per day, which would not be adequate for anything greater than a 5 mm/day rainfall event. Additionally, the introduction of large volumes of fresh water would have a significantly disruptive effect on operations at the WWTP. According to the GDC Group Manager Operations (Aaron Haymes), the Greymouth WWTP will not accept site discharges. We have yet to receive a response regarding acceptance at the Runanga WWTP. As such, removal via sucker truck is not deemed practicable or sustainable.

Other alternatives include discharging the water directly to a nearby surface water feature. Due to the very low flow in the roadside drain (0.001 – 0.002 m³/s), this is not considered a suitable receiving environment as the receiving waters will likely be unable to attenuate changes in water quality. As an alternative, we have considered a discharge to Noname Creek.

Based on estimates of diluted concentrations (refer Table 3), direct discharge to Noname Creek would likely result in an exceedance of one or more of the assessment criteria. While it is highly unlikely that this water is being used as a source of potable water, there is potential for an effect to ecological health. As such, discharge to Noname Creek is not deemed a suitable alternative to the proposed discharge to land.

9 Planned Further Works

TRPL is continuously exploring options to improve the water management system at the site. Current planned upgrades include the installation of an aeration fountain in Stage 2 of the settlement pond (anticipated completion in September 2024) and assessing the feasibility of reconfiguring the sequence of the treatment train to allow for flocculation prior to Stage 1 of the settlement pond. As the process is improved and revised, this report will be updated to reflect the current water management practices on-site.

10 Limitations

- i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Taylorville Resource Park Limited, their professional advisers, and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.
- ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.
- iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.
- iv. This Limitation should be read in conjunction with the Engineering NZ / ACENZ Standard Terms of Engagement.
- v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (03) 328 9012 if you require any further information.

Report prepared by



Lyn Nugent, CEnvP

Senior Environmental Scientist



Jimmy Whitmore, CEnvP

Environmental Scientist

Report reviewed by



Dave Robotham, CEnvP SC

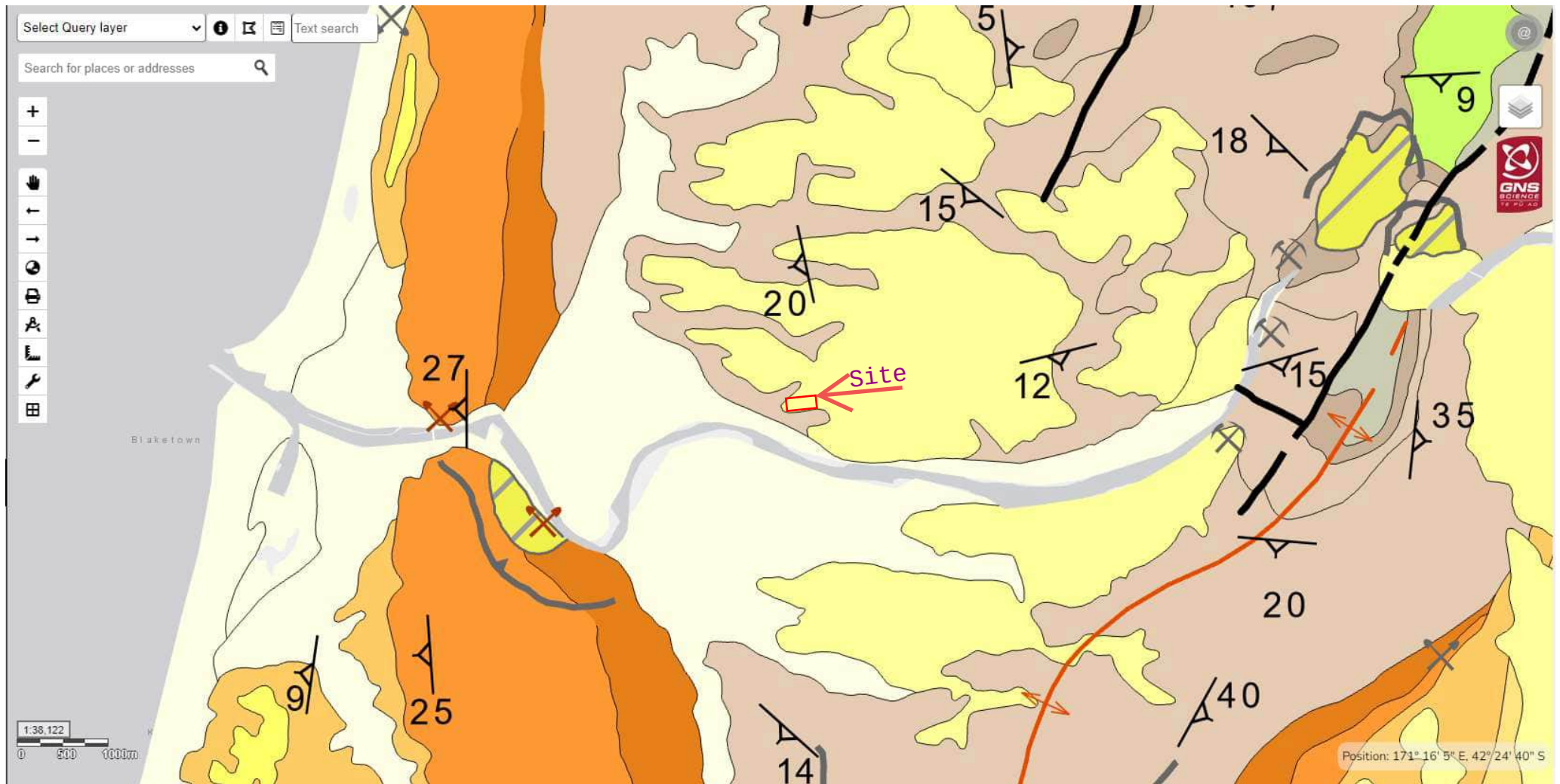
Principal Environmental Consultant

11 References

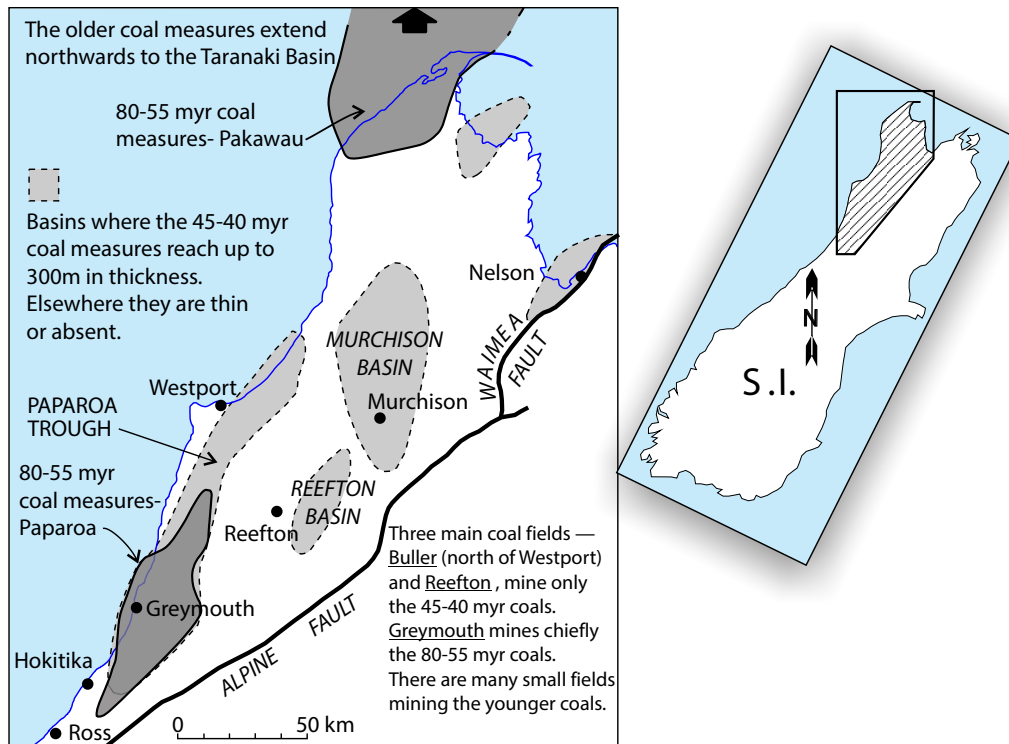
- Ballance, P. (2009). *New Zealand Geology: an illustrated guide*. Wellington: GNS.
- Carleton, G. (2010). *Simulation of Groundwater Mounding Beneath Hypothetical Stormwater Infiltration Basins (#2010-5102)*. Reston, VA: United States Geological Survey.
- Commonwealth of Australia. (2024, September 1). *Default Guideline Values*. Retrieved from Australia & New Zealand Guidelines for Fresh & Marine Water Quality: <https://www.waterquality.gov.au/anz-guidelines/guideline-values/default>
- Domenico, P. a. (1990). *Physical and Chemical Hydrogeology*. New York: John Wiley & Sons.
- Fetter, C. (2021). *Applied Hydrogeology*. Upper Saddle River, NJ: Prentice-Hall, Inc.
- Freeze, R. A. (1979). *Gropundwater*. Englewood Cliffs: Prentice Hall.
- Gelhar, L. (1985). *A Review of Field-Scale Physical Solute Transport Processes in Saturated and Unsaturated Porous Media*. Washington: Electric Power Research Institute.
- Hantush, M. (1967). Growth and Decay of Groundwater Mounds in Response to Uniform Percolation. *Water Resources Journal* (3), 227-234.
- Kruseman, G. a. (2000). *Analysis and Evaluation of Pumping Test Data (2nd Ed)*. International Institute for Land Reclamation and Improvement.
- MBIE. (2020). *Acceptable Solutions and Verification Methods For New Zealand Building Code Clause E1 Surface water*. Wellington: New Zealand Government.
- MoH. (2018). *Drinking Water Standards for New Zealand 2005 (Revised 2018)*. Wellington: Ministry of Health.
- NIWA. (2024, September 4). *West Coast*. Retrieved from Climate and Weather: <https://niwa.co.nz/climate-and-weather/west-coast>
- NIWA, J. M. (2019). *National Environmental Monitoring Standard*. Wellington: Ministry for the Environment.
- Rattenbury, M., & Isaac, M. (2012). The QMAP 1:250 000 Geological Map of New Zealand project. *New Zealand Journal of Geology and Geophysics*, 55, 393-405.
- WCRC. (2020). *Regional Land and Water Plan*. Greymouth: West Coast Regional Council.
- Westerhoff, R. (2018). Incorporation of Satellite Data and Uncertainty in a Nationwide Groundwater Recharge Model in New Zealand. *Remote Sensing* 10(1), 58.



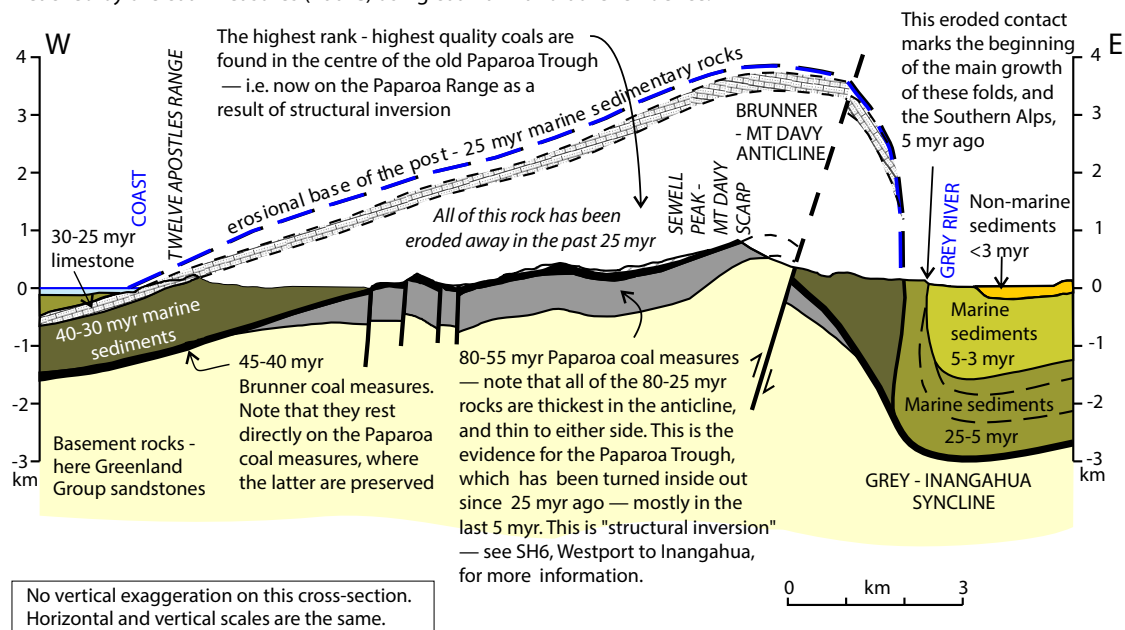
APPENDIX 1: Supporting Geological Information



Box 20.4 A. West Coast coal measures.



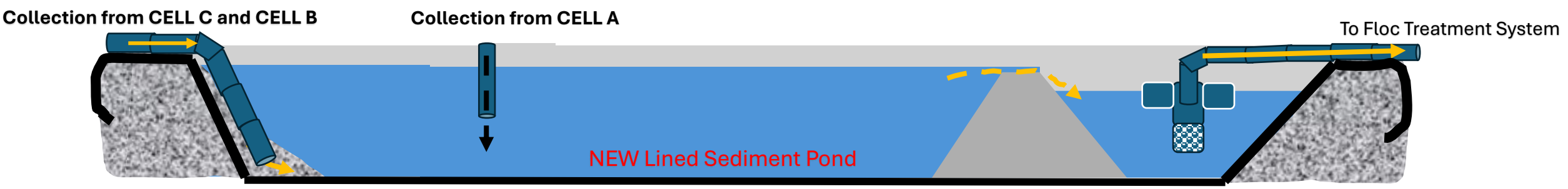
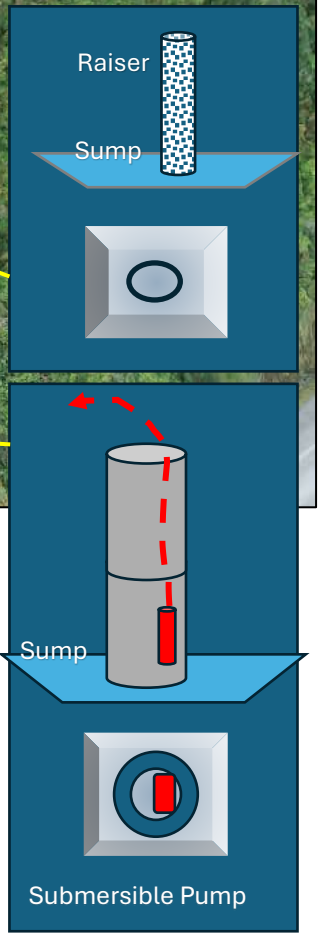
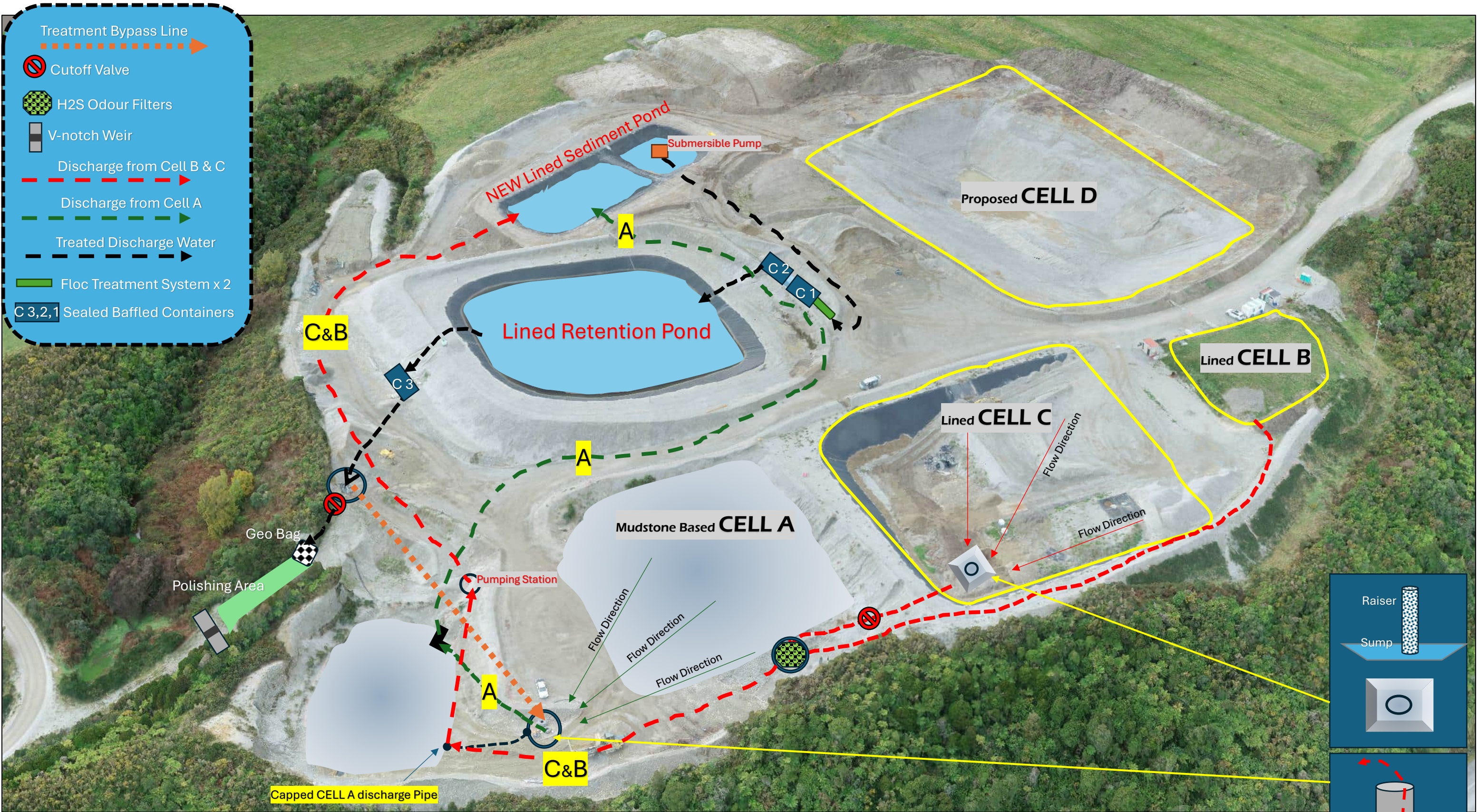
Note the 7 km of "structural relief". It may be as high as 9 km, according to calculations of maximum temperature reached by the coal measures (180°C) using coal rank and other evidence.



West-to-east cross section located just north of Greymouth, to show the relationship of the two sets of coal measures to each other and to the old Paparaoa Trough, and the structural inversion of the trough to form the Brunner - Mt Davy anticline/Paparaoa Range.



APPENDIX 2: TRP On-Site Water Management Layout





APPENDIX 3: Odour Filter Specifications

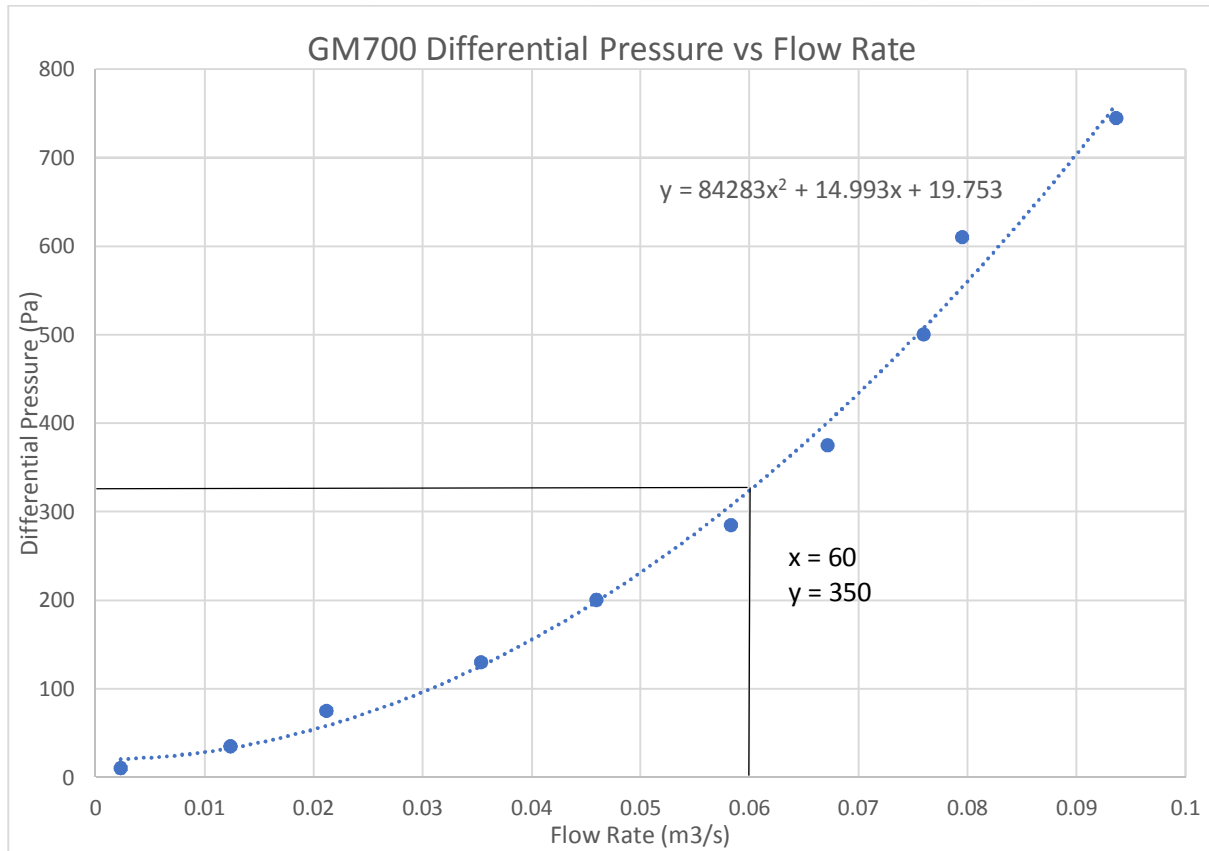
GM700 - Specifications

Process Overview

The air filtration system is designed to treat wastewater odour emissions entering the unit by the four McBerns Proprietary Combined Media Cartridges, which is emitted to atmosphere.



Filtration Properties	H ₂ S Adsorption Capacity	11kg
	Total Media Volume	0.1m ³
	Media Mass	
	McBerns Combined Media (Cartridges)	4 x F375MC
	Total Media Mass	56kg
Flow Properties	Max Flow	60 L/s
	Fan Flow Properties	
	Storm 10 (Valve Controlled)	60L/s
	Differential Pressure (refer to figure at back)	324 Pa
Unit Properties	Dimensions	
	Unit Housing	880 x 821 x 609 mm
	Inlet Duct	DN150 UPVC
	Outlet Duct	DN150 UPVC
	Material Properties	
	Fabrication Material	UPVC
	Specific Gravity	1.42g/cm ³
	Max Continuous Operating Temperature	50°C
	Max Short Term Operating Temperature	60°C
	Tensile Strength	51MPa
	Brinell Hardness	15kg/mm ²
	Mass	
	Unit Housing	32kg
	Overall	88kg





APPENDIX 4: Flocculant Specifications



PORTABLE WATER TREATMENT SYSTEM

FLOCCULANT INTRODUCTION AND MIXING SYSTEM
FOR USE WITH APPLIED POLYMER SYSTEMS FLOC LOGS®



REMOVE SEDIMENT, METALS, AND NUTRIENTS FROM WATER - FAST!

In-pipe water treatment for
dewatering applications and
clarification of ponds and lakes

Rapid flocculant introduction
and mixing system that removes
>95% of turbidity in seconds

Metal and phosphorus removal
efficiency of >70%

Easy to use, environmentally safe



Untreated Pond



Treated Pond



THE SECRET TO RAPID WATER CLARIFICATION

The Turbo Floc System
is optimized for use
with Applied Polymer
Systems Floc Logs -
the industries first
and leading anionic
polyacrylamide logs.

The Turbo Floc system
provides rapid Floc
Log dosing and
mixing in a portable,
easy to use system.

Floc Logs are site
specific and tailored
to each project,
ensuring effective
turbidity reduction.



Floc Log



IY Progen
Systems

www.turbofloc.com
info@turbofloc.com
404-353-3546



Applied
Polymer
Systems, Inc.

www.siltstop.com
info@siltstop.com
678-494-5998

COMPONENTS

- **Doser** - Easy insert and removal of APS Floc Logs to dose turbid water with powerful and environmentally friendly water clarifying polymers
- **Mixer** - Inline mixer allows for rapid polymer-sediment reaction and floc formation
- **Connectors (OPTIONAL)** - Allow for 90 and 180 degree hose direction changes. Makes hose connections easy and saves space. Connectors also create turbulence and additional mixing for superior floc formation.
- **Floc Logs** - Site specific anionic polyacrylamide logs that dissolve, target, and bind turbidity
- Lay flat hose and pump sold separately

SIZE AND CAPACITY

4 inch system - Up to 500 GPM

6 inch system - Up to 1000 GPM

Multiple systems may be used together to increase treatment capacity

DO NOT EXCEED FLOW AND PRESSURE LIMITS

SPECIFICATIONS

Schedule 40 PVC

Aluminum Camlock Couplings

Max Pressure: 220 PSI (4 inch system)

180 PSI (6 inch system)

FLOC CAPTURE

Flocculated sediment should be captured prior to discharge of treated water off site. Floc may be settled in a sediment trap or basin, or using other sediment retention devices (jute matting, dispersion field, rock checks, wattles, SRBs).



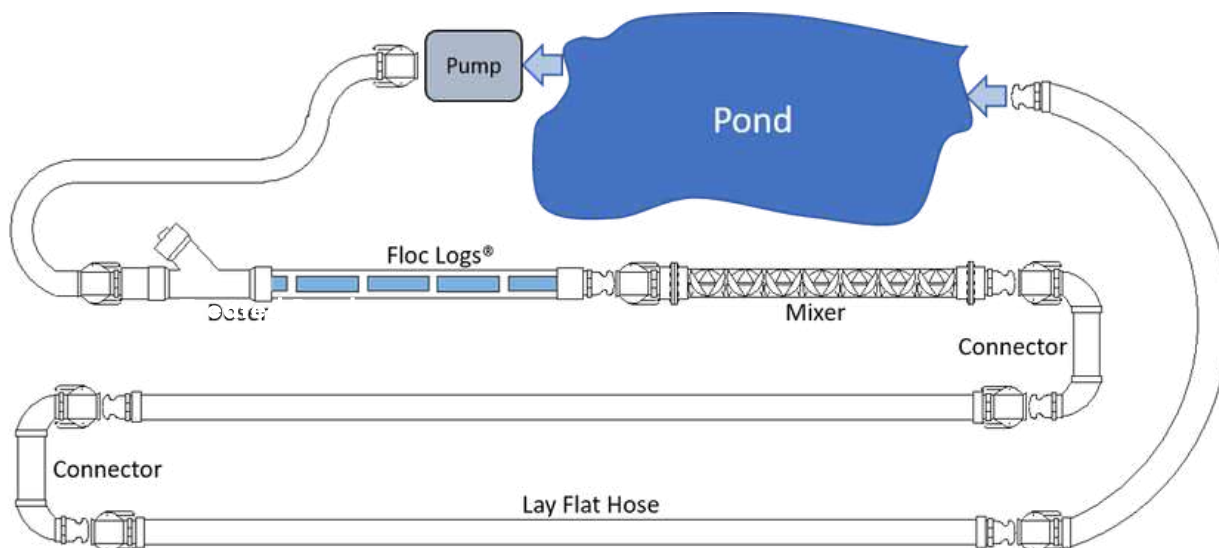
Top: Dosier; Bottom: Mixer



Connectors



Turbo Floc System





APPENDIX 5: Summary of Laboratory Analytical Results

Table A6.1: TRP Water Treatment System Sample Results

Analyte	NZDWS ¹	NZWQS (95%) ²	NZWQS (90%) ²	NZWQS (80%) ²	Leachate (Cell A)		Leachate (Cell B/C)							
					20/06/24	31/07/24	06/07/23	18/07/23	27/09/23	04/10/23	20/06/24	31/07/24	08/06/23	18/07/23
Sum of Anions					-	14	-	-	-	-	-	14.2	-	-
Sum of Cations					-	14.2	-	-	-	-	-	14.6	-	-
An/Cat balance (%)					-	-1%	-	-	-	-	-	-1%	-	-
pH		7.7	7.7	7.7	-	7.7	7.5	7.2	7.1	7	-	6.9	7.8	7.8
Total Alkalinity					-	330	-	-	-	-	-	310	-	-
Bicarbonate					-	400	-	-	-	-	-	380	-	-
Total Hardness	200				-	590	-	-	-	-	-	550	-	-
Electrical conductivity (mS/m)		10.7	10.7	10.7	-	125.1	503	523	349	427	-	130.1	-	89.5
Dissolved aluminium	0.1	0.055	0.08	0.15	<0.06	0.005	0.185	-	-	0.22	0.1	0.05	-	-
Total aluminium		0.055	0.08	0.15	<0.063	0.071	0.23	-	-	0.24	0.76	0.082	0.52	-
Dissolved calcium					-	220	-	-	-	-	-	196	-	-
Dissolved iron					-	0.1	-	-	-	-	-	0.51	-	-
Total iron	0.2				-	1.96	-	-	-	-	-	0.68	-	-
Dissolved magnesium					-	11.3	1.72	-	-	1.4	-	15.6	-	-
Total magnesium					-	11.7	1.77	-	-	1.42	-	15.4	-	-
Dissolved manganese	0.4	1.9	2.5	3.6	3.1	1.97	-	-	-	-	2.7	2.7	-	-
Total manganese		1.9	2.5	3.6	3.6	2.1	-	-	-	-	2.8	2.6	-	-
Dissolved potassium					-	22	-	-	-	-	-	29	-	-
Dissolved sodium	200				-	33	-	-	-	-	-	34	-	-
Chloride	250				30	17.7	79	89	64	79	19.8	19.7	-	18.3
Total Ammoniacal-N	0.82	0.9	1.43	2.3	-	5.4	96	98	68	94	-	16.1	4.7	3
Nitrite-N	0.912				-	0.069	<0.1	<0.2	0.37	0.06	-	0.025	0.023	0.089
Nitrate-N	11.3	0.092	0.092	0.092	-	0.079	<0.1	<0.2	<0.002	0.72	-	0.34	0.37	2.2
Nitrite+Nitrate-N					0.005	0.148	<0.1	<0.2	0.34	0.78	0.94	0.36	0.39	2.3
DRP		0.009	0.009	0.009	-	< 0.004	-	-	-	-	-	0.024	-	-
Sulphate	250				-	330	-	-	-	-	-	350	-	-
cBOD5					-	3	-	-	-	-	-	11	-	-
COD					-	74	-	-	-	-	-	114	-	-
Dissolved arsenic	0.01	0.013	0.42	1.4	0.0123	0.0112	0.89	0.96	0.53	0.37	0.024	0.041	0.026	0.0151
Dissolved cadmium	0.004	0.0002	0.0004	0.0008	<0.00005	< 0.00005	<0.0003	<0.000053	<0.00011	<0.000053	<0.00005	< 0.00005	<0.0005	<0.00005
Dissolved chromium	0.05	0.0033	0.006	0.04	0.008	0.006	0.21	0.22	0.12	0.144	0.0061	0.0139	0.007	0.0075
Dissolved copper	2	0.0014	0.0018	0.0025	0.0017	0.0054	0.003	0.00178	<0.0011	0.058	0.001	0.033	<0.005	0.0011
Dissolved lead	0.01	0.0034	0.0056	0.0094	<0.00010	< 0.00010	0.0024	0.00123	0.00066	0.00024	<0.00010	0.00012	0.0021	<0.00010
Dissolved nickel	0.08	0.011	0.013	0.017	0.0054	0.0029	0.016	0.0146	0.014	0.0147	0.0046	0.0026	<0.005	0.003
Dissolved zinc	1.5	0.008	0.015	0.031	0.02	0.024	0.012	0.0133	0.0139	0.0066	0.041	0.0077	0.093	0.063
Total arsenic		0.013	0.42	1.4	0.052	0.026	0.98	0.97	0.56	0.15	0.044	0.05	0.03	0.025
Total cadmium		0.0002	0.0004	0.0008	0.000178	< 0.000053	<0.000053	<0.00053	<0.000053	<0.00027	<0.000053	< 0.000053	0.000074	0.000127
Total chromium (IV)		0.0033	0.006	0.04	0.0112	0.0082	0.22	0.22	0.115	0.149	0.008	0.0164	0.0105	0.0087
Total copper		0.0014	0.0018	0.0025	0.0127	0.009	0.0087	0.008	0.00125	0.193	0.023	0.178	0.0056	0.0055
Total lead		0.0034	0.0056	0.0094	0.0044	0.00033	0.013	0.0109	0.0023	0.0025	0.00038	0.00021	0.0041	0.00135
Total nickel		0.011	0.013	0.017	0.0056	0.0031	0.0145	0.0149	0.0129	0.0145	0.0049	0.0028	0.0037	0.0035
Total zinc		0.008	0.015	0.031	0.197	0.036	0.071	0.09	0.026	0.0158	0.042	0.0164	0.11	0.21

Notes:

All values provided in units of milligrams per liter (mg/L) unless otherwise specified.

¹ Ministry of Health (2018). Drinking-water Standards for New Zealand 2005 (revised 2018). Table 2.2 (health based), Table 2.3 (aesthetic)

² Australia and New Zealand Guidelines from Fresh & Marine Water Quality. Default Guideline Values, level of protection specified. Where no Toxicant DGV has been derived, values are for physical chemical (PC) stressors (based on MFE REC CX/L)

Bordered values exceed the NZDWS (MAV or GV)

Values in *italics* exceed the NZWQS, 95% level of protection

Values in **bold** exceed the NZWQS, 90% level of protection

Gray highlighted values exceed the NZWQS, 80% level of protection

< Below the laboratory reporting limit (<RL)

Table A6.1: TRP Water Treatment System Sample Results

Analyte	NZDWS ¹	NZWQS (95%) ²	NZWQS (90%) ²	NZWQS (80%) ²	Sediment Pond					SWSDP	Settlement Stage 2	DC/C3	Deep Sump
					17/09/23	03/10/23	16/01/24	19/06/24	31/07/24				
Sum of Anions					-	-	11.6	-	0.46	12.5	14.3	14.2	14.1
Sum of Cations					-	-	12.4	-	0.44	13	14.6	14.8	14.5
An/Cat balance (%)					-	-	7.2	-	2%	-2%	-1%	-2%	-1%
pH		7.7	7.7	7.7	7.5	7	7.2	7.4	6.3	7.7	8.1	8.2	7.8
Total Alkalinity					-	-	200	-	3.2	210	340	310	320
Bicarbonate					-	-	240	-	4	250	410	380	390
Total Hardness	200				-	-	530	-	13.4	550	600	610	600
Electrical conductivity (mS/m)		10.7	10.7	10.7	101.9	116.1	106.8	136.5	5.4	114	125.6	126.2	125.9
Dissolved aluminium	0.1	0.055	0.08	0.15	-	0.05	-	0.004	< 0.003	-	0.016	0.013	0.008
Total aluminium		0.055	0.08	0.15	-	0.103	0.086	0.096	0.67	0.035	0.21	0.035	0.041
Dissolved calcium					-	-	197	-	3.7	210	220	230	220
Dissolved iron									< 0.02		0.05	0.04	0.1
Total iron	0.2				-	-	3.9	-	0.29	-	1.56	0.41	0.89
Dissolved magnesium					-	0.57	8.7	3.5	1.04	9.2	11.6	11.6	11.4
Total magnesium					-	0.55	-	3.2	1.11	-	11.9	12.3	11.7
Dissolved manganese	0.4	1.9	2.5	3.6	-	-	-	-	0.056		2.6	1.71	1.85
Total manganese		1.9	2.5	3.6	-	-	3.2	-	0.061		2.6	1.8	1.95
Dissolved potassium					-	-	16.5	-	0.52	18.7	23	23	22
Dissolved sodium	200				-	-	27	-	3.7	29	36	34	33
Chloride	250				20	25	18.1	20	3.8	19.6	19.6	18.2	18.1
Total Ammoniacal-N	0.82	0.9	1.43	2.3	0.98	7.6	3.8	6.4	0.015	4.2	5.4	5.9	5.5
Nitrite-N	0.912				0.34	0.013	0.057	0.011	< 0.002	0.022	0.053	0.082	0.074
Nitrate-N	11.3	0.092	0.092	0.092	6.5	0.33	0.026	0.009	0.107	0.013	0.1	0.064	0.075
Nitrite+Nitrate-N					6.8	0.34	0.083	0.02	0.108	0.035	0.154	0.145	0.15
DRP		0.009	0.009	0.009	-	-	< 0.004	-	< 0.004	0.01	< 0.004	< 0.004	< 0.004
Sulphate	250				-	-	340	-	13.6	320	330	360	340
cBOD5					-	-	4	-	< 2	< 2	3	3	3
COD					-	-	56	-	< 6	62	84	80	70
Dissolved arsenic	0.01	0.013	0.42	1.4	0.021	0.057	-	0.021	< 0.0010	-	0.0125	0.022	0.0146
Dissolved cadmium	0.004	0.0002	0.0004	0.0008	0.00007	0.00006	-	< 0.00005	< 0.00005	-	< 0.00005	< 0.00005	< 0.00005
Dissolved chromium	0.05	0.0033	0.006	0.04	0.0099	0.0179	-	0.0071	< 0.0005	-	0.0065	0.0069	0.0063
Dissolved copper	2	0.0014	0.0018	0.0025	0.0049	0.0183	-	0.0013	< 0.0005	-	0.0077	0.0078	0.0061
Dissolved lead	0.01	0.0034	0.0056	0.0094	0.00082	0.00061	-	< 0.00010	< 0.00010	-	< 0.00010	< 0.00010	< 0.00010
Dissolved nickel	0.08	0.011	0.013	0.017	0.0041	0.0037	-	0.005	< 0.0005	-	0.0037	0.0031	0.003
Dissolved zinc	1.5	0.008	0.015	0.031	0.182	0.069	-	0.025	0.0033	-	0.044	0.023	0.023
Total arsenic		0.013	0.42	1.4	0.026	0.068	0.043	0.037	< 0.0011	0.000069	0.021	0.026	0.024
Total cadmium		0.0002	0.0004	0.0008	0.00022	0.00009	0.000053	0.000102	< 0.000053	0.0092	< 0.000053	< 0.000053	< 0.000053
Total chromium (IV)		0.0033	0.006	0.04	0.0105	0.0184	0.0088	0.0085	< 0.00053	0.0192	0.0086	0.0084	0.0082
Total copper		0.0014	0.0018	0.0025	0.0106	0.113	0.039	0.006	0.00061	0.00058	0.021	0.0108	0.009
Total lead		0.0034	0.0056	0.0094	0.0021	0.00101	0.00057	0.00191	0.0007		0.00057	0.00025	0.00014
Total nickel		0.011	0.013	0.017	0.0039	0.004	0.0033	0.0049	< 0.00053	0.156	0.0037	0.0031	0.0031
Total zinc		0.008	0.015	0.031	0.34	0.099	0.115	0.066	0.0064	1.62	0.056	0.03	0.027

Notes:

All values provided in units of milligrams per liter (mg/L) unless otherwise specified.

¹ Ministry of Health (2018). Drinking-water Standards for New Zealand 2005 (revised 2018). Table 2.2 (health based), Table 2.3 (aesthetic)² Australia and New Zealand Guidelines from Fresh & Marine Water Quality. Default Guideline Values, level of protection specified. Where no Toxicant DGV has been derived, values are for physical chemical (PC) stressors (based on MfE REC CX/L)

Bordered values exceed the NZDWS (MAV or GV)

Values in *italics* exceed the NZWQS, 95% level of protectionValues in **bold** exceed the NZWQS, 90% level of protection

Gray highlighted values exceed the NZWQS, 80% level of protection

< Below the laboratory reporting limit (<RL)

Table A6.2: TRP Spring and Groundwater Sample Results

Analyte	NZDWS ¹	NZWQS (95%) ²	NZWQS (90%) ²	NZWQS (80%) ²	31/07/24 Trace ³	Upgradient groundwater springs												
						SPA	SPC	SPE		TCD1/Discharge								
						25/08/23	28/08/23	28/08/23	31/07/24	31/01/23	19/07/23	27/09/23	03/10/23	16/01/24	14/02/24	22/05/24	19/06/24	31/07/24
Sum of Anions					4.68	-	-	-	0.64	-	-	-	-	2.4	-	-	-	3.1
Sum of Cations					4.68	-	-	-	0.67	-	-	-	-	2.4	-	-	-	3.1
An/Cat balance (%)									-2%					0%				0%
pH		7.7	7.7	7.7			6.2	7	7.1	7.4	7.2	7.9	6.7	6.3	6.3	6.8	7.1	6.6
Total Alkalinity					211.2	-	-	-	11.8	-	-	-	-	46	-	-	-	55
Bicarbonate					252	-	-	-	14.4	-	-	-	-	56	-	-	-	67
Total Hardness	200				60	-	-	-	21	-	-	-	-	95	-	-	-	125
Electrical conductivity (mS/m)		10.7	10.7	10.7	42.96		7.9	7.1	7.7	60.1	66.1	89.6	27.7	26.6	41.4	41.5	95.3	32.8
Dissolved aluminium	0.1	0.055	0.08	0.15	0.1116	0.01	0.104	0.037	0.043	-	-	-	0.008	-	0.011	0.012	0.008	0.012
Total aluminium		0.055	0.08	0.15	23.16	0.042	-	-	0.39	0.82	-	-	2.6	0.026	0.024	0.024	0.022	0.038
Dissolved calcium					15.96	-	-	-	6.7	-	-	-	-	32	-	-	-	43
Dissolved iron					< 0.02				0.02	-	-	-	-	-	-	-	-	< 0.02
Total iron	0.2				18.36	-	-	-	0.38	-	-	-	-	0.131	-	-	-	0.032
Dissolved magnesium					4.92	0.048	0.0174	0.0179	1.08	-	-	-	-	3.4	-	-	-	4.0
Total magnesium					8.4	0.055	-	-	1.1	-	-	-	-	-	-	-	-	4.0
Dissolved manganese	0.4	1.9	2.5	3.6	0.66				0.0039	-	-	-	0.0019	-	1.7	1.84	2.4	0.92
Total manganese		1.9	2.5	3.6	0.9	-	-	-	0.147	0.87	-	-	2.3	1.81	1.62	1.72	2.5	0.94
Dissolved potassium					1.908	-	-	-	0.68	-	-	-	-	2.3	-	-	-	3.7
Dissolved sodium	200				76.8	-	-	-	5	-	-	-	-	11	-	-	-	11.8
Chloride	250				13.32	-	6.4	6.5	7.4	12.7	14.4	19.6	10.4	10.3	-	11.4	15.8	7.7
Total Ammoniacal-N	0.82	0.9	1.43	2.3	0.3	<0.010	-	-	< 0.010	1.32	1.42	0.28	0.032	0.152	0.18	0.012	3.4	0.011
Nitrite-N	0.912				< 0.002	<0.002	<0.002	<0.002	< 0.002	0.28	0.119	0.199	0.005	0.01	0.011	0.005	0.03	0.008
Nitrate-N	11.3	0.092	0.092	0.092	1.476	0.24	1.06	1.4	1.38	0.005	2.7	5.8	1.53	0.58	0.7	1.54	0.43	2.6
Nitrite+Nitrate-N					1.476	0.24	1.06	1.4	1.39	0.28	2.8	6	1.54	0.59	0.71	1.55	0.46	2.6
DRP		0.009	0.009	0.009	0.1932	-	-	-	< 0.004	-	-	-	-	< 0.004	-	-	-	< 0.004
Sulphate	250				8.28	-	-	-	4.8	-	-	-	-	56	-	-	-	75
cBOD5					< 2	-	-	-	< 2	-	-	-	-	< 2	-	-	-	< 2
COD					36	-	-	-	6	-	-	-	-	6	-	-	-	8
Dissolved arsenic	0.01	0.013	0.42	1.4	0.009	<0.0010	<0.0010	<0.0010	< 0.0010	-	0.0083	0.007	0.0017	-	0.0025	< 0.0010	0.0149	0.001
Dissolved cadmium	0.004	0.0002	0.0004	0.0008	< 0.00005	<0.00005	<0.00005	<0.00005	< 0.00005	-	<0.00005	<0.00005	<0.00005	-	0.00006	< 0.00005	< 0.00005	< 0.00005
Dissolved chromium	0.05	0.0033	0.006	0.04	< 0.0005	<0.0005	<0.0005	<0.0005	< 0.0005	-	0.0042	0.0067	0.0005	-	0.0011	0.001	0.0037	0.0007
Dissolved copper	2	0.0014	0.0018	0.0025	< 0.0005	<0.0005	<0.0005	<0.0005	< 0.0005	-	0.0008	0.0025	0.0011	-	0.0046	0.0018	0.002	0.0015
Dissolved lead	0.01	0.0034	0.0056	0.0094	< 0.00010	<0.00010	<0.00010	<0.00010	< 0.00010	-	<0.00010	0.00018	<0.00010	-	<0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved nickel	0.08	0.011	0.013	0.017	< 0.0005	<0.0005	<0.0005	<0.0005	< 0.0005	-	0.0025	0.0034	0.0007	-	0.0019	0.002	0.0025	0.0012
Dissolved zinc	1.5	0.008	0.015	0.031	0.00408	0.0018	0.0011	<0.0010	< 0.0010	-	0.044	0.073	0.0051	-	0.025	0.0051	0.0117	0.005
Total arsenic		0.013	0.42	1.4	0.0252	<0.0011	-	-	< 0.0011	0.026	0.0093	0.0084	0.0113	0.0023	0.0025	< 0.0011	0.0179	< 0.0011
Total cadmium		0.0002	0.0004	0.0008	0.00072	<0.000053	-	-	< 0.000053	0.000103	0.000062	0.000069	0.000102	<0.000053	0.000053	< 0.000053	< 0.000053	< 0.000053
Total chromium (IV)		0.0033	0.006	0.04	0.01344	<0.00053	-	-	< 0.00053	0.0064	0.0044	0.0068	0.0033	0.00069	0.00162	0.00127	0.0042	0.00092
Total copper		0.0014	0.0018	0.0025	0.0288	0.00054	-	-	< 0.00053	0.0079	0.0021	0.0041	0.0088	0.0024	0.0052	0.00193	0.0022	0.00169
Total lead		0.0034	0.0056	0.0094	0.036	<0.00011	-	-	0.00041	0.0021	0.00028	0.00083	0.007	0.00029	<0.00011	< 0.00011	< 0.00011	< 0.00011
Total nickel		0.011	0.013	0.017	0.01632	<0.00053	-	-	< 0.00053	0.0026	0.0026	0.0031	0.0036	0.00141	0.00182	0.00193	0.0027	0.00135
Total zinc		0.008	0.015	0.031	0.0708	0.0023	-	-	0.0033	0.174	0.059	0.105	0.048	0.0198	0.024	0.0053	0.0123	0.0053
Dissolved boron	1.4	0.94	1.5	2.5	-	0.005	-	-	-	-	-	-	-	-	0.33	-	-	-
Total boron		0.94	1.5	2.5	-	<0.0053	-	-	-	0.67	-	-	-	-	0.32	-	-	-

Notes:

All values provided in units of milligrams per liter (mg/L) unless otherwise specified.

¹ Ministry of Health (2018). Drinking-water Standards for New Zealand 2005 (revised 2018). Table 2.2 (health based), Table 2.3 (aesthetic)

² Australia and New Zealand Guidelines from Fresh & Marine Water Quality. Default Guideline Values, level of protection specified. Where no Toxicant DGV has been derived, values are for physical chemical (PC) stressors (based on MfE REC CX/L)

³ Trace concentration (defined as the highest upgradient [MB1, MB2s, MB2d] concentration ± 20%).

Values in **red** exceed the trace level (defined as the highest upgradient [MB1, MB2s, MB2d] concentration ± 20%).

Bordered values exceed the NZDWS (MAV or GV)

Values in *italics* exceed the NZWQS, 95% level of protection

Values in **bold** exceed the NZWQS, 90% level of protection

Gray highlighted values exceed the NZWQS, 80% level of protection

< Below the laboratory reporting limit (<RL)

Table A6.2: TRP Spring and Groundwater Sample Results

Analyte	NZDWS ¹	NZWQS (95%) ²	NZWQS (90%) ²	NZWQS (80%) ²	31/07/24 Trace ³	Cross/downgradient groundwater springs						Upgradient			
						SP1		SP2		SP3		MB1			
						17/01/24	31/07/24	17/01/24	31/07/24	17/01/24	31/07/24	06/07/23	09/10/23	19/06/24	30/07/24
Sum of Anions					4.68	3.4	0.4	2.6	0.37	4.9	2.8	-	-	-	0.73
Sum of Cations					4.68	3.6	0.4	2.7	0.39	5.2	2.7	-	-	-	0.77
An/Cat balance (%)							0%		-3%		2%				-3%
pH		7.7	7.7	7.7		6.6	6	6.1	4.9	6.7	6.4	6.7	6.3	6.3	6.1
Total Alkalinity					211.2	5.5	4.1	2.7	1.4	8.4	4.3	-	-	-	17.2
Bicarbonate					252	6.7	5	3.4	1.7	10.2	5.2	-	-	-	21
Total Hardness	200				60	151	7	112	5.9	210	109	-	-	-	25
Electrical conductivity (mS/m)		10.7	10.7	10.7	42.96	36.4	4.5	28.5	4.7	50	30.4	8.8	8.3	8.2	8.4
Dissolved aluminium	0.1	0.055	0.08	0.15	0.1116	-	0.093	-	0.31	-	0.047	0.058	0.088	0.062	0.093
Total aluminium		0.055	0.08	0.15	23.16	1.33	0.196	0.2	0.49	0.7	0.155	1.02	-	0.87	0.29
Dissolved calcium					15.96	53	1.45	35	0.85	63	36	-	-	-	7.6
Dissolved iron					< 0.02		< 0.02		0.03		< 0.02				< 0.02
Total iron	0.2				18.36	0.62	0.053	0.076	0.138	1.31	0.19	-	-	-	0.115
Dissolved magnesium					4.92	4.9	0.81	5.8	0.91	13.3	4.6	0.021	0.0094	0.0078	1.39
Total magnesium					8.4	-	0.82	-	0.85	-	4.6	0.039	-	0.0165	1.39
Dissolved manganese	0.4	1.9	2.5	3.6	0.66		0.0061		0.0118		0.0019				0.0077
Total manganese		1.9	2.5	3.6	0.9	0.052	0.0182	0.067	0.0117	0.067	0.005	-	-	-	0.0104
Dissolved potassium					1.908	0.26	0.13	0.07	0.25	0.27	0.6	-	-	-	0.61
Dissolved sodium	200				76.8	13.1	5.5	11.3	5.1	21	12.2	-	-	-	5.6
Chloride	250				13.32	12	8.4	13.5	7.2	19	11.5	7.2	6.6	-	6.7
Total Ammoniacal-N	0.82	0.9	1.43	2.3	0.3	<0.010	0.011	<0.010	0.013	<0.010	< 0.010	0.035	-	< 0.010	< 0.010
Nitrite-N	0.912				< 0.002	<0.002	< 0.002	<0.002	< 0.002	<0.002	< 0.002	0.74	<0.002	0.004	< 0.002
Nitrate-N	11.3	0.092	0.092	0.092	1.476	0.32	0.66	0.008	1.13	0.3	0.22	0.115	1.17	1.17	1.07
Nitrite+Nitrate-N					1.476	0.32	0.66	0.008	1.13	0.3	0.22	0.85	1.17	1.17	1.07
DRP		0.009	0.009	0.009	0.1932	<0.004	< 0.004	<0.004	< 0.004	<0.004	< 0.004	-	-	-	0.005
Sulphate	250				8.28	139	1.7	102	2.9	200	112	-	-	-	5.6
cBOD5					< 2	< 2	< 2	< 2	< 2	< 2	< 2	-	-	-	< 2
COD					36	17	10	13	< 6	32	14	-	-	-	< 6
Dissolved arsenic	0.01	0.013	0.42	1.4	0.009	-	< 0.0010	-	< 0.0010	-	< 0.0010	<0.0010	<0.0010	< 0.0010	< 0.0010
Dissolved cadmium	0.004	0.0002	0.0004	0.0008	< 0.00005	-	< 0.00005	-	< 0.00005	-	< 0.00005	<0.00005	<0.00005	< 0.00005	< 0.00005
Dissolved chromium	0.05	0.0033	0.006	0.04	< 0.0005	-	< 0.0005	-	< 0.0005	-	< 0.0005	<0.0005	<0.0005	< 0.0005	< 0.0005
Dissolved copper	2	0.0014	0.0018	0.0025	< 0.0005	-	< 0.0005	-	< 0.0005	-	< 0.0005	0.027	0.0015	0.0011	< 0.0005
Dissolved lead	0.01	0.0034	0.0056	0.0094	< 0.00010	-	< 0.00010	-	< 0.00010	-	< 0.00010	0.00077	<0.00010	< 0.00010	< 0.00010
Dissolved nickel	0.08	0.011	0.013	0.017	< 0.0005	-	< 0.0005	-	< 0.0005	-	< 0.0005	0.0033	<0.0005	< 0.0005	< 0.0005
Dissolved zinc	1.5	0.008	0.015	0.031	0.00408	-	< 0.0010	-	0.001	-	< 0.0010	0.133	0.0193	0.017	0.0016
Total arsenic		0.013	0.42	1.4	0.0252	<0.0011	< 0.0011	<0.0011	< 0.0011	<0.0011	< 0.0011	0.0018	-	< 0.0011	< 0.0011
Total cadmium		0.0002	0.0004	0.0008	0.00072	<0.000053	< 0.000053	0.000067	< 0.000053	0.000055	< 0.000053	<0.000053	-	< 0.000053	< 0.000053
Total chromium (IV)		0.0033	0.006	0.04	0.01344	0.00083	< 0.00053	0.00065	< 0.00053	0.00122	< 0.00053	0.00131	-	0.00095	< 0.00053
Total copper		0.0014	0.0018	0.0025	0.0288	0.00109	< 0.00053	<0.00053	< 0.00053	0.00077	< 0.00053	0.04	-	0.0041	< 0.00053
Total lead		0.0034	0.0056	0.0094	0.036	0.00057	0.00011	<0.00011	0.00012	0.00085	0.00013	0.0132	-	0.0021	0.00034
Total nickel		0.011	0.013	0.017	0.01632	0.0058	< 0.00053	0.0023	< 0.00053	0.0039	< 0.00053	0.0053	-	0.0009	< 0.00053
Total zinc		0.008	0.015	0.031	0.0708	0.0102	0.0019	0.0028	0.0026	0.0072	0.0014	0.153	-	0.022	0.003
Dissolved boron	1.4	0.94	1.5	2.5	-	-	-	-	-	-	-	0.008	-	-	-
Total boron		0.94	1.5	2.5	-	-	-	-	-	-	-	0.008	-	-	-

Notes:

All values provided in units of milligrams per liter (mg/L) unless otherwise specified.

¹ Ministry of Health (2018). Drinking-water Standards for New Zealand 2005 (revised 2018). Table 2.2 (health based), Table 2.3 (aesthetic)

² Australia and New Zealand Guidelines from Fresh & Marine Water Quality. Default Guideline Values, level of protection specified. Where no Toxicant DGV has been derived, values are for physical chemical (PC) stressors (based on MfE REC CX/L)

³ Trace concentration (defined as the highest upgradient [MB1, MB2s, MB2d] concentration $\pm$ 20%).

Values in red exceed the trace level (defined as the highest upgradient [MB1, MB2s, MB2d] concentration $\pm$ 20%).

Bordered values exceed the NZDWS (MAV or GV)

Values in *italics* exceed the NZWQS, 95% level of protection

Values in **bold** exceed the NZWQS, 90% level of protection

Gray highlighted values exceed the NZWQS, 80% level of protection

< Below the laboratory reporting limit (<RL)

Table A6.2: TRP Spring and Groundwater Sample Results

Analyte	NZDWS ¹	NZWQS (95%) ²	NZWQS (90%) ²	NZWQS (80%) ²	31/07/24 Trace ³	Upgradient/crossgradient								Up/crossgradient		
						MB2s				MB2d				MB3		
						04/10/23	09/10/23	19/06/24	30/07/24	09/10/23	16/01/24	19/07/24	30/07/24	09/10/23	19/06/24	30/07/24
Sum of Anions					4.68	-	-	-	0.84	-	3.8	-	3.9	-	-	0.74
Sum of Cations					4.68	-	-	-	0.89	-	4	-	3.9	-	-	0.8
An/Cat balance (%)									-3%		-3%		0%			-4%
pH		7.7	7.7	7.7		6.4	-	6	6.1	7.3	7.4	7	6.8	6.5	6	6
Total Alkalinity					211.2	-	-	-	19.2	-	171	-	176	-	-	16.2
Bicarbonate					252	-	-	-	23	-	210	-	210	-	-	19.8
Total Hardness	200				60	-	-	-	32	-	59	-	50	-	-	28
Electrical conductivity (mS/m)		10.7	10.7	10.7	42.96	12.1	-	10.5	9.8	35	36.1	36.1	35.8	9.2	8.4	8.9
Dissolved aluminium	0.1	0.055	0.08	0.15	0.1116	0.022	0.032	<i>0.056</i>	<i>0.069</i>	0.006		0.005	0.004	0.033	<i>0.064</i>	<i>0.062</i>
Total aluminium		0.055	0.08	0.15	23.16	-	-	8.5	1.22	-	0.89	12.8	19.3	-	2.5	0.68
Dissolved calcium					15.96	-	-	-	11.1	-	15.3	-	13.3	-	-	9.4
Dissolved iron					< 0.02	-	-	-	< 0.02	-	-	-	< 0.02	-	-	< 0.02
Total iron	0.2				18.36	-	-	-	0.96	-	1.15	-	15.3	-	-	0.5
Dissolved magnesium					4.92	0.72	0.62	0.102	1.1	1.58	5	0.76	4.1	0.9	0.39	1.04
Total magnesium					8.4	-	-	0.21	1.29	-	-	0.94	7	-	0.42	1.16
Dissolved manganese	0.4	1.9	2.5	3.6	0.66	-	-	-	0.075	-	-	-	0.55	-	-	0.146
Total manganese		1.9	2.5	3.6	0.9	-	-	-	0.088	-	0.84	-	0.75	-	-	0.151
Dissolved potassium					1.908	-	-	-	0.89	-	2.1	-	1.59	-	-	0.69
Dissolved sodium	200				76.8	-	-	-	4.9	-	64	-	64	-	-	4.9
Chloride	250				13.32	8.9	-	-	7.8	11.2	12.2	-	11.1	6.6	-	7
Total Ammoniacal-N	0.82	0.9	1.43	2.3	0.3	-	-	< 0.010	< 0.010	-	< 0.010	0.104	0.25	-	< 0.010	< 0.010
Nitrite-N	0.912				< 0.002	0.009	-	< 0.002	< 0.002	< 0.002	< 0.002	0.003	< 0.002	0.003	< 0.002	< 0.002
Nitrate-N	11.3	0.092	0.092	0.092	1.476	1.03	-	1.05	1.23	< 0.002	0.019	0.036	< 0.002	1.21	1.2	1.42
Nitrite+Nitrate-N					1.476	1.04	-	1.05	1.23	< 0.002	0.019	0.039	< 0.002	1.21	1.2	1.42
DRP		0.009	0.009	0.009	0.1932	-	-	-	< 0.004	-	0.02	-	0.161	-	-	< 0.004
Sulphate	250				8.28	-	-	-	6.9	-	0.6	-	0.6	-	-	5.8
cBOD5					< 2	-	-	-	< 2	-	< 2	-	< 2	-	-	< 2
COD					36	-	-	-	< 6	-	< 6	-	30	-	-	< 6
Dissolved arsenic	0.01	0.013	0.42	1.4	0.009	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0042	-	0.0032	0.0075	< 0.0010	< 0.0010	< 0.0010
Dissolved cadmium	0.004	0.0002	0.0004	0.0008	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	-	0.00006	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved chromium	0.05	0.0033	0.006	0.04	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved copper	2	0.0014	0.0018	0.0025	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-	0.0009	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved lead	0.01	0.0034	0.0056	0.0094	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	-	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved nickel	0.08	0.011	0.013	0.017	< 0.0005	0.0024	0.002	0.0007	< 0.0005	0.0008	-	0.0012	< 0.0005	0.0021	< 0.0005	< 0.0005
Dissolved zinc	1.5	0.008	0.015	0.031	0.00408	0.0029	0.0072	0.0028	0.0034	0.0043	-	0.0027	< 0.0010	0.0032	0.0079	0.0033
Total arsenic		0.013	0.42	1.4	0.0252	-	-	0.0038	< 0.0011	-	0.0051	0.0121	<i>0.021</i>	-	0.0013	< 0.0011
Total cadmium		0.0002	0.0004	0.0008	0.00072	-	-	< 0.000053	< 0.000053	-	0.000096	0.00102	0.0006	-	< 0.000053	< 0.000053
Total chromium (IV)		0.0033	0.006	0.04	0.01344	-	-	<i>0.0045</i>	0.00083	-	0.00099	0.01	0.0112	-	0.0023	< 0.00053
Total copper		0.0014	0.0018	0.0025	0.0288	-	-	0.0084	<i>0.0015</i>	-	0.0069	0.028	0.024	-	0.0025	0.00072
Total lead		0.0034	0.0056	0.0094	0.036	-	-	0.0108	0.00169	-	0.003	0.036	0.03	-	0.0033	0.00082
Total nickel		0.011	0.013	0.017	0.01632	-	-	0.0064	0.00129	-	0.0061	0.0136	0.0136	-	0.00157	0.00063
Total zinc		0.008	0.015	0.031	0.0708	-	-	0.027	0.007	-	0.029	0.081	0.059	-	<i>0.0141</i>	0.0053
Dissolved boron	1.4	0.94	1.5	2.5	-	-	-	-	-	-	-	-	-	-	-	-
Total boron		0.94	1.5	2.5	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

All values provided in units of milligrams per liter (mg/L) unless otherwise specified.

¹ Ministry of Health (2018). Drinking-water Standards for New Zealand 2005 (revised 2018). Table 2.2 (health based), Table 2.3 (aesthetic)² Australia and New Zealand Guidelines from Fresh & Marine Water Quality. Default Guideline Values, level of protection specified. Where no Toxicant DGV has been derived, values are for physical chemical (PC) stressors (based on MfE REC CX/L)³ Trace concentration (defined as the highest upgradient [MB1, MB2s, MB2d] concentration ± 20%).Values in **red** exceed the trace level (defined as the highest upgradient [MB1, MB2s, MB2d] concentration ± 20%).

Bordered values exceed the NZDWS (MAV or GV)

Values in *italics* exceed the NZWQS, 95% level of protectionValues in **bold** exceed the NZWQS, 90% level of protection

Gray highlighted values exceed the NZWQS, 80% level of protection

< Below the laboratory reporting limit (<RL)

Table A6.2: TRP Spring and Groundwater Sample Results

Analyte	NZDWS ¹	NZWQS (95%) ²	NZWQS (90%) ²	NZWQS (80%) ²	31/07/24 Trace ³	Downgradient								Downgradient		
						MB4s			MB4d					MB5		
						09/10/23	19/07/24	30/07/24	09/10/23	16/01/24	19/06/24	30/07/24	04/10/23	19/07/24	30/07/24	
Sum of Anions					4.68	-	-	-	-	3.6	-	1.8	-	-	-	
Sum of Cations					4.68	-	-	-	-	3.7	-	1.91	-	-	-	
An/Cat balance (%)						-	-	-		-1%		-3%				
pH		7.7	7.7	7.7		-	-	-	-	6.3	6.6	6.5	-	-	-	
Total Alkalinity					211.2	-	-	-	-	48	-	43	-	-	-	
Bicarbonate					252	-	-	-	-	58	-	53	-	-	-	
Total Hardness	200				60	-	-	-	-	153	-	76	-	-	-	
Electrical conductivity (mS/m)		10.7	10.7	10.7	42.96	-	-	-	-	38.3	23.3	19.9	-	-	-	
Dissolved aluminium	0.1	0.055	0.08	0.15	0.1116	-	-	-	0.07		0.006	0.009	-	-	-	
Total aluminium		0.055	0.08	0.15	23.16	-	-	-	-	2.1	2.8	0.34	-	-	-	
Dissolved calcium					15.96	-	-	-	-	56	-	28	-	-	-	
Dissolved iron					< 0.02							< 0.02				
Total iron	0.2				18.36	-	-	-	-	2.2	-	0.31	-	-	-	
Dissolved magnesium					4.92	-	-	-	0.146	3.3	0.24	1.64	-	-	-	
Total magnesium					8.4	-	-	-	-	-	0.26	1.64	-	-	-	
Dissolved manganese	0.4	1.9	2.5	3.6	0.66							0.191				
Total manganese		1.9	2.5	3.6	0.9	-	-	-	-	0.189	-	0.192	-	-	-	
Dissolved potassium					1.908	-	-	-	-	0.7	-	0.79	-	-	-	
Dissolved sodium	200				76.8	-	-	-	-	14.8	-	8.4	-	-	-	
Chloride	250				13.32	-	-	-	19.4	10.6	-	7	-	-	-	
Total Ammoniacal-N	0.82	0.9	1.43	2.3	0.3	-	-	-	-	<0.010	0.015	0.039	-	-	-	
Nitrite-N	0.912				< 0.002	-	-	-	0.007	0.045	0.014	0.034	-	-	-	
Nitrate-N	11.3	0.092	0.092	0.092	1.476	-	-	-	4.5	3.2	1.8	1.92	-	-	-	
Nitrite+Nitrate-N					1.476	-	-	-	4.5	3.2	1.82	1.95	-	-	-	
DRP		0.009	0.009	0.009	0.1932	-	-	-	-	<0.004	-	< 0.004	-	-	-	
Sulphate	250				8.28	-	-	-	-	103	-	29	-	-	-	
cBOD5					< 2	-	-	-	-	2	-	< 2	-	-	-	
COD					36	-	-	-	-	20	-	< 6	-	-	-	
Dissolved arsenic	0.01	0.013	0.42	1.4	0.009	-	-	-	0.0023	-	< 0.0010	< 0.0010	-	-	-	
Dissolved cadmium	0.004	0.0002	0.0004	0.0008	< 0.00005	-	-	-	0.00006	-	< 0.00005	< 0.00005	-	-	-	
Dissolved chromium	0.05	0.0033	0.006	0.04	< 0.0005	-	-	-	0.0006	-	< 0.0005	< 0.0005	-	-	-	
Dissolved copper	2	0.0014	0.0018	0.0025	< 0.0005	-	-	-	0.0008	-	< 0.0005	< 0.0005	-	-	-	
Dissolved lead	0.01	0.0034	0.0056	0.0094	< 0.00010	-	-	-	<0.00010	-	< 0.00010	< 0.00010	-	-	-	
Dissolved nickel	0.08	0.011	0.013	0.017	< 0.0005	-	-	-	0.0008	-	< 0.0005	< 0.0005	-	-	-	
Dissolved zinc	1.5	0.008	0.015	0.031	0.00408	-	-	-	0.0032	-	0.0089	0.0018	-	-	-	
Total arsenic		0.013	0.42	1.4	0.0252	-	-	-	-	0.002	0.0014	< 0.0011	-	-	-	
Total cadmium		0.0002	0.0004	0.0008	0.00072	-	-	-	-	<0.000053	< 0.000053	< 0.000053	-	-	-	
Total chromium (IV)		0.0033	0.006	0.04	0.01344	-	-	-	-	0.0022	0.0017	< 0.00053	-	-	-	
Total copper		0.0014	0.0018	0.0025	0.0288	-	-	-	-	0.0057	0.0028	0.00081	-	-	-	
Total lead		0.0034	0.0056	0.0094	0.036	-	-	-	-	0.0041	0.0035	0.00065	-	-	-	
Total nickel		0.011	0.013	0.017	0.01632	-	-	-	-	0.0047	0.00173	< 0.00053	-	-	-	
Total zinc		0.008	0.015	0.031	0.0708	-	-	-	-	0.038	0.0175	0.0035	-	-	-	
Dissolved boron	1.4	0.94	1.5	2.5	-	-	-	-	-	-	-	-	-	-	-	
Total boron		0.94	1.5	2.5	-	-	-	-	-	-	-	-	-	-	-	

Notes:

All values provided in units of milligrams per liter (mg/L) unless otherwise specified.

¹ Ministry of Health (2018). Drinking-water Standards for New Zealand 2005 (revised 2018). Table 2.2 (health based), Table 2.3 (aesthetic)

² Australia and New Zealand Guidelines from Fresh & Marine Water Quality. Default Guideline Values, level of protection specified. Where no Toxicant DGV has been derived, values are for physical chemical (PC) stressors (based on MFE REC CX/L)

³ Trace concentration (defined as the highest upgradient [MB1, MB2s, MB2d] concentration ± 20%).

Values in **red** exceed the trace level (defined as the highest upgradient [MB1, MB2s, MB2d] concentration ± 20%).

Bordered values exceed the NZDWS (MAV or GV)

Values in *italics* exceed the NZWQS, 95% level of protection

Values in **bold** exceed the NZWQS, 90% level of protection

Gray highlighted values exceed the NZWQS, 80% level of protection

< Below the laboratory reporting limit (<RL)

Table A3.2: TRP Spring and Groundwater Sample Results

Analyte	NZDWS ¹	NZWQS (95%) ²	NZWQS (90%) ²	NZWQS (80%) ²	31/07/24 Trace ³	Downgradient			
						TSB1			
						04/10/23	16/01/24	19/06/24	30/07/24
Sum of Anions					4.68	-	0.34	-	0.29
Sum of Cations					4.68	-	0.34	-	0.51
An/Cat balance (%)							0%		-28%
pH		7.7	7.7	7.7		5.8	5.8	5.7	5.6
Total Alkalinity					211.2	-	4	-	3.5
Bicarbonate					252	-	4.8	-	4.3
Total Hardness	200				60	-	7.6	-	7.8
Electrical conductivity (mS/m)		10.7	10.7	10.7	42.96	3.3	4.1	3.1	3.5
Dissolved aluminium	0.1	0.055	0.08	0.15	0.1116	0.044		0.038	1.77
Total aluminium		0.055	0.08	0.15	23.16	-	37	48	60
Dissolved calcium					15.96	-	2.3	-	2.5
Dissolved iron					< 0.02				< 0.02
Total iron	0.2				18.36	-	29	-	41
Dissolved magnesium					4.92	0.0119	0.42	0.0126	0.38
Total magnesium					8.4	-	-	0.6	10.3
Dissolved manganese	0.4	1.9	2.5	3.6	0.66				0.033
Total manganese		1.9	2.5	3.6	0.9	-	0.52	-	0.76
Dissolved potassium					1.908	-	0.43	-	0.52
Dissolved sodium	200				76.8	-	4	-	3.3
Chloride	250				13.32	4.9	6	-	4.7
Total Ammoniacal-N	0.82	0.9	1.43	2.3	0.3	-	<0.010	< 0.010	< 0.010
Nitrite-N	0.912				< 0.002	<0.002	<0.002	< 0.002	< 0.002
Nitrate-N	11.3	0.092	0.092	0.092	1.476	0.31	0.44	0.167	0.3
Nitrite+Nitrate-N					1.476	0.31	0.44	0.167	0.3
DRP		0.009	0.009	0.009	0.1932	-	<0.004	-	< 0.004
Sulphate	250				8.28	-	3.2	-	3.3
cBOD5					< 2	-	<2	-	< 2
COD					36	-	340	-	43
Dissolved arsenic	0.01	0.013	0.42	1.4	0.009	<0.0010	-	< 0.0010	< 0.0010
Dissolved cadmium	0.004	0.0002	0.0004	0.0008	< 0.00005	<0.00005	-	< 0.00005	< 0.00005
Dissolved chromium	0.05	0.0033	0.006	0.04	< 0.0005	<0.0005	-	< 0.0005	< 0.0005
Dissolved copper	2	0.0014	0.0018	0.0025	< 0.0005	<0.0005	-	< 0.0005	0.0032
Dissolved lead	0.01	0.0034	0.0056	0.0094	< 0.00010	<0.00010	-	< 0.00010	0.00054
Dissolved nickel	0.08	0.011	0.013	0.017	< 0.0005	<0.0005	-	< 0.0005	< 0.0005
Dissolved zinc	1.5	0.008	0.015	0.031	0.00408	<0.0010	-	< 0.0010	0.026
Total arsenic		0.013	0.42	1.4	0.0252	-	0.014	0.0183	0.021
Total cadmium		0.0002	0.0004	0.0008	0.00072	-	0.000077	0.000077	0.00012
Total chromium (IV)		0.0033	0.006	0.04	0.01344	-	0.021	0.022	0.029
Total copper		0.0014	0.0018	0.0025	0.0288	-	0.04	0.053	0.062
Total lead		0.0034	0.0056	0.0094	0.036	-	0.049	0.063	0.075
Total nickel		0.011	0.013	0.017	0.01632	-	0.03	0.034	0.04
Total zinc		0.008	0.015	0.031	0.0708	-	0.121	0.129	0.172
Dissolved boron	1.4	0.94	1.5	2.5	-	-	-	-	-
Total boron		0.94	1.5	2.5	-	-	-	-	-

Notes:

All values provided in units of milligrams per liter (mg/L) unless otherwise specified.

¹ Ministry of Health (2018). Drinking-water Standards for New Zealand 2005 (revised 2018). Table 2.2 (health based), Table 2.3 (aesthetic)

² Australia and New Zealand Guidelines from Fresh & Marine Water Quality. Default Guideline Values, level of protection specified. Where no Toxicant DGV has been derived, values are for physical chemical (PC) stressors (based on MfE REC CX/L)

³ Trace concentration (defined as the highest upgradient [MB1, MB2s, MB2d] concentration ± 20%).

Values in **red** exceed the trace level (defined as the highest upgradient [MB1, MB2s, MB2d] concentration ± 20%).

Bordered values exceed the NZDWS (MAV or GV)

Values in *italics* exceed the NZWQS, 95% level of protection

Values in **bold** exceed the NZWQS, 90% level of protection

Gray highlighted values exceed the NZWQS, 80% level of protection

< Below the laboratory reporting limit (<RL)

Table A6.3: Taylorville Road Drain Sample Results

Analyte	NZDWS ¹	NZWQS (95%) ²	NZWQS (90%) ²	NZWQS (80%) ²	31/07/24 GW Trace ³	31/07/24 TRD 4 Trace ⁴	SPF Pit/TRD1								
							31/01/23	06/07/23	19/07/23	25/08/23	27/09/23	03/10/23	17/01/24	22/05/24	31/07/24
Sum of Anions					4.68	0.89									2.6
Sum of Cations					4.68	0.91									2.7
An/Cat balance (%)															-2%
pH		7.7	7.7	7.7	-	-	7.8	7.9	7.1	7.9	7.4	7.5	-	7.6	7.7
Total Alkalinity					211.2	19.6									53
Bicarbonate					252	23.8									64
Total Hardness	200				60	31.2									109
Electrical conductivity (mS/m)		10.7	10.7	10.7	42.96	9.7	61.7	70.7	10.4	71.6	93.8	26.2	-	33.4	28.3
Dissolved aluminium	0.1	0.055	0.08	0.15	0.1116	0.032	-	0.005	-	0.018	-	0.019	0.006	0.007	0.027
Total aluminium		0.055	0.08	0.15	23.16	0.2	0.115	0.138	-	0.133	-	0.27	0.22	0.189	0.28
Dissolved calcium					15.96	9.8									38
Dissolved iron					< 0.02	< 0.02									0.04
Total iron	0.2				18.36	0.042									1.2
Dissolved magnesium					4.92	1.57									3.3
Total magnesium					8.4	1.49									3.3
Dissolved manganese	0.4	1.9	2.5	3.6	0.66	0.013	-	<0.0005	-	0.125	-	0.0101	0.041	0.022	0.0064
Total manganese		1.9	2.5	3.6	0.9	0.017	0.5	1.2	-	0.24	-	0.149	0.29	0.091	0.04
Dissolved potassium					1.908	0.6									3.2
Dissolved sodium	200				76.8	6.1									10.5
Chloride	250				13.32	9.7	13.3	15.9	7.8	15	19.4	9.8	-	10.3	9.6
Total Ammoniacal-N	0.82	0.9	1.43	2.3	0.3	< 0.010	1.2	1.99	<0.010	<0.010	1.12	<0.010	0.012	< 0.010	< 0.010
Nitrite-N	0.912				< 0.002	< 0.002	0.01	0.006	<0.002	<0.002	0.3	<0.002	-	< 0.002	0.003
Nitrate-N	11.3	0.092	0.092	0.092	1.476	1.02	0.061	0.7	0.37	3.2	5.2	0.7	-	0.137	1.22
Nitrite+Nitrate-N					1.476	1.02	0.071	0.71	0.37	3.2	5.5	0.71	0.23	0.137	1.22
DRP		0.009	0.009	0.009	0.1932	< 0.004									< 0.004
Sulphate	250				8.28	7.2									59
cBOD5					< 2	< 2									< 2
COD					36	< 6									26
Dissolved arsenic	0.01	0.013	0.42	1.4	0.009	< 0.0010	-	0.0085	<0.0010	0.0031	0.0104	0.0014	0.0015	< 0.0010	< 0.0010
Dissolved cadmium	0.004	0.0002	0.0004	0.0008	< 0.00005	< 0.00005	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	< 0.00005	< 0.00005
Dissolved chromium	0.05	0.0033	0.006	0.04	< 0.0005	< 0.0005	-	0.0042	<0.0005	0.0028	0.0072	0.001	0.0019	0.0005	0.0007
Dissolved copper	2	0.0014	0.0018	0.0025	< 0.0005	< 0.0005	-	0.0011	<0.0005	0.0012	0.0027	0.001	0.0014	0.0006	0.0008
Dissolved lead	0.01	0.0034	0.0056	0.0094	< 0.00010	< 0.00010	-	<0.00010	<0.00010	<0.0001	0.0003	<0.00010	<0.00010	< 0.00010	< 0.00010
Dissolved nickel	0.08	0.011	0.013	0.017	< 0.0005	< 0.0005	-	0.0024	0.0036	0.0022	0.0032	0.0012	0.0013	0.0007	0.0007
Dissolved zinc	1.5	0.008	0.015	0.031	0.00408	< 0.0010	-	0.0012	0.0027	0.03	0.1	0.0177	0.0041	0.004	0.0012
Total arsenic		0.013	0.42	1.4	0.0252	< 0.0011	0.0151	0.0092	-	0.0043	0.012	0.0033	0.0023	0.0013	0.0014
Total cadmium		0.0002	0.0004	0.0008	0.00072	< 0.000053	0.000054	<0.000053	-	<0.000053	0.000088	<0.000053	<0.000053	< 0.000053	< 0.000053
Total chromium (IV)		0.0033	0.006	0.04	0.01344	< 0.00053	0.0043	0.005	-	0.0039	0.0073	0.00144	0.0023	0.00094	0.0013
Total copper		0.0014	0.0018	0.0025	0.0288	< 0.00053	0.0041	0.00145	-	0.00191	0.0052	0.0023	0.00168	0.00106	0.00113
Total lead		0.0034	0.0056	0.0094	0.036	< 0.00011	0.00056	0.00033	-	0.00057	0.00088	0.00106	0.00041	0.00065	0.00046
Total nickel		0.011	0.013	0.017	0.01632	< 0.00053	0.0029	0.0032	-	0.0022	0.003	0.00178	0.00165	0.00095	0.00093
Total zinc		0.008	0.015	0.031	0.0708	< 0.0011	0.081	0.0088	-	0.046	0.139	0.034	0.0112	0.0088	0.007

Notes:

All values provided in units of milligrams per liter (mg/L) unless otherwise specified.

¹ Ministry of Health (2018). Drinking-water Standards for New Zealand 2005 (revised 2018). Table 2.2 (health based), Table 2.3 (aesthetic)

² Australia and New Zealand Guidelines from Fresh & Marine Water Quality. Default Guideline Values, level of protection specified. Where no Toxicant DGV has been derived, values are for physical chemical (PC) stressors (based on MfE REC CX/L)

³ Trace concentration (defined as the highest upgradient [MB1, MB2s, MB2d] concentration ± 20%).

⁴ Trace concentration (defined as the upgradient [TRD3] concentration ± 20%).

Values in **red** exceed the trace level (defined as the upgradient [TRD3] concentration ± 20%).

Bordered values exceed the NZDWS (MAV or GV)

Values in *italics* exceed the NZWQS, 95% level of protection

Values in **bold** exceed the NZWQS, 90% level of protection

Gray highlighted values exceed the NZWQS, 80% level of protection

- Not analysed

< Below the laboratory reporting limit (<RL)

Table A6.3: Taylorville Road Drain Sample Results

Analyte	NZDWS ¹	NZWQS (95%) ²	NZWQS (90%) ²	NZWQS (80%) ²	31/07/24 GW Trace ³	31/07/24 TRD 4 Trace ⁴	TRD2						TRD3		
							31/01/23	06/07/23	28/08/23	17/01/24	22/05/24	31/07/24	17/01/24	22/05/24	31/07/24
Sum of Anions					4.68	0.89						2.4			0.74
Sum of Cations					4.68	0.91						2.4			0.76
An/Cat balance (%)												0%			-1%
pH		7.7	7.7	7.7	-	-	6.9	6.2	7	-	7.2	6.4	-	7	7
Total Alkalinity					211.2	19.6						7			16.3
Bicarbonate					252	23.8						8.6			19.8
Total Hardness	200				60	31.2						96			26
Electrical conductivity (mS/m)		10.7	10.7	10.7	42.96	9.7	13	13.8	6.7	-	24.2	26.2	-	10.4	8.1
Dissolved aluminium	0.1	0.055	0.08	0.15	0.1116	0.032	-	0.069	0.13	0.021	0.027	0.064	0.03	0.032	0.027
Total aluminium		0.055	0.08	0.15	23.16	0.2	0.29	0.139	-	0.77	0.66	0.51	0.071	0.15	0.143
Dissolved calcium					15.96	9.8						32			8.2
Dissolved iron					< 0.02	< 0.02						< 0.02			< 0.02
Total iron	0.2				18.36	0.042						0.105			0.035
Dissolved magnesium					4.92	1.57						4.1			1.31
Total magnesium					8.4	1.49						4.1			1.24
Dissolved manganese	0.4	1.9	2.5	3.6	0.66	0.013	-	0.0067	0.0027	0.0016	0.0113	0.063	0.0018	0.091	0.0107
Total manganese		1.9	2.5	3.6	0.9	0.017	0.084	0.0087	-	0.084	0.047	0.074	0.0065	0.12	0.0143
Dissolved potassium					1.908	0.6						0.44			0.5
Dissolved sodium	200				76.8	6.1						10.7			5.1
Chloride	250				13.32	9.7	6.7	13.8	7	-	8.7	9.7	-	6.6	8.1
Total Ammoniacal-N	0.82	0.9	1.43	2.3	0.3	< 0.010	<0.010	0.045	-	<0.010	< 0.010	< 0.010	<0.010	0.031	< 0.010
Nitrite-N	0.912				< 0.002	< 0.002	<0.002	<0.002	<0.002	-	< 0.002	< 0.002	-	< 0.002	< 0.002
Nitrate-N	11.3	0.092	0.092	0.092	1.476	1.02	0.08	0.092	0.42	-	0.54	0.015	-	0.079	0.85
Nitrite+Nitrate-N					1.476	1.02	0.082	0.092	0.42	0.81	0.54	0.016	0.7	0.08	0.85
DRP		0.009	0.009	0.009	0.1932	< 0.004						< 0.004			< 0.004
Sulphate	250				8.28	7.2						93			6
cBOD5					< 2	< 2						< 2			< 2
COD					36	< 6						12			< 6
Dissolved arsenic	0.01	0.013	0.42	1.4	0.009	< 0.0010	-	0.0012	<0.0010	<0.0010	< 0.0010	< 0.0010	<0.0010	< 0.0010	< 0.0010
Dissolved cadmium	0.004	0.0002	0.0004	0.0008	< 0.00005	< 0.00005	-	<0.00005	<0.00005	<0.00005	< 0.00005	0.00005	<0.00005	< 0.00005	< 0.00005
Dissolved chromium	0.05	0.0033	0.006	0.04	< 0.0005	< 0.0005	-	<0.0005	<0.0005	<0.0005	< 0.0005	< 0.0005	<0.0005	< 0.0005	< 0.0005
Dissolved copper	2	0.0014	0.0018	0.0025	< 0.0005	< 0.0005	-	<0.0005	<0.0005	<0.0005	< 0.0005	0.001	<0.0005	< 0.0005	< 0.0005
Dissolved lead	0.01	0.0034	0.0056	0.0094	< 0.00010	< 0.00010	-	<0.00010	0.00011	<0.00010	< 0.00010	0.00014	<0.00010	< 0.00010	< 0.00010
Dissolved nickel	0.08	0.011	0.013	0.017	< 0.0005	< 0.0005	-	<0.0005	<0.0005	0.0029	0.0024	0.0129	<0.0005	< 0.0005	< 0.0005
Dissolved zinc	1.5	0.008	0.015	0.031	0.00408	< 0.0010	-	0.0016	0.0011	0.0016	0.0017	0.0143	<0.0010	< 0.0010	< 0.0010
Total arsenic		0.013	0.42	1.4	0.0252	< 0.0011	<0.0011	0.0012	-	<0.0011	< 0.0011	< 0.0011	<0.0011	< 0.0011	< 0.0011
Total cadmium		0.0002	0.0004	0.0008	0.00072	< 0.000053	<0.000053	<0.000053	-	<0.000053	< 0.000053	0.000063	<0.000053	< 0.000053	< 0.000053
Total chromium (IV)		0.0033	0.006	0.04	0.01344	< 0.00053	<0.00053	<0.00053	-	0.00088	0.00109	< 0.00053	<0.00053	< 0.00053	< 0.00053
Total copper		0.0014	0.0018	0.0025	0.0288	< 0.00053	0.00089	<0.00053	-	0.00065	0.0009	0.00127	<0.00053	< 0.00053	< 0.00053
Total lead		0.0034	0.0056	0.0094	0.036	< 0.00011	0.00019	<0.00011	-	0.00063	0.00068	0.00055	<0.00011	0.00046	< 0.00011
Total nickel		0.011	0.013	0.017	0.01632	< 0.00053	0.0082	<0.00053	-	0.0045	0.0038	0.0132	<0.00053	< 0.00053	< 0.00053
Total zinc		0.008	0.015	0.031	0.0708	< 0.0011	0.0057	<0.0011	-	0.0071	0.0057	0.0159	<0.0011	0.0036	< 0.0011

Notes:

All values provided in units of milligrams per liter (mg/L) unless otherwise specified.

¹ Ministry of Health (2018). Drinking-water Standards for New Zealand 2005 (revised 2018). Table 2.2 (health based), Table 2.3 (aesthetic)

² Australia and New Zealand Guidelines from Fresh & Marine Water Quality. Default Guideline Values, level of protection specified. Where no Toxicant DGV has been derived, values are for physical chemical (PC) stressors (based on MfE REC CX/L)

³ Trace concentration (defined as the highest upgradient [MB1, MB2s, MB2d] concentration ± 20%).

⁴ Trace concentration (defined as the upgradient [TRD3] concentration ± 20%).

Values in **red** exceed the trace level (defined as the upgradient [TRD3] concentration ± 20%).

Bordered values exceed the NZDWS (MAV or GV)

Values in *italics* exceed the NZWQS, 95% level of protection

Values in **bold** exceed the NZWQS, 90% level of protection

Gray highlighted values exceed the NZWQS, 80% level of protection

- Not analysed

< Below the laboratory reporting limit (<RL)

Table A6.3: Taylorville Road Drain Sample Results

Analyte	NZDWS ¹	NZWQS (95%) ²	NZWQS (90%) ²	NZWQS (80%) ²	31/07/24 GW Trace ³	31/07/24 TRD 4 Trace ⁴	TRD4					TRD5/EPAS2				
							19/07/23	18/08/23	17/01/24	22/05/24	31/07/24	25/08/23	17/01/24	22/05/24	19/06/24	31/07/24
Sum of Anions					4.68	0.89					2.1					2.9
Sum of Cations					4.68	0.91					2					3.1
An/Cat balance (%)											2%					-3%
pH		7.7	7.7	7.7	-	-	6.8	6.9	-	7	7.3	6.9	-	6	6.8	6.9
Total Alkalinity					211.2	19.6					22					11.4
Bicarbonate					252	23.8					27					13.8
Total Hardness	200				60	31.2					82					122
Electrical conductivity (mS/m)		10.7	10.7	10.7	42.96	9.7	5.7	5.8	-	6.9	23.3	13.9	-	30.3	30.5	31.1
Dissolved aluminium	0.1	0.055	0.08	0.15	0.1116	0.032	-	0.093	0.136	0.093	0.021	0.067	0.045	0.136	0.133	0.132
Total aluminium		0.055	0.08	0.15	23.16	0.2	-	-	0.92	0.147	2.6	-	0.98	0.61	0.18	0.21
Dissolved calcium					15.96	9.8					28					39
Dissolved iron					< 0.02	< 0.02					0.02					0.08
Total iron	0.2				18.36	0.042					6.5					0.183
Dissolved magnesium					4.92	1.57					2.9					6.3
Total magnesium					8.4	1.49					3.3					6.4
Dissolved manganese	0.4	1.9	2.5	3.6	0.66	0.013	-	0.006	0.0025	0.0069	0.0012	0.028	0.084	0.031	0.023	0.026
Total manganese		1.9	2.5	3.6	0.9	0.017	-	-	0.032	0.009	0.3	-	0.121	0.035	0.024	0.027
Dissolved potassium					1.908	0.6					0.47					1.01
Dissolved sodium	200				76.8	6.1					9.1					13.5
Chloride	250				13.32	9.7	7.6	7.1	-	7.9	9.2	9.7	-	12.4	12.6	12.8
Total Ammoniacal-N	0.82	0.9	1.43	2.3	0.3	< 0.010	<0.010	-	<0.010	< 0.010	< 0.010	-	<0.010	0.039	0.052	< 0.010
Nitrite-N	0.912				< 0.002	< 0.002	<0.002	<0.002	-	< 0.002	< 0.002	<0.002	-	< 0.002	0.003	< 0.002
Nitrate-N	11.3	0.092	0.092	0.092	1.476	1.02	0.27	0.44	-	0.29	0.56	0.188	-	0.037	0.176	0.21
Nitrite+Nitrate-N					1.476	1.02	0.27	0.44	0.194	0.29	0.56	0.19	0.116	0.037	0.178	0.21
DRP		0.009	0.009	0.009	0.1932	< 0.004					< 0.004					< 0.004
Sulphate	250				8.28	7.2					66					109
cBOD5					< 2	< 2					< 2					< 2
COD					36	< 6					50					8
Dissolved arsenic	0.01	0.013	0.42	1.4	0.009	< 0.0010	<0.0010	<0.0010	<0.0011	< 0.0010	< 0.0010	<0.0010	<0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved cadmium	0.004	0.0002	0.0004	0.0008	< 0.00005	< 0.00005	<0.00005	<0.00005	<0.000053	< 0.00005	< 0.00005	<0.00005	<0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved chromium	0.05	0.0033	0.006	0.04	< 0.0005	< 0.0005	<0.0005	<0.0005	0.00077	< 0.0005	< 0.0005	<0.0005	0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved copper	2	0.0014	0.0018	0.0025	< 0.0005	< 0.0005	<0.0005	<0.0005	<0.00053	< 0.0005	< 0.0005	0.0006	<0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved lead	0.01	0.0034	0.0056	0.0094	< 0.00010	< 0.00010	0.00018	<0.00010	0.0009	< 0.00010	< 0.00010	<0.00010	<0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved nickel	0.08	0.011	0.013	0.017	< 0.0005	< 0.0005	<0.0005	<0.0005	0.0009	< 0.0005	0.0036	<0.0005	0.0013	0.0008	0.001	0.001
Dissolved zinc	1.5	0.008	0.015	0.031	0.00408	< 0.0010	0.0017	<0.0010	0.0037	0.0015	< 0.0010	0.0025	0.0017	0.0046	0.0027	0.0031
Total arsenic		0.013	0.42	1.4	0.0252	< 0.0011	-	-	<0.0010	< 0.0011	0.0021	-	<0.0011	< 0.0011	< 0.0011	< 0.0011
Total cadmium		0.0002	0.0004	0.0008	0.00072	< 0.000053	-	-	<0.00005	< 0.000053	0.000064	-	<0.000053	< 0.000053	< 0.000053	< 0.000053
Total chromium (IV)		0.0033	0.006	0.04	0.01344	< 0.00053	-	-	<0.0005	< 0.00053	0.0023	-	0.00125	< 0.00053	< 0.00053	< 0.00053
Total copper		0.0014	0.0018	0.0025	0.0288	< 0.00053	-	-	<0.0005	< 0.00053	0.0024	-	0.0011	< 0.00053	< 0.00053	< 0.00053
Total lead		0.0034	0.0056	0.0094	0.036	< 0.00011	-	-	<0.00010	0.00013	0.0025	-	0.00119	0.00025	< 0.00011	< 0.00011
Total nickel		0.011	0.013	0.017	0.01632	< 0.00053	-	-	<0.0005	< 0.00053	0.0113	-	0.0021	0.00101	0.00105	0.00099
Total zinc		0.008	0.015	0.031	0.0708	< 0.0011	-	-	<0.0010	0.0017	0.031	-	0.0097	0.0061	0.0027	0.0034

Notes:

All values provided in units of miligrams per liter (mg/L) unless otherwise specified.

¹ Ministry of Health (2018). Drinking-water Standards for New Zealand 2005 (revised 2018). Table 2.2 (health based), Table 2.3 (aesthetic)

² Australia and New Zealand Guidelines from Fresh & Marine Water Quality. Default Guideline Values, level of protection specified. Where no Toxicant DGV has been derived, values are for physical chemical (PC) stressors (based on MfE REC CX/L)

³ Trace concentration (defined as the highest upgradient [MB1, MB2s, MB2d] concentration ± 20%).

⁴ Trace concentration (defined as the upgradient [TRD3] concentration ± 20%).

Values in red exceed the trace level (defined as the upgradient [TRD3] concentration ± 20%).

Bordered values exceed the NZDWS (MAV or GV)

Values in italics exceed the NZWQS, 95% level of protection

Values in bold exceed the NZWQS, 90% level of protection

Gray highlighted values exceed the NZWQS, 80% level of protection

- Not analysed

< Below the laboratory reporting limit (<RL)

Table A6.4: Noname Creek Sample Results

Analyte	NZDWS ¹	NZWQS (95%) ²	NZWQS (90%) ²	NZWQS (80%) ²	31/07/24 Trace ³	SPFUS					SPFMS			
						31/01/23	06/07/23	16/01/24	22/05/24	31/07/24	31/01/23	06/07/23	22/05/24	31/07/24
Sum of Anions					0.90	-	-	0.69	-	0.75	-	-	-	1.51
Sum of Cations					0.94	-	-	0.7	-	0.78	-	-	-	1.62
An/Cat balance (%)								-1%		-2%				-4%
pH		7.7	7.7	7.7	8.3	7.2	7.4	6.7	7.4	6.9	7.4	7.5	7.2	7.4
Total Alkalinity					18	-	-	15.2	-	15	-	-	-	38
Bicarbonate					22.0	-	-	18.5	-	18.3	-	-	-	46
Total Hardness	200				34	-	-	25	-	28	-	-	-	64
Electrical conductivity (mS/m)		10.7	10.7	10.7	10.6	11	11.8	7.9	16.9	8.8	11.2	12.6	26.5	17.1
Dissolved aluminium	0.1	0.055	0.08	0.15	0.055	-	0.006	-	0.008	0.046	-	0.011	0.011	0.019
Total aluminium		0.055	0.08	0.15	0.084	<i>0.069</i>	0.039	0.027	0.025	0.07	0.108	0.193	0.0198	<i>0.062</i>
Dissolved calcium					11.3	-	-	8.3	-	9.4	-	-	-	23
Dissolved iron					0.048					0.04				0.04
Total iron	0.2				0.11	-	-	0.026	-	0.09	-	-	-	0.3
Dissolved magnesium					1.25	-	-	0.98		1.04	-	-	-	1.81
Total magnesium					1.3	-	-	-		1.1	-	-	-	1.8
Dissolved manganese	0.4	1.9	2.5	3.6	0.0089	-	0.0011		0.0143	0.0074	-	0.0017	0.075	<i>0.0164</i>
Total manganese		1.9	2.5	3.6	0.0094	0.132	0.023	0.0086	0.0185	0.0078	0.142	0.05	0.077	<i>0.051</i>
Dissolved potassium					1.2	-	-	0.89	-	0.96	-	-	-	1.91
Dissolved sodium	200				5.3	-	-	4.2	-	4.4	-	-	-	6.6
Chloride	250				9.0	7.4	6.5	6.4	8.3	7.5	7.3	6.7	9.3	7.9
Total Ammoniacal-N	0.82	0.9	1.43	2.3	< 0.010	0.025	0.019	<0.010	< 0.010	< 0.010	0.024	0.029	< 0.010	< 0.010
Nitrite-N	0.912				0.002	0.003	0.004	<0.002	0.003	0.002	0.003	0.006	0.007	<i>0.005</i>
Nitrate-N	11.3	0.092	0.092	0.092	1.52	0.32	1.44	0.95	1.13	1.27	0.31	1.39	1.19	1.03
Nitrite+Nitrate-N					1.52	0.33	1.44	0.95	1.13	1.27	0.31	1.39	1.2	1.04
DRP		0.009	0.009	0.009	0.018	-	-	0.007	-	0.015	-	-	-	< 0.004
Sulphate	250				8.5	-	-	6.4	-	7.1	-	-	-	22
cBOD5					< 2	-	-	<2	-	< 2	-	-	-	< 2
COD					7.2	-	-	<6	-	6	-	-	-	18
Dissolved arsenic	0.01	0.013	0.42	1.4	< 0.0010	-	<0.0010	-	< 0.0010	< 0.0010	-	<0.0010	< 0.0010	< 0.0010
Dissolved cadmium	0.004	0.0002	0.0004	0.0008	< 0.00005	-	<0.00005	-	< 0.00005	< 0.00005	-	<0.00005	< 0.00005	< 0.00005
Dissolved chromium	0.05	0.0033	0.006	0.04	< 0.0005	-	<0.0005	-	< 0.0005	< 0.0005	-	<0.0005	0.0006	< 0.0005
Dissolved copper	2	0.0014	0.0018	0.0025	< 0.0005	-	0.0006	-	< 0.0005	< 0.0005	-	0.0007	0.0006	<i>0.0006</i>
Dissolved lead	0.01	0.0034	0.0056	0.0094	< 0.00010	-	<0.00010	-	< 0.00010	< 0.00010	-	<0.00010	< 0.00010	< 0.00010
Dissolved nickel	0.08	0.011	0.013	0.017	< 0.0005	-	<0.0005	-	< 0.0005	< 0.0005	-	<0.0005	< 0.0005	< 0.0005
Dissolved zinc	1.5	0.008	0.015	0.031	< 0.0010	-	0.0047	-	0.005	< 0.0010	-	0.0067	0.0069	<i>0.0034</i>
Total arsenic		0.013	0.42	1.4	< 0.0011	<0.0011	<0.0011	<0.0011	< 0.0011	< 0.0011	<0.0011	<0.0011	< 0.0011	< 0.0011
Total cadmium		0.0002	0.0004	0.0008	< 0.000053	<0.000053	<0.000053	<0.000053	< 0.000053	< 0.000053	<0.000053	<0.000053	< 0.000053	< 0.000053
Total chromium (IV)		0.0033	0.006	0.04	< 0.00053	<0.00053	<0.00053	<0.00053	< 0.00053	< 0.00053	<0.00053	0.00058	0.0006	< 0.00053
Total copper		0.0014	0.0018	0.0025	< 0.00053	0.00097	0.00062	<0.00053	0.00076	< 0.00053	0.00117	0.00075	0.00068	<i>0.00071</i>
Total lead		0.0034	0.0056	0.0094	< 0.00011	0.00052	0.00022	<0.00011	0.00015	< 0.00011	0.00073	0.00056	0.00017	<i>0.00042</i>
Total nickel		0.011	0.013	0.017	< 0.00053	<0.00053	<0.00053	<0.00053	< 0.00053	< 0.00053	<0.00053	<0.00053	< 0.00053	< 0.00053
Total zinc		0.008	0.015	0.031	0.002	<i>0.0094</i>	<i>0.012</i>	0.0017	0.0053	0.0013	<i>0.0086</i>	<i>0.0125</i>	0.0052	<i>0.0059</i>

Notes:

All values provided in units of milligrams per liter (mg/L) unless otherwise specified.

¹ Ministry of Health (2018). Drinking-water Standards for New Zealand 2005 (revised 2018). Table 2.2 (health based), Table 2.3 (aesthetic)

² Australia and New Zealand Guidelines from Fresh & Marine Water Quality. Default Guideline Values, level of protection specified. Where no Toxicant DGV has been derived, values are for physical chemical (PC) stressors (based on MfE REC CX/L)

³ Trace concentration (defined as the upgradient [SPFUS] concentration $\pm$ 20%).

Values in **red** exceed the trace level (defined as the upgradient [SPFUS] concentration $\pm$ 20%).

Bordered values exceed the NZDWS (MAV or GV)

Values in *italics* exceed the NZWQS, 95% level of protection

Values in **bold** exceed the NZWQS, 90% level of protection

Gray highlighted values exceed the NZWQS, 80% level of protection

< Below the laboratory reporting limit (<RL)

Table A6.4: Noname Creek Sample Results

Analyte	NZDWS ¹	NZWQS (95%) ²	NZWQS (90%) ²	NZWQS (80%) ²	31/07/24 Trace ³	SPFDS			
						31/01/23	06/07/23	22/05/24	31/07/24
Sum of Anions					0.90	-	-	-	1.51
Sum of Cations					0.94	-	-	-	1.6
An/Cat balance (%)									-3%
pH		7.7	7.7	7.7	8.3	7.6	7.6	7.8	7.6
Total Alkalinity					18	-	-	-	39
Bicarbonate					22.0	-	-	-	47
Total Hardness	200				34	-	-	-	62
Electrical conductivity (mS/m)		10.7	10.7	10.7	10.6	11.3	13	28.7	17.1
Dissolved aluminium	0.1	0.055	0.08	0.15	0.055	-	0.021	0.012	0.033
Total aluminium		0.055	0.08	0.15	0.084	0.083	0.26	0.035	0.079
Dissolved calcium					11.3	-	-	-	22
Dissolved iron					0.048				0.05
Total iron	0.2				0.11	-	-	-	0.157
Dissolved magnesium					1.25	-	-	-	1.76
Total magnesium					1.3	-	-	-	1.87
Dissolved manganese	0.4	1.9	2.5	3.6	0.0089	-	0.0009	0.0062	0.001
Total manganese		1.9	2.5	3.6	0.0094	0.032	0.039	0.031	0.0136
Dissolved potassium					1.2	-	-	-	1.94
Dissolved sodium	200				5.3	-	-	-	6.8
Chloride	250				9.0	7.3	6.9	10	7.8
Total Ammoniacal-N	0.82	0.9	1.43	2.3	< 0.010	<0.010	0.014	< 0.010	< 0.010
Nitrite-N	0.912				0.002	<0.002	0.005	0.002	0.002
Nitrate-N	11.3	0.092	0.092	0.092	1.52	0.3	1.33	1.16	0.96
Nitrite+Nitrate-N					1.52	0.3	1.34	1.16	0.96
DRP		0.009	0.009	0.009	0.018	-	-	-	< 0.004
Sulphate	250				8.5	-	-	-	21
cBOD5					< 2	-	-	-	< 2
COD					7.2	-	-	-	12
Dissolved arsenic	0.01	0.013	0.42	1.4	< 0.0010	-	<0.0010	< 0.0010	< 0.0010
Dissolved cadmium	0.004	0.0002	0.0004	0.0008	< 0.00005	-	<0.00005	< 0.00005	< 0.00005
Dissolved chromium	0.05	0.0033	0.006	0.04	< 0.0005	-	<0.0005	0.0007	< 0.0005
Dissolved copper	2	0.0014	0.0018	0.0025	< 0.0005	-	0.0007	0.0006	0.0007
Dissolved lead	0.01	0.0034	0.0056	0.0094	< 0.00010	-	<0.00010	< 0.00010	< 0.00010
Dissolved nickel	0.08	0.011	0.013	0.017	< 0.0005	-	<0.0005	< 0.0005	< 0.0005
Dissolved zinc	1.5	0.008	0.015	0.031	< 0.0010	-	0.0042	0.0028	0.0016
Total arsenic		0.013	0.42	1.4	< 0.0011	<0.0011	0.0012	< 0.0011	< 0.0011
Total cadmium		0.0002	0.0004	0.0008	< 0.000053	<0.000053	<0.000053	< 0.000053	< 0.000053
Total chromium (IV)		0.0033	0.006	0.04	< 0.00053	<0.00053	0.00076	0.00102	< 0.00053
Total copper		0.0014	0.0018	0.0025	< 0.00053	0.00123	0.00076	0.00071	0.00086
Total lead		0.0034	0.0056	0.0094	< 0.00011	0.00036	0.00074	0.00017	0.00022
Total nickel		0.011	0.013	0.017	< 0.00053	<0.00053	<0.00053	< 0.00053	< 0.00053
Total zinc		0.008	0.015	0.031	0.002	0.0036	0.0103	0.0028	0.0029

Notes:

All values provided in units of milligrams per liter (mg/L) unless otherwise specified.

¹ Ministry of Health (2018). Drinking-water Standards for New Zealand 2005 (revised 2018). Table 2.2 (health based), Table 2.3 (aesthetic)

² Australia and New Zealand Guidelines from Fresh & Marine Water Quality. Default Guideline Values, level of protection specified. Where no Toxicant DGV has been derived, values are for physical chemical (PC) stressors (based on MfE REC CX/L)

³ Trace concentration (defined as the upgradient [SPFUS] concentration $\pm$ 20%).

Values in **red** exceed the trace level (defined as the upgradient [SPFUS] concentration $\pm$ 20%).

Bordered values exceed the NZDWS (MAV or GV)

Values in *italics* exceed the NZWQS, 95% level of protection

Values in **bold** exceed the NZWQS, 90% level of protection

Gray highlighted values exceed the NZWQS, 80% level of protection

< Below the laboratory reporting limit (<RL)

Table A6.5: Summary of Exceedances

Analyte	Groundwater			Drain		Noname Creek			WTS (DC/C3)		Pond		TCD1	
	Level 1 COC	Level 2 COC		Level 1 COC	Level 2 COC		Level 1 COC	Level 2 COC		Level 2 COC	Level 2 COC		Level 2 COC	
		NZDWS	NZWQS		NZDWS	NZWQS		NZDWS	NZWQS		NZDWS	NZWQS	NZDWS	NZWQS
pH				X										
Total Alkalinity	X			X			X							
Bicarbonate	X			X			X							
Total Hardness	X			X			X			GV				
Electrical conductivity (mS/m)						80/90/95			80/90/95		80/90/95			80/90/95
Dissolved aluminium		GV	80/90/95		GV									
Total aluminium			80/90/95			80/90/95			95			80/90/95		
Dissolved calcium	X			X			X							
Dissolved iron	X			X			X							
Total Iron		GV		X			X	GV		GV		GV		
Dissolved magnesium				X			X							
Total magnesium				X			X							
Dissolved manganese				X			X			MAV			MAV	
Total Manganese				X			X							
Dissolved potassium				X			X							
Dissolved sodium				X			X							
Chloride				X										
Total Ammoniacal-N										MAV	80/90/95			
Nitrite-N	X													
Nitrate-N			80/90/95			80/90/95						80/90/95		80/90/95
Sulphate	X			X			X			GV				
COD	X			X			X							
Dissolved arsenic										MAV	95			
Dissolved chromium											95			
Dissolved copper			90/95								80/90/95			90/95
Dissolved nickel						95								
Dissolved zinc			95			95					95			
Total arsenic											90/95			
Total chromium			95								95			
Total copper			90/95			90/95					80/90/95			90/95
Total lead			90/95											
Total nickel			90/95			90/95								
Total zinc			90/95			90/95	X				90/95			



APPENDIX 6:
Laboratory Report (July 2024)

Certificate of Analysis

Page 1 of 7

Client:	Engeo Limited	Lab No:	3642348	SPV1
Contact:	Jimmy Whitmore	Date Received:	05-Aug-2024	
	C/- Engeo Limited	Date Reported:	13-Aug-2024	
	PO Box 373	Quote No:	132451	
	Christchurch 8140	Order No:		
		Client Reference:	26200.000.001	
		Submitted By:	Jimmy Whitmore	

Sample Type: Aqueous

Sample Name:	TRD1	TRD2	TRD3	TRD4	TRD5 / EPA_S2
		31-Jul-2024 2:40 pm	31-Jul-2024	31-Jul-2024 3:00 pm	31-Jul-2024 2:20 pm
Lab Number:	3642348.1	3642348.2	3642348.3	3642348.4	3642348.5

Individual Tests

Sum of Anions	meq/L	2.6	2.4	0.74	2.1	2.9
Sum of Cations	meq/L	2.7	2.4	0.76	2.0	3.1
pH	pH Units	7.7	6.4	7.0	7.3	6.9
Total Alkalinity	g/m ³ as CaCO ₃	53	7.0	16.3	22	11.4
Bicarbonate	g/m ³ at 25°C	64	8.6	19.8	27	13.8
Total Hardness	g/m ³ as CaCO ₃	109	96	26	82	122
Electrical Conductivity (EC)	mS/m	28.3	26.2	8.1	23.3	31.1
Dissolved Aluminium	g/m ³	0.027	0.064	0.027	0.021	0.132
Total Aluminium	g/m ³	0.28	0.51	0.143	2.6	0.21
Dissolved Calcium	g/m ³	38	32	8.2	28	39
Dissolved Iron	g/m ³	0.04	< 0.02	< 0.02	0.02	0.08
Total Iron	g/m ³	1.20	0.105	0.035	6.5	0.183
Dissolved Magnesium	g/m ³	3.3 #1	4.1 #1	1.31 #1	2.9	6.3
Total Magnesium	g/m ³	3.3 #1	4.1 #1	1.24 #1	3.3	6.4
Dissolved Manganese	g/m ³	0.0064	0.063	0.0107	0.0012	0.026
Total Manganese	g/m ³	0.040	0.074	0.0143	0.30	0.027
Dissolved Potassium	g/m ³	3.2	0.44	0.50	0.47	1.01
Dissolved Sodium	g/m ³	10.5	10.7	5.1	9.1	13.5
Chloride	g/m ³	9.6	9.7	8.1	9.2	12.8
Total Ammoniacal-N	g/m ³	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Nitrite-N	g/m ³	0.003	< 0.002	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m ³	1.22	0.015	0.85	0.56	0.21
Nitrate-N + Nitrite-N	g/m ³	1.22	0.016	0.85	0.56	0.21
Dissolved Reactive Phosphorus	g/m ³	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Sulphate	g/m ³	59	93	6.0	66	109
Carbonaceous Biochemical Oxygen Demand (CBOD ₅)	g O ₂ /m ³	< 2	< 2	< 2	< 2	< 2
Chemical Oxygen Demand (COD)	g O ₂ /m ³	26	12	< 6	50	8

Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn

Dissolved Arsenic	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Cadmium	g/m ³	< 0.00005	0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m ³	0.0007	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper	g/m ³	0.0008	0.0010	< 0.0005	< 0.0005	< 0.0005
Dissolved Lead	g/m ³	< 0.00010	0.00014	< 0.00010	< 0.00010	< 0.00010
Dissolved Nickel	g/m ³	0.0007	0.0129	< 0.0005	0.0036	0.0010
Dissolved Zinc	g/m ³	0.0012	0.0143	< 0.0010	< 0.0010	0.0031



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Aqueous						
Sample Name:		TRD1	TRD2 31-Jul-2024 2:40 pm	TRD3 31-Jul-2024	TRD4 31-Jul-2024 3:00 pm	TRD5 / EPA_S2 31-Jul-2024 2:20 pm
Lab Number:		3642348.1	3642348.2	3642348.3	3642348.4	3642348.5
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m ³	0.0014	< 0.0011	< 0.0011	0.0021	< 0.0011
Total Cadmium	g/m ³	< 0.000053	0.000063	< 0.000053	0.000064	< 0.000053
Total Chromium	g/m ³	0.00130	< 0.00053	< 0.00053	0.0023	< 0.00053
Total Copper	g/m ³	0.00113	0.00127	< 0.00053	0.0024	< 0.00053
Total Lead	g/m ³	0.00046	0.00055	< 0.00011	0.0025	< 0.00011
Total Nickel	g/m ³	0.00093	0.0132	< 0.00053	0.0113	0.00099
Total Zinc	g/m ³	0.0070	0.0159	< 0.0011	0.031	0.0034
Sample Name:		EPA_S1 31-Jul-2024 10:40 am	SP1	SP2	SP3	SPE
Lab Number:		3642348.6	3642348.7	3642348.8	3642348.9	3642348.10
Individual Tests						
Sum of Anions	meq/L	0.46	0.40	0.37	2.8	0.64
Sum of Cations	meq/L	0.44	0.40	0.39	2.7	0.67
pH	pH Units	6.3	6.0	4.9	6.4	7.1
Total Alkalinity	g/m ³ as CaCO ₃	3.2	4.1	1.4	4.3	11.8
Bicarbonate	g/m ³ at 25°C	4.0	5.0	1.7	5.2	14.4
Total Hardness	g/m ³ as CaCO ₃	13.4	7.0	5.9	109	21
Electrical Conductivity (EC)	mS/m	5.4	4.5	4.7	30.4	7.7
Dissolved Aluminium	g/m ³	< 0.003	0.093	0.31	0.047	0.043
Total Aluminium	g/m ³	0.67	0.196	0.49	0.155	0.39
Dissolved Calcium	g/m ³	3.7	1.45	0.85	36	6.7
Dissolved Iron	g/m ³	< 0.02	< 0.02	0.03	< 0.02	0.02
Total Iron	g/m ³	0.29	0.053	0.138	0.190	0.38
Dissolved Magnesium	g/m ³	1.04	0.81	0.91 #1	4.6	1.08
Total Magnesium	g/m ³	1.11	0.82	0.85 #1	4.6	1.10
Dissolved Manganese	g/m ³	0.056	0.0061	0.0118 #1	0.0019	0.0039
Total Manganese	g/m ³	0.061	0.0182	0.0117 #1	0.0050	0.147
Dissolved Potassium	g/m ³	0.52	0.13	0.25	0.60	0.68
Dissolved Sodium	g/m ³	3.7	5.5	5.1	12.2	5.0
Chloride	g/m ³	3.8	8.4	7.2	11.5	7.4
Total Ammoniacal-N	g/m ³	0.015	0.011	0.013	< 0.010	< 0.010
Nitrite-N	g/m ³	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m ³	0.107	0.66	1.13	0.22	1.38
Nitrate-N + Nitrite-N	g/m ³	0.108	0.66	1.13	0.22	1.39
Dissolved Reactive Phosphorus	g/m ³	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Sulphate	g/m ³	13.6	1.7	2.9	112	4.8
Carbonaceous Biochemical Oxygen Demand (CBOD ₅)	g O ₂ /m ³	< 2	< 2	< 2	< 2	< 2
Chemical Oxygen Demand (COD)	g O ₂ /m ³	< 6	10	< 6	14	6
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Nickel	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Zinc	g/m ³	0.0033	< 0.0010	0.0010	< 0.0010	< 0.0010
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m ³	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011
Total Cadmium	g/m ³	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053
Total Chromium	g/m ³	< 0.00053	< 0.00053	< 0.00053	< 0.00053	< 0.00053
Total Copper	g/m ³	0.00061	< 0.00053	< 0.00053	< 0.00053	< 0.00053
Total Lead	g/m ³	0.00070	0.00011	0.00012	0.00013	0.00041

Sample Type: Aqueous						
Sample Name:		EPA_S1 31-Jul-2024 10:40 am	SP1	SP2	SP3	SPE
Lab Number:		3642348.6	3642348.7	3642348.8	3642348.9	3642348.10
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Nickel	g/m ³	< 0.00053	< 0.00053	< 0.00053	< 0.00053	< 0.00053
Total Zinc	g/m ³	0.0064	0.0019	0.0026	0.0014	0.0033

Sample Name:		SPF_US 31-Jul-2024 2:00 pm	SPF-MS	SPF_DS	TCD1 31-Jul-2024 10:30 am	TSB1 31-Jul-2024 11:00 am
Lab Number:		3642348.11	3642348.12	3642348.13	3642348.14	3642348.15
Individual Tests						
Sum of Anions	meq/L	0.75	1.51	1.51	3.1	0.29
Sum of Cations	meq/L	0.78	1.62	1.60	3.1	0.51
pH	pH Units	6.9	7.4	7.6	6.6	5.6
Total Alkalinity	g/m ³ as CaCO ₃	15.0	38	39	55	3.5
Bicarbonate	g/m ³ at 25°C	18.3	46	47	67	4.3
Total Hardness	g/m ³ as CaCO ₃	28	64	62	125	7.8
Electrical Conductivity (EC)	mS/m	8.8	17.1	17.1	32.8	3.5
Dissolved Aluminium	g/m ³	0.046	0.019	0.033	0.012	1.77
Total Aluminium	g/m ³	0.070	0.062	0.079	0.038	60
Dissolved Calcium	g/m ³	9.4	23	22	43	2.5
Dissolved Iron	g/m ³	0.04	0.04	0.05	< 0.02	< 0.02
Total Iron	g/m ³	0.090	0.30	0.157	0.032	41
Dissolved Magnesium	g/m ³	1.04	1.81 #1	1.76	4.0 #1	0.38
Total Magnesium	g/m ³	1.10	1.80 #1	1.87	4.0 #1	10.3
Dissolved Manganese	g/m ³	0.0074	0.0164	0.0010	0.92	0.033
Total Manganese	g/m ³	0.0078	0.051	0.0136	0.94	0.76
Dissolved Potassium	g/m ³	0.96	1.91	1.94	3.7	0.52
Dissolved Sodium	g/m ³	4.4	6.6	6.8	11.8	3.3
Chloride	g/m ³	7.5	7.9	7.8	7.7	4.7
Total Ammoniacal-N	g/m ³	< 0.010	< 0.010	< 0.010	0.011	< 0.010
Nitrite-N	g/m ³	0.002	0.005	0.002	0.008	< 0.002
Nitrate-N	g/m ³	1.27	1.03	0.96	2.6	0.30
Nitrate-N + Nitrite-N	g/m ³	1.27	1.04	0.96	2.6	0.30
Dissolved Reactive Phosphorus	g/m ³	0.015	< 0.004	< 0.004	< 0.004	< 0.004
Sulphate	g/m ³	7.1	22	21	75	3.3
Carbonaceous Biochemical Oxygen Demand (cBOD ₅)	g O ₂ /m ³	< 2	< 2	< 2	< 2	< 2
Chemical Oxygen Demand (COD)	g O ₂ /m ³	6	18	12	8	43
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m ³	< 0.0010	< 0.0010	< 0.0010	0.0010 #1	< 0.0010
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0007	< 0.0005
Dissolved Copper	g/m ³	< 0.0005	0.0006	0.0007	0.0015	0.0032
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	0.00054
Dissolved Nickel	g/m ³	< 0.0005	< 0.0005	< 0.0005	0.0012	< 0.0005
Dissolved Zinc	g/m ³	< 0.0010	0.0034	0.0016	0.0050	0.026
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m ³	< 0.0011	< 0.0011	< 0.0011	< 0.0011 #1	0.021
Total Cadmium	g/m ³	< 0.000053	< 0.000053	< 0.000053	< 0.000053	0.000120
Total Chromium	g/m ³	< 0.00053	< 0.00053	< 0.00053	0.00092	0.029
Total Copper	g/m ³	< 0.00053	0.00071	0.00086	0.00169	0.062
Total Lead	g/m ³	< 0.00011	0.00042	0.00022	< 0.00011	0.075
Total Nickel	g/m ³	< 0.00053	< 0.00053	< 0.00053	0.00135	0.040
Total Zinc	g/m ³	0.0013	0.0059	0.0029	0.0053	0.172

Sample Type: Aqueous						
Sample Name:		Cell A Leachate	Cell B + C Leachate 30-Jul-2024 4:00 pm	Sed Basin Stage 2 31-Jul-2024 12:30 pm	DC/C3 31-Jul-2024	MB1 30-Jul-2024 1:10 pm
Lab Number:		3642348.16	3642348.17	3642348.18	3642348.19	3642348.20
Individual Tests						
Sum of Anions	meq/L	14.0	14.2	14.3	14.2	0.73
Sum of Cations	meq/L	14.2	14.6	14.6	14.8	0.77
pH	pH Units	7.7	6.9	8.1	8.2	6.1
Total Alkalinity	g/m ³ as CaCO ₃	330	310	340	310	17.2
Bicarbonate	g/m ³ at 25°C	400	380	410	380	21
Total Hardness	g/m ³ as CaCO ₃	590	550	600	610	25
Electrical Conductivity (EC)	mS/m	125.1	130.1	125.6	126.2	8.4
Dissolved Aluminium	g/m ³	0.005	0.050	0.016	0.013	0.093
Total Aluminium	g/m ³	0.071	0.082	0.21	0.035	0.29
Dissolved Calcium	g/m ³	220	196	220	230	7.6
Dissolved Iron	g/m ³	0.10	0.51	0.05	0.04	< 0.02
Total Iron	g/m ³	1.96	0.68	1.56	0.41	0.115
Dissolved Magnesium	g/m ³	11.3	15.6 ^{#1}	11.6	11.6	1.39 ^{#1}
Total Magnesium	g/m ³	11.7	15.4 ^{#1}	11.9	12.3	1.39 ^{#1}
Dissolved Manganese	g/m ³	1.97	2.7 ^{#1}	2.6	1.71	0.0077
Total Manganese	g/m ³	2.1	2.6 ^{#1}	2.6	1.80	0.0104
Dissolved Potassium	g/m ³	22	29	23	23	0.61
Dissolved Sodium	g/m ³	33	34	36	34	5.6
Chloride	g/m ³	17.7	19.7	19.6	18.2	6.7
Total Ammoniacal-N	g/m ³	5.4	16.1	5.4	5.9	< 0.010
Nitrite-N	g/m ³	0.069	0.025	0.053	0.082	< 0.002
Nitrate-N	g/m ³	0.079	0.34	0.100	0.064	1.07
Nitrate-N + Nitrite-N	g/m ³	0.148	0.36	0.154	0.145	1.07
Dissolved Reactive Phosphorus	g/m ³	< 0.004	0.024	< 0.004	< 0.004	0.005
Sulphate	g/m ³	330	350	330	360	5.6
Carbonaceous Biochemical Oxygen Demand (cBOD ₅)	g O ₂ /m ³	3	11	3	3	< 2
Chemical Oxygen Demand (COD)	g O ₂ /m ³	74	114	84	80	< 6
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m ³	0.0112	0.041	0.0125	0.022	< 0.0010
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m ³	0.0060	0.0139	0.0065	0.0069	< 0.0005
Dissolved Copper	g/m ³	0.0054	0.033	0.0077	0.0078	< 0.0005
Dissolved Lead	g/m ³	< 0.00010	0.00012	< 0.00010	< 0.00010	< 0.00010
Dissolved Nickel	g/m ³	0.0029	0.0026	0.0037	0.0031	< 0.0005
Dissolved Zinc	g/m ³	0.024	0.0077	0.044	0.023	0.0016
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m ³	0.026	0.050	0.021	0.026	< 0.0011
Total Cadmium	g/m ³	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053
Total Chromium	g/m ³	0.0082	0.0164	0.0086	0.0084	< 0.00053
Total Copper	g/m ³	0.0090	0.178	0.021	0.0108	< 0.00053
Total Lead	g/m ³	0.00033	0.00021	0.00057	0.00025	0.00034
Total Nickel	g/m ³	0.0031	0.0028	0.0037	0.0031	< 0.00053
Total Zinc	g/m ³	0.036	0.0164	0.056	0.030	0.0030
Sample Name:		MB2(S) 31-Jul-2024 9:00 am	MB2(D) 31-Jul-2024 9:45 am	MB3 30-Jul-2024 12:20 pm	MB4D 30-Jul-2024 3:10 pm	Deep Sump 31-Jul-2024 11:40 am
Lab Number:		3642348.21	3642348.22	3642348.23	3642348.24	3642348.25
Individual Tests						
Sum of Anions	meq/L	0.84	3.9	0.74	1.80	14.1
Sum of Cations	meq/L	0.89	3.9	0.80	1.91	14.5
pH	pH Units	6.1	6.8	6.0	6.5	7.8
Total Alkalinity	g/m ³ as CaCO ₃	19.2	176	16.2	43	320
Bicarbonate	g/m ³ at 25°C	23	210	19.8	53	390

Sample Type: Aqueous						
Sample Name:		MB2(S) 31-Jul-2024 9:00 am	MB2(D) 31-Jul-2024 9:45 am	MB3 30-Jul-2024 12:20 pm	MB4D 30-Jul-2024 3:10 pm	Deep Sump 31-Jul-2024 11:40 am
Lab Number:		3642348.21	3642348.22	3642348.23	3642348.24	3642348.25
Individual Tests						
Total Hardness	g/m ³ as CaCO ₃	32	50	28	76	600
Electrical Conductivity (EC)	mS/m	9.8	35.8	8.9	19.9	125.9
Dissolved Aluminium	g/m ³	0.069	0.004	0.062	0.009	0.008
Total Aluminium	g/m ³	1.22	19.3	0.68	0.34	0.041
Dissolved Calcium	g/m ³	11.1	13.3	9.4	28	220
Dissolved Iron	g/m ³	< 0.02	< 0.02	< 0.02	< 0.02	0.10
Total Iron	g/m ³	0.96	15.3	0.50	0.31	0.89
Dissolved Magnesium	g/m ³	1.10	4.1	1.04	1.64	11.4
Total Magnesium	g/m ³	1.29	7.0	1.16	1.64	11.7
Dissolved Manganese	g/m ³	0.075	0.55	0.146	0.191	1.85
Total Manganese	g/m ³	0.088	0.75	0.151	0.192	1.95
Dissolved Potassium	g/m ³	0.89	1.59	0.69	0.79	22
Dissolved Sodium	g/m ³	4.9	64	4.9	8.4	33
Chloride	g/m ³	7.8	11.1	7.0	7.0	18.1
Total Ammoniacal-N	g/m ³	< 0.010	0.25	< 0.010	0.039	5.5
Nitrite-N	g/m ³	< 0.002	< 0.002	< 0.002	0.034	0.074
Nitrate-N	g/m ³	1.23	< 0.002	1.42	1.92	0.075
Nitrate-N + Nitrite-N	g/m ³	1.23	< 0.002	1.42	1.95	0.150
Dissolved Reactive Phosphorus	g/m ³	< 0.004	0.161	< 0.004	< 0.004	< 0.004
Sulphate	g/m ³	6.9	0.6	5.8	29	340
Carbonaceous Biochemical Oxygen Demand (cBOD ₅)	g O ₂ /m ³	< 2	< 2	< 2	< 2	3
Chemical Oxygen Demand (COD)	g O ₂ /m ³	< 6	30	< 6	< 6	70
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m ³	< 0.0010	0.0075	< 0.0010	< 0.0010	0.0146
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0063
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0061
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Nickel	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0030
Dissolved Zinc	g/m ³	0.0034	< 0.0010	0.0033	0.0018	0.023
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m ³	< 0.0011	0.021	< 0.0011	< 0.0011	0.024
Total Cadmium	g/m ³	< 0.000053	0.00060	< 0.000053	< 0.000053	< 0.000053
Total Chromium	g/m ³	0.00083	0.0112	< 0.00053	< 0.00053	0.0082
Total Copper	g/m ³	0.00150	0.024	0.00072	0.00081	0.0090
Total Lead	g/m ³	0.00169	0.030	0.00082	0.00065	0.00014
Total Nickel	g/m ³	0.00129	0.0136	0.00063	< 0.00053	0.0031
Total Zinc	g/m ³	0.0070	0.059	0.0053	0.0035	0.027

Analyst's Comments

#1 It has been noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods.

Appendix No.1 - Chain of Custody

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00005 - 0.0010 g/m ³	1-25
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B (modified) : Online Edition / US EPA 200.8.	0.000053 - 0.0011 g/m ³	1-25

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Filtration, Unpreserved	Sample filtration through 0.45 µm membrane filter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch.	-	1-25
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1-25
Total anions for anion/cation balance check	Calculation: sum of anions as mEq/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E : Online Edition.	0.07 meq/L	1-25
Total cations for anion/cation balance check	Sum of cations as mEq/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H ⁺) also included in calculation if available. APHA 1030 E : Online Edition.	0.05 meq/L	1-25
pH	pH meter. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 4500-H ⁺ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-25
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m ³ as CaCO ₃	1-25
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO ₂ D : Online Edition.	1.0 g/m ³ at 25°C	1-25
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m ³ as CaCO ₃	1-25
Electrical Conductivity (EC)	Conductivity meter, 25°C. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 2510 B : Online Edition.	0.1 mS/m	1-25
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1-25
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.003 g/m ³	1-25
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition / US EPA 200.8.	0.0032 g/m ³	1-25
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-25
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-25
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-25
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-25
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m ³	1-25
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0005 g/m ³	1-25
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition / US EPA 200.8.	0.00053 g/m ³	1-25
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m ³	1-25
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m ³	1-25
Chloride	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-25
Total Ammoniacal-N	Filtered Sample from Christchurch. Phenol/hypochlorite colourimetry. Flow injection analyser. (NH ₄ -N = NH ₄ ⁺ -N + NH ₃ -N). APHA 4500-NH ₃ H (modified) : Online Edition.	0.010 g/m ³	1-25
Nitrite-N	Filtered sample from Christchurch. Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-25
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m ³	1-25
Nitrate-N + Nitrite-N	Filtered sample from Christchurch. Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO ₃ ⁻ I (modified) : Online Edition.	0.002 g/m ³	1-25

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Dissolved Reactive Phosphorus	Filtered sample from Christchurch. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) : Online Edition.	0.004 g/m ³	1-25
Sulphate	Filtered sample from Christchurch. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m ³	1-25
Carbonaceous Biochemical Oxygen Demand (cBOD ₅)	Incubation 5 days, DO meter, nitrification inhibitor added, seeded. Analysed at Hill Laboratories - Chemistry; Unit 1, 17 Print Place, Middleton, Christchurch. APHA 5210 B (modified) : Online Edition.	2 g O ₂ /m ³	1-25
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D : Online Edition.	6 g O ₂ /m ³	2-3, 5-14, 20-21, 23-24
Chemical Oxygen Demand (COD), screen level	Dichromate/sulphuric acid digestion, colorimetry. Screen Level method. APHA 5220 D : Online Edition.	25 g O ₂ /m ³	1, 4, 15-19, 22, 25

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 06-Aug-2024 and 13-Aug-2024. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

3/3



Hill Laboratories
TRIED, TESTED AND TRUSTED

Quote No 132451

Primary Contact Jimmy Whitmore

Submitted By "

Client Name ENGEO Ltd [160117]

Address 124 Montreal Street
Christchurch Postcode 8023

Phone 03 328 9012 **Mobile** +64 27 200 6898

Email JDWhitmore@engeo.co.nz

Charge To ENGEO Ltd

Client Reference 26200.000.001

Order No

Results To Reports will be emailed to Primary Contact by default.
Additional Reports will be sent as specified below.

☒ Email Primary Contact ☐ Email Submitter ☐ Email Client

☒ Email Other LNugent@engeo.co.nz

☐ Other

Dates of testing are not routinely included in the Certificates of Analysis.
Please inform the Laboratory if you would like this information reported.

ADDITIONAL INFORMATION / KNOWN HAZARDS

BH2 (bottle label) = MB2 (COC Label)
BH1 (bottle label) = MB1 (COC Label)

ANALYSIS REQUEST

R J Hill Laboratories Limited
28 Duke Street, Hamilton 3204
Private Bag 3205
Hamilton 3240, New Zealand

Job No: **Date Recv:** 05-Aug-24 13:34

364 2348

Received by: Findabair Joynes

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

3136423486

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories **Date & Time:** 05/08/2024

Name: JDWhitmore

☐ Tick if you require COC to be emailed back **Signature:**

Received at Hill Laboratories **Date & Time:**

Name:

Signature:

Condition **Temp:**

☐ Room Temp ☐ Chilled ☐ Frozen 86

Priority ☐ Low ☒ Normal ☐ High

☐ Urgent (ASAP, extra charge applies, please contact lab first)

Requested Reporting Date:

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
1	TRD1	30-31/07/2024	-	SW	As per quote for all samples.
2	TRD2			SW	
3	TRD3			SW	
4	TRD4			SW	
5	TRD5 / EPA_S2			SW	
6	EPA_S1			SW	
7	SP1			SW	
8	SP2			SW	
9	SP3			SW	
10	SPE			SW	
11	SPF_US			SW	
12	SPF-MS			SW	

Continued on next page

No.	Sample Name	Sample Date	Sample Time	Sample Type	Tests Required (if not as per Quote)
13	SPF_DS			SW	
14	TCD1			SW	
15	TSB1			GW	
16	Cell A Leachate			GW	
17	Cell B + C Leachate			GW	
18	Sed basin Stage 2			SW	
19	DC/C3			GW	
20	MB1			GW	
21	MB2(S)			GW	
22	MB2(D)			GW	
23	MB3			GW	
24	MB4			GW	
25	Deep Sump			GW	
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					



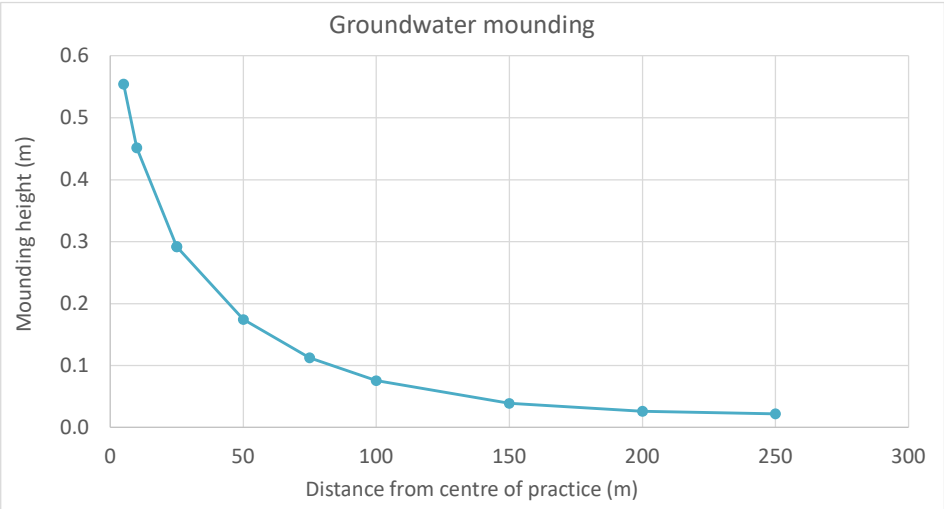
APPENDIX 7: Hantush Modelling Results

This spreadsheet will calculate the height of a groundwater mound beneath an stormwater infiltration BMP.
More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102
"Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

[Go to the USGS report](#)

Input Values		
Recharge (infiltration) rate (m/day)	8.000	R
Specific yield, S_y (dimensionless)	0.130	S_y
Horizontal hydraulic conductivity, K_h (m/day)	86.400000	K_h
1/2 length of basin (x direction, in m)	5.0	x
1/2 width of basin (y direction, in m)	5.0	y
Duration of infiltration period (days)	1	t
Initial thickness of saturated zone (m)	8.0	$h_i(0)$

CALCULATE



Distance from center of infiltration BMP (m)	Ground-water mounding (m)
5	0.55
10	0.45
25	0.29
25	0.29
50	0.17
75	0.11
100	0.08
150	0.04
200	0.03
250	0.02

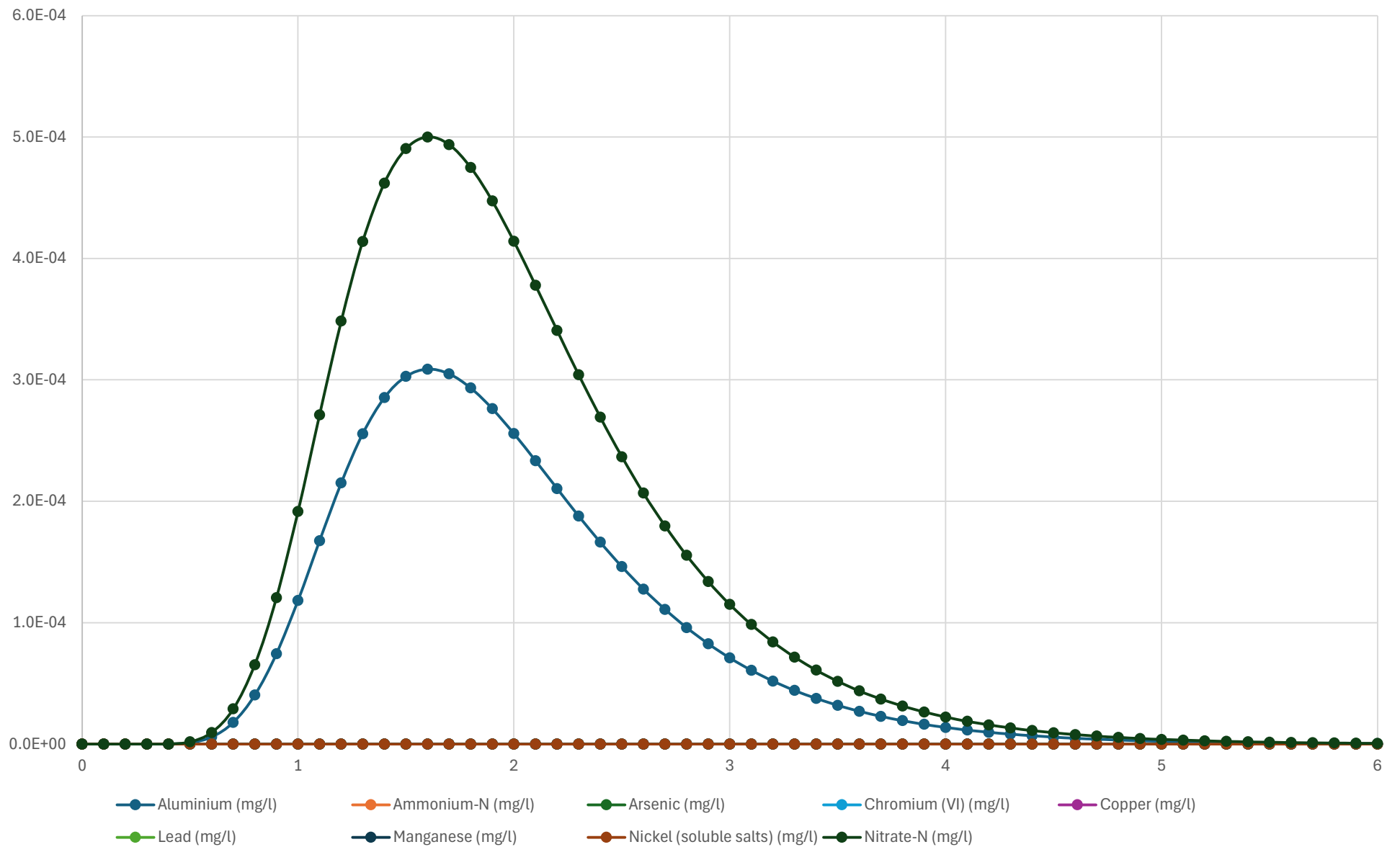
IF YOU CHANGE THE SCALE OF THE
DISTANCE MEASUREMENTS
(OR ANY OTHER PARAMETER),
YOU MUST RECALCULATE!!

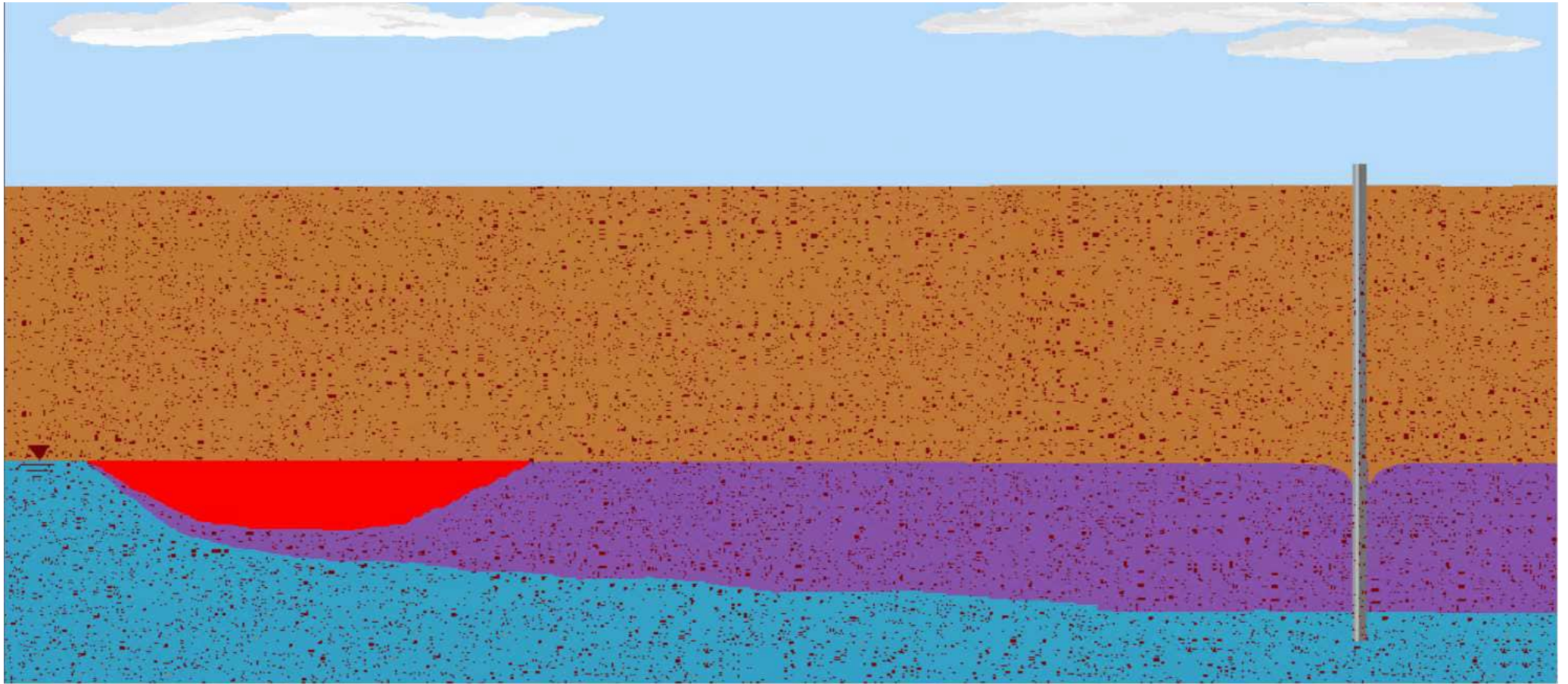


APPENDIX 8: RISC5 Modelling Results

8.3	7.1E-09	1.4E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-08
8.4	5.9E-09	1.8E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E-15	0.0E+00	9.6E-09
8.5	5.0E-09	2.4E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.8E-15	0.0E+00	8.0E-09
8.6	4.2E-09	3.0E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.4E-15	0.0E+00	6.7E-09
8.7	3.5E-09	3.9E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E-14	0.0E+00	5.6E-09
8.8	2.9E-09	4.9E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E-14	0.0E+00	4.7E-09
8.9	2.4E-09	6.2E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.4E-14	0.0E+00	4.0E-09
9	2.0E-09	7.8E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.4E-14	0.0E+00	3.3E-09
9.1	1.7E-09	9.7E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.8E-14	0.0E+00	2.8E-09
9.2	1.4E-09	1.2E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-14	0.0E+00	2.3E-09
9.3	1.2E-09	1.5E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-13	0.0E+00	2.0E-09
9.4	1.0E-09	1.8E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E-13	0.0E+00	1.6E-09
9.5	8.5E-10	2.2E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.8E-13	0.0E+00	1.4E-09
9.6	7.1E-10	2.7E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.4E-13	0.0E+00	1.1E-09
9.7	5.9E-10	3.3E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.1E-13	0.0E+00	9.6E-10
9.8	5.0E-10	4.0E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.1E-13	0.0E+00	8.1E-10
9.9	4.2E-10	4.8E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.3E-13	0.0E+00	6.8E-10
10	3.5E-10	5.7E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.8E-13	0.0E+00	5.7E-10

[COC] at Downgradient Receptor (310 m)





Appendix 4

Rules Assessment



Urban & Environmental

Proposal:	Temporary discharge from retention pond to land, via a soakage area
Address:	Taylorville Resource Park, Taylorville Road, Coal Creek 7802
Regional Plan:	Regional Land and Water Plan (27 May 2014)
Proneness to Erosion:	The application site is located within the 'Non Erosion Prone Area', which is defined as 'land not in the Greymouth Earthworks Control Area with a dominant slope angle less than 12 Degrees (or a 1:4.7 ratio)'. The application site is not located within the Greymouth Earthworks Control Area, contained at Schedule 4.

Regional Rules	Compliance or Non-Compliance
18.1 ACTIVITIES ON LAND	
18.1.1 Permitted Activities on Land	
Rule 2 Earthworks in riparian margins	
Earthworks within riparian margins, and any associated discharge of sediment are a permitted activity if all of the following conditions are met	N/A – There will be no earthworks within a riparian margin.
Rule 3 Earthworks in the Non Erosion Prone Area, outside riparian margins	
Earthworks in the Non Erosion Prone Area (less than 120 slope or a 1:4.7 ratio), and outside any riparian margin, and any associated discharge of sediment is a permitted activity if all of the following conditions are met:	Complies - The proposed earthworks associated with the construction of the soakage area will be within a non-erosion prone area and outside of any riparian margin.
(a) Earthworks either: i) Are for the formation, construction, or reconstruction of roads, tracks, railway lines, landings, firebreaks, and network utility lines, pipes, or cables; or ii) Do not exceed an annual volume of 5,000m ³ per landholding or hectare, whichever is the smaller; and	Complies - The proposed volume of earthworks for the construction of the soakage area will be 200m ³ (10m x 10m x 2m deep).
(b) Sufficient sediment control is constructed so that the activity does not either: i) Decrease the visual clarity of any receiving water by more than 40% as measured by black disc; or ii) Alter the natural turbidity in the receiving water by more than 1 Nephelometric Turbidity Unit (NTU) where the natural turbidity upstream from the discharge is less than or equal to 10 NTU; or iii) Alter the natural turbidity in the receiving water by more than 10 NTU where the natural turbidity upstream from the discharge is greater than 10 NTU; as measured beyond 12 times the river's width or 200m of the activity, whichever is the lesser; and	Complies - The proposed earthworks associated with the construction of the soakage area will be within a non-erosion prone area and outside of any riparian margin.

Regional Rules	Compliance or Non-Compliance
(c) No soil or debris is placed directly in any river or lake bed; and	Complies -The proposed earthworks will comply as the area is not located near any surface waterbodies.
(d) There is no conspicuous deposition of sediment on the bed of any water body, or on land beyond the boundary of the subject property; and	Complies -The proposed earthworks will comply as the area is not located near any surface waterbodies.
(e) The activity does not affect any surface water take; and	Complies -The proposed earthworks will comply as the area is not located near any surface waterbodies or take.
(f) The activity is not within: i) 50m of the Coastal Marine Area on the open coast line; or ii) 20m of the Coastal Marine Area elsewhere; or iii) Any wetland identified in Schedule 1; or iv) Any wetland identified in Schedule 2 unless it meets the requirements of Rule 7; and	Complies -The proposed area for the soakage pit will not be located within any of these areas.
(g) Where earthworks are for the formation, construction, or reconstruction of any road, track, firebreak, landing, line, pipe, or cable: i) Formed surfaces with an inward cross fall must have a constructed form of drainage control such as a water table, kerb and channel, swale, channel/ditch, or sumps and pipes to avoid causing erosion; and ii) Any culverts, or cut and fill batters are designed and constructed or installed so as to prevent their failure and avoid causing erosion; and iii) Trenches for the purpose of installing lines, pipes, or cables are backfilled and compacted as soon as practicable; and	N/A
(h) The activity does not cause or contribute toward any slope or land surface instability, including subsidence or other erosion; and	Complies -The proposed earthworks will not cause or contribute to this as the proposed area is reasonable flat.
(i) All areas of bare ground created by the activity and any stockpiles of material are protected from soil erosion as soon as practicable; and	Complies -This will be undertaken.
(j) ¹ Where earthworks are for the purpose of forming a drain ² ...	N/A

¹ For condition (j) the quality of any discharged drainage water must comply with the conditions of the permitted activity Rule 64 in Chapter 18.4 Discharges to Water.

² Refers to an artificial channel or subsurface conduit (e.g. mole drain, tile drain or drainage tunnel, or roadside swale) constructed for the purpose of:

- Collecting and diverting surface runoff, but also includes water collected from sealed surfaces with no associated reticulated stormwater system such as roadside swales and concrete dish swales, or
- Intercepting groundwater in order to lower the water table or divert water (excluding a water race), and directing it to a receiving water body.

Regional Rules	Compliance or Non-Compliance
(k) Where the earthworks are for the purpose of constructing a water supply bore...	N/A
18.4 DISCHARGES TO WATER ³	
18.4.1 Permitted Discharges to Water	
Rule 63 Discharge of stormwater ⁴ from reticulated systems ⁵	
The discharge of stormwater from any reticulated stormwater system to water is a permitted activity if all of the following conditions are met...	N/A – the liquid within the retention pond cannot be classified as stormwater.
Rule 64 - Discharge from any drain	
The discharge from any drain to a water body, or another drain beyond the property boundary, is a permitted activity if all of the following conditions are met...	N/A – the discharge from the retention pond will be via a new onsite soakage area.
Rule 67 - Discharge of water to water excluding activities permitted by Rules 63, 64, 65, or 66	
Excluding the activities permitted by Rules 63, 64, 65, or 66 any discharge of water to water is a permitted activity if all of the following conditions are met.	N/A - Defaults to discretionary activity under Rule 71. Note: Proposal relates to the discharge of water from the retention pond to ground, which daylight via Noname Creek and a roadside drain, and may ultimately discharge to the Grey River.
(a) The discharge contains no contaminants beyond trace concentrations ⁶ , or hazardous substances ⁷ ; and	Consent required - Engeo have advised that the proposed discharges will contain contaminants exceeding this standard.
(b) Beyond a mixing zone of 12 times the width of the receiving water body, or 200m, whichever is the lesser, the discharge does not:	N/A – The discharge will be to land via a soakage pit.

The channel must not incorporate the bed of an existing river or creek, or the water from the bed of an existing river or creek. The hollows of humped and hollowed land are considered drains.

³ Means water in all its physical forms whether flowing or not and whether over or under the ground. Includes fresh water, coastal water and geothermal water; but does not include water in any form while in any pipe, tank or cistern.

⁴ No definition of stormwater within the RLWP.

⁵ A reticulated stormwater system is any system that collects water from impervious surfaces such as roofs, buildings and other structures. A drain is a collection and delivery system that collects water from generally unsealed surfaces (e.g. on farm or rural roadside drains) but also includes water collected from sealed surfaces with no associated reticulated stormwater system such as roadside swales and concrete dish swales. The hollows of humped and hollowed land are considered drains.

⁶ In terms of Rule 64 means the presence of a contaminant in concentrations that will not alter the background concentration in receiving waters by more than 20% or exceed the ANZECC aquatic ecosystem guidelines. Note: The Australian and New Zealand Guidelines for Freshwater Quality are produced by the Australian and New Zealand Environmental and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.

⁷ Defined as “(a) With one or more of the following intrinsic properties: (i) Explosiveness; (ii) Flammability; (iii) A capacity to oxidise; (iv) Corrosiveness; (v) Toxicity (including chronic toxicity); (vi) Ecotoxicity, with or without bioaccumulation; or (b) Which on contact with air or water (other than air or water where the temperature or pressure has been artificially increased or decreased) generates a substance with any one or more of the properties specified in paragraph (a) of this definition.”

Regional Rules		Compliance or Non-Compliance	
i) Change the pH of the receiving water by more than 0.5 pH units where the pH is above 8 or below 6.5; or ii) Raise the temperature in the receiving water by more than 3 degrees Celsius, or cause the temperature to rise above 25 degrees Celsius; and			
(c) The discharge does not cause flooding of another person’s property, erosion, land instability, sedimentation or property damage.		N/A - The proposed discharge will be controlled so as to not cause flooding of another person’s property, erosion, land instability, sedimentation or property damage.	
18.4.2 Discretionary Discharges to Water			
Rule 71 - Discharge of any contaminant, or water to water, not complying with Rules 63 to 70			
Unless permitted by Rules 63, 64, 65, 66, 67, 68, 69 or 70 the discharge of any contaminant or water to water is a discretionary activity		Consent required - Non-compliance with Rule 67(a) and therefore is classified as a Discretionary Activity under Rule 71.	
		Discretionary Activity	
18.5 DISCHARGES TO LAND			
18.5.1 Permitted Discharges to Land			
Solid waste ⁸ and offal pits			
The discharge of any contaminants into or onto land in connection with the disposal of solid waste, including offal, on production land is a permitted activity, provided that all of the following conditions are met:		N/A – This proposal relates to the discharge of water from the retention pond to land, via a soakage area.	
Rule 81 - Discharge of stormwater runoff ⁹			
The discharge of collected stormwater runoff into or onto land is a permitted activity provided that all of the following conditions are met...		N/A – This proposal relates to the discharge of water from the retention pond to land, via a soakage area and the proposal does not meet the definition of ‘stormwater’.	

⁸ Solid waste is defined to mean the solid residue of domestic, industrial and commercial waste that excludes green waste, hazardous waste, and organic waste.

⁹ Stormwater runoff is defined to refer to the overland flow of rainwater not contained within or forming part of a water body. Waterbody is defined as "fresh water or geothermal water in a river, lake, stream, pond, wetland, or aquifer or any part thereof, that is not located within the coastal marine area".

Regional Rules		Compliance or Non-Compliance	
Rule 86 - The discharge of cleanfill ¹⁰ into or onto land in the Non Erosion Prone Area, outside riparian margins			
The discharge of cleanfill into or onto land in the Non Erosion Prone Area, outside riparian margins is a permitted activity subject to the following conditions...		N/A – This proposal relates to the discharge of water from the retention pond to land, via a soakage area.	
18.5.2 Controlled Discharges to Land			
Rule 90 - Discharge of stormwater runoff not permitted by Rule 81			
The discharge of any contaminant into or onto land in connection with the discharge of stormwater runoff is a controlled activity unless permitted by Rule 81, and shall comply with the following standards and terms...		N/A – This proposal relates to the discharge of water from the retention pond to land, via a soakage area and the proposal does not meet the definition of ‘stormwater’.	
18.5.3 Discretionary Discharges to Land			
Rule 91 - Discharge to land discretionary activity Rule			
Unless permitted by Rules 72 to 86, or controlled by Rules 87 to 90, any discharge of contaminants into or onto land is a discretionary activity.		Consent required - The proposed temporary discharge from the retention pond to land via a soakage area is not covered by Rules 72 to 86, or controlled by Rules 87 to 90 and therefore would be classified as a Discretionary Activity under Rule 91.	
		Discretionary Activity	

¹⁰ Cleanfill is defined as “material that when buried will have no adverse effect on people or the environment. Cleanfill material includes virgin natural materials such as clay, soil and rock, and other inert materials such as concrete or brick that are free of:

- (a) combustible, putrescible, degradable or leachable components
- (b) hazardous substances
- (c) products or materials derived from hazardous waste treatment, hazardous waste stabilisation or hazardous waste disposal practices
- (d) materials that may present a risk to human or animal health such as medical and veterinary waste, asbestos or radioactive substances
- (e) liquid waste
- (f) Protruding reinforcing, any reinforcing must be cut off from the concrete face.”



388 Main South Rd, Paroa
P.O. Box 66, Greymouth 7840
The West Coast, New Zealand
Telephone (03) 768 0466
Toll free 0508 800 118
Email info@wcrc.govt.nz
www.wcrc.govt.nz

21 October 2024

Taylorville Resource Park Ltd
c/o Barker & Associates
KerstinG@barker.co.nz

Enquiries to: Michael Durand

Dear Ms Ghisel

RC-2024-0122 – DISCHARGES OF CONTAMINANTS AT TAYLORVILLE RESOURCE PARK
Further information request under section 92(1) of the Resource Management Act 1991

Thank you for your application to discharge collected leachate and stormwater to land (RC-2024-0122) from the Taylorville Resource Park Ltd landfill.

The application is being assessed against relevant provisions of the RMA, regulations and regional plans and policy statements. It is also being assessed for any gaps in the information provided and in your assessments of that information. As a result of these assessments further information is requested under section 92(1) of the RMA as follows.

Leachate generation

The application states (pg. 8) that:

“the site operations also include two large water treatment / retention devices with a combined capacity of approximately 15,000m³ for treated leachate and stormwater captured by the onsite operations.”

TRPL stated in its 2021 application for RC-2021-0097 (16 July 2021 site assessment) that the proposed methodology included *“installation / creation of surface water and potentially leachate treatment systems (e.g. containment / settlement / treatment ponds)”*. WCRC sought by section 92(1) information about that, to which TRPL replied:

“the Davis Ogilvie report states potential leachate is highly unlikely, but, if possible, it will be captured by the cell/pit sump. From there it will be piped into the water management system (attached). Treatment can only be confirmed upon leachate detection. If there are leachate present, they will be collected via a Hydra-Vac Truck and taken to the appropriate dump site”.

RC-2021-0097 was granted with an explicit condition prohibiting contamination of surface water and groundwater as a result of the exercise of the consent (Condition 11). None of the subsequent changes made to RC-2021-0097 concerned leachate or its management.

Nevertheless, and contrary to TRPL’s expectation, the landfill has produced leachate.

Questions:

1. Why is leachate being generated?
2. How long has it been known that leachate is being generated?
3. Why has 15,000 m³ of leachate mixed with stormwater been able to accumulate on site?
4. Why has leachate not been “collected via a Hydra-Vac Truck and taken to the appropriate dump site” as described in the 2021 consent application and instead been allowed to accumulate over time?
5. Is leachate likely to continue to be generated, and if so at what quality?
6. Is TRPL making or planning steps to reduce or avoid future leachate generation?
7. If yes, please explain steps, set out a timetable for their implementation and provide an assessment of their efficacy.
8. In relation to any future leachate generated, what steps is TRPL making to “collect this via a Hydra-Vac Truck and taken to the appropriate dump site”?
9. What, if any, steps is TRPL taking now or planning to take in the future to reduce or avoid the mixing or leachate with stormwater?

Discharge and rationale

The application AEE states (pg. 11) that:

“the devices are currently at capacity and with heavy rainfall predicted for the coming months, the applicant is seeking temporary consent to discharge water to land, to help in creating a freeboard within the retention pond.”

The AEE does not state how much freeboard is intended to be created, nor the total volume of leachate proposed to be discharged. It does however, state that the discharge will contribute 800m³ of water per day to the unconfined aquifer.

Questions:

10. Please confirm TRPL’s intentions for the temporary discharge subject to the requested resource consent:
 - a. What is considered to be a sufficient leachate retention pond freeboard and why?
 - b. What volume of leachate is required to be removed from the pond “to help in creating a freeboard”?
 - c. What is the daily volume, weekly volume, monthly volume and total expected volume of leachate TRPL is seeking to discharge?
 - d. Is this volume more than, or less than, what is required to “to help in creating a freeboard”?

We understand that collected stormwater and leachate flows through the system of pond in series. The application states (pg. 9) that *“the first stage of the settlement pond has a capacity of approximately 2,700m³, allowing for an approximate residence time of 135-180 days.”* However, the need for the discharge permit is predicated on 50 mm/day of rain feeding 800 m³ of water into the water management system. By our calculations the first stage pond residence time would be 3.4 days if there were three consecutive days with 50 mm of rain each day.

Questions:

11. Please reconcile and further explain:

- a. The expected volumetric inputs into the system under anticipated rainfall events;
- b. The residence time in each pond resulting from these anticipated rainfall events.

Answers to these questions should be given in conjunction with answers to questions above relating to freeboard sought to be created and the volume of water to be removed from the water management system to achieve this.

Material that is, or may be, generating leachate

The site is authorised to receive material as follows:

- Under condition 5: *“The Consent Holder shall only deposit fill material initially in the area outlined in red and labelled Dump Cells Stage 1,2,3 on the attached aerial photograph labelled Annexure 1 “RC-2021-0097 Application Area” or asbestos and coal tar or coal pitch only in the areas labelled Existing Lines ACM Cell and new application area lined ACM Cell on the attached aerial photograph titled “RC-2021-0097 Annexure 3. Variation September 2022”; and*
- Under Condition 9: *“Only demolition waste (including clean fill) and whole or shredded tyres, but not including the disposal of asbestos or other hazardous materials may be disposed of in the location identified in Annexure 1. Asbestos and other hazardous materials approved by the Consent Authority can only be disposed of in the dedicated, lined cells identified in Annexure 3.”*

Questions:

12. WCRC understands that the site has received other materials that have the potential to generate leachate. Please confirm:

- a. Whether any other materials have been discharged into the cells;
- b. If they have, please confirm:
 - i. what these materials are;
 - ii. their volumes;
 - iii. their source(s);
 - iv. their potential for leachate generation when placed in a cell on their own;

- v. their potential for leachate generation when placed in a cell with other materials;
 - vi. the expected characteristics of leachate arising from the presence of these materials in cells, including (but not limited to) the expected values for analytes listed in Table A6.1 of Appendix 5 of the AEE (of the Hydrological Assessment by ENGEO);
 - c. Whether the analytes measured in leachate are consistent with that expected from the materials that have been discharged to the cells;
13. Please provide an assessment of whether the contaminants expected to be found in leachate are likely to be present in leachate over:
- a. the period between now and in 6 months' time
 - b. the period of 6-12 months from now.

These questions are asked so that WCRC has sufficient information to understand the actual and possible constituents of the leachate that will, or may, be discharged over the term of any consent granted.

Groundwater and surface water dynamics and environmental risk

The assessment of effects is predicated on groundwater flow presented in Figure 6 (pg. 12) being correct. Technical reviews of the available information, however, suggest data on groundwater dynamics is sparing and subject to some uncertainty. We are particularly mindful of the following:

- the high potential impact on the GDC water supply if the discharge were to flow directly via groundwater under Taylorville Road (e.g. via a fracture network in the Kaiata mudstone).
- that the application assesses daylighting of groundwater in Noname Creek and elsewhere to the western margins of the site, but there is some uncertainty over whether groundwater currently, and under the scenario in the application, daylight from the Taylorville Road roadcut as well or instead.
- any potential for unmitigated surface or subsurface flow of the discharge outside of the area of flow identified in Figure 6 (pg. 12).

Questions:

14. In light of the above points, please re-assess and describe whether there are any potential pathways for water to flow from the discharge site to the GDC water intake by:
- a. Overland flow;
 - b. Groundwater flow;
 - c. A combination of overland flow and groundwater flow.

This assessment should include a statement from a suitably qualified expert that identifies the nature and extent of uncertainties in any of the scientific information used in the assessment,

and the analyses relied on in making the assessment. It should also identify the potential implications of any uncertainty.

Consideration of possible alternatives

WCRC must have regard to any possible alternative methods of discharge, including discharge into any other receiving environment (section 105). Sufficient information is required by WCRC before due regard can be given to this matter.

Questions:

15. Please provide an assessment of all possible combinations of the following methods to help in creating freeboard:

- a. Extraction by pump into tank wagons or removable tanks;
- b. Discharge to an offsite location with lower environmental risk to the proposed site;
- c. Discharge to a licenced facility;
- d. Pumping and discharge to another environment;
- e. Alternative methods of discharge, such as via irrigation to land within or outside of TRPL's property boundary, or a discharge to water.

16. Based on responses to Question 10, please provide interpretation and supporting information on:

- a. The daily volume of water that would need to be removed from the retention pond, on average, to
 - i. maintain static water level; and
 - ii. create freeboard;
- b. The volumes of tank wagons that could reach the site by road. (We note that there may be large tank wagons licenced for road transport of bulk liquids in New Zealand – potentially between 22,000 and 45,000 litres capacity.);
- c. The rate of loads carried by these tank wagons that would be required, on average, to:
 - i. maintain static water level; and
 - ii. create freeboard;
- d. The total number and rate of tank wagon loads that would be required to empty the storage pond within the six-month period of the requested resource consent.

17. For each of the possible alternatives identified, please provide an assessment of:

- a. Their technical feasibility;
- b. The costs and benefits of each relative to the proposed land discharge;

c. The environmental effects.

Site contamination

Questions:

18. Please provide an assessment of the environmental fate of contaminants in the discharge.
19. Please provide an assessment of whether the discharge will create a contaminated site in the discharge area and anywhere downstream.
20. Please identify whether any remedial works are planned to address site contamination, and if so a description of the works and an assessment of their effectiveness in remediating site contamination.

Condition 11 of RC-2021-0097

WCRC has considered the interrelationship between Condition 11 of RC-2021-0097 and RC-2024-0122, including how Condition 11 might affect any decision made on RC-2024-0122, including the exercise of any consent that may be granted.

The factual background is that:

- Condition 11 states: *The Consent Holder shall ensure that there is no contamination of groundwater or surface water outside of the site (Secs 1-3 5-6 Pt Secs 4 & 8 SO 11520 Sec 1 SO 3935 Sec 1 SO 3934 Lots 1 3 DP 2432 Lots 1-5 DP 3265) as a result of the exercise of this consent.*
- The landfill has produced leachate, contrary to TRPL's expectation.
- If any of the leachate is discharged, this discharge will contaminate groundwater and/or surface water and this contamination will, by definition, be "*as a result of the exercise of this consent [RC-2021-0097]*".

Furthermore:

- The terms of RC-2021-0097 are an "other matter" that the consent authority must have regard to when determining RC-2024-0122.
- Condition 11 as currently worded prohibits contamination of surface water and groundwater by any discharge of the leachate being generated by the landfill.
- A consent authority cannot issue a consent with condition(s) that directly contradict another consent.
- Condition 11 of RC-2021-0097 as currently worded precludes RC-2024-0122 from being granted.

We note that TRPL made application under section 127 (RC-2021-0097-V9) to change Condition 11 of RC-2021-0097 as follows:

"The Consent Holder shall ensure that there is no contamination of groundwater or surface water outside of the site (~~Secs 1-3 5-6 Pt Secs 4 & 8 SO 11520 Sec 1 SO 3935 Sec 1 SO 3934 Lots 1 3 DP 2432 Lots 1-5 DP 3265~~ Lot 1-2 DP 584105) as a result of the

exercise of this consent, unless a separate discharge permit has been obtained from the West Coast Regional Council."

As noted in WCRC's section 88 letter to TRPL on 2 October 2024, if approved this change would authorise contamination of groundwater and surface water by leachate from sources other than the short-term discharge. The application was incomplete in that regard and was returned to TRPL on that basis. No further application has been received to date.

Questions:

21. Does TRPL agree that RC-2024-0122 cannot be granted to discharge leachate to surface water and groundwater whilst Condition 11 of RC-2021-0097 is in force (which prohibits the contamination of groundwater and surface water)?
22. If not, on what basis is it suggested that a resource consent can be issued that directly contradicts another?
23. Does TRPL consider that, to remove the prohibition of contamination of groundwater and surface water of Condition 11 of RC-2021-0097:
 - a. an application to change Condition 11 could be made within the scope of section 127?; or
 - b. such an application would be beyond the scope of RC-2021-0097 and therefore that RC-2021-0097 would need to be replaced with a new permit of wider scope and absent any such prohibition?

Answers to these questions may be accompanied by a further application(s) for resource consent as deemed necessary by TRPL.

Next steps

The steps set out in section 92A(1) apply to this request. TRPL must take one of the options in section 92(1) by 12 November 2024, which is 15 working days from the date of this request.

Decisions under sections 95A and 95B of the RMA are postponed until receipt of this information, unless section 95C applies.

If you have any queries regarding this matter, please contact Michael Durand on 021 035 2593 or e-mail on michael@planzconsultants.co.nz .

Yours faithfully,



Michael Durand
Consultant Planning Officer
West Coast Regional Council

1 November 2024

Taylorville Resource Park Limited
Attn: Bruce Tinnelly
P O Box 2103
Washdyke
Timaru

Dear Bruce,

Request For Information – 287 Taylorville Road, Coal Creek, Greymouth

(Our Reference: 026200.000.001_07)

ENGEO has reviewed the further information request relating to Taylorville Resource Park Limited's (TRPL) the application to discharge collected leachate and stormwater to land (RC-2024-0012). The further information request was issued by the West Coast Regional Council (WCRC, dated 21-Oct-24) under section 92(1) of the Resource Management Act 1991.

WCRC's questions (in grey) and ENGEO responses (in blue) are provided below.

1. Why is leachate being generated?

Leachate is generated when groundwater or surface water (i.e., stormwater) interacts with fill materials and extracts solutes. The generation of some leachate is anticipated at any outdoor operation where fill materials are received. In facilities that have been consented to accept construction & demolition (C&D) waste, leachate may include soluble heavy metals, inorganic nutrients, and ions in solution.

2. How long has it been known that leachate is being generated?

The generation of leachate with concentrations that contravene Condition 11 of RC-2021-0097 was first suspected on 4 May 2023, when TRPL received an abatement notice (Reference Number RC-2021-0097) from the West Coast Regional Council.

3. Why has 15,000 m³ of leachate mixed with stormwater been able to accumulate on site?

The on-site settlement and retention devices were constructed in response to concerns regarding off-site discharges of leachate, to allow for investigation and implementation of on-site treatment methods.

4. Why has leachate not been "collected via a Hydra-Vac Truck and taken to the appropriate dump site" as described in the 2021 consent application and instead been allowed to accumulate over time?

On the date of the abatement notice (4 May 2023), the former sediment pond contained approximately 1,000 m³, with additional daily inflow on the order of 100–200 m³. Based on the size of a standard sucker truck (3–5 m³) and the fact that an authorised off-site facility had not been identified, on-site retention and treatment was deemed the most practicable response to the abatement notice. The on-

site retention pond was completed in November 2023 and began accepting leachate that had been treated with a flocculant. Following advice from the Environmental Protection Authority (EPA), TRPL constructed on-site settlement devices to allow for the treatment of leachate generated in the waste cells.

5. Is leachate likely to continue to be generated, and if so at what quality?

As stated, leachate is generated at any outdoor operation where fill materials are received. It is anticipated that leachate will continue to be generated during the active use of Cell A and Cell C; however, leachate is and will be captured for settlement and treatment.

It is also anticipated that the untreated leachate will have generally the same characteristics as the water currently stored on-site, which contains concentrations of heavy metals and ammoniacal-nitrogen at levels that exceed the human health-based drinking water standards and one or more of the water quality standards (levels of protection) for aquatic protection. However, we note that concentrations are generally within one magnitude of order relative to the standards, as such minimal dilution would be required to mitigate concentrations in the receiving environment.

TRPL is currently investigating upgrades and modifications to the water treatment system. It is anticipated that after the modifications are implemented and necessary adjustments are made to maximise efficacy, discharge of the treated leachate will not have an off-site effect.

6. Is TRPL making or planning steps to reduce or avoid future leachate generation?

As stated, leachate is generated at any outdoor operation where fill materials are received. It is anticipated that leachate will continue to be generated during the active use of Cell A and Cell C; however, leachate is and will be captured for settlement and treatment.

TRPL is currently investigating upgrades and modifications to the water treatment system. It is anticipated that after the modifications are implemented and necessary adjustments are made to maximize efficacy, discharge of the treated leachate will not have an off-site effect.

7. If yes, please explain steps, set out a timetable for their implementation and provide an assessment of their efficacy.

Pilot testing of upgrades and modifications to the water treatment system commenced on 25 September 2024 with the installation of an aeration fountain in the settlement pond. Additional changes (e.g., alterations to the treatment train and flocculation dosing) are currently being implemented and will be assessed early November (depending on external suppliers) using the laboratory analysis of water samples collected from multiple stages in the treatment train.

8. In relation to any future leachate generated, what steps is TRPL making to “collect this via a Hydra-Vac Truck and taken to the appropriate dump site”?

As discussed in the ENGEO (2024) *Preliminary Hydrogeological Assessment*, removal via sucker truck is not deemed a practicable or sustainable alternative to the works proposed in application RC-2024-0122 due to the volume of water and number of truck movements. Further to this, and subsequent to delivery of this report, TRPL have been notified that treated leachate cannot be received at any wastewater treatment plants (WWTP) owned by the Grey District Council. Refer response to item number 15(a).

9. What, if any, steps is TRPL taking now or planning to take in the future to reduce or avoid the mixing or leachate with stormwater?

As stated, leachate is generated at any outdoor operation where fill materials are received. It is anticipated that leachate will continue to be generated during the active use of Cell A and Cell C; however, leachate is and will be captured for settlement and treatment. Once waste cells have reached capacity, they will be capped in accordance with WasteMINZ (2023) *Technical Guidelines for Disposal to Land* to reduce the infiltration of stormwater through the waste cell.

10. Please confirm TRPL's intentions for the temporary discharge subject to the requested resource consent:

- a. What is considered to be a sufficient leachate retention pond freeboard and why?

Based on climate data (NIWA [2016] *The Climate and Weather of West Coast, 2nd Edition*), the average annual rainfall is 2,800 – 3,000 mm, which contributes approximately 46,200 – 49,500 m³ of water per annum to Cell A, Cell C, the settlement pond, and the retention pond.

The current freeboard in the retention pond is approximately 0.2 m. Dam safety observations have been undertaken at site and it is recommended that the pond maintain a freeboard of at least 0.5 m. Based on the retention pond measurements, to achieve this freeboard and accommodate one month of heavy rainfall (300 mm), the pond needs to maintain a water level that is approximately 3.3 m lower than the current water level (assuming negligible evaporation and no discharges to the proposed soakage area during this time).

- b. What volume of leachate is required to be removed from the pond “to help in creating a freeboard”?

Initially (to achieve the desired water level), approximately 5,500 m³ of water needs to be removed from the retention pond.

- c. What is the daily volume, weekly volume, monthly volume and total expected volume of leachate TRPL is seeking to discharge?

As stated in the application, the objective of the proposed temporary discharges is to achieve and maintain adequate freeboard in the retention pond. Initially, a total volume of approximately 5,500 m³ of water needs to be removed from the retention pond. To conservatively assess for potential effects, the preliminary hydrogeological assessment modelled for a maximum volume of 800 m³/day; however, the actual discharge volumes will depend on the infiltration capacity in the soakage area, rainfall and evaporation rates.

- d. Is this volume more than, or less than, what is required to “to help in creating a freeboard”?

As stated in the application, the objective of the proposed temporary discharges is to achieve and maintain adequate freeboard in the retention pond. Initially, a total volume of approximately 5,500 m³ of water needs to be removed from the retention pond. To conservatively assess for potential effect, the preliminary hydrogeological assessment modelled for a maximum volume of 800 m³/day; however, the actual discharge volumes will depend on the infiltration capacity in the soakage area, rainfall and evaporation rates.

TRPL is amenable to a condition of consent that limits discharges to the volume required to maintain a freeboard of 3.3 m.

11. Please reconcile and further explain:

- a. The expected volumetric inputs into the system under anticipated rainfall events.

We note that the residence time calculation in the ENGEO (2024) *Preliminary Hydrogeological Assessment* did not include the average contribution of leachate from Cell A; as such, the correct residence time is approximately 16 – 23 days. However, we note that this query appears to reflect a misunderstanding of “residence time”.

Residence time is defined as:

“..the time water spends in the pond’s still-water environment while floating from the inlet to the outlet”

(Ferguson [1998] *Introduction to Stormwater*. John Wiley & Sons, Inc.)

The residence time of a settlement pond is calculated to ensure that water in the pond has sufficient time for suspended sediment to settle out of the water column; it is not intended to represent the time required for a device to reach capacity, as that is dependent on other factors (e.g., climate, discharge rate). We further note that sufficient residence time for fine sediment (i.e., silt) is generally measured on the scale of minutes to hours (ibid); as such, even during a 2% AEP storm event, the pond will provide an adequate residence time (~4.1 days) for the sufficient removal of suspended sediment from the waters originating from Cell A and Cell B/C (estimated as 570 m³/day for 50 mm of rainfall over an area of 11,400 m²).

- b. The residence time in each pond resulting from these anticipated rainfall events.

Residence time is measured by the volume of the storage device divided by the volume of inflow.

Including the waters originating from Cell A and Cell B/C (570 m³/day) and rainfall on the settlement pond (82 m³/day), the residence time in the settlement pond will be approximately 4.1 days during a 2% AEP storm event.

Including the waters originating from Cell A and Cell B/C, rainfall on the settlement pond, and rainfall on the retention pond (200 m³/day), the residence time in the retention pond will be approximately 16 days during a 2% AEP storm event.

We note again that residence time is not intended to represent the time required for a device to reach capacity.

12. WCRC understands that the site has received other materials that have the potential to generate leachate. Please confirm:

- a. Whether any other materials have been discharged into the cells.

Under Condition 5 and Condition 9 of RC-2021-0097 V3, TRPL accepts the following materials:

Cell	Received Materials
Cell A	Demolition waste (including cleanfill), whole or shredded tyres.
Cell C (aka. Lined ACM Cell)	Demolition waste (including cleanfill), whole or shredded tyres, asbestos, coal tar and coal pitch, other hazardous materials approved by the Consent Authority.

Following receipt of written approval by WCRC, the site has received materials that do not meet the definition of *“Demolition waste (including cleanfill), whole or shredded tyres, asbestos, coal tar and coal pitch”* (refer Appendix 1).

No materials have been deposited at the site that do not comply with Condition 5 and Condition 9 of RC-2021-0097 V3.

Materials that do not meet the definition of *“Demolition waste (including cleanfill), whole or shredded tyres, asbestos, coal tar and coal pitch”* but deposited at the site following approval by the Consent Authority are discussed in the items below.

- b. If they have, please confirm:

- i. what these materials are:

Refer Appendix 1 for details of other potentially hazardous materials deposited at the site following approval by the Consent Authority.

- ii. their volumes:

Refer Appendix 1 for details of other potentially hazardous materials deposited at the site following approval by the Consent Authority.

- iii. their source(s):

Refer Appendix 1 for details of other potentially hazardous materials deposited at the site following approval by the Consent Authority.

- iv. their potential for leachate generation when placed in a cell on their own:

Of all material received at the site under Condition 9— *“other hazardous materials approved by the Consent Authority”*—greenwaste has the most significant potential to generate leachate. The site accepted 560 tonnes of greenwaste (virus-infected Solanaceous plants and growing medium) under WCRC approval (Clark, R. ‘RE: Taylorville Resource Park – MPI Clean-out’.

Received by Wayne O'Keefe, 5 December 2022), which allowed for the disposal of:

"...approximately 450 Tons (possibly more) of greenwaste and growing medium that needs disposal via burial."

Greenwaste generates leachate while organic matter decomposes, with ammonia being the primary contaminant of concern. We note that the greenwaste accepted at the site was placed in Cell C with other waste materials (e.g., C&D waste), not on its own.

- v. their potential for leachate generation when placed in a cell with other materials:

To assess the likely interactions between greenwaste and other waste types, it is helpful to look at the general evolution of leachate composition in a municipal solid waste (MSW, Class 1) landfill. As shown in Figure 1, the decomposition of organic waste can cause a reduction in pH, which may mobilise heavy metals; however, this effect is likely mitigated by the presence of C&D wastes (e.g., concrete), which will increase the alkalinity of the leachate.

The anticipated duration of this effect is measured on the scale of months to approximately two years. As greenwaste has not been deposited at the site since January 2023, it is likely that leachate generation at the site is post-peak (late Stage III / Stage IV) and concentrations will further reduce.

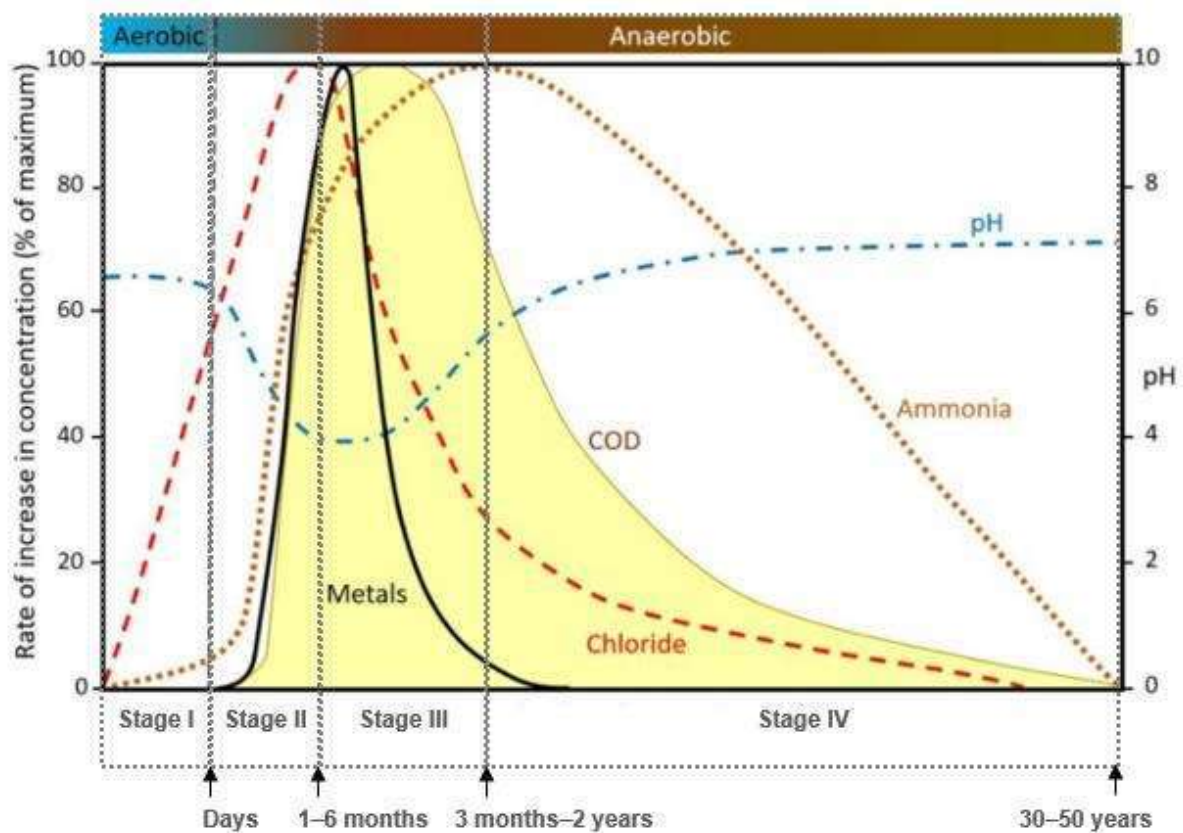


Figure 1: Stages of landfill leachate generation (modified from Earle, Steven [undated] *Environmental Geology* [<https://environmental-geol.pressbooks.tru.ca>] and MfE [2001] *Guide for the Management of Closing and Closed Landfills*)

- vi. the expected characteristics of leachate arising from the presence of these materials in cells, including (but not limited to) the expected values for analytes listed in Table A6.1 of Appendix 5 of the AEE (the Hydrological Assessment by ENGEO).

As stated, it is likely that leachate generation at the site is post-peak (late Stage III / Stage IV) and concentrations will further reduce. As such, concentrations listed in Table A6.1 of ENGEO (2024) *Preliminary Hydrogeological Assessment* suitably and conservatively characterise the concentrations of greenwaste mixed with other fill materials.

- c. Whether the analytes measured in leachate are consistent with that expected from the materials that have been discharged to the cells.

The analytes measured in leachate are consistent with that expected from the materials consented for disposal at the site, including “*Demolition waste (including cleanfill), whole or shredded tyres, asbestos, coal tar and coal pitch, other hazardous materials approved by the Consent Authority*” As stated in WasteMINZ (2023):

“*Class 2 C&D Landfill leachate is typically characterised by mildly acidic pH, and the presence of ammoniacal nitrogen and soluble metals, including heavy metals.*”

13. Please provide an assessment of whether the contaminants expected to be found in leachate are likely to be present in leachate over:

a. the period between now and in 6 months' time.

As stated, it is likely that leachate generation at the site is post-peak (late Stage III / Stage IV) and concentrations will further reduce.

b. the period of 6-12 months from now.

As shown in Figure 1, concentrations in leachate are expected to decrease with time.

14. In light of the above points, please re-assess and describe whether there are any potential pathways for water to flow from the discharge site to the GDC water intake by:

a. Overland flow:

There is no reasonably practicable overland flowpath from the discharge site to the GDC water intake. As discussed in Section 5 of ENGEO (2024) *Preliminary Hydrogeological Assessment*, the soakage area will be excavated to a depth of at least 2 m and water will be pumped at a flow that is no greater than the infiltration capacity of the basin. As such, there will be no surface flow of water from the soakage area.

b. Groundwater flow:

There is no reasonably practicable groundwater flowpath from the discharge site to the GDC water intake. As discussed in Section 6 of ENGEO (2024) *Preliminary Hydrogeological Assessment*, water discharged into the soakage area will infiltrate to the water table (in the Pleistocene glacial outwash sandy gravel) and migrate west-southwest with a horizontal conductivity on the order of 10^{-3} m/s (Fetter [2021] *Applied Hydrogeology*. Prentice-Hall, Inc.). At the west-southwest extents of the Pleistocene gravels (refer Figure 8, ENGEO [2024]), the water daylights in the springs along Taylorville Road.

We understand that there is concern regarding the potential for the flow of leachate-impacted groundwater through fractures in the mudstone to within the radius of influence of the GDC abstraction wells. As discussed in Section 2.2 of ENGEO (2024) *Preliminary Hydrogeological Assessment*, the Pleistocene gravels are underlain by the Paleogene Kaiata Formation (Rapahoe Group), comprising brown carbonaceous mudstone, with a formation thickness on the order of hundreds of meters. Based on published studies, the anticipated horizontal hydraulic conductivity in the mudstone is on the order of 10^{-8} to 10^{-6} m/s (Bishop & McCarthy [2004] *Hydraulic conductivity of mudstone formations in the West Coast region, South Island, New Zealand*, New Zealand Journal of Geology and Geophysics, 47(3), 421-432), with a ratio of horizontal to vertical conductivity of 10:1 (Domenico [1990] *Physical and Chemical Hydrogeology*. John Wiley & Sons, Inc.)

Mudstone is considered an excellent rock type for geological containment due to very low permeability, even when faulted (Ozaki, *et al*, [2022] *Variation in fault hydraulic connectivity with depth in mudstone: An analysis of poroelastic hydraulic response to excavation in the Horonobe URL*, Geomechanics for Energy and the Environment, Volume 31:100311). Clay minerals comprising mudstone will expand when they encounter water, thus infilling the

fracture and blocking the transmission of water (Baker & Grath [2005] *Hydraulic properties of a fractured mudstone*. Hydrogeology Journal, 13(3), 344-358).

Based on fundamental hydrogeological concepts developed by Henry Darcy (ca. 1856) it is highly unlikely that any greater-than-minor quantity of groundwater will naturally migrate from an unconfined, high-permeability aquifer down through a mudstone aquitard with a hydraulic conductivity that is lower by 3–5 orders of magnitude (i.e., groundwater flow will principally be horizontal within the overlying, high permeability sandy gravel aquifer).

c. A combination of overland flow and groundwater flow.

Ground water that daylights in the springs along Taylorville Road is piped under the road to the unnamed tributary / wetland on the south side of Taylorville Road, before joining with the Grey River approximately 550 m downstream. Any water that infiltrates to ground into the Holocene gravel and sand deposits adjacent to and underlying the unnamed tributary / wetland will be captured by the flow of groundwater in these river deposits, which flow parallel to the direction of flow in the Grey River. The Holocene gravels estimated hydraulic conductivity is anticipated in the order of 10^{-3} to 10^{-4} m/sec, based on unconsolidated ranges (Fetter [1994] *Applied Hydrogeology*. Macmillian College Publishing Company).

We have requested but not been provided with any details of the GDC abstraction wells (e.g., pump test results, abstraction rates); however, based on the distance of the point of discharge into the unnamed tributary / wetland relative to the GDC intake (~250 m) the flow in the Grey River, and the estimated hydraulic conductivity in the Holocene gravels, there is no reasonably practicable overland / groundwater flowpath from the discharge site to the GDC water intake.

15. Please provide an assessment of all possible combinations of the following methods to help in creating freeboard:

a. Extraction by pump into tank wagons or removable tanks.

This alternative is discussed in Section 8 of ENGEO (2024) *Preliminary Hydrogeological Assessment*. As stated in that report, based on the number of required truck movements to transport the water (whether by a sucker truck or tank wagon / removable tank), this alternative is not deemed practicable.

Following submission of the application for RC-2024-0122, we received confirmation from GDC (Aaron Haymes, Group Manager Operations) that the treated leachate cannot be received at any GDC wastewater facility. This is due to the highly disruptive effect of fresh water (i.e. with low carbon content) on the efficacy of wastewater treatment plant operations. As such, the water would likely need to be transported to a facility in Canterbury or Southland. TRPL have identified a subcontractor that has a 30 m³ tanker truck (located in Canterbury) that would be able to transport the water. This would require at least 186 truck movements and a rate of one load per day.

This would generate approximately 2000 kg of greenhouse gas emissions (Ministry of Transport [2020] *Green Freight – Strategic Working Paper*) at an indicative cost of approximately \$3 – 6 million dollars, based on cost estimates provided by likely vendors. This is not a financially realistic option.

- b. Discharge to an off-site location with lower environmental risk to the proposed site.

Discharge to an off-site location would require investigation works to identify an off-site location, negotiations with off-site property owners, and the preparation / lodgement / approval of a resource consent to discharge to land. Additionally, there would be feasibility limitations related to the piping / trucking of the water to another location. Due to operational practicalities and the timeframes required to obtain a consent, this alternative is not reasonably practicable.

- c. Discharge to a licenced facility.

Refer response to item number 15(a).

- d. Pumping and discharge to another environment.

This alternative is discussed in Section 8 of ENGEO (2024) *Preliminary Hydrogeological Assessment*. As stated in that report, due to the very low flow in the roadside drain (0.001 – 0.002 m³/s), this is not considered a suitable receiving environment as the receiving waters will likely be unable to attenuate changes in water quality. Based on estimates of diluted concentrations, direct discharge to Noname Creek would likely result in an exceedance of one or more of the assessment criteria. While it is highly unlikely that this water is being used as a source of potable water, there is potential for an effect to ecological health. As such, discharge to Noname Creek is not deemed a suitable alternative to the proposed discharge to land.

There are no other reasonably practicable receiving environments for the discharges.

- e. Alternative methods of discharge, such as via irrigation to land within or outside of TRPL's property boundary, or a discharge to water.

Refer responses to item number 15(b) and item number 15(d) for responses to irrigation to land outside TRPL's boundary and discharge to water, respectively.

Irrigation to land within TRPL's boundary would be technically feasible; however, the proposed method (discharge to a soakage area) is preferable due to the following considerations:

- The proposed soakage area has been sited to prevent short-circuiting into the catchment of Noname Creek. Due to the hump and hollow topography across the wider area, there is greater potential that diffuse discharges (e.g., via drip irrigation) will accumulate in the low-lying hollows and result in overland flow.
- The loading of contaminants to land will be the same regardless of the site of the application area. Discharging to a defined area will result in a smaller footprint of activities.
- It would not be practicable to monitor for the effects of irrigation to land. Three monitoring wells have been installed between potential points of exposure and the discharge area (refer MB13, MB12, MB17, Figure 10 in ENGEO [2024] *Preliminary Hydrogeological Assessment*) to intercept groundwater migrating from the discharge area. Water samples collected from these locations will be used to calibrate the fate and transport model and serve as an "early warning

system” if concentrations vary from the model. This ongoing evaluation would not be possible if discharges are distributed across a wide area.

16. Based on responses to Question 10, please provide interpretation and supporting information on:

a. The daily volume of water that would need to be removed from the retention pond, on average, to:

i. maintain static water level.

It is not possible to provide a precise daily average discharge volume that will be required to maintain a static water level, as this will be depended on weather conditions (i.e., precipitation, evaporation). Based on climate data (NIWA [2016]), the average annual rainfall is 2,800 – 3,000 mm, which contributes approximately 46,200 – 49,500 m³ of water per annum to Cell A, Cell C, the settlement pond, and the retention pond. This equates to an average of 125–135 m³ of water per day that could accumulate from Cell A, Cell C, the settlement pond, and the retention pond.

However, this amount will be reduced by evaporation from the waste cells, settlement pond, retention pond, and discharge area. The anticipated evaporation is on the order of 700 – 800 mm per annum (NIWA [2016]), resulting in an anticipated average of 90–100 m³ of water per day that will require removal to maintain static water level.

As modelled in Section 6 of ENGEO (2024) *Preliminary Hydrogeological Assessment*, there will not be a greater than minor effect of discharging at a rate of 800 m³ of water per day.

ii. create freeboard.

Approximately 600 m³ needs to be removed to create the recommended freeboard of 0.5 m. The daily volume will depend on the infiltration capacity in the soakage area, rainfall and evaporation rates.

As modelled in Section 6 of ENGEO (2024) *Preliminary Hydrogeological Assessment*, there will not be a greater than minor effect of discharging at a rate of 800 m³ of water per day.

b. The volumes of tank wagons that could reach the site by road. (We note that there may be large tank wagons licenced for road transport of bulk liquids in New Zealand – potentially between 22,000 and 45,000 litres capacity).

Refer response to item number 15(a).

c. The rate of loads carried by these tank wagons that would be required, on average, to:

i. maintain static water level; and

Based on the volumes in the response to item number 16(a[i]) and information in the response to item number 15(a), approximately 3–4 truck movements would be required per day to maintain static water level.

- ii. create freeboard;

Based on the volumes in the response to item number 16(a[ii]) and information in the response to item number 15(a), approximately 20 truck movements would be required per day to create the recommended freeboard of 0.5 m.

- d. The total number and rate of tank wagon loads that would be required to empty the storage pond within the six-month period of the requested resource consent.

TRPL is not seeking consent to empty the retention pond.

17. For each of the possible alternatives identified, please provide an assessment of:

- a. Their technical feasibility.

Irrigation to land within TRPL's boundary would be technically feasible; however, the proposed method (discharge to a soakage area) is preferable (refer response to item number 15[e]).

- b. The costs and benefits of each relative to the proposed land discharge.

The cost to irrigate to land within TRPL's boundary would be marginally higher due to material costs for irrigation piping and emitters; however, it is not preferable due to potential short-circuiting to surface water and the inability to monitor effects (refer response to item number 15[e]).

- c. The environmental effects.

Refer response to item number 15(e).

18. Please provide an assessment of the environmental fate of contaminants in the discharge.

This was discussed at length in Section 6 of ENGEO (2024) *Preliminary Hydrogeological Assessment*, there will not be a greater than minor effect of discharging at a rate of 800 m³ of water per day. As stated in that report:

"Based on the modelling results (refer Appendix 8b), contaminants in discharges to the soakage area will generally be attenuated through dilution / dispersion in the unconfined aquifer. Very low concentrations of aluminium, ammoniacal-N, manganese, and nitrate-N may reach the point of discharge (hypothetical well), with the concentration maximum in 1.6 years. The highest modelled concentrations are for aluminium and nitrate-N; however, these concentrations are negligible (0.00031 mg/L and 0.00050 mg/L, respectively) and below the range of natural variability or analytical error."

19. Please provide an assessment of whether the discharge will create a contaminated site in the discharge area and anywhere downstream.

There is potential that gravels in the discharge area may accumulate low concentrations of ammoniacal nitrogen and heavy metals; however, the ammoniacal nitrogen will undergo natural attenuation via nitrification and it is highly unlikely that the concentrations of heavy metals in leachate (< 1 g/m³) will adsorb at concentrations that exceed either human or ecological-health based standards.

We note that the site is currently consented under Condition 5 and Condition 9 of RC-2021-0097 to receive *“Demolition waste (including cleanfill), whole or shredded tyres”* in unlined waste cells. It is highly unlikely that discharge of leachate to the discharge area will result in ground contamination above what is expected from demolition waste (including cleanfill), whole or shredded tyres.

20. Please identify whether any remedial works are planned to address site contamination, and if so a description of the works and an assessment of their effectiveness in remedying site contamination.

Refer response to item number 19(a). No remedial works are planned or deemed necessary.

21. Does TRPL agree that RC-2024-0122 cannot be granted to discharge leachate to surface water and groundwater whilst Condition 11 of RC-2021-0097 is in force (which prohibits the contamination of groundwater and surface water)?

Agreed, which is why an application was made pursuant to section 127 of the RMA to change condition 11. That application was rejected by WCRC so will be re-submitted.

22. If not, on what basis is it suggested that a resource consent can be issued that directly contradicts another?

Refer response to item number 21.

23. Does TRPL consider that, to remove the prohibition of contamination of groundwater and surface water of Condition 11 of RC-2021-0097:

- a. an application to change Condition 11 could be made within the scope of section 127?;
or

Refer to pending re-submitted section 127 application.

- b. such an application would be beyond the scope of RC-2021-0097 and therefore that RC-2021-0097 would need to be replaced with a new permit of wider scope and absent any such prohibition?

Refer to pending re-submitted section 127 application.

Prepared by



Lyn Nugent, CEnvP

Senior Environmental Scientist

Reviewed by



Dave Robotham, CEnvP SC

Principal Environmental Consultant

APPENDIX 1

DATE	JOB NO	SOURCE ADDRESS	MATERIALS		TOTAL (T)	Manifest Dkt No.	WeighBridge Facility	Date Waste Measured	Time Waste Measured (24 hr)	Weighbridge Ticket No.	Invoice No.	Approved by
12/06/2023	CH4311 - 16565	32 Tuam Street	Contaminated		16.34	2601	Fulton Hogan	12/06/2023	8:06	94117155	10125	Chris Barnes
12/06/2023	CH4311 - 16565	32 Tuam Street	Contaminated		11.60	0969	Frews	12/06/2023	7:12	C31463	10125	Chris Barnes

27.94

15/12/2022	CH4095 - 16533	Johns Road	Contaminated Spoil		29.01	0601	T Croft	15-Dec	19:11	120834	10044	Colin Helem
20/02/1904	CH4095 - 16533	Johns Road	Contaminated Spoil		22.74	0751	T Croft	16-Dec	6:26	120836	10044	Colin Helem
20/12/2022	CH4095 - 16533	Johns Road	Tree Stumps		3.62	0086	Road Metals	20-Dec	6:21	815384	10044	Colin Helem

55.37

1/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		29.16	4004	T Croft	30/11/2023	17:58:00	128438	10201	Chris Barnes
1/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		28.74	1278	T Croft	30/11/2023	16:44:00	128437	10201	Chris Barnes
1/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		28.48	1164	T Croft	30/11/2023	20:56:00	128440	10201	Chris Barnes
1/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		23.38	1877	Road Metals	30/11/2023	12:42:00	851807	10201	Chris Barnes
1/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		26.86	2678	Road Metals	30/11/2023	12:28:00	851803	10201	Chris Barnes
1/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		29.81	1976	T Croft	1/12/2023	07:19:00	128442	10201	Chris Barnes
1/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		29.17	2729	Road Metals	30/11/2023	14:57:00	851843	10201	Chris Barnes
1/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		41.54	1279	GVT	1/12/2023	09:05:00	25037	10201	Chris Barnes
5/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		26.59	3955	T Croft	5/12/2023	06:33:00	128462	10201	Chris Barnes
5/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		30.14	4101	T Croft	5/12/2023	11:50:00	128477	10201	Chris Barnes
5/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		37.20	1280	Road Metals	5/12/2023	10:50:00	852074	10201	Chris Barnes
5/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		27.72	1977	Fulton Hogan	4/12/2023	13:42:00	96217195	10201	Chris Barnes
5/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		24.03	1351	T Croft	5/12/2023	07:11:00	128464	10201	Chris Barnes
5/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		24.64	2679	Road Metals	4/12/2023	15:43:00	852038	10201	Chris Barnes
5/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		21.24	1878	Road Metals	4/12/2023	15:46:00	852039	10201	Chris Barnes
6/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		27.68	1281	Road Metals	5/12/2023	15:48:00	852125	10201	Chris Barnes
6/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		35.58	1283	GVT	5/12/2023	06:35:00	25188	10201	Chris Barnes
6/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		21.70	1978	Fulton Hogan	5/12/2023	14:33:00	96217817	10201	Chris Barnes
6/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		13.36	3855	Road Metals	5/12/2023	15:02:00	852121	10201	Chris Barnes
6/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		26.55	3826	T Croft	5/12/2023	15:13:00	128495	10201	Chris Barnes
6/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		22.70	1879	Road Metals	5/12/2023	13:40:00	852110	10201	Chris Barnes
6/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		25.92	2680	Road Metals	5/12/2023	13:35:00	852106	10201	Chris Barnes
7/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		21.96	1165	T Croft	7/12/2023	10:54:00	128531	10201	Chris Barnes
7/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		25.38	1979	Fulton Hogan	6/12/2023	13:25:00	96218289	10201	Chris Barnes
7/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		26.40	3856	Road Metals	6/12/2023	12:53:00	852177	10201	Chris Barnes
7/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		23.18	2681	Road Metals	6/12/2023	14:47:00	852175	10201	Chris Barnes
7/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		26.61	2730	Road Metals	6/12/2023	16:06:00	852206	10201	Chris Barnes
7/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		20.74	1880	Road Metals	6/12/2023	12:21:00	852172	10201	Chris Barnes
7/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		36.60	1285	GVT	7/12/2023	11:42:00	25273	10201	Chris Barnes
8/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		24.38	2682	Road Metals	7/12/2023	12:30:00	852272	10201	Chris Barnes
8/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		27.55	2731	Road Metals	7/12/2023	12:35:00	852275	10201	Chris Barnes
8/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		21.10	1881	Road Metals	7/12/2023	12:50:00	852280	10201	Chris Barnes
8/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		38.10	1284	GVT	7/12/2023	17:01:00	25296	10201	Chris Barnes
8/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		26.12	3857	Road Metals	7/12/2023	12:59:00	852282	10201	Chris Barnes
8/12/2023	CH4334 - 16574	205 Gloucester Street	Contaminated		9.38	1980	Fulton Hogan	7/12/2023	13:56:00	96218937	10201	Chris Barnes

929.69

1/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.82	2658	Road Metals	31/10/2023	14:02	848844	10181	Chris Barnes
1/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		22.42	0137	Road Metals	31/10/2023	17:08	848875	10181	Chris Barnes
1/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.80	1955	Road Metals	1/11/2023	6:56	848881	10181	Chris Barnes
1/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.85	2708	Road Metals	31/10/2023	14:07	848845	10181	Chris Barnes
1/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		23.52	3951	T Croft	1/11/2023	7:46	127869	10181	Chris Barnes
1/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.20	1264	T Croft	31/10/2023	19:44	127868	10181	Chris Barnes
1/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.56	1025	T Croft	1/11/2023	11:13	127873	10181	Chris Barnes
2/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.00	2709	Road Metals	1/11/2023	15:48	849014	10181	Chris Barnes
2/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		21.36	0138	T Croft	2/11/2023	7:47	127904	10181	Chris Barnes
2/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.82	2659	Road Metals	1/11/2023	13:32	848980	10181	Chris Barnes
2/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		25.61	1057	T Croft	1/11/2023	15:47	127892	10181	Chris Barnes
2/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		25.10	1157	T Croft	2/11/2023	14:50	127917	10181	Chris Barnes
3/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.44	1158	T Croft	3/11/2023	14:21	127945	10181	Chris Barnes
3/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.82	2660	Road Metals	2/11/2023	13:36	849108	10181	Chris Barnes
3/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		22.68	0139	T Croft	3/11/2023	7:40	127929	10181	Chris Barnes
3/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		32.06	2710	Road Metals	2/11/2023	14:37	849123	10181	Chris Barnes
3/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		25.80	1957	Road Metals	3/11/2023	6:45	849145	10181	Chris Barnes
6/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		15.82	1958	Road Metals	6/11/2023	7:33	849282	10181	Chris Barnes
6/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		23.44	2661	Road Metals	3/11/2023	14:11	849225	10181	Chris Barnes
6/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		23.30	0140	Road Metals	6/11/2023	6:23	849274	10181	Chris Barnes
6/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.47	2711	Road Metals	3/11/2023	14:27	849229	10181	Chris Barnes
7/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		25.62	1266	T Croft	7/11/2023	6:53	127979	10181	Chris Barnes
7/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.68	2662	Road Metals	6/11/2023	15.45	849389	10181	Chris Barnes
7/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		23.38	0141	Road Metals	6/11/2023	15:27	849384	10181	Chris Barnes
7/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.87	2712	Road Metals	6/11/2023	15.03	849380	10181	Chris Barnes
7/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		25.68	1159	T Croft	7/11/2023	14.44	127988	10181	Chris Barnes
8/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.98	2801	Birchfield Energy Darfield	8/11/2023	11.03	111294	10181	Chris Barnes
8/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.62	1961	Road Metals	8/11/2023	6.47	849574	10181	Chris Barnes
8/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.17	2713	Road Metals	7/11/2023	15.49	849555	10181	Chris Barnes
8/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		24.42	0142	Road Metals	7/11/2023	13.24	849507	10181	Chris Barnes
8/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.00	2901	T Croft	8/11/2023	6.50	128008	10181	Chris Barnes
8/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		25.08	2663	Road Metals	7/11/2023	13.12	849504	10181	Chris Barnes
9/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.70	1962	Road Metals	9/11/2023	7.55	849768	10181	Chris Barnes
9/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		23.72	0143	Road Metals	9/11/2023	7.42	421211	10181	Chris Barnes
9/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.85	2714	Road Metals	8/11/2023	14.36	849700	10181	Chris Barnes
9/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.86	2664	Road Metals	8/11/2023	26.86	849676	10181	Chris Barnes
10/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.41	2715	Road Metals	9/11/2023	14.08	849890	10181	Chris Barnes
10/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		33.23	1267	T Croft	9/11/2023	18.27	128059	10181	Chris Barnes
10/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.44	2665	Road Metals	9/11/2023	13.50	849884	10181	Chris Barnes
10/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		25.26	0144	Fulton Hogan	10/11/2023	7.48	57090632	10181	Chris Barnes
10/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.10	1963	Road Metals	10/11/2023	7.47	849937	10181	Chris Barnes
13/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.97	2851	T Croft	10/11/2023	14.27	128077	10181	Chris Barnes

13/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.38	2666	Road Metals	13/11/2023	8.15	850109	10181	Chris Barnes
13/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		24.94	0145	Road Metals	13/11/2023	8.31	850111	10181	Chris Barnes
13/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.06	1059	T Croft	13/11/2023	12.55	128103	10181	Chris Barnes
13/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.64	1964	Road Metals	13/11/2023	6.47	650092	10181	Chris Barnes
13/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.35	2716	Road Metals	10/11/2023	14.47	850037	10181	Chris Barnes
14/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		11.02	0146	Road Metals	14/11/2023	8.43	422034	10181	Chris Barnes
14/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.48	2667	Road Metals	14/11/2023	7.56	850261	10181	Chris Barnes
14/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.59	2717	Road Metals	13/11/2023	15.42	850227	10181	Chris Barnes
14/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		24.10	1965	Road Metals	14/11/2023	8.05	850263	10181	Chris Barnes
14/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.17	1160	T Croft	14/11/2023	15.12	128149	10181	Chris Barnes
15/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.26	1701	Fulton Hogan	15/11/2023	16.14	57090657	10181	Chris Barnes
15/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.15	0753	T Croft	15/11/2023	13.28	128165	10181	Chris Barnes
15/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		25.66	2668	Road Metals	15/11/2023	8.11	850393	10181	Chris Barnes
15/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		24.28	1966	Road Metals	15/11/2023	15.11	850398	10181	Chris Barnes
15/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.55	2718	Road Metals	14/11/2023	15.48	850356	10181	Chris Barnes
15/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		32.83	3501	T Croft	14/11/2023	17.32	128156	10181	Chris Barnes
16/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.84	2669	Road Metals	16/11/2023	8.02	850541	10181	Chris Barnes
16/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.17	3502	T Croft	15/11/2023	19.27	128189	10181	Chris Barnes
16/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.97	2719	Road Metals	15/11/2023	14.45	850496	10181	Chris Barnes
16/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.76	1967	Road Metals	16/11/2023	6.54	850524	10181	Chris Barnes
20/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.51	2720	Road Metals	20/11/2023	15.05	850656	10181	Chris Barnes
20/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.20	2670	Road Metals	20/11/2023	7.59	850702	10181	Chris Barnes
20/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.00	1269	T Croft	20/11/2023	15.35	128253	10181	Chris Barnes
20/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.84	1702	Birchfield Energy Darfield	20/11/2023	12.06	111412	10181	Chris Barnes
21/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		24.54	2671	Road Metals	21/11/2023	7.50	850821	10181	Chris Barnes
21/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.08	1968	Road Metals	21/11/2023	7.48	850820	10181	Chris Barnes
21/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		33.25	2721	Road Metals	20/11/2023	15.29	850796	10181	Chris Barnes
22/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.30	1161	T Croft	22/11/2023	14.53	128311	10181	Chris Barnes
22/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		22.79	0754	T Croft	22/11/2023	11.47	128305	10181	Chris Barnes
22/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.73	4001	T Croft	21/11/2023	18.29	128297	10181	Chris Barnes
22/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.58	2672	Road Metals	22/11/2023	7.51	850908	10181	Chris Barnes
22/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.74	1969	Road Metals	22/11/2023	8.03	850911	10181	Chris Barnes
22/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.39	2722	Road Metals	21/11/2023	15.31	850887	10181	Chris Barnes
22/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		21.56	0150	Fulton Hogan	22/11/2023	7.48	57090746	10181	Chris Barnes
24/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.58	3952	T Croft	23/11/2023	21.32	128355	10181	Chris Barnes
23/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		22.62	2673	Road Metals	23/11/2023	8.12	851021	10181	Chris Barnes
23/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		31.47	2723	Road Metals	22/11/2023	14.36	850974	10181	Chris Barnes
23/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		33.65	4051	T Croft	23/11/2023	6.32	128325	10181	Chris Barnes
23/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.04	1970	Road Metals	23/11/2023	7.48	851016	10181	Chris Barnes
23/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.04	1162	T Croft	23/11/2023	14.49	128339	10181	Chris Barnes
24/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		25.10	0431	Road Metals	23/11/2023	13.17	851075	10181	Chris Barnes
24/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.71	1026	T Croft	24/11/2023	9.24	128357	10181	Chris Barnes
24/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		31.27	2724	Road Metals	24/11/2023	6.22	851128	10181	Chris Barnes
24/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.88	1971	Road Metals	24/11/2023	6.41	851129	10181	Chris Barnes
27/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.62	3851	Road Metals	27/11/2023	10.18	423539	10181	Chris Barnes
27/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.52	1972	Road Metals	27/11/2023	6.51	851280	10181	Chris Barnes
27/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		31.47	2725	Road Metals	24/11/2023	15.42	851243	10181	Chris Barnes
27/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.00	2674	Road Metals	24/11/2023	14.26	851224	10181	Chris Barnes
27/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.01	3824	T Croft	27/11/2023	14.13	128378	10181	Chris Barnes
27/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.32	1163	T Croft	27/11/2023	11.40	128376	10181	Chris Barnes
28/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		32.10	1271	Road Metals	27/11/2023	14.22	851415 851416	10181	Chris Barnes
28/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.55	2726	Road Metals	27/11/2023	15.38	851441	10181	Chris Barnes
28/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		25.28	1973	Road Metals	28/11/2023	6.47	851461	10181	Chris Barnes
28/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		22.10	1874	Road Metals	28/11/2023	6.26	851458	10181	Chris Barnes
28/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.34	3852	Road Metals	28/11/2023	8.07	423729	10181	Chris Barnes
28/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		31.00	1027	T Croft	28/11/2023	13.59	128392	10181	Chris Barnes
28/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.32	2675	Road Metals	27/11/2023	12.38	851373	10181	Chris Barnes
28/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.88	3953	T Croft	28/11/2023	7.21	128386	10181	Chris Barnes
28/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		37.10	1270	GVT Landline	27/11/2023	15.41	24840	10181	Chris Barnes
28/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		36.92	1272	GVT Landline	28/11/2023	8.16	24860	10181	Chris Barnes
29/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		23.72	1875	Road Metals	28/11/2023	16.53	851616	10181	Chris Barnes
29/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.00	3853	Fulton Hogan	29/11/2023	8.10	57090879	10181	Chris Barnes
29/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.31	2727	Road Metals	28/11/2023	14.43	851589	10181	Chris Barnes
29/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.12	1974	Road Metals	29/11/2023	8.26	851641	10181	Chris Barnes
29/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.54	2676	Road Metals	28/11/2023	13.01	851562	10181	Chris Barnes
29/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		33.98	1275	GVT Landline	29/11/2023	9.35	24919	10181	Chris Barnes
29/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.60	1274	GVT Landline	29/11/2023	4.00	24898	10181	Chris Barnes
29/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.92	0756	T Croft	29/11/2023	12.03	128409	10181	Chris Barnes
29/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.09	4002	T Croft	28/11/2023	18.12	128396	10181	Chris Barnes
29/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		32.01	1028	T Croft	29/11/2023	11.25	128401	10181	Chris Barnes
30/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		39.10	1276	GVT Landline	29/11/2023	10.23	CB10	10181	Chris Barnes
30/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.89	3903	T Croft	30/11/2023	11.08	128426	10181	Chris Barnes
30/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		25.40	3954	T Croft	30/11/2023	7.39	128422	10181	Chris Barnes
30/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		31.69	2728	Road Metals	29/11/2023	14.58	851719	10181	Chris Barnes
30/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		39.58	1277	GVT Landline	29/11/2023	15.38	24960	10181	Chris Barnes
30/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.92	1975	Road Metals	30/11/2023	8.12	851755	10181	Chris Barnes
30/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.21	3825	T Croft	30/11/2023	13.48	128429	10181	Chris Barnes
30/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.48	2677	Road Metals	30/11/2023	12.50	851692	10181	Chris Barnes
30/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.38	4003	T Croft	29/11/2023	19.44	128418	10181	Chris Barnes
30/11/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		22.26	1876	Road Metals	29/11/2023	14.42	851715	10181	Chris Barnes

3396.73

20/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		22.98	2652	Road Metals	20/10/2023	6:34	847908	10167	Chris Barnes
20/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.12	1551	Road Metals	20/10/2023	10:36	848001	10167	Chris Barnes
20/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.26	0130	Road Metals	20/10/2023	7:46	847936	10167	Chris Barnes
20/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.82	2702	Road Metals	20/10/2023	7:37	847933	10167	Chris Barnes
24/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		24.88	2653	Road Metals	24/10/2023	6:24	848105	10167	Chris Barnes
24/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.68	0131	Road Metals	24/10/2023	6:26	848106	10167	Chris Barnes
24/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.58	1951	Road Metals	24/10/2023	6:50	848115	10167	Chris Barnes
24/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.82	2703	Road Metals	24/10/2023	8:06	848135	10167	Chris Barnes
24/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.23	1054	T Croft	24/10/2023	5:16	127676	10167	Chris Barnes
25/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		21.28	0132	Road Metals	24/10/2023	16:14	848271	10167	Chris Barnes
25/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		22.86	1952	Road Metals	25/10/2023	6:58	848288	10167	Chris Barnes
25/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		21.18	2654	Road Metals	25/10/2023	6:33	848277	10167	Chris Barnes
25/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.56	2704	Road Metals	25/10/2023	7:58	848297	10167	Chris Barnes
25/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.62	1055	T Croft	25/10/2023	15:21	127721	10167	Chris Barnes
25/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.32	1155	T Croft	25/10/2023	15:24	127722	10167	Chris Barnes
26/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.96	0133	Road Metals	25/10/2023	14:29	848370	10167	Chris Barnes
26/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.96	1953	Road Metals	26/10/2023	6:54	848406	10167	Chris Barnes
26/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		36.43	3901	T Croft	25/10/2023	17:38	127729	10167	Chris Barnes
26/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		37.28	0752	T Croft	25/10/2023	21:26	127732	10167	Chris Barnes

26/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.08	2951	T Croft	26/10/2023	12:42	127747	10167	Chris Barnes
26/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.06	2655	Road Metals	26/10/2023	10:32	848452	10167	Chris Barnes
27/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.76	0134	Road Metals	27/10/2023	16:05	848524	10167	Chris Barnes
27/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		32.63	2705	Road Metals	27/10/2023	6:30	848531	10167	Chris Barnes
27/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		26.76	3902	T Croft	26/10/2023	22:21	127762	10167	Chris Barnes
27/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.89	1023	T Croft	27/10/2023	15:37	127783	10167	Chris Barnes
30/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		33.06	2656	Road Metals	27/10/2023	16:35	848630	10167	Chris Barnes
30/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		28.50	0135	Road Metals	30/10/2023	8:33	848661	10167	Chris Barnes
30/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		32.99	2705	Road Metals	27/10/2023	16:14	848626	10167	Chris Barnes
30/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		29.98	1954	Road Metals	30/10/2023	6:59	848649	10167	Chris Barnes
31/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.76	2657	Road Metals	30/10/2023	15:27	848744	10167	Chris Barnes
31/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		30.33	2707	Road Metals	30/10/2023	15:49	848750	10167	Chris Barnes
31/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		22.38	0136	Road Metals	31/10/2023	7:56	848773	10167	Chris Barnes
31/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		24.29	1265	T Croft	30/10/2023	19:12	127843	10167	Chris Barnes
31/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		25.13	1056	T Croft	31/10/2023	15:16	127857	10167	Chris Barnes
31/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		22.66	1156	T Croft	31/10/2023	15:09	127856	10167	Chris Barnes
31/10/2023	CH4334 - 16574	205 Gloucester Street	Contaminated Soil		27.26	1024	T Croft	31/10/2023	11:16	127850	10167	Chris Barnes

1010.34

Superlot 2 - Ch4334	Total for 16574
---------------------	-----------------

5336.76

6/11/2023	CH4083 - 16536	56 Langdons Road	Contaminated Soil		9.08	1959	Road Metals	6/11/2023	7:31	849281	10189	Chris Barnes
-----------	----------------	------------------	-------------------	--	------	------	-------------	-----------	------	--------	-------	--------------

9.08

9/10/2023	CH4083 - 16536	56 Langdons Road	Contaminated		18.46	2651	Road Metals	6/10/2023	15:09	846441	10169	Chris Barnes
9/10/2023	CH4083 - 16536	56 Langdons Road	Contaminated		15.80	0001	Road Metals	6/10/2023	15:39	846448	10169	Chris Barnes
9/10/2023	CH4083 - 16536	56 Langdons Road	Contaminated		16.58	2701	Road Metals	6/10/2023	16:02	846453	10169	Chris Barnes

50.84

5/07/2023	CH4083 - 16536	30 Langdons Road	Asbestos		2.88	0127	Frews	4/07/2023	15:50	C31977	10134	Chris Barnes
-----------	----------------	------------------	----------	--	------	------	-------	-----------	-------	--------	-------	--------------

2.88

11/01/2023	CH4083 - 16536	Papanui High School	Contaminated		20.65	0469	T Croft	11/01/2023	17:55	121057	10056	Chris Barnes
12/01/2023	CH4083 - 16536	Papanui High School	Contaminated		26.56	1451	Fulton Hogan	12/01/2023	13:03	57085567	10056	Chris Barnes
25/01/2023	CH4083 - 16536	Papanui High School	Contaminated		10.00	1862	No weigh docket				10056	Chris Barnes
31/01/2023	CH4083 - 16536	Papanui High School	Contaminated		18.48	0904	Fulton Hogan	30/01/2023	16:38	94111851	10056	Chris Barnes

75.69

7/03/2023	CH4083 - 16536	Langdons Road - PHS	Contaminated		22.40	1872	Road Metals	7/03/2023	8.25	822867	10080	Chris Barnes
7/03/2023	CH4083 - 16536	Langdons Road - PHS	Contaminated		27.86	0965	Road Metals	7/03/2023	8.05	822860	10080	Chris Barnes
7/03/2023	CH4083 - 16536	Langdons Road - PHS	Contaminated		27.50	0922	Road Metals	7/03/2023	7.37	822855	10080	Chris Barnes
16/03/2023	CH4083 - 16536	Langdons Road - PHS	Contaminated		27.90	0126	Road Metals	15/03/2023	14.06	823982	10080	Chris Barnes

105.66

2/09/2024	CH4083 - 16536	Papanui High School	Coal Tar		26.54	1985	Road Metals	2/09/2024	06:57:00	869147	10323	Chris Barnes
2/09/2024	CH4083 - 16536	Papanui High School	Coal Tar		19.76	3002	Road Metals	30/08/2024	15:38:00	869110	10323	Chris Barnes
2/09/2024	CH4083 - 16536	Papanui High School	Coal Tar		23.38	3864	Road Metals	2/09/2024	07:48:00	869154	10323	Chris Barnes
2/09/2024	CH4083 - 16536	Papanui High School	Coal Tar		17.88	4959	Road Metals	2/09/2024	08:04:00	869157	10323	Chris Barnes
3/09/2024	CH4083 - 16536	Papanui High School	Coal Tar		13.52	3865	Road Metals	3/09/2024	06:47:00	869275	10323	Chris Barnes
6/09/2024	CH4083 - 16536	Papanui High School	Contaminated Spoil		23.36	6502	Road Metals	6/09/2024	07:52:00	869607	10323	Chris Barnes
12/09/2024	CH4083 - 16536	Papanui High School	Contaminated Spoil		28.34	3866	Road Metals	6/09/2024	06:09:00	869610	10323	Chris Barnes

152.78

29/08/2024	CH4083 - 16536	Papanui High School	Coal Tar		25.70	1983	Chch Readymix	29/08/2024	08:25:00	1035633	10316	Chris Barnes
29/08/2024	CH4083 - 16536	Papanui High School	Coal Tar		26.02	3862	Road Metals	29/08/2024	08:06:00	868931	10316	Chris Barnes
30/08/2024	CH4083 - 16536	Papanui High School	Coal Tar		20.00	3001	Road Metals	29/08/2024	15:51:00	869010	10316	Chris Barnes
30/08/2024	CH4083 - 16536	Papanui High School	Coal Tar		22.06	1984	Chch Readymix	30/08/2024	07:42:00	1035762	10316	Chris Barnes
30/08/2024	CH4083 - 16536	Papanui High School	Coal Tar		22.94	3863	Chch Readymix	30/08/2024	07:30:00	1035763	10316	Chris Barnes
30/08/2024	CH4083 - 16536	Papanui High School	Coal Tar		23.24	4958	Chch Readymix	30/08/2024	06:38:00	1035761	10316	Chris Barnes

139.96

Papanui High School - Ch4083	Total for 16536
------------------------------	-----------------

536.89

7/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		29.66	1051	T Croft	7/02/2023	16:38	121589	10071	Chris Barnes
7/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		24.32	1002	T Croft	7/02/2023	15:37	121583	10071	Chris Barnes
8/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		25.62	0953	Road Metals	8/02/2023	9:23	819059	10071	Chris Barnes
7/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		27.56	1101	T Croft	7/02/2023	20:00	121599	10071	Chris Barnes
8/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		25.29	1052	T Croft	8/02/2023	15:41	121616	10071	Chris Barnes
8/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		32.71	1003	T Croft	8/02/2023	14:38	121615	10071	Chris Barnes
8/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		29.50	0118	Frews	8/02/2023	6:58	P28718	10071	Chris Barnes
8/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		26.41	1868	T Croft	9/02/2023	10:03	121636	10071	Chris Barnes
8/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		27.25	1102	T Croft	8/02/2023	19:23	121624	10071	Chris Barnes
9/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		30.05	0119	Frews	9/02/2023	7:03	P28740	10071	Chris Barnes
9/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		31.82	0954	Road Metals	9/02/2023	9:37	819301	10071	Chris Barnes
9/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		25.28	1151	T Croft	9/02/2023	15:26	121651	10071	Chris Barnes
9/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		27.18	1053	T Croft	9/02/2023	14:27	121649	10071	Chris Barnes
9/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		25.62	1004	T Croft	9/02/2023	11:47	121643	10071	Chris Barnes
13/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		33.22	0120	Road Metals	10/02/2023	14:53	819683	10071	Chris Barnes
13/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		25.80	1869	Fulton Hogan	3/02/2023	15:13	96100451	10071	Chris Barnes
13/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		30.50	0955	Road Metals	10/02/2023	16:21	819703	10071	Chris Barnes
13/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		32.26	1005	T Croft	13/02/2023	12:40	121709	10071	Chris Barnes
13/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		27.58	1152	T Croft	13/02/2023	13:43	121710	10071	Chris Barnes
21/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		24.40	1153	T Croft	21/02/2023	14:41	121858	10071	Chris Barnes
21/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		31.95	1006	T Croft	21/02/2023	14:38	121857	10071	Chris Barnes
27/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		23.85	1007	T Croft	27/02/2023	11:28	121980	10071	Chris Barnes
27/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		22.31	1154	T Croft	27/02/2023	11:32	121981	10071	Chris Barnes
27/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		30.20	0705	T Croft	27/02/2023	16:45	121997	10071	Chris Barnes
28/02/2023	CH4204 - 16549	208 Montreal Street	Contaminated		25.98	706	T Croft	28/02/2023	15:08	122019	10071	Chris Barnes

696.32

28/02/2023	CH4247 - 16548	30 Quaifes Road	Contaminated		26.68	0919	Fulton Hogan	21/02/2023	14:58	96105681	10070	Chris Barnes
28/02/2023	CH4247 - 16548	30 Quaifes Road	Contaminated		23.18	1474	Road Metals	28/02/2023	10:27	822148	10070	Chris Barnes
28/02/2023	CH4247 - 16548	30 Quaifes Road	Contaminated		10.40	0963	Frews	1/03/2023	8:29	C28839	10070	Chris Barnes

60.26

7/06/2023	16531	49 Blackbyre Road, Appleby	Tomato Waste		21.94	2654	Sollys	6/06/2023	14:44	81251	10119	Rachel Clarke
8/06/2023	16531	49 Blackbyre Road, Appleby	Green Waste		19.44	2655	Sollys	8/06/2023	11:13	81286	10119	Rachel Clarke
21/06/2023	16531	49 Blackbyre Road, Appleby	Green Waste		22.45	2656	Sollys	21/06/2023	9:06	81430	10119	Rachel Clarke

63.83

1/05/2023	16531	Pugh Road, Hope	Greenwaste & Slabs		21.54	2652	Sollys - Richmond	28/04/2023	14.02	80815	10114	Rachel Clarke
23/05/2023	16531	49 Blackbyre Road, Appleby	Tomato Waste		29.44	1260	Sollys - Richmond	23/05/2023	Unknown	WB # 1034829	10114	Rachel Clarke
25/05/2023	16531	49 Blackbyre Road, Appleby	Tomato Waste		23.79	1261	Sollys - Richmond	25/05/2023	9.16	81104	10114	Rachel Clarke

74.77

9/01/2023	16531	Tailored Energy Solution	Capsicum Waste		13.24	0951	Fulton Hogan	9/01/2023	10:31	57085506	10062	Rachel Clarke
10/01/2023	16531	Tailored Energy Solution	Capsicum Waste		8.75	0802	Sollys	10/01/2023	12:32	79646	10062	Rachel Clarke
10/01/2023	16531	Tailored Energy Solution	Capsicum Waste		21.57	0801	Sollys	10/01/2023	10:29	79644	10062	Rachel Clarke

43.56

30/12/2022	16531	Tailored Energy Solution	Contaminated		9.84	0901	Sollys	29/12/2022	17:05	79624	10049	Rachel Clarke
30/12/2022	16531	Tailored Energy Solution	Contaminated		13.15	0902	Sollys	29/12/2022	12:53	79623	10049	Rachel Clarke

22.99

3/03/2023	16531	49 Blackbyre Road, Appleby	Green Waste		23.34	2651	Sollys	2/03/2023	14.20	80184	10078	Rachel Clarke
14/03/2023	16531	49 Blackbyre Road, Appleby	Green Waste		20.93	1257	Sollys	13/03/2023	15.37	80308	10078	Rachel Clarke
14/03/2023	16531	37 Blackbyre Road, Appleby	Green Waste		24.52	1258	Sollys	13/03/2023	13.47	80306	10078	Rachel Clarke
27/03/2023	16531	49 Blackbyre Road, Appleby	Green Waste		28.18	2653	Sollys	24/03/2023	16.38	80430	10078	Rachel Clarke

96.97

Total for 16531 302.12

24/01/2023	16538	Nelson / Appleby	Green Waste		24.9	1251	Sollys	24/01/2023	7:28	79751	10057	Rachel Clarke
26/01/2023	16538	Nelson / Appleby	Green Waste		25.48	1254	Sollys	25/01/2023	16:03	79765	10057	Rachel Clarke
26/01/2023	16538	Nelson / Appleby	Green Waste		24.04	1255	Sollys	26/01/2023	1:57	79768	10057	Rachel Clarke
27/01/2023	16538	Nelson / Appleby	Green Waste		26.79	1256	NFL Belgrove	27/01/2023	11:36	126326	10057	Rachel Clarke
25/01/2023	16538	Nelson / Appleby	Green Waste		30.92	1252	Sollys	25/01/2023	6:27	79760	10057	Rachel Clarke
25/01/2023	16538	Nelson / Appleby	Green Waste		30.97	1253	Sollys	25/01/2023	10:05	79761	10057	Rachel Clarke

163.10

SUMMARY:	
CH4311 - 16565	27.94
CH4095 - 16533	55.37
CH4334 - 16574	5336.76
CH4083 - 16536	536.89
CH4204 - 16549	696.32
CH4247 - 16548	60.26
16531	302.12
16532	163.10

S127 to RC-2021-0097

To vary consent condition 11

Taylorville Road - Lot 1-2 Deposited Plan 584105

Assessment of Environmental Effects and Statutory Analysis

13 November 2024

B&A

Urban & Environmental

Prepared for:
Taylorville Resource Park Limited

FORM C: CHANGE OR CANCELLATION OF CONSENT CONDITIONS

Office Use Only



Notes

- You must **fully** complete this form. Provide as much detail as you can.
- You must pay the required initial deposit/fee (\$862.50 incl GST) when you submit your consent application form, or your application will be returned to you.**
- Failure to provide the required information and payment will delay the processing of your application. If you do not provide adequate information then we will not be able to process your application, and will return it to you.
- Remember to sign and date all forms. A signature is not required if you email or submit your application by electronic means.

If you need any further help, please phone a member of the Consents team on **(03) 768 0466 or 0508 800 118.**

Office use only

Application Number:

Deposit Fee Paid:

\$ _____

Date Deposit Fee Paid:

Current File Number:

Contact details

Applicant details

For **individuals**, you must provide the full names of all individuals (such as John Robert Smith and Mary Jane Williams).
For **companies and other incorporated entities** you must provide the company name and you must also provide the name of a person or persons who will represent your company and be responsible for the application.
For **partnerships, groups and unincorporated entities** (such as private or family trusts or unincorporated societies) we must have the details of all authorised partners, trustees, members or officers. We may also request a copy of your society's rules to verify your status as a formal body or society.

Full name/s of applicant/s This is the name/s that the consent will be issued to. We will not accept applications made in the name of unregistered companies.				
Applicant's postal address				
Applicant's residential address If different from postal address				
Primary contact person/s				
Email address				
Phone number/s	Home:		Business:	
	Mobile:		Fax:	

Partnership / Groups / Unincorporated entity details

For **partnerships, groups or unincorporated entities** (such as private or family trusts or unincorporated bodies or societies) you must provide details of all authorised partners, trustees or members. Any consent granted will then include these names, and all individuals will be legally responsible for the consent and any associated costs. Should these persons change, then you must notify us.

Name of person: Status (such as partner, member or trustee): Residential address:	
Name of person: Status (such as partner, member or trustee): Residential address:	
Name of person: Status (such as partner, member or trustee): Residential address:	
Name of person: Status (such as partner, member or trustee): Residential address:	

Include details of any further partners/trustees/members on a separate page if necessary.

Application consultant/agent details (if applicable)

Name/company name				
Contact person				
Postal address				
Email address				
Phone number/s	Home:		Business:	
	Mobile:		Fax:	

Who should we send application correspondence to?

☐

Applicant

☐

Consultant/Agent

Have you discussed this application with a West Coast Regional Council staff member:

☐

Yes

☐

No

Name of staff member(s):

--

Consultation

Please list the persons that you believe to have an interest in, or that may be affected by, the proposed change or cancellation of conditions.

Affected Party name/s				
Postal address				
Email address				
Phone number/s	Home:		Business:	
	Mobile:		Fax:	
Affected Party name/s				
Postal address				
Email address				
Phone number/s	Home:		Business:	
	Mobile:		Fax:	
Affected Party name/s				
Postal address				
Email address				
Phone number/s	Home:		Business:	
	Mobile:		Fax:	

Have you discussed your proposal with your neighbours and other parties who may be affected, eg, Fish & Game, Department of Conservation, Iwi, New Zealand Transport Agency, user groups and interest groups:

☐ Yes ☐ No

If yes, who was consulted (Attach any correspondence if appropriate):

--

Do they have any concerns:

--

How can these concerns be met:

--

Location

Property address / Location:	
Legal description / Site description:	
Name of closest road/street or nearest settlement/town	
Map reference (NZTM):	

Territorial Authority in which the activity will be located

☐ Buller ☐ Grey ☐ Westland

List the Conditions that you wish to change or cancel:

--

Describe any change to Conditions that you wish to make:

--

Describe any changes to documents referred to in the Resource Consent (Please attach amended documents, eg, maps, aerial photographs):

--

Describe the changes in circumstances that has caused the need to change the Conditions:

--

Provide information to demonstrate that the degree of adverse environmental effect of the activity is likely to be unchanged or decreased as a result of any such change or cancellation:

Provide information to demonstrate that the degree of adverse environmental effect of the activity is likely to be unchanged or decreased as a result of any such change or cancellation. The following information requirements were introduced by the Resource Management Amendment Act 2013 and took effect on 3 March 2015. These are mandatory requirements for all applications. The sections require varying degrees of familiarity with the RMA and documents produced under the RMA. If you need any further help, please phone a member of the Consents team.

Part 2 of the RMA

Part 2 of the RMA is attached at the end of this document.

Provide an assessment of your proposed activity/activities against the matters set out in Part 2.

Other policies, rules and requirements

Assess your proposal against any relevant provisions of:

- national environmental standards
- other regulations
- national policy statements
- the West Coast Regional Policy Statement (RPS)
- Regional Air Quality Plan, the Regional Coastal Plan for the West Coast and the Regional Land and Water Plan

Please complete an assessment of environmental effects in the detail that corresponds with the scale and significance of the effects that a change to, or cancellation of, the activity may have on the environment.

Advice Note: Please attach a separate sheet(s) if required.

Schedule 4 of the RMA is attached at the end of this document.

Application deposit / fees

Initial deposit

You will be charged the West Coast Regional Council's full actual and reasonable costs for processing this application. An initial deposit is required when you submit your application forms. This deposit helps cover our initial processing costs and will also help offset the total cost of your application/s.

For complex proposals, you will generally receive an invoice on a monthly basis. This invoice will be for costs incurred in the previous month. For simple consents that are processed quickly, you will generally only receive one invoice. This will be sent to you after you receive the final decision on your application.

Please refer to the table below for the **deposit fee required for your application** (updated 25 August 2023)

Application type	Charge (excl GST)	Charge (incl GST)
Application for a Change or Cancellation of consent conditions	\$750	\$862.50

Payment can be made in the following ways:

- at the West Coast Regional Council Office by cash or cheque
- by post by cheque
- by electronic banking using the details below:

WEST COAST REGIONAL COUNCIL

WESTPAC BANK ACCOUNT NUMBER:

0	3	0	8	4	6
---	---	---	---	---	---

Bank Branch Number

0	1	2	1	5	0	0
---	---	---	---	---	---	---

Account Number

0	0	
---	---	--

Suffix

Payer particulars – **Name of applicant**

Payer reference - **RCAPPLN**

Payer particulars (max 12 characters)

--	--	--	--	--	--	--	--	--	--	--	--

Payer code (max 12 characters)

--	--	--	--	--	--	--	--	--	--	--	--

Payer reference (max 12 characters)

--	--	--	--	--	--	--	--	--	--	--	--

Declaration

"I/the applicant, hereby certify that, to the best of my knowledge and belief, the information given in this application is true and correct. I/the applicant, agree to pay all actual and reasonable costs incurred by the West Coast Regional Council in processing the consent application/s regardless of whether or not the application is granted. I/the applicant, also agree to pay 10% penalty interest on amounts not paid within 30 days of the due date. This also applies to any subsequent compliance monitoring charges relating to the resource consent.

A signature is not required if the application is made by electronic means.

Signature of applicant or applicant's agent

Date

--	--

Print Name (BLOCK CAPITALS)

--

Final Checklist

Have you?

Please tick

☐

Filled in all parts of this form.

☐

Included a sketch or location map that shows us exactly where your changed activity will take place.

☐

Attached any written approvals obtained from parties potentially affected by your proposed change of conditions.

☐

Paid the required deposit/fee.

Important information – please read carefully

Public information

The information you provide with your application is public information. It is used to help process your resource consent application and assess the impact of your activity on the environment and other people.

Your information is held and administered by the West Coast Regional Council in accordance with the Local Government Official Information and Meetings Act 1987 and the Privacy Act 1993. This means that your information may be disclosed to other people who request it in accordance with the terms of these Acts. It is therefore important you let us know if your application includes trade secrets, commercially sensitive material or any other information you consider should not be disclosed.

Consent holder costs – Ongoing responsibilities

Consent conditions will be monitored. Monitoring will incur additional fees which will be charged to the Consent Holder. Please contact us if you have any queries regarding your deposit/fee or processing costs or the monitoring charges for your activity.

Consultation

Consultation with other parties who may be interested in or affected by your activity is encouraged. This involves discussing your activity with others who may have some concerns, listening to what others have to say, considering their responses and deciding what will be done.

More information

For more information on the application process or resource consents, visit our website at www.wcrc.govt.nz or phone the Consents team on (03) 768 0466 or 0508 800 118.

Form updated 25 August 2023



THE WEST COAST
REGIONAL COUNCIL

388 Main South Road, Paroa, Greymouth 7805
PO Box 66, Greymouth 7840
Telephone (03) 768 0466
Toll Free 0508 800 118
Facsimile (03) 768 7133
Email info@wcrc.govt.nz
Website www.wcrc.govt.nz

Part 2 of the Resource Management Act 1991

Purpose and principles

5 Purpose

- (1) The purpose of this Act is to promote the sustainable management of natural and physical resources.
- (2) In this Act, *sustainable management* means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—
- (a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
 - (b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and
 - (c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.

6 Matters of national importance

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:

- (a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:
- (b) the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development:
- (c) the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna:
- (d) the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers:
- (e) the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga:
- (f) the protection of historic heritage from inappropriate subdivision, use, and development:
- (g) the protection of protected customary rights.

7 Other matters

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to—

- (a) kaitiakitanga:
 - (aa) the ethic of stewardship:
- (b) the efficient use and development of natural and physical resources:
 - (ba) the efficiency of the end use of energy:
- (c) the maintenance and enhancement of amenity values:
- (d) intrinsic values of ecosystems:
- (e) [Repealed]
- (f) maintenance and enhancement of the quality of the environment:
- (g) any finite characteristics of natural and physical resources:
- (h) the protection of the habitat of trout and salmon:
- (i) the effects of climate change:
- (j) the benefits to be derived from the use and development of renewable energy.

8 Treaty of Waitangi

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall take into account the principles of the [Treaty of Waitangi](#) (Te Tiriti o Waitangi).

Schedule 4

Information required in application for resource consent

1 Information must be specified in sufficient detail

Any information required by this schedule, including an assessment under clause 2(1)(f) or (g), must be specified in sufficient detail to satisfy the purpose for which it is required.

2 Information required in all applications

- (1) An application for a resource consent for an activity (the *activity*) must include the following:
 - (a) a description of the activity;
 - (b) a description of the site at which the activity is to occur;
 - (c) the full name and address of each owner or occupier of the site;
 - (d) a description of any other activities that are part of the proposal to which the application relates;
 - (e) a description of any other resource consents required for the proposal to which the application relates;
 - (f) an assessment of the activity against the matters set out in Part 2;
 - (g) an assessment of the activity against any relevant provisions of a document referred to in section 104(1)(b).
- (2) The assessment under subclause (1)(g) must include an assessment of the activity against—
 - (a) any relevant objectives, policies, or rules in a document; and
 - (b) any relevant requirements, conditions, or permissions in any rules in a document; and
 - (c) any other relevant requirements in a document (for example, in a national environmental standard or other regulations).
- (3) An application must also include an assessment of the activity's effects on the environment that—
 - (a) includes the information required by clause 6; and
 - (b) addresses the matters specified in clause 7; and
 - (c) includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

3 Additional information required in some applications

An application must also include any of the following that apply:

- (a) if any permitted activity is part of the proposal to which the application relates, a description of the permitted activity that demonstrates that it complies with the requirements, conditions, and permissions for the permitted activity (so that a resource consent is not required for that activity under section 87A(1));
- (b) if the application is affected by section 124 or 165ZH(1)(c) (which relate to existing resource consents), an assessment of the value of the investment of the existing consent holder (for the purposes of section 104(2A));
- (c) if the activity is to occur in an area within the scope of a planning document prepared by a customary marine title group under section 85 of the Marine and Coastal Area (Takutai Moana) Act 2011, an assessment of the activity against any resource management matters set out in that planning document (for the purposes of section 104(2B)).

4 Additional information required in application for subdivision consent

An application for a subdivision consent must also include information that adequately defines the following:

- (a) the position of all new boundaries;
- (b) the areas of all new allotments, unless the subdivision involves a cross lease, company lease, or unit plan;
- (c) the locations and areas of new reserves to be created, including any esplanade reserves and esplanade strips;
- (d) the locations and areas of any existing esplanade reserves, esplanade strips, and access strips;
- (e) the locations and areas of any part of the bed of a river or lake to be vested in a territorial authority under section 237A;
- (f) the locations and areas of any land within the coastal marine area (which is to become part of the common marine and coastal area under section 237A);
- (g) the locations and areas of land to be set aside as new roads.

5 Additional information required in application for reclamation

An application for a resource consent for reclamation must also include information to show the area to be reclaimed, including the following:

- (a) the location of the area;
- (b) if practicable, the position of all new boundaries;
- (c) any part of the area to be set aside as an esplanade reserve or esplanade strip.

Assessment of environmental effects

6 Information required in assessment of environmental effects

- (1) An assessment of the activity's effects on the environment must include the following information:
 - (a) if it is likely that the activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for undertaking the activity;
 - (b) an assessment of the actual or potential effect on the environment of the activity;
 - (c) if the activity includes the use of hazardous substances and installations, an assessment of any risks to the environment that are likely to arise from such use;
 - (d) if the activity includes the discharge of any contaminant, a description of—
 - (i) the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and
 - (ii) any possible alternative methods of discharge, including discharge into any other receiving environment;
 - (e) a description of the mitigation measures (including safeguards and contingency plans where relevant) to be undertaken to help prevent or reduce the actual or potential effect;
 - (f) identification of the persons affected by the activity, any consultation undertaken, and any response to the views of any person consulted;
 - (g) if the scale and significance of the activity's effects are such that monitoring is required, a description of how and by whom the effects will be monitored if the activity is approved;
 - (h) if the activity will, or is likely to, have adverse effects that are more than minor on the exercise of a protected customary right, a description of possible alternative locations or methods for the exercise of the activity (unless written approval for the activity is given by the protected customary rights group).
- (2) A requirement to include information in the assessment of environmental effects is subject to the provisions of any policy statement or plan.
- (3) To avoid doubt, subclause (1)(f) obliges an applicant to report as to the persons identified as being affected by the proposal, but does not—
 - (a) oblige the applicant to consult any person; or
 - (b) create any ground for expecting that the applicant will consult any person.

7 Matters that must be addressed by assessment of environmental effects

- (1) An assessment of the activity's effects on the environment must address the following matters:
 - (a) any effect on those in the neighbourhood and, where relevant, the wider community, including any social, economic, or 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 value, 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.
- (2) The requirement to address a matter in the assessment of environmental effects is subject to the provisions of any policy statement or plan.

B&A Reference:

CH025279

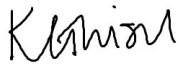
Status:

Final Revision

Date:

13 November 2024

Prepared by:



Kerstin Ghisel

Senior Associate, Barker & Associates Limited

Reviewed by:



Karl Cook

Director, Barker & Associates Limited

Contents

1.0	Applicant and Property Details	5
2.0	Introduction and Background	6
2.1	Introduction	6
2.2	Background	6
3.0	Site Context	7
3.1	Site Description	7
3.2	Surrounding Locality	9
4.0	Proposal	10
4.1	Proposed Changes to Consent Conditions	10
5.0	Reasons for Consent	11
5.1	Section 127 of the Resource Management Act 1991	11
6.0	Public Notification Assessment (Sections 95A, 95C and 95D)	12
6.1	Assessment of Steps 1 to 4 (Sections 95A)	12
6.2	Section 95D Statutory Matters	13
6.3	Land Excluded from the Assessment	13
6.4	Assessment of Effects on the Wider Environment	14
6.5	Summary of Effects	15
6.6	Public Notification Conclusion	15
7.0	Limited Notification Assessment (Sections 95B, 95E to 95G)	15
7.1	Assessment of Steps 1 to 4 (Sections 95B)	15
7.2	Section 95E Statutory Matters	16
7.3	Assessment of Effects on Persons	17
7.4	Limited Notification Conclusion	17
8.0	Consideration of Applications (Section 104)	17
8.1	Statutory Matters	17
9.0	Effects on the Environment (Section 104(1)(A))	18
10.0	Regional and District Plan and Statutory Documents (Section 104(1)(B))	18
10.1	National Policy Statement For Freshwater Management 2020	18
10.2	Objectives and Policies of the West Coast Regional Policy Statement (2020)	19
10.3	Objectives and Policies of the Regional Land and Water Plan	22
10.4	Summary	23
11.0	Part 2 Matters	23
12.0	Other Matters (Section 104(1)(C))	24
12.1	Record of Title Interests	24
12.2	Non-Statutory Documents	24
12.3	District Plans	25
13.0	Conclusion	26

Appendices

Appendix 1 Record of Title and Interests

Appendix 2 RC-2021-0097-V3

1.0 Applicant and Property Details

To:	West Coast Regional Council
Site Address:	Taylorville Road
Applicant Name:	Taylorville Resource Park Limited
Address for Service:	Barker & Associates Ltd Level 3, 61 Cambridge Terrace Christchurch Central City Christchurch 8013 Attention: Kerstin Ghisel
Legal Description:	Lot 1-2 Deposited Plan 584105 contained within Record of Title 1097679 (refer to Record of Title as Appendix 1)
Site Area:	19.342 ha
Site Owner:	Taylorville Resource Park Limited
Regional Plan:	Regional Land and Water Plan (RLWP)
District Plans:	Operative Grey District Plan Proposed Te Tai o Poutini Plan
GDP Zoning:	Rural Environmental Area
Locality Diagram:	Refer to Figure 1
Brief Description of Proposal:	s127 application to vary condition 11 of RC-2021- 0097.
Summary of Reasons for Consent:	S127: Discretionary Activity

2.0 Introduction and Background

2.1 Introduction

This report has been prepared to address a resource consent application submitted by Taylorville Resource Park Limited (hereafter referred to as 'TRPL') for a S127 application to vary an existing consent condition in regard to a regional consent for the site located at Lot 1-2 DP 584105 at Taylorville. This report is intended to address the relevant matters under the Resource Management Act 1991 ('RMA').

The proposed change seeks to amend Condition 11 of RC-2021-0097, which effectively imposes blanket restriction on contamination of groundwater or surface water outside of the site from the exercise of the consent. The amendment would enable application(s) to be made, and if duly granted in accordance with the requirements of Resource Management Act 1991 (RMA), for such discharges to take place without contravening Condition 11. Importantly, however, the amendment to Condition 11 would not, of itself, enable any contamination of groundwater or surface water outside of the site from the exercise of the consent which would remain expressly excluded unless subject to a separate discharge permit being obtained. The proposal will also update the application site's legal description.

2.2 Background

The application site, which is known as the 'Taylorville Resource Park', is a demolition and clean fill disposal facility. Consents granted for activities on the site are outlined below.

2.2.1 Approved Regional Resource Consents

The onsite operations were originally consented by the West Coast Regional Council (WCRC) in August 2021, involving the following consents:

- RC-2021-0097-01 Land Use Consent - To undertake earthworks, including land-based gravel extraction to construct, operate and rehabilitate a demolition fill site, Taylorville.
- RC-2021-0097-02 Discharge Permit - To discharge demolition waste to land, Taylorville.

Consent was granted for a 20-year term from August 2021. Subsequent variations to the above consents have allowed asbestos and coal tar contaminated material to also be accepted in two lined cells. Consent conditions also allow for 'other hazardous materials' at the discretion of the WCRC. The latest variation (RC-2021-0097-V3) is subject to the consent conditions outlined at Appendix 2.

2.2.2 Lodged Regional Discharge Applications

TRPL lodged an application for the temporary discharge of collected leachate and stormwater to land in September 2024 (Council reference RC-2024-0122).

2.2.3 Approved District Resource Consents

Land use resource consent was obtained from the Grey District Council (GDC) in 2022 (reference LU3084/22) to undertake the discharge of demolition waste to land that does not comply with the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS) 2011.

2.2.4 Planned Further Works

In terms of planned further works the applicant is continuously exploring options to improve the water management system at the site. Current planned upgrades include the installation of an aeration fountain in Stage 2 of the settlement pond (anticipated completion in late 2024) and assessing the feasibility of reconfiguring the sequence of the treatment train to allow for flocculation prior to Stage 1 of the settlement pond.

3.0 Site Context

3.1 Site Description

The application site is located to the west of the township of Taylorville and approximately 3.5km east of Greymouth. The application site is legally described as Lot 1-2 DP 584105 and is contained within one Record of Title (1097679) and the overall site area is over 19ha. The application site is positioned on the northern side of Taylorville Road (Figure 1). The Grey River is located to the south of the application site and is the source of water for the GDC water treatment plant on the opposite side of Taylorville Rd.



Figure 1: Application site outlined in blue (Source: EMaps)

The application site is located in a flat to gently undulating area between Mount Buckley and Cobden Hill, on the northern side of the Grey River. The local topography dips gently to the southwest with an average grade of approximately 1.6% (1:64). The application site is located between the floodplain of the Grey River and the channel of Noname Creek, which forms a downstream tributary of the Grey River and flows through the eastern portion of the application site (Figure 2).

Noname Creek flows in a southwest direction approximately 15m from the north-northeast boundary of the site. The creek receives water from the fill operation located on the adjacent landholding to the west of the application site. Noname Creek runs through a culvert under

Taylorville Road and discharges into an unnamed tributary/wetland on the south side of the road, before joining with the Grey River approximately 350m westward (downstream) of the confluence with the wetland. Downstream of the site, the Grey River meanders westward in a wide channel for approximately 7km before discharging onto the Tasman Sea.

The western portion of the application site (approximately 12.5ha) has been developed with three waste cells (Cells A–C), with one cell (Cell D) identified for a future development (Figure 2). Cell B is closed and capped; Cells A and C are active.



Figure 2: Layout of application site

As noted above, regional consent reference RC-2021-0097-V3, allows for the disposal to land of demolition waste (including cleanfill), asbestos, coal tar and coal pitch, shredded tyres, and other hazardous materials approved by the Consent Authority (Figure 3).

Cell	Aerial Extent	Approximate Depth	Approximate Volume	Received Materials	Cell Construction
Cell A	5,000 m ²	~10–15 m (to mudstone)	~40,000–60,000 m ³	Demolition waste (including cleanfill), whole or shredded tyres	Unlined cell.
Cell C	6,400 m ²	10 m	37,000 m ³	Demolition waste (including cleanfill), whole or shredded tyres, asbestos, coal tar and coal pitch, other approved hazardous materials	Cell is lined with geomembrane underlain with geofabric.

Figure 3: Cell descriptions and received material types (Source Engeo Hydrogeological Assessment)

The site operations also include two large water treatment / retention devices with a combined capacity of approximately 15,000m³ for treated leachate and stormwater captured by the onsite operations (Figure 4).



Figure 4: Retention pond

3.2 Surrounding Locality

The immediate adjoining neighbour to the north and east is a dairy farm (Sewell Peak Farm). The immediately adjoining neighbour to the west (legally described as being Part Section 120-121 Square 119) has a regional discharge permit (RC-2019-0024-01) for the discharge of demolition waste and cleanfill to land.

The closest residential unit to the application site is located to the west at 173 Taylorville Road, which is approximately 170m east of the application site's western boundary.

The GDC's water treatment plant is located opposite the application site, on the southern side of Taylorville Road (Lot 1 Deposited Plan 343801) (Figure 5). This networked public drinking water supply (GRE001) is located approximately 430m south of the application site. The supply provides drinking water to approximately 10,000 people in the area. The source of the water supply (RC01092.3) is a subsurface infiltration system that takes water from the Grey River for treatment and distribution from bores located 320m - 420m to the south-southeast from the application site.



Figure 5: Grey District Council's water treatment plant

GDC's waste management centre, 'McLean's Pit Landfill and Recycling Centre' is located approximately 900m (as the crow flies) to the north of the application site, at 142 McLeans Pit Road.

4.0 Proposal

A change to consent condition 11 of RC-2021-0097 is needed so that the existing application for a temporary discharge of leachate and stormwater from the existing onsite retention pond to land via a soakage area can be given effect, if granted. The proposed amendment could also allow other discharges but only if they are duly consented. No unconsented discharges would be authorised by the amendment. The current wording of condition 11 is:

- The Consent Holder shall ensure that there is no contamination of groundwater or surface water outside of the site (Secs 1-3 5-6 Pt Secs 4 & 8 SO 11520 Sec 1 SO 3935 Sec 1 SO 3934 Lots 1 3 DP 2432 Lots 1-5 DP 3265) as a result of the exercise of this consent.

This section 127 application seeks to change condition 11 of RC-2021-0097-03 to enable the following:

- To enable any authorised discharge consents granted by the WCRC for contamination of groundwater or surface water outside of the site as a result of the exercise of consent RC-2021-0097; and
- To update the application site's legal description.

4.1 Proposed Changes to Consent Conditions

The proposed amendments to condition 11 is to provide for the changes outlined above are detailed as follows (deletions shown as ~~strike through~~ and additions as **bold underlined**):

- The Consent Holder shall ensure that there is no contamination of groundwater or surface water outside of the site (~~Secs 1 3 5 6 Pt Secs 4 & 8 SO 11520 Sec 1 SO 3935 Sec 1 SO 3934 Lots 1 3 DP 2432 Lots 1-5 DP 3265~~**Lot 1-2 DP584105**) as a result of the exercise of this consent

unless, and only to the extent that, a separate discharge permit has been obtained from the West Coast Regional Council.

5.0 Reasons for Consent

The proposal involves changes to condition 11 of RC-2021-0097. The proposed changes are considered to be within the scope of the original resource consent as the proposal remains the same in terms of the activity and its scale. It does not have materially different adverse effects from that originally consented. Furthermore, the proposed change will enable the exercising of any regional discharge consent(s) duly granted by the WCRC.

The proposal does not seek to amend the duration of consent.

As an application to change conditions under section 127 of the Act, the proposal is treated as if it were a **discretionary** activity, and the relevant matters for consideration are the proposed change and its effects.

5.1 Section 127 of the Resource Management Act 1991

The proposal involves changes to the conditions of regional resource consent RC-2021-0097.

Section 127 of the Act allows for the change or cancellation of a condition or conditions of resource consent (other than a condition as to the duration of the consent).

Sections 88 to 121 of the Act apply to the consideration of the application, with all necessary modifications, as if:

- a) the application was for resource consent for a discretionary activity; and
- b) the references to the resource consent and the activity were references only to the change or cancellation of a condition and the effects of the change or cancellation respectively.
- c) For the purposes of determining who is adversely affected by the change or cancellation of condition, a local authority must consider, in particular, every person who:
- d) made a submission on the original application; and
- e) may be affected by the change or cancellation of condition.

The main point to consider when assessing whether an application should be processed as a section 127 change of conditions or a new application, is whether the proposed change in conditions will result in a “fundamentally different activity” or “an activity having materially different adverse effects” to those that lawfully exist or that were assessed under the original application.

In this instance, the proposed changes to conditions are required to enable the exercising of a new discharge consent if granted by the WCRC to facilitate the temporary discharge to land associated with an approved landfill activity on the site.

As noted, under section 127 of the Act, resource consent for the change is required as a **discretionary** activity.

6.0 Public Notification Assessment (Sections 95A, 95C and 95D)

6.1 Assessment of Steps 1 to 4 (Sections 95A)

Section 95A specifies the steps the council is to follow to determine whether an application is to be publicly notified. These are addressed in statutory order below.

6.1.1 Step 1: Mandatory public notification is required in certain circumstances

Step 1 requires public notification where this is requested by the applicant; or the application is made jointly with an application to exchange of recreation reserved land under section 15AA of the Reserves Act 1977.

The above does not apply to the proposal.

6.1.2 Step 2: If not required by step 1, public notification precluded in certain circumstances

Step 2 describes that public notification is precluded where all applicable rules and national environmental standards preclude public notification; or where the application is for a controlled activity; or a restricted discretionary, discretionary or non-complying boundary activity.

In this case, the applicable rules do not preclude public notification, and the proposal is not a controlled activity or boundary activity. Therefore, public notification is not precluded.

6.1.3 Step 3: If not required by step 2, public notification required in certain circumstances

Step 3 describes that where public notification is not precluded by step 2, it is required if the applicable rules or national environmental standards require public notification, or if the activity is likely to have adverse effects on the environment that are more than minor.

As noted under step 2 above, public notification is not precluded, and an assessment in accordance with section 95A is required, which is set out in the sections below. As described below, it is considered that any adverse effects will be no more than minor.

6.1.4 Step 4: Public notification in special circumstances

If an application is not required to be publicly notified as a result of any of the previous steps, then the council is required to determine whether special circumstances exist that warrant it being publicly notified.

Special circumstances are those that are:

- Exceptional or unusual, but something less than extraordinary; or
- Outside of the common run of applications of this nature; or
- Circumstances which make notification desirable, notwithstanding the conclusion that the adverse effects will be no more than minor.

The modifications proposed are considered to be within the scope of the original application. The proposed amendments to the conditions will not materially alter the approved development.

It is considered that there is nothing noteworthy about the proposal. It is therefore considered that the application cannot be described as being out of the ordinary or giving rise to special circumstances.

6.2 Section 95D Statutory Matters

In determining whether to publicly notify an application, section 95D specifies a council must decide whether an activity will have, or is likely to have, adverse effects on the environment that are more than minor.

In determining whether adverse effects are more than minor:

- Adverse effects on persons who own or occupy the land within which the activity will occur, or any land adjacent to that land, must be disregarded.

The land to be excluded from the assessment is listed in section 6.3 below.

- Adverse effects permitted by a rule in a plan or national environmental standard (the 'permitted baseline') may be disregarded.

It is considered that there is no permitted baseline that can be usefully applied in this case. However, the approved resource consents referred to in Section 2.2. are part of the receiving environment against which any adverse effects from this proposal should be assessed.

- Trade competition must be disregarded.

This is not considered to be a relevant matter in this case.

- The adverse effects on those persons who have provided their written approval must be disregarded.

No persons have provided their written approval for this proposal.

The sections below set out an assessment in accordance with section 95D, including identification of adjacent properties, and an assessment of adverse effects.

6.3 Land Excluded from the Assessment

In terms of the tests for public notification (but not for the purposes of limited notification or service of notice), the adjacent properties to be excluded from the assessment are shown in Figure 6, and include:

- North and West – Lot 3-4 Deposited Plan 584105
- East – Part Section 120-121 Square 119

- South – Section 2-3 Survey Office Plan 338671, Lot 1 Deposited Plan 343801, Lot 4 Deposited Plan 2432

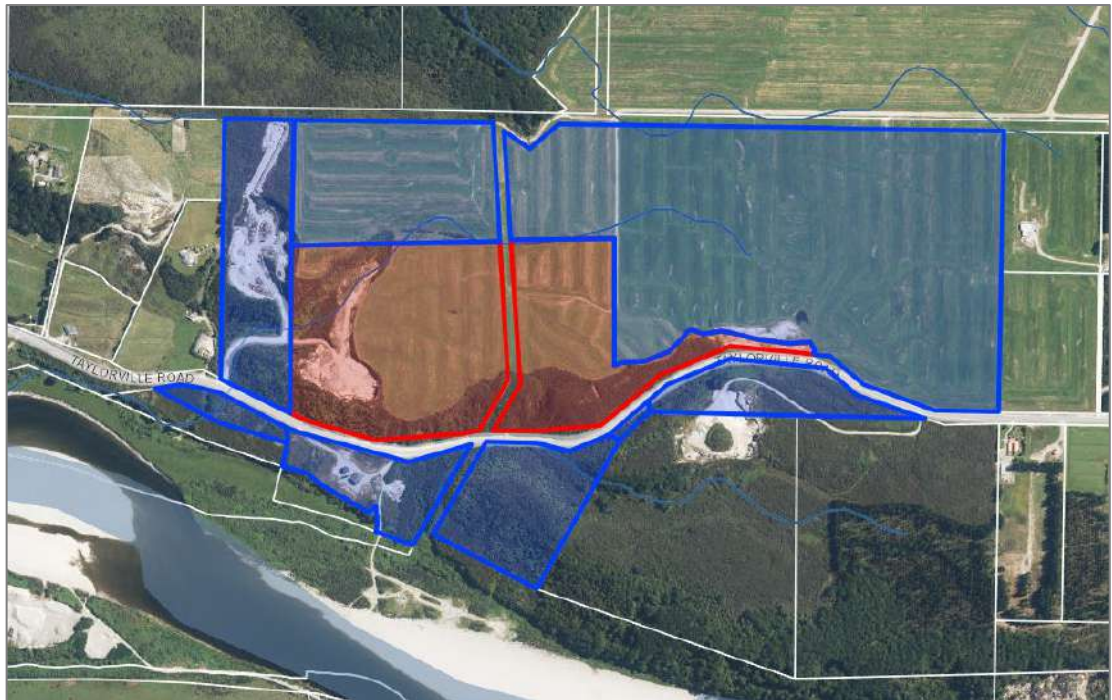


Figure 6: Adjacent properties (coloured in blue) in relation to application site (coloured in red) (Source: Emaps)

6.4 Assessment of Effects on the Wider Environment

In terms of an assessment of wider effects of the proposal, and it is considered that effects in regards to the following matters are less than minor:

- Effects on groundwater quantity and quality;
- Effects on surface water quality and aquatic ecosystems;
- Effects on the quality and safety of human and animal drinking water; and
- Effects on Tangata Whenua Values.

This application relates to the rewording of consent condition 11 of RC-2021-0097 to provide for the exercising of any separately obtained discharge consent by the WCRC. If no separate discharge consents have been granted by the regional council, then there are no additional authorisations in place. Furthermore, all potential adverse effects on the wider environment will be assessed by the regional council through the processing of these applications.

Furthermore, the application site is not listed as a site of significance to Ngāi Tahu, nor is it located within a Statutory Acknowledgement Area, a silent file, or within an archaeological site. Furthermore, there are no Heritage New Zealand sites or New Zealand Archaeological Association sites registered on the property. Consequently, there are no specifically identified cultural values associated with this site. However, below the site there is groundwater aquifers and surface water bodies that may have cultural value to Ngāi Tahu. For the reason that the proposed change to Condition 11 will in no way authorise a discharge of contaminants to groundwater or surface water that is not expressly approved by a separate consent, there will be no adverse effects relating to tangata whenua values.

This application relates to the rewording of consent condition 11 of RC-2021-0097 to provide for the exercising of any separately obtained discharge consent by the WCRC. The primary reasoning behind seeking the amendment is to enable the temporary discharge from the existing onsite retention pond to land, via a proposed soakage area which is currently being sought by RC-2021-0097-V9. Any potential adverse effects relating to that discharge consent application is currently being assessed by Council as part of the resource consenting process for RC-2021-0097-V9.

For the reason that the proposed change to Condition 11 will in no way authorise a discharge of contaminants to groundwater or surface water that is not expressly approved by a separate consent, or that exceeds the extent of such a consent. Therefore, there will be no adverse effects relating to groundwater quantity and quality and surface water quality.

6.5 Summary of Effects

Overall, it is considered that there will be no adverse effects on the environment relating to this proposal.

6.6 Public Notification Conclusion

Having undertaken the section 95A public notification tests, the following conclusions are reached:

- Under step 1, public notification is not mandatory;
- Under step 2, public notification is not precluded;
- Under step 3, public notification is not required as it is considered that the activity will result in less than minor adverse effects; and
- Under step 4, there are no special circumstances.

Therefore, based on the conclusions reached under steps 3 and 4, it is recommended that this application be processed without public notification.

7.0 Limited Notification Assessment (Sections 95B, 95E to 95G)

7.1 Assessment of Steps 1 to 4 (Sections 95B)

If the application is not publicly notified under section 95A, the council must follow the steps set out in section 95B to determine whether to limited notify the application. These steps are addressed in the statutory order below.

7.1.1 Step 1: Certain affected protected customary rights groups must be notified

Step 1 requires limited notification where there are any affected protected customary rights groups or customary marine title groups; or affected persons under a statutory acknowledgement affecting the land.

The above does not apply to this proposal.

7.1.2 Step 2: If not required by step 1, limited notification precluded in certain circumstances

Step 2 describes that limited notification is precluded where all applicable rules and national environmental standards preclude limited notification; or the application is for a controlled activity (other than the subdivision of land).

In this case, the applicable rules do not preclude limited notification and the proposal is not a controlled activity. Therefore, limited notification is not precluded.

7.1.3 Step 3: If not precluded by step 2, certain other affected persons must be notified

Step 3 requires that, where limited notification is not precluded under step 2 above, a determination must be made as to whether any of the following persons are affected persons:

- In the case of a boundary activity, an owner of an allotment with an infringed boundary;
- In the case of any other activity, a person affected in accordance with s95E.

The application is not for a boundary activity, and therefore an assessment in accordance with section 95E is required and is set out below.

Overall, it is considered that any adverse effects on persons will be less than minor, and accordingly, that no persons are adversely affected.

7.1.4 Step 4: Further notification in special circumstances

In addition to the findings of the previous steps, the council is also required to determine whether special circumstances exist in relation to the application that warrant notification of the application to any other persons not already determined as eligible for limited notification.

In this instance, having regard to the assessment in section 6.1.4 above, it is considered that special circumstances do not apply.

7.2 Section 95E Statutory Matters

If the application is not publicly notified, a council must decide if there are any affected persons and give limited notification to those persons. A person is affected if the effects of the activity on that person are minor or more than minor (but not less than minor).

In deciding who is an affected person under section 95E:

- Adverse effects permitted by a rule in a plan or national environmental standard (the 'permitted baseline') may be disregarded;
- Only those effects that relate to a matter of control or discretion can be considered (in the case of controlled or restricted discretionary activities); and
- The adverse effects on those persons who have provided their written approval must be disregarded.

These matters were addressed in section 6.2 above, and no written approvals have been sought.

Having regard to the above provisions, an assessment is provided below.

7.3 Assessment of Effects on Persons

Any adverse effects on persons at adjacent properties are considered to be less than minor as the rewording of condition 11 is to provide for the exercising of any separate discharge permits authorised by the WCRC.

7.3.1 Summary of Effects

Taking the above into account, it is considered that there will be no adverse effects on persons at the aforementioned properties in relation to this proposal.

7.4 Limited Notification Conclusion

Having undertaken the section 95B limited notification tests, the following conclusions are reached:

- Under step 1, limited notification is not mandatory;
- Under step 2, limited notification is not precluded;
- Under step 3, limited notification is not required as it is considered that the activity will not result in any adversely affected persons; and
- Under step 4, there are no special circumstances.

Therefore, it is recommended that this application be processed without limited notification.

8.0 Consideration of Applications (Section 104)

8.1 Statutory Matters

Subject to Part 2 of the Act, when considering an application for resource consent and any submissions received, a council must, in accordance with section 104(1) of the Act have regard to:

- Any actual and potential effects on the environment of allowing the activity;
- Any relevant provisions of a national environmental standard, other regulations, national policy statement, a New Zealand coastal policy statement, a regional policy statement or proposed regional policy statement; a plan or proposed plan; and
- Any other matter a council considers relevant and reasonably necessary to determine the application.

As a discretionary activity, section 104B of the Act states that a council:

- (a) may grant or refuse the application; and
- (b) if it grants the application, may impose conditions under section 108.

9.0 Effects on the Environment (Section 104(1)(A))

Having regard to the actual and potential effects on the environment of the activity resulting from the proposal, it is concluded that there will be no adverse effects from the proposed change. Subsequent applications are required to be granted before the proposed change has any actual impact and that impact is limited to allowing any granted discharge consent to be implemented.

Furthermore, it is considered that the proposal will result in positive effects through enabling, in the event the separate temporary discharge consent application (at least) is granted, managing the discharge from the retention pond in a controlled manner and avoid the uncontrolled overtopping of the pond.

Overall, it is considered that there are no actual and potential adverse effects on the environment of allowing the proposed change.

10.0 Regional and District Plan and Statutory Documents (Section 104(1)(B))

10.1 National Policy Statement For Freshwater Management 2020

It is noted that the new Government, has agreed to replace the National Policy Statement for Freshwater Management 2020 (NPS-FM) and work on the replacement was due to commence at the end of last year¹. Notwithstanding this, below is an assessment against the NPS-FM for completeness.

The National Policy Statement for Freshwater Management 2020 sets out the objectives and policies for freshwater management under the Resource Management Act 1991. The objective of the policy statement is as follows:

The objective of this National Policy Statement is to ensure that natural and physical resources are managed in a way that prioritises:

a) first, the health and well-being of water bodies and freshwater ecosystems

b) second, the health needs of people (such as drinking water)

c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

Fifteen policies support this objective, with the following being of relevance to the proposal:

- Policy 1: Freshwater is managed in a way that gives effect to Te Mana o te Wai.
- Policy 2: Tangata whenua are actively involved in freshwater management (including decision-making processes), and Māori freshwater values are identified and provided for. The application site is not located within a statutory acknowledgement area, rūnanga sensitive area or silent file area.

¹ <https://www.beehive.govt.nz/release/government-takes-first-steps-towards-pragmatic-and-sensible-freshwater-rules>

- Policy 3: Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.
- Policy 5: Freshwater is managed (including through a National Objectives Framework) to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.
- Policy 15: Communities are enabled to provide for their social, economic, and cultural wellbeing in a way that is consistent with this National Policy Statement.

It is considered that the proposal is consistent with the relevant provisions of the NPS:FM because it would enable application(s) to be made, and if duly granted in accordance with the requirements of Resource Management Act 1991 (RMA), for such discharges to take place without contravening Condition 11. But the amendment to Condition 11 would not, of itself, enable any contamination of groundwater or surface water outside of the site from the exercise of the consent as it would remain expressly subject to a separate discharge permit being obtained.

10.2 Objectives and Policies of the West Coast Regional Policy Statement (2020)

Below is an assessment against the relevant objectives and policies within Chapter 6 and 8 of the West Coast Regional Policy Statement (RPS). Consideration has also been given to other objectives and policies within the RPS, including Chapters 7 and 7A, however for the reasons that there are no direct effects on any indigenous biodiversity, that ecosystems will be protected from treatment of the discharge and dilution, and there will be no additional impacts on natural character beyond the current landfill operation.

Chapter 6 - Regionally Significant Infrastructure (RSI)

Chapter 6 outlines that there is a need to recognise the social, economic, and environmental benefits that accrue locally, regionally and nationally from the establishment and continued operation of regionally significant infrastructure (RSI), which is defined within the RPS to include 'public or community solid waste storage and disposal facilities'.

The key objective of this chapter is to enable the safe, efficient and integrated development, operation, maintenance, and upgrading of regionally and nationally significant infrastructure. This objective is supported by a number relevant policies which seek to:

- Policy 1 - Provide for the development, operation, maintenance and upgrading of new and existing RSI...
- Policy 4 - Recognise that RSI important to the West Coast's wellbeing needs to be protected from the reverse sensitivity effects arising from incompatible new subdivision, use and development, and the adverse effects of other activities, which would compromise the effective operation, maintenance, upgrading, or development of the infrastructure.
- Policy 5 - When considering any adverse environmental effects of RSI that cannot be avoided, remedied or mitigated, other than effects on indigenous biological diversity, decision-makers must have regard to any offsets and compensation proposed which benefit the natural environment or the community affected.

- Policy 8 - Land use and infrastructure should be integrated to avoid as much as practicably possible the constraints through the lack of supporting infrastructure; unsustainable demands being placed on infrastructure to meet new growth; and significant adverse effects on existing land uses.

Chapter 8 – Land and Water

- Objective 1 - The life-supporting capacity of freshwater is maintained or improved.
- Objective 2 - Provide for a range of land and water uses to enable the economic, social and cultural wellbeing of West Coast communities while maintaining or improving water quality and aquatic ecosystems.
- Objective 3 - Determine allocation of water within environmental controls.
- Objective 4 - Identify and protect the significant values of wetlands and outstanding freshwater bodies.
- Objective 5 - Achieve the integrated management of water and the subdivision, use and development of land within catchments, recognising the interconnections between land, fresh water, and coastal water, including by managing adverse effects of land and water use on coastal water quality.

The policies seek to:

- Policy 1 - Adverse effects on fresh and coastal water quality and aquatic ecosystems arising from:
 - Subdivision, use or development of land;
 - Discharges of contaminants to water and to land in circumstances which may result in contaminants entering water;
 - Water use and take; and
 - Activities in, or on, water including damming and diversion, will be avoided, remedied or mitigated, to ensure that water quality and aquatic ecosystems are maintained or improved.
- Policy 2 - To give effect to Objective 2 of Chapter 3, the adverse effects of subdivision, use and development on Poutini Ngāi Tahu cultural values will be avoided, remedied or mitigated taking into account the following matters:
 - A preference by Poutini Ngāi Tahu for discharges to land over water where practicable;
 - The value of riparian margin vegetation for water quality and aquatic ecosystems; and
 - Effects on the sustainability of mahinga kai, and protection of taonga areas.
- Policy 3 - To give effect to Objective 2 of Chapter 3, manage land and water use in a way that avoids significant adverse effects (other than those arising from the development, operation, maintenance, or upgrading of RSI and local roads) and avoids, remedies or mitigates other adverse water quality effects on sites that are significant to Poutini Ngāi Tahu, including the following:
 - Estuaries, hāpua lagoons, and other coastal wetlands; and

- Shellfish beds and fishing areas.
- Policy 4 - Until priority frameworks for water take and use are developed through the FMU processes and added to a regional plan, consent applications will be processed on a “first-come, first served” basis, and in making decisions, the following matters must be considered:
 - The reasonably foreseeable future requirements for domestic and community water supply needs, stock drinking, and firefighting;
 - The degree of community, regional or national benefit from the take, use, damming or diversion of water;
 - Any adverse environmental effects from the take, use, damming or diversion of water will be avoided, remedied or mitigated including where applicable by applying provisions of the regional plan;
 - Applying rates of take, volume limits and residual flows at the point of take to ensure that there is enough water for the purpose of the take, and to maintain or improve water quality and aquatic ecosystems;
 - The extent to which the proposal maximises the efficient allocation and efficient use of water; and
 - The reasonable needs of other water users.
- Policy 5 - Maintain or improve water quality within freshwater management units.
- Policy 6 - Identify the significant values of wetlands and outstanding freshwater bodies in regional plans and protect those values.
- Policy 7 - Encourage the coordination of urban growth, land use and development including the provision of infrastructure to achieve integrated management of effects on fresh and coastal water.
- Policy 8 - Provide for the social, economic and cultural wellbeing derived from the use and development of land and water resources, while maintaining or improving water quality and aquatic ecosystems.
- Policy 9 - Implement the National Policy Statement for Freshwater Management including the National Objectives Framework.

Comments:

Having resilient regionally significant infrastructure is important for the region and the application site, which currently operates as a landfill, assists in providing for the social and economic wellbeing of the West Coast.

The proposed change to condition 11 cannot be contrary to the objectives and policies within the regional policy statement. The rewording of condition 11 is only to enable the exercising of any separate discharge consent granted by the WCRC. Any subsequent discharge proposal would need to mitigate any potential adverse effects through the treatment and dilution of the discharged water, along with potentially a monitoring programme and ensure it is consistent with the objectives and policies of the regional policy statement.

10.3 Objectives and Policies of the Regional Land and Water Plan

3 - Natural and Human Use Values

- Objective 3.2.1 - To provide for the sustainable use and development of land and water resources.
- Objective 3.2.2 - To protect water bodies from inappropriate use and development by maintaining and where appropriate enhancing their natural and amenity values including natural character and the life supporting capacity of aquatic ecosystems.
- Policy 3.3.1 In the management of any activity involving water to give priority to avoiding, in preference to remedying or mitigating:
 - Adverse effects on:
 - The habitats of threatened species identified in Schedule 7A;
 - Water supply values identified in Schedule 7B;
 - Spiritual and cultural values and uses of significance to Poutini Ngāi Tahu identified in Schedule 7C;
 - The significant natural character of wetlands, and lakes and rivers and their margins;
 - Outstanding natural features and landscapes;
 - Significant indigenous vegetation and significant habitat of indigenous fauna assessed in accordance with Policy 9.2 of the West Coast Regional Policy Statement;
 - Existing public access to and along lakes and rivers;
 - Significant historic heritage;
 - Adverse effects which cause or exacerbate flooding, erosion, land instability, sedimentation or property damage;
 - Adverse effects on existing lawful uses including regionally significant infrastructure.
- Policy 3.3.7 - In the management of any activity involving water, to avoid, remedy, or mitigate adverse effects on:
 - Water quality;
 - Amenity values;
 - Indigenous biological diversity;
 - Intrinsic values of ecosystems;
 - The natural character of wetlands, and lakes and rivers and their margins, not described in 3.3.1(1)(d); and
 - Historic heritage not described in 3.3.1(1)(h).
- Policy 3.3.8 - To recognise Poutini Ngāi Tahu's interests by promoting opportunities for their involvement in resource consent processing.

10 – Groundwater

Objective 10.2.1 - To sustain existing uses of the West Coast's groundwater, by protecting water quantity and quality and avoiding depleting surface water flows.

14 - Solid Contaminants

- Objective 14.2 - To ensure that the adverse effects from the discharge of solid contaminants into or onto land, on water and soil quality, social, cultural and amenity values, and human health are avoided, remedied or mitigated.
- Policy 14.3 - To ensure that solid waste disposal facilities are sited, designed, constructed and managed to avoid, remedy, or mitigate any adverse effects on the environment

Comments:

It is recognised that groundwater is an important resource to many West Coast communities, where it serves a number of recognised uses, including domestic and public water supply, stock drinking water, irrigation and industrial uses. This water is largely accessed from shallow aquifers. High rainfall on the West Coast assists recharge of these aquifers. There is often a hydrological connection between surface water and groundwater. Furthermore, the effects of inappropriate land, water use and development on groundwater quantity and quality are often long term, and in some cases may be permanent.

The proposed change to condition 11 does not, in and of itself, enable the discharge of contaminants to groundwater or surface water outside of the application site. The only means by which such a discharge would be authorised is as a result of obtaining a separate discharge permit from the WCRC. That discharge consent will be assessed to determine whether it is contrary to the objectives and policies within Chapter 14. The rewording of condition 11 only enables the exercising of any separate discharge consent granted by the WCRC. Such a discharge proposal would need to demonstrate the mitigation of any potential adverse effects through the treatment and dilution of the discharged water, along with potentially a monitoring programme.

10.4 Summary

It is considered that the proposed discharge is appropriate in terms of the objectives and policies of the RPS and RLWRP.

11.0 Part 2 Matters

Section 5 of Part 2 identifies the purpose of the RMA as being the sustainable management of natural and physical resources. This means managing the use, development and protection of natural and physical resources in a way that enables people and communities to provide for their social, cultural and economic well-being and health and safety while sustaining those resources for future generations, protecting the life supporting capacity of ecosystems, and avoiding, remedying or mitigating adverse effects on the environment.

Section 6 of the Act sets out a number of matters of national importance including (but not limited to) the protection of outstanding natural features and landscapes and historic heritage from inappropriate subdivision, use and development.

Section 7 identifies a number of “other matters” to be given particular regard by Council and includes (but is not limited to) Kaitiakitanga, the efficient use of natural and physical resources, the maintenance and enhancement of amenity values, and maintenance and enhancement of the quality of the environment.

Section 8 requires Council to take into account the principles of the Treaty of Waitangi.

Overall, as the proposal will have no adverse effects, and accords with the relevant RLWP objectives and policies, it is considered that the proposal will not offend against the general resource management principles set out in Part 2 of the Act.

12.0 Other Matters (Section 104(1)(C))

12.1 Record of Title Interests

The Record of Title for the site are subject to a number of interests (refer Appendix 1). None of these are anticipated to affect the resource consent application as discussed in Table 1 below:

Table 1: Record of Title interests

Interest	Comment
Land Covenant in Covenant Instrument 12630203.5	Relates to a no objection and support of activities and development on the application site.
12630203.3 Consent Notice pursuant to Section 221 Resource Management Act 1991	Relates to the following: • Site being used for either farming and landfill activities and not residential development. • Prior to the construction of any building, a minimum storage of 20,000l of water for fire-fighting purposes is required. • At the time of constructing any building development, a stormwater disposal system needs to be designed and consented. • Prior to the construction of a residential unit a sewage disposal system has to be designed and constructed. • At the time of subdivision, the site is not serviced by way of electricity or telecommunications.
12630203.2 Consent Notice pursuant to Section 221 Resource Management Act 1991	This relates to the NESCS on the application site. The NESCS is administered by the district council and is not applicable to this application.

12.2 Non-Statutory Documents

12.2.1 Paetae Kotahitanga ki Te Tai Poutini Partnership Protocol

This agreement is for a partnership between Council and iwi, however, as it informs the way in which Council make resource consent decisions, we have had regard to this. With regard to consent processing, the partnership document notes that the practice of granting retrospective consents for unlawful activities or breaches of consent conditions is not consistent with a Treaty partnership approach to resource management, as the ability of Poutini Ngāi Tahu to influence the

activity is greatly diminished, and undesirable consent holder/applicant behaviour is rewarded. In this case, Taylorville Resource Park has been operating for several years and is subject to existing regional and district consents. We are not aware of any previous objection by iwi to these applications or approvals.

The Partnership also states that Council will support the development of iwi management plans. These will inform the development of Council policies, planning frameworks and resource consent decisions. In this participation agreement the parties agree that acting in accordance with iwi management plans is a primary means by which a Treaty partnership approach to resource management can be achieved.

12.2.2 Iwi Management Plans

In addition to the Partnership Protocol, the RMA requires that Council take into account any relevant planning document recognised by an iwi authority and lodged with the council. There are two iwi management plans relevant to this application site, Te Rūnanga o Makaawhio Pounamu Management Plan and Ngāti Waewae Pounamu Resource Management Plan. These are considered below:

These iwi management plans address how Te Runanga o Ngāi Tahu can best look after pounamu allowing for on-going use and ensuring its sustainability for the future. This application relates to an existing Taylorville Resource Park and the iwi management plans are of limited specific relevance to the proposal. The iwi management plans require the use of accidental discovery protocol which will be adopted for the application site. Therefore, the application is considered to be consistent with the iwi management plans.

12.3 District Plans

12.3.1 Grey District Plan

Under the provisions of the Grey District Plan (GDP) the application site is located within the Rural Environmental Area. The rural environments of the Grey District contain extensive resources, including indigenous forest, exotic forest, farmland, minerals, rivers, lakes, buildings and infrastructure. They are all used to a greater or lesser extent to provide social, economic and cultural wellbeing of the community.

The proposed change to Condition 11 will have no impact on the provisions of the GDP.

12.3.2 Proposed Te Tai o Poutini Plan

The Proposed Te Tai o Poutini Plan (PTTPP) is the combined District Plan for the Buller, Grey and Westland District Councils. It will replace the current individual district plans. The PTTPP sets out the objectives, policies, rules and methods to manage land use activities and subdivision across the districts. The hearing on the PTTPP commenced in October 2023 and it is envisaged hearings will be held through to November 2024.

The application site is zoned 'General Rural' within the PTTPP, which recognises that rural land is an important resource as it underpins the social and economic well-being of the West Coast/Te Tai o Poutini. Furthermore, the rural area is a dynamic environment, influenced by changing farming practice and by a wide range of productive activities.

Under the PTTPP, the application site is not located within the following areas:

- Site of significance to Maori;
- Aotea Management Area;
- Contain any notable trees, Historic Heritage Items and Areas or Archaeological Areas; or

Furthermore, the application site is not subject to any hazard or risk overlays or any natural environment overlays.

The site is located within the 'Pounamu Management Area', which are meant to be given priority as areas of protection and 'Poutini Ngāi Tahu'² whānui access, including through the use of local planning instruments.

The proposed change to Condition 11 will have no impact on the provisions of the PTTPP.

13.0 Conclusion

The proposal involves an application for resource consent under s127 to change condition 11 of RC-2021-0097.

Based on the above report it is considered that:

- Public notification is not required as there are no adverse effects in relation to groundwater quality and quantity, surface water quality and mana whenua values as a result of the proposed change. There are, however, positive effects in terms of enabling consents that may be granted by WCRC.
- Limited notification is not required as there will be no adverse effects on any persons from the proposed change;
- The proposed change has no effect on the relevant RLWP objectives and policies; and
- The proposal is considered to be consistent with Part 2 of the Act.

It is therefore concluded that the proposal satisfies all matters the consent authority is required to assess, and that it can be granted on a non-notified basis.

² Means the members of the two Ngāi Tahu hapū from the West Coast/Tai o Poutini - Ngāti Waewae and Ngāti Mahaki.

Appendix 1

Record of Title



Urban & Environmental



RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD
Search Copy



R.W. Muir
Registrar-General
of Land

Identifier **1097679**
Land Registration District **Westland**
Date Issued 25 January 2023

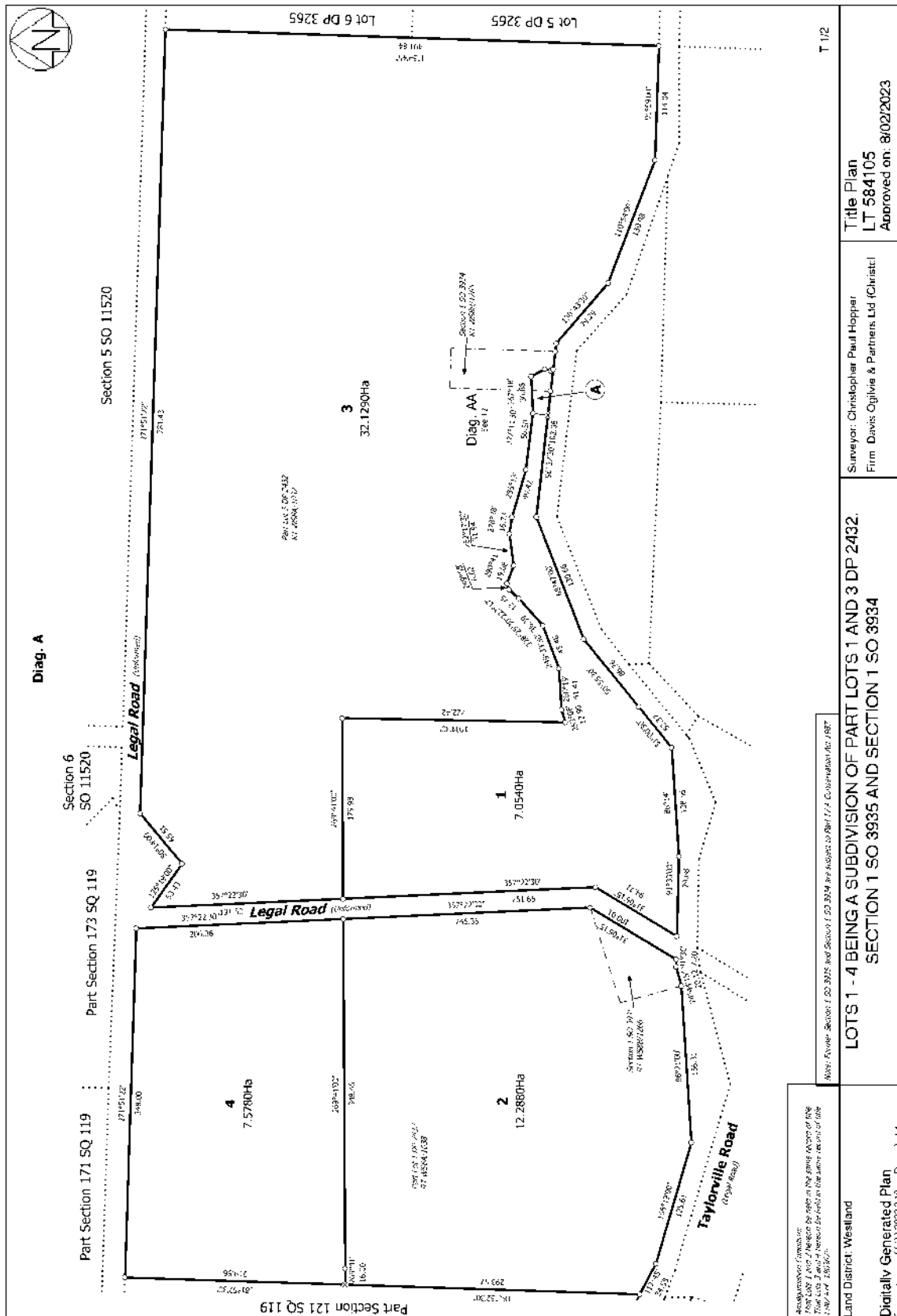
Prior References

WS8A/1037 WS8A/1038 WS8B/1265
WS8B/1266

Estate Fee Simple
Area 19.3420 hectares more or less
Legal Description Lot 1-2 Deposited Plan 584105
Registered Owners
Taylorville Resource Park Limited

Interests

Subject to Section 8 Coal Mines Amendment Act 1950 (affects part Lot 1 DP 584105 formerly Lot 3 DP 2432)
Subject to Section 8 Atomic Energy Act 1945 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934 and part Lot 2 DP 584105 formerly Section 1 SO 3935)
Subject to Section 3 Geothermal Energy Act 1953 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934 and part Lot 2 DP 584105 formerly Section 1 SO 3935)
Subject to Section 3 Petroleum Act 1937 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934 and part Lot 2 DP 584105 formerly Section 1 SO 3935)
Subject to Section 6 Mining Act 1971 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934 and part Lot 2 DP 584105 formerly Section 1 SO 3935)
Subject to Section 8 Mining Act 1971 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934)
Subject to Section 5 Coal Mines Act 1979 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934 and part Lot 2 DP 584105 formerly Section 1 SO 3935)
Subject to Section 261 Coal Mines Act 1979 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934 and part Lot 2 DP 584105 formerly Section 1 SO 3935)
Subject to Part IV A Conservation Act 1987 (affects part Lot 1 DP 584105 formerly Section 1 SO 3934 and part Lot 2 DP 584105 formerly Section 1 SO 3935)
Subject to Section 241(2) Resource Management Act 1991 (affects DP 584105)
12630203.2 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 25.1.2023 at 8:27 am
12630203.3 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 25.1.2023 at 8:27 am
Subject to a right of way over part Lot 1 DP 584105 marked A on DP 584105 created by Easement Instrument 12630203.4 - 25.1.2023 at 8:27 am
The easements created by Easement Instrument 12630203.4 are subject to Section 243 (a) Resource Management Act 1991
Land Covenant in Covenant Instrument 12630203.5 - 25.1.2023 at 8:27 am



Appendix 2

RC-2021-0097-V3



Urban & Environmental

RC-2021-0097-V3 Consent Conditions

- (1) The deposition/discharge shall be carried out in general accordance with the details contained in the consent application and the applications to change or cancel consent conditions received 23 March 2022, and 4 July 2022 and 29 September 2022 submitted to the Consent Authority, except where inconsistent with these conditions.
- (2) The Consent Holder shall supply any agent or contractor working under this consent with a copy of the consent.
- (3) Any person working under this consent shall have a copy of the consent conditions on site and present it to an officer of the Consent Authority upon request.
- (4) Any refuelling, lubrication or mechanical repairs shall be undertaken in such a manner so as to ensure that no spillages of hazardous substances onto the land surface or into water occur. If a fuel spillage in excess of 20 litres occurs, the Consent Holder shall inform the Consent Authority immediately.
- (5) The Consent Holder shall only deposit fill material initially in the area outlined in red and labelled Dump Cells Stage 1,2,3 on the attached aerial photograph labelled Annexure 1 "RC-2021-0097 Application Area" or asbestos and coal tar or coal pitch only in the areas labelled Existing Lined ACM Cell and New Application Area Lined ACM Cell on the attached aerial photograph titled RC-2021-0097 Annexure 3. Variation September 2022. Should an "Expansion of Fill Area Report" be supplied to and approved by the Consent Authority then filling may occur within the wider area outlined in maroon on the attached aerial photograph.
- (6) The "Expansion of Fill Area Report" required by Condition 5 shall contain the following as a minimum:-
 - The location, size and approximate development time for any new cells to accept fill material;
 - The base material present and the porosity of that material;
 - How the leachate system will be extended into the new areas;
 - Type and location of monitoring and sediment control for the new areas to be developed.
- (7) The Consent Holder shall:
 - Ensure all works are undertaken in such a manner so as to minimise soil erosion and to avoid slope instability;
 - Ensure the works do not cause or exacerbate flooding of another person's property, erosion, land instability, sedimentation or property damage;
 - Ensure that surface water is diverted around the fill site, as far as practicable.
- (8) In addition to Condition 7, the Consent Holder shall install an appropriate sediment pond in the approximate location and constructed in the manner detailed in the attached annexure titled "Infrastructure Consultants Water Management Structure July 2021".
- (9) Only demolition waste (including clean fill) and whole or shredded tyres, but not including the disposal of asbestos or other hazardous materials may be disposed of in the location

identified in Annexure 1. Asbestos and other hazardous materials approved by the Consent Authority can only be disposed of in the dedicated, lined cells identified in Annexure 3.

(10) The volume of deposited demolition waste shall not exceed a maximum volume of 30,000m³ per calendar year.

(11) The Consent Holder shall ensure that there is no contamination of groundwater or surface water outside of the site (Secs 1-3 5-6 Pt Secs 4 & 8 SO 11520 Sec 1 SO 3935 Sec 1 SO 3934 Lots 1 3 DP 2432 Lots 1-5 DP 3265) as a result of the exercise of this consent.

(12) Notwithstanding Condition 11 the Consent Holder shall install and maintain a groundwater monitoring bore in the approximate location identified in the annexure title "Infrastructure Consultants Water Management Structure July 2021" and attached to this consent. The Consent Holder shall monitor that groundwater bore annually for the following parameters:

- Groundwater level
- pH
- Turbidity
- Conductivity
- BOD
- Nitrate Nitrogen
- Ammoniacal Nitrogen
- Chloride
- Manganese
- Zinc (total)
- Iron
- Chromium IV (total)
- Copper (total)
- Lead (total)
- Arsenic (total)
- Aluminium (total)
- Cadmium (total)
- Mercury (total)
- Benzo(A)pyrene

(13) The Consent Holder shall conduct annual surface water monitoring at the locations identified on the annexure titled "Sewell Peak Farm Sampling Areas June 2021 – For Infrastructure Consultants" and attached to these consents. The Consent Holder shall monitor for the following parameters:

- pH
- Conductivity

- Turbidity
- Dissolved oxygen
- BOD
- Nitrate Nitrogen
- Ammoniacal Nitrogen
- Chloride
- Dissolved reactive phosphorus
- Zinc
- Chromium
- Arsenic
- Lead
- Aluminium
- Manganese

(14) Macroinvertebrate monitoring shall be undertaken at the request of the Consent Authority.

(15) When material is received for deposition onsite:

- The volume of all material shall be recorded before deposition;
- For each load, delivery documentation shall include confirmation that the material is consistent with what is consented;
- The delivery documentation shall clearly identify:
 - The contractor delivering the material;
 - The physical address of the original source of the material;
 - That the material is not contaminated.

(16) The Consent Holder shall undertake an inspection of the site and the material which has been deposited at least once every 30 days or before any deposited material is covered, whichever is the lesser. Confirmation that the material deposited is consistent with what is consented is to be documented for each inspection undertaken.

(17) Should the inspection undertaken in accordance with Condition 16 indicate materials deposited on site are not consistent with what is consented, these should be removed from the site immediately and deposited at an appropriate facility that is authorised to receive such material and the actions recorded.

(18) All documentation and information recorded regarding consented materials delivered to the consent holder's site, and regarding site inspections, is to be retained by the Consent Holder and provided in an electronic format to the Consent Authority on request.

(19) The management on site shall include:

- The site shall be surrounded by fencing and lockable gates to prevent, as far as practicable, the unauthorised deposition of material;

- All entrances to the site shall be securely locked when the site is not supervised unless monitored in a way that can identify responsibility for any deposition/discharge that is contrary to these consent conditions.
- Notwithstanding Condition 19 b) all entrances to the site shall be securely locked at the completion of each day's deposition/discharge activities.

(20) The Consent Holder shall compile and supply the Consent Authority with an annual monitoring report at intervals no greater than 12 months. As a minimum the report shall include the following information:

- A summary of all monitoring results obtained in accordance with the conditions of these consents supported by analysis and discussion by a suitably qualified person;
- The effectiveness of any treatment method in meeting the compliance limits of the consents;
- The environmental implications of any significant trends in monitoring data gathered with respect to the consented activities;
- Any incidences or problems experienced with achieving consent compliance;
- The summary of any complaints received and any mitigation measures that were adopted;
- Any maintenance works needed, proposed or that have been undertaken to ensure compliance with consent conditions;
- (g) Any modifications to more effectively control the quality of the discharge; and
- (h) Adverse effects from the discharge and the steps taken or proposed to be taken to correct or mitigate these effects.

(21) At the completion of filling activities the fill material shall be compacted, covered with a suitable growing medium and grassed, as soon as practicable.

(22) Pursuant to Section 128 of the Resource Management Act 1991, the Consent Authority may review the conditions of this consent by serving notice within a one month period of each anniversary of the date of commencement of the consent for any of the following purposes:

- To deal with any adverse effect on the environment which may arise from the exercise of this consent and which it is appropriate to deal with at a later stage.
- To require the Consent Holder to adopt the best practicable option to remove or reduce any adverse effect on the environment.



388 Main South Rd, Paroa
P.O. Box 66, Greymouth 7840
The West Coast, New Zealand
Telephone (03) 768 0466
Toll free 0508 800 118
Email info@wcrc.govt.nz
www.wcrc.govt.nz

19 December 2024

Taylorville Resource Park Ltd
c/o Barker & Associates
KerstinG@barker.co.nz

Enquiries to: Michael Durand

Dear Ms Ghisel

RC-2024-0122 and RC-2021-0097-V10 – DISCHARGES OF CONTAMINANTS AT TAYLORVILLE RESOURCE PARK

Further information request under section 92(1) of the Resource Management Act 1991

Thank you for your application to discharge collected leachate and stormwater to land (RC-2024-0122) from the Taylorville Resource Park Ltd landfill and the application (RC2021.0097-V10) to change consent condition 11 of consent RC2021.0097 to authorise the discharges applied in application RC2024.0122. Also thank you for the response provided on s92(1) request related to application RC2024.0122 in a letter from Engeo addressed to Bruce Tinnelly of TRP dated 1 November 2024 and the accompanying AEE dated 19 October 2024.

We have engaged Carl Steffens of PDP to review AEE provided. Please see attached the review provided by PDP. As a result of these assessments further information is requested under section 92(1) of the RMA as listed below.

This information is requested so that WCRC can complete its assessment of the environmental effects of the proposed discharge and to determine notification or non-notification of the application. The additional information requested below will also enable us to assess potential adverse effects on the Grey District Council's water supply and potential ecological effects on surface water.

Information requested

1. Hydraulic conductivity estimates from onsite testing (pump testing and/or slug testing). If slug testing is used, then please provide testing data from at least 3 bore locations on the upper terrace surface.
2. Updated mounding and contaminant modelling simulations using the hydraulic conductivity estimates derived from the requested testing. Based on the testing results, please take into account that the results from testing (particularly slug testing) may provide local values for hydraulic conductivity but not necessarily be representative of the average hydraulic conductivity over the area of the landfill. Therefore, please provide multiple modelling simulations informed by the testing results using a realistic range of potential hydraulic conductivity values for the strata beneath the upper terrace surface (i.e. a sensitivity assessment based on varying the hydraulic conductivity that is informed by the testing results).
3. Updated contaminant modelling simulations using input parameters more consistent with high parameter concentrations that have been measured in leachate and wastewater.

4. An ecological survey of the surface water features and aquatic habitat surrounding the site, including Noname Creek, the drain along Taylorville Road, including that part of the drain that begins at spring seep TCD1 and the streams on the southern side of Taylorville Road (excluding the Grey River) and an impact assessment on surface water quality and ecological values resulting from the proposed discharge.
5. A water quality comparison between water samples collected from the GDC water supply, the Grey River, groundwater upgradient of the landfill north of Taylorville Road and surface water samples collected at TRD2 and TRD4. The samples should include analysis for anions and cations and nitrogen species, in addition to other parameters sampled to date by TRPL. The purpose of the sampling is to inform whether the GDC water supply source is dominantly Grey River water and that there is minimal input to the supply bores from upgradient groundwater and surface drainage.
6. Yield versus drawdown data from the GDC supply bores to confirm the gravel deposits immediately adjacent to the Grey River are of high permeability with a high hydraulic connection to the Grey River.
7. XRD sample analysis from the Kaiata mudstone underlying the landfill to confirm clay mineralogy in the mudstone and confirm ENGEO comments that swelling within any fractures that may be present in the mudstone will block the transmission of groundwater via a fracture network.

Next steps

The steps set out in section 92A(1) apply to this request. TRPL must take one of the options in section 92(1) by 3 February 2025, which is 15 working days from the date of this request.

Decisions under sections 95A and 95B of the RMA are postponed until receipt of this information, unless section 95C applies.

If you have any queries regarding this matter, please contact Michael Durand on 021 035 2593 or e-mail on michael@planzconsultants.co.nz.

Yours faithfully,



Michael Durand
Consultant Planning Officer
West Coast Regional Council



memorandum



TO	Michael Durand	FROM	Carl Steffens
	Planz Consultants	DATE	18 December 2024
RE	Technical Review – TRPL short-term consent application to discharge contaminants to ground.		

Pattle Delamore Partners Limited (PDP) has been engaged by West Coast Regional Council (WCRC) to provide a technical review of a resource consent application by Taylorville Resource Park Limited. The application has been prepared by Barker and Associates Limited (B&A) with technical assessment provided by ENGEO Limited (ENGEO). The application seeks a temporary discharge (for up to six months) from the existing onsite retention pond to land via a soakage area. The maximum daily discharge is up to 800 m³, which represents a continuous discharge of approximately 9.3 L/s). A change to condition 11 of existing resource consent RC-2021-0097-03 is also sought to allow for potential contamination of groundwater or surface water outside of the site.

PDP has recently prepared a report which commented on the potential impacts of TRPL landfill on the nearby Grey District Council (GDC) water supply intake (supply to Greymouth). That report is titled Impacts of Taylorville Resource Park Limited Landfill on Grey District Council Coal Creek Water Supply Intake and is dated 11 October 2024. Based on limited available information, the report concluded that the risk of contamination to the water supply was likely to be low. However, the report also highlighted that there are considerable uncertainties regarding the risk posed by leachate migration and given the proximity of the GDC supply to the landfill, a very high level of assessment should be provided by the consent holder. To date, that information has not been provided.

While there is still considerable additional information required to assess the ongoing effects of the landfill on the environment, we note that an ENGEO memorandum dated 6 November 2024 reports that TRPL has recently installed eight additional monitoring bores (MB13-MB19s/d). ENGEO note that they have updated their groundwater flow contours based on groundwater elevation measurements in all existing and new bores at the site. They report that this updated information shows that groundwater flow is to the west-southwest and their memo presents a preliminary figure showing the updated contours that have been constructed by ENGEO. This is useful additional information, however we have not been able to review the data used to construct the contours and we also consider the presence of groundwater seeps along the Taylorville Road cutting indicate there is also a southerly component to groundwater flow that is not evident from the ENGEO contours. It is possible there could be groundwater divides at the site and more complex groundwater flow than indicated by the ENGEO contours.

Further to the existing risks to the environment (and human health based on the presence of the landfill in proximity to the water supply), the current proposal represents an additional discharge at the site that was not considered during the drafting of the previous October 2024 PDP report.

The ENGEO technical assessment relating to the current proposal is provided in their report titled Preliminary Hydrogeological Assessment – 287 Taylorville Road, Coal Creek, Greymouth, dated 19

September 2024 and which is appended to the main Planning report prepared by B&A. We understand that water from the retention pond will be piped to a proposed soakage area which will be located approximately 150 m east from the retention pond. ENGEO has carried out modelling to simulate the migration of contaminants in groundwater following the discharge. It is assumed that the discharge will occur to an approximately 10 m x 10 m soakage area constructed to a depth of at least 2 m below ground level (bgl).

ENGEO has presented the results of groundwater quality sampling in Appendix 5 of their report. This information has been collected at and in the vicinity of the site from January 2023 to present. The water quality monitoring includes samples collected at the following locations:

- ✧ Samples of Leachate or wastewater from landfill Cells A, B and C, sediment/settlement/retention ponds and sumps. These sample names include Leachate (Cell A), Leachate (Cell B/C), Sediment Pond, SWSDP, Settlement Stage 2, DC/C3 and Deep Sump.
- ✧ Upgradient groundwater spring/seep locations with sample names SPA, SPC and SPE.
- ✧ Downgradient spring/seep locations with sample names TCD1/Discharge, SP1, SP2 and SP3.
- ✧ Upgradient bore locations with sample names MB1, MB2s MB2d and MB3.
- ✧ Downgradient bore locations with sample names MB4s, MB4d, MB5 and TSB1.
- ✧ Upgradient drain locations with sample names TRD3 and TRD4.
- ✧ Downgradient drain locations with sample names SPF Pit/TRD1, TRD2 and TRD5
- ✧ Samples from Noname Creek to the west of the site on the opposite side of the road from the western site perimeter drain with sample names SPF US, SPF MS, SPF DS.

Based on our review of the water quality data we note leachate is being generated at the site and concentrations of many contaminants in leachate and wastewater are significantly elevated. We note that concentrations of dissolved manganese, arsenic and chromium have been recorded in leachate or wastewater well above the Water Services (Drinking Water Standards for New Zealand) Regulations 2022 (DWSNZ), human health based Maximum Acceptable Value (MAV) concentrations. Arsenic has been recorded at nearly 100 x the MAV concentration in one leachate sample. In addition, there are a significant number of leachate or wastewater samples where parameters exceed or significantly exceed the relevant Taumata Arowai Aesthetic Values for Drinking Water Notice 2022 (AVDWN) Guideline Value (GV) concentrations and/or Australia and New Zealand Guidelines for Fresh and Marine Water Quality 2018 (ANZG) Default Guideline Values (DGV) for ecological toxicants.

Samples to determine the impacts of the landfill on groundwater quality are very limited. We note that upgradient bore MB2d is drilled into mudstone and has significantly different water quality results than the other three upgradient bores. This indicates that the source rock may be impacting on the water quality results. As a result, downgradient bore MB4d (also drilled into mudstone) may not be a good bore for assessing the effects on groundwater migrating from the landfill through the more permeable overlying gravel strata (although much higher sulphate concentrations have been recorded in MB4d compared to MB2d which could be caused by leachate). Of the remaining three downgradient bores (MB4s, MB5 and TSB1), only TSB1 has intercepted groundwater and therefore this may be the only representative downgradient bore. As a result, there is significant uncertainty whether the potential effects on groundwater are well constrained. We note TSB1 has recorded dissolved aluminium at up to 19 times the concentrations recorded in the upgradient groundwater bores, however most other relevant parameters are not significantly different between the upgradient and downgradient gravel bores.

Of further significance to water quality we note the following:

- ✧ Samples collected from seeps SP1, SP2 and SP3 (below the landfill in the Taylorville Road cutting) typically show higher parameter concentrations than those measured from upgradient springs SPA, SPC and SPE. In particular, total hardness, electrical conductivity, dissolved calcium and magnesium, sulphate and Chemical Oxygen Demand are many times higher in the downgradient seep locations.
- ✧ Samples from downgradient seep TCD1/Discharge (the seep feeding the western perimeter drain) typically show poorer water quality than the Taylorville Road downgradient seeps, however it should be noted that there are only two individual samples that have been collected from the Taylorville Road seeps compared to nine samples from TCD1/Discharge.
- ✧ Dissolved manganese and dissolved arsenic have been measured at concentrations in TCD1/Discharge exceeding DWSNZ MAV concentrations, while dissolved arsenic, chromium, copper, zinc and manganese, in addition to electrical conductivity, total ammoniacal nitrogen and nitrate have been measured above or well above ecological DGV concentrations in this bore.
- ✧ Concentrations of dissolved aluminium and nitrate have been measured above ecological criteria in the upgradient springs, however significantly higher concentrations for these two parameters have been recorded in either TCD1/Discharge or the downgradient Taylorville Road Springs.
- ✧ Downgradient drain samples SPF Pit/TRD1, TRD2 and TRD5 have recorded higher concentrations for most parameters compared to samples collected from upgradient drains TRD3 and TRD4. All samples (upgradient and downgradient) have been collected from the roadside drain along Taylorville Road. We note dissolved arsenic in SPF Pit/TRD1 has been recorded on one occasion exceeding the DWSNZ MAV, while a significant number of ecological DGV exceedances have occurred for all three downstream drain locations.

Based on the above information, the landfill is generating leachate and it appears that this has impacted on the water quality in downgradient groundwater, springs/seeps and drains. We note that some sample locations have only a very limited number of samples.

Mounding Assessment

The infiltration basin will create a raised mounding of the underlying water table. Based on the proposed discharge of up to 800 m³/day, ENGEO has estimated the potential mounding at the water table. We note the calculations are based on an assumed horizontal hydraulic conductivity (K) of 84 m/d, which is assumed based on text book values for various strata descriptions. We consider the adopted value may not sufficiently take into account the potential for fine grained silt and clay in the matrix and note that the mounding model will potentially predict much higher levels of mounding if K is actually significantly lower. We consider onsite testing would be required to confirm the hydraulic conductivity and typically this would involve pumping testing or slug testing. Infiltration testing would also be advisable to confirm the infiltration capacity of the soils. At present we consider the mounding assessment is highly uncertain. Significant mounding has the potential to impact on the flow direction of contaminants contained in the discharge.

Effects on Groundwater Quality

The level of impacts to groundwater quality onsite are currently not well constrained as there are only limited downgradient sampling results and, as noted above, potentially only one bore within the site with relevant data. Groundwater underlying the site likely discharges into surrounding springs and drains and there may not be hydraulic connection with groundwater on surrounding properties, although that would ultimately need to be confirmed by offsite drilling and monitoring. To date no offsite drilling or monitoring has been carried out.

Our concerns regarding the actual hydraulic conductivity of the strata underlying the site (mentioned above in our comment on the groundwater mounding assessment) apply equally to the RISC5 contaminant transport modelling carried out by ENGEO. We consider that lower values of hydraulic conductivity may result in higher predicted contaminant concentrations due to less dilution and dispersion in the aquifer and consider that to more comprehensively assess the potential for contaminant migration further simulations using lower values of hydraulic conductivity should be carried out.

We also note that the model source concentrations are stated to be the highest concentrations detected in samples collected from locations in the water treatment system in July 2024. However, we note much higher concentrations have been recorded in the past than the input concentrations that have been used. While the most recent sample results may potentially be relevant for an initial discharge, if discharges are still occurring for up to 6 months, these later discharges could contain much greater concentrations than those modelled, as the impacts of rainfall dilution may be less than the current situation.

Based on the above comments, we consider additional mounding and model simulations would be required, by undertaking a sensitivity analysis of the model input parameters, to adequately address the potential effects on groundwater quality and the resulting impacts on the natural surface water discharge areas. We consider the risk to offsite groundwater (from direct groundwater flow) is likely low due to an expected lack of hydraulic connection, however the level of information provided to date to confirm that is currently low.

We also consider that while there are a significant number of samples that have been collected at the site to date, some sample locations do not have a lot of data. In addition, VOC and SVOCs are not included in the parameters that are sampled and therefore we can't be sure that all potential contaminants are sufficiently characterised.

Effects on Groundwater Quantity

ENGEO has assessed the effects on groundwater quantity based on the results of their mounding assessment. As described above, we consider the mounding assessment is highly uncertain and recommend that further simulations based on lower hydraulic conductivity values should be carried out. Ideally those simulations should be based on testing data from the site to constrain the hydraulic conductivity.

Effects on Surface Water Quality

Effects on surface water quality have been assessed by ENGEO in Noname Creek and the Grey River. The potential lack of connection between groundwater at the site and surface water in Noname Creek is noted by ENGEO and we consider this is likely relevant (although if mounding from the discharge is very high there could be potential for discharge to Noname Creek). In addition, dilution in the Grey River will be very large with minimal impacts. However, ENGEO has not assessed the potential effects in the drain that begins at TCD1, the extension of that drain along Taylorville Road and the surface water bodies on the alluvial gravels on the south side of Taylorville Road that receive flow inputs from the roadside drain.

Discharges from the landfill have impacted on these drains in the past and we consider the proposed discharge will likely result in further exceedances (possibly by significant amounts) of ecological limits in the drains which have not been considered. Further ecological information has been requested in the past, relevant to a previous application by TRPL, but has not been provided. As a result, we are unsure of the ecological status of the roadside drain or the surface water bodies on the southern side of the road. Therefore, based on the information provided, we can't confirm that the effects on surface water quality or ecology within these surface water bodies will be less than minor.

Effects on GDC Water Supply

As per our October 2024 report, we expect the risk to the GDC water supply from the operation of the TRPL landfill is likely low. However, we also note the supply services around 10,000 people and a landfill operation would typically not be appropriate within such close proximity to a public water supply. The proposed discharge to ground results in an additional risk to the GDC supply compared to that considered by PDP previously, as the applicant now seeks to discharge a large quantity of contaminated water directly to ground over a short time period. In addition, the proposed discharge area will be closer to an upgradient location, relative to the water supply, than most of the landfill cells and treatment system.

We consider the risk to the water supply from direct groundwater flow is still likely low, as there is unlikely to be a connection between the gravels underlying the landfill and those south of Taylorville Road (where the GDC bores are located). However, that is based solely on an assumed conceptual understanding of the groundwater and surface water system on the southern side of Taylorville Road. It would be best to confirm that is the case via a drilling and monitoring programme which has not been carried out to date. In addition, this assumes there is no potential for fracture flow in the mudstone that underlies the gravels at the site. ENGEO has previously indicated that clay minerals within the mudstone will swell and seal any fractures that may be present, however they have not provided any information to confirm the clay content within the mudstone underlying the site. This information could be provided via X-Ray Diffraction (XRD) analysis.

While the risk from direct groundwater flow is likely low between the upper and lower terrace, there is the potential for transport of contaminants from the site to the southern terrace via the roadside drain on Taylorville Road and the culverts that transport the water under the road.

We expect any water that makes its way under the road at the location of TRD5 is unlikely to impact on the water supply as it will be further separated from the water supply bores by other surface water features on the lower terrace.

The main risk is likely from flow under the road via the culvert at TRD2. Figure 1 of the March 2024 EHS Support report shows that the drain at TRD2 could receive seepage and flow from the drain impacted by leachate. There is a potential transport mechanism via the associated stream on the southern side of Taylorville Road where losses of flow to the underlying gravels could allow contaminants to reach the strata from which the GDC supply bores abstract water. In reality we expect that the GDC bores will derive most of their water from the Grey River and the extent of input from the gravels on the landfill side of the aquifer will be very limited. This would likely significantly dilute any contaminants that may reach the southern side of Taylorville Road. However, we also note we have not been provided with any information to confirm the performance of the GDC bores (yield versus drawdown in individual supply bores and drawdown interference effects induced in other supply bores) to confirm that is the case. In addition, water quality sampling comparing the GDC supply bore water, Grey River water, groundwater and drain water would provide useful information to determine the potential for upgradient groundwater to reach the GDC supply bores.

Furthermore, it can't be ruled out that the concentrations of impacted water that reach the roadside drain as a result of the proposed discharge won't be higher than those that have reached the drain in the past, due to the discharge of a significantly increased mass of contaminants to ground over a short time period. We recommend further modelling simulations should be carried out to address this uncertainty. Even after that, detailed monitoring of the effects from any discharge is likely to be required.

Conclusion

Based on our review of the ENGEO assessments, we consider their assessments could potentially underestimate the effects of the proposed discharge. We consider the hydraulic conductivity used in their

modelling could be too high and lower values of hydraulic conductivity would result in more mounding and may also result in higher contaminant concentrations in groundwater and surface water. In addition, we consider the input contaminant concentrations in their RISC5 model may be too low which will also result in lower output concentrations. As a result, further modelling could be provided.

We also consider that ENGEO should provide further information to confirm the potential surface water quality effects on the perimeter drains on the western boundary and along Taylorville Road and the potential ecological impacts on the drains surrounding the site and the downstream surface water features on the southern side of Taylorville Road.

Additional information should also be provided to confirm the potential for contamination of the GDC water supply via surface water impacted from the landfill which may cross Taylorville Road via the culvert at TRD2.

It is important to note that irrespective of the results of any further modelling, the assessment will still be highly theoretical and subject to uncertainty. The most certain way to assess the potential for impacts on the GDC water supply are via a detailed drilling and monitoring programme on the southern side of Taylorville Road. We have recommended such monitoring on a number of occasions but to date nothing has been carried out.

Without a site-specific monitoring programme on the GDC land and if WCRC decide to grant the consent application, it will be important that a robust monitoring programme is incorporated into consent conditions. We note the proposed monitoring programme set out in Section 7 of the ENGEO report recommends sampling from a number of groundwater monitoring bores downgradient of the discharge. We consider further bores should be added directly south of MB13 in case groundwater mounding is significant and affects groundwater flow direction. In addition, MB17 should also be monitored along with spring seeps and drain sample locations along Taylorville Road. It would be good for PDP to review any consent conditions prior to granting of a consent.

Limitations

This memorandum has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by West Coast Regional Council and others (not directly contracted by PDP for the work), including Planz, Engeo and Barkers and Associates. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the memorandum. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This memorandum has been prepared by PDP on the specific instructions of West Coast Regional Council for the limited purposes described in the memorandum. PDP accepts no liability if the memorandum is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

© 2024 Pattle Delamore Partners Limited

Prepared by



Carl Steffens

Technical Director - Water Resources

Site Memorandum

Project Name	Taylorville Resource Park		
Memo Topic	RC-2024-0122 and RC-2021-0097-V10 - RFI Response		
Memo Date	30 January 2025	Date of Site Visit	N/A
ENGEO Memo No.	08	ENGEO Project No.	26200.000.001
To	Taylorville Resource Park Limited	Copy	Barker and Associates
Author	Lyn Nugent	Reviewer	Dave Robotham

ENGEO has reviewed the further information request relating to Taylorville Resource Park Limited's (TRPL) application to discharge collected leachate and stormwater to land (RC-2024-0012) and the application (RC2021.0097-V10) to change consent condition 11 of consent RC2021.0097. The further information request was issued by the West Coast Regional Council (WCRC, dated 19-Dec-24) under section 92(1) of the Resource Management Act 1991.

WCRC's questions (in grey) and ENGEO responses (in blue) are provided below.

1. Hydraulic conductivity estimates from onsite testing (pump testing and/or slug testing). If slug testing is used, then please provide testing data from at least 3 bore locations on the upper terrace surface

To assess for the hydraulic conductivity in the Pleistocene gravels, aquifer testing was undertaken at three on-site groundwater monitoring bores (MB13, MB14, and MB19d). Based on an assessment of the slug testing data using the method for unconfined aquifers (Bouwer & Rice, 1976) (refer Appendix 1), the hydraulic conductivity of the Pleistocene gravels ranges from 1×10^{-6} m/s to 1×10^{-5} m/s.

2. Updated mounding and contaminant modelling simulations using the hydraulic conductivity estimates derived from the requested testing. Based on the testing results, please take into account that the results from testing (particularly slug testing) may provide local values for hydraulic conductivity but not necessarily be representative of the average hydraulic conductivity over the area of the landfill. Therefore, please provide multiple modelling simulations informed by the testing results using a realistic range of potential hydraulic conductivity values for the strata beneath the upper terrace surface (i.e. a sensitivity assessment based on varying the hydraulic conductivity that is informed by the testing results).

Updated mounding using the Hantush method (Hantush, 1967) is provided in Appendix 2. As stated in our memo dated 12 November 2024, the actual discharge volumes will depend on the infiltration capacity in the soakage area, rainfall and evaporation rates. Using the Green-Ampt equation and based on the proposed location and aerial extent of the soakage area, the anticipated infiltration capacity of the soakage is on the order of 200 m³/d – 300 m³/d. This generally corresponds to the maximum potential mounding beneath the soakage area (i.e., the mound height that will intersect with the base of the soakage area). To be conservative, the RISC5 model was updated to include a source area with a height of 8 m (assuming seasonal groundwater fluctuations and mounding to the base of the soakage area). Additionally, the RISC5 model was re-run using the maximum (1.0×10^{-5} m/s) and minimum (1.2×10^{-6} m/s) values for hydraulic conductivity. As shown in Appendix 3, concentrations at the boundary are highest in the maximum conductivity scenario; however, even under this scenario, the maximum modelled concentrations at the boundary are either not detectable or orders of magnitude below the human or ecological health-based criteria (0.0069 mg/L, nitrate-N; 0.0027 mg/L total aluminium).

3. Updated contaminant modelling simulations using input parameters more consistent with high parameter concentrations that have been measured in leachate and wastewater.

Whilst we think that it is highly unlikely that blended concentrations of leachate (in the soakage area) will contain concentrations equivalent to the highest parameter concentrations ENGEO detected at the site, the RISC5 model was re-run using the maximum concentrations detected in the water treatment system locations since sampling began. As shown in Appendix 3, the maximum modelled concentrations at the boundary are either not detectable or orders of magnitude below the human or ecological health-based criteria.

4. An ecological survey of the surface water features and aquatic habitat surrounding the site, including Noname Creek, the drain along Taylorville Road, including that part of the drain that begins at spring seep TCD1 and the streams on the southern side of Taylorville Road (excluding the Grey River) and an impact assessment on surface water quality and ecological values resulting from the proposed discharge.

The ecological survey will be provided as a separate memo (Appendix 4)

5. A water quality comparison between water samples collected from the GDC water supply, the Grey River, groundwater upgradient of the landfill north of Taylorville Road and surface water samples collected at TRD2 and TRD4. The samples should include analysis for anions and cations and nitrogen species, in addition to other parameters sampled to date by TRPL. The purpose of the sampling is to inform whether the GDC water supply source is dominantly Grey River water and that there is minimal input to the supply bores from upgradient groundwater and surface drainage.

Water quality samples were collected from the raw (untreated) water at GRE001 (PWT01) and the Grey River approximately 300 – 400 m upstream of GRE001 (GR-01; Figure A5.1). On the day of our sampling visit, all three active bores (Bore 1–Bore 3) were operating. The samples were submitted for laboratory analysis for dissolved metals and ions in solution (Table 5.1). These results were converted to milliequivalents and compared to the most recent (October 24) results for samples collected from monitoring wells along the southern side boundary adjacent to the current operations (MB4d, MB14, MB18; Figure A5.2) and the full boundary extent, including upgradient / cross-gradient of the operations (MB2s/d, MB3, MB4d, MB14, MB18; Figure A5.3).

As shown in Figure A5.2, the ion profile of PWT01 very closely matches that of GR-01, indicating that there is minimal input from waters downgradient of the site operations. When the samples collected from upgradient / cross-gradient wells are included (Figure A5.3) there is a greater distribution of profiles, with more similarity in anions between the upgradient / cross-gradient wells and PWT01. However, the ion profile of PWT-1 is still most closely matched to that of GR-01 and broad similarity is expected, as all samples were collected from the same catchment.

We do note that the profile of MB2d was anomalous relative to the other samples. Water quality results from deep upgradient wells (MB2d and MB19d) are noticeably different from other locations at the site—including shallow wells MB2s and MB19s (Table 5.1)—potentially due to inputs from the underlying Kaiata Mudstone formation. The remaining cross-gradients wells cluster tightly, indicating general homogeneity in the waters above the mudstone contact. As such, MB2d was not considered further in this assessment.

The concentrations of ions in solution indicates that water quality at PWT01 is dominantly influenced by the Grey River, with no demonstrable input from the site. We do note the concentrations of dissolved metals (copper, lead, nickel, zinc) in PWT01 differed significantly from GR-01 and samples collected along the southern site boundary. The cause of this has not been assessed but may be naturally occurring (e.g., concentrations in the Holocene gravels) or may indicate the influence of waters originating at another (offsite) source area.

6. Yield versus drawdown data from the GDC supply bores to confirm the gravel deposits immediately adjacent to the Grey River are of high permeability with a high hydraulic connection to the Grey River.

Based on aquifer testing information provided by GDC (Appendix 6), the hydraulic conductivity in the Holocene river gravels at BH02 (abstraction well for public supply GRE001) is between 3.42×10^{-2} m/s (Boulton method) and 1.58×10^{-2} m/s (Neuman method). Pumping test analysis reports are provided in Appendix 6.

7. XRD sample analysis from the Kaiata mudstone underlying the landfill to confirm clay mineralogy in the mudstone and confirm ENGEO comments that swelling within any fractures that may be present in the mudstone will block the transmission of groundwater via a fracture network.

XRD analysis of two mudstone outcrops (Leaver, 1999) show that it is comprised of a mixture of kaolinite, illite, and vermiculite (Appendix 6). As the minerology of the Kaiata Mudstone comprises a mixture of swelling and non-swelling clay minerals, it is inferred that there is negligible flow through defects (e.g., microfractures) due to clay swelling. There is potential for preferential pathways through interbedded layers of non-clay materials (e.g., silts, sands). Groundwater that intersects with these layers will most likely be transported west-southwest, along the dip of the mudstone bedding planes and away from GRE001.

Based on our assessment works to date and in conjunction with the proposed conditions of consent, it is deemed *highly unlikely* that the proposed discharges will have a deleterious effect on human or ecological health.

This memorandum has been prepared for the use of our client, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this memo. No liability is accepted for the use of any part of the report for any other purposes or by any other person or entity. This Limitation should be read in conjunction with the Engineering NZ / ACENZ Standard Terms of Engagement.

References

- Bouwer, H., & Rice, R. (1976). A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells. *Water Resources Research*, V12:3, 423-428.
- Hantush, M. (1967). Growth and Decay of Groundwater Mounds in Response to Uniform Percolation. *Water Resources Journal* (3), 227-234.
- Leaver, H. (1999). *Paleogeography, sedimentology and basin development of the Eocene Rapahoe Group in the Punakaiki-Westport area*. Christchurch: University of Canterbury.

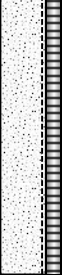


APPENDIX 1

Slug Testing Reports

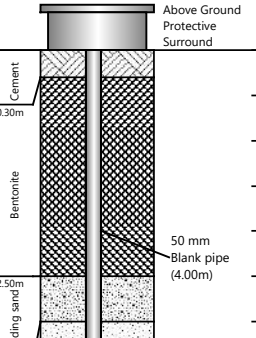
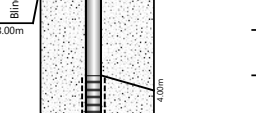
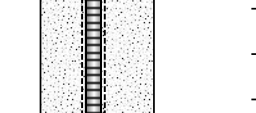
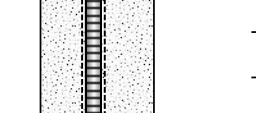
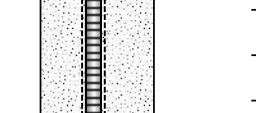
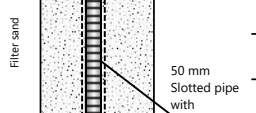
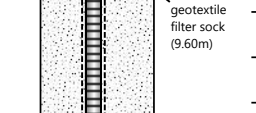
Generated by GEROC Core-GS

McMILLAN Drilling		Client: ENGEO				Bore No.: BH013			
		Project: 287 Taylorville Road, Coal Creek				Job No.: 22638			
Site Location: 287 Taylorville Road, Coal Creek						Date: 3/10/2024 - 3/10/2024			
Grid Reference: 1457182.23m E, 5299473.42m N (NZTM) - Handheld GPS						Rig Operator: E. Diaz Farias			
Elevation: 0.00m		Datum: Ground		Equipment: Geoprobe 8140LC - track					
Description	Graphic Log	Depth	Method	Runs and recovery	Water at hole depth	SPT (NZS 4402) N-value Uncorrected	In-Situ Tests	Samples - Permeability tests	Installation & Resources
Sandy fine to coarse GRAVEL with minor cobbles; light brown. Well graded.		0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0	114mm OD Sonic core drilling	25 50 75		0 10 20 30 40 50 60			Above Ground Protective Surround 50 mm Blank pipe (5.00m) 50 mm Slotted pipe with geotextile filter sock (13.24m)
				100% 100% 100% 100% 100% 100% 100% 100% 100% 92% 39% 78% 78%					
				6.20m bgl					
Remarks									Additional Resources: Core boxes: 7 Water added: 2000 liters Concrete: 3 bags Bentonite: 2 bags Blinding sand: 0.25 bag Filter sand: 6 bags
120 High Street, Southbridge 7602, Canterbury, New Zealand ph: (03) 324 2571 fax: (03) 324 2431 web: www.drilling.co.nz									Hole Depth: 18.24m Page 1 of 2

	Client: ENGEO		Bore No.: BH013						
	Project: 287 Taylorville Road, Coal Creek		Job No.: 22638						
Site Location: 287 Taylorville Road, Coal Creek									
Date: 3/10/2024 - 3/10/2024									
Grid Reference: 1457182.23m E, 5299473.42m N (NZTM) - Handheld GPS									
Rig Operator: E. Diaz Farias									
Elevation: 0.00m									
Datum: Ground									
Equipment: Geoprobe 8140LC - track									
Description	Graphic Log	Depth	Method	Runs and recovery	Water at hole depth	SPT (NZS 4402) N-value Uncorrected	In-Situ Tests	Samples - Permeability tests	Installation & Resources
Sandy fine to coarse GRAVEL with minor cobbles; light brown. Well graded.		15.5	114mm OD Sonic core drilling	25		0			
		16.0		50		10			
		16.5		75		20			
		17.0				30			
Grey MUDSTONE.		17.5				40			
		18.0				50			
						60			
EOH: 18.24m									
Remarks									
Additional Resources: Core boxes: 7 Water added: 2000 liters Concrete: 3 bags Bentonite: 2 bags Blinding sand: 0.25 bag Filter sand: 6 bags									
Hole Depth: 18.24m									
Page 2 of 2									

Client:	ENGEO	Bore No.:	BH014
Project:	287 Taylorville Road, Coal Creek	Job No.:	22638

Site Location: 287 Taylorville Road, Coal Creek	Date: 23/9/2024 - 25/9/2024
Grid Reference: 1456883.14m E, 5299346.95m N (NZTM) - Handheld GPS	Rig Operator: E. Diaz Farias
Elevation: 0.00m	Equipment: Geoprobe 8140LC - track
Datum: Ground	

Description	Graphic Log	Depth	Method	Runs and recovery	Water at hole depth	SPT (NZS 4402) N-value Uncorrected	In-Situ Tests	Samples - Permeability tests	Installation & Resources
Sandy fine to coarse GRAVEL; light brown. Well graded.		0.5	114mm OD Sonic core drilling 6" overdrilling 4 1/2" DT	25 50 75 65%					 Above Ground Protective Surround Cement 0.30m Bentonite 50 mm Blank pipe (4.00m)
WOOD with some rubbish.		1.0		59%					
Sandy fine to coarse GRAVEL with minor cobbles; light brown. Well graded.		2.5		59%					
		3.0	114mm OD Sonic core drilling 6" overdrilling 4 1/2" DT	59%					 Blinding sand 2.50m 3.00m
		4.0		59%					
		5.0		100%					
		6.0	114mm OD Sonic core drilling 6" overdrilling 4 1/2" DT	32%					 4.00m
		7.0		32%					
		8.0		36%					
		9.0	114mm OD Sonic core drilling 6" overdrilling 4 1/2" DT	32%					 5.00m
		10.0		32%					
		11.0		100%					
Silty fine to coarse GRAVEL; reddish brown. Well graded.		10.3	114mm OD Sonic core drilling 6" overdrilling 4 1/2" DT	100%					 6.00m
		11.0		100%					
		11.4		100%					
Grey MUDSTONE.		11.4	114mm OD Sonic core drilling 6" overdrilling 4 1/2" DT	100%					 7.00m
		12.0		100%					
		13.0		100%					
		13.5	114mm OD Sonic core drilling 6" overdrilling 4 1/2" DT	100%					 8.00m
		13.5		100%					
		13.5		100%					

EOH: 13.68m

5.70m bgl

Remarks

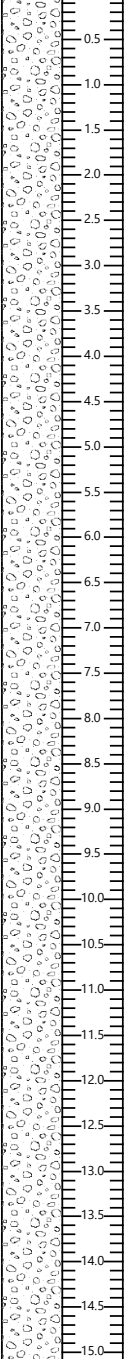
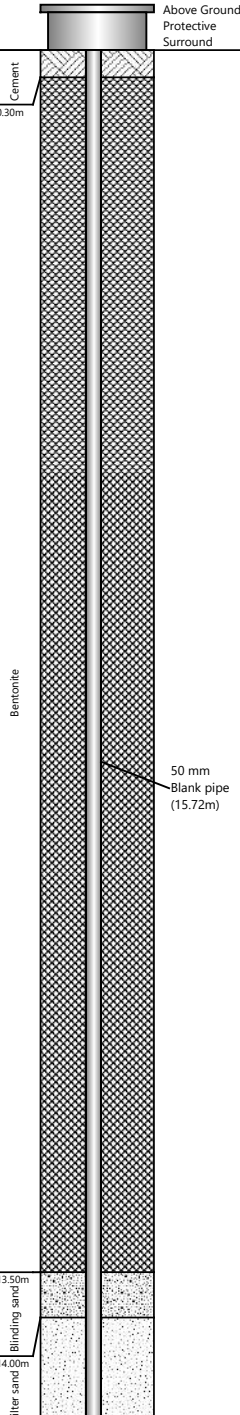
Hammer energy ratio 84.3%

Additional Resources:

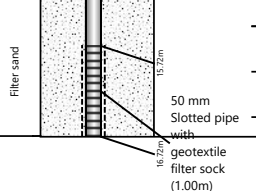
Core boxes: 5
Water added: 6000 liters
Concrete: 3 bags
Bentonite: 1.5 bags
Blinding sand: 0.25 bag
Filter sand: 5 bags

Client:	ENGEO	Bore No.:	BH019
Project:	287 Taylorville Road, Coal Creek	Job No.:	22638

Site Location: 287 Taylorville Road, Coal Creek	Date: 1/10/2024 - 2/10/2024
Grid Reference: 1457351.03m E, 5299489.22m N (NZTM) - Handheld GPS	Rig Operator: E. Diaz Farias
Elevation: 0.00m	Equipment: Geoprobe 8140LC - track
Datum: Ground	

Description	Graphic Log	Depth	Method	Runs and recovery	Water at hole depth	SPT (NZS 4402) N-value Uncorrected	In-Situ Tests	Samples - Permeability tests	Installation & Resources
Sandy fine to coarse GRAVEL with minor cobbles; light brown. Well graded.		0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0	114mm OD Sonic core drilling	25 50 75 100% 100% 72% 100% 65% 59% 39% 72% 59% 65%		0 10 20 30 40 50 60			

Remarks	Additional Resources: Core boxes: 6 Water added: 1500 liters Concrete: 3 bags Bentonite: 1.5 bags Blinding sand: 0.25 bag Filter sand: 6 bags
----------------	--

	Client: ENGEO		Bore No.: BH019						
	Project: 287 Taylorville Road, Coal Creek		Job No.: 22638						
Site Location: 287 Taylorville Road, Coal Creek									
Date: 1/10/2024 - 2/10/2024									
Grid Reference: 1457351.03m E, 5299489.22m N (NZTM) - Handheld GPS									
Rig Operator: E. Diaz Farias									
Elevation: 0.00m									
Datum: Ground									
Equipment: Geoprobe 8140LC - track									
Description	Graphic Log	Depth	Method	Runs and recovery	Water at hole depth	SPT (NZS 4402) N-value Uncorrected	In-Situ Tests	Samples - Permeability tests	Installation & Resources
Sandy fine to coarse GRAVEL with minor cobbles; light brown. Well graded.		15.5	114mm OD Sonic core drilling	25 50 75 78%		0 10 20 30 40 50 60			
Grey MUDSTONE.		16.00m							
EOH: 16.72m									
Remarks									
Additional Resources: Core boxes: 6 Water added: 1500 liters Concrete: 3 bags Bentonite: 1.5 bags Blinding sand: 0.25 bag Filter sand: 6 bags									
Hole Depth: 16.72m									
Page 2 of 2									

				Slug Test - Water Level Data		Page 1 of 8	
				Project: TRP			
				Number: 26200.000.001			
				Client: TRPL			
Location: Taylorville, Coal Creek			Slug Test: MB19d in			Test Well: MB19d	
Test Conducted by: J. Green / M. Knopick Test Date: 16/10/2024							
Water level at t=0 [m]: 4.23			Static Water Level [m]: 4.91			Water level change at t=0 [m]: -0.68	
	Time [s]	Water Level [m]	WL Change [m]				
1	1	4.2273	-0.6827				
2	2	4.2985	-0.6115				
3	3	4.3191	-0.5909				
4	4	4.329	-0.581				
5	5	4.3895	-0.5205				
6	6	4.403	-0.507				
7	7	4.4656	-0.4444				
8	8	4.5254	-0.3846				
9	9	4.5403	-0.3697				
10	10	4.5503	-0.3597				
11	11	4.5695	-0.3405				
12	12	4.5951	-0.3149				
13	13	4.6093	-0.3007				
14	14	4.5958	-0.3142				
15	15	4.6022	-0.3078				
16	16	4.6178	-0.2922				
17	17	4.6306	-0.2794				
18	18	4.6242	-0.2858				
19	19	4.583	-0.327				
20	20	4.6257	-0.2843				
21	21	4.6392	-0.2708				
22	22	4.6555	-0.2545				
23	23	4.6655	-0.2445				
24	24	4.6726	-0.2374				
25	25	4.6783	-0.2317				
26	26	4.6833	-0.2267				
27	27	4.6882	-0.2218				
28	28	4.6918	-0.2182				
29	29	4.6961	-0.2139				
30	30	4.6939	-0.2161				
31	31	4.6761	-0.2339				
32	32	4.6889	-0.2211				
33	33	4.7025	-0.2075				
34	34	4.7032	-0.2068				
35	35	4.6897	-0.2203				
36	36	4.664	-0.246				
37	37	4.7032	-0.2068				
38	38	4.7188	-0.1912				
39	39	4.7295	-0.1805				
40	40	4.7366	-0.1734				
41	41	4.7423	-0.1677				
42	42	4.7458	-0.1642				
43	43	4.7494	-0.1606				
44	44	4.7522	-0.1578				
45	45	4.7551	-0.1549				
46	46	4.7579	-0.1521				
47	47	4.7608	-0.1492				
48	48	4.7629	-0.1471				
49	49	4.7658	-0.1442				
50	50	4.7679	-0.1421				
51	51	4.77	-0.14				
52	52	4.7722	-0.1378				

				Slug Test - Water Level Data	Page 2 of 8
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
53	53	4.7743	-0.1357		
54	54	4.7764	-0.1336		
55	55	4.7786	-0.1314		
56	56	4.7807	-0.1293		
57	57	4.7828	-0.1272		
58	58	4.7842	-0.1258		
59	59	4.7864	-0.1236		
60	60	4.7885	-0.1215		
61	61	4.7899	-0.1201		
62	62	4.7921	-0.1179		
63	63	4.7935	-0.1165		
64	64	4.7956	-0.1144		
65	65	4.797	-0.113		
66	66	4.7992	-0.1108		
67	67	4.8013	-0.1087		
68	68	4.8027	-0.1073		
69	69	4.8041	-0.1059		
70	70	4.8056	-0.1044		
71	71	4.807	-0.103		
72	72	4.8091	-0.1009		
73	73	4.8105	-0.0995		
74	74	4.812	-0.098		
75	75	4.8134	-0.0966		
76	76	4.8148	-0.0952		
77	77	4.8162	-0.0938		
78	78	4.8177	-0.0923		
79	79	4.8191	-0.0909		
80	80	4.8205	-0.0895		
81	81	4.8219	-0.0881		
82	82	4.8205	-0.0895		
83	83	4.8226	-0.0874		
84	84	4.8248	-0.0852		
85	85	4.8262	-0.0838		
86	86	4.8276	-0.0824		
87	87	4.829	-0.081		
88	88	4.8297	-0.0803		
89	89	4.8312	-0.0788		
90	90	4.8319	-0.0781		
91	91	4.8333	-0.0767		
92	92	4.834	-0.076		
93	93	4.8354	-0.0746		
94	94	4.8368	-0.0732		
95	95	4.8376	-0.0724		
96	96	4.839	-0.071		
97	97	4.8397	-0.0703		
98	98	4.8404	-0.0696		
99	99	4.8411	-0.0689		
100	100	4.8418	-0.0682		
101	101	4.8432	-0.0668		
102	102	4.844	-0.066		
103	103	4.8454	-0.0646		
104	104	4.8461	-0.0639		
105	105	4.8468	-0.0632		
106	106	4.8475	-0.0625		
107	107	4.8482	-0.0618		
108	108	4.8489	-0.0611		
109	109	4.8496	-0.0604		

				Slug Test - Water Level Data	Page 3 of 8
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
110	110	4.8511	-0.0589		
111	111	4.8518	-0.0582		
112	112	4.8525	-0.0575		
113	113	4.8532	-0.0568		
114	114	4.8539	-0.0561		
115	115	4.8546	-0.0554		
116	116	4.8553	-0.0547		
117	117	4.856	-0.054		
118	118	4.8568	-0.0532		
119	119	4.8575	-0.0525		
120	120	4.8582	-0.0518		
121	121	4.8589	-0.0511		
122	122	4.8589	-0.0511		
123	123	4.8596	-0.0504		
124	124	4.8603	-0.0497		
125	125	4.861	-0.049		
126	126	4.8617	-0.0483		
127	127	4.8624	-0.0476		
128	128	4.8631	-0.0469		
129	129	4.8639	-0.0461		
130	130	4.8639	-0.0461		
131	131	4.8646	-0.0454		
132	132	4.8653	-0.0447		
133	133	4.866	-0.044		
134	134	4.866	-0.044		
135	135	4.8667	-0.0433		
136	136	4.8674	-0.0426		
137	137	4.8674	-0.0426		
138	138	4.8681	-0.0419		
139	139	4.8688	-0.0412		
140	140	4.8695	-0.0405		
141	141	4.8695	-0.0405		
142	142	4.8703	-0.0397		
143	143	4.871	-0.039		
144	144	4.871	-0.039		
145	145	4.8717	-0.0383		
146	146	4.8695	-0.0405		
147	147	4.871	-0.039		
148	148	4.8717	-0.0383		
149	149	4.8731	-0.0369		
150	150	4.8738	-0.0362		
151	151	4.8738	-0.0362		
152	152	4.8745	-0.0355		
153	153	4.8752	-0.0348		
154	154	4.8752	-0.0348		
155	155	4.8759	-0.0341		
156	156	4.8766	-0.0334		
157	157	4.8766	-0.0334		
158	158	4.8766	-0.0334		
159	159	4.8774	-0.0326		
160	160	4.8781	-0.0319		
161	161	4.8781	-0.0319		
162	162	4.8781	-0.0319		
163	163	4.8788	-0.0312		
164	164	4.8788	-0.0312		
165	165	4.8788	-0.0312		
166	166	4.8795	-0.0305		

				Slug Test - Water Level Data	Page 4 of 8
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
167	167	4.8802	-0.0298		
168	168	4.8802	-0.0298		
169	169	4.8809	-0.0291		
170	170	4.8809	-0.0291		
171	171	4.8809	-0.0291		
172	172	4.8816	-0.0284		
173	173	4.8823	-0.0277		
174	174	4.8823	-0.0277		
175	175	4.8823	-0.0277		
176	176	4.883	-0.027		
177	177	4.883	-0.027		
178	178	4.8838	-0.0262		
179	179	4.8837	-0.0263		
180	180	4.8837	-0.0263		
181	181	4.8845	-0.0255		
182	182	4.8845	-0.0255		
183	183	4.8852	-0.0248		
184	184	4.8852	-0.0248		
185	185	4.8852	-0.0248		
186	186	4.8852	-0.0248		
187	187	4.8859	-0.0241		
188	188	4.8859	-0.0241		
189	189	4.8859	-0.0241		
190	190	4.8866	-0.0234		
191	191	4.8866	-0.0234		
192	192	4.8866	-0.0234		
193	193	4.8866	-0.0234		
194	194	4.8873	-0.0227		
195	195	4.888	-0.022		
196	196	4.888	-0.022		
197	197	4.888	-0.022		
198	198	4.888	-0.022		
199	199	4.8887	-0.0213		
200	200	4.8887	-0.0213		
201	201	4.8887	-0.0213		
202	202	4.8894	-0.0206		
203	203	4.8894	-0.0206		
204	204	4.8894	-0.0206		
205	205	4.8894	-0.0206		
206	206	4.8901	-0.0199		
207	207	4.8901	-0.0199		
208	208	4.8901	-0.0199		
209	209	4.8901	-0.0199		
210	210	4.888	-0.022		
211	211	4.8894	-0.0206		
212	212	4.8894	-0.0206		
213	213	4.8901	-0.0199		
214	214	4.8908	-0.0192		
215	215	4.8908	-0.0192		
216	216	4.8916	-0.0184		
217	217	4.8916	-0.0184		
218	218	4.8916	-0.0184		
219	219	4.8916	-0.0184		
220	220	4.8923	-0.0177		
221	221	4.8923	-0.0177		
222	222	4.8923	-0.0177		
223	223	4.893	-0.017		

				Slug Test - Water Level Data	Page 5 of 8
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
224	224	4.893	-0.017		
225	225	4.893	-0.017		
226	226	4.893	-0.017		
227	227	4.8937	-0.0163		
228	228	4.8937	-0.0163		
229	229	4.8937	-0.0163		
230	230	4.8937	-0.0163		
231	231	4.8937	-0.0163		
232	232	4.8944	-0.0156		
233	233	4.8937	-0.0163		
234	234	4.8944	-0.0156		
235	235	4.8944	-0.0156		
236	236	4.8944	-0.0156		
237	237	4.8951	-0.0149		
238	238	4.8951	-0.0149		
239	239	4.8951	-0.0149		
240	240	4.8951	-0.0149		
241	241	4.8951	-0.0149		
242	242	4.8951	-0.0149		
243	243	4.8958	-0.0142		
244	244	4.8958	-0.0142		
245	245	4.8951	-0.0149		
246	246	4.8958	-0.0142		
247	247	4.8958	-0.0142		
248	248	4.8958	-0.0142		
249	249	4.8965	-0.0135		
250	250	4.8965	-0.0135		
251	251	4.8965	-0.0135		
252	252	4.8965	-0.0135		
253	253	4.8965	-0.0135		
254	254	4.8965	-0.0135		
255	255	4.8965	-0.0135		
256	256	4.8965	-0.0135		
257	257	4.8972	-0.0128		
258	258	4.8972	-0.0128		
259	259	4.8972	-0.0128		
260	260	4.8972	-0.0128		
261	261	4.8972	-0.0128		
262	262	4.8979	-0.0121		
263	263	4.8979	-0.0121		
264	264	4.8972	-0.0128		
265	265	4.8979	-0.0121		
266	266	4.8979	-0.0121		
267	267	4.8979	-0.0121		
268	268	4.8979	-0.0121		
269	269	4.8979	-0.0121		
270	270	4.8987	-0.0113		
271	271	4.8987	-0.0113		
272	272	4.8987	-0.0113		
273	273	4.8987	-0.0113		
274	274	4.8958	-0.0142		
275	275	4.8972	-0.0128		
276	276	4.8979	-0.0121		
277	277	4.8987	-0.0113		
278	278	4.8987	-0.0113		
279	279	4.8987	-0.0113		
280	280	4.8987	-0.0113		

				Slug Test - Water Level Data	Page 6 of 8
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
281	281	4.8987	-0.0113		
282	282	4.8994	-0.0106		
283	283	4.8994	-0.0106		
284	284	4.8994	-0.0106		
285	285	4.8994	-0.0106		
286	286	4.8994	-0.0106		
287	287	4.8994	-0.0106		
288	288	4.8994	-0.0106		
289	289	4.8994	-0.0106		
290	290	4.9001	-0.0099		
291	291	4.9001	-0.0099		
292	292	4.9001	-0.0099		
293	293	4.9001	-0.0099		
294	294	4.9001	-0.0099		
295	295	4.9001	-0.0099		
296	296	4.9008	-0.0092		
297	297	4.9008	-0.0092		
298	298	4.9008	-0.0092		
299	299	4.9008	-0.0092		
300	300	4.9008	-0.0092		
301	301	4.9008	-0.0092		
302	302	4.9008	-0.0092		
303	303	4.9008	-0.0092		
304	304	4.9008	-0.0092		
305	305	4.9008	-0.0092		
306	306	4.9008	-0.0092		
307	307	4.9008	-0.0092		
308	308	4.9008	-0.0092		
309	309	4.9015	-0.0085		
310	310	4.9015	-0.0085		
311	311	4.9015	-0.0085		
312	312	4.9015	-0.0085		
313	313	4.9015	-0.0085		
314	314	4.9015	-0.0085		
315	315	4.9015	-0.0085		
316	316	4.9015	-0.0085		
317	317	4.9015	-0.0085		
318	318	4.9022	-0.0078		
319	319	4.9015	-0.0085		
320	320	4.9022	-0.0078		
321	321	4.9022	-0.0078		
322	322	4.9022	-0.0078		
323	323	4.9022	-0.0078		
324	324	4.9022	-0.0078		
325	325	4.9022	-0.0078		
326	326	4.9022	-0.0078		
327	327	4.9022	-0.0078		
328	328	4.9022	-0.0078		
329	329	4.9022	-0.0078		
330	330	4.9022	-0.0078		
331	331	4.9022	-0.0078		
332	332	4.9022	-0.0078		
333	333	4.9022	-0.0078		
334	334	4.9022	-0.0078		
335	335	4.9022	-0.0078		
336	336	4.9029	-0.0071		
337	337	4.9022	-0.0078		

				Slug Test - Water Level Data	Page 7 of 8
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
338	338	4.9001	-0.0099		
339	339	4.9015	-0.0085		
340	340	4.9022	-0.0078		
341	341	4.9022	-0.0078		
342	342	4.9022	-0.0078		
343	343	4.9029	-0.0071		
344	344	4.9029	-0.0071		
345	345	4.9029	-0.0071		
346	346	4.9029	-0.0071		
347	347	4.9029	-0.0071		
348	348	4.9029	-0.0071		
349	349	4.9029	-0.0071		
350	350	4.9029	-0.0071		
351	351	4.9029	-0.0071		
352	352	4.9029	-0.0071		
353	353	4.9029	-0.0071		
354	354	4.9029	-0.0071		
355	355	4.9029	-0.0071		
356	356	4.9029	-0.0071		
357	357	4.9029	-0.0071		
358	358	4.9029	-0.0071		
359	359	4.9029	-0.0071		
360	360	4.9029	-0.0071		
361	361	4.9029	-0.0071		
362	362	4.9029	-0.0071		
363	363	4.9036	-0.0064		
364	364	4.9029	-0.0071		
365	365	4.9029	-0.0071		
366	366	4.9029	-0.0071		
367	367	4.9036	-0.0064		
368	368	4.9036	-0.0064		
369	369	4.9036	-0.0064		
370	370	4.9036	-0.0064		
371	371	4.9029	-0.0071		
372	372	4.9036	-0.0064		
373	373	4.9036	-0.0064		
374	374	4.9036	-0.0064		
375	375	4.9036	-0.0064		
376	376	4.9036	-0.0064		
377	377	4.9036	-0.0064		
378	378	4.9036	-0.0064		
379	379	4.9036	-0.0064		
380	380	4.9036	-0.0064		
381	381	4.9036	-0.0064		
382	382	4.9036	-0.0064		
383	383	4.9036	-0.0064		
384	384	4.9036	-0.0064		
385	385	4.9036	-0.0064		
386	386	4.9036	-0.0064		
387	387	4.9036	-0.0064		
388	388	4.9036	-0.0064		
389	389	4.9043	-0.0057		
390	390	4.9043	-0.0057		
391	391	4.9036	-0.0064		
392	392	4.9043	-0.0057		
393	393	4.9043	-0.0057		
394	394	4.9036	-0.0064		

				Slug Test - Water Level Data	Page 8 of 8
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
395	395	4.9036	-0.0064		
396	396	4.9036	-0.0064		
397	397	4.9036	-0.0064		
398	398	4.9043	-0.0057		
399	399	4.9043	-0.0057		
400	400	4.9043	-0.0057		
401	401	4.9043	-0.0057		
402	402	4.9015	-0.0085		
403	403	4.9029	-0.0071		
404	404	4.9036	-0.0064		
405	405	4.9036	-0.0064		
406	406	4.9043	-0.0057		
407	407	4.9043	-0.0057		
408	408	4.905	-0.005		
409	409	4.9043	-0.0057		
410	410	4.905	-0.005		

			Slug Test Analysis Report		
			Project: TRP		
			Number: 26200.000.001		
			Client: TRPL		
Location: Taylorville, Coal Creek		Slug Test: MB19d in		Test Well: MB19d	
Test Conducted by: J. Green / M. Knopick				Test Date: 16/10/2024	
Analysis Performed by: L. Nugent		MB19d slug in		Analysis Date: 11/11/2024	
Aquifer Thickness: 11.81 m					
Time [s] 15.790.8166241.1316.2391.4 h/h0 1E01E-11E-21E-3					
Calculation using Bouwer & Rice					
Observation Well		Hydraulic Conductivity			
		[m/s]			
MB19d		9.76 × 10 ⁻⁶			

				Slug Test - Analyses Report				
				Project: TRP				
				Number: 26200.000.001				
				Client: TRPL				
Location: Taylorville, Coal Creek			Slug Test: MB19d in			Test Well: MB19d		
Test Conducted by: J. Green / M. Knopick						Test Date: 16/10/2024		
Aquifer Thickness: 11.81 m								
	Analysis Name	Analysis Performed	Analysis Date	Method name	Well	T [m²/s]	K [m/s]	S
1	MB19d slug in	L. Nugent	11/11/2024	Bouwer & Rice	MB19d		9.76 × 10 ⁻⁶	

				Slug Test - Water Level Data		Page 1 of 7	
				Project: TRP			
				Number: 26200.000.001			
				Client: TRPL			
Location: Taylorville, Coal Creek			Slug Test: MB19d out			Test Well: MB19d	
Test Conducted by: J. Green / M. Knopick Test Date: 16/10/2024							
Water level at t=0 [m]: 5.42			Static Water Level [m]: 4.91			Water level change at t=0 [m]: 0.51	
	Time [s]	Water Level [m]	WL Change [m]				
1	1	5.4165	0.5065				
2	2	5.4122	0.5022				
3	3	5.4058	0.4958				
4	4	5.3952	0.4852				
5	5	5.3852	0.4752				
6	6	5.3731	0.4631				
7	7	5.3631	0.4531				
8	8	5.3511	0.4411				
9	9	5.3418	0.4318				
10	10	5.3304	0.4204				
11	11	5.3197	0.4097				
12	12	5.3084	0.3984				
13	13	5.2991	0.3891				
14	14	5.2906	0.3806				
15	15	5.282	0.372				
16	16	5.2742	0.3642				
17	17	5.2664	0.3564				
18	18	5.2593	0.3493				
19	19	5.2522	0.3422				
20	20	5.2451	0.3351				
21	21	5.2386	0.3286				
22	22	5.2322	0.3222				
23	23	5.2258	0.3158				
24	24	5.2194	0.3094				
25	25	5.2138	0.3038				
26	26	5.2081	0.2981				
27	27	5.2024	0.2924				
28	28	5.1938	0.2838				
29	29	5.1896	0.2796				
30	30	5.1853	0.2753				
31	31	5.1803	0.2703				
32	32	5.1753	0.2653				
33	33	5.1704	0.2604				
34	34	5.1661	0.2561				
35	35	5.1611	0.2511				
36	36	5.1568	0.2468				
37	37	5.1519	0.2419				
38	38	5.1476	0.2376				
39	39	5.1433	0.2333				
40	40	5.1391	0.2291				
41	41	5.1348	0.2248				
42	42	5.1312	0.2212				
43	43	5.127	0.217				
44	44	5.1234	0.2134				
45	45	5.1191	0.2091				
46	46	5.1156	0.2056				
47	47	5.112	0.202				
48	48	5.1085	0.1985				
49	49	5.1049	0.1949				
50	50	5.1013	0.1913				
51	51	5.0985	0.1885				
52	52	5.0949	0.1849				

				Slug Test - Water Level Data	Page 2 of 7
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
53	53	5.0921	0.1821		
54	54	5.0893	0.1793		
55	55	5.0857	0.1757		
56	56	5.0829	0.1729		
57	57	5.08	0.17		
58	58	5.0772	0.1672		
59	59	5.0743	0.1643		
60	60	5.0715	0.1615		
61	61	5.0686	0.1586		
62	62	5.0658	0.1558		
63	63	5.0636	0.1536		
64	64	5.0608	0.1508		
65	65	5.058	0.148		
66	66	5.0558	0.1458		
67	67	5.053	0.143		
68	68	5.0508	0.1408		
69	69	5.0487	0.1387		
70	70	5.0466	0.1366		
71	71	5.0444	0.1344		
72	72	5.0423	0.1323		
73	73	5.0402	0.1302		
74	74	5.038	0.128		
75	75	5.0359	0.1259		
76	76	5.0338	0.1238		
77	77	5.0316	0.1216		
78	78	5.0302	0.1202		
79	79	5.0281	0.1181		
80	80	5.0259	0.1159		
81	81	5.0245	0.1145		
82	82	5.0224	0.1124		
83	83	5.021	0.111		
84	84	5.0188	0.1088		
85	85	5.0174	0.1074		
86	86	5.016	0.106		
87	87	5.0138	0.1038		
88	88	5.0124	0.1024		
89	89	5.011	0.101		
90	90	5.0089	0.0989		
91	91	5.0074	0.0974		
92	92	5.0039	0.0939		
93	93	5.0032	0.0932		
94	94	5.0025	0.0925		
95	95	5.0018	0.0918		
96	96	5.0003	0.0903		
97	97	4.9989	0.0889		
98	98	4.9975	0.0875		
99	99	4.9961	0.0861		
100	100	4.9946	0.0846		
101	101	4.9939	0.0839		
102	102	4.9925	0.0825		
103	103	4.9918	0.0818		
104	104	4.9904	0.0804		
105	105	4.9889	0.0789		
106	106	4.9875	0.0775		
107	107	4.9868	0.0768		
108	108	4.9854	0.0754		
109	109	4.984	0.074		

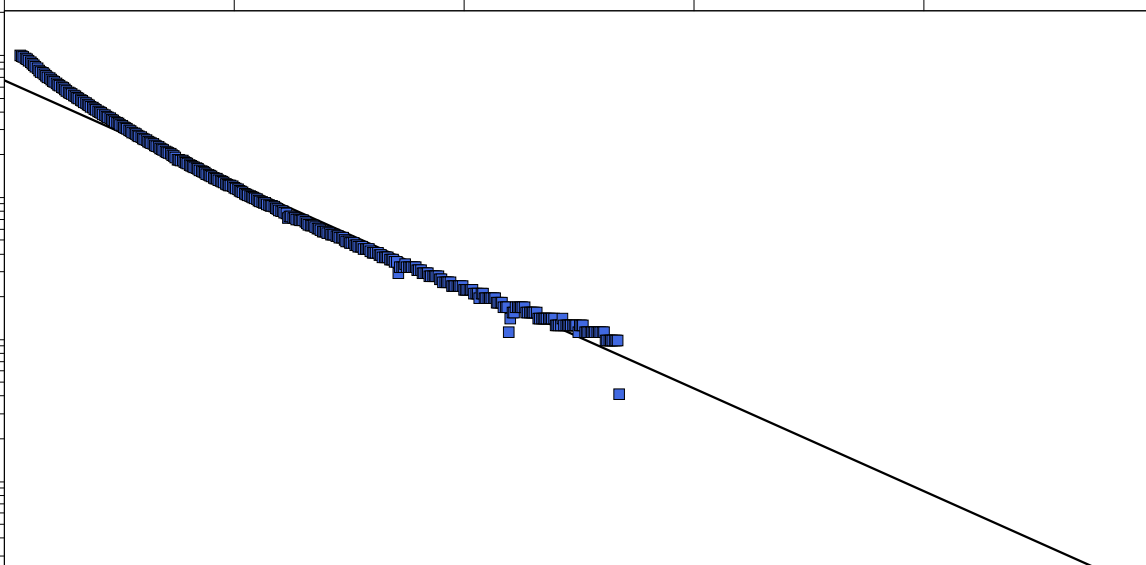
				Slug Test - Water Level Data	Page 3 of 7
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
110	110	4.9833	0.0733		
111	111	4.9818	0.0718		
112	112	4.9811	0.0711		
113	113	4.9797	0.0697		
114	114	4.979	0.069		
115	115	4.9783	0.0683		
116	116	4.9769	0.0669		
117	117	4.9761	0.0661		
118	118	4.9754	0.0654		
119	119	4.9747	0.0647		
120	120	4.9733	0.0633		
121	121	4.9726	0.0626		
122	122	4.9719	0.0619		
123	123	4.9712	0.0612		
124	124	4.9705	0.0605		
125	125	4.969	0.059		
126	126	4.9683	0.0583		
127	127	4.9676	0.0576		
128	128	4.9662	0.0562		
129	129	4.9655	0.0555		
130	130	4.9648	0.0548		
131	131	4.964	0.054		
132	132	4.9633	0.0533		
133	133	4.9626	0.0526		
134	134	4.9619	0.0519		
135	135	4.9612	0.0512		
136	136	4.9605	0.0505		
137	137	4.9598	0.0498		
138	138	4.9591	0.0491		
139	139	4.9584	0.0484		
140	140	4.9576	0.0476		
141	141	4.9569	0.0469		
142	142	4.9562	0.0462		
143	143	4.9562	0.0462		
144	144	4.9555	0.0455		
145	145	4.9548	0.0448		
146	146	4.9541	0.0441		
147	147	4.9541	0.0441		
148	148	4.9534	0.0434		
149	149	4.9527	0.0427		
150	150	4.952	0.042		
151	151	4.9512	0.0412		
152	152	4.9505	0.0405		
153	153	4.9505	0.0405		
154	154	4.9498	0.0398		
155	155	4.9491	0.0391		
156	156	4.9463	0.0363		
157	157	4.947	0.037		
158	158	4.947	0.037		
159	159	4.9463	0.0363		
160	160	4.9463	0.0363		
161	161	4.9456	0.0356		
162	162	4.9456	0.0356		
163	163	4.9448	0.0348		
164	164	4.9448	0.0348		
165	165	4.9448	0.0348		
166	166	4.9441	0.0341		

				Slug Test - Water Level Data	Page 4 of 7
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
167	167	4.9434	0.0334		
168	168	4.9427	0.0327		
169	169	4.942	0.032		
170	170	4.942	0.032		
171	171	4.942	0.032		
172	172	4.9413	0.0313		
173	173	4.9406	0.0306		
174	174	4.9406	0.0306		
175	175	4.9399	0.0299		
176	176	4.9391	0.0291		
177	177	4.9391	0.0291		
178	178	4.9391	0.0291		
179	179	4.9384	0.0284		
180	180	4.9384	0.0284		
181	181	4.9377	0.0277		
182	182	4.9377	0.0277		
183	183	4.9377	0.0277		
184	184	4.937	0.027		
185	185	4.937	0.027		
186	186	4.9363	0.0263		
187	187	4.9363	0.0263		
188	188	4.9363	0.0263		
189	189	4.9356	0.0256		
190	190	4.9349	0.0249		
191	191	4.9349	0.0249		
192	192	4.9342	0.0242		
193	193	4.9342	0.0242		
194	194	4.9342	0.0242		
195	195	4.9335	0.0235		
196	196	4.9335	0.0235		
197	197	4.9327	0.0227		
198	198	4.9327	0.0227		
199	199	4.9327	0.0227		
200	200	4.932	0.022		
201	201	4.932	0.022		
202	202	4.932	0.022		
203	203	4.932	0.022		
204	204	4.9313	0.0213		
205	205	4.9306	0.0206		
206	206	4.9306	0.0206		
207	207	4.9306	0.0206		
208	208	4.9306	0.0206		
209	209	4.9299	0.0199		
210	210	4.9299	0.0199		
211	211	4.9292	0.0192		
212	212	4.9292	0.0192		
213	213	4.9292	0.0192		
214	214	4.9292	0.0192		
215	215	4.9285	0.0185		
216	216	4.9285	0.0185		
217	217	4.9285	0.0185		
218	218	4.9278	0.0178		
219	219	4.9278	0.0178		
220	220	4.9249	0.0149		
221	221	4.9263	0.0163		
222	222	4.9263	0.0163		
223	223	4.9263	0.0163		

				Slug Test - Water Level Data	Page 5 of 7
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
224	224	4.9271	0.0171		
225	225	4.9263	0.0163		
226	226	4.9263	0.0163		
227	227	4.9263	0.0163		
228	228	4.9263	0.0163		
229	229	4.9263	0.0163		
230	230	4.9263	0.0163		
231	231	4.9256	0.0156		
232	232	4.9256	0.0156		
233	233	4.9256	0.0156		
234	234	4.9249	0.0149		
235	235	4.9249	0.0149		
236	236	4.9249	0.0149		
237	237	4.9249	0.0149		
238	238	4.9242	0.0142		
239	239	4.9242	0.0142		
240	240	4.9242	0.0142		
241	241	4.9242	0.0142		
242	242	4.9242	0.0142		
243	243	4.9242	0.0142		
244	244	4.9235	0.0135		
245	245	4.9235	0.0135		
246	246	4.9228	0.0128		
247	247	4.9228	0.0128		
248	248	4.9228	0.0128		
249	249	4.9228	0.0128		
250	250	4.9228	0.0128		
251	251	4.9221	0.0121		
252	252	4.9221	0.0121		
253	253	4.9221	0.0121		
254	254	4.9221	0.0121		
255	255	4.9221	0.0121		
256	256	4.9221	0.0121		
257	257	4.9221	0.0121		
258	258	4.9214	0.0114		
259	259	4.9214	0.0114		
260	260	4.9214	0.0114		
261	261	4.9214	0.0114		
262	262	4.9214	0.0114		
263	263	4.9214	0.0114		
264	264	4.9207	0.0107		
265	265	4.9207	0.0107		
266	266	4.9207	0.0107		
267	267	4.9199	0.0099		
268	268	4.9207	0.0107		
269	269	4.9207	0.0107		
270	270	4.9199	0.0099		
271	271	4.9199	0.0099		
272	272	4.9199	0.0099		
273	273	4.9199	0.0099		
274	274	4.9199	0.0099		
275	275	4.9199	0.0099		
276	276	4.9199	0.0099		
277	277	4.9192	0.0092		
278	278	4.9192	0.0092		
279	279	4.9192	0.0092		
280	280	4.9192	0.0092		

				Slug Test - Water Level Data	Page 6 of 7
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
281	281	4.9185	0.0085		
282	282	4.9185	0.0085		
283	283	4.9185	0.0085		
284	284	4.9157	0.0057		
285	285	4.9171	0.0071		
286	286	4.9178	0.0078		
287	287	4.9178	0.0078		
288	288	4.9185	0.0085		
289	289	4.9185	0.0085		
290	290	4.9185	0.0085		
291	291	4.9185	0.0085		
292	292	4.9185	0.0085		
293	293	4.9185	0.0085		
294	294	4.9178	0.0078		
295	295	4.9178	0.0078		
296	296	4.9178	0.0078		
297	297	4.9178	0.0078		
298	298	4.9178	0.0078		
299	299	4.9178	0.0078		
300	300	4.9178	0.0078		
301	301	4.9171	0.0071		
302	302	4.9171	0.0071		
303	303	4.9171	0.0071		
304	304	4.9171	0.0071		
305	305	4.9171	0.0071		
306	306	4.9171	0.0071		
307	307	4.9171	0.0071		
308	308	4.9171	0.0071		
309	309	4.9171	0.0071		
310	310	4.9171	0.0071		
311	311	4.9164	0.0064		
312	312	4.9164	0.0064		
313	313	4.9164	0.0064		
314	314	4.9164	0.0064		
315	315	4.9171	0.0071		
316	316	4.9164	0.0064		
317	317	4.9164	0.0064		
318	318	4.9164	0.0064		
319	319	4.9164	0.0064		
320	320	4.9164	0.0064		
321	321	4.9164	0.0064		
322	322	4.9164	0.0064		
323	323	4.9164	0.0064		
324	324	4.9157	0.0057		
325	325	4.9164	0.0064		
326	326	4.9164	0.0064		
327	327	4.9164	0.0064		
328	328	4.9157	0.0057		
329	329	4.9157	0.0057		
330	330	4.9157	0.0057		
331	331	4.9157	0.0057		
332	332	4.9157	0.0057		
333	333	4.9157	0.0057		
334	334	4.9157	0.0057		
335	335	4.9157	0.0057		
336	336	4.9157	0.0057		
337	337	4.9157	0.0057		

				Slug Test - Water Level Data		Page 7 of 7
				Project: TRP		
				Number: 26200.000.001		
				Client: TRPL		
	Time [s]	Water Level [m]	WL Change [m]			
338	338	4.9157	0.0057			
339	339	4.9157	0.0057			
340	340	4.915	0.005			
341	341	4.915	0.005			
342	342	4.915	0.005			
343	343	4.915	0.005			
344	344	4.915	0.005			
345	345	4.915	0.005			
346	346	4.915	0.005			
347	347	4.915	0.005			
348	348	4.9121	0.0021			

			Slug Test Analysis Report	
			Project: TRP	
			Number: 26200.000.001	
			Client: TRPL	
Location: Taylorville, Coal Creek		Slug Test: MB19d out		Test Well: MB19d
Test Conducted by: J. Green / M. Knopick			Test Date: 16/10/2024	
Analysis Performed by: L. Nugent		MB19d slug out		Analysis Date: 11/11/2024
Aquifer Thickness: 11.81 m				
Time [s] -8.1 125 258.1 391.2 524.3 657.4 h/h0 1E0 1E-1 1E-2 1E-3 				
Calculation using Bouwer & Rice				
Observation Well	Hydraulic Conductivity			
	[m/s]			
MB19d	1.11 × 10 ⁻⁵			

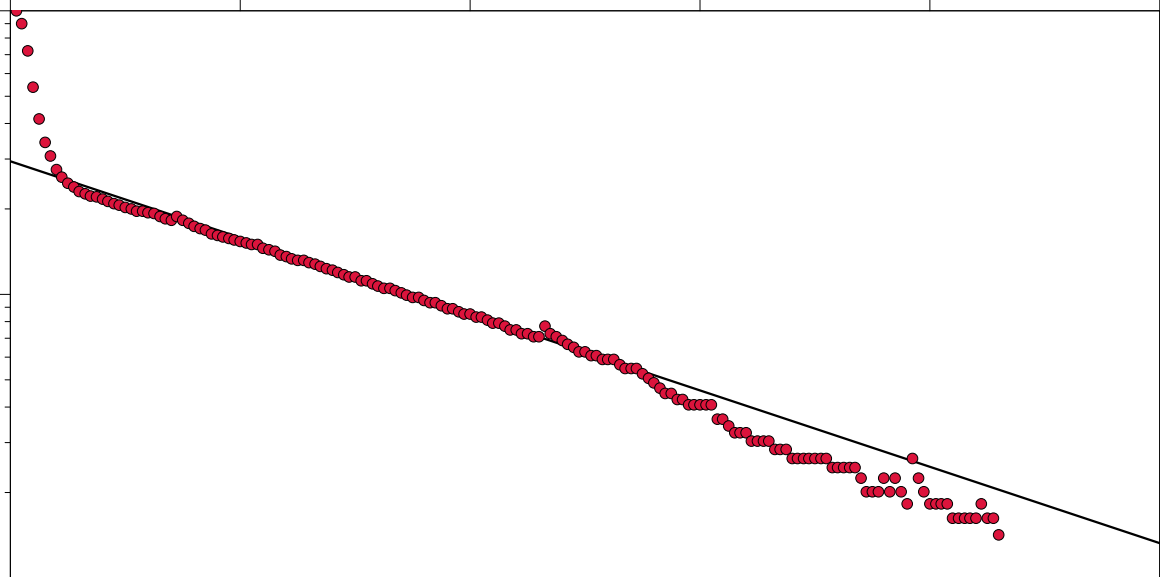
				Slug Test - Analyses Report				
				Project: TRP				
				Number: 26200.000.001				
				Client: TRPL				
Location: Taylorville, Coal Creek			Slug Test: MB19d out			Test Well: MB19d		
Test Conducted by: J. Green / M. Knopick						Test Date: 16/10/2024		
Aquifer Thickness: 11.81 m								
	Analysis Name	Analysis Performed	Analysis Date	Method name	Well	T [m²/s]	K [m/s]	S
1	MB19d slug out	L. Nugent	11/11/2024	Bouwer & Rice	MB19d		1.11 × 10 ⁻⁵	

				Slug Test - Water Level Data		Page 1 of 4	
				Project: TRP			
				Number: 26200.000.001			
				Client: TRPL			
Location: Taylorville, Coal Creek			Slug Test: MB13 in			Test Well: MB13	
Test Conducted by: J. Green / M. Knopick Test Date: 16/10/2024							
Water level at t=0 [m]: 7.58			Static Water Level [m]: 7.93			Water level change at t=0 [m]: -0.35	
	Time [s]	Water Level [m]	WL Change [m]				
1	1	7.5785	-0.3515				
2	2	7.6134	-0.3166				
3	3	7.6767	-0.2533				
4	4	7.7415	-0.1885				
5	5	7.7841	-0.1459				
6	6	7.809	-0.121				
7	7	7.8218	-0.1082				
8	8	7.8332	-0.0968				
9	9	7.8389	-0.0911				
10	10	7.8432	-0.0868				
11	11	7.846	-0.084				
12	12	7.8489	-0.0811				
13	13	7.8503	-0.0797				
14	14	7.8517	-0.0783				
15	15	7.8524	-0.0776				
16	16	7.8539	-0.0761				
17	17	7.8553	-0.0747				
18	18	7.8567	-0.0733				
19	19	7.8574	-0.0726				
20	20	7.8588	-0.0712				
21	21	7.8595	-0.0705				
22	22	7.861	-0.069				
23	23	7.861	-0.069				
24	24	7.8617	-0.0683				
25	25	7.8624	-0.0676				
26	26	7.8638	-0.0662				
27	27	7.8652	-0.0648				
28	28	7.8659	-0.0641				
29	29	7.8638	-0.0662				
30	30	7.8659	-0.0641				
31	31	7.8674	-0.0626				
32	32	7.8688	-0.0612				
33	33	7.8702	-0.0598				
34	34	7.8709	-0.0591				
35	35	7.8724	-0.0576				
36	36	7.8731	-0.0569				
37	37	7.8738	-0.0562				
38	38	7.8745	-0.0555				
39	39	7.8752	-0.0548				
40	40	7.8759	-0.0541				
41	41	7.8766	-0.0534				
42	42	7.8773	-0.0527				
43	43	7.8773	-0.0527				
44	44	7.8788	-0.0512				
45	45	7.8795	-0.0505				
46	46	7.8802	-0.0498				
47	47	7.8816	-0.0484				
48	48	7.8823	-0.0477				
49	49	7.883	-0.047				
50	50	7.8837	-0.0463				
51	51	7.8837	-0.0463				
52	52	7.8844	-0.0456				

				Slug Test - Water Level Data	Page 2 of 4
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
53	53	7.8852	-0.0448		
54	54	7.8859	-0.0441		
55	55	7.8866	-0.0434		
56	56	7.8873	-0.0427		
57	57	7.888	-0.042		
58	58	7.8887	-0.0413		
59	59	7.8894	-0.0406		
60	60	7.8894	-0.0406		
61	61	7.8908	-0.0392		
62	62	7.8908	-0.0392		
63	63	7.8916	-0.0384		
64	64	7.8923	-0.0377		
65	65	7.893	-0.037		
66	66	7.893	-0.037		
67	67	7.8937	-0.0363		
68	68	7.8944	-0.0356		
69	69	7.8951	-0.0349		
70	70	7.8958	-0.0342		
71	71	7.8958	-0.0342		
72	72	7.8965	-0.0335		
73	73	7.8972	-0.0328		
74	74	7.8972	-0.0328		
75	75	7.898	-0.032		
76	76	7.8987	-0.0313		
77	77	7.8987	-0.0313		
78	78	7.8994	-0.0306		
79	79	7.9001	-0.0299		
80	80	7.9001	-0.0299		
81	81	7.9008	-0.0292		
82	82	7.9008	-0.0292		
83	83	7.9015	-0.0285		
84	84	7.9022	-0.0278		
85	85	7.9022	-0.0278		
86	86	7.9029	-0.0271		
87	87	7.9037	-0.0263		
88	88	7.9037	-0.0263		
89	89	7.9044	-0.0256		
90	90	7.9044	-0.0256		
91	91	7.9051	-0.0249		
92	92	7.9051	-0.0249		
93	93	7.9029	-0.0271		
94	94	7.9044	-0.0256		
95	95	7.9051	-0.0249		
96	96	7.9058	-0.0242		
97	97	7.9065	-0.0235		
98	98	7.9072	-0.0228		
99	99	7.9079	-0.0221		
100	100	7.9079	-0.0221		
101	101	7.9086	-0.0214		
102	102	7.9086	-0.0214		
103	103	7.9093	-0.0207		
104	104	7.9093	-0.0207		
105	105	7.9093	-0.0207		
106	106	7.9101	-0.0199		
107	107	7.9108	-0.0192		
108	108	7.9108	-0.0192		
109	109	7.9108	-0.0192		

				Slug Test - Water Level Data	Page 3 of 4
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
110	110	7.9115	-0.0185		
111	111	7.9122	-0.0178		
112	112	7.9129	-0.0171		
113	113	7.9136	-0.0164		
114	114	7.9143	-0.0157		
115	115	7.9143	-0.0157		
116	116	7.915	-0.015		
117	117	7.915	-0.015		
118	118	7.9157	-0.0143		
119	119	7.9157	-0.0143		
120	120	7.9157	-0.0143		
121	121	7.9157	-0.0143		
122	122	7.9157	-0.0143		
123	123	7.9172	-0.0128		
124	124	7.9172	-0.0128		
125	125	7.9179	-0.0121		
126	126	7.9186	-0.0114		
127	127	7.9186	-0.0114		
128	128	7.9186	-0.0114		
129	129	7.9193	-0.0107		
130	130	7.9193	-0.0107		
131	131	7.9193	-0.0107		
132	132	7.9193	-0.0107		
133	133	7.92	-0.01		
134	134	7.92	-0.01		
135	135	7.92	-0.01		
136	136	7.9207	-0.0093		
137	137	7.9207	-0.0093		
138	138	7.9207	-0.0093		
139	139	7.9207	-0.0093		
140	140	7.9207	-0.0093		
141	141	7.9207	-0.0093		
142	142	7.9207	-0.0093		
143	143	7.9214	-0.0086		
144	144	7.9214	-0.0086		
145	145	7.9214	-0.0086		
146	146	7.9214	-0.0086		
147	147	7.9214	-0.0086		
148	148	7.9221	-0.0079		
149	149	7.9229	-0.0071		
150	150	7.9229	-0.0071		
151	151	7.9229	-0.0071		
152	152	7.9221	-0.0079		
153	153	7.9229	-0.0071		
154	154	7.9221	-0.0079		
155	155	7.9229	-0.0071		
156	156	7.9236	-0.0064		
157	157	7.9207	-0.0093		
158	158	7.9221	-0.0079		
159	159	7.9229	-0.0071		
160	160	7.9236	-0.0064		
161	161	7.9236	-0.0064		
162	162	7.9236	-0.0064		
163	163	7.9236	-0.0064		
164	164	7.9243	-0.0057		
165	165	7.9243	-0.0057		
166	166	7.9243	-0.0057		

				Slug Test - Water Level Data		Page 4 of 4	
				Project: TRP			
				Number: 26200.000.001			
				Client: TRPL			
	Time [s]	Water Level [m]	WL Change [m]				
167	167	7.9243	-0.0057				
168	168	7.9243	-0.0057				
169	169	7.9236	-0.0064				
170	170	7.9243	-0.0057				
171	171	7.9243	-0.0057				
172	172	7.925	-0.005				

			Slug Test Analysis Report		
			Project: TRP		
			Number: 26200.000.001		
			Client: TRPL		
Location: Taylorville, Coal Creek		Slug Test: MB13 in		Test Well: MB13	
Test Conducted by: J. Green / M. Knopick				Test Date: 16/10/2024	
Analysis Performed by: L. Nugent		MB13 slug in		Analysis Date: 11/11/2024	
Aquifer Thickness: 10.31 m					
Time [s] 0 40 80 120 160 200 h/h0 1E0 1E-1 1E-2 					
Calculation using Bouwer & Rice					
Observation Well		Hydraulic Conductivity			
		[m/s]			
MB13		1.88 × 10 ⁻⁶			

				Slug Test - Analyses Report				
				Project: TRP				
				Number: 26200.000.001				
				Client: TRPL				
Location: Taylorville, Coal Creek			Slug Test: MB13 in			Test Well: MB13		
Test Conducted by: J. Green / M. Knopick						Test Date: 16/10/2024		
Aquifer Thickness: 10.31 m								
	Analysis Name	Analysis Performed	Analysis Date	Method name	Well	T [m²/s]	K [m/s]	S
1	MB13 slug in	L. Nugent	11/11/2024	Bouwer & Rice	MB13		1.88 × 10 ⁻⁶	

				Slug Test - Water Level Data		Page 1 of 8	
				Project: TRP			
				Number: 26200.000.001			
				Client: TRPL			
Location: Taylorville, Coal Creek			Slug Test: MB13 out			Test Well: MB13	
Test Conducted by: MK/ JG			Test Date: 16/10/2024				
Water level at t=0 [m]: 8.85			Static Water Level [m]: 7.93			Water level change at t=0 [m]: 0.92	
	Time [s]	Water Level [m]	WL Change [m]				
1	1	8.8491	0.9191				
2	2	8.551	0.621				
3	3	8.3355	0.4055				
4	4	8.2209	0.2909				
5	5	8.1519	0.2219				
6	6	8.1121	0.1821				
7	7	8.0886	0.1586				
8	8	8.073	0.143				
9	9	8.0623	0.1323				
10	10	8.0552	0.1252				
11	11	8.0502	0.1202				
12	12	8.0466	0.1166				
13	13	8.0438	0.1138				
14	14	8.0417	0.1117				
15	15	8.0424	0.1124				
16	16	8.0409	0.1109				
17	17	8.036	0.106				
18	18	8.031	0.101				
19	19	8.0281	0.0981				
20	20	8.0253	0.0953				
21	21	8.0239	0.0939				
22	22	8.0217	0.0917				
23	23	8.0203	0.0903				
24	24	8.0189	0.0889				
25	25	8.0175	0.0875				
26	26	8.016	0.086				
27	27	8.0146	0.0846				
28	28	8.0132	0.0832				
29	29	8.0118	0.0818				
30	30	8.0111	0.0811				
31	31	8.0096	0.0796				
32	32	8.0082	0.0782				
33	33	8.0075	0.0775				
34	34	8.0061	0.0761				
35	35	8.0047	0.0747				
36	36	8.004	0.074				
37	37	8.0032	0.0732				
38	38	8.0018	0.0718				
39	39	8.0011	0.0711				
40	40	7.9997	0.0697				
41	41	7.999	0.069				
42	42	7.9975	0.0675				
43	43	7.994	0.064				
44	44	7.9947	0.0647				
45	45	7.994	0.064				
46	46	7.9933	0.0633				
47	47	7.9926	0.0626				
48	48	7.9919	0.0619				
49	49	7.9911	0.0611				
50	50	7.9904	0.0604				
51	51	7.9897	0.0597				
52	52	7.9883	0.0583				

				Slug Test - Water Level Data	Page 2 of 8
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
53	53	7.9876	0.0576		
54	54	7.9869	0.0569		
55	55	7.9862	0.0562		
56	56	7.9855	0.0555		
57	57	7.9847	0.0547		
58	58	7.984	0.054		
59	59	7.9826	0.0526		
60	60	7.9819	0.0519		
61	61	7.9812	0.0512		
62	62	7.9805	0.0505		
63	63	7.9798	0.0498		
64	64	7.9791	0.0491		
65	65	7.9783	0.0483		
66	66	7.9783	0.0483		
67	67	7.9776	0.0476		
68	68	7.9769	0.0469		
69	69	7.9762	0.0462		
70	70	7.9755	0.0455		
71	71	7.9748	0.0448		
72	72	7.9741	0.0441		
73	73	7.9741	0.0441		
74	74	7.9734	0.0434		
75	75	7.9726	0.0426		
76	76	7.9719	0.0419		
77	77	7.9712	0.0412		
78	78	7.9705	0.0405		
79	79	7.9705	0.0405		
80	80	7.9698	0.0398		
81	81	7.9691	0.0391		
82	82	7.9684	0.0384		
83	83	7.9677	0.0377		
84	84	7.9677	0.0377		
85	85	7.967	0.037		
86	86	7.967	0.037		
87	87	7.9662	0.0362		
88	88	7.9655	0.0355		
89	89	7.9648	0.0348		
90	90	7.9648	0.0348		
91	91	7.9641	0.0341		
92	92	7.9634	0.0334		
93	93	7.9634	0.0334		
94	94	7.9627	0.0327		
95	95	7.9627	0.0327		
96	96	7.962	0.032		
97	97	7.9613	0.0313		
98	98	7.9613	0.0313		
99	99	7.9606	0.0306		
100	100	7.9606	0.0306		
101	101	7.9598	0.0298		
102	102	7.9598	0.0298		
103	103	7.9591	0.0291		
104	104	7.9591	0.0291		
105	105	7.9591	0.0291		
106	106	7.9584	0.0284		
107	107	7.9556	0.0256		
108	108	7.9563	0.0263		
109	109	7.9563	0.0263		

				Slug Test - Water Level Data	Page 3 of 8
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
110	110	7.9563	0.0263		
111	111	7.9563	0.0263		
112	112	7.9556	0.0256		
113	113	7.9556	0.0256		
114	114	7.9556	0.0256		
115	115	7.9549	0.0249		
116	116	7.9549	0.0249		
117	117	7.9549	0.0249		
118	118	7.9549	0.0249		
119	119	7.9542	0.0242		
120	120	7.9542	0.0242		
121	121	7.9542	0.0242		
122	122	7.9534	0.0234		
123	123	7.9534	0.0234		
124	124	7.9527	0.0227		
125	125	7.9527	0.0227		
126	126	7.9527	0.0227		
127	127	7.952	0.022		
128	128	7.9513	0.0213		
129	129	7.9513	0.0213		
130	130	7.9513	0.0213		
131	131	7.9506	0.0206		
132	132	7.9506	0.0206		
133	133	7.9506	0.0206		
134	134	7.9499	0.0199		
135	135	7.9499	0.0199		
136	136	7.9499	0.0199		
137	137	7.9492	0.0192		
138	138	7.9492	0.0192		
139	139	7.9492	0.0192		
140	140	7.9492	0.0192		
141	141	7.9492	0.0192		
142	142	7.9485	0.0185		
143	143	7.9485	0.0185		
144	144	7.9485	0.0185		
145	145	7.9485	0.0185		
146	146	7.9477	0.0177		
147	147	7.9477	0.0177		
148	148	7.9477	0.0177		
149	149	7.9477	0.0177		
150	150	7.947	0.017		
151	151	7.947	0.017		
152	152	7.947	0.017		
153	153	7.947	0.017		
154	154	7.9463	0.0163		
155	155	7.9463	0.0163		
156	156	7.9463	0.0163		
157	157	7.9463	0.0163		
158	158	7.9463	0.0163		
159	159	7.9463	0.0163		
160	160	7.9456	0.0156		
161	161	7.9456	0.0156		
162	162	7.9456	0.0156		
163	163	7.9456	0.0156		
164	164	7.9456	0.0156		
165	165	7.9456	0.0156		
166	166	7.9456	0.0156		

				Slug Test - Water Level Data	Page 4 of 8
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
167	167	7.9449	0.0149		
168	168	7.9449	0.0149		
169	169	7.9449	0.0149		
170	170	7.9449	0.0149		
171	171	7.9421	0.0121		
172	172	7.9428	0.0128		
173	173	7.9435	0.0135		
174	174	7.9442	0.0142		
175	175	7.9442	0.0142		
176	176	7.9442	0.0142		
177	177	7.9442	0.0142		
178	178	7.9435	0.0135		
179	179	7.9435	0.0135		
180	180	7.9435	0.0135		
181	181	7.9428	0.0128		
182	182	7.9435	0.0135		
183	183	7.9428	0.0128		
184	184	7.9428	0.0128		
185	185	7.9428	0.0128		
186	186	7.9428	0.0128		
187	187	7.9428	0.0128		
188	188	7.9428	0.0128		
189	189	7.9421	0.0121		
190	190	7.9421	0.0121		
191	191	7.9428	0.0128		
192	192	7.9428	0.0128		
193	193	7.9428	0.0128		
194	194	7.9428	0.0128		
195	195	7.9421	0.0121		
196	196	7.9421	0.0121		
197	197	7.9421	0.0121		
198	198	7.9421	0.0121		
199	199	7.9421	0.0121		
200	200	7.9421	0.0121		
201	201	7.9421	0.0121		
202	202	7.9421	0.0121		
203	203	7.9421	0.0121		
204	204	7.9421	0.0121		
205	205	7.9421	0.0121		
206	206	7.9413	0.0113		
207	207	7.9413	0.0113		
208	208	7.9413	0.0113		
209	209	7.9413	0.0113		
210	210	7.9413	0.0113		
211	211	7.9413	0.0113		
212	212	7.9413	0.0113		
213	213	7.9413	0.0113		
214	214	7.9406	0.0106		
215	215	7.9413	0.0113		
216	216	7.9406	0.0106		
217	217	7.9406	0.0106		
218	218	7.9406	0.0106		
219	219	7.9406	0.0106		
220	220	7.9406	0.0106		
221	221	7.9406	0.0106		
222	222	7.9406	0.0106		
223	223	7.9406	0.0106		

				Slug Test - Water Level Data	Page 5 of 8
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
224	224	7.9406	0.0106		
225	225	7.9406	0.0106		
226	226	7.9406	0.0106		
227	227	7.9399	0.0099		
228	228	7.9399	0.0099		
229	229	7.9399	0.0099		
230	230	7.9399	0.0099		
231	231	7.9399	0.0099		
232	232	7.9399	0.0099		
233	233	7.9399	0.0099		
234	234	7.9399	0.0099		
235	235	7.9371	0.0071		
236	236	7.9378	0.0078		
237	237	7.9385	0.0085		
238	238	7.9385	0.0085		
239	239	7.9392	0.0092		
240	240	7.9392	0.0092		
241	241	7.9392	0.0092		
242	242	7.9392	0.0092		
243	243	7.9392	0.0092		
244	244	7.9392	0.0092		
245	245	7.9392	0.0092		
246	246	7.9392	0.0092		
247	247	7.9392	0.0092		
248	248	7.9392	0.0092		
249	249	7.9392	0.0092		
250	250	7.9392	0.0092		
251	251	7.9385	0.0085		
252	252	7.9392	0.0092		
253	253	7.9385	0.0085		
254	254	7.9392	0.0092		
255	255	7.9392	0.0092		
256	256	7.9392	0.0092		
257	257	7.9385	0.0085		
258	258	7.9385	0.0085		
259	259	7.9385	0.0085		
260	260	7.9385	0.0085		
261	261	7.9385	0.0085		
262	262	7.9385	0.0085		
263	263	7.9385	0.0085		
264	264	7.9385	0.0085		
265	265	7.9385	0.0085		
266	266	7.9385	0.0085		
267	267	7.9385	0.0085		
268	268	7.9385	0.0085		
269	269	7.9385	0.0085		
270	270	7.9385	0.0085		
271	271	7.9385	0.0085		
272	272	7.9385	0.0085		
273	273	7.9378	0.0078		
274	274	7.9378	0.0078		
275	275	7.9378	0.0078		
276	276	7.9385	0.0085		
277	277	7.9385	0.0085		
278	278	7.9378	0.0078		
279	279	7.9378	0.0078		
280	280	7.9385	0.0085		

				Slug Test - Water Level Data	Page 6 of 8
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
281	281	7.9378	0.0078		
282	282	7.9385	0.0085		
283	283	7.9378	0.0078		
284	284	7.9378	0.0078		
285	285	7.9378	0.0078		
286	286	7.9378	0.0078		
287	287	7.9378	0.0078		
288	288	7.9378	0.0078		
289	289	7.9378	0.0078		
290	290	7.9378	0.0078		
291	291	7.9378	0.0078		
292	292	7.9378	0.0078		
293	293	7.9378	0.0078		
294	294	7.9378	0.0078		
295	295	7.9378	0.0078		
296	296	7.9378	0.0078		
297	297	7.9378	0.0078		
298	298	7.9378	0.0078		
299	299	7.9349	0.0049		
300	300	7.9364	0.0064		
301	301	7.9371	0.0071		
302	302	7.9371	0.0071		
303	303	7.9378	0.0078		
304	304	7.9378	0.0078		
305	305	7.9378	0.0078		
306	306	7.9371	0.0071		
307	307	7.9378	0.0078		
308	308	7.9378	0.0078		
309	309	7.9378	0.0078		
310	310	7.9378	0.0078		
311	311	7.9378	0.0078		
312	312	7.9371	0.0071		
313	313	7.9371	0.0071		
314	314	7.9371	0.0071		
315	315	7.9371	0.0071		
316	316	7.9371	0.0071		
317	317	7.9371	0.0071		
318	318	7.9371	0.0071		
319	319	7.9371	0.0071		
320	320	7.9371	0.0071		
321	321	7.9371	0.0071		
322	322	7.9371	0.0071		
323	323	7.9371	0.0071		
324	324	7.9371	0.0071		
325	325	7.9371	0.0071		
326	326	7.9371	0.0071		
327	327	7.9371	0.0071		
328	328	7.9371	0.0071		
329	329	7.9371	0.0071		
330	330	7.9371	0.0071		
331	331	7.9371	0.0071		
332	332	7.9371	0.0071		
333	333	7.9371	0.0071		
334	334	7.9371	0.0071		
335	335	7.9371	0.0071		
336	336	7.9371	0.0071		
337	337	7.9371	0.0071		

				Slug Test - Water Level Data	Page 7 of 8
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
338	338	7.9371	0.0071		
339	339	7.9371	0.0071		
340	340	7.9371	0.0071		
341	341	7.9371	0.0071		
342	342	7.9364	0.0064		
343	343	7.9364	0.0064		
344	344	7.9364	0.0064		
345	345	7.9364	0.0064		
346	346	7.9364	0.0064		
347	347	7.9364	0.0064		
348	348	7.9364	0.0064		
349	349	7.9364	0.0064		
350	350	7.9364	0.0064		
351	351	7.9364	0.0064		
352	352	7.9364	0.0064		
353	353	7.9364	0.0064		
354	354	7.9364	0.0064		
355	355	7.9364	0.0064		
356	356	7.9364	0.0064		
357	357	7.9364	0.0064		
358	358	7.9364	0.0064		
359	359	7.9364	0.0064		
360	360	7.9364	0.0064		
361	361	7.9364	0.0064		
362	362	7.9364	0.0064		
363	363	7.9342	0.0042		
364	364	7.9349	0.0049		
365	365	7.9357	0.0057		
366	366	7.9364	0.0064		
367	367	7.9364	0.0064		
368	368	7.9364	0.0064		
369	369	7.9364	0.0064		
370	370	7.9364	0.0064		
371	371	7.9364	0.0064		
372	372	7.9364	0.0064		
373	373	7.9364	0.0064		
374	374	7.9364	0.0064		
375	375	7.9364	0.0064		
376	376	7.9364	0.0064		
377	377	7.9364	0.0064		
378	378	7.9364	0.0064		
379	379	7.9364	0.0064		
380	380	7.9364	0.0064		
381	381	7.9364	0.0064		
382	382	7.9364	0.0064		
383	383	7.9364	0.0064		
384	384	7.9364	0.0064		
385	385	7.9364	0.0064		
386	386	7.9364	0.0064		
387	387	7.9364	0.0064		
388	388	7.9364	0.0064		
389	389	7.9364	0.0064		
390	390	7.9364	0.0064		
391	391	7.9364	0.0064		
392	392	7.9364	0.0064		
393	393	7.9364	0.0064		
394	394	7.9364	0.0064		

				Slug Test - Water Level Data	Page 8 of 8
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
395	395	7.9364	0.0064		
396	396	7.9364	0.0064		
397	397	7.9364	0.0064		
398	398	7.9364	0.0064		
399	399	7.9364	0.0064		
400	400	7.9364	0.0064		
401	401	7.9364	0.0064		
402	402	7.9364	0.0064		
403	403	7.9364	0.0064		
404	404	7.9364	0.0064		
405	405	7.9364	0.0064		
406	406	7.9357	0.0057		
407	407	7.9357	0.0057		
408	408	7.9364	0.0064		
409	409	7.9364	0.0064		
410	410	7.9364	0.0064		
411	411	7.9364	0.0064		
412	412	7.9364	0.0064		
413	413	7.9357	0.0057		
414	414	7.9357	0.0057		
415	415	7.9364	0.0064		
416	416	7.9349	0.0049		
417	417	7.9357	0.0057		
418	418	7.9357	0.0057		
419	419	7.9357	0.0057		
420	420	7.9357	0.0057		
421	421	7.9357	0.0057		
422	422	7.9364	0.0064		
423	423	7.9364	0.0064		
424	424	7.9357	0.0057		
425	425	7.9357	0.0057		
426	426	7.9357	0.0057		
427	427	7.9335	0.0035		

			Slug Test Analysis Report		
			Project: TRP		
			Number: 26200.000.001		
			Client: TRPL		
Location: Taylorville, Coal Creek		Slug Test: MB13 out		Test Well: MB13	
Test Conducted by: MK/ JG				Test Date: 16/10/2024	
Analysis Performed by: L. Nugent		MB13 slug out		Analysis Date: 11/11/2024	
Aquifer Thickness: 10.81 m					
Time [s] h/h0					
Calculation using Bouwer & Rice					
Observation Well		Hydraulic Conductivity			
		[m/s]			
MB13		1.51 × 10 ⁻⁶			

				Slug Test - Analyses Report				
				Project: TRP				
				Number: 26200.000.001				
				Client: TRPL				
Location: Taylorville, Coal Creek			Slug Test: MB13 out			Test Well: MB13		
Test Conducted by: MK/ JG						Test Date: 16/10/2024		
Aquifer Thickness: 10.81 m								
	Analysis Name	Analysis Performed	Analysis Date	Method name	Well	T [m²/s]	K [m/s]	S
1	MB13 slug out	L. Nugent	11/11/2024	Bouwer & Rice	MB13		1.51 × 10 ⁻⁶	

				Slug Test - Water Level Data		Page 1 of 5	
				Project: TRP			
				Number: 26200.000.001			
				Client: TRPL			
Location: Taylorville, Coal Creek			Slug Test: MB14 in			Test Well: MB14	
Test Conducted by: J. Green			Test Date: 16/01/2025				
Water level at t=0 [m]: 7.86			Static Water Level [m]: 8.70			Water level change at t=0 [m]: -0.84	
	Time [s]	Water Level [m]	WL Change [m]				
1	1	7.855	-0.845				
2	2	7.867	-0.833				
3	3	7.907	-0.793				
4	4	7.958	-0.742				
5	5	8.012	-0.688				
6	6	8.061	-0.639				
7	7	8.106	-0.594				
8	8	8.148	-0.552				
9	9	8.183	-0.517				
10	10	8.211	-0.489				
11	11	8.234	-0.466				
12	12	8.253	-0.447				
13	13	8.267	-0.433				
14	14	8.278	-0.422				
15	15	8.287	-0.413				
16	16	8.295	-0.405				
17	17	8.302	-0.398				
18	18	8.309	-0.391				
19	19	8.316	-0.384				
20	20	8.322	-0.378				
21	21	8.328	-0.372				
22	22	8.334	-0.366				
23	23	8.34	-0.36				
24	24	8.345	-0.355				
25	25	8.351	-0.349				
26	26	8.356	-0.344				
27	27	8.36	-0.34				
28	28	8.365	-0.335				
29	29	8.369	-0.331				
30	30	8.37	-0.33				
31	31	8.376	-0.324				
32	32	8.381	-0.319				
33	33	8.386	-0.314				
34	34	8.39	-0.31				
35	35	8.394	-0.306				
36	36	8.399	-0.301				
37	37	8.404	-0.296				
38	38	8.408	-0.292				
39	39	8.413	-0.287				
40	40	8.417	-0.283				
41	41	8.421	-0.279				
42	42	8.425	-0.275				
43	43	8.429	-0.271				
44	44	8.434	-0.266				
45	45	8.438	-0.262				
46	46	8.442	-0.258				
47	47	8.447	-0.253				
48	48	8.451	-0.249				
49	49	8.456	-0.244				
50	50	8.46	-0.24				
51	51	8.465	-0.235				
52	52	8.469	-0.231				

				Slug Test - Water Level Data	Page 2 of 5
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
53	53	8.473	-0.227		
54	54	8.477	-0.223		
55	55	8.48	-0.22		
56	56	8.484	-0.216		
57	57	8.487	-0.213		
58	58	8.491	-0.209		
59	59	8.494	-0.206		
60	60	8.497	-0.203		
61	61	8.50	-0.20		
62	62	8.504	-0.196		
63	63	8.508	-0.192		
64	64	8.511	-0.189		
65	65	8.515	-0.185		
66	66	8.518	-0.182		
67	67	8.52	-0.18		
68	68	8.523	-0.177		
69	69	8.526	-0.174		
70	70	8.528	-0.172		
71	71	8.531	-0.169		
72	72	8.534	-0.166		
73	73	8.537	-0.163		
74	74	8.54	-0.16		
75	75	8.543	-0.157		
76	76	8.545	-0.155		
77	77	8.548	-0.152		
78	78	8.551	-0.149		
79	79	8.554	-0.146		
80	80	8.555	-0.145		
81	81	8.559	-0.141		
82	82	8.561	-0.139		
83	83	8.564	-0.136		
84	84	8.566	-0.134		
85	85	8.568	-0.132		
86	86	8.57	-0.13		
87	87	8.572	-0.128		
88	88	8.574	-0.126		
89	89	8.575	-0.125		
90	90	8.577	-0.123		
91	91	8.579	-0.121		
92	92	8.58	-0.12		
93	93	8.582	-0.118		
94	94	8.582	-0.118		
95	95	8.585	-0.115		
96	96	8.587	-0.113		
97	97	8.589	-0.111		
98	98	8.591	-0.109		
99	99	8.593	-0.107		
100	100	8.595	-0.105		
101	101	8.596	-0.104		
102	102	8.598	-0.102		
103	103	8.60	-0.10		
104	104	8.602	-0.098		
105	105	8.603	-0.097		
106	106	8.605	-0.095		
107	107	8.607	-0.093		
108	108	8.609	-0.091		
109	109	8.611	-0.089		

				Slug Test - Water Level Data	Page 3 of 5
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
110	110	8.613	-0.087		
111	111	8.615	-0.085		
112	112	8.616	-0.084		
113	113	8.618	-0.082		
114	114	8.619	-0.081		
115	115	8.621	-0.079		
116	116	8.622	-0.078		
117	117	8.623	-0.077		
118	118	8.625	-0.075		
119	119	8.626	-0.074		
120	120	8.627	-0.073		
121	121	8.628	-0.072		
122	122	8.63	-0.07		
123	123	8.631	-0.069		
124	124	8.632	-0.068		
125	125	8.633	-0.067		
126	126	8.634	-0.066		
127	127	8.635	-0.065		
128	128	8.636	-0.064		
129	129	8.637	-0.063		
130	130	8.638	-0.062		
131	131	8.639	-0.061		
132	132	8.64	-0.06		
133	133	8.641	-0.059		
134	134	8.641	-0.059		
135	135	8.642	-0.058		
136	136	8.643	-0.057		
137	137	8.643	-0.057		
138	138	8.644	-0.056		
139	139	8.644	-0.056		
140	140	8.645	-0.055		
141	141	8.645	-0.055		
142	142	8.646	-0.054		
143	143	8.647	-0.053		
144	144	8.647	-0.053		
145	145	8.648	-0.052		
146	146	8.649	-0.051		
147	147	8.65	-0.05		
148	148	8.65	-0.05		
149	149	8.651	-0.049		
150	150	8.651	-0.049		
151	151	8.652	-0.048		
152	152	8.653	-0.047		
153	153	8.653	-0.047		
154	154	8.654	-0.046		
155	155	8.654	-0.046		
156	156	8.655	-0.045		
157	157	8.656	-0.044		
158	158	8.653	-0.047		
159	159	8.655	-0.045		
160	160	8.655	-0.045		
161	161	8.656	-0.044		
162	162	8.657	-0.043		
163	163	8.658	-0.042		
164	164	8.658	-0.042		
165	165	8.659	-0.041		
166	166	8.659	-0.041		

				Slug Test - Water Level Data	Page 4 of 5
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
167	167	8.66	-0.04		
168	168	8.66	-0.04		
169	169	8.66	-0.04		
170	170	8.661	-0.039		
171	171	8.661	-0.039		
172	172	8.661	-0.039		
173	173	8.662	-0.038		
174	174	8.662	-0.038		
175	175	8.663	-0.037		
176	176	8.663	-0.037		
177	177	8.663	-0.037		
178	178	8.663	-0.037		
179	179	8.664	-0.036		
180	180	8.664	-0.036		
181	181	8.665	-0.035		
182	182	8.665	-0.035		
183	183	8.666	-0.034		
184	184	8.666	-0.034		
185	185	8.666	-0.034		
186	186	8.667	-0.033		
187	187	8.667	-0.033		
188	188	8.667	-0.033		
189	189	8.668	-0.032		
190	190	8.668	-0.032		
191	191	8.669	-0.031		
192	192	8.669	-0.031		
193	193	8.669	-0.031		
194	194	8.67	-0.03		
195	195	8.67	-0.03		
196	196	8.67	-0.03		
197	197	8.671	-0.029		
198	198	8.671	-0.029		
199	199	8.671	-0.029		
200	200	8.671	-0.029		
201	201	8.671	-0.029		
202	202	8.672	-0.028		
203	203	8.672	-0.028		
204	204	8.673	-0.027		
205	205	8.673	-0.027		
206	206	8.673	-0.027		
207	207	8.674	-0.026		
208	208	8.674	-0.026		
209	209	8.674	-0.026		
210	210	8.674	-0.026		
211	211	8.675	-0.025		
212	212	8.675	-0.025		
213	213	8.675	-0.025		
214	214	8.675	-0.025		
215	215	8.676	-0.024		
216	216	8.676	-0.024		
217	217	8.676	-0.024		
218	218	8.676	-0.024		
219	219	8.677	-0.023		
220	220	8.677	-0.023		
221	221	8.677	-0.023		
222	222	8.675	-0.025		
223	223	8.677	-0.023		

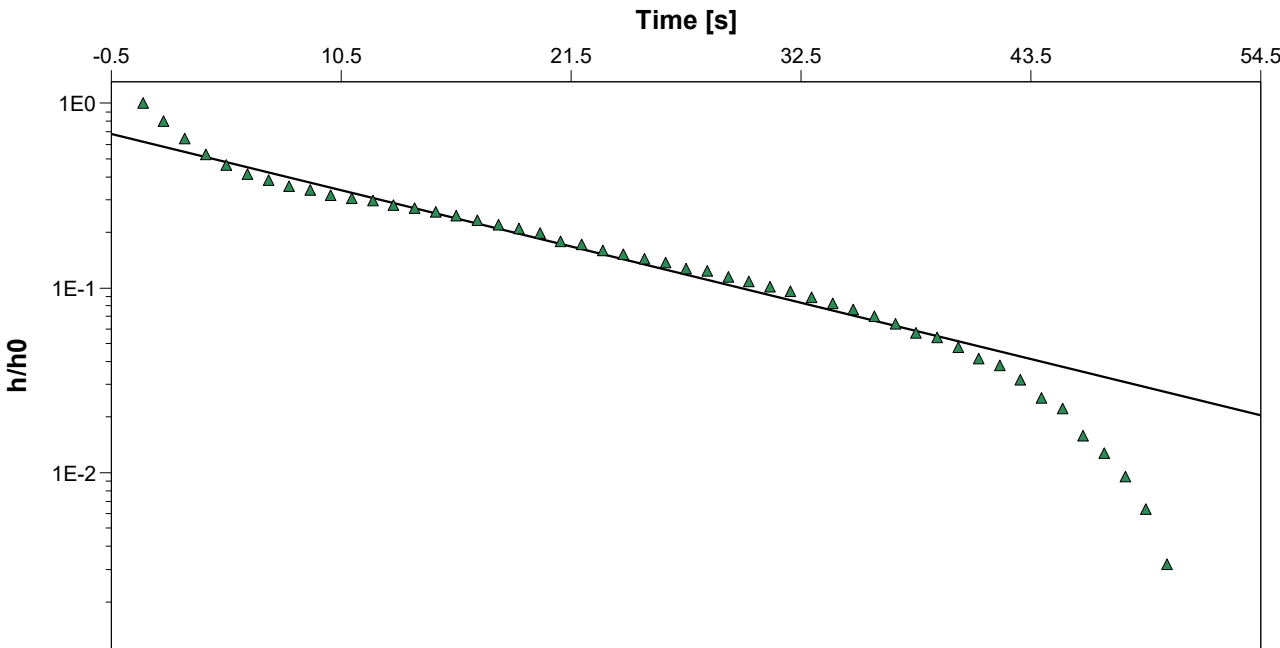
Client: TRPL

	Time [s]	Water Level [m]	WL Change [m]
224	224	8.678	-0.022
225	225	8.678	-0.022
226	226	8.679	-0.021

			Slug Test Analysis Report		
			Project: TRP		
			Number: 26200.000.001		
			Client: TRPL		
Location: Taylorville, Coal Creek		Slug Test: MB14 in		Test Well: MB14	
Test Conducted by: J. Green				Test Date: 16/01/2025	
Analysis Performed by: L Nugent		MB14 slug in		Analysis Date: 21/01/2025	
Aquifer Thickness: 4.92 m					
Time [s] -9.6 43.2 96 148.8 201.6 254.4 1E0 1E-1 1E-2 1E-3 h/h0					
Calculation using Bouwer & Rice					
Observation Well		Hydraulic Conductivity [m/s]			
MB14		2.33×10^{-6}			

				Slug Test - Analyses Report				
				Project: TRP				
				Number: 26200.000.001				
				Client: TRPL				
Location: Taylorville, Coal Creek			Slug Test: MB14 in			Test Well: MB14		
Test Conducted by: J. Green						Test Date: 16/01/2025		
Aquifer Thickness: 4.92 m								
	Analysis Name	Analysis Performed	Analysis Date	Method name	Well	T [m²/s]	K [m/s]	S
1	MB14 slug in	L Nugent	21/01/2025	Bouwer & Rice	MB14		2.33 × 10 ⁻⁶	

				Slug Test - Water Level Data		Page 1 of 1
				Project: TRP		
				Number: 26200.000.001		
				Client: TRPL		
Location: Taylorville, Coal Creek		Slug Test: MB14 out			Test Well: MB14	
Test Conducted by:			Test Date: 16/01/2025			
Water level at t=0 [m]: 9.01		Static Water Level [m]: 8.70			Water level change at t=0 [m]: 0.31	
	Time [s]	Water Level [m]	WL Change [m]			
1	1	9.014	0.314			
2	2	8.952	0.252			
3	3	8.903	0.203			
4	4	8.866	0.166			
5	5	8.846	0.146			
6	6	8.83	0.13			
7	7	8.821	0.121			
8	8	8.812	0.112			
9	9	8.807	0.107			
10	10	8.80	0.10			
11	11	8.796	0.096			
12	12	8.793	0.093			
13	13	8.788	0.088			
14	14	8.785	0.085			
15	15	8.781	0.081			
16	16	8.777	0.077			
17	17	8.773	0.073			
18	18	8.769	0.069			
19	19	8.766	0.066			
20	20	8.762	0.062			
21	21	8.756	0.056			
22	22	8.754	0.054			
23	23	8.75	0.05			
24	24	8.748	0.048			
25	25	8.745	0.045			
26	26	8.743	0.043			
27	27	8.74	0.04			
28	28	8.739	0.039			
29	29	8.736	0.036			
30	30	8.734	0.034			
31	31	8.732	0.032			
32	32	8.73	0.03			
33	33	8.728	0.028			
34	34	8.726	0.026			
35	35	8.724	0.024			
36	36	8.722	0.022			
37	37	8.72	0.02			
38	38	8.718	0.018			
39	39	8.717	0.017			
40	40	8.715	0.015			
41	41	8.713	0.013			
42	42	8.712	0.012			
43	43	8.71	0.01			
44	44	8.708	0.008			
45	45	8.707	0.007			
46	46	8.705	0.005			
47	47	8.704	0.004			
48	48	8.703	0.003			
49	49	8.702	0.002			
50	50	8.701	0.001			
51	51	8.70	0.00			

			Slug Test Analysis Report		
			Project: TRP		
			Number: 26200.000.001		
			Client: TRPL		
Location: Taylorville, Coal Creek		Slug Test: MB14 out		Test Well: MB14	
Test Conducted by:				Test Date: 16/01/2025	
Analysis Performed by: L. Nugent		MB14 slug out		Analysis Date: 21/01/2025	
Aquifer Thickness: 4.92 m					
Time [s] 					
Calculation using Bouwer & Rice					
Observation Well		Hydraulic Conductivity [m/s]			
MB14		9.93 × 10 ⁻⁶			

				Slug Test - Analyses Report				
				Project: TRP				
				Number: 26200.000.001				
				Client: TRPL				
Location: Taylorville, Coal Creek			Slug Test: MB14 out			Test Well: MB14		
Test Conducted by:						Test Date: 16/01/2025		
Aquifer Thickness: 4.92 m								
	Analysis Name	Analysis Performed	Analysis Date	Method name	Well	T [m²/s]	K [m/s]	S
1	MB14 slug out	L. Nugent	21/01/2025	Bouwer & Rice	MB14		9.93 × 10 ⁻⁶	

				Slug Test - Water Level Data		Page 1 of 7	
				Project: TRP			
				Number: 26200.000.001			
				Client: TRPL			
Location: Taylorville, Coal Creek			Slug Test: MB14 in.2			Test Well: MB14	
Test Conducted by: J. Green			Test Date: 16/01/2025				
Water level at t=0 [m]: 8.11			Static Water Level [m]: 8.70			Water level change at t=0 [m]: -0.59	
	Time [s]	Water Level [m]	WL Change [m]				
1	1	8.106	-0.594				
2	2	8.171	-0.529				
3	3	8.251	-0.449				
4	4	8.297	-0.403				
5	5	8.319	-0.381				
6	6	8.343	-0.357				
7	7	8.356	-0.344				
8	8	8.365	-0.335				
9	9	8.373	-0.327				
10	10	8.38	-0.32				
11	11	8.387	-0.313				
12	12	8.391	-0.309				
13	13	8.398	-0.302				
14	14	8.403	-0.297				
15	15	8.407	-0.293				
16	16	8.412	-0.288				
17	17	8.417	-0.283				
18	18	8.421	-0.279				
19	19	8.425	-0.275				
20	20	8.429	-0.271				
21	21	8.433	-0.267				
22	22	8.437	-0.263				
23	23	8.442	-0.258				
24	24	8.445	-0.255				
25	25	8.449	-0.251				
26	26	8.453	-0.247				
27	27	8.457	-0.243				
28	28	8.46	-0.24				
29	29	8.463	-0.237				
30	30	8.466	-0.234				
31	31	8.468	-0.232				
32	32	8.471	-0.229				
33	33	8.474	-0.226				
34	34	8.477	-0.223				
35	35	8.479	-0.221				
36	36	8.482	-0.218				
37	37	8.484	-0.216				
38	38	8.466	-0.234				
39	39	8.482	-0.218				
40	40	8.487	-0.213				
41	41	8.491	-0.209				
42	42	8.495	-0.205				
43	43	8.497	-0.203				
44	44	8.50	-0.20				
45	45	8.502	-0.198				
46	46	8.505	-0.195				
47	47	8.507	-0.193				
48	48	8.509	-0.191				
49	49	8.511	-0.189				
50	50	8.513	-0.187				
51	51	8.515	-0.185				
52	52	8.517	-0.183				

				Slug Test - Water Level Data	Page 2 of 7
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
53	53	8.519	-0.181		
54	54	8.521	-0.179		
55	55	8.523	-0.177		
56	56	8.525	-0.175		
57	57	8.528	-0.172		
58	58	8.53	-0.17		
59	59	8.531	-0.169		
60	60	8.533	-0.167		
61	61	8.535	-0.165		
62	62	8.537	-0.163		
63	63	8.538	-0.162		
64	64	8.54	-0.16		
65	65	8.539	-0.161		
66	66	8.542	-0.158		
67	67	8.544	-0.156		
68	68	8.546	-0.154		
69	69	8.547	-0.153		
70	70	8.549	-0.151		
71	71	8.551	-0.149		
72	72	8.552	-0.148		
73	73	8.554	-0.146		
74	74	8.555	-0.145		
75	75	8.556	-0.144		
76	76	8.557	-0.143		
77	77	8.558	-0.142		
78	78	8.559	-0.141		
79	79	8.561	-0.139		
80	80	8.562	-0.138		
81	81	8.563	-0.137		
82	82	8.564	-0.136		
83	83	8.565	-0.135		
84	84	8.567	-0.133		
85	85	8.568	-0.132		
86	86	8.569	-0.131		
87	87	8.57	-0.13		
88	88	8.572	-0.128		
89	89	8.573	-0.127		
90	90	8.574	-0.126		
91	91	8.575	-0.125		
92	92	8.577	-0.123		
93	93	8.578	-0.122		
94	94	8.579	-0.121		
95	95	8.577	-0.123		
96	96	8.577	-0.123		
97	97	8.579	-0.121		
98	98	8.583	-0.117		
99	99	8.585	-0.115		
100	100	8.587	-0.113		
101	101	8.588	-0.112		
102	102	8.589	-0.111		
103	103	8.591	-0.109		
104	104	8.592	-0.108		
105	105	8.594	-0.106		
106	106	8.595	-0.105		
107	107	8.596	-0.104		
108	108	8.597	-0.103		
109	109	8.598	-0.102		

				Slug Test - Water Level Data	Page 3 of 7
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
110	110	8.60	-0.10		
111	111	8.60	-0.10		
112	112	8.601	-0.099		
113	113	8.602	-0.098		
114	114	8.603	-0.097		
115	115	8.604	-0.096		
116	116	8.604	-0.096		
117	117	8.605	-0.095		
118	118	8.606	-0.094		
119	119	8.607	-0.093		
120	120	8.608	-0.092		
121	121	8.608	-0.092		
122	122	8.609	-0.091		
123	123	8.61	-0.09		
124	124	8.611	-0.089		
125	125	8.612	-0.088		
126	126	8.612	-0.088		
127	127	8.613	-0.087		
128	128	8.614	-0.086		
129	129	8.612	-0.088		
130	130	8.614	-0.086		
131	131	8.615	-0.085		
132	132	8.616	-0.084		
133	133	8.616	-0.084		
134	134	8.618	-0.082		
135	135	8.618	-0.082		
136	136	8.619	-0.081		
137	137	8.62	-0.08		
138	138	8.62	-0.08		
139	139	8.621	-0.079		
140	140	8.621	-0.079		
141	141	8.622	-0.078		
142	142	8.622	-0.078		
143	143	8.623	-0.077		
144	144	8.623	-0.077		
145	145	8.624	-0.076		
146	146	8.624	-0.076		
147	147	8.625	-0.075		
148	148	8.625	-0.075		
149	149	8.626	-0.074		
150	150	8.626	-0.074		
151	151	8.627	-0.073		
152	152	8.627	-0.073		
153	153	8.628	-0.072		
154	154	8.628	-0.072		
155	155	8.629	-0.071		
156	156	8.629	-0.071		
157	157	8.629	-0.071		
158	158	8.63	-0.07		
159	159	8.63	-0.07		
160	160	8.63	-0.07		
161	161	8.63	-0.07		
162	162	8.631	-0.069		
163	163	8.631	-0.069		
164	164	8.632	-0.068		
165	165	8.632	-0.068		
166	166	8.633	-0.067		

				Slug Test - Water Level Data	Page 4 of 7
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
167	167	8.633	-0.067		
168	168	8.633	-0.067		
169	169	8.634	-0.066		
170	170	8.634	-0.066		
171	171	8.634	-0.066		
172	172	8.635	-0.065		
173	173	8.635	-0.065		
174	174	8.636	-0.064		
175	175	8.636	-0.064		
176	176	8.637	-0.063		
177	177	8.637	-0.063		
178	178	8.637	-0.063		
179	179	8.637	-0.063		
180	180	8.638	-0.062		
181	181	8.638	-0.062		
182	182	8.638	-0.062		
183	183	8.639	-0.061		
184	184	8.639	-0.061		
185	185	8.639	-0.061		
186	186	8.64	-0.06		
187	187	8.64	-0.06		
188	188	8.64	-0.06		
189	189	8.64	-0.06		
190	190	8.641	-0.059		
191	191	8.641	-0.059		
192	192	8.641	-0.059		
193	193	8.639	-0.061		
194	194	8.64	-0.06		
195	195	8.641	-0.059		
196	196	8.641	-0.059		
197	197	8.642	-0.058		
198	198	8.642	-0.058		
199	199	8.642	-0.058		
200	200	8.642	-0.058		
201	201	8.643	-0.057		
202	202	8.643	-0.057		
203	203	8.643	-0.057		
204	204	8.643	-0.057		
205	205	8.644	-0.056		
206	206	8.644	-0.056		
207	207	8.644	-0.056		
208	208	8.644	-0.056		
209	209	8.644	-0.056		
210	210	8.644	-0.056		
211	211	8.645	-0.055		
212	212	8.645	-0.055		
213	213	8.645	-0.055		
214	214	8.647	-0.053		
215	215	8.647	-0.053		
216	216	8.647	-0.053		
217	217	8.647	-0.053		
218	218	8.647	-0.053		
219	219	8.647	-0.053		
220	220	8.648	-0.052		
221	221	8.648	-0.052		
222	222	8.648	-0.052		
223	223	8.649	-0.051		

				Slug Test - Water Level Data	Page 5 of 7
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
224	224	8.649	-0.051		
225	225	8.649	-0.051		
226	226	8.65	-0.05		
227	227	8.65	-0.05		
228	228	8.651	-0.049		
229	229	8.651	-0.049		
230	230	8.652	-0.048		
231	231	8.652	-0.048		
232	232	8.652	-0.048		
233	233	8.653	-0.047		
234	234	8.653	-0.047		
235	235	8.653	-0.047		
236	236	8.654	-0.046		
237	237	8.654	-0.046		
238	238	8.654	-0.046		
239	239	8.655	-0.045		
240	240	8.655	-0.045		
241	241	8.656	-0.044		
242	242	8.656	-0.044		
243	243	8.656	-0.044		
244	244	8.657	-0.043		
245	245	8.657	-0.043		
246	246	8.657	-0.043		
247	247	8.658	-0.042		
248	248	8.658	-0.042		
249	249	8.658	-0.042		
250	250	8.659	-0.041		
251	251	8.659	-0.041		
252	252	8.659	-0.041		
253	253	8.66	-0.04		
254	254	8.66	-0.04		
255	255	8.66	-0.04		
256	256	8.661	-0.039		
257	257	8.659	-0.041		
258	258	8.661	-0.039		
259	259	8.661	-0.039		
260	260	8.662	-0.038		
261	261	8.663	-0.037		
262	262	8.663	-0.037		
263	263	8.663	-0.037		
264	264	8.663	-0.037		
265	265	8.664	-0.036		
266	266	8.664	-0.036		
267	267	8.665	-0.035		
268	268	8.665	-0.035		
269	269	8.665	-0.035		
270	270	8.666	-0.034		
271	271	8.666	-0.034		
272	272	8.666	-0.034		
273	273	8.667	-0.033		
274	274	8.667	-0.033		
275	275	8.667	-0.033		
276	276	8.668	-0.032		
277	277	8.668	-0.032		
278	278	8.669	-0.031		
279	279	8.669	-0.031		
280	280	8.669	-0.031		

				Slug Test - Water Level Data	Page 6 of 7
				Project: TRP	
				Number: 26200.000.001	
				Client: TRPL	
	Time [s]	Water Level [m]	WL Change [m]		
281	281	8.669	-0.031		
282	282	8.67	-0.03		
283	283	8.67	-0.03		
284	284	8.67	-0.03		
285	285	8.67	-0.03		
286	286	8.67	-0.03		
287	287	8.671	-0.029		
288	288	8.671	-0.029		
289	289	8.671	-0.029		
290	290	8.671	-0.029		
291	291	8.671	-0.029		
292	292	8.672	-0.028		
293	293	8.672	-0.028		
294	294	8.672	-0.028		
295	295	8.672	-0.028		
296	296	8.672	-0.028		
297	297	8.672	-0.028		
298	298	8.672	-0.028		
299	299	8.673	-0.027		
300	300	8.673	-0.027		
301	301	8.672	-0.028		
302	302	8.673	-0.027		
303	303	8.673	-0.027		
304	304	8.674	-0.026		
305	305	8.674	-0.026		
306	306	8.674	-0.026		
307	307	8.674	-0.026		
308	308	8.675	-0.025		
309	309	8.675	-0.025		
310	310	8.675	-0.025		
311	311	8.675	-0.025		
312	312	8.675	-0.025		
313	313	8.675	-0.025		
314	314	8.675	-0.025		
315	315	8.675	-0.025		
316	316	8.675	-0.025		
317	317	8.676	-0.024		
318	318	8.676	-0.024		
319	319	8.676	-0.024		
320	320	8.676	-0.024		
321	321	8.674	-0.026		
322	322	8.675	-0.025		
323	323	8.675	-0.025		
324	324	8.676	-0.024		
325	325	8.676	-0.024		
326	326	8.677	-0.023		
327	327	8.677	-0.023		
328	328	8.677	-0.023		
329	329	8.677	-0.023		
330	330	8.677	-0.023		
331	331	8.677	-0.023		
332	332	8.677	-0.023		
333	333	8.678	-0.022		
334	334	8.678	-0.022		
335	335	8.678	-0.022		
336	336	8.678	-0.022		
337	337	8.678	-0.022		

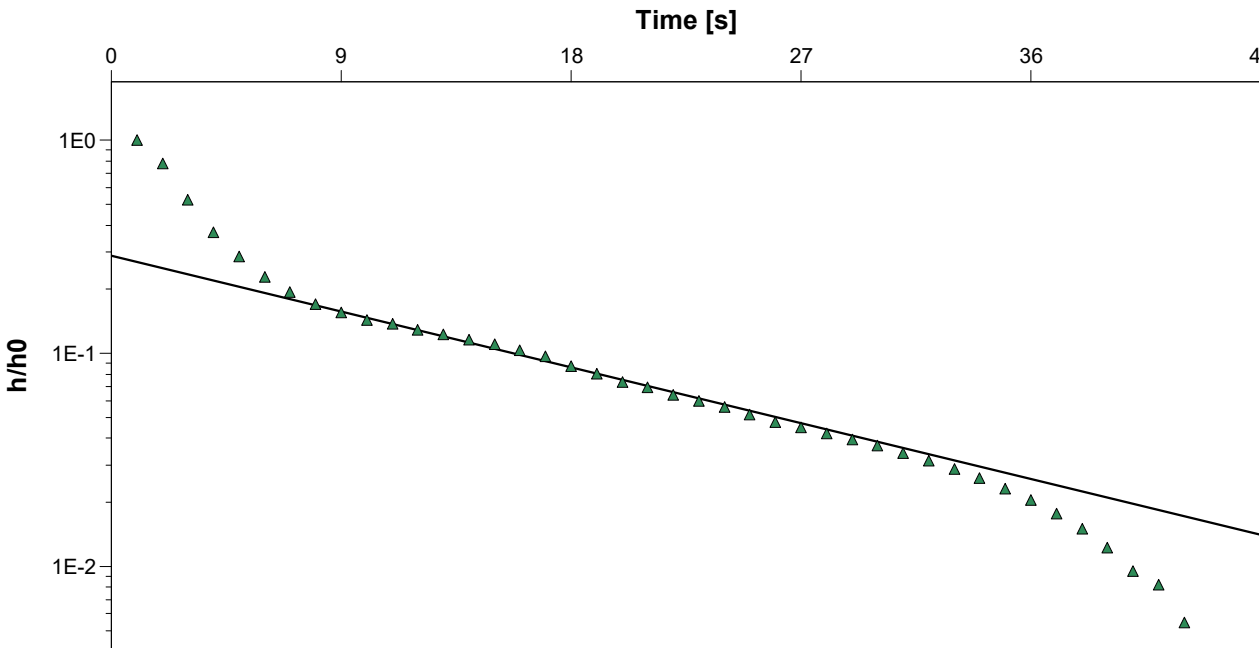
Client:	TRPL
---------	------

	Time [s]	Water Level [m]	WL Change [m]
338	338	8.678	-0.022
339	339	8.678	-0.022
340	340	8.678	-0.022
341	341	8.678	-0.022
342	342	8.678	-0.022
343	343	8.679	-0.021

			Slug Test Analysis Report		
			Project: TRP		
			Number: 26200.000.001		
			Client: TRPL		
Location: Taylorville, Coal Creek		Slug Test: MB14 in.2		Test Well: MB14	
Test Conducted by: J. Green				Test Date: 16/01/2025	
Analysis Performed by: L. Nugent		MB14 slug in (2)		Analysis Date: 21/01/2025	
Aquifer Thickness: 6.80 m					
Time [s] -25.2130285.3440.5595.8751 h/h0 1E01E-11E-2 					
Calculation using Bouwer & Rice					
Observation Well		Hydraulic Conductivity [m/s]			
MB14		1.30 × 10 ⁻⁶			

				Slug Test - Analyses Report				
				Project: TRP				
				Number: 26200.000.001				
				Client: TRPL				
Location: Taylorville, Coal Creek			Slug Test: MB14 in.2			Test Well: MB14		
Test Conducted by: J. Green						Test Date: 16/01/2025		
Aquifer Thickness: 6.80 m								
	Analysis Name	Analysis Performed	Analysis Date	Method name	Well	T [m²/s]	K [m/s]	S
1	MB14 slug in (2)	L. Nugent	21/01/2025	Bouwer & Rice	MB14		1.30 × 10 ⁻⁶	

				Slug Test - Water Level Data		Page 1 of 1
				Project: TRP		
				Number: 26200.000.001		
				Client: TRPL		
Location: Taylorville, Coal Creek		Slug Test: MB14 out.2			Test Well: MB14	
Test Conducted by: J. Green			Test Date: 16/01/2025			
Water level at t=0 [m]: 9.43		Static Water Level [m]: 8.70			Water level change at t=0 [m]: 0.73	
	Time [s]	Water Level [m]	WL Change [m]			
1	1	9.433	0.733			
2	2	9.271	0.571			
3	3	9.085	0.385			
4	4	8.972	0.272			
5	5	8.909	0.209			
6	6	8.867	0.167			
7	7	8.842	0.142			
8	8	8.825	0.125			
9	9	8.814	0.114			
10	10	8.805	0.105			
11	11	8.801	0.101			
12	12	8.795	0.095			
13	13	8.79	0.09			
14	14	8.785	0.085			
15	15	8.781	0.081			
16	16	8.776	0.076			
17	17	8.771	0.071			
18	18	8.764	0.064			
19	19	8.759	0.059			
20	20	8.754	0.054			
21	21	8.751	0.051			
22	22	8.747	0.047			
23	23	8.744	0.044			
24	24	8.741	0.041			
25	25	8.738	0.038			
26	26	8.735	0.035			
27	27	8.733	0.033			
28	28	8.731	0.031			
29	29	8.729	0.029			
30	30	8.727	0.027			
31	31	8.725	0.025			
32	32	8.723	0.023			
33	33	8.721	0.021			
34	34	8.719	0.019			
35	35	8.717	0.017			
36	36	8.715	0.015			
37	37	8.713	0.013			
38	38	8.711	0.011			
39	39	8.709	0.009			
40	40	8.707	0.007			
41	41	8.706	0.006			
42	42	8.704	0.004			
43	43	8.702	0.002			
44	44	8.701	0.001			

			Slug Test Analysis Report		
			Project: TRP		
			Number: 26200.000.001		
			Client: TRPL		
Location: Taylorville, Coal Creek		Slug Test: MB14 out.2		Test Well: MB14	
Test Conducted by: J. Green				Test Date: 16/01/2025	
Analysis Performed by: L. Nugent		MB14 slug out (2)		Analysis Date: 21/01/2025	
Aquifer Thickness: 6.80 m					
Time [s] 					
Calculation using Bouwer & Rice					
Observation Well		Hydraulic Conductivity			
		[m/s]			
MB14		1.04 × 10 ⁻⁵			

				Slug Test - Analyses Report				
				Project: TRP				
				Number: 26200.000.001				
				Client: TRPL				
Location: Taylorville, Coal Creek			Slug Test: MB14 out.2			Test Well: MB14		
Test Conducted by: J. Green						Test Date: 16/01/2025		
Aquifer Thickness: 6.80 m								
	Analysis Name	Analysis Performed	Analysis Date	Method name	Well	T [m²/s]	K [m/s]	S
1	MB14 slug out (2)	L. Nugent	21/01/2025	Bouwer & Rice	MB14		1.04 × 10 ⁻⁵	

APPENDIX 2

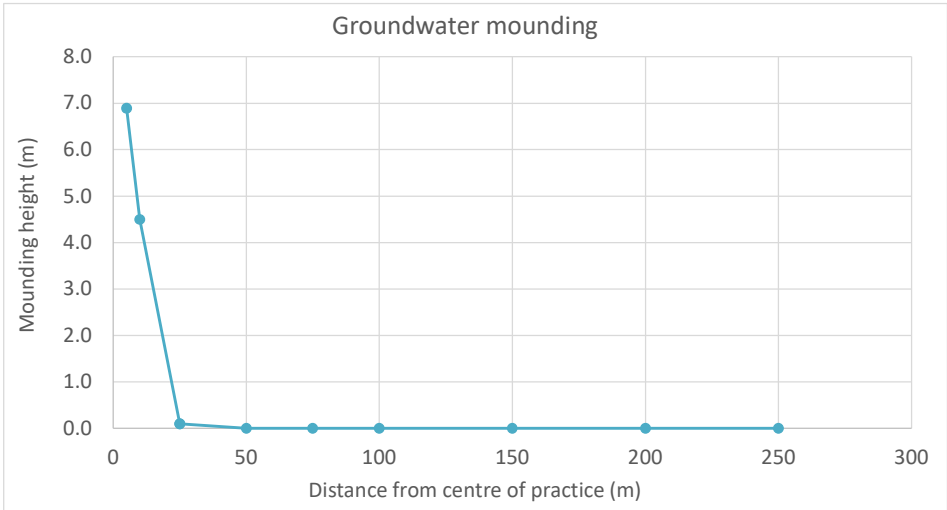
Updated Hantush Model

This spreadsheet will calculate the height of a groundwater mound beneath an stormwater infiltration BMP.
More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102
"Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

[Go to the USGS report](#)

Input Values		
Recharge (infiltration) rate (m/day)	2.000	R
Specific yield, S_y (dimensionless)	0.190	S_y
Horizontal hydraulic conductivity, K_h (m/day)	0.860000	K_h
1/2 length of basin (x direction, in m)	10.0	x
1/2 width of basin (y direction, in m)	10.0	y
Duration of infiltration period (days)	1	t
Initial thickness of saturated zone (m)	8.0	$h_i(0)$

CALCULATE



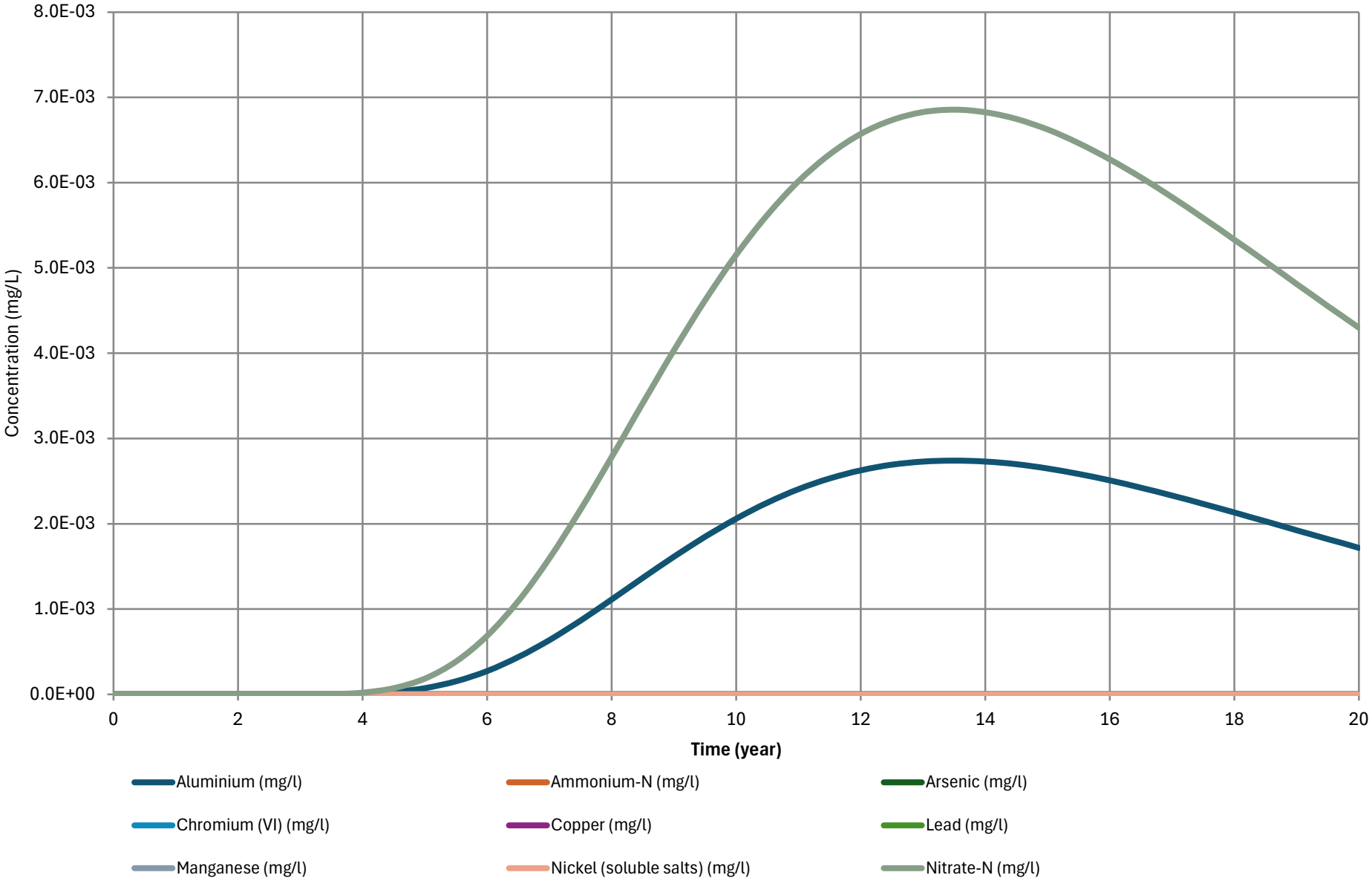
Distance from center of infiltration BMP (m)	Ground-water mounding (m)
5	6.89
10	4.50
25	0.10
25	0.10
50	0.00
75	0.00
100	0.00
150	0.00
200	0.00
250	0.00

IF YOU CHANGE THE SCALE OF THE
DISTANCE MEASUREMENTS
(OR ANY OTHER PARAMETER),
YOU MUST RECALCULATE!!

APPENDIX 3

Updated RISC5 Model

Soakage Area to 310 m Downgradient Well (0.86 m/d)



[illegible]

Summary of Input Values Used in Fate and Transport Model

Model Description:

Source media: Groundwater (dissolved phase concentration)

Saturated zone model (dissolved phase source)

Aquifer Properties		
Effective porosity	cm3/cm3	3.0E-01
Fraction organic carbon	g oc/g soil	1.0E-03
Hydraulic conductivity	m/d	1.1E-01
Soil bulk density	g/cm3	1.6E+00
Hydraulic gradient	m/m	1.8E-02

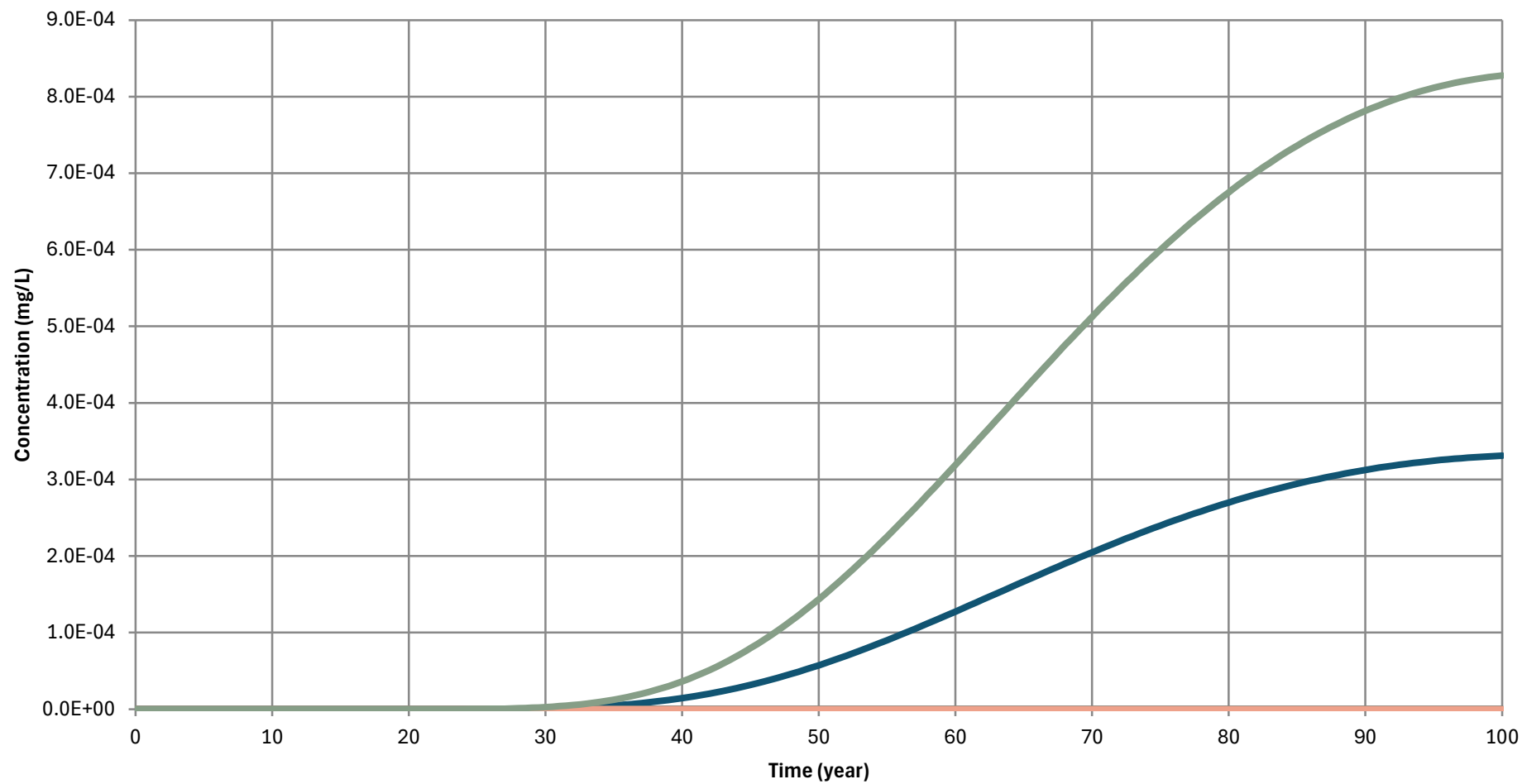
Groundwater Source Geometry		
***Pulse Source. Length of pulse:	yr	5.0E-01
Total thickness of source	m	8.0E+00
Length of source	m	1.0E+01
Width of source	m	1.0E+01

Receptor Well Location		
Distance downgradient	m	3.1E+02
Distance cross-gradient	m	0.0E+00
Depth to top of well screen	m	0.0E+00
Depth to bottom of well screen	m	5.0E+00
Number of vertical points used to calculate conc.	-	5.0E+00
Longitudinal dispersivity code calculated. See output file.		
Transverse dispersivity code calculated. See output file.		
Vertical dispersivity code calculated. See output file.		

Dissolved Source for Groundwater Model [mg/l]		
Total Aluminium	mg/l	2.6E+00
Ammonium-N	mg/l	9.8E+01
Total Arsenic	mg/l	9.8E-01
Total Chromium	mg/l	2.2E-01
Total Copper	mg/l	1.9E-01
Total Lead	mg/l	1.3E-02
Total Manganese	mg/l	6.7E+00
Total Nickel	mg/l	1.6E-01
Nitrate-N	mg/l	6.5E+00

[illegible]

Soakage Area to 310 m Downgradient Well (0.11 m/d)



— Aluminium (mg/l)

— Ammonium-N (mg/l)

— Arsenic (mg/l)

— Chromium (VI) (mg/l)

— Copper (mg/l)

— Lead (mg/l)

— Manganese (mg/l)

— Nickel (soluble salts) (mg/l)

— Nitrate-N (mg/l)

Time	Aluminium	Ammonium-N	Arsenic	Chromium (VI)	Copper	Lead	Manganese	Nickel (soluble salts)	Nitrate-N
(year)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
3	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
4	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
5	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
6	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
7	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
8	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
9	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
12	2.8E-14	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.0E-14
13	3.4E-13	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.4E-13
14	2.4E-12	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E-12
15	1.3E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.3E-11
16	5.7E-11	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-10
17	2.1E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.2E-10
18	6.5E-10	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E-09
19	1.8E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.5E-09
20	4.4E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-08
21	1.0E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E-08
22	2.1E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.2E-08
23	4.1E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-07
24	7.4E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E-07
25	1.3E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.2E-07
26	2.2E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.4E-07
27	3.4E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.6E-07
28	5.3E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E-06
29	7.9E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-06
30	1.1E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.8E-06
31	1.6E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.0E-06
32	2.2E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.5E-06
33	3.0E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.4E-06
34	3.9E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.7E-06
35	5.0E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E-05
36	6.4E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E-05
37	8.0E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-05
38	9.9E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E-05
39	1.2E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E-05
40	1.5E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.6E-05
41	1.7E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.3E-05
42	2.0E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.1E-05
43	2.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E-05
44	2.8E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.9E-05
45	3.2E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.0E-05
46	3.6E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.1E-05
47	4.1E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-04
48	4.6E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-04

[illegible]

APPENDIX 4

Ecological Survey

APPENDIX 5

Water Quality Comparison

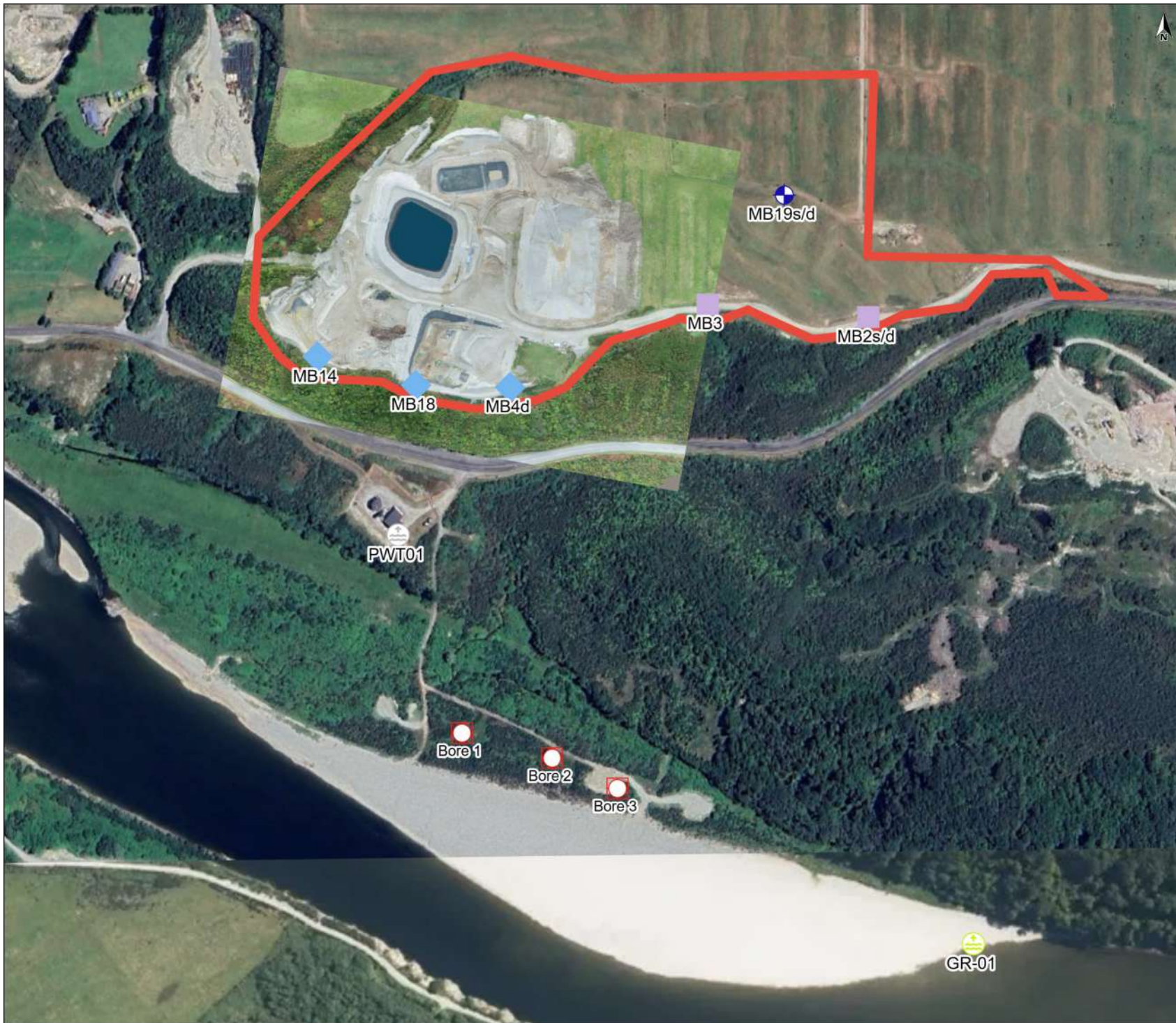
Table A5.1: Excerpt of Sample Results

	GRE001	Grey River	Upgradient / Cross-Gradient of Operations						Downgradient of Operations				Upgradient	
	PWT01	GR-01	MB2s		MB2d		MB3		MB4d		MB14	MB18	MB19s	MB19d
	16/01/25	16/01/25	30/07/24	14/10/24	30/07/24	14/10/24	30/07/24	14/10/24	30/07/24	16/10/24	14/10/24	10/11/24	15/10/24	15/10/24
Sum of Anions	0.63	0.67	0.84	0.84	3.9	3.7	0.74	0.77	1.8	1.12	11	17.3	2.9	9.7
Sum of Cations	0.63	0.65	0.89	0.89	3.9	3.9	0.8	0.8	1.91	1.16	11.8	18.7	3.2	10.5
An/Cat balance (%)	0%	2%	-3%	-3%	0%	-3%	-4%	-2%	-3%	-2%	-4%	-4%	-5%	-4%
pH	6.4	7.2	6.1	5.6	6.8	6.7	6	5.7	6.5	6.2	7.3	6.5	6.2	7.1
Total Alkalinity	20	24	19.2	18.7	176	169	16.2	16	43	24	350	330	54	290
Carbonate	< 1.0	< 1.0	-	< 1.0	-	< 1.0	-	< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	24	29	23	23	210	210	19.8	19.6	53	29	430	400	66	360
Total Hardness	21	22	32	32	50	50	28	28	76	43	470	690	113	330
Electrical conductivity (mS/m)	6.6	6.6	9.8	9.9	35.8	34.9	8.9	9.1	19.9	12.7	100.7	157.9	30.5	89.7
Dissolved calcium	6.7	7.2	11.1	11.3	13.3	13.2	9.4	9.6	28	15.8	173	240	34	102
Dissolved magnesium	0.98	1.08	1.1	1.04	4.1	4.1	1.04	1.03	1.64	1	9.4	23	6.6	18.5
Dissolved potassium	0.84	0.77	0.89	0.86	1.59	1.65	0.69	0.69	0.79	0.94	16.4	22	2.2	8.3
Dissolved sodium	4.2	4.3	4.9	4.6	64	64	4.9	4.8	8.4	5.9	27	62	18.6	71
Chloride	4.4	4.5	7.8	7.8	11.1	11.8	7	7.8	7	6.7	24	33	10	15.2
Total-N	0.2	0.15		1.2		0.71		1.54		1.53	6.3	21	1.97	10.7
Total Ammoniacal-N	< 0.010	< 0.010	< 0.010	< 0.010	0.25	0.27	< 0.010	< 0.010	0.039	< 0.010	4.1	18.7	0.5	3.0
Nitrite-N	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.003	< 0.002	< 0.002	0.034	< 0.002	< 0.02	< 0.002	0.009	< 0.002
Nitrate-N	0.17	0.091	1.23	1.12	< 0.002	0.007	1.42	1.43	1.92	1.41	< 0.02	< 0.002	0.36	< 0.002
Nitrite+Nitrate-N	0.17	0.091	1.23	1.12	< 0.002	0.01	1.42	1.43	1.95	1.41	< 0.02	< 0.002	0.37	< 0.002
TKN	< 0.10	< 0.10		< 0.10		0.7		0.1		0.11	6.3	21	1.6	10.7
Sulphate	4.3	2.4	6.9	7.9	0.6	0.9	5.8	6.3	29	17	158	470	71	165
Dissolved arsenic	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0075	0.017	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.026	0.12	0.0049	0.014
Dissolved cadmium	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved chromium	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.013	0.0047	0.0017	0.0055
Dissolved copper	0.193	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0013	0.0007
Dissolved lead	0.006	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	0.0003	0.00014	0.00036
Dissolved nickel	0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0019	0.0039	0.002	0.0044
Dissolved zinc	0.15	< 0.0010	0.0034	0.0021	< 0.0010	0.0014	0.0033	0.0018	0.0018	0.0014	0.0091	0.0087	0.0027	0.008

Notes:

All values provided in units of milligrams per liter (mg/L) unless otherwise specified.

< Below the laboratory reporting limit (<RL)



- Legend**
- GRE001
 - Grey River Sample Location
 - Upgradient Monitoring Well
 - Crossgradient Sample Locations
 - Downgradient Sample Locations
 - GRE001 Abstraction Wells
 - Approximate Site Boundary

0 50 m 100 m
LINZ CC BY 4.0 © Imagery Basemap contributors

ENGEO

Produced by **Datanest.earth**

Title: Ion Assessment Sample Locations		
Client: Taylorville Resource Park Ltd		Size: A4
Project: Taylorville Resource Park	Drawn: LN	Figure: A5.1
Date: 28-01-2025	Checked: DR	
Proj No: 26200.000.001	Scale: 1:5000	Version: 1.0

Figure A5.2 Extended Durov Class Scatter

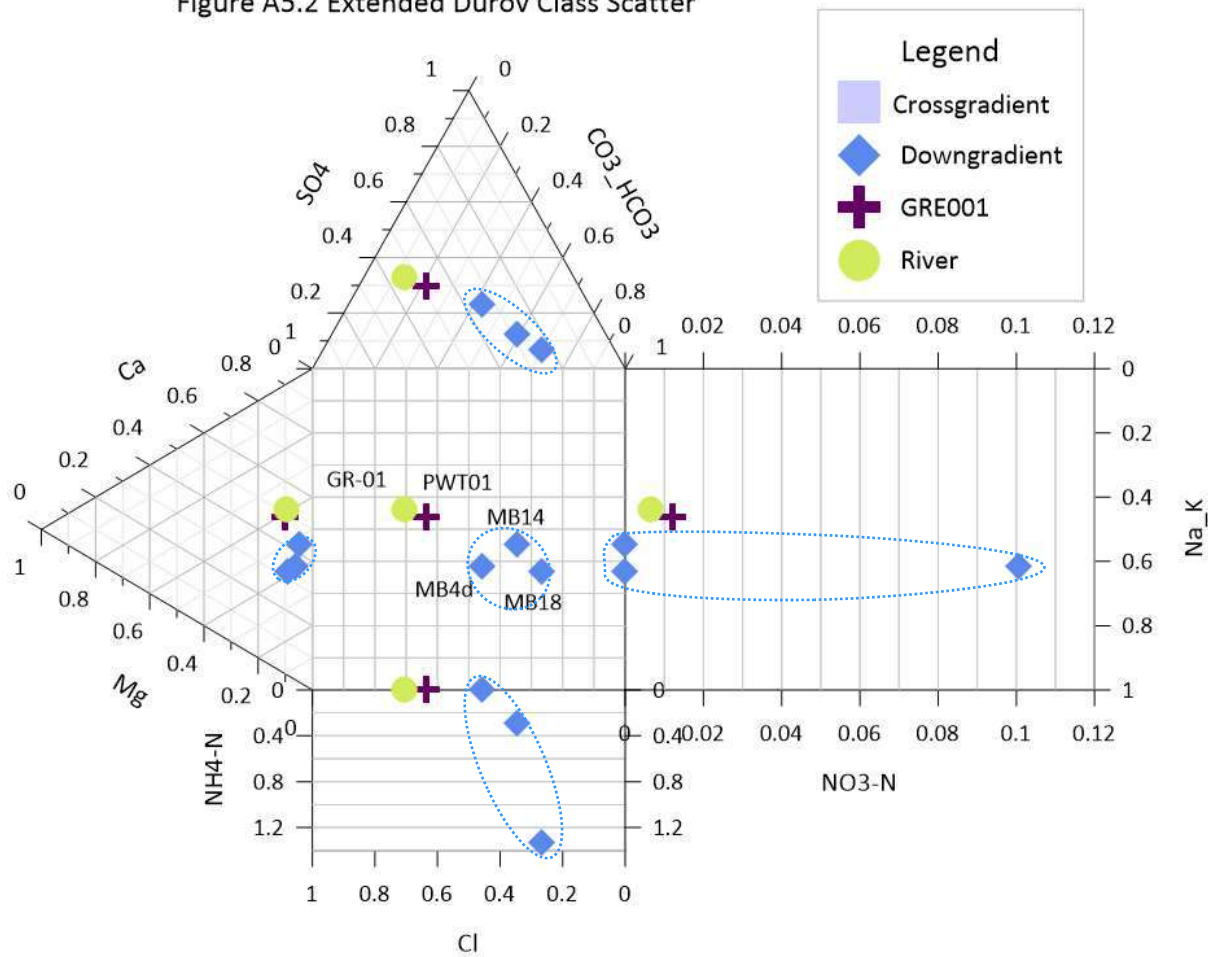
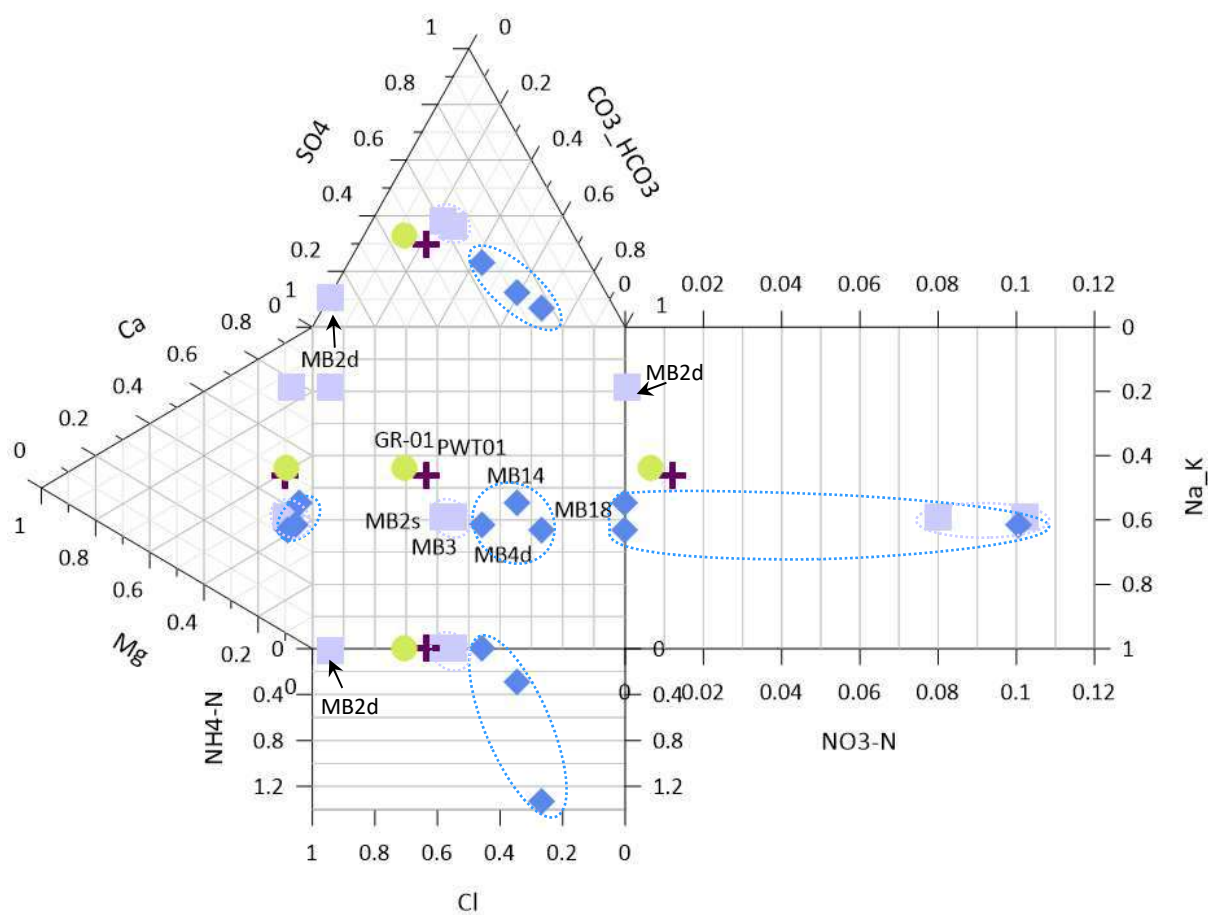


Figure A5.3 Extended Durov Class Scatter



APPENDIX 6

Aquifer Testing Information

McMILLAN Drilling

FINAL DELIVERABLES FOR GREY DISTRICT COUNCIL

Coal Creek WTP Bore Installation (2021-22-26a) - Drilling
and testing of one new production bore



Handover Documentation

Coal Creek WTP Bore Installation (2021-22-26a)

☒ Producer Statement

BH01 (decommissioned)

☒ Final Bore Log

BH02 (production)

☒ Final Bore Log

☒ Step Rate Pumping Test - 9/05/2023

- Graphs
- Manual readings - pumped bore

☒ Constant Discharge Pumping Test - 9/05/2023 - 10/05/2023

- Graphs
- Manual readings - pumped bore

☒ Mill Test Certificate

- DN300 casing - stainless steel

Separate Files

☒ Sentinel Data includes drawdowns and flowrates (vented level transducer)

SIXTH SCHEDULE**FORM OF PRODUCER STATEMENT - CONSTRUCTION**

ISSUED BY:McMillan Drilling Ltd (Contractor)

TO:Grey District Council (Principal)

IN RESPECT OF:..... Drilling of one New Well

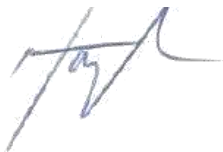
AT: Coal Creek, Greymouth

McMillan Drilling Ltd (Contractor) has contracted to Grey District Council (Principal) to carry out and complete works in accordance with the contract documents titled **GDC 2021-22-26a Coal Creek WTP Bore Installation - Drilling Investigation**.

- BH01 - 10.8m deep (decommissioned)
- BH02 - 10.5m deep (production)

I Iain Haycock a duly authorised representative of McMillan Drilling Ltd believe on reasonable grounds that McMillan Drilling Ltd has carried out and completed:

- ☒ All works as specified in the contract and all works were carried out in accordance with NZS 4411:2001 (Environmental Standard for Drilling of Soil and Rock) and that the wells have been adequately sealed to prevent ingress of contaminants from the surface.
- ☐ Part only as specified in the attached particulars of the contract works in accordance with the Contract.



(Signature of Authorized Agent on behalf of)

Date: 11/05/2023

McMillan Drilling Ltd
(Contractor)

120 High Street Southbridge, 7602
(Address)



Client:	Grey District Council	Bore No.:	BH01
Project:	Drilling of New 12" (300mm) Well	Job No.:	20874

Site Location: Coal Creek, GREYMOUTH
Grid Reference: 1457012m E, 5298980m N (NZTM) Map or aerial photograph
Lot Number:

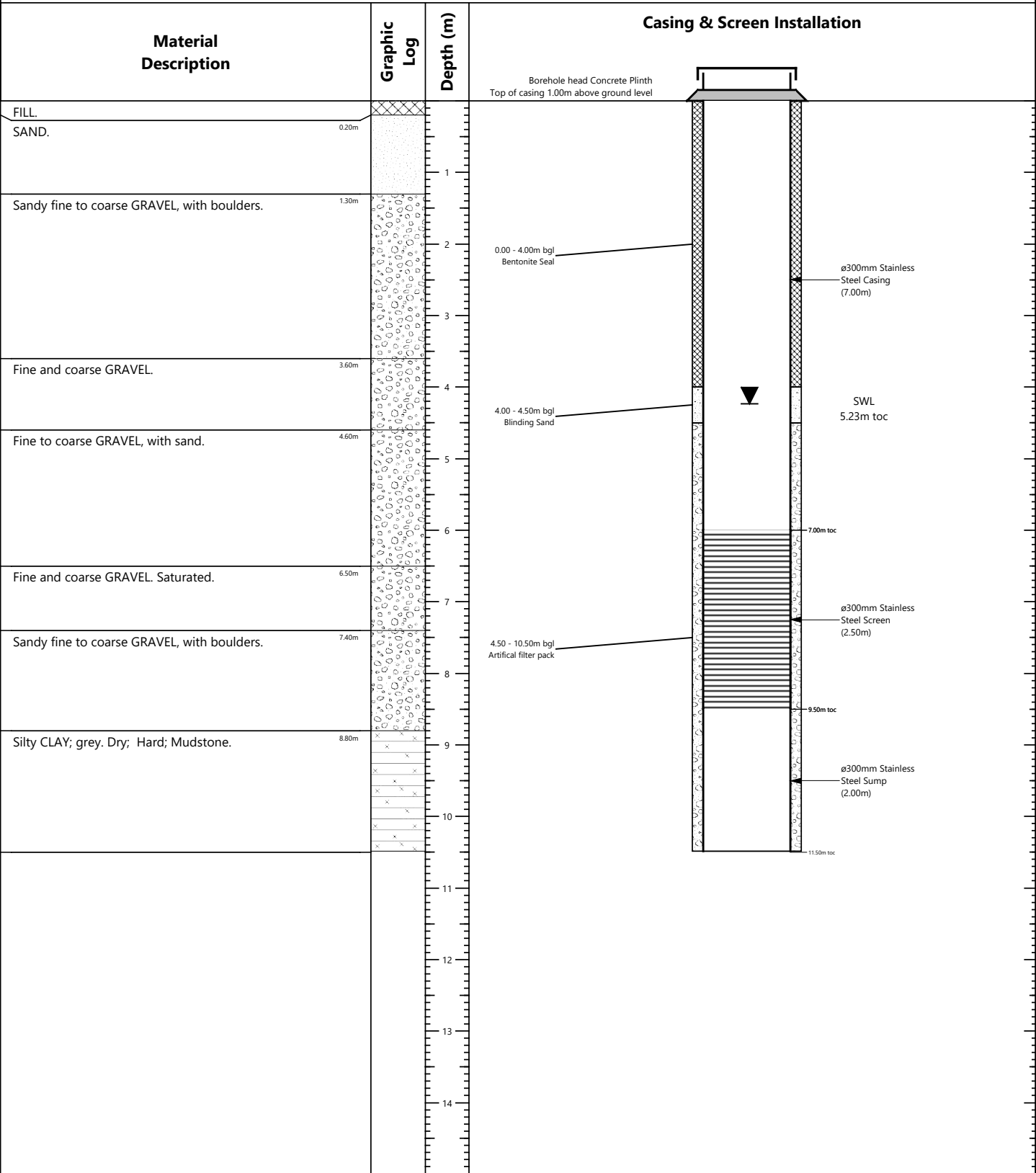
Date: 2/12/2022
Rig Operator: A. Harkerss
Method / Rig: Cable Tool

Material Description	Graphic Log	Depth (m)	Casing & Screen Installation
FILL.			
CLAY; brown.		0.40m	
Sandy fine to coarse GRAVEL.		0.80m	
Coarse SAND, with gravel and boulders; grey.		2.90m	
Sandy fine to coarse GRAVEL; grey. Some staining.		8.00m	
Clayey GRAVEL; brown.		8.60m	
Silty CLAY; grey. Dry; Mudstone.		8.70m	
		11	
		12	
		13	
		14	

Remarks: Insufficient water found - all casing removed, backfilled & sealed to surface.	Development Duration (hr):	Flow Rate (gpm) (l/sec)	Draw Down (m)	Duration (hr)
Bore Diameter: 450mm Total Bore Depth: -	Static Water Level: - Total Depth Drilled: 10.80m bgl	Pumping Duration (hr):		

Client:	Grey District Council	Bore No.:	BH02
Project:	Drilling of New 12" (300mm) Well	Job No.:	20874

Method / Rig: Cable Tool



Remarks: Production Bore Bore completed with DN300 table E flange, blank and dressing kit. 24hr constant rate test influenced by rising river levels - resultant draw down not reported (refer electronic data & graphs)		Development Duration (hr): 17.25	<table border="1"> <thead> <tr> <th colspan="2">Flow Rate</th> <th>Draw Down</th> <th>Duration</th> </tr> <tr> <th>(gpm)</th> <th>(l/sec)</th> <th>(m)</th> <th>(hr)</th> </tr> </thead> <tbody> <tr> <td>528</td> <td>40.0</td> <td>0.41</td> <td>1.00</td> </tr> <tr> <td>660</td> <td>50.0</td> <td>0.61</td> <td>1.00</td> </tr> <tr> <td>792</td> <td>60.0</td> <td>0.79</td> <td>1.00</td> </tr> <tr> <td>924</td> <td>70.0</td> <td>1.03</td> <td>1.00</td> </tr> </tbody> </table>	Flow Rate		Draw Down	Duration	(gpm)	(l/sec)	(m)	(hr)	528	40.0	0.41	1.00	660	50.0	0.61	1.00	792	60.0	0.79	1.00	924	70.0	1.03	1.00
Flow Rate		Draw Down	Duration																								
(gpm)	(l/sec)	(m)	(hr)																								
528	40.0	0.41	1.00																								
660	50.0	0.61	1.00																								
792	60.0	0.79	1.00																								
924	70.0	1.03	1.00																								
Bore Diameter: 450mm Static Water Level: 5.23m btoc Total Bore Depth: 11.50m toc Total Depth Drilled: 10.50m bgl		Pumping Duration (hr): 28																									



Client:

Grey District Council

Bore No.:

BH02 - Production

Project:

Coal Creek WTP Bore Installation (2021-22-26a)

Job No.:

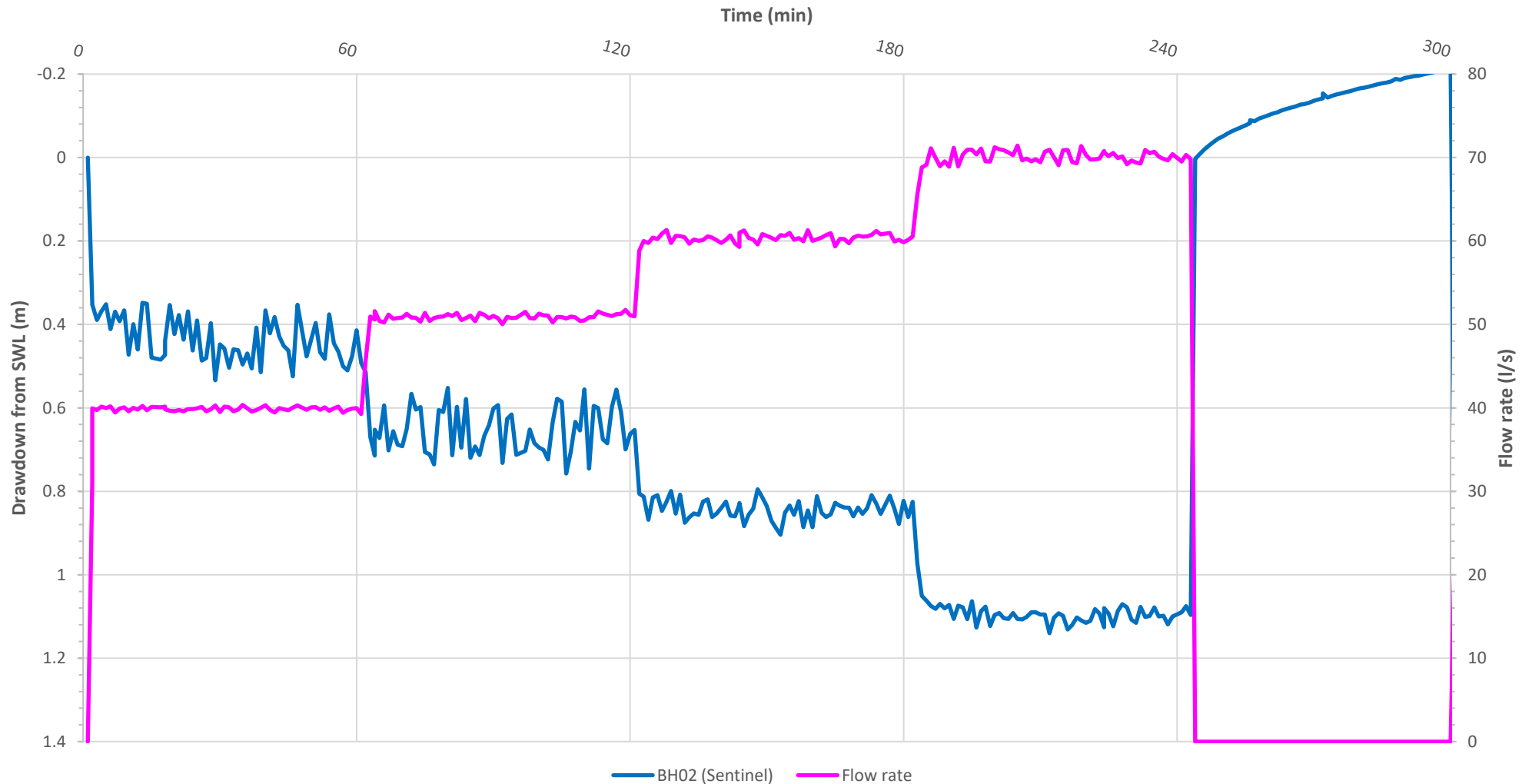
20874

Stepped Drawdown and Sand Test

Site Location: Coal Creek, GREYMOUTH

Static water level: 4.77m btoc

Date: 9/5/2023

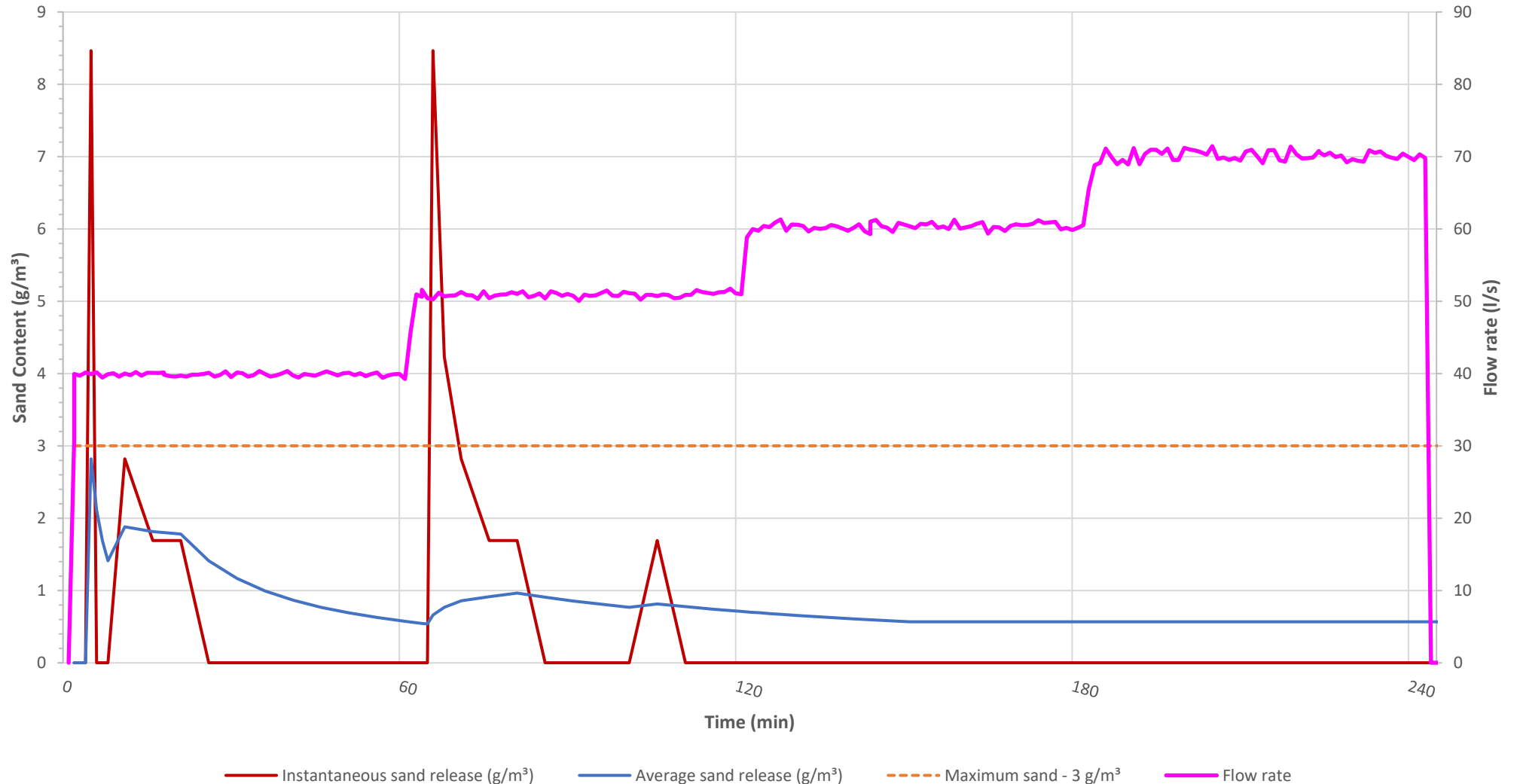


Client:	Grey District Council	Bore No.:	BH02 - Production
Project:	Coal Creek WTP Bore Installation (2021-22-26a)	Job No.:	20874

Sand release test

Site Location: Coal Creek, GREYMOUTH

Date: 9/5/2023



	Client: Grey District Council	Bore No.: BH02 - Production
	Project: Coal Creek WTP Bore Installation (2021-22-26a)	Job No.: 20874

Stepped Drawdown and Sand Test

Site Location: Coal Creek, GREYMOUTH

Start date: 9/5/2023

Water level: 4.77m btoc (SWL)

Finish date: 9/5/2023

Top of casing: 1.00m agl

Well depth: 10.50m toc

Step / min	Date	Time	Water depth (m)	Drawdown (m)	Pumping rate (l/s)	Sand (ml)	Comments
1 / 1	9/5/2023	8:01	5.15	0.38	40.09	0.000	
1 / 2	9/5/2023	8:02	5.15	0.38	40.07	0.000	
1 / 3	9/5/2023	8:03	5.15	0.38	40.07	0.000	
1 / 4	9/5/2023	8:04	5.15	0.38	40.00	0.010	
1 / 5	9/5/2023	8:05	5.15	0.38	40.30	0.010	
1 / 6	9/5/2023	8:06	5.15	0.38	40.01	0.010	
1 / 7	9/5/2023	8:07	5.15	0.38	40.00	0.010	
1 / 10	9/5/2023	8:10	5.15	0.38	40.30	0.010	
1 / 15	9/5/2023	8:15	5.16	0.39	40.20	0.010	
1 / 20	9/5/2023	8:20	5.17	0.40	40.10	0.010	
1 / 25	9/5/2023	8:25	5.17	0.40	40.00	0.010	
1 / 30	9/5/2023	8:30	5.17	0.40	40.40	0.010	
1 / 35	9/5/2023	8:35	5.17	0.40	40.10	0.010	
1 / 40	9/5/2023	8:40	5.18	0.41	40.00	0.010	
1 / 45	9/5/2023	8:45	5.18	0.41	40.10	0.010	
1 / 50	9/5/2023	8:50	5.18	0.41	39.90	0.010	
1 / 55	9/5/2023	8:55	5.18	0.41	39.90	0.010	
1 / 60	9/5/2023	9:00	5.18	0.41	40.00	0.010	

	Client: Grey District Council					Bore No.: BH02 - Production	
	Project: Coal Creek WTP Bore Installation (2021-22-26a)					Job No.: 20874	
Stepped Drawdown and Sand Test							
Site Location: Coal Creek, GREYMOUTH					Start date: 9/5/2023		
Water level: 4.77m btoc (SWL)					Finish date: 9/5/2023		
Top of casing: 1.00m agl					Well depth: 10.50m toc		
Step / min	Date	Time	Water depth (m)	Drawdown (m)	Pumping rate (l/s)	Sand (ml)	Comments
2 / 1	9/5/2023	9:01	5.35	0.58	49.80	0.000	
2 / 2	9/5/2023	9:02	5.36	0.59	51.80	0.000	
2 / 3	9/5/2023	9:03	5.36	0.59	50.90	0.000	
2 / 4	9/5/2023	9:04	5.37	0.60	50.70	0.000	
2 / 5	9/5/2023	9:05	5.37	0.60	50.70	0.010	
2 / 7	9/5/2023	9:07	5.37	0.60	50.90	0.010	
2 / 10	9/5/2023	9:10	5.37	0.60	51.30	0.010	
2 / 15	9/5/2023	9:15	5.37	0.60	51.00	0.010	
2 / 20	9/5/2023	9:20	5.37	0.60	51.20	0.010	
2 / 25	9/5/2023	9:25	5.37	0.60	51.00	0.010	
2 / 30	9/5/2023	9:30	5.38	0.61	50.90	0.010	
2 / 35	9/5/2023	9:35	5.38	0.61	51.10	0.010	
2 / 40	9/5/2023	9:40	5.38	0.61	51.30	0.010	
2 / 45	9/5/2023	9:45	5.38	0.61	51.80	0.020	
2 / 50	9/5/2023	9:50	5.38	0.61	51.00	0.020	
2 / 55	9/5/2023	9:55	5.38	0.61	51.80	0.020	
2 / 60	9/5/2023	10:00	5.38	0.61	50.50	0.020	

	Client: Grey District Council					Bore No.: BH02 - Production	
	Project: Coal Creek WTP Bore Installation (2021-22-26a)					Job No.: 20874	
Stepped Drawdown and Sand Test							
Site Location: Coal Creek, GREYMOUTH					Start date: 9/5/2023		
Water level: 4.77m btoc (SWL)					Finish date: 9/5/2023		
Top of casing: 1.00m agl					Well depth: 10.50m toc		
Step / min	Date	Time	Water depth (m)	Drawdown (m)	Pumping rate (l/s)	Sand (ml)	Comments
3 / 1	9/5/2023	10:01	5.54	0.77	60.10	0.000	
3 / 2	9/5/2023	10:02	5.55	0.78	60.60	0.000	
3 / 3	9/5/2023	10:03	5.55	0.78	60.50	0.000	
3 / 4	9/5/2023	10:04	5.55	0.78	60.30	0.000	
3 / 5	9/5/2023	10:05	5.55	0.78	61.10	0.000	
3 / 7	9/5/2023	10:07	5.55	0.78	59.90	0.000	
3 / 10	9/5/2023	10:10	5.56	0.79	60.60	0.000	
3 / 15	9/5/2023	10:15	5.56	0.79	60.90	0.000	
3 / 20	9/5/2023	10:20	5.56	0.79	61.30	0.000	
3 / 25	9/5/2023	10:25	5.56	0.79	60.80	0.000	
3 / 30	9/5/2023	10:30	5.56	0.79	61.00	0.000	
3 / 35	9/5/2023	10:35	5.56	0.79	60.50		
3 / 40	9/5/2023	10:40	5.56	0.79	61.00		
3 / 45	9/5/2023	10:45	5.56	0.79	60.70		
3 / 50	9/5/2023	10:50	5.56	0.79	60.90		
3 / 55	9/5/2023	10:55	5.56	0.79	60.90		
3 / 60	9/5/2023	11:00	5.56	0.79	60.90		

	Client: Grey District Council					Bore No.: BH02 - Production	
	Project: Coal Creek WTP Bore Installation (2021-22-26a)					Job No.: 20874	
Stepped Drawdown and Sand Test							
Site Location: Coal Creek, GREYMOUTH					Start date: 9/5/2023		
Water level: 4.77m btoc (SWL)					Finish date: 9/5/2023		
Top of casing: 1.00m agl					Well depth: 10.50m toc		
Step / min	Date	Time	Water depth (m)	Drawdown (m)	Pumping rate (l/s)	Sand (ml)	Comments
4 / 1	9/5/2023	11:02	5.74	0.97	70.00		
4 / 2	9/5/2023	11:03	5.76	0.99	69.70		
4 / 3	9/5/2023	11:04	5.77	1.00	70.00		
4 / 4	9/5/2023	11:05	5.77	1.00	70.30		
4 / 5	9/5/2023	11:06	5.77	1.00	69.70		
4 / 7	9/5/2023	11:08	5.78	1.01	70.10		
4 / 10	9/5/2023	11:11	5.78	1.01	70.70		
4 / 15	9/5/2023	11:16	5.78	1.01	70.40		
4 / 20	9/5/2023	11:21	5.79	1.02	70.40		
4 / 25	9/5/2023	11:26	5.80	1.03	70.90		
4 / 30	9/5/2023	11:31	5.80	1.03	71.30		
4 / 35	9/5/2023	11:36	5.80	1.03	71.00		
4 / 40	9/5/2023	11:41	5.80	1.03	70.60		
4 / 45	9/5/2023	11:46	5.80	1.03	70.60		
4 / 50	9/5/2023	11:51	5.80	1.03	71.10		
4 / 55	9/5/2023	11:56	5.80	1.03	69.80		
4 / 60	9/5/2023	12:01	5.80	1.03	70.50		

	Client: Grey District Council	Bore No.: BH02 - Production
	Project: Coal Creek WTP Bore Installation (2021-22-26a)	Job No.: 20874

Stepped Drawdown and Sand Test

Site Location: Coal Creek, GREYMOUTH

Start date: 9/5/2023

Water level: 4.77m btoc (SWL)

Finish date: 9/5/2023

Top of casing: 1.00m agl

Well depth: 10.50m toc

Step / min	Date	Time	Water depth (m)	Drawdown (m)	Pumping rate (l/s)	Sand (ml)	Comments
Rec / 1	9/5/2023	12:03	4.78	0.01			
Rec / 2	9/5/2023	12:04	4.75	-0.02			
Rec / 3	9/5/2023	12:05	4.76	-0.01			
Rec / 4	9/5/2023	12:06	4.74	-0.03			
Rec / 5	9/5/2023	12:07	4.72	-0.05			
Rec / 7	9/5/2023	12:09	4.70	-0.07			
Rec / 10	9/5/2023	12:12	4.69	-0.08			
Rec / 15	9/5/2023	12:17	4.68	-0.09			
Rec / 20	9/5/2023	12:22	4.67	-0.10			
Rec / 25	9/5/2023	12:27	4.65	-0.12			
Rec / 30	9/5/2023	12:32	4.64	-0.13			
Rec / 35	9/5/2023	12:37	4.62	-0.15			
Rec / 40	9/5/2023	12:42	4.61	-0.16			
Rec / 45	9/5/2023	12:47	4.60	-0.17			
Rec / 50	9/5/2023	12:52	4.60	-0.17			
Rec / 55	9/5/2023	12:57	4.60	-0.17			
Rec / 60	9/5/2023	13:02	4.59	-0.18			

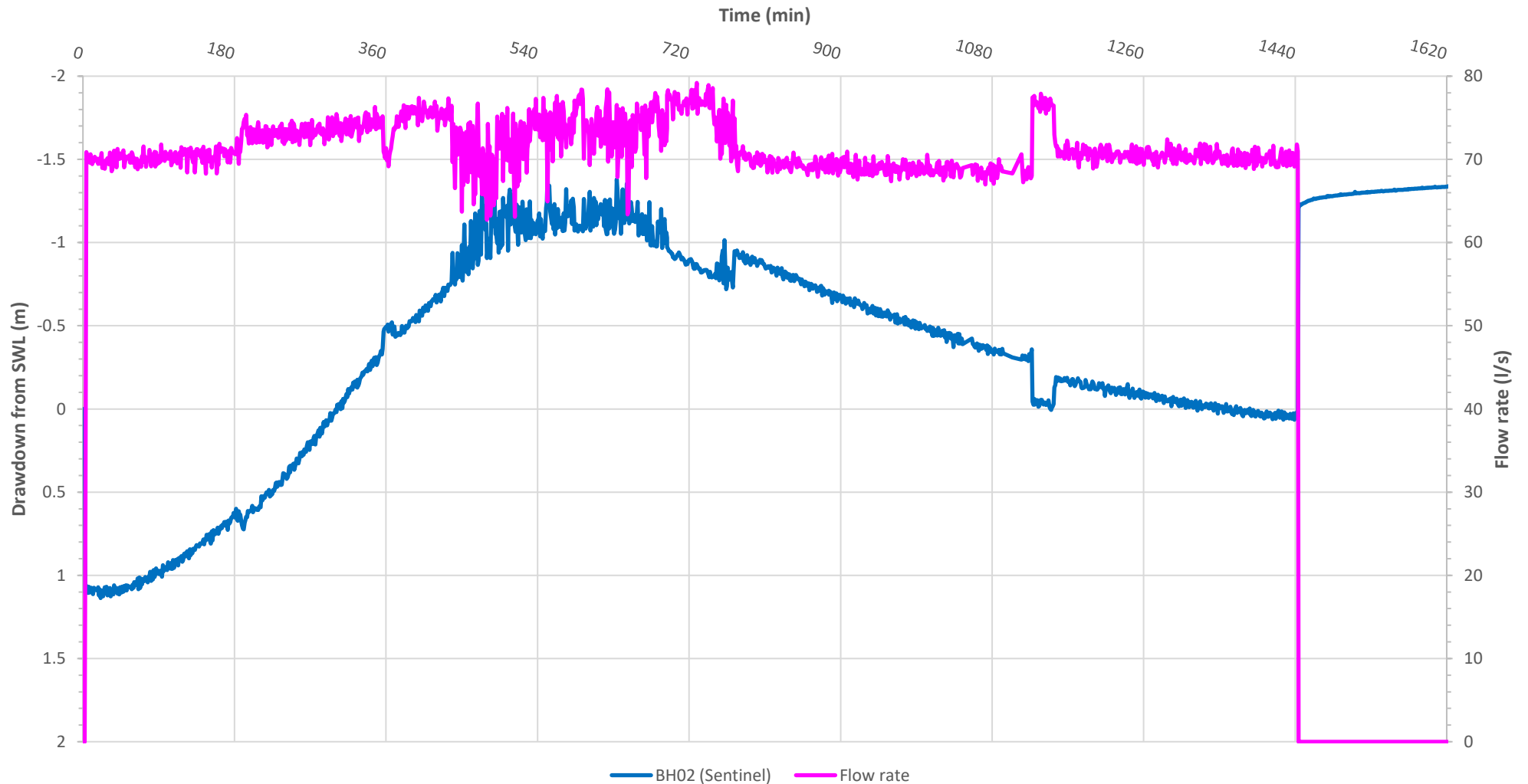
Client:	Grey District Council	Bore No.:	BH02 - Production
Project:	Coal Creek WTP Bore Installation (2021-22-26a)	Job No.:	20874

Constant Rate and Sand Test

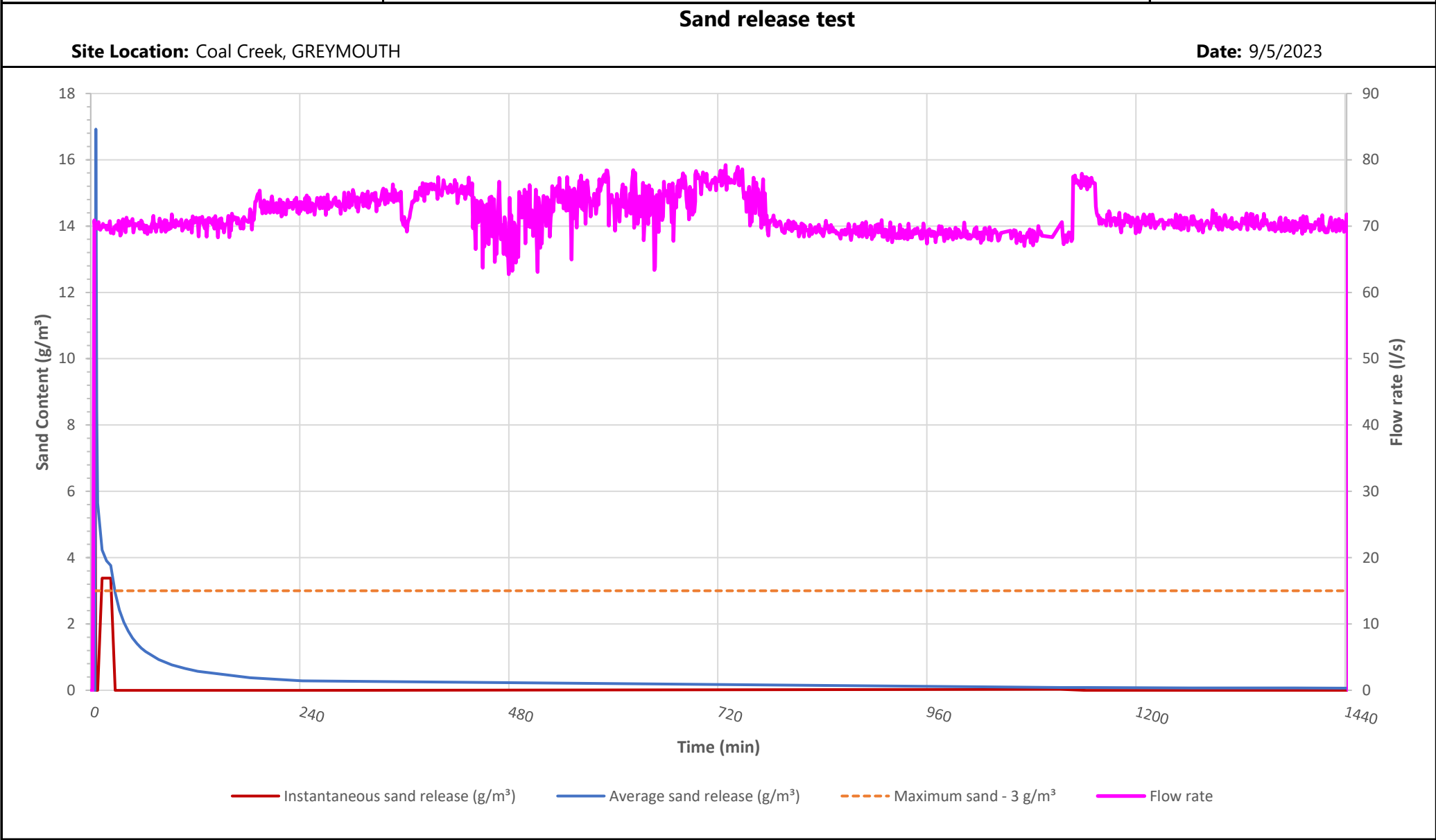
Site Location: Coal Creek, GREYMOUTH

Static water level: 4.60m btoc

Date: 9/5/2023



	Client: Grey District Council	Bore No.: BH02 - Production
	Project: Coal Creek WTP Bore Installation (2021-22-26a)	Job No.: 20874



	Client: Grey District Council					Bore No.: BH02 - Production	
	Project: Coal Creek WTP Bore Installation (2021-22-26a)					Job No.: 20874	
Constant Rate and Sand Test							
Site Location: Coal Creek, GREYMOUTH					Start date: 9/5/2023		
Water level: 4.60m btoc (SWL)					Finish date: 11/5/2023		
Top of casing: 1.00m agl					Well depth: 10.50m toc		
Step / min	Date	Time	Water depth (m)	Drawdown (m)	Pumping rate (l/s)	Sand (ml)	Comments
Constant rate	9/5/2023	13:01	5.58	0.98	70.8	0.010	
Constant rate	9/5/2023	13:02	5.58	0.98	70.70	0.020	
Constant rate	9/5/2023	13:03	5.59	0.99	70.00	0.020	
Constant rate	9/5/2023	13:04	5.59	0.99	70.10	0.020	
Constant rate	9/5/2023	13:05	5.60	1.00	70.90	0.020	
Constant rate	9/5/2023	13:10	5.60	1.00	70.40	0.020	
Constant rate	9/5/2023	13:15	5.60	1.00	70.60	0.020	
Constant rate	9/5/2023	13:20	5.60	1.00	70.20	0.020	
Constant rate	9/5/2023	13:25	5.60	1.00	70.80	0.020	
Constant rate	9/5/2023	13:30	5.60	1.00	69.90	0.020	
Constant rate	9/5/2023	13:35	5.60	1.00	70.40	0.020	
Constant rate	9/5/2023	13:40	5.60	1.00	70.10	0.020	
Constant rate	9/5/2023	13:45	5.60	1.00	70.40	0.020	
Constant rate	9/5/2023	13:50	5.60	1.00	70.60	0.020	
Constant rate	9/5/2023	13:55	5.60	1.00	70.00	0.020	
Constant rate	9/5/2023	14:00	5.59	0.99	70.20	0.020	
Constant rate	9/5/2023	14:15	5.55	0.95	71.40	0.020	Heavy rain - water in river rising
Constant rate	9/5/2023	14:30	5.50	0.90	70.90	0.020	
Constant rate	9/5/2023	14:45	5.45	0.85	70.60	0.020	
Constant rate	9/5/2023	15:00	5.40	0.80	70.30	0.020	
Constant rate	9/5/2023	16:00	5.20	0.60	71.40	0.020	
Constant rate	9/5/2023	17:00	4.94	0.34	72.60	0.020	
Constant rate	10/5/2023	7:30	4.31	-0.29	69.10	0.050	
Constant rate	10/5/2023	8:00	4.58	-0.02	75.10	0.050	Flowrate adjusted
Constant rate	10/5/2023	9:00	4.47	-0.13	69.90	0.050	
Constant rate	10/5/2023	10:00	4.51	-0.09	71.50	0.050	
Constant rate	10/5/2023	11:00	4.58	-0.02	71.10	0.050	
Constant rate	10/5/2023	12:00	4.61	0.01	71.00	0.050	
Constant rate	10/5/2023	13:00	4.65	0.05	69.90	0.050	

	Client: Grey District Council	Bore No.: BH02 - Production
	Project: Coal Creek WTP Bore Installation (2021-22-26a)	Job No.: 20874

Constant Rate and Sand Test

Site Location: Coal Creek, GREYMOUTH

Start date: 9/5/2023

Water level: 4.60m btoc (SWL)

Finish date: 11/5/2023

Top of casing: 1.00m agl

Well depth: 10.50m toc

Step / min	Date	Time	Water depth (m)	Drawdown (m)	Pumping rate (l/s)	Sand (ml)	Comments
Rec / 1	10/5/2023	13:01	3.50	-1.10			
Rec / 2	10/5/2023	13:02	3.45	-1.15			
Rec / 3	10/5/2023	13:03	3.44	-1.16			
Rec / 4	10/5/2023	13:04	3.44	-1.16			
Rec / 5	10/5/2023	13:05	3.44	-1.16			
Rec / 7	10/5/2023	13:07	3.45	-1.15			
Rec / 10	10/5/2023	13:10	3.45	-1.15			
Rec / 15	10/5/2023	13:15	3.43	-1.17			
Rec / 20	10/5/2023	13:20	3.44	-1.16			
Rec / 25	10/5/2023	13:25	3.43	-1.17			
Rec / 30	10/5/2023	13:30	3.40	-1.20			
Rec / 35	10/5/2023	13:35	3.40	-1.20			
Rec / 40	10/5/2023	13:40	3.40	-1.20			
Rec / 45	10/5/2023	13:45	3.39	-1.21			
Rec / 50	10/5/2023	13:50	3.39	-1.21			
Rec / 55	10/5/2023	13:55	3.38	-1.22			
Rec / 60	10/5/2023	14:00	3.38	-1.22			
Rec / 90	10/5/2023	14:30	3.37	-1.23			
Rec / 120	10/5/2023	15:00	3.36	-1.24			
Rec / 150	10/5/2023	15:30	3.34	-1.26			
Rec / 180	10/5/2023	16:00	3.34	-1.26			
Rec / 1140	11/5/2023	8:00	3.45	-1.15			

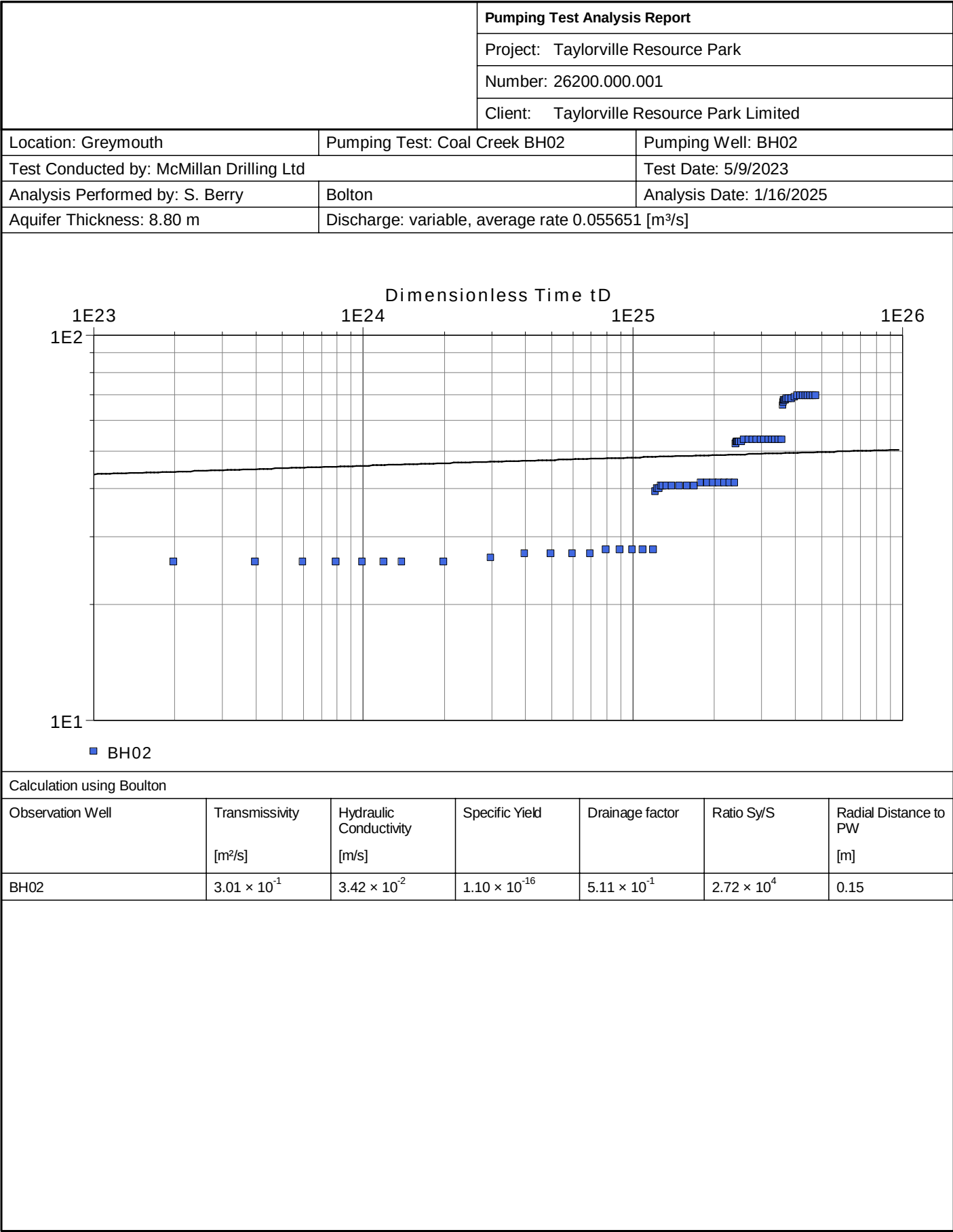


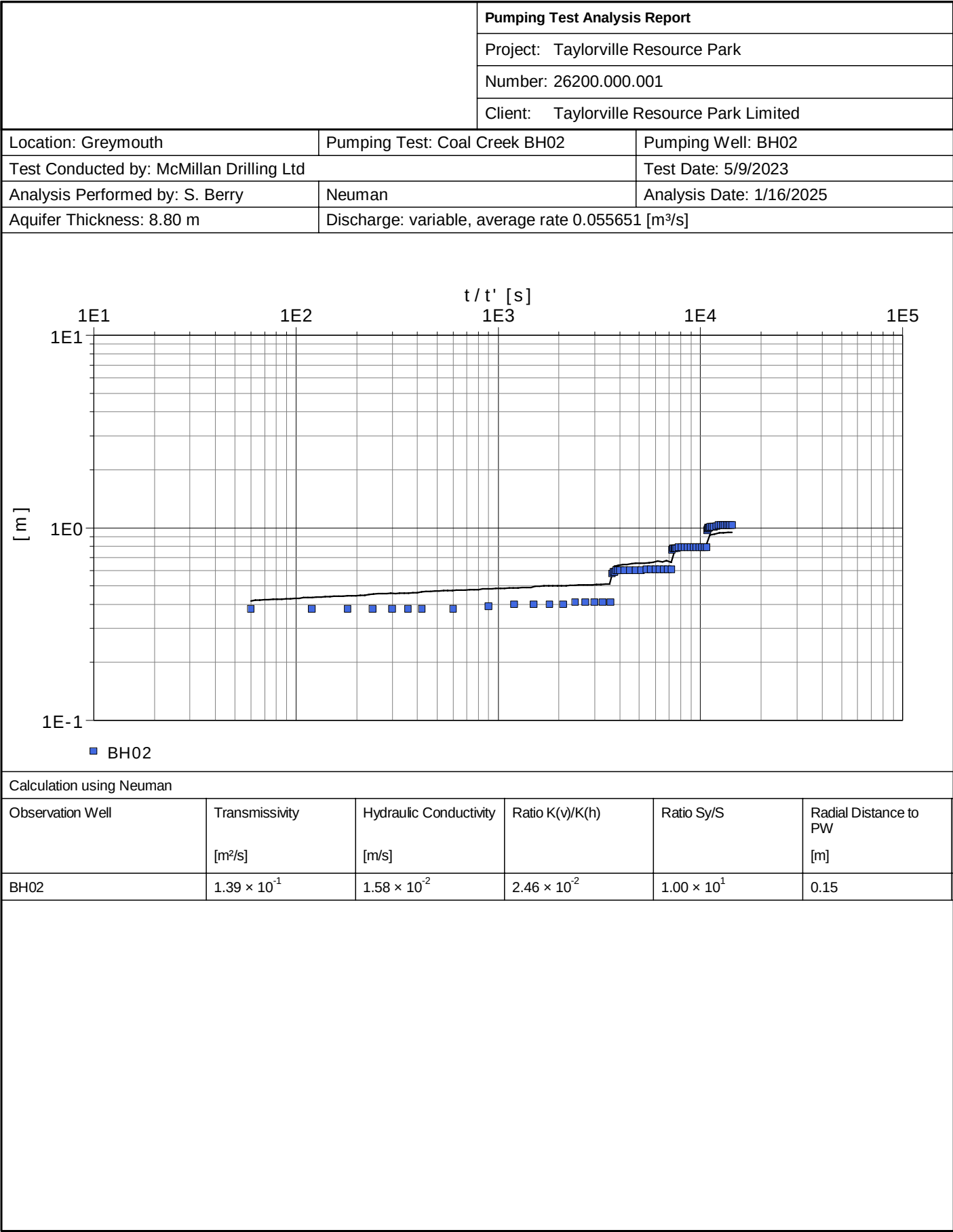
Customer	STAINLESS PRODUCTS LTD			Customer No.	FHK076	Certificate No.	211220P0123
Product	STAINLESS STEEL WELDED PIPE			Commercial Invoice No.	J21110271	Date of Issue	2021/12/20
Specification	ASTM A312/A312M-21			PO No.	6853	Order No.	EP21100179-1
Steel Grade	TP304/304L	Finish	PICKLED	P.I.No.	PI 2110-114	Weight No.	C21120150

Item No.	Heat No.	Product Description		Chemical Composition(%)								Tension Test			*01 HR	*02 HT	*03 HY	*04 ET	*05 F1
				Quantity Pcs	C	Si	Mn	P	S	Ni	Cr	0.2% Y.S.	T.S.	E.L.					
		Dimension	X10 ⁻³		X10 ⁻²	X10 ⁻²	X10 ⁻³	X10 ⁻³	X10 ⁻²	X10 ⁻²	MPa	%	HRB	°C	MPa				
			Specification		Min.														
			Max.	35	100	200	45	30	1100	2000					1040				
1	VCB111262	12"(323.9mm) x SCH-10S(4.57mm) x 6M	1	20	37	140	29	1	801	1830	307	650	58	86	1060	3.0	-	OK	
2	VCB111696	12"(323.9mm) x SCH-10S(4.57mm) x 6M	3	24	43	141	32	1	801	1803	305	632	56	85	1060	3.0	-	OK	
3	VCB111910	12"(323.9mm) x SCH-10S(4.57mm) x 6M	1	20	37	140	29	1	801	1830	307	650	58	86	1060	3.0	-	OK	
4	PCB110416	1"(33.4mm) x SCH-40S(3.38mm) x 6M	35	23	42	141	29	2	802	1805	304	655	56	86	1060	-	OK	OK	
5	PCB110479	1"(33.4mm) x SCH-40S(3.38mm) x 6M	5	26	39	139	37	1	801	1820	292	625	56	86	1060	-	OK	OK	
6	PCB100754	1 1/4"(42.2mm) x SCH-40S(3.56mm) x 6M	15	20	39	138	28	2	802	1825	286	643	59	86	1060	-	OK	OK	
7	PCB110792	1 1/2"(48.3mm) x SCH-40S(3.68mm) x 6M	15	25	35	138	33	2	801	1811	285	629	56	85	1060	-	OK	OK	
8	PCB110262	3"(88.9mm) x SCH-40S(5.49mm) x 6M	15	22	35	137	32	1	801	1820	293	623	59	84	1060	-	OK	OK	
9	PCB110605	6"(168.3mm) x SCH-40S(7.11mm) x 6M	2	25	39	129	30	1	801	1831	331	654	54	87	1060	9.0	-	OK	
TOTAL:			92																

Remark	Note
	Hardness according to NACE MR0175 / ISO 15156-3:2015 : Satisfactory.
	Visual Inspection(Surface) and Dimension Check : OK

Surveyor By	We hereby certify that material described herein has been manufactured and tested with satisfactory results in accordance with the requirement of the above material specification. The material described above has been found free of radiation by raw material supplier.	1.ISO 9001:2015 (No.01 100 056299) 2.PED / AD2000 (No.01 202 TWN/Q-05 0105) 3.ISO 14001:2015 (No.01 104 822 096385) 4.ISO 45001:2018 (No.01 113 822 096385)	Manager of Quality Assurance Department
N/A			<i>Russell Wu</i>





APPENDIX 7

XRD Analysis

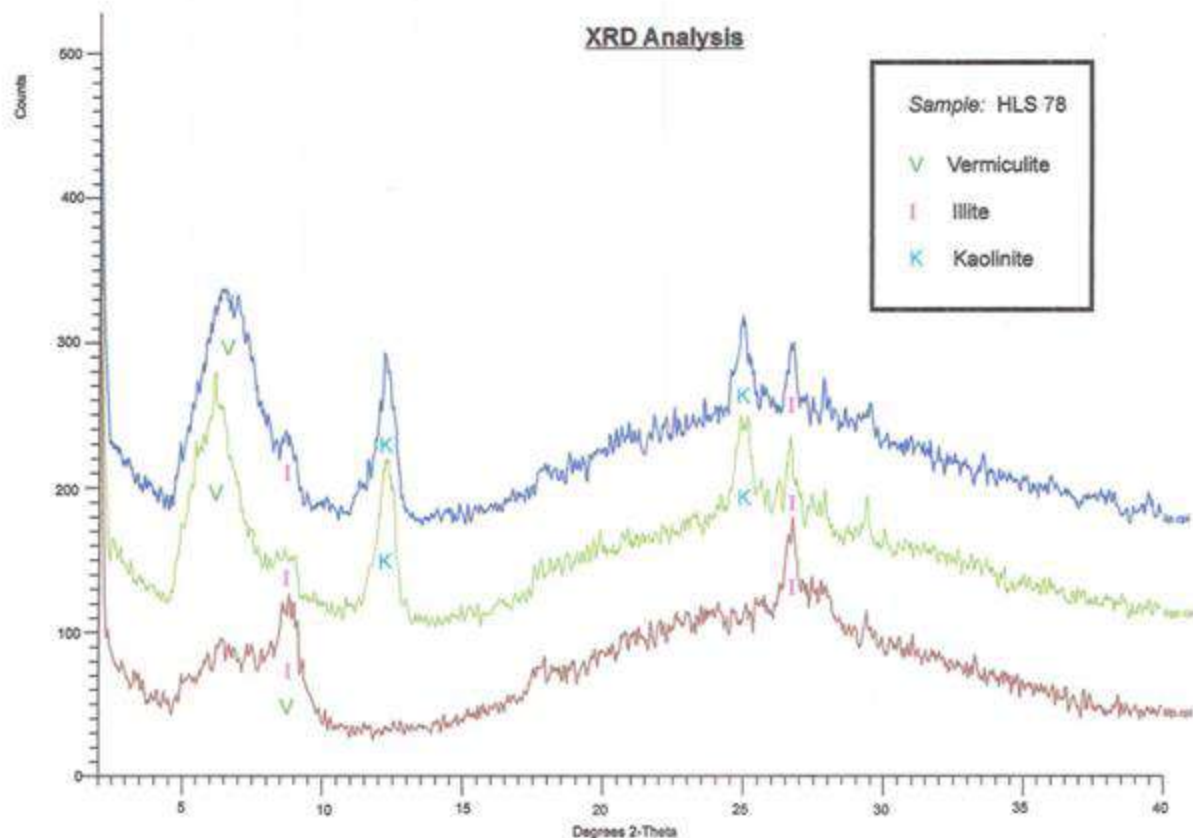


Figure 4.12: XRD analysis of Kaiata Mudstone sample HLS 78 from the Punakaiki River Gorge. Another sample, HLS 34 ur Mile River, gave the same results at a lesser concentration.

TO: Taylorville Resource Park
COPY TO: Jimmy Whitmore (Engeo)
FROM: Laura Drummond

Date: 7 February 2025
Job No: 67662

TAYLORVILLE RESOURCE PARK S92 RESPONSE - ECOLOGY

Bioresearches were engaged by Engeo, on behalf of their client Taylorville Resource Park (TRP), to undertake an ecological impact assessment for the discharge of water associated with landfill operations, for the temporary discharge of leachate contaminated water to land (RC-2024-0122).

This memorandum addresses the questions raised under Section 92 (S92) of the RMA by Pattle Delmore Partners (PDP), on behalf of West Coast Regional Council.

The S92 ecology related question is copied in blue italics below, with the responses in black:

4. [West Coast Regional Council requests] An ecological survey of the surface water features and aquatic habitat surrounding the site, including Noname Creek, the drain along Taylorville Road, including that part of the drain that begins at spring seep TCD1 and the streams on the southern side of Taylorville Road (excluding the Grey River) and an impact assessment on surface water quality and ecological values resulting from the proposed discharge.

The Ecological Impact Assessment (EclIA) assessed the ecological values of the roadside drain, Noname Creek, and the tributary of the Grey River (Grey Tributary) which receives surface water from the surrounding environment (including the roadside drain, any stormwater runoff etc). This assessment generally follows the EclIA Guidelines for use in New Zealand published by the Environmental Institute of Australia and New Zealand (EIANZ) (Roper-Lindsay *et al.*, 2017¹). The EclIA Guidelines provide a standardised matrix framework that allows ecological effects assessments to be clear, transparent, and consistent. The EclIAG framework is generally used in Ecological Impact Assessments in New Zealand as good practice, and a detailed analysis of this methodology is presented Appendix A.

¹ Roper-Lindsay, J., Fuller S.A., Hooson, S., Sanders, M.D., Ussher, G.T. (2018). Ecological impact assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition.

Ecological Values

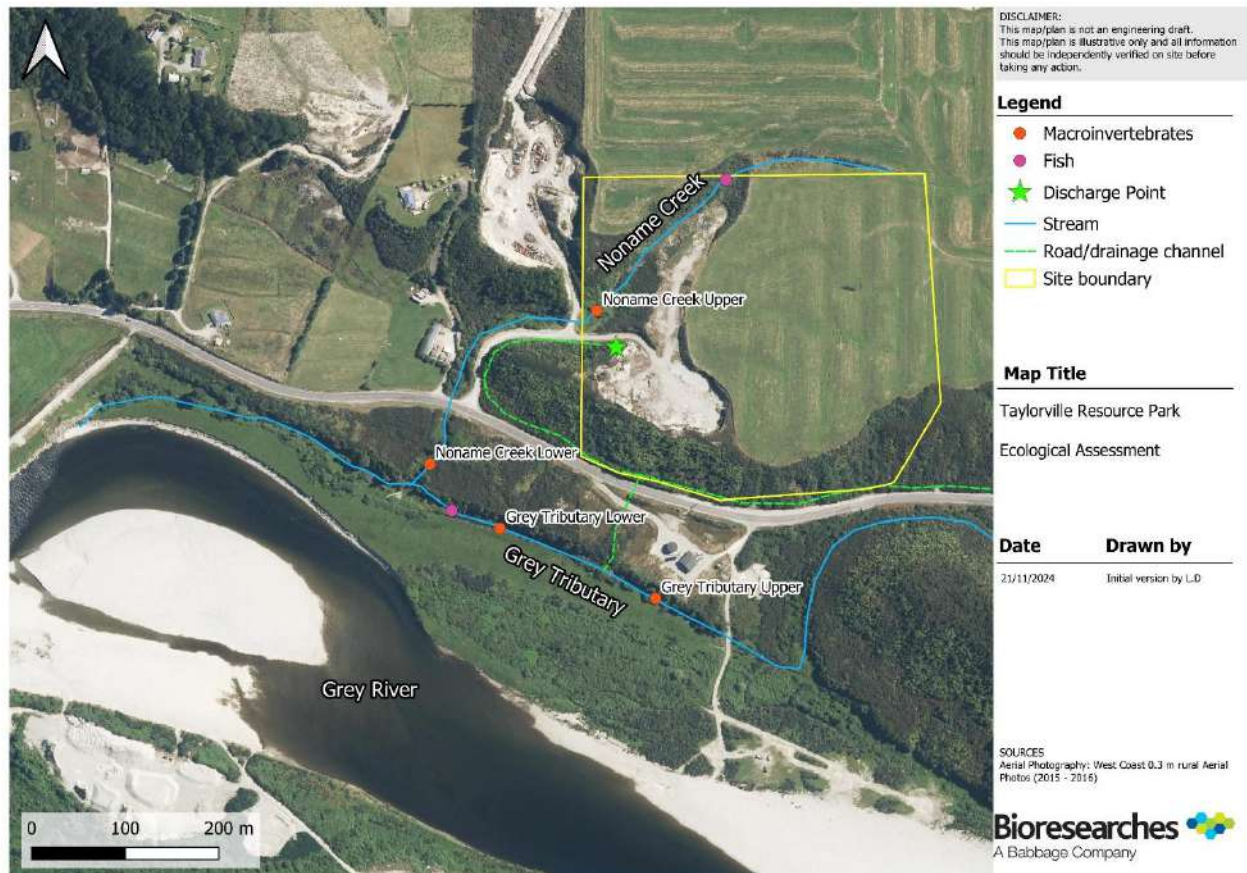


Figure 1. Map of the site and surrounding river systems

Noname Creek

Noname Creek was considered to be of **low** ecological value.

The creek originates on the northern boundary of the site and flows in a west to south-west direction for approximately 590 m before entering a culvert under Taylorville Road. It then continues for a further 91 m before discharging into the Grey Tributary.

Noname Creek consisted of a narrow (average 0.40 m), shallow (average 0.10 m) waterway. The substrate is primarily hard bottomed, dominated by gravels, cobbles and boulders, although occasional patches of soft sediment are present. When disturbed, sediment plumes were present within the upper portion, above the Taylorville Road culvert. Hydrological heterogeneity throughout the reach was good, and consisted of fast and slow runs, riffles and pools. No natural inland wetlands were associated with Noname Creek.

Riparian vegetation was variable, with the upper Noname Creek consisting of predominantly exotic vegetation and pasture. The lower portion of Noname Creek, below the culvert was largely native with patē, pigeon wood (*Hedycarya arborea*), kanono (*Coprosma grandifolia*), kiokio (*Parablechnum novae-zelandiae*), blackberry, and kōtukutuku (*Fuchsia excorticata*). With the exception of the upper 150 m of Noname Creek, the waterway was well vegetated with good shading and bank stability. The upper portion of Noname Creek, present along the site boundary, was less vegetation and predominantly contained gorse, blackberry, and willow (*Salix* sp) within the riparian yard. Despite this, bank stability appeared to be

good and riparian yard functions such as overhanging vegetation and organic matter inputs were abundant.



Photo 1. Noname Upper



Photo 2. Noname Upper



Photo 3. Noname Lower



Photo 4. Noname Lower

Aquatic habitat abundance and diversity in Noname Creek was good, with riffles, pools, runs and overhanging vegetation present throughout. It is likely the elevation and culvert separating the upper and lower reaches, which may act as a partial barrier to fish passage. In the absence of fish barriers, it is expected bully species (*Gobiomorphus* sp) and eels could be present.

Table 1. Ecological value and justification of Noname Creek under assessment matters of the EIANZ guidelines.

Matters	Value and Justification
Representativeness	Low Modified water body on the upper reaches through agricultural land use. More naturalised downstream reach. Water flow shallow with a run-riffle-run sequences over cobbles and gravels.
Rarity/distinctiveness	Low May support threatened species on the lower extent, low likelihood of fish species colonising upper reach. Typical for stream within the West Coast region.
Diversity and pattern	Low Good variety of in-stream habitats, however shallow in depth. Available habitat is not complex and limited, and is likely to only provide habitat for pollutant tolerant macroinvertebrates. culvert creates at least a partial barrier to fish passage, limiting is

Ecological context	Moderate First order stream with permanent hard substrates throughout and loading of fine sediments from surrounding agricultural land use. Lower riparian yard indigenous, upper riparian yard exotic.
Overall Ecological Value	Low

Grey Tributary

The Grey Tributary was considered to be of **low** ecological value.

The Grey Tributary is located south of the site and classified as a permanent stream. The proposed discharge will eventually enter the Grey Tributary via a roadside drain that collects water from the site and adjoining roadside drains. From this drain connection point, water flows for an additional 615 m in the tributary before entering the Grey River.

The Grey Tributary consisted of a wide (8 m – 13 m) flow path which was relatively shallow throughout, with depth ranging between 0.4 m to 0.7 m, excluding deep pools. The flow path was predominantly soft bottomed, with a layer of thick, but firm mud covering the stream bed. This substrate was not considered to be excessively silty or subject to high sediment loading, with the boot depressions in the substrate approximately 0.06 m in depth. Flow through the tributary was slow with a low variation in hydrology, only consisting of slow runs and deep pools. Approximately 300 m downstream of the drain connection to the tributary, the stream channel narrows (<1 m), with flows becoming swifter and the prevalence of stony substrates increased. The channel morphology of the Grey Tributary was variable. The true right bank was relatively steep sloping, and vegetated with a mix of exotic and native vegetation. The true left bank of the stream was flat sloping with high connectivity to the floodplain.

The riparian vegetation on the true right bank was exotic and native, consisting of species such as of willow (*Salix* sp.), kamāhi (*Pterophylla racemosa*), wild broom (*Cytisus scoparius*), karamū (*Coprosma lucida*), round-leaved coprosma (*Coprosma rotundifolia*), kahikatea (*Dacrycarpus dacrydioides*), gorse (*Ulex europaeus*), patē (*Schefflera digita*), blackberry (*Rubus fruticosus*), and pōhuehue (*Muehlenbeckia complexa*). The true left bank supported a riverine wetland is supported on the immediate floodplain, extending 1 m – 2 m upslope, with the hydric vegetation predominantly exotic; soft rush (*Juncus effusus*), buttercup (*Ranunculus* sp.), wet-tolerant grasses, and fan flowered rush (*Juncus sarophorus*). The base of the Grey River supported macrophyte growth with pond weed (*Potamogeton* sp.).

*Photo 5. Grey Tributary Upper**Photo 6. Grey Tributary Upper**Photo 7. Grey Tributary Lower**Photo 8. Grey Tributary Lower*

Aquatic habitat within the Grey River was limited to slow runs, pools, macrophytes, woody debris, overhanging vegetation and floodplain vegetation. The macroinvertebrate and fish communities within the Grey Tributary would likely reflect this. Fish passage from the Grey River to the Grey Tributary is limited due to the topography of the two waterways, limiting the potential diversity of fish species capable of accessing the Grey Tributary, and therefore Noname Creek, to species with climbing abilities.

Table 2. Ecological value and justification of the Grey Tributary under assessment matters of the EIANZ guidelines.

Matters	Value and Justification
Representativeness	Low Permanent stream with wetland habitats on margins. Water slow flowing and predominantly soft bottomed, lacking diverse habitats, and hydrological variation.
Rarity/distinctiveness	Moderate Likely to support at risk species, such as longfin eel. Soft bottomed and silty substrates reduce the quality and complexity of aquatic habitats. Exotic wetland present on the margins and floodplain.
Diversity and pattern	Low Likely low diversity of macroinvertebrate and fish communities due to low diversity and complexity of aquatic habitats. Low diversity and complexity of aquatic habitats

Ecological context	Low Second order stream with low diversity and abundance on in-stream habitats, predominantly being macrophytes, rushes and woody debris. Indigenous and exotic, pasture riparian yard limiting functions such as filtration and shade.
Overall Ecological Value	Low

Roadside Drain

The roadside drain was considered to be of **negligible** ecological value

The roadside drain meets the definition of a 'drain' under the Regional Land and Water Plan (2014), as it is an artificial channel, likely constructed to collect and transport water from the roading. The drain is absent in historic aerial images, and does not incorporate any natural bed, as no river or creek is present in the location of the roadside drain in historic aerials.

The drain, at the point of TCD1 discharge (Section 1), consists of a narrow, shallow drain within 2 m of the gravel road. The base of the drain appears to be bedrock with areas of filamentous algae and water cress (*Nasturtium officinale*) within the channel. Further downstream, where the drain runs eastwards (Section 2) adjacent to Taylorville Road, patches of budding-club rush (*Isolepis prolifera*) and duckweed (*Lemna minor*) was observed. As with Section 1, water depth was overtly shallow, and the channel is located within 2 m of the road and narrow. Section 3 of the drain, which runs westwards from the spring, is also situated close to the road, has very shallow water depth and the bed is covered in fine silts and soft sediments. Overall, the drain (Section 1, Section 2 and Section 3), contains very little hydrological heterogeneity, with shallow depth, and very little to stagnant flow.



Figure 2. Map of the roadside drain and descriptive sections.

The roadside drain receives water from multiple sources, including daylighted groundwater, overland flow paths, and surface water run-off from the surrounding landscape and roading. Water quality analysis undertaken by Engeo² show elevated levels of nitrate-N and conductivity throughout the drain, independent of the site operations.

The drain lacks complex habitats, such as woody debris, cobbles/gravels and interstitial spaces, overhanging vegetation and due to the poor water quality, the macroinvertebrate populations are expected to be of low diversity and abundance, and would consist of pollutant tolerant taxa throughout both Drain 1 and Drain 2. Barriers to fish passage are present where the drain discharges into the Grey Tributary. Native fish populations are not expected to be present in the drain.



Photo 9. Section 1



Photo 10. Section 2



Photo 11. Section 3



Photo 12. Discharge point and polishing area

Table 3. Ecological value and justification of the roadside drain under assessment matters of the EIANZ guidelines.

Matters	Value and Justification
Representativeness	Very Low Waterbody is an artificial drain constructed to receive water run-off from surrounding roading. Water still standing or hosts trickle flow, with macrophytes and long filamentous periphyton growing in channel. Minimal aquatic habitat.

² Engeo (2024). Review of PDP (11-Oct-24) "Impacts of Taylorville Resource Park Limited Landfill on Grey District Council Coal Creek Water Supply Intake". Memo date: 6 November 2024.

Rarity/distinctiveness	Very Low Roadside drain is highly unlikely to support threatened fauna as it is not a natural waterway and has very limited connectivity to the wider catchment.
Diversity and pattern	Very Low Drain channel is not a natural waterway and consists of a uniform channel width and depth. Available habitat is not complex and limited, and is likely to only provide habitat for pollutant tolerant macroinvertebrates.
Ecological context	Very Low Channel is an artificial roadside drain, lacking aquatic habitat and diversity with the exception of macrophyte growth. Receives water from multiple sources, including containments from agricultural and roading, reducing water quality.
Overall Ecological Value	Negligible

Ecological Impact Assessment

The discharge of water from the site (both temporary to land (RC-2024-0122) and via the hummus filter (RC2021.0097)), has the potential to alter the water quality and chemistry within the roadside drain. PDP has acknowledged leachate concentrations are significantly diluted as water moves away from the landfill, and will be below the Drinking Water Standards health-based MAV criteria, therefore no changes in water quality to the Grey Tributary should occur as a result of the discharge to land.

The discharge of water via the roadside drain, which will enter the Grey Tributary ~100 m downstream of the discharge. Water discharged from the TRP is captured via a roadside drain and diverted away from Noname Creek. As such, no future treated leachate or contaminant originating from TRP should enter Noname Creek.

In regards to the roadside drain, hydraulic modelling undertaken by Engeo³ indicates any contaminants will be generally diluted and dispersed through an aquifer to negligible concentrations prior to discharge and interception within the roadside drain. As such, the discharge of water is unlikely to result in significant, or noticeable changes to the ecological values of the drain as a result of altered water quality and water chemistry. Considering the dilution factor within the drain, no excess in contaminants as a result of the TRP discharge should enter the Grey Tributary.

Whilst site operations may have a minor influence on the water quality within the roadside drains, multiple sources of water enter the channel which are heavily influenced by surrounding land use, independent of TRP. Existing land-use includes agricultural/rural, including aerial spraying of fertiliser, and vehicle use and the associated roading run-off from Taylorville Road. As such, influences to water quality in the roadside cannot be solely attributed to the operations within the site.

The discharge of water to land, which will then enter the roadside drain will not result in the displacement of indigenous fauna (macroinvertebrates and fish), as any organisms, if present, in the drain will be pollutant tolerant macroinvertebrate taxa.

³ Engeo (2024). Preliminary Hydrogeological Assessment: 287 Taylorville Road, Coal Creek, Greymouth.

The discharge to the roadside drain was considered to be of **low** magnitude and overall **very low** level of effect to the roadside drain and Grey Tributary as it will have a very slight shift from the existing baseline conditions, and negligible impact on ecological values and communities of the drain. There should be no effect to Noname Creek as discharged water should not enter this system.

Regards,

Laura Drummond, M.Sc. (Hons), MEIANZ

Coastal & Freshwater Ecologist

M +64 27 254 9685 |

Bioresearches 
A Babbage Company

Babbage Consultants Limited

Appendix A. Ecological Impact Assessment Methodology

Table 4. Criteria for assigning value to habitat/species for assessment.

Value	Determining Factors
Very High	Nationally Threatened species found in the 'zone of influence' (ZOI) either permanently or seasonally. Area rates 'High' for at least three of the assessment matters of Representativeness, Rarity/distinctiveness, Diversity and Pattern, and Ecological Context. Likely to be nationally important and recognised as such.
High	Species listed as At Risk – Declining found in the ZOI either permanently or seasonally. Area rates 'High' for two of the assessment matters, and 'Moderate' and 'Low' for the remainder OR area rates 'High' for one of the assessment matters and 'Moderate' for the remainder. Likely to be regionally significant and recognised as such.
Moderate	Species listed as At Risk – Relict, Naturally Uncommon, Recovering found in the ZOI either permanently or seasonally. Locally uncommon or distinctive species. Area rates 'High' for one of the assessment matters, 'Moderate' or 'Low' for the remainder OR area rates as 'Moderate' for at least two of the assessment matters and 'Low' or 'Very Low' for the remainder. Likely to be important at the level of the Ecological District.
Low	Nationally and locally common indigenous species. Area rates 'Low' or 'Very Low' for majority of assessment matters, and 'Moderate' for one. Limited ecological value other than as local habitat for tolerant native species.
Negligible	Exotic species including pests, species having recreational value. Area rates 'Very Low' for three assessment matters and 'Moderate', 'Low' or 'Very Low' for the remainder.

Table 5. Criteria for describing the magnitude of effects (EIANZ 2018)

Magnitude	Description
Very High	Total loss of, or a very major alteration to, key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature.
High	Major loss of major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature.
Moderate	Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature.

Low	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances and patterns; AND/OR Having minor effect on the known population or range of the element/feature.
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR Having negligible effect on the known population or range of the element/feature.

Table 6. Criteria for describing the level of effects (EIANZ 2018). Where text is italicised it indicates 'significant effects' where mitigation is required.

Magnitude of Effect	Ecological Value				
	Very High	High	Moderate	Low	Negligible
Very High	<i>Very High</i>	<i>Very High</i>	<i>High</i>	<i>Moderate</i>	Low
High	<i>Very High</i>	<i>Very High</i>	<i>Moderate</i>	Low	Very Low
Moderate	<i>High</i>	<i>High</i>	<i>Moderate</i>	Low	Very Low
Low	<i>Moderate</i>	Low	Low	Very Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low	Very Low
Positive	Net Gain	Net Gain	Net Gain	Net Gain	Net Gain



memorandum



TO	Michael Durand	FROM	Carl Steffens
	Planz Consultants	DATE	24 February 2025
RE	Technical Review – TRPL short-term consent application to discharge contaminants to ground – RFI Response		

West Coast Regional Council (WCRC) sent Taylorville Regional Park Limited (TRPL) a Request for Further Information (RFI) dated 19 December 2024 relating to the TRPL short-term consent application to discharge contaminants to ground at Taylorville Regional Park (TRP) landfill. On behalf of TRPL, ENGEO has provided a response to the RFI via a memo dated 30 January 2025. The response provided includes an additional separate memo prepared by Bioresarches that describes an ecological impact assessment (a request made in the WCRC RFI). Pattle Delamore Partners Limited (PDP) has been engaged by WCRC to carry out a technical review of the RFI response documents. Our review is detailed in this memo.

There are seven individual questions in the WCRC RFI. Each of these is set out below (in bold) followed by comment on whether we consider the additional information provided by ENGEO or Bioresarches sufficiently addresses the question posed.

- 1. Hydraulic conductivity estimates from onsite testing (pump testing and/or slug testing). If slug testing is used, then please provide testing data from at least 3 bore locations on the upper terrace surface.**

ENGEO report they have carried out slug testing at three onsite groundwater monitoring bores (MB13, MB14 and MB19d). Based on analysis of the slug testing using the methodology of Bouwer and Rice (1976), ENGEO report hydraulic conductivity (K) values for the Pleistocene gravels ranging from 1.3×10^{-6} to 1.11×10^{-5} m/s (0.11 to 0.96 m/d).

We note the use of bore MB19d for the testing is not considered ideal given the small screen interval and the location of much of the screen over the deep mudstone (although the filter pack around the screen extends into the gravelly strata). In addition, this bore is significantly upgradient of the proposed discharge location and we consider downgradient bores are more relevant to the proposal. We also note it is somewhat surprising that the analysis results from MB19d gave the highest values of K given the screen location in the mudstone.

Despite the comments above, overall it is considered that the information provided has sufficiently addressed the first request of the RFI.

- 2. Updated mounding and contaminant modelling simulations using the hydraulic conductivity estimates derived from the requested testing. Based on the testing results, please take into account that the results from testing (particularly slug testing) may provide local values for hydraulic conductivity but not necessarily be representative of the average hydraulic**

conductivity over the area of the landfill. Therefore, please provide multiple modelling simulations informed by the testing results using a realistic range of potential hydraulic conductivity values for the strata beneath the upper terrace surface (i.e. a sensitivity assessment based on varying the hydraulic conductivity that is informed by the testing results).

Mounding

ENGEO has carried out additional mounding calculations using a K value of 0.86 m/day. However, we note this value is at the higher range of values estimated from their slug testing analysis and is also significantly higher than the values derived from bore MB13 (values of 0.13 to 0.16 m/day), which is in close proximity of the proposed discharge location. Lower values of K will result in larger mounding and therefore the values estimated from testing in MB13 would result in higher mounding predictions. Given the location of the proposed discharge the K values from this bore are potentially more relevant. We also note the updated mounding assessment is based on a significantly larger infiltration area (20 m x 20 m instead of 10 m x 10 m in the original application) which will result in a very large excavation onsite.

ENGEO has not reduced the discharge volume for the new assessment (still 800 m³/day), although in their response they state the anticipated infiltration capacity is on the order of 200 to 300 m³/day. Therefore, the updated assessment appears to be inconsistent with the expected infiltration rate. The updated assessment predicts maximum mounding of over 8 m after a day of discharge, compared to the much lower mounding prediction of around 0.6 m in the original application. In addition, we note that our own calculations show the predicted mounding will continue to increase significantly for prolonged infiltration periods.

In late 2024, ENGEO indicated that an initial volume of 5,500 m³ of water needs to be removed from the onsite retention pond, although we assume that volume may have increased since that time. Assuming this volume is still valid, then 6.9 days of continuous discharge would be required at a rate of 800 m³/day to remove 5,500 m³ from storage. Our calculations indicate this situation would result in over 20 m of mounding at the end of the discharge period. If the discharge rate is reduced to 200 m³/day (in line with the infiltration capacity suggested by ENGEO) the mounding after 1 day reduces to around 4.5 m. However, to discharge 5,500 m³ would require 27.5 days and result in around 12 m of mounding. Furthermore, if K is reduced to 0.13 m/day (as per the slug testing results from MB13), mounding based on discharging 200 m³ in a day is over 9 m, while discharging that volume of water for 27.5 days results in predicted mounding of over 50 m.

Based on the low values of K estimated from the ENGEO slug testing, we have concerns that discharging the proposed quantities of water to ground will not be feasible, because the calculated mound heights are similar (some short-term discharge scenarios) or significantly greater (prolonged discharge scenarios) than the reported depth to water, which was measured at 7.9 m below ground level in monitoring bore MB13 (located closest to the proposed infiltration basin) at the time of the slug testing. Even for the situation where the proposed discharge rate is significantly reduced, it appears mounding could still be prohibitive, accentuated by the prolonged discharges that will be required. Further to the potential difficulties with disposing of the proposed quantities of groundwater to ground at the site, we assume that mounding of the scale predicted could potentially cause stability concerns (including within the landfill) on the terrace.

While ENGEO has addressed the request for additional mounding assessment, the results indicate that the discharge to ground may not be feasible.

Contaminant Modelling

ENGEO has provided updated RISC5 contaminant modelling using high and low K values estimated from their recent slug testing. Based on the information provided with the original short-term consent application, we understand the RISC5 modelling is based on a continuous discharge for 6 months. It isn't clear what discharge rate is used for the modelling, but we assume it is 800 m³/day, as per the mounding assessments that have been provided. A groundwater gradient of 0.0018 m/m was assumed for the original modelling along with a K value of 84 m/day.

The updated modelling uses much lower values of K (0.11 m/day and 0.86 m/day) based on the slug testing results. We assumed the most recent modelling is also based on a volume of 800 m³/day discharged continuously for 6 months. We note the outputs from the updated modelling show an assumed gradient of 0.018 m/m compared to 0.0018 m/m, but no reasoning is provided for this change.

The modelling results reported show that only aluminium and Nitrate-N have detectable concentrations at the inferred point of measurement, 310 m from the discharge location. However, for both parameters, the modelled concentrations have significantly reduced by around 3 to 4 orders of magnitude compared to the modelled source water at the point of discharge. The high hydraulic conductivity scenario indicates that peak concentrations at 310 m from the discharge occur around 13 years from the time of discharge, while the low hydraulic conductivity scenario takes around 100 years, or longer, for peak concentrations to occur. We note that the modelled peak concentrations are around an order of magnitude higher for the high hydraulic conductivity scenario compared to the low hydraulic conductivity scenario. This is generally at odds with what we would expect, as more dilution and dispersion would typically be expected to occur under a higher conductivity scenario.

We have concerns regarding the validity of the modelling results. It is stated by ENGEO that the modelling assumes no degradation along the flowpath and that contaminants will generally be attenuated through dilution and dispersion in the unconfined aquifer. However, we note that based on the range of K values estimated from the slug testing, the throughflow of groundwater beneath the terrace is very low. Assuming that groundwater flow occurs along a width of around 100 m (in reality we expect the width of aquifer impacting on the flow of contaminants is likely to be less) and the average thickness of groundwater in the gravel strata above the mudstone is 10 m, the cross-sectional area of groundwater flow beneath the terrace is only 1,000 m². Based on the highest modelled K value of 0.86 m/day and hydraulic gradient of 0.0018 m/m, the aquifer throughflow is only 1.55 m³/day. For the lowest derived slug testing K value of 0.11 m/day, the throughflow is only 0.2 m³/day. For a discharge of 800 m³/day (considered unlikely to be feasible based on the mounding results), the potential for dilution of contaminant concentrations is negligible which seems inconsistent with the modelling results.

We also note that the modelling results predict much higher concentrations of Nitrate N in the output compared to Ammonia N (no concentration provided). This is despite the source concentration of Ammonia N (98 mg/L) being much greater than the source concentration of Nitrate N (6.5 mg/L) and the statement by ENGEO that the modelling assumes no degradation of contaminants.

Based on the low potential for dilution (but noting we have not carried out our own detailed modelling), we consider the modelling provided may not be reliable. To address these concerns, we would need either further explanation from ENGEO, or to carry out our own modelling to justify/confirm the large decrease in contaminant concentrations shown by the ENGEO modelling.

In addition to our concerns around the modelling, we consider it is possible these results may not represent the actual discharge that could occur, as the results of the mounding assessments indicate discharging large quantities of water to ground at the site may not be achievable.

3. Updated contaminant modelling simulations using input parameters more consistent with high parameter concentrations that have been measured in leachate and wastewater.

As per the previous section, we have concerns around the validity of the modelling results and further information from ENGEO or additional modelling by PDP would be required to address our concerns.

4. An ecological survey of the surface water features and aquatic habitat surrounding the site, including Noname Creek, the drain along Taylorville Road, including that part of the drain that begins at spring seep TCD1 and the streams on the southern side of Taylorville Road (excluding the Grey River) and an impact assessment on surface water quality and ecological values resulting from the proposed discharge.

An ecological impact assessment has been carried out by Bioresarches and summarised in a memo dated 7 February 2025. Bioresarches consider the ecological value of NoName Creek, the roadside drain originating at TCD1 and the Grey Tributary on the lower terrace surface below Taylorville Road is low based on the Ecological Impact Assessment (EclA) Guidelines for use in New Zealand (Roper-Linkday et al., 2017).

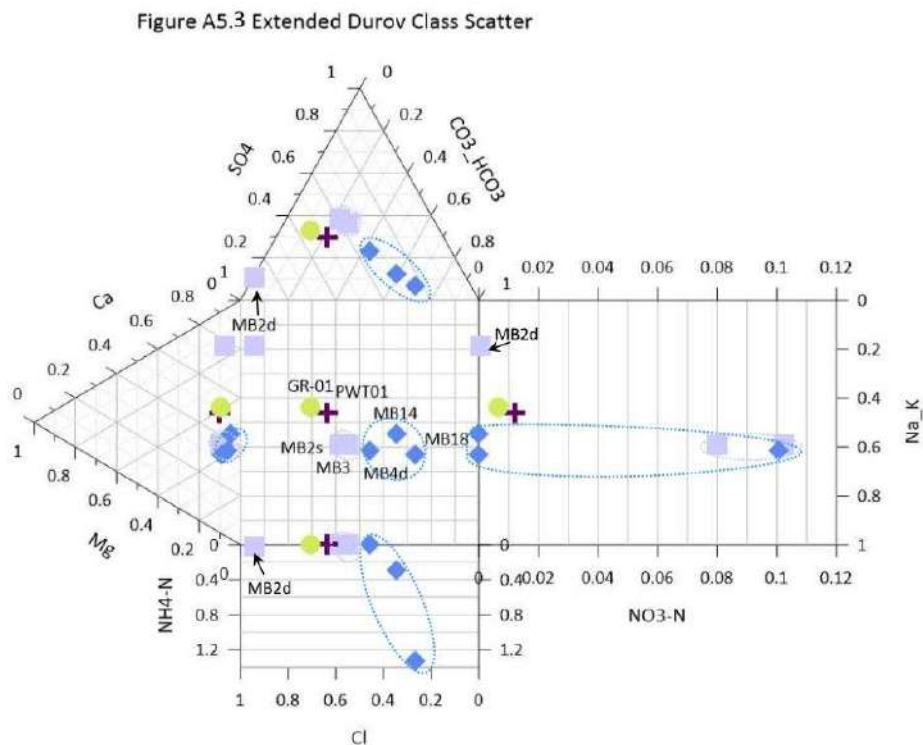
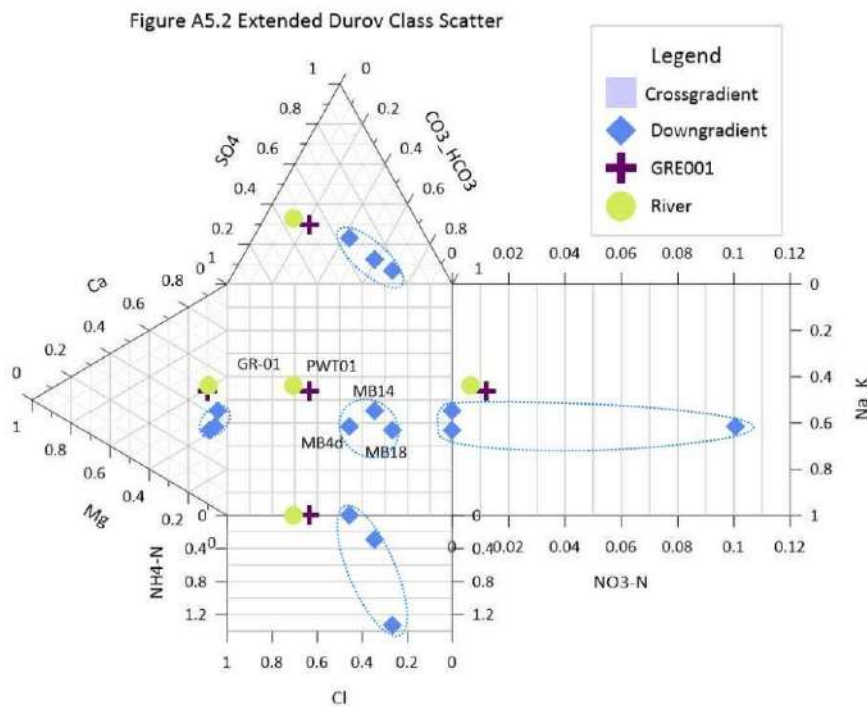
A review by PDP's ecology team would be required to confirm the results of the ecological assessment, however at this stage we have not carried out that review because we consider other effects assessments have not been adequately addressed. Our current view is that discharge to ground is unlikely to be feasible due to the low K soils underlying the terrace and the associated large mounding effects that are predicted to occur. In addition, we don't consider we have sufficient information to confirm the potential contaminant concentrations that may reach the surface water bodies in the area. We consider these two issues should be resolved before we review the ecological assessment, however our view is that the currently available information, presented in response to question 1, indicates that the proposed discharge to ground is unlikely to be feasible.

Regarding contaminant concentrations, if it could be confirmed that ecological receiving water standards wouldn't be breached during discharge of the contaminants to ground, then the results of the ecological assessment are less critical. We do not think that the current information is sufficient to reach that conclusion, but if further work shows that to be the case, then the ecological work that has been carried out may be sufficient.

5. A water quality comparison between water samples collected from the GDC water supply, the Grey River, groundwater upgradient of the landfill north of Taylorville Road and surface water samples collected at TRD2 and TRD4. The samples should include analysis for anions and cations and nitrogen species, in addition to other parameters sampled to date by TRPL. The purpose of the sampling is to inform whether the GDC water supply source is dominantly Grey River water and there is minimal input to the supply bores from upgradient groundwater and surface drainage.

ENGEO collected a water quality sample from the raw (untreated) water at the GDC treatment plant (sample PWT01), in addition to a sample from the Grey River upstream of the treatment plant and GDC supply bores (sample GR-01). The samples were analysed for a number of chemical parameters, including general water quality parameters, nitrogen species, dissolved metals and ions in solution.

The results for ions were compared to October 2024 results from samples collected from monitoring bores MB2s, MB2d, MB3, MB4d, MB14 and MB18 and plotted on an extended Durov diagram (Figures A5.2 and A5.3 of the RFI response). These figures are shown below. ENGEO notes that bores MB2s, MB2d and MB3 are cross gradient bores, while MB4d, MB14 and MB18 are downgradient bores with respect to the waste storage areas.



As reported by ENGEO, samples PWT01 and GR-01 plot relatively closely together. This indicates similar water composition between Grey River water and the water in the GDC treatment plant, although they are not exactly the same. The Durov diagrams indicate some deviation in ion chemistry between downgradient groundwater samples and those collected from the Grey River and GDC treatment plant, however the treatment plant sample plots very slightly closer to the downgradient bores compared to the Grey River sample. There is more similarity between samples PWT01 and GR-01 and the cross-gradient bore samples compared with those from down-gradient locations, with the exception of sample MB2d, although the results from this bore may be affected by the screen being in the underlying mudstone beneath the terrace. Overall, based on the ion information provided by ENGEO, there is a relatively good match between raw GDC treatment plant water and Grey River water, although the GDC raw water does suggest some influence from the water chemistry in the groundwater monitoring bores on the terrace above Taylorville Road.

With regard to the results for other parameters, we note the sampling did not include analysis for all parameters previously sampled by TRPL as requested in the RFI. For example, samples PWT01 and GR-01 did not include analysis for dissolved aluminium, iron, manganese or DRP. Ideally, the samples at PWT01 and GR-01 would have been compared with new groundwater samples collected at the same time (rather than comparison with older samples) and we also note that comparison has not been provided with TRD2 and TRD4 as requested.

Furthermore, we note that concentrations of copper, lead and zinc in treatment plant sample PWT01 are unexpectedly high and exceed ecological guideline criteria, whereas Grey River sample GR-01 recorded all dissolved metals at concentrations below the laboratory detection level. Together with the slight deviation of sample PWT01 towards the groundwater bore samples, this potentially suggests an influence on water chemistry in the supply bores from the groundwater north of the river.

With regard to copper (0.193 mg/L) and lead (0.006 mg/L), the concentrations measured in PWT01 are particularly high compared to all other water samples presented in the applicant's information. Both of these parameters were measured in PWT01 at concentrations well above those measured by TRPL in upgradient groundwater and surface water. Furthermore, the dissolved copper and lead concentrations in PWT01 are also higher than those measured in any of the samples collected from wastewater or leachate to date at the landfill (highest concentration in leachate or wastewater of 0.058 mg/L for copper and 0.0024 mg/L for lead), although presumably these concentrations will vary depending on the different wastes that are being received at any particular time. While nickel and zinc were also detected/elevated in PWT01, higher (nickel) or very similar (zinc) concentrations have been measured previously by TRPL in upgradient groundwater bores.

The groundwater quality results from PWT01 and GR-01 potentially indicate that groundwater north of the Grey River may influence the chemistry of water taken for the GDC community water supply. This is despite the supply bores being situated immediately adjacent to the Grey River. We consider this is a significant finding and assuming these results are not due to some other factor (such as potential contamination within the treatment plant), this finding may potentially alter our previous assessment that there is a low risk to the water supply from the operation of the landfill. It would be helpful (and important) for the applicant to provide comment on the potential cause of the elevated concentrations of copper, lead, nickel and zinc in the water treatment plant sample.

6. Yield versus drawdown data from the GDC supply bores to confirm the gravel deposits immediately adjacent to the Grey River are of high permeability with a high hydraulic connection to the Grey River.

ENGEO has provided driller's logs for GDC bores BH01 and BH02 (two of the three GDC community drinking-water supply bores) and data from step-drawdown and constant rate pump testing in BH02. We note the McMillan Drilling report provided indicates that BH01 has been decommissioned and therefore we assume that the drilling and testing in BH02 was carried out to replace BH01.

The driller's log for BH02 describes 0.2 m of fill underlain by sand to 1.3 m below ground level (bgl) and gravel dominated strata (sandy gravel and gravel) thereafter to 8.8 m bgl. Silty clay hard mudstone was observed from 8.8 m to the base of the borehole at 10.5 m bgl. BH02 is screened between approximately 6 and 8.5 m bgl and the static water level in the bore following drilling was measured at 4.23 m bgl. In contrast, the driller's log for BH01 describes fill to 0.4 m bgl, clay to 0.8 m bgl, underlain by sandy gravel to 2.9 m bgl. A thick deposit of coarse sand (with gravels and cobbles) was encountered between 2.9 m and 8 m bgl, underlain by sandy gravel to 8.6 m and clayey gravel to 8.7 m bgl. Silty clay mudstone was encountered thereafter to the base of the borehole at around 10.8 m bgl. No bore construction details are provided for BH01, however based on the logs provided it is clear that large thicknesses of relatively fine-grained strata (sand and clay) was observed during drilling of this bore, which is likely to have negatively impacted on the potential yield that could be achieved.

Raw water level observations are also provided from BH02 during step-drawdown testing and constant rate testing in the bore, as well as pumping rate and sand ingress measurements. In addition, plots of these measurements are also provided, along with analyses of the step-drawdown testing data with associated estimates of K and transmissivity (T) (provided by McMillan Drilling). Based on those analyses, ENGEO report that values for K of 3.42×10^{-2} m/s (2,955 m/day) and 1.58×10^{-2} m/s (1,365 m/day) were obtained. We have reviewed the analyses and consider these are not accurate estimates. However, it is clear that pumping from BH02 induces only low levels of drawdown in the bore. Measured drawdown of up to 1 m was measured in the bore at a flow rate of up to approximately 70 L/s.

It would be possible to carry out a more accurate analysis of the pumping test data provided to better estimate K and T, however we don't consider this is necessary as it is clear that operation of BH02 induces very little drawdown in the bore. Drawdown outside the bore casing can be expected to be less than that measured during the testing as additional well losses from turbulent head losses will occur within the bore casing. This information would typically suggest that operation of the GDC bores draws very large volumes of water directly from the Grey River. However, the elevated metals concentrations in sample PWT01 suggests there is still some other significant influence on the chemistry of water abstracted for the GDC water supply. As indicated in the previous section, we consider it will be important for the applicant to provide comment on the potential cause of the elevated concentrations of copper, lead, nickel and zinc in the water treatment plant sample.

7. XRD sample analysis from the Kaiata mudstone underlying the landfill to confirm clay mineralogy in the mudstone and confirm ENGEO comments that swelling within any fractures that may be present in the mudstone will block the transmission of groundwater via a fracture network.

ENGEO has quoted previous XRD analysis (Leaver, 1999) from two Kaiata Mudstone outcrops on the west coast. Based on that data, they state the mineralogy of the Kaiata mudstone comprises

a mixture of kaolinite, illite and vermiculite. They consider this mineralogy comprises a mixture of swelling and non-swelling clay minerals and therefore it is inferred there is negligible flow through defects due to clay swelling. ENGEO do consider there is the potential for preferential pathways through interbedded layers of non-clay materials (silts and sands), but that groundwater that intersects these layers will most likely be transported west-southwest, along the dip of the mudstone bedding planes and away from the GDC water supply.

A review of clay swelling behaviour indicates that kaolinite and illite don't appear to have high swelling ability. The swelling ability of vermiculite may be higher (but still not high), although is also highly dependent on temperature. In addition, there are other properties that affect the swelling ability of these clay minerals (for example pH, salinity and presence of cations) which haven't been discussed by ENGEO. We also note the sample results are from sites distant from the landfill and therefore may not be relevant to local conditions. Furthermore, ENGEO indicate there are layers within the mudstone that may not contain clay minerals, but in those cases groundwater flow will occur along the direction of bedding away from the GDC water supply bores. However, ENGEO has not provided any information to confirm there is no potential for fracture networks at other angles to the dip of the bedding. Based on the information provided, we are currently not satisfied there is no potential for groundwater flow in the direction of the GDC supply bores within fractures within the mudstone.

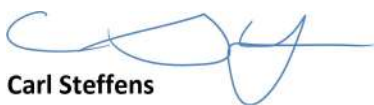
Limitations

This memorandum has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by West Coast Regional Council and others (not directly contracted by PDP for the work), including Planz, ENGEO and Biorearches. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the memorandum. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This memorandum has been prepared by PDP on the specific instructions of West Coast Regional Council for the limited purposes described in the memorandum. PDP accepts no liability if the memorandum is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

© 2025 Pattle Delamore Partners Limited

Prepared by



Carl Steffens

Technical Director – Water Resources

Site Memorandum

Project Name	Taylorville Resource Park		
Memo Topic	RC-2024-0122 and RC-2021-0097-V10 - RFI Response		
Memo Date	5 March 2025	Date of Site Visit	N/A
ENGEO Memo No.	09	ENGEO Project No.	26200.000.001
To	Taylorville Resource Park Ltd	Copy	Barker and Associates
Author	Lyn Nugent	Reviewers	Dave Robotham, James Thurber, Richard Justice

ENGEO has reviewed the memo prepared by PDP (Steffens, C [24 February 2025] to Michael Durand “*RE Technical Review – TRPL short-term consent to discharge contaminants to ground – RFI Response*”). The original queries (in grey) and ENGEO responses (in blue), reflecting comments by PDP, are provided below.

1. Hydraulic conductivity estimates from onsite testing (pump testing and/or slug testing). If slug testing is used, then please provide testing data from at least 3 bore locations on the upper terrace surface

PDP considers that the information provided by ENGEO sufficiently addresses this item of the RFI, with commentary regarding the results. We do note that the range of hydraulic conductivity values (1.05×10^{-5} m/s – 1.3×10^{-6} m/s) generally fall within one standard deviation of the mean, which suggests a small variance (good reproducibility) in the dataset. We further note the hydraulic conductivity values should not be interpreted as a precise measurement; rather, they represent a likely range of conductivity values, of which the most conservative should be applied (refer next item).

2. Updated mounding and contaminant modelling simulations using the hydraulic conductivity estimates derived from the requested testing. Based on the testing results, please take into account that the results from testing (particularly slug testing) may provide local values for hydraulic conductivity but not necessarily be representative of the average hydraulic conductivity over the area of the landfill. Therefore, please provide multiple modelling simulations informed by the testing results using a realistic range of potential hydraulic conductivity values for the strata beneath the upper terrace surface (i.e. a sensitivity assessment based on varying the hydraulic conductivity that is informed by the testing results).

PDP provided a lengthy response to the ENGEO assessment for this item. For brevity, we have consolidated their queries in our response.

Groundwater

PDP indicates that ENGEO applied a discharge rate of 800 m³/d in the RISC model. To be conservative, we did not consider vadose (unsaturated zone) transport in our RISC model; as such, the discharge rate is not an input parameter (we refer to the model input summary in Appendix 3 of the ENGEO memo dated 30 January 2025).

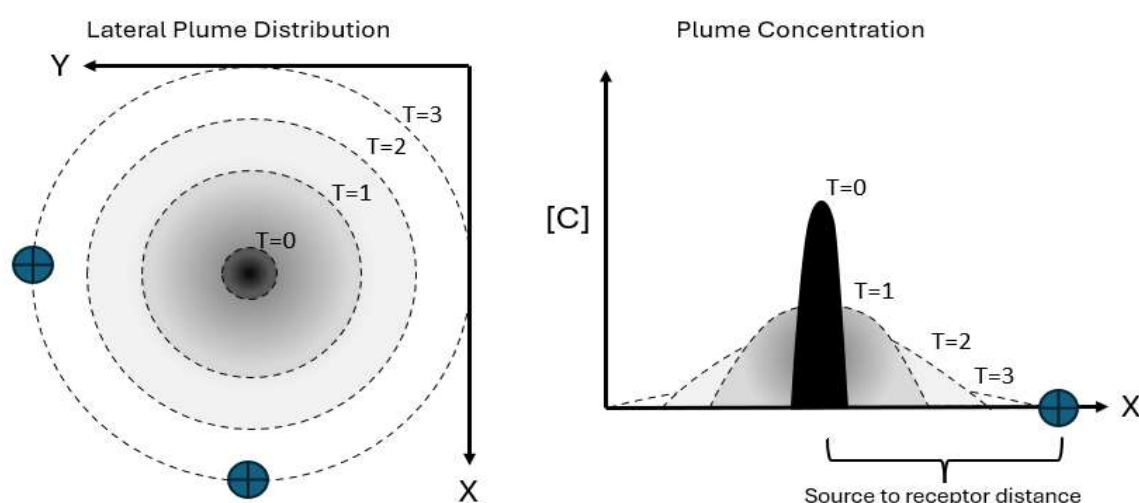
In our model we considered a saturated source with cross-sectional area measuring 80 m² (8 m thickness and 10 m width) and a length of 10 m.

PDP queried the change in inferred hydraulic gradient between the original modelling works (0.0018 m/m; ENGEO, 2024) and the updated modelling (0.018 m/m; January 2025). The hydraulic gradient was revised following the installation of additional monitoring wells in October 2024. This update was provided to WCRC in a memorandum prepared by ENGEO dated 6 November 2024.

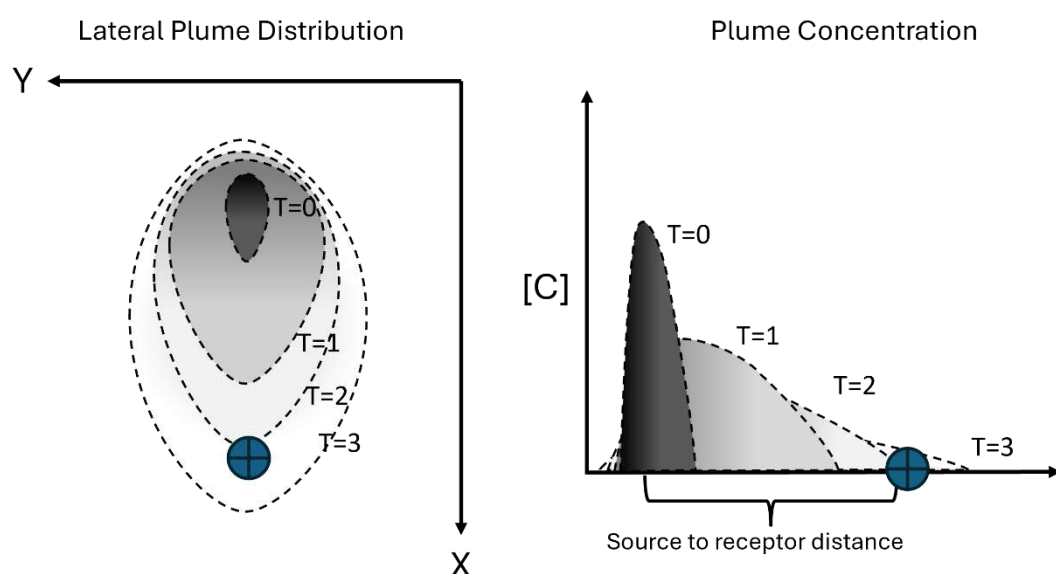
PDP notes that they have not undertaken their own modelling but questions the validity of the ENGEO modelling results based on their expectation that the modelled peak concentrations should be inversely proportional to hydraulic conductivity (i.e., lower peak concentrations with higher hydraulic conductivity).

The movement of a contaminant plume is governed by groundwater flow (i.e., advection and dispersion) and short-range interactions between water molecules (e.g., concentration-dependent diffusion, Brownian motion) (Fetter, 2021). In a scenario with no water flow ($K=0$), a contaminant plume would uniformly migrate away from the source outward as the concentrations equilibrate due to short-range interactions. As such, the concentration (C) will be the same in all directions at a given radius. Figure 1 shown the migration of a plume with $K=0$ at multiple time steps ($T=0$, $T=1$, $T=2$, $T=3$).

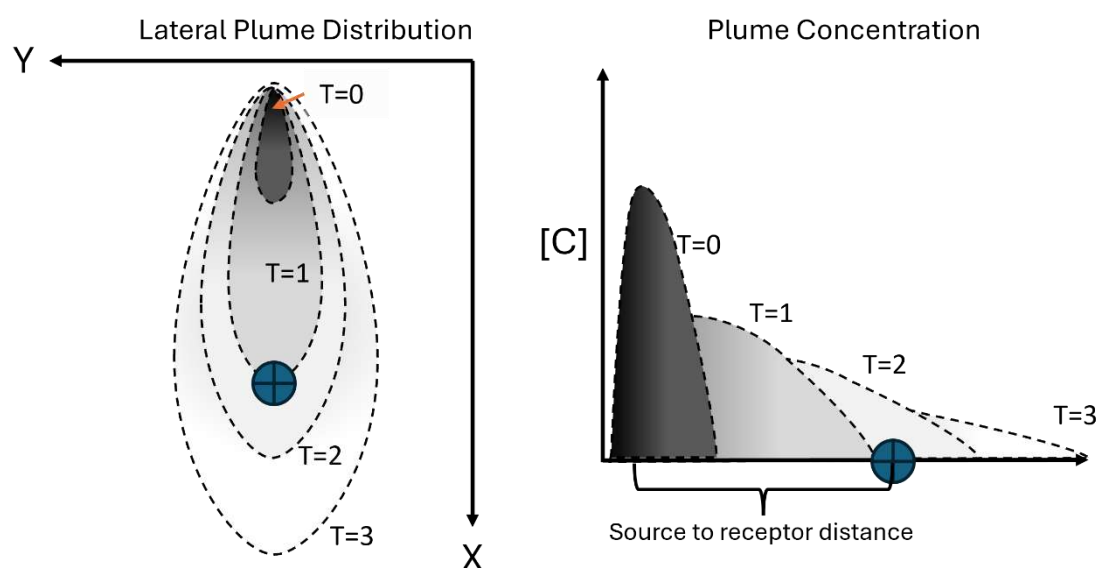
Figure 1: Plume Migration at $K=0$



If groundwater flow is introduced and hydraulic conductivity is greater than zero (K_1), the plume will still diffuse due to short-range interactions; however, it will also elongate in the direction of flow (X) due to advection and spread laterally and vertically due to dispersion (refer Figure 2).

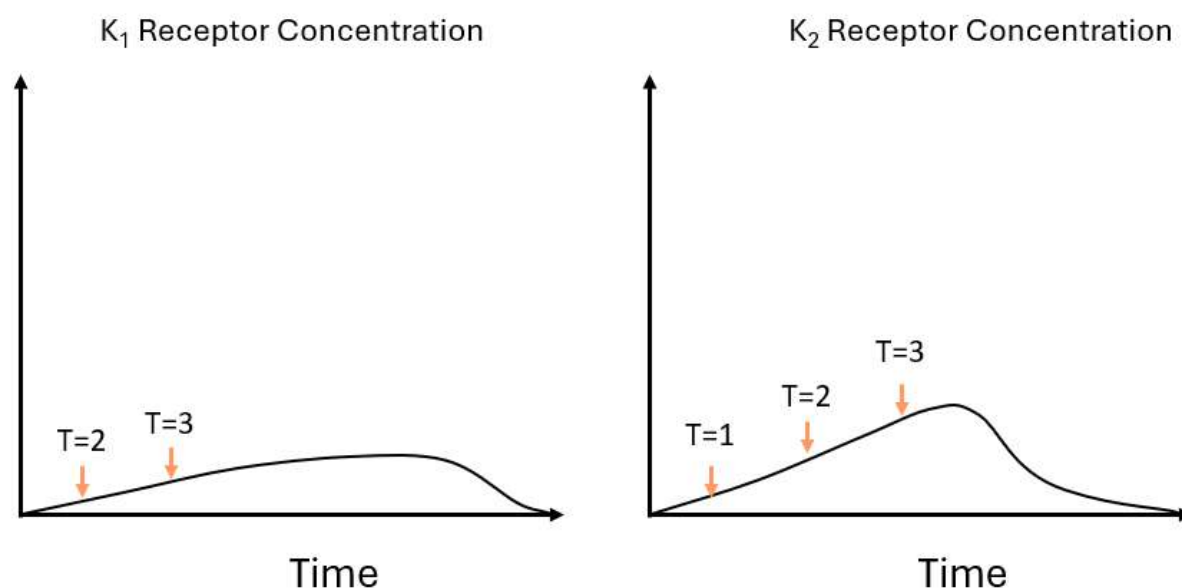
Figure 2: Plume Migration at K_1 

If the hydraulic conductivity is increased ($K_2 > K_1$), the plume will further elongate in the direction of flow (X) and short-range interactions will become less significant (Figure 3).

Figure 3: Plume Migration at k_2 

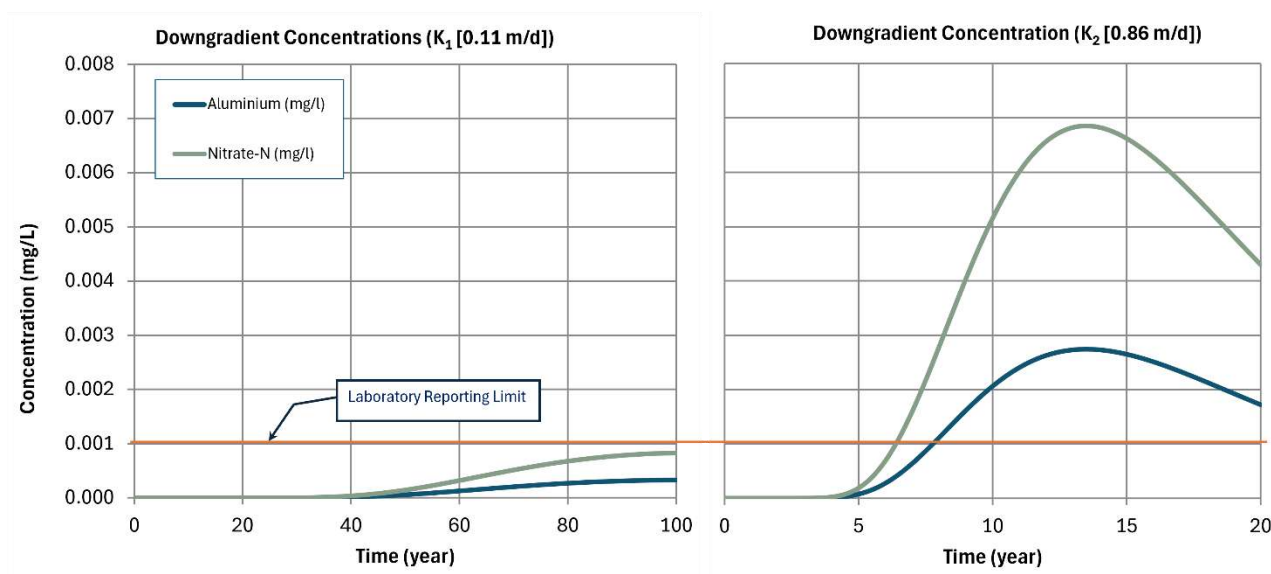
Note that in all scenarios, the mass of the contaminant in the plume at any time interval is constant. As such, with greater elongation the mass of contaminants in the plume will be more constrained in the lateral (Y) direction and concentrations will be higher along the flow axis. As shown in Figure 4, the downgradient effect will be that, as the hydraulic conductivity increases, the plume will reach the receptor sooner, the maximum concentration will be higher, and the plume will pass more quickly (noting that the source is a 6-month pulse so concentrations will not reach steady state).

Figure 4: Receptor Concentration with Time, where $K_1 < K_2$



This corresponds with the results provided in the ENGEO memo dated 30 January 2025 (Figure 5), which showed the concentrations at a point located directly 310 m downgradient of the soakage area.

Figure 5: RISC Modelled Downgradient Concentration at K₁ and K₂



Note: Concentration graphs have been excerpted and modified for relevance.

As demonstrated, when all other inputs (e.g., porosity) are held constant and there is no retardation, modelled peak concentrations should be proportional to hydraulic conductivity (i.e., lower peak concentrations with lower hydraulic conductivity).

Furthermore, we reiterate that the modelled concentrations in both scenarios (0.11 m/d and 0.86 m/d) are at least two orders of magnitude below the most conservative human or ecological health-based criteria (0.055 mg/L, aluminium [NZWQS 95%]; 11.3 mg/L, nitrate-N [NZDWS]).

The effect of dilution by upgradient groundwater will not be significant (i.e., relative to advection / dispersion) where there is no retardation. There will likely be some dilution from surface infiltration along the flow path, which will *reduce* concentrations; however, this was not considered in the model. The cross-sectional area of the aquifer is not germane.

In summary, the findings reported in the ENGEO memo dated 30 January 2025 are valid and consistent with anticipated results related to a change in hydraulic conductivity. Furthermore, the hydraulic conductivity applied in the ENGEO model (0.86 m/d) is a conservative estimate from the slug testing and, even under this scenario, the maximum modelled contractions at the boundary are either not detectable or orders of magnitude below the human or ecological-health based criteria.

Mounding

The predicted maximum mounding is based on a conservative scenario whereby the mound extends from the water table up to the base of the soakage area (saturated conditions below the soakage area). As stated in the ENGEO memo dated 21 November 2024, the anticipated infiltration of the soakage is on the order of 200 m³/d – 300 m³/d. We acknowledge that the length and width of the basin bottom (10 m x 10 m) were not halved when the dimensions were input into the model. The corrected Hantush model (Hantush, 1967) is included in Appendix 1. As shown, correcting the dimensions of the soakage area resulted in a 58% *reduction* to the mounding height while still allowing for a daily discharge of 200 m³/day.

As noted in our letter dated 30 October 2024, the actual discharge volumes will vary and depend on the infiltration capacity in the soakage area, rainfall, and evaporation rates. Uncertainties related to the infiltration rate do not present a potential risk to off-site receptors, as they can be managed through conditions of consent. WCRC has been provided with proposed conditions of consent (Cook, K [25/11/24] email to Michael Durand “RE: RC-2024-0122 – s92 response”) to address uncertainties relating to the infiltration rate, specifically:

12	Discharging shall be undertaken at a rate that is no greater than the infiltration capacity of the soakage area, with a <i>maximum</i> discharge rate of 800 m ³ /day.
14	The soakage area shall maintain a freeboard of <i>at least</i> 0.5 m. If the rate of discharge is such that a 0.5 m freeboard cannot be maintained, the flowrate shall be reduced to a rate that maintains a <i>minimum</i> 0.5 m freeboard.

In summary, we do not agree with the PDP statement that the results of the mound modelling indicate that discharge to ground may not be feasible. While ENGEO concurs that the soakage area may not be able to accommodate the maximum discharge of 800 m³/d, it will still be able to receive discharges to achieve the application objectives without causing a *greater than minor* offsite effect.

- Updated contaminant modelling simulations using input parameters more consistent with high parameter concentrations that have been measured in leachate and wastewater.

PDP considers that additional information is required to assess the validity of the modelling results. The above section addresses PDP queries.

- An ecological survey of the surface water features and aquatic habitat surrounding the site, including Noname Creek, the drain along Taylorville Road, including that part of the drain that begins at spring seep TCD1 and the streams on the southern side of Taylorville Road (excluding the Grey River) and an impact assessment on surface water quality and ecological values resulting from the proposed discharge.

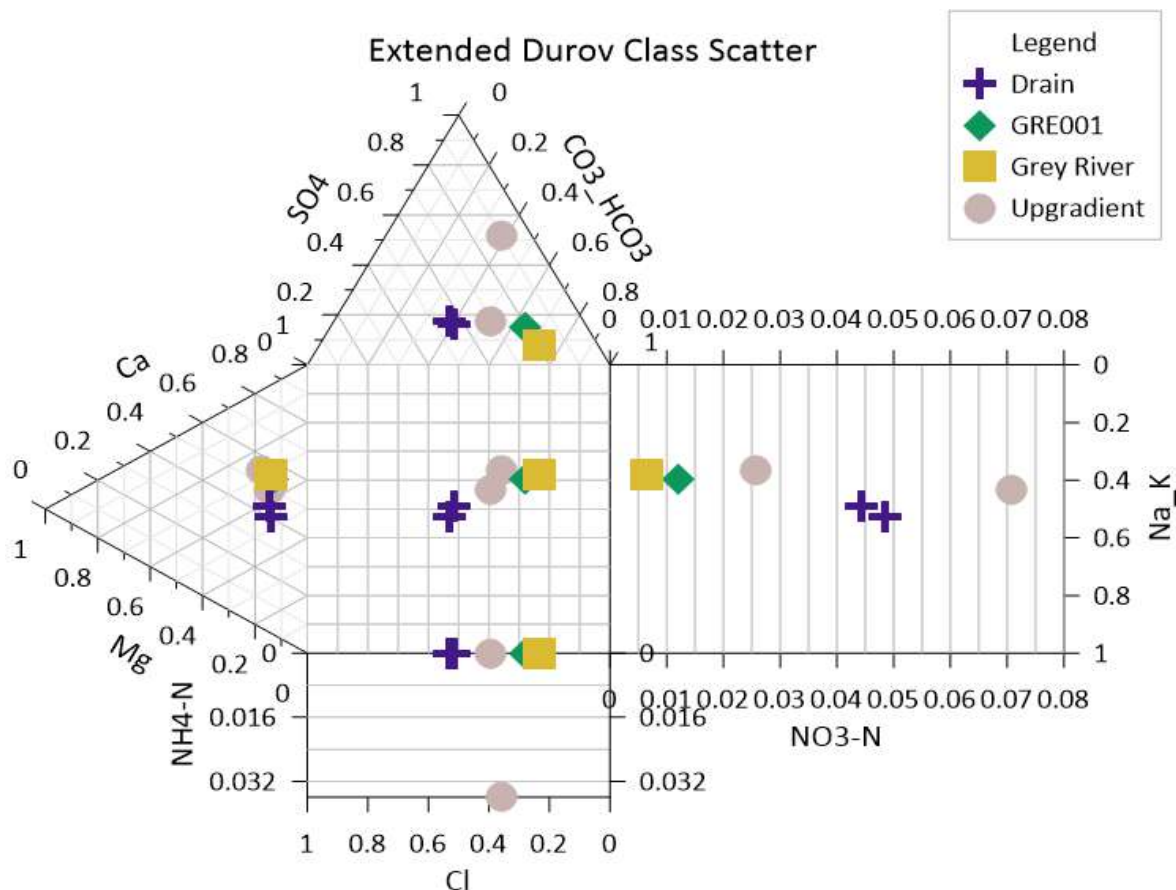
PDP has not reviewed the ecological impact assessment prepared by Bio-researchers.

5. A water quality comparison between water samples collected from the GDC water supply, the Grey River, groundwater upgradient of the landfill north of Taylorville Road and surface water samples collected at TRD2 and TRD4. The samples should include analysis for anions and cations and nitrogen species, in addition to other parameters sampled to date by TRPL. The purpose of the sampling is to inform whether the GDC water supply source is dominantly Grey River water and that there is minimal input to the supply bores from upgradient groundwater and surface drainage.

PDP notes that samples collected from TRD2 and TRD4 were not included in the comparison. We have revised our plot (Figure 6) to include only upgradient bores (MB1, MB19s), the Grey River (GR-01), untreated water for the GRE001 supply (PWT01), and the requested drain locations (TRD2 and TRD4). The drain locations were excluded from the original assessment due to the influence of other inputs along Taylorville Road and because water quality in samples collected from monitoring bores MB4, MB14, and MB18 are more relevant to assess inputs from the operations.

We refer to Figure A5.1 of the 30 January 2025 memo for sample locations.

Figure 6: Durov Plot of GRE001 Water and Upgradient Locations



As shown, the water sample from untreated water from the GRE100 supply (◆) plots most closely with the sample collected from the Grey River (■) with some similarity to upgradient groundwater (●).

We note that there is another deposit of the Pleistocene gravels (on the south side of Taylorville Road) that is not hydraulically connected to the subject site (ENGEO, 2024). Considering that ambient groundwater quality is likely similar in both deposits and the abstraction area is located approximately

100 m due south of the deposits on the south side of Taylorville Road, it is inferred that groundwater discharges from these deposits may be influencing water quality in the abstraction gallery, rather than waters from upgradient of the site.

The sample collected from the untreated water at the GRE001 water supply was most dissimilar to the samples collected from the drain adjacent to the site (+).

PDP notes that, compared to water samples collected from downgradient of the operations, there is more similarity between the water sample collected from the raw (untreated) water at GRE001 (PWT01), the Grey River approximately 300 – 400 m upstream of GRE001 (GR-01), and water samples collected upgradient of the operations. As stated in the ENGEO memo dated 30 January 2025, this is to be expected as all samples were collected from the same catchment.

In the ENGEO memo dated 30 January 25, it was noted that concentrations of dissolved metals (copper, lead, nickel, zinc) in the sample collected from the GRE100 supply (PWT01) differed significantly from the sample collected from the Grey River (GR-01) and samples collected along the southern site boundary. PDP states that, unless the applicant can identify another potential cause of the elevated metals, it may be interpreted that these concentrations are due to landfill operations.

We note that the concentrations detected in PWT01 are higher—by several orders of magnitude—than *any concentrations recorded* in water samples collected from Taylorville Road Drain, locations in the water treatment system, or monitoring bores located downgradient of the operations (ENGEO, 2024) (ENGEO, 2025). As such, there is no basis to suggest that the concentrations of dissolved metals in PWT01 are related to the operations.

It is beyond the scope of the proposed works to require the applicant to undertake a detailed investigation of all potential inputs to the GDC abstraction gallery which, as has been noted (ibid), is upgradient of the operations.

As stated in the memo dated 30 January 2025, it is inferred that concentrations in PWT-01 are naturally occurring (e.g., concentrations in the Holocene gravels) or due to the influence of waters originating at another (offsite) source area.

6. Yield versus drawdown data from the GDC supply bores to confirm the gravel deposits immediately adjacent to the Grey River are of high permeability with a high hydraulic connection to the Grey River.

ENGEO analysed pumping test data provided by GDC using published and industry accepted methods (Boulton [1963], Neuman [1975]) and hydrogeological software (Aquifer Test 11.0) to estimate hydraulic conductivity in the Holocene gravels.

PDP states, without details, they do not consider that these are accurate estimates; however, they do not consider further analysis necessary as there was very little drawdown in the bore.

ENGEO notes only that these estimates are consistent with a variety of published estimates for unconsolidated gravels (Fetter, 2021).

7. XRD sample analysis from the Kaiata mudstone underlying the landfill to confirm clay mineralogy in the mudstone and confirm ENGEO comments that swelling within any fractures that may be present in the mudstone will block the transmission of groundwater via a fracture network.

As stated in the memo dated 30 January 2025, XRD analysis of two mudstone outcrops show that it is comprised of a mixture of swelling and non-swelling clay minerals. PDP maintains that there is still potential from migration from the site to the GRE100 supply bores through fracture flow in the mudstone.

There is no confining pressure at the site or natural force that will cause significant quantities of groundwater to migrate vertically from the Pleistocene gravels into the mudstone—which has a hydraulic conductivity that is lower by orders of magnitude—much less induce it to migrate hydraulically upgradient via fracture flow.

Regardless of the extent of investigations, due to natural heterogeneity and uneven stress / strain placed on rock formations, it is not feasible to disprove the *possibility* of fractures that trend in the direction from the site to the GRE001 abstraction bores and that fractures (if any) could *possibly* transmit minute quantities of water along a 300–400 m flowpath. However, based on the presence of swelling clays and absence of observable fracturing, we consider this a *highly unlikely* migration pathway.

We note that the threshold for the purpose of processing the application is not to prove a null hypothesis; it is to assess the likelihood of a *greater than minor* deleterious effect, and that the applicant is being asked to provide evidence that far exceeds the scale and significance of the proposed activity.

To consider potential effects, we used Darcy's Equation ($Q=KiA$) to calculate an estimated daily flow (Q) of groundwater from upgradient onto the site that is on the order of $50 \text{ m}^3/\text{day}^1$. In correspondences from GDC to the West Coast Regional Council (Lane, L [19 January 2024] to Chris Barnes, "*RE: Flow Rate Compliance Report*"), GDC reports an average flow rate from the GRE001 abstraction bores ($8,513 \text{ m}^3/\text{day}$) that is 170 times higher than the *total flow* of groundwater across the site.

In summary, it is considered *highly unlikely* that groundwater from the site will migrate through the mudstone from the site to the abstraction bores and, noting the relative flow rates, it is *highly unlikely* that any incidental migration would be detectable or have a *greater than minor* effect.

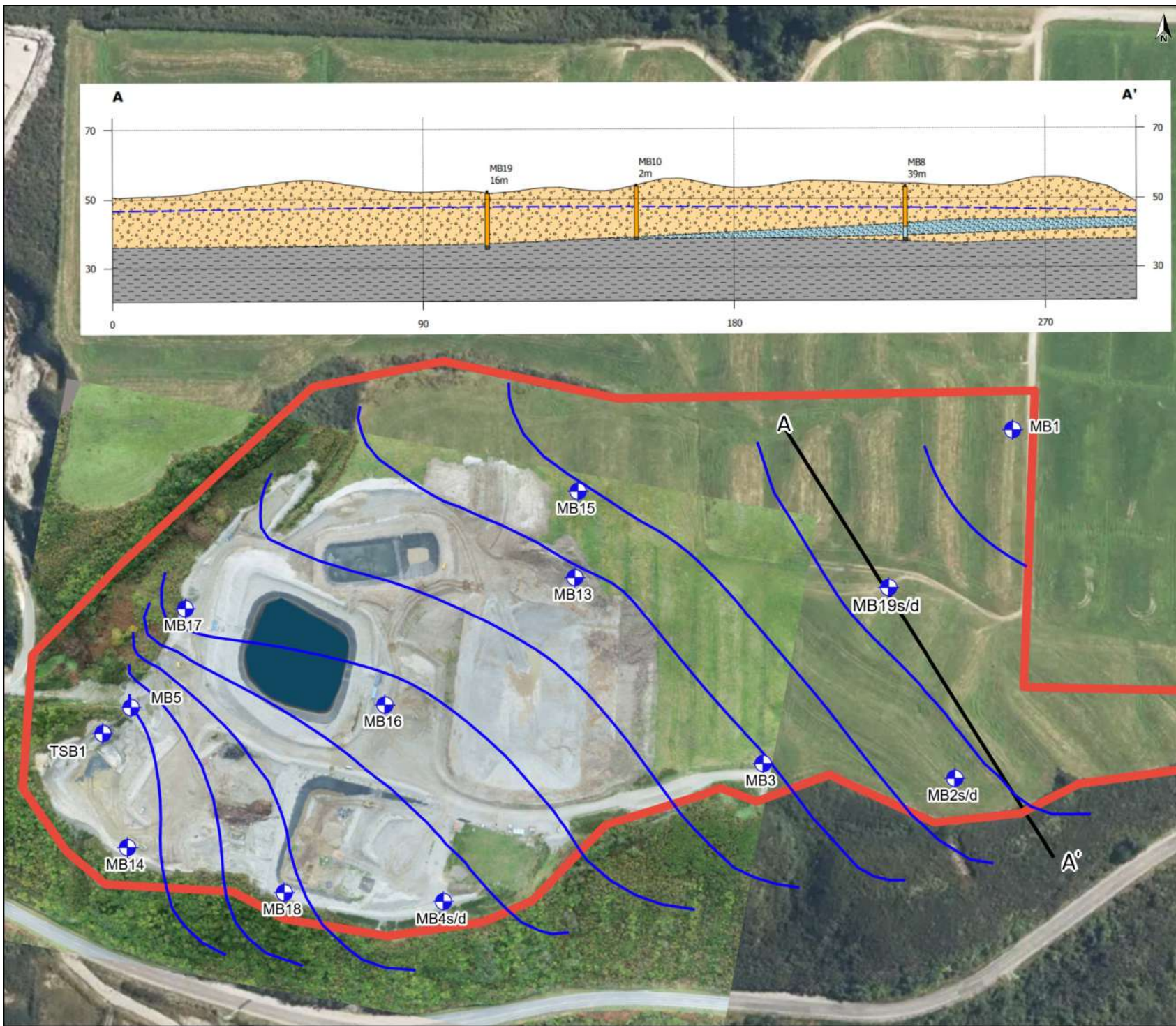
Based on our assessment works to date and in conjunction with the proposed conditions of consent, it is deemed ***highly unlikely*** that the proposed discharges will have a deleterious effect on human or ecological health.

This memorandum has been prepared for the use of our client, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this memo. No liability is accepted for the use of any part of the report for any other purposes or by any other person or entity. This Limitation should be read in conjunction with the Engineering NZ / ACENZ Standard Terms of Engagement.

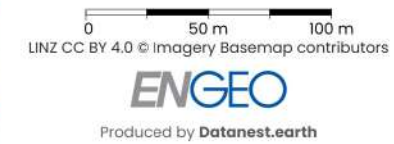
¹ Estimated using the hydraulic conductivity ($K=1 \times 10^{-5} \text{ m/s}$), the hydraulic gradient ($i=0.018$), and the approximate cross-sectional area of the saturated aquifer perpendicular to flow between the head of Noname Creek and the extent of the Pleistocene gravels ($A=3,000 \text{ m}^2$ – $3,600 \text{ m}^2$; refer Figure 6.)

References

- ENGEO. (2024). *Preliminary Hydrogeological Assessment*. Job No. 26200.000.001: Prepared for TRPL.
- ENGEO. (2025). *2024 Annual Report*. Job No. 26200.000.001: Prepared for TRPL.
- Fetter, C. (2021). *Applied Hydrogeology*. Upper Saddle River, NJ: Prentice-Hall, Inc.
- Hantush, M. (1967). Growth and Decay of Groundwater Mounds in Response to Uniform Percolation. *Water Resources Journal* (3), 227-234.



- Legend**
- A-A' Cross Section (2x scale)
 - Monitoring Well Locations
 - Inferred Groundwater Contour Lines
 - Approximate Site Boundary
 - Line of Cross Section



Title: Pleistocene Aquifer Cross Section		
Client: Taylorville Resource Park Ltd		Size: A4
Project: Taylorville Resource Park	Drawn: LN	Figure No: 6
Date: 21-01-2025	Checked: DR	
Proj No: 26200.000.001	Scale: 1:3068	Version: 1.0

APPENDIX 1

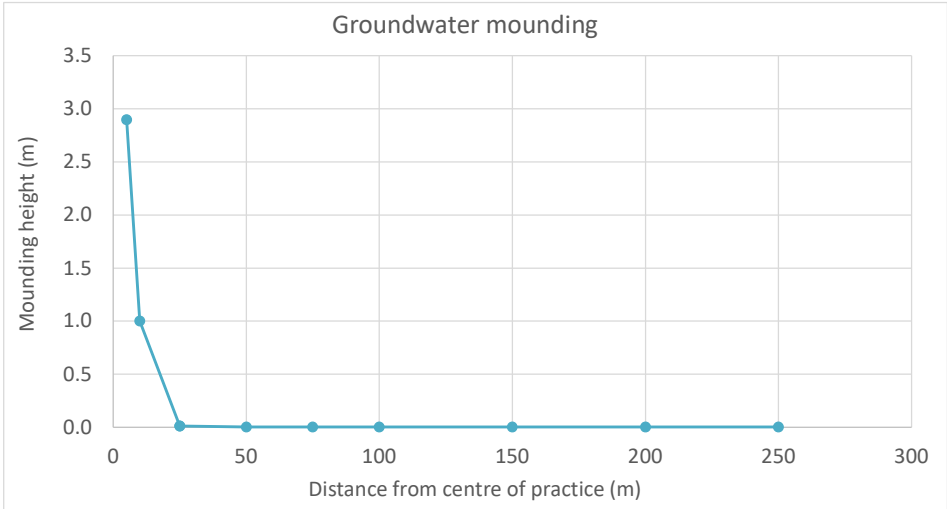
Corrected Hantush Model

This spreadsheet will calculate the height of a groundwater mound beneath an stormwater infiltration BMP.
More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102
"Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

[Go to the USGS report](#)

Input Values		
Recharge (infiltration) rate (m/day)	2.000	R
Specific yield, S_y (dimensionless)	0.190	S_y
Horizontal hydraulic conductivity, K_h (m/day)	0.860000	K_h
1/2 length of basin (x direction, in m)	5.0	x
1/2 width of basin (y direction, in m)	5.0	y
Duration of infiltration period (days)	1	t
Initial thickness of saturated zone (m)	8.0	$h_i(0)$

CALCULATE



Distance from center of infiltration BMP (m)	Ground-water mounding (m)
5	2.90
10	1.00
25	0.01
25	0.01
50	0.00
75	0.00
100	0.00
150	0.00
200	0.00
250	0.00

IF YOU CHANGE THE SCALE OF THE
DISTANCE MEASUREMENTS
(OR ANY OTHER PARAMETER),
YOU MUST RECALCULATE!!

Site Memorandum

Project Name	Taylorville Resource Park		
Memo Topic	RC-2024-0122 and RC-2021-0097-V10 - RFI Response		
Memo Date	17 March 2025	Date of Site Visit	N/A
ENGEO Memo No.	10	ENGEO Project No.	26200.000.001
To	Taylorville Resource Park Ltd	Copy	Barker and Associates
Author	Lyn Nugent	Reviewers	Richard Griffiths Neil Charters

ENGEO attended discussions with the West Coast Regional Council (WCRC) on 7 March 2025, to discuss further information requested by WCRC in relation to resource consent application RC-2024-0012. WCRC has requested additional information related to the further information request issued by WCRC (dated 21-Oct-24) under Section 92(1) of the Resource Management Act 1991. WCRC queries are shown in grey, with ENGEO responses are shown in blue.

1. Will mounding beneath the soakage area affect slope stability?

Infiltrating water beneath the soakage area may mound to an elevation that intersects with the base of the soakage area, which will be approximately 8 m above the current water table. The rate of infiltration will be limited by the vertical hydraulic conductivity in the Pleistocene gravels. As the gravels are not bedded, we assume a relatively isotropic formation, meaning that the horizontal conductivity is likely very similar to the vertical and the extent of mounding will be proportionally limited (i.e., the formation will not accept more water than it can disperse).

Our conservative mounding estimate (Appendix 1) shows the lateral extent of any mounding will be limited to a radius of ~20 m beyond the infiltration basin. Beyond that distance, the mounding effect will be significantly less than the inferred seasonal variability of the water table (< 4 cm).

The proposed soakage area is located approximately 100 m away from the head of Noname Creek and approximately 150 m away from the extents of the Pleistocene gravels, which demarcate the nearest sloping ground. This negligible groundwater response from mounding will not increase the risk of slope instability.

As noted in our letter dated 30 October 2024, the actual discharge volumes will vary and depend on the infiltration capacity in the soakage area, rainfall, and evaporation rates. Uncertainties related to the infiltration rate do not present a potential risk to offsite receptors, as they can be managed through conditions of consent. WCRC has been provided with proposed conditions of consent (Cook, K [25/11/24] email to Michael Durand “RE: RC-2024-0122 – s92 response”) to address uncertainties relating to the infiltration rate, specifically:

12	Discharging shall be undertaken at a rate that is no greater than the infiltration capacity of the soakage area, with a maximum discharge rate of 800 m3/day.
14	The soakage area shall maintain a freeboard of at least 0.5 m. If the rate of discharge is such that a 0.5 m freeboard cannot be maintained, the flowrate shall be reduced to a rate that maintains a minimum 0.5 m freeboard.

2. Provide updated contaminant modelling showing a scenario with no retardation.

Updated modelling is attached in Appendix 2. As shown, even in a high hydraulic conductivity ($K=0.86$ m/d) scenario with no attenuation / degradation and no retardation ($K_d/K_{oc}=0$), and using the maximum concentrations detected at the site, concentrations at the downgradient boundary will not exceed the Drinking Water Standards for New Zealand (DWSNZ) or the Australian and New Zealand Guidelines for Fresh and Marine Water Quality default guideline values (DGVs) for 90% protection of freshwater species. This modelling is based on several conservative assumptions:

- The concentrations of the discharges will be equivalent to the highest concentrations ever recorded at the site (e.g., undiluted leachate from Cell C in July 2023);
- There will be no interactions between contaminants and aquifer materials (e.g., inert aquifer media);
- There will be no interactions with organic matter in the Pleistocene gravels; and
- There will be no nitrification / oxidation along the flow path.

These assumptions overestimate the actual anticipated, detectable concentrations at the boundary for several reasons:

- The modelled concentrations were undiluted and have not been detected in over a year. They were likely related to the discharge of greenwaste (i.e., tomato plants) in Cell C (January 2023). Waters in the retention pond (waters proposed for discharge) are significantly lower due to treatment (flocculation), aeration, and dilution with stormwater.
- Site-specific K_d values have been developed for heavy metals (Table 1); as shown, the mobility is generally classified as slightly mobile to immobile.
- We have not quantified partition coefficients for nitrogen compounds; however, there may be some adsorption to the substrate media. Based on field measurements (e.g., redox, dissolved oxygen) and laboratory results (Appendix 3), the subsurface conditions are suboxic near the proposed soakage area and become oxic as water moves downgradient towards the Pleistocene gravels, indicating that conditions are favourable to nitrification, which would reduce the concentration of ammoniacal-N.

This demonstrates it is *highly unlikely* that discharges will have a *greater than minor effect* at the downgradient property boundary.

WCRC has been provided with proposed conditions of consent (Cook, K [25/11/24] email to Michael Durand “RE: RC-2024-0122 – s92 response”) to address uncertainties relating to concentrations in discharges and the fate and transport of determinands in discharge waters, specifically:

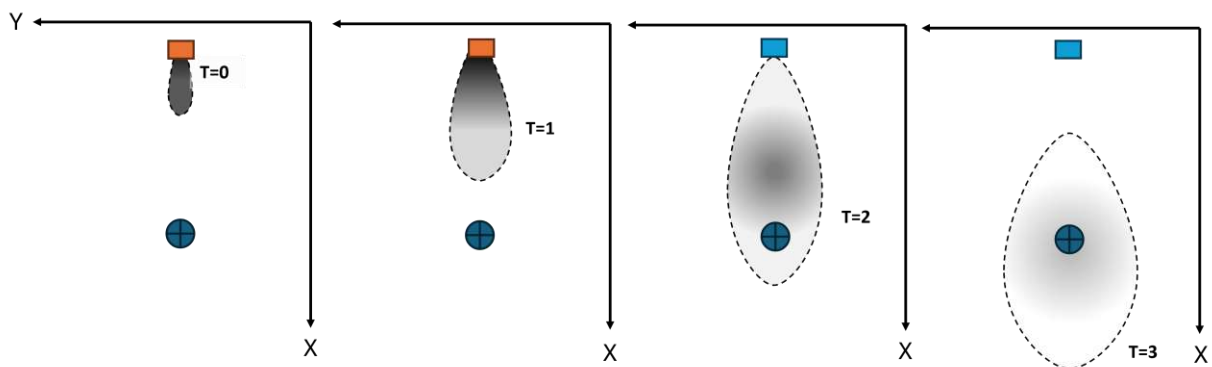
17	Prior to the commencement of discharges, baseline groundwater samples shall be collected from monitoring bores MB13 and MB15 and analysed for the following determinands: • Sum of Anions • Sum of Cations • An/Cat balance (%) • pH • Total Alkalinity • Bicarbonate. CO₃, CO₂ • Total Hardness • Electrical conductivity (mS/m) • Dissolved aluminium • Total aluminium • Dissolved calcium • Dissolved iron • Total iron • Dissolved magnesium • Total magnesium • Dissolved manganese • Total manganese • Dissolved potassium • Dissolved sodium • Chloride • Total Ammoniacal-N • Nitrite-N • Nitrate-N • TKN • Total-N • Total-P • DRP • Sulphate • cBOD₅ • Total and dissolved heavy metals (arsenic, cadmium, chromium, copper, lead, nickel, zinc)
18	For six weeks following the commencement of discharges, groundwater samples shall be collected at 2-week intervals from monitoring bores MB13 and MB15 and analysed for the determinands in Condition 17.
19	Following the two-weekly groundwater monitoring described in Condition 16 groundwater samples shall be collected at monthly intervals for the duration of discharges from monitoring bores MB13 and MB15 and analysed for the determinands in Condition 17.
20	Following each monitoring round described in Conditions 18–19, groundwater analytical results shall be compared to the baseline concentrations (refer Condition 17). If the <i>change</i> in groundwater quality exceeds 50% of the New Zealand Drinking Water Standard (NZDWS), discharges shall cease and the actions in Condition 21 shall be implemented.
21	If the <i>change</i> in groundwater quality at monitoring bores MB13 or MB15 exceeds 50% of the NZDWS, the Applicant shall: Cease discharges to the soakage area; Notify the WCRC Group Manager – Regulatory & Policy; Engage a Suitably Qualified and Experienced Practitioner (SQEP) to Assess if the change in groundwater quality at MB13 and MB15 is due to discharges or other (e.g., upgradient water quality) factors; Characterise the potential offsite effect of changes due to changes in water quality on likely human and ecological receptors; If necessary, develop a revised monitoring programme at downgradient monitoring bores and develop mitigation measures; and Prepare a Response Plan for submission to the WCRC.

22	All groundwater quality monitoring results shall be provided to the WCRC Group Manager – Regulatory & Policy within one week of them being received in an electronic format, suitable for automatic upload to a water quality database. At the conclusion of discharges, a summary email will be prepared for the WCRC that includes: Estimated total volume of discharges Tabulated analytical results and a trend analysis Exceedances of Condition 20 criteria and any mitigation actions
----	--

3. How will a pulse source (six-month discharge) affect the mass flux of contaminants or concentrations at the receptor?

The plume maximum will extend downgradient from the source area, with a stable source area for the duration of discharges (Figure 1). However, the concentrations will not achieve steady-state conditions and, once the discharges cease, the maximum concentration will be transported downgradient and reduced due to minute differences in flow velocity (Hemond, 2000). The total mass of contaminants in the plume will be the same as the mass of contaminants discharged (excluding degradation / attenuation / decay). Concentrations at the receptor are provided in Appendix 2.

Figure 1: Plume Migration with a Pulse Source at Different Time Intervals



Note: Source area discharging at T=0 and T=1 (orange rectangle), no discharges from the source area at T=2 and T=3 (blue rectangle). Downgradient receptor shown as a blue circle.

4. Provide additional comparison between water collected at the GRE001 supply (PWT01), the Grey River (GR-01), Taylorville Road drain locations (TRD1—TRD5), upgradient groundwater monitoring bores (MB1, MB19s/d) and locations downgradient of the operations.

As discussed in our memos dated 30 January and 5 March 2025, concentrations of heavy metals in the sample collected from PWT-01 are higher—by several orders of magnitude—than any concentrations recorded in water samples collected from:

- Taylorville Road drain
- The water treatment system, or
- Monitoring bores located downgradient of the operations.

To further assess for any potential contributions from the site to the sample collected at the GRE001 supply, we compared the analytical results for copper, nickel, lead, and zinc in all samples collected during the January 2025 monitoring round (Table 2). While dissolved metals concentrations are more applicable for this migration pathway, we have considered concentrations of both total and dissolved metals.

The ternary diagrams in Appendix 3 show that the proportions of metals in the sample collected at PWT-01 are significantly different from any groundwater samples collected at the site (upgradient and downgradient), Taylorville Road drain, the Grey River and the river tributaries.

The solubility of heavy metals is dependent on the pH and presence of anionic species (e.g., hydroxide, sulphate); however, in general, at a neutral pH (7), the copper will be relatively insoluble followed by zinc, lead, and nickel (most soluble) (Karimi, 2017) (Lewis, 2010) (MacBerthouex, 2019) (Brezonik, 2011). If the concentrations at PWT-01 originated from any of the other sample locations, the proportion of soluble metals (e.g., nickel) would be higher than insoluble (e.g., copper) relative to the source; however, the inverse condition exists.

We also compared the concentrations of the target heavy metal determinands (Appendix 3). As shown, the absolute and relative concentrations of heavy metals in the sample collected from PWT-01 do not resemble those in *any other sample collected*. This is additional to the fact that there is no mechanism that would cause metals concentrations from the site to concentrate by orders of magnitude on the flow path from the site to the abstraction bores.

This demonstrates that there is no basis to suggest that the concentrations of total and dissolved metals in PWT-01 are related to the operations and it is beyond the scale and significance of the proposed works to require the applicant to undertake additional sampling or investigation works.

WCRC requested a review of the Durov scatter plots to explain differences in the plot provided on 30 January and the plot provided on 5 March 2025. Both plots were based on the sample dataset; however, the plotted samples differed between the two memoranda. The original plot did not include samples from the upgradient bores and Taylorville Road drain locations, but did include downgradient / cross gradient bores. In accordance with WCRC's request of 25 February 2025, the plot was updated to include only upgradient bores (MB1, MB19s), the Grey River (GR-01), untreated water for the GRE001 supply (PWT01), and the requested drain locations (TRD2 and TRD4). We do note that the axis titles for the anions were incorrectly placed in the figures provided on 30 January; this was corrected in the 5 March memorandum.

5. WCRC/PDP is not satisfied that swelling within any fractures that may be present in the mudstone will block the transmission of groundwater via a fracture network.

We understand this question is essentially in relation to a concern that contaminated groundwater may be able to travel below / downgradient of the soakage area to the GDC supply bores through fractures in the mudstone.

We have drawn up a cross section from the supply bores to the landfill (Figure 2). We consider it *highly unlikely* that fracture flow of potentially contaminated groundwater (if any) will have a *greater than minor effect* on users of the GRE001 water supply based on the following rationale:

- Previous investigations (Golder and Associates, 2005) (Bishop, 2004) estimated the horizontal hydraulic conductivity of the Kaiata Mudstone (1×10^{-8} m/s), with an inferred ratio of horizontal to vertical conductivity of at least 10:1 (Domenico, 1990). Based on field observations made by ENGEO along exposures of the Kaiata Mudstone, the formation is massive with little evidence of fracturing.
- The measured hydraulic conductivity in the overlying Pleistocene gravels is higher by 2–3 orders of magnitude (1×10^{-5} m/s– 1×10^{-6} m/s). There is no confining pressure at the site or natural force that would cause significant quantities of groundwater to migrate vertically from the much higher permeability Pleistocene gravels into the lower permeability mudstone.

- Flow from the discharge area to the abstraction bores would require a *highly unlikely* scenario which would need to involve:
 - Discharges from the soakage area migrating vertically (perpendicular to the flow of groundwater) to the mudstone, **and**
 - The discharges encounter a fracture(s) that runs perpendicular to the regional orientation of mapped faults (northeast–southwest) and are connected along the 300–400 m flow path to the abstraction wells, **and**
 - The fractures do not intersect with any preferential pathways in the bedding planes in the mudstone and travel west-southwest along the dip direction, **and**
 - The fractures have an angle(s) that will cause them to daylight near the abstraction bores (i.e., and not in the road cut or the banks of the Grey River channel), **and**
 - The mudstone does not contain swelling clays at an adequate proportion to hinder the flow of groundwater, **and**
 - The discharges are not diluted by any other groundwater flowing through the mudstone; **and**
 - The discharges are not captured or diluted by groundwater flow in the Holocene gravels, **and**
 - The discharges intersect with the radius of influence of the abstraction wells (noting that there is very little measured drawdown).

Even assuming a *highly conservative* scenario whereby 1% of the maximum daily discharges (8 m³/d) are transported via the *highly unlikely* scenario outlined above, the discharges would still comprise *less than 0.1%* of the average flow rate from the abstraction bores (8,513 m³/d) and the resulting concentrations would be orders of magnitude below any of the human health-based criteria.

PDP has recommended a Lugeon test to assess for the *possibility* of fracture flow. Noting again that the threshold for notification is based on the likelihood and magnitude of potential effect(s), rather than possibility, a Lugeon test has several limitations that make it unsuitable to address this query:

- It will not differentiate different flow pathways (e.g., bedding vs. fracture),
- It will not determine the orientation and angle of any fractures, and
- It will not determine the connectedness of any flow paths between the site and the abstraction wells.

As such, this issue is most appropriately addressed through a logic test and, as described above, it is considered *highly unlikely* that groundwater from the site will migrate through the mudstone from the site to the abstraction bores and, noting the relative flow rates, it is *highly unlikely* that any incidental migration would be detectable or have a *greater than minor* effect.

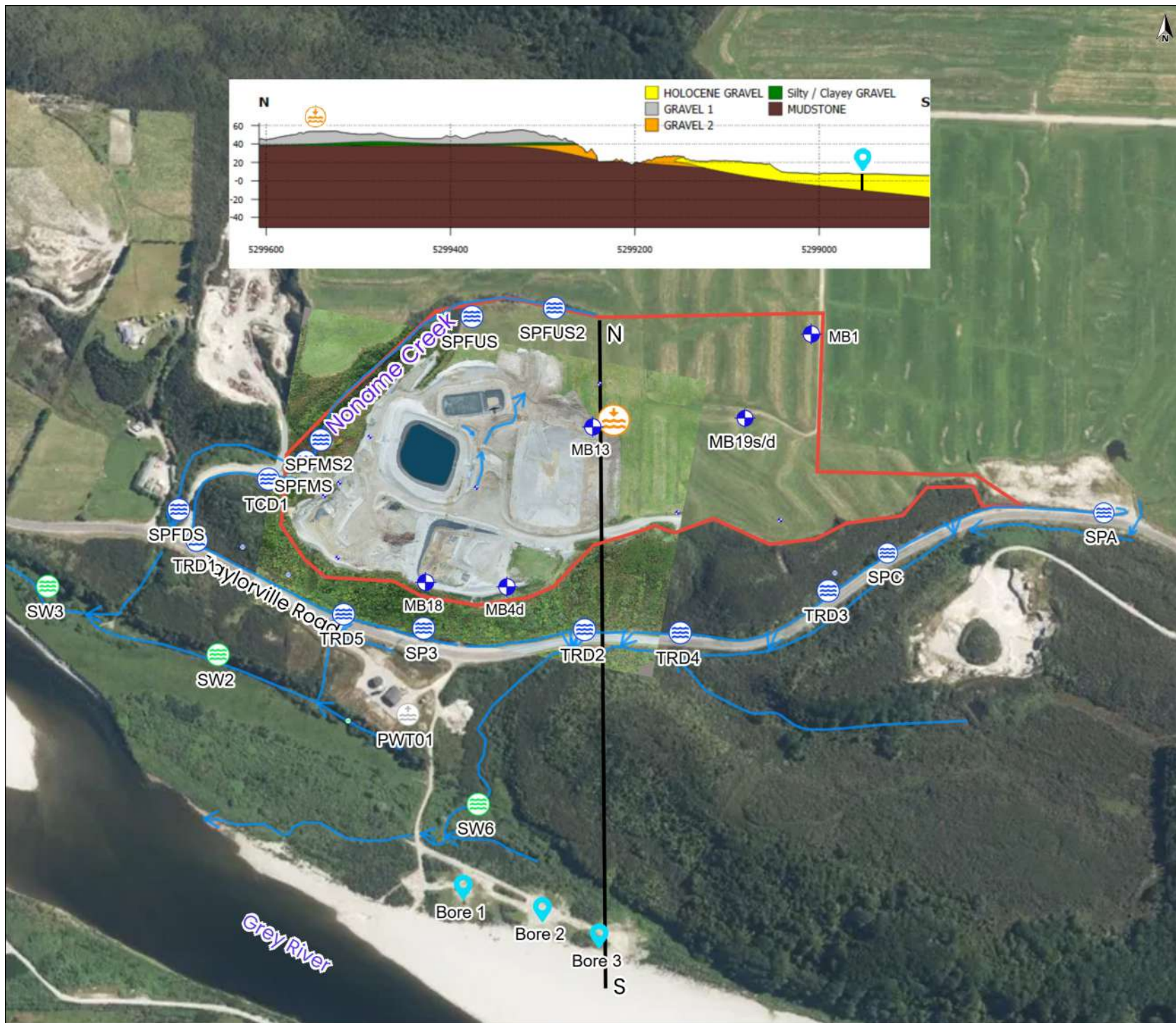
If there are additional queries regarding fracture flow transport through the mudstone, we recommend a meeting between one of the Principal Engineering Geologists at ENGEO and their PDP counterpart(s).

Based on our assessment works to date and in conjunction with the proposed conditions of consent, it is deemed **highly unlikely** that the proposed discharges will have an adverse effect on human or ecological health.

This memorandum has been prepared for the use of our client, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this memo. No liability is accepted for the use of any part of the report for any other purposes or by any other person or entity. This Limitation should be read in conjunction with the Engineering NZ / ACENZ Standard Terms of Engagement.

References

- Bishop. (2004). Hydraulic Conductivity of Mudstone Formations in the West Coast Region, South Island, New Zealand. *New Zealand Journal of Geology and Geophysics*, 47(3), 421-432.
- Brezonik, P. (2011). *Water Chemistry*. New York: University of Oxford Press.
- Domenico, P. a. (1990). *Physical and Chemical Hydrogeology*. New York: John Wiley & Sons.
- ENGEO. (2024). *Preliminary Hydrogeological Assessment*. Job No. 26200.000.001: Prepared for TRPL.
- ENGEO. (2025). *2024 Annual Report*. Job No. 26200.000.001: Prepared for TRPL.
- Fetter, C. (2021). *Applied Hydrogeology*. Upper Saddle River, NJ: Prentice-Hall, Inc.
- Golder and Associates. (2005). *Arnold Hydro-Electric Power Scheme, West Coast, New ZEaland. Geological and Geotechnical Feasibility Studies*. Prepared for TrustPower Limited (R05641036-01).
- Hantush, M. (1967). Growth and Decay of Groundwater Mounds in Response to Uniform Percolation. *Water Resources Journal* (3), 227-234.
- Hemond, H. (2000). *Chemical Fate and Transport in the Environment*. Academic Press.
- Karimi, H. (2017). Effect of pH and Initial pb(III) Concentration on teh Lead Removal Efficiency from INdustrial Wastewater using Ca(OH)₂. *International Journal of Wastewater Treatment*.
- Lewis, A. (2010). Review of Metal Sulfide Precipitation. *Hydrometallurgy*, 222-234.
- MacBerthouex, P. (2019). *Pollution Prevention & Control - Material Balances*.



- Legend**
- Surface Water Sampling Locations
 - Coal Creek WTP
 - Grey River Sample Location
 - Monitoring Well Locations
 - Tributary Surface Water Sample Locations
 - GRE001 Abstraction Wells
 - Proposed Discharge Location
 - Approximate Site Boundary
 - Line of Cross Section

0 100 m 200 m
LINZ CC BY 4.0 © Imagery Basemap contributors

ENGEO

Produced by **Datanest.earth**

Title:
Sampling Locations and Cross Section
(soakage area to abstraction wells)

Client:
Taylorville Resource Park Ltd

Size: A4

Project:
Taylorville Resource Park

Drawn: PS

Figure No: 2

Date: 12-03-2025

Checked: DW

Proj No:
26200.000.001

Scale: 1:5730

Version: 1.0

Table 1: Gravel Analytical Results and Calculated Partition Coefficients

Analyte	BH13	BH13	BH13	BH15	BH15	BH15	BH19	BH19	BH19
	0m - 1.5m	9m - 10m	17m - 18m	0m - 1.5m	13m - 15m	16m - 18m	0m - 1.5m	7m - 8m	15.6m - 16.5m
	18-10-2024	18-10-2024	18-10-2024	18-10-2024	18-10-2024	18-10-2024	18-10-2024	18-10-2024	18-10-2024
Total Metals (mg/kg)									
Arsenic	3	5	13	3	7	13	3	3	15
Chromium (III+VI)	20	13	34	14	23	31	10	13	29
Copper	9	11	17	8	12	16	7	9	15
Lead	11	18.7	11.6	9.3	19.5	11.7	8.5	16	12.8
Nickel	14	13	36	11	15	36	9	13	40
Zinc	38	50	81	31	52	76	26	42	73
SPLP Metals (mg/L)									
Arsenic	<i>0.0011</i>	0.0013	0.0022	<i>0.0011</i>	0.0028	<i>0.0011</i>	<i>0.0011</i>	0.002	<i>0.0011</i>
Chromium (III+VI)	0.003	0.0023	0.0057	<i>0.00053</i>	0.0086	0.0007	<i>0.00053</i>	0.0049	<i>0.00053</i>
Copper	0.00191	0.0032	<i>0.00053</i>	<i>0.00053</i>	0.0061	0.00054	<i>0.00053</i>	0.0047	<i>0.00053</i>
Lead	0.002	0.0044	0.00021	<i>0.00011</i>	0.0086	0.00012	<i>0.00011</i>	0.0082	<i>0.00011</i>
Nickel	0.00172	0.0027	0.0049	<i>0.00053</i>	0.006	0.00132	<i>0.00053</i>	0.0039	0.0013
Zinc	0.0055	0.0122	<i>0.0011</i>	<i>0.0011</i>	0.023	<i>0.0011</i>	<i>0.0011</i>	0.0158	<i>0.0011</i>
Soil-Water Partition Coefficient (L/kg)									
Arsenic	2707	3826	5889	2707	2480	11798	2707	1480	13616
Chromium (III+VI)	6647	5632	5945	26395	2654	44266	18848	2633	54697
Copper	4692	3418	32055	15074	1947	29610	13188	1895	28282
Lead	5480	4230	55218	84525	2247	97480	77253	1931	116344
Nickel	8120	4795	7327	20735	2480	27253	16961	3313	30749
Zinc	6889	4078	73616	28162	2241	69071	23616	2638	66344

Notes:

All values provided in units of milligrams per kilogram (mg/kg).

Values in *italics* were detected below the laboratory reporting limit (RL shown)

McCall's Soil Mobility Classification Scheme Colour Key:

Mobility class	Range of Kd
Very high	0 - 50
High	50 - 150
Medium	150 - 500
Low	500 - 2000
Slightly	2000 - 5000
Immobile	> 5000

Table 2: January 2025 TRP Sample Results

Analyte	NZDWS ¹	NZWQS (95%) ²	NZWQS (90%) ²	NZWQS (80%) ²	Groundwater						Taylorville Road Drain					Downgradient Springs / Seeps			
					MB1	MB4d	MB13	MB18	MP19s	MB19	TRD1	TRD2	TRD3	TRD4	TRD5	TCD1	SPA	SPC	SP3
					20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25
Sum of Anions					0.76	1.12	2.2	7.6	0.9	6.4	5.1	0.45	0.73	0.54	8.1	6.3	0.77	0.72	4.6
Sum of Cations					0.75	1.11	2.3	7.7	0.87	6.7	5.2	0.45	0.73	0.55	7.2	6.4	0.73	0.73	4.6
An/Cat balance (%)																			
pH					6.2	6.1	6.6	7.1	5.9	7.5	7.8	6.2	6.7	6.9	4.8	6.4	7.1	7.1	5.2
Total Alkalinity					17.9	30	94	210	23	290	82	6.7	18.9	9.2	1.5	100	18.8	19.9	2.4
Bicarbonate					22	36	115	250	28	360	99	8.1	23	11.2	1.9	122	23	24	2.9
Total Hardness					25	38	73	250	28	220	220	9.6	24	13.7	280	270	27	25	176
Electrical conductivity (mS/m)					8.4	12.4	22.1	74.7	10.2	57.6	52.4	5.2	7.9	6	80.1	63.1	8.3	7.7	48.3
Dissolved aluminium	1	0.055	0.08	0.15	<i>0.08</i>	0.017	0.006	0.013	0.028	0.038	0.05	0.142	0.051	<i>0.118</i>	<i>0.097</i>	0.005	0.005	<i>0.071</i>	0.2
Total aluminium		0.055	0.08	0.15	0.119	0.84	0.02	6.8	1.51	0.029	0.088	1.36	0.095	0.17	0.97	0.0098	0.0138	0.25	3.4
Dissolved calcium					7.7	13.7	17.5	90	9	66	77	2.6	7.4	3.9	91	96	9.3	8.3	57
Dissolved iron					< 0.02	0.04	2.7	0.85	< 0.02	4.3	0.06	0.27	0.08	0.3	0.03	0.02	0.13	0.24	0.03
Total iron					0.024	0.55	3.1	8.3	2.6	7.7	0.142	4.4	0.29	0.6	0.4	0.083	0.57	2.8	4.2
Dissolved magnesium					1.37	1.01	7	7.1	1.34	12.4	6.4	0.73	1.34	0.93	13.5	7.5	0.9	0.94	8.4
Total magnesium					1.28	1.05	6.6	8.7	1.79	10.1	5.9	0.83	1.33	0.99	14.5	7.7	0.9	0.91	8.1
Dissolved manganese	0.4	1.9	2.5	3.6	0.009	0.028	0.89	2.3	0.186	1.18	0.0018	0.02	0.0099	0.0106	0.139	2	0.23	0.024	0.067
Total manganese		1.9	2.5	3.6	0.0081	0.042	0.9	2.3	0.21	1.35	0.03	0.04	0.0177	0.0148	0.173	<i>2.1</i>	0.27	0.39	0.096
Dissolved potassium					0.62	1.29	1.25	18.1	0.79	3.6	5.8	0.24	0.62	0.28	1.66	5.2	0.88	0.93	0.4
Dissolved sodium					5.2	6.9	16.3	20	6.3	48	15.3	5.1	5.1	5.6	34	17.4	3.7	4.5	24
Chloride					7.9	6.7	9.8	10.2	7.8	11.4	12.9	9	8.1	8.4	26	11.4	8.2	7.6	18.4
Total-N					0.96	1.14	0.17	17.9	0.8	2.1	0.88	0.47	0.27	0.28	1.82	3	0.15	0.23	0.83
Total Ammoniacal-N		0.9	1.43	2.3	< 0.010	< 0.010	0.011	17	0.069	0.7	0.012	< 0.010	< 0.010	< 0.010	<i>0.93</i>	0.041	0.019	0.016	< 0.010
Nitrite-N	0.912				< 0.002	< 0.002	0.004	< 0.002	< 0.002	< 0.002	0.003	< 0.002	< 0.002	< 0.002	< 0.002	0.021	< 0.002	< 0.002	< 0.002
Nitrate-N	11.3				0.91	1.05	0.064	< 0.002	0.65	< 0.002	0.41	0.065	0.191	0.087	0.57	2.4	0.015	0.027	0.021
Nitrite+Nitrate-N					0.91	1.05	0.068	0.003	0.65	< 0.002	0.41	0.065	0.191	0.089	0.57	2.4	0.015	0.028	0.021
TKN					< 0.10	< 0.10	0.11	17.9	0.15	2.1	0.47	0.4	< 0.10	0.19	1.26	0.63	0.14	0.21	0.81
DRP					< 0.004	0.004	< 0.004	< 0.004	0.006	0.043	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total-P					0.009	0.22	0.044	0.35	0.077	0.13	0.026	0.12	0.003	0.011	0.007	0.007	0.004	0.011	0.182
Sulphate					5.5	12.3	2.8	155	8.5	10.3	147	2.8	5.5	5.5	350	183	7.7	4.9	196
cBOD5					< 2	< 2	< 2	3	< 2	11	< 2	2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
COD					-	-	-	-	-	-	28	38	17	10	36	36	< 6	18	75
Dissolved arsenic	0.01	0.013	0.42	1.4	< 0.0010	< 0.0010	0.0023	0.044	< 0.0010	0.003	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0014	0.0013	< 0.0010	< 0.0010	< 0.0010
Dissolved cadmium	0.004	0.0002	0.0004	0.0008	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.00005	< 0.00005	< 0.00005	< 0.00005	0.00006
Dissolved chromium	0.05	0.0033	0.006	0.04	< 0.0005	< 0.0005	< 0.0005	0.0017	< 0.0005	0.0017	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0008	0.0009	< 0.0005	< 0.0005	0.0005
Dissolved copper	2	0.0014	0.0018	0.0025	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0008	0.0007	< 0.0005	< 0.0005	< 0.0005	0.0009	< 0.0005	< 0.0005	0.0005
Dissolved lead	0.01	0.0034	0.0056	0.0094	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	0.00011	< 0.00010	< 0.00010	< 0.00010	0.00014
Dissolved nickel	0.08	0.011	0.013	0.017	< 0.0005	< 0.0005	0.0007	0.0013	0.0007	< 0.0005	0.0007	< 0.0005	< 0.0005	< 0.0005	0.0017	0.0016	< 0.0005	< 0.0005	0.0011
Dissolved zinc		0.008	0.015	0.031	0.0059	0.0025	0.0016	0.0065	0.0019	0.0011	< 0.0010	0.002	< 0.0010	< 0.0010	0.0072	0.0039	0.0012	< 0.0010	0.0054
Total arsenic		0.013	0.42	1.4	< 0.0011	< 0.0011	0.0024	<i>0.047</i>	0.0015	0.0022	< 0.0011	0.0013	< 0.0011	< 0.0011	0.0019	0.0013	< 0.0011	< 0.0011	0.0012
Total cadmium		0.0002	0.0004	0.0008	< 0.000053	< 0.000053	< 0.000053	< 0.00053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	0.000060	< 0.000053	< 0.000053	< 0.000053	0.000069
Total chromium (IV)		0.0033	0.006	0.04	< 0.00053	0.00108	< 0.00053	0.02	<i>0.0042</i>	0.00124	0.00103	0.00099	< 0.00053	< 0.00053	0.00161	0.00131	< 0.00053	0.00057	0.0029
Total copper		0.0014	0.0018	0.0025	< 0.00053	<i>0.00168</i>	< 0.00053	0.0133	0.0023	< 0.00053	0.00079	<i>0.00163</i>	< 0.00053	< 0.00053	0.00058	0.00085	< 0.00053	< 0.00053	0.0049
Total lead		0.0034	0.0056	0.0094	< 0.00011	0.0026	< 0.00011	0.0118	0.0031	0.00016	0.00013	0.00151	< 0.00011	0.00018	0.00059	< 0.00011	< 0.00011	0.00056	<i>0.0046</i>
Total nickel		0.011	0.013	0.017	< 0.00053	0.00072	0.00066	0.0087	0.0031	< 0.00053	0.00074	0.00062	< 0.00053	< 0.00053	0.00194	0.00141	< 0.00053	< 0.00053	0.0024
Total zinc		0.008	0.015	0.031	0.0057	0.0051	0.0013	0.036	0.0079	0.0012	0.0018	0.007	< 0.0011	0.0012	<i>0.0093</i>	0.0043	0.0015	0.0021	<i>0.0128</i>
Benzo(a)Pyrene					-	<0.00010	-	<0.00010	-	-	-	-	-	-	-	-	-	-	-

Notes:
All values provided in units of milligrams per liter (mg/L) unless otherwise specified.
¹ Drinking-water Standards for New Zealand 2022. Table 2 (maximum acceptable values for inorganic determinands)
² Australia and New Zealand Guidelines from Fresh & Marine Water Quality. Default Guideline Values, level of protection specified.
Bordered values exceed the NZDWS MAV
Values in *italics* exceed the NZWQS, 95% level of protection
Values in **bold** exceed the NZWQS, 90% level of protection
Gray highlighted values exceed the NZWQS, 80% level of protection

Table 2: January 2025 TRP Sample Results

Analyte	NZDWS ¹	NZWQS (95%) ²	NZWQS (90%) ²	NZWQS (80%) ²	Grey River Tributaries			Grey Rvr	GRE001	Noname Creek				
					SW2	SW3	SW6	GR-01	PWT01	SPFUS	SPFMS	SPFDS	SPFUS2	SPFMS2
					20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25	20/01/25
Sum of Anions					5.2	2.9	0.78	0.58	0.68	0.87	1.95	1.86	1.12	0.84
Sum of Cations					4.8	2.9	0.81	0.56	0.65	0.86	2	1.89	1.19	0.87
An/Cat balance (%)														
pH					7.2	7.4	7.3	7.5	7	6.8	7.6	7.9	6.6	6.7
Total Alkalinity					27	70	12.9	21	22	12.3	63	57	11	11.9
Bicarbonate					33	85	15.7	25	27	15	77	69	13.4	14.5
Total Hardness					188	118	25	19.3	21	29	79	73	32	30
Electrical conductivity (mS/m)					51.6	30.3	8.8	5.7	6.9	10.2	20.5	19.7	13.8	9.9
Dissolved aluminium	1	0.055	0.08	0.15	0.061	0.006	0.125	0.035	0.012	0.07	0.015	0.023	0.21	0.065
Total aluminium		0.055	0.08	0.15	0.19	0.039	0.22	0.159	0.0183	0.084	0.074	0.044	0.28	0.117
Dissolved calcium					61	42	7.7	6.2	6.8	9.7	28	26	10.4	9.9
Dissolved iron					0.03	< 0.02	0.16	0.05	< 0.02	0.07	0.08	0.06	0.23	0.11
Total iron					0.171	0.29	0.28	0.26	< 0.021	0.132	0.55	0.128	0.43	0.5
Dissolved magnesium					8.5	3.2	1.3	0.9	1.0	1.2	2.2	2.1	1.34	1.19
Total magnesium					8.9	3.2	1.2	1.0	1.0	1.2	2.1	2.1	1.36	1.22
Dissolved manganese	0.4	1.9	2.5	3.6	0.0065	0.0034	0.0062	0.0009	< 0.0005	0.0151	0.096	0.0048	0.059	0.022
Total manganese		1.9	2.5	3.6	0.084	0.147	0.0125	0.0141	0.00059	0.021	0.162	0.0127	0.067	0.051
Dissolved potassium					3.4	3.8	0.8	0.71	0.94	1.48	3.3	3	6.8	1.26
Dissolved sodium					21	10.7	6.4	3.5	4.6	5.3	8.1	8	7.9	5.3
Chloride					17.6	10.5	8.7	3.7	5.2	13.2	10.2	9.9	27	13
Total-N					0.86	0.42	0.29	-	-	0.67	0.67	0.47	1.58	0.57
Total Ammoniacal-N		0.9	1.43	2.3	0.055	0.01	< 0.010	-	-	< 0.010	0.02	< 0.010	0.08	< 0.010
Nitrite-N	0.912				0.013	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.008	< 0.002	0.013	< 0.002
Nitrate-N	11.3				0.23	< 0.002	0.125	0.079	0.26	0.35	0.3	0.25	0.34	0.3
Nitrite+Nitrate-N					0.24	< 0.002	0.126	0.08	0.26	0.35	0.31	0.25	0.35	0.3
TKN					0.62	0.42	0.16	-	-	0.32	0.36	0.21	1.23	0.26
DRP					< 0.004	< 0.004	< 0.004	-	-	0.005	< 0.004	< 0.004	0.035	< 0.004
Total-P					0.025	0.021	0.021	-	-	0.017	0.027	0.007	0.172	0.015
Sulphate					197	58	12.7	2.3	3.3	10.9	18.1	20	4.6	10.5
cBOD5					< 2	< 2	< 2	-	-	< 2	< 2	< 2	< 2	< 2
COD					32	28	12	-	-	9	11	11	63	7
Dissolved arsenic	0.01	0.013	0.42	1.4	0.0013	0.0011	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0015	< 0.0010
Dissolved cadmium	0.004	0.0002	0.0004	0.0008	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved chromium	0.05	0.0033	0.006	0.04	0.0006	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved copper	2	0.0014	0.0018	0.0025	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0115	0.0006	0.0006	0.0008	0.0024	0.0005
Dissolved lead	0.01	0.0034	0.0056	0.0094	< 0.00010	< 0.00010	< 0.00010	< 0.00010	0.00061	< 0.00010	< 0.00010	< 0.00010	0.00012	< 0.00010
Dissolved nickel	0.08	0.011	0.013	0.017	0.0008	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved zinc		0.008	0.015	0.031	0.001	< 0.0010	< 0.0010	< 0.0010	0.0113	< 0.0010	0.0017	< 0.0010	0.0057	0.0014
Total arsenic		0.013	0.42	1.4	0.0016	0.0014	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	0.0018	< 0.0011
Total cadmium		0.0002	0.0004	0.0008	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053
Total chromium (IV)		0.0033	0.006	0.04	0.00113	0.00084	< 0.00053	< 0.00053	< 0.00053	< 0.00053	0.00059	0.0006	0.0006	< 0.00053
Total copper		0.0014	0.0018	0.0025	0.00102	< 0.00053	0.00054	< 0.00053	0.053	0.00061	0.00074	0.00088	0.0027	0.00058
Total lead		0.0034	0.0056	0.0094	0.00025	0.0002	0.00014	0.00025	0.0023	< 0.00011	0.00071	0.00012	0.00031	< 0.00011
Total nickel		0.011	0.013	0.017	0.00083	< 0.00053	< 0.00053	< 0.00053	< 0.00053	< 0.00053	< 0.00053	< 0.00053	< 0.00053	< 0.00053
Total zinc		0.008	0.015	0.031	0.0047	0.0013	< 0.0011	< 0.0011	0.043	0.0014	0.003	0.0024	0.0059	0.0016
Benzo(a)Pyrene					-	-	-	-	-	-	-	-	-	-

Notes:

All values provided in units of miligrams per liter (mg/L) unless otherwise specified.

¹ Drinking-water Standards for New Zealand 2022. Table 2 (maximum acceptable values

² Australia and New Zealand Guidelines from Fresh & Marine Water Quality. Default Gui

Bordered values exceed the NZDWS MAV

Values in *italics* exceed the NZWQS, 95% level of protection

Values in **bold** exceed the NZWQS, 90% level of protection

Gray highlighted values exceed the NZWQS, 80% level of protection

APPENDIX 1

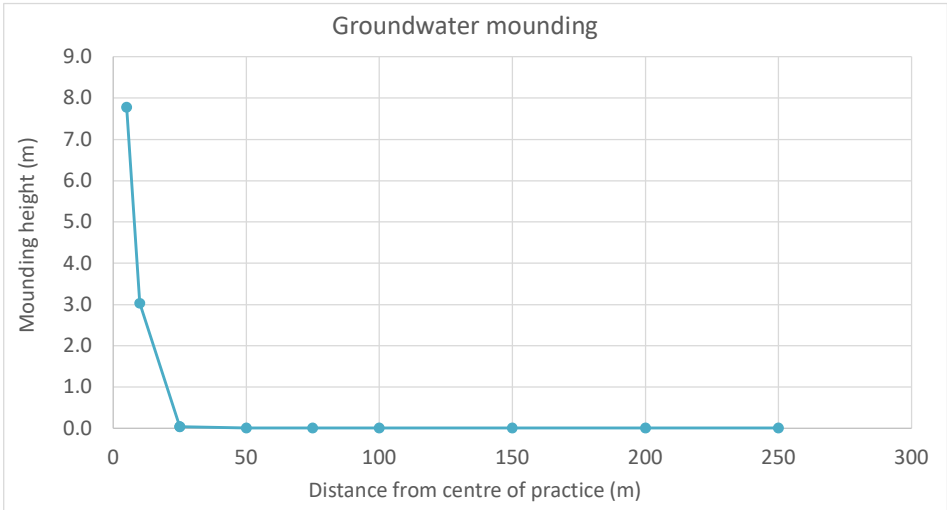
Hantush Model

This spreadsheet will calculate the height of a groundwater mound beneath an stormwater infiltration BMP.
More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102
"Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

[Go to the USGS report](#)

Input Values		
Recharge (infiltration) rate (m/day)	6.000	R
Specific yield, S_y (dimensionless)	0.190	S_y
Horizontal hydraulic conductivity, K_h (m/day)	0.860000	K_h
1/2 length of basin (x direction, in m)	5.0	x
1/2 width of basin (y direction, in m)	5.0	y
Duration of infiltration period (days)	1	t
Initial thickness of saturated zone (m)	8.0	$h_i(0)$

CALCULATE



Distance from center of infiltration BMP (m)	Ground-water mounding (m)
5	7.78
10	3.03
25	0.04
25	0.04
50	0.01
75	0.01
100	0.01
150	0.01
200	0.01
250	0.01

IF YOU CHANGE THE SCALE OF THE
DISTANCE MEASUREMENTS
(OR ANY OTHER PARAMETER),
YOU MUST RECALCULATE!!

APPENDIX 2

RISC Model

Summary of Input Values Used in Fate and Transport Model

Model Description:

Source media: Groundwater (dissolved phase concentration)

Saturated zone model (dissolved phase source)

Aquifer Properties		
Effective porosity	cm3/cm3	3.0E-01
Fraction organic carbon	g oc/g soil	1.0E-03
Hydraulic conductivity	m/d	8.6E-01
Soil bulk density	g/cm3	1.6E+00
Hydraulic gradient	m/m	1.8E-02

Groundwater Source Geometry		
***Pulse Source. Length of pulse:	yr	5.0E-01
Total thickness of source	m	8.0E+00
Length of source	m	1.0E+01
Width of source	m	1.0E+01

Receptor Well Location		
Distance downgradient	m	3.1E+02
Distance cross-gradient	m	0.0E+00
Depth to top of well screen	m	0.0E+00
Depth to bottom of well screen	m	5.0E+00
Number of vertical points used to calculate conc.	-	5.0E+00
Longitudinal dispersivity code calculated. See output file.		
Transverse dispersivity code calculated. See output file.		
Vertical dispersivity code calculated. See output file.		

Dissolved Source for Groundwater Model [mg/l]		
Aluminium	mg/l	2.6E+00
Ammonium-N	mg/l	9.8E+01
Arsenic	mg/l	9.8E-01
Chromium (VI)	mg/l	2.2E-01
Copper	mg/l	1.9E-01
Lead	mg/l	1.3E-02
Manganese	mg/l	6.7E+00
Nickel (soluble salts)	mg/l	1.6E-01
Nitrate-N	mg/l	6.5E+00

[illegible]

Time (year)	Aluminium (mg/l)	Ammonium-N (mg/l)	Arsenic (mg/l)	Chromium (VI) (mg/l)	Copper (mg/l)	Lead (mg/l)	Manganese (mg/l)	Nickel (soluble salts) (mg/l)	Nitrate-N (mg/l)
0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
1	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
2	6.5E-11	2.5E-09	2.5E-11	5.5E-12	4.8E-12	3.3E-13	1.7E-10	3.9E-12	1.6E-10
3	1.8E-07	6.7E-06	6.7E-08	1.5E-08	1.3E-08	8.8E-10	4.6E-07	1.1E-08	4.4E-07
4	8.1E-06	3.0E-04	3.0E-06	6.8E-07	6.0E-07	4.0E-08	2.1E-05	4.8E-07	2.0E-05
5	6.9E-05	2.6E-03	2.6E-05	5.8E-06	5.1E-06	3.4E-07	1.8E-04	4.1E-06	1.7E-04
6	2.5E-04	9.6E-03	9.6E-05	2.2E-05	1.9E-05	1.3E-06	6.6E-04	1.5E-05	6.4E-04
7	5.9E-04	2.2E-02	2.2E-04	5.0E-05	4.4E-05	3.0E-06	1.5E-03	3.6E-05	1.5E-03
8	1.0E-03	3.9E-02	3.9E-04	8.8E-05	7.7E-05	5.2E-06	2.7E-03	6.2E-05	2.6E-03
9	1.5E-03	5.7E-02	5.7E-04	1.3E-04	1.1E-04	7.5E-06	3.9E-03	9.0E-05	3.8E-03
10	1.9E-03	7.3E-02	7.3E-04	1.6E-04	1.4E-04	9.6E-06	5.0E-03	1.2E-04	4.8E-03
11	2.3E-03	8.5E-02	8.5E-04	1.9E-04	1.7E-04	1.1E-05	5.8E-03	1.4E-04	5.6E-03
12	2.5E-03	9.3E-02	9.3E-04	2.1E-04	1.8E-04	1.2E-05	6.4E-03	1.5E-04	6.2E-03
13	2.6E-03	9.7E-02	9.7E-04	2.2E-04	1.9E-04	1.3E-05	6.6E-03	1.5E-04	6.4E-03
14	2.6E-03	9.7E-02	9.7E-04	2.2E-04	1.9E-04	1.3E-05	6.6E-03	1.5E-04	6.4E-03
15	2.5E-03	9.4E-02	9.4E-04	2.1E-04	1.9E-04	1.3E-05	6.5E-03	1.5E-04	6.3E-03
16	2.4E-03	9.0E-02	9.0E-04	2.0E-04	1.8E-04	1.2E-05	6.1E-03	1.4E-04	5.9E-03
17	2.2E-03	8.3E-02	8.3E-04	1.9E-04	1.6E-04	1.1E-05	5.7E-03	1.3E-04	5.5E-03
18	2.0E-03	7.6E-02	7.6E-04	1.7E-04	1.5E-04	1.0E-05	5.2E-03	1.2E-04	5.1E-03
19	1.8E-03	6.9E-02	6.9E-04	1.5E-04	1.4E-04	9.2E-06	4.7E-03	1.1E-04	4.6E-03
20	1.6E-03	6.2E-02	6.2E-04	1.4E-04	1.2E-04	8.2E-06	4.2E-03	9.8E-05	4.1E-03
21	1.5E-03	5.5E-02	5.5E-04	1.2E-04	1.1E-04	7.3E-06	3.7E-03	8.7E-05	3.6E-03
22	1.3E-03	4.8E-02	4.8E-04	1.1E-04	9.5E-05	6.4E-06	3.3E-03	7.7E-05	3.2E-03
23	1.1E-03	4.2E-02	4.2E-04	9.4E-05	8.3E-05	5.6E-06	2.9E-03	6.7E-05	2.8E-03
24	9.7E-04	3.7E-02	3.7E-04	8.2E-05	7.2E-05	4.8E-06	2.5E-03	5.8E-05	2.4E-03
25	8.4E-04	3.2E-02	3.2E-04	7.1E-05	6.2E-05	4.2E-06	2.2E-03	5.0E-05	2.1E-03
26	7.2E-04	2.7E-02	2.7E-04	6.1E-05	5.4E-05	3.6E-06	1.9E-03	4.3E-05	1.8E-03
27	6.2E-04	2.3E-02	2.3E-04	5.2E-05	4.6E-05	3.1E-06	1.6E-03	3.7E-05	1.5E-03
28	5.3E-04	2.0E-02	2.0E-04	4.5E-05	3.9E-05	2.6E-06	1.4E-03	3.2E-05	1.3E-03
29	4.5E-04	1.7E-02	1.7E-04	3.8E-05	3.4E-05	2.3E-06	1.2E-03	2.7E-05	1.1E-03
30	3.8E-04	1.4E-02	1.4E-04	3.3E-05	2.9E-05	1.9E-06	9.9E-04	2.3E-05	9.6E-04
31	3.3E-04	1.2E-02	1.2E-04	2.8E-05	2.4E-05	1.6E-06	8.4E-04	2.0E-05	8.2E-04
32	2.8E-04	1.0E-02	1.0E-04	2.3E-05	2.1E-05	1.4E-06	7.1E-04	1.7E-05	6.9E-04
33	2.3E-04	8.8E-03	8.8E-05	2.0E-05	1.7E-05	1.2E-06	6.0E-04	1.4E-05	5.8E-04
34	2.0E-04	7.5E-03	7.5E-05	1.7E-05	1.5E-05	9.9E-07	5.1E-04	1.2E-05	4.9E-04
35	1.7E-04	6.3E-03	6.3E-05	1.4E-05	1.2E-05	8.3E-07	4.3E-04	1.0E-05	4.2E-04
36	1.4E-04	5.3E-03	5.3E-05	1.2E-05	1.0E-05	7.0E-07	3.6E-04	8.4E-06	3.5E-04
37	1.2E-04	4.5E-03	4.5E-05	1.0E-05	8.8E-06	5.9E-07	3.0E-04	7.1E-06	3.0E-04

38	1.0E-04	3.8E-03	3.8E-05	8.4E-06	7.4E-06	5.0E-07	2.6E-04	6.0E-06	2.5E-04
39	8.4E-05	3.2E-03	3.2E-05	7.1E-06	6.2E-06	4.2E-07	2.2E-04	5.0E-06	2.1E-04
40	7.0E-05	2.6E-03	2.6E-05	5.9E-06	5.2E-06	3.5E-07	1.8E-04	4.2E-06	1.8E-04
41	5.9E-05	2.2E-03	2.2E-05	5.0E-06	4.4E-06	2.9E-07	1.5E-04	3.5E-06	1.5E-04
42	4.9E-05	1.9E-03	1.9E-05	4.2E-06	3.7E-06	2.5E-07	1.3E-04	3.0E-06	1.2E-04
43	4.1E-05	1.6E-03	1.6E-05	3.5E-06	3.1E-06	2.1E-07	1.1E-04	2.5E-06	1.0E-04
44	3.5E-05	1.3E-03	1.3E-05	2.9E-06	2.6E-06	1.7E-07	9.0E-05	2.1E-06	8.7E-05
45	2.9E-05	1.1E-03	1.1E-05	2.5E-06	2.2E-06	1.5E-07	7.5E-05	1.7E-06	7.3E-05
46	2.4E-05	9.2E-04	9.2E-06	2.1E-06	1.8E-06	1.2E-07	6.3E-05	1.5E-06	6.1E-05
47	2.0E-05	7.7E-04	7.7E-06	1.7E-06	1.5E-06	1.0E-07	5.3E-05	1.2E-06	5.1E-05
48	1.7E-05	6.4E-04	6.4E-06	1.4E-06	1.3E-06	8.5E-08	4.4E-05	1.0E-06	4.3E-05
49	1.4E-05	5.4E-04	5.4E-06	1.2E-06	1.1E-06	7.1E-08	3.7E-05	8.6E-07	3.6E-05
50	1.2E-05	4.5E-04	4.5E-06	1.0E-06	8.9E-07	6.0E-08	3.1E-05	7.2E-07	3.0E-05
51	1.0E-05	3.8E-04	3.8E-06	8.4E-07	7.4E-07	5.0E-08	2.6E-05	6.0E-07	2.5E-05
52	8.3E-06	3.1E-04	3.1E-06	7.1E-07	6.2E-07	4.2E-08	2.2E-05	5.0E-07	2.1E-05
53	7.0E-06	2.6E-04	2.6E-06	5.9E-07	5.2E-07	3.5E-08	1.8E-05	4.2E-07	1.7E-05
54	5.8E-06	2.2E-04	2.2E-06	4.9E-07	4.3E-07	2.9E-08	1.5E-05	3.5E-07	1.5E-05
55	4.9E-06	1.8E-04	1.8E-06	4.1E-07	3.6E-07	2.4E-08	1.3E-05	2.9E-07	1.2E-05
56	4.1E-06	1.5E-04	1.5E-06	3.4E-07	3.0E-07	2.0E-08	1.0E-05	2.4E-07	1.0E-05
57	3.4E-06	1.3E-04	1.3E-06	2.9E-07	2.5E-07	1.7E-08	8.8E-06	2.0E-07	8.5E-06
58	2.8E-06	1.1E-04	1.1E-06	2.4E-07	2.1E-07	1.4E-08	7.3E-06	1.7E-07	7.1E-06
59	2.4E-06	8.9E-05	8.9E-07	2.0E-07	1.8E-07	1.2E-08	6.1E-06	1.4E-07	5.9E-06
60	2.0E-06	7.5E-05	7.5E-07	1.7E-07	1.5E-07	9.9E-09	5.1E-06	1.2E-07	5.0E-06
61	1.7E-06	6.2E-05	6.2E-07	1.4E-07	1.2E-07	8.3E-09	4.3E-06	9.9E-08	4.1E-06
62	1.4E-06	5.2E-05	5.2E-07	1.2E-07	1.0E-07	6.9E-09	3.6E-06	8.3E-08	3.5E-06
63	1.2E-06	4.3E-05	4.3E-07	9.8E-08	8.6E-08	5.8E-09	3.0E-06	6.9E-08	2.9E-06
64	9.6E-07	3.6E-05	3.6E-07	8.2E-08	7.2E-08	4.8E-09	2.5E-06	5.8E-08	2.4E-06
65	8.0E-07	3.0E-05	3.0E-07	6.8E-08	6.0E-08	4.0E-09	2.1E-06	4.8E-08	2.0E-06
66	6.7E-07	2.5E-05	2.5E-07	5.7E-08	5.0E-08	3.4E-09	1.7E-06	4.0E-08	1.7E-06
67	5.6E-07	2.1E-05	2.1E-07	4.7E-08	4.2E-08	2.8E-09	1.4E-06	3.4E-08	1.4E-06
68	4.7E-07	1.8E-05	1.8E-07	4.0E-08	3.5E-08	2.3E-09	1.2E-06	2.8E-08	1.2E-06
69	3.9E-07	1.5E-05	1.5E-07	3.3E-08	2.9E-08	2.0E-09	1.0E-06	2.3E-08	9.8E-07
70	3.3E-07	1.2E-05	1.2E-07	2.8E-08	2.4E-08	1.6E-09	8.4E-07	2.0E-08	8.2E-07
71	2.7E-07	1.0E-05	1.0E-07	2.3E-08	2.0E-08	1.4E-09	7.0E-07	1.6E-08	6.8E-07
72	2.3E-07	8.6E-06	8.6E-08	1.9E-08	1.7E-08	1.1E-09	5.9E-07	1.4E-08	5.7E-07
73	1.9E-07	7.2E-06	7.2E-08	1.6E-08	1.4E-08	9.5E-10	4.9E-07	1.1E-08	4.8E-07
74	1.6E-07	6.0E-06	6.0E-08	1.3E-08	1.2E-08	7.9E-10	4.1E-07	9.5E-09	4.0E-07
75	1.3E-07	5.0E-06	5.0E-08	1.1E-08	9.9E-09	6.6E-10	3.4E-07	8.0E-09	3.3E-07
76	1.1E-07	4.2E-06	4.2E-08	9.4E-09	8.2E-09	5.5E-10	2.9E-07	6.6E-09	2.8E-07
77	9.3E-08	3.5E-06	3.5E-08	7.8E-09	6.9E-09	4.6E-10	2.4E-07	5.6E-09	2.3E-07
78	7.7E-08	2.9E-06	2.9E-08	6.5E-09	5.7E-09	3.9E-10	2.0E-07	4.6E-09	1.9E-07
79	6.5E-08	2.4E-06	2.4E-08	5.5E-09	4.8E-09	3.2E-10	1.7E-07	3.9E-09	1.6E-07

80	5.4E-08	2.0E-06	2.0E-08	4.6E-09	4.0E-09	2.7E-10	1.4E-07	3.2E-09	1.3E-07
81	4.5E-08	1.7E-06	1.7E-08	3.8E-09	3.3E-09	2.3E-10	1.2E-07	2.7E-09	1.1E-07
82	3.8E-08	1.4E-06	1.4E-08	3.2E-09	2.8E-09	1.9E-10	9.7E-08	2.3E-09	9.4E-08
83	3.1E-08	1.2E-06	1.2E-08	2.7E-09	2.3E-09	1.6E-10	8.1E-08	1.9E-09	7.9E-08
84	2.6E-08	9.9E-07	9.9E-09	2.2E-09	2.0E-09	1.3E-10	6.8E-08	1.6E-09	6.6E-08
85	2.2E-08	8.3E-07	8.3E-09	1.9E-09	1.6E-09	1.1E-10	5.6E-08	1.3E-09	5.5E-08
86	1.8E-08	6.9E-07	6.9E-09	1.5E-09	1.4E-09	9.2E-11	4.7E-08	1.1E-09	4.6E-08
87	1.5E-08	5.8E-07	5.8E-09	1.3E-09	1.1E-09	7.7E-11	3.9E-08	9.2E-10	3.8E-08
88	1.3E-08	4.8E-07	4.8E-09	1.1E-09	9.5E-10	6.4E-11	3.3E-08	7.7E-10	3.2E-08
89	1.1E-08	4.0E-07	4.0E-09	9.0E-10	7.9E-10	5.3E-11	2.8E-08	6.4E-10	2.7E-08
90	8.9E-09	3.4E-07	3.4E-09	7.6E-10	6.6E-10	4.5E-11	2.3E-08	5.4E-10	2.2E-08
91	7.5E-09	2.8E-07	2.8E-09	6.3E-10	5.5E-10	3.7E-11	1.9E-08	4.5E-10	1.9E-08
92	6.2E-09	2.3E-07	2.3E-09	5.3E-10	4.6E-10	3.1E-11	1.6E-08	3.7E-10	1.6E-08
93	5.2E-09	2.0E-07	2.0E-09	4.4E-10	3.9E-10	2.6E-11	1.3E-08	3.1E-10	1.3E-08
94	4.4E-09	1.6E-07	1.6E-09	3.7E-10	3.2E-10	2.2E-11	1.1E-08	2.6E-10	1.1E-08
95	3.6E-09	1.4E-07	1.4E-09	3.1E-10	2.7E-10	1.8E-11	9.4E-09	2.2E-10	9.1E-09
96	3.0E-09	1.1E-07	1.1E-09	2.6E-10	2.3E-10	1.5E-11	7.8E-09	1.8E-10	7.6E-09
97	2.5E-09	9.6E-08	9.6E-10	2.2E-10	1.9E-10	1.3E-11	6.5E-09	1.5E-10	6.4E-09
98	2.1E-09	8.0E-08	8.0E-10	1.8E-10	1.6E-10	1.1E-11	5.5E-09	1.3E-10	5.3E-09
99	1.8E-09	6.7E-08	6.7E-10	1.5E-10	1.3E-10	8.9E-12	4.6E-09	1.1E-10	4.4E-09
100	1.5E-09	5.6E-08	5.6E-10	1.3E-10	1.1E-10	7.4E-12	3.8E-09	8.9E-11	3.7E-09

APPENDIX 3

Redox Model

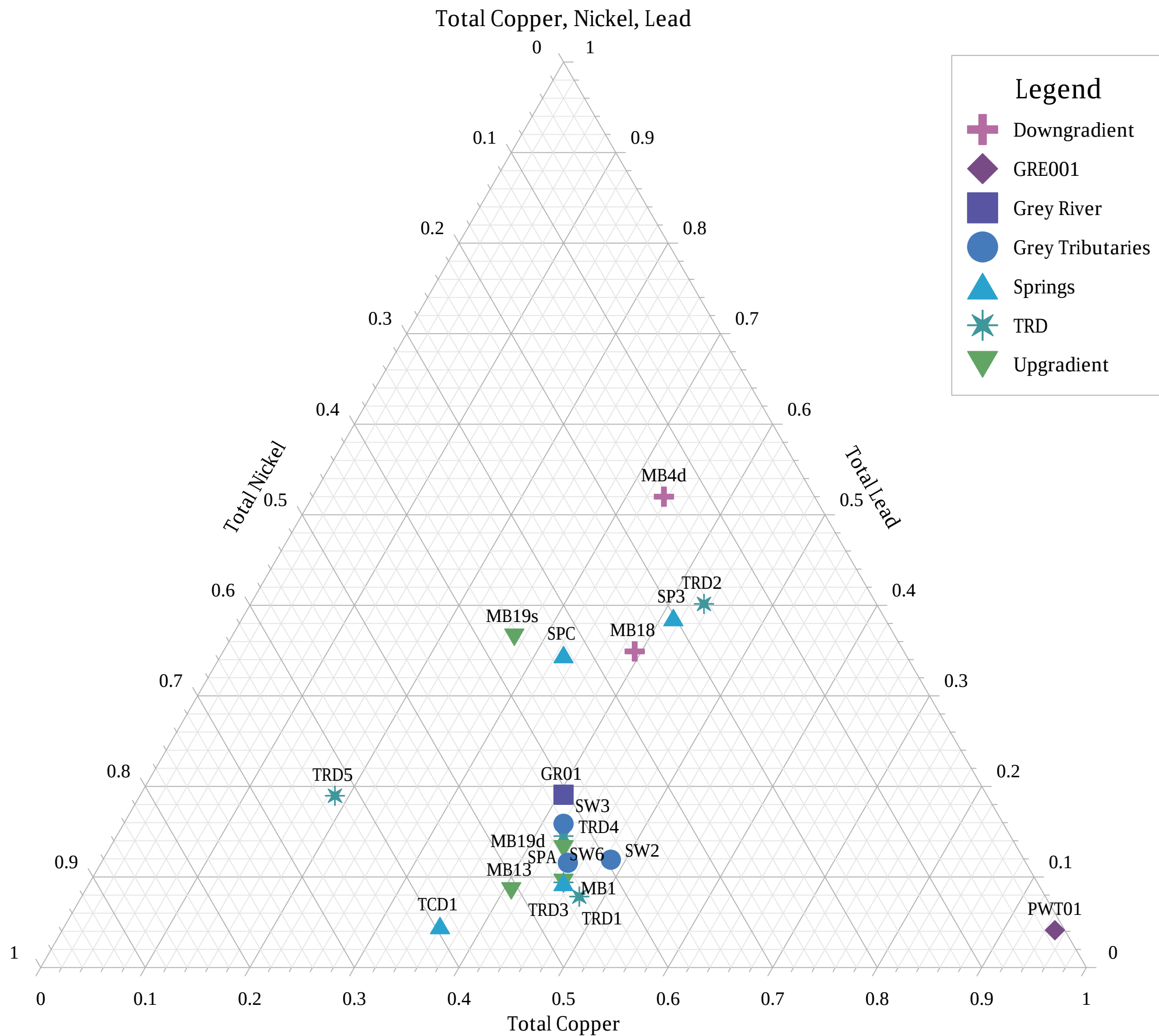
Redox Assignment

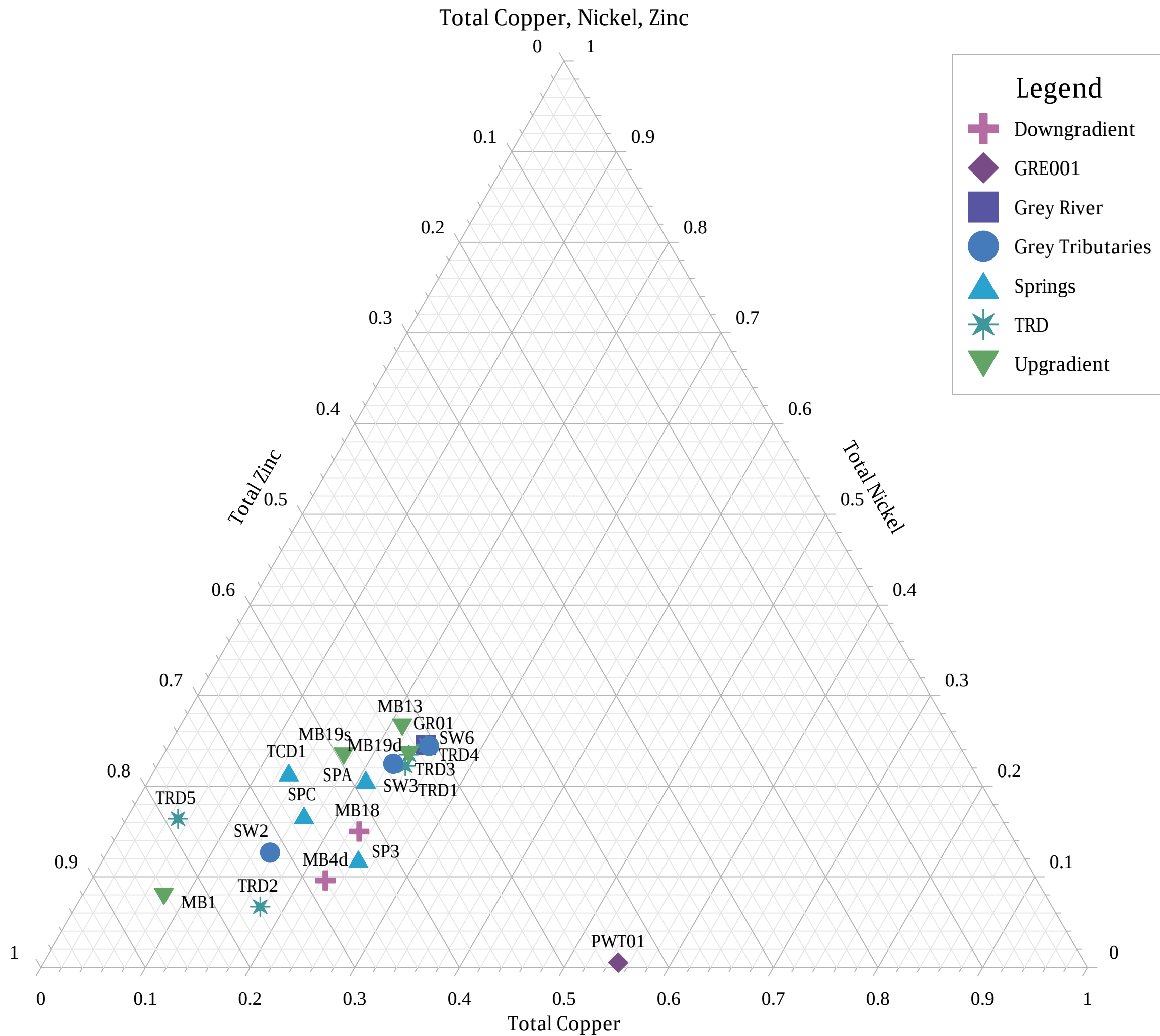
Sample ID	Redox	Redox Variables	Dissolved O ₂	NO ₃ ⁻ (as Nitrogen)	Mn ²⁺	Fe ²⁺	SO ₄ ²⁻	Num of Params	General Redox Category	Redox Process
	mV	Units Threshold values	millig/L ▼	millig/L ▼	microg/L ▼	microg/L ▼	millig/L ▼			
			0.5	0.5	50	100	0.5			
MB4d	144		2.96	1.05	0.028	0.04	12.3	5	Oxic	O2
MB13	-17		0.23	0.064	0.89	2.7	2.8	5	Suboxic	Suboxic
MB18	6		0.76	0.002	2.3	0.85	155	5	Oxic	O2

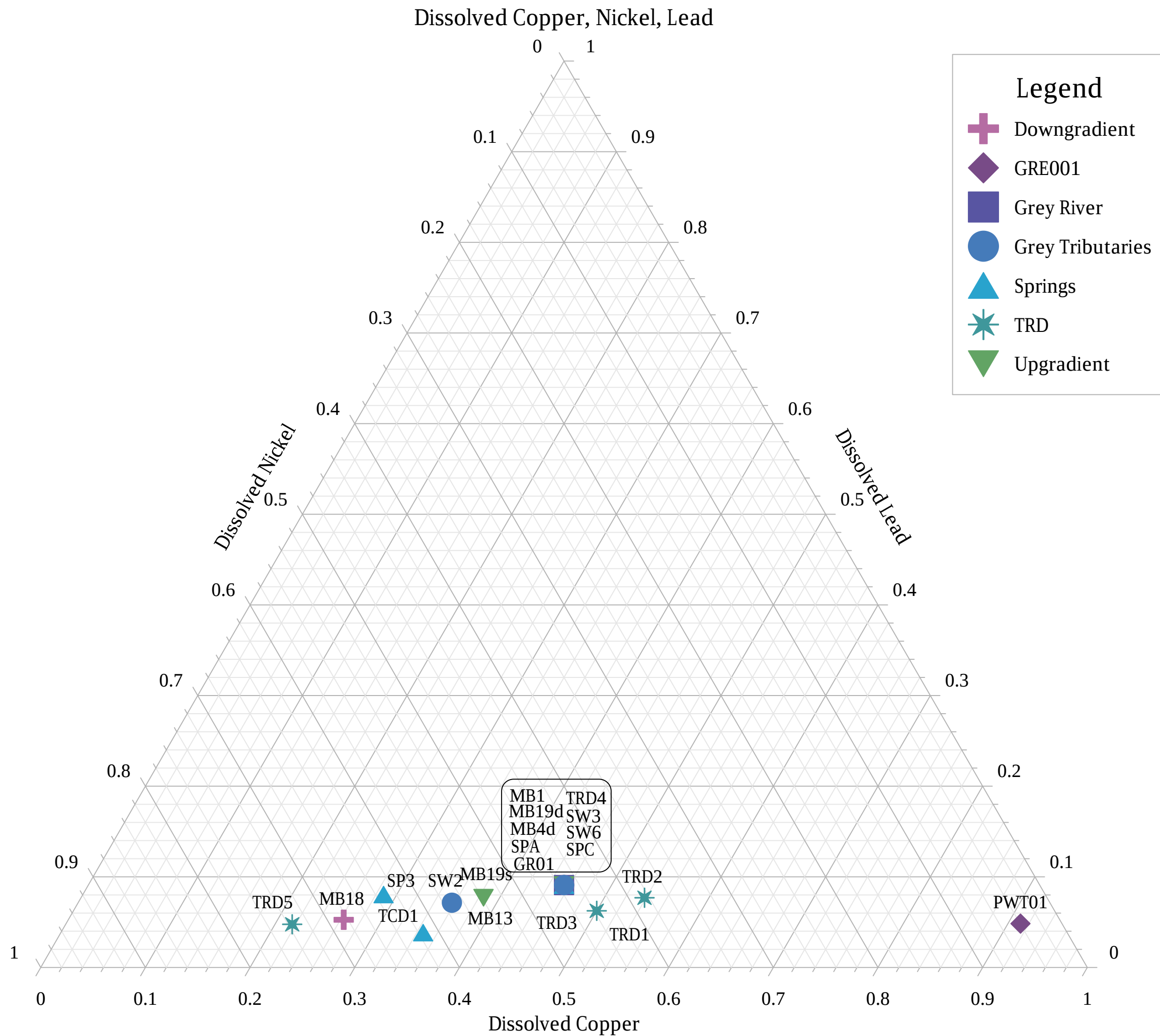
Modified from Jurgens, B.C., McMahon, P.B., Chapelle, F.H., and Eberts, S.M., 2009, An Excel® workbook for identifying redox processes in ground water: U.S. Geological Survey Open-File Report 2009–1004 8 p.

APPENDIX 4

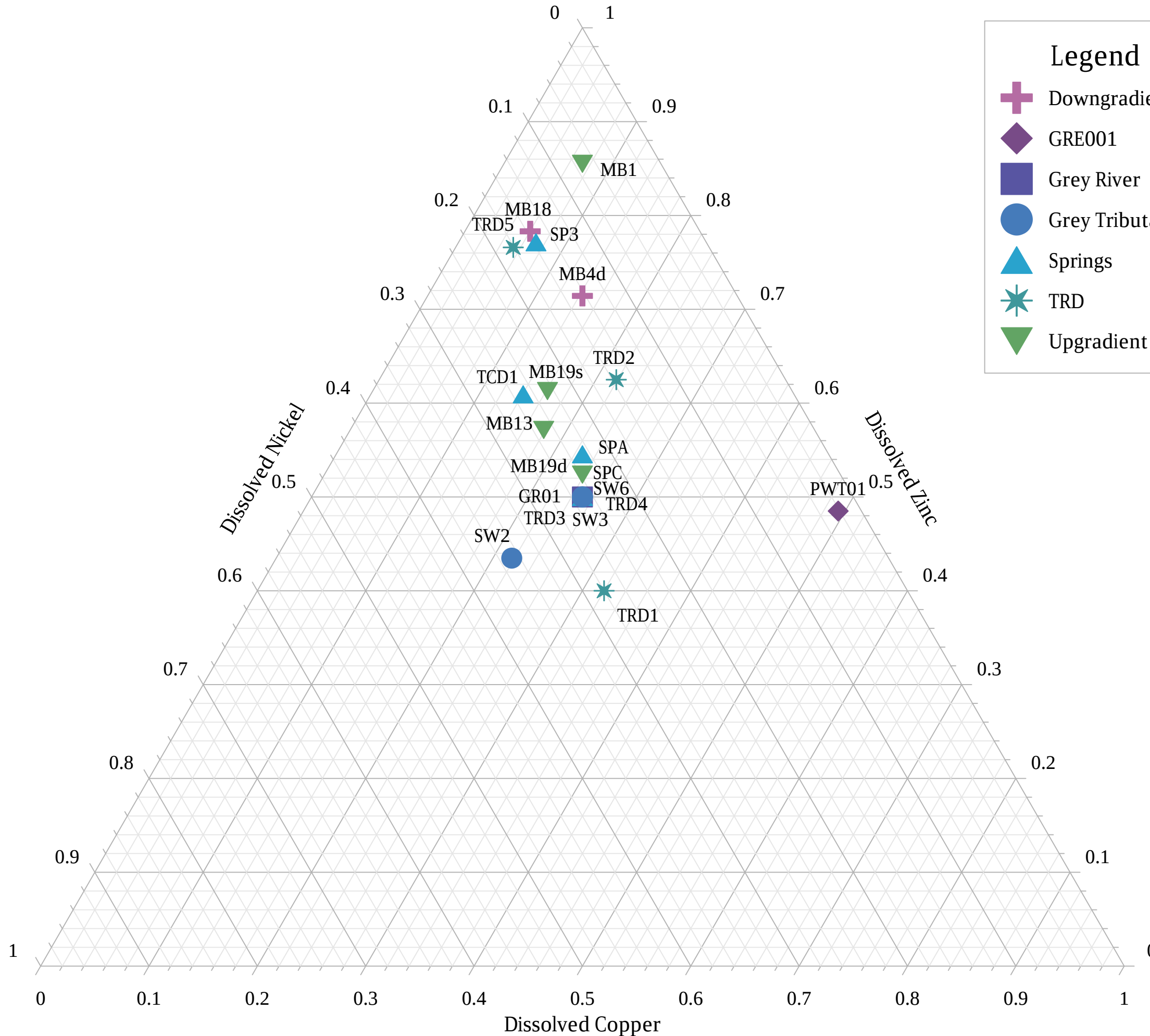
Heavy Metal Concentration Graphs



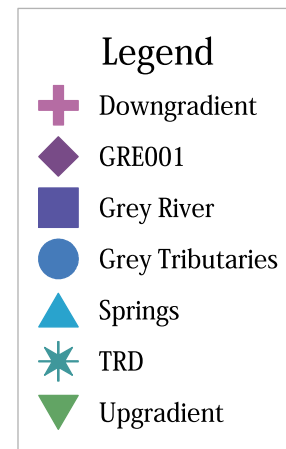
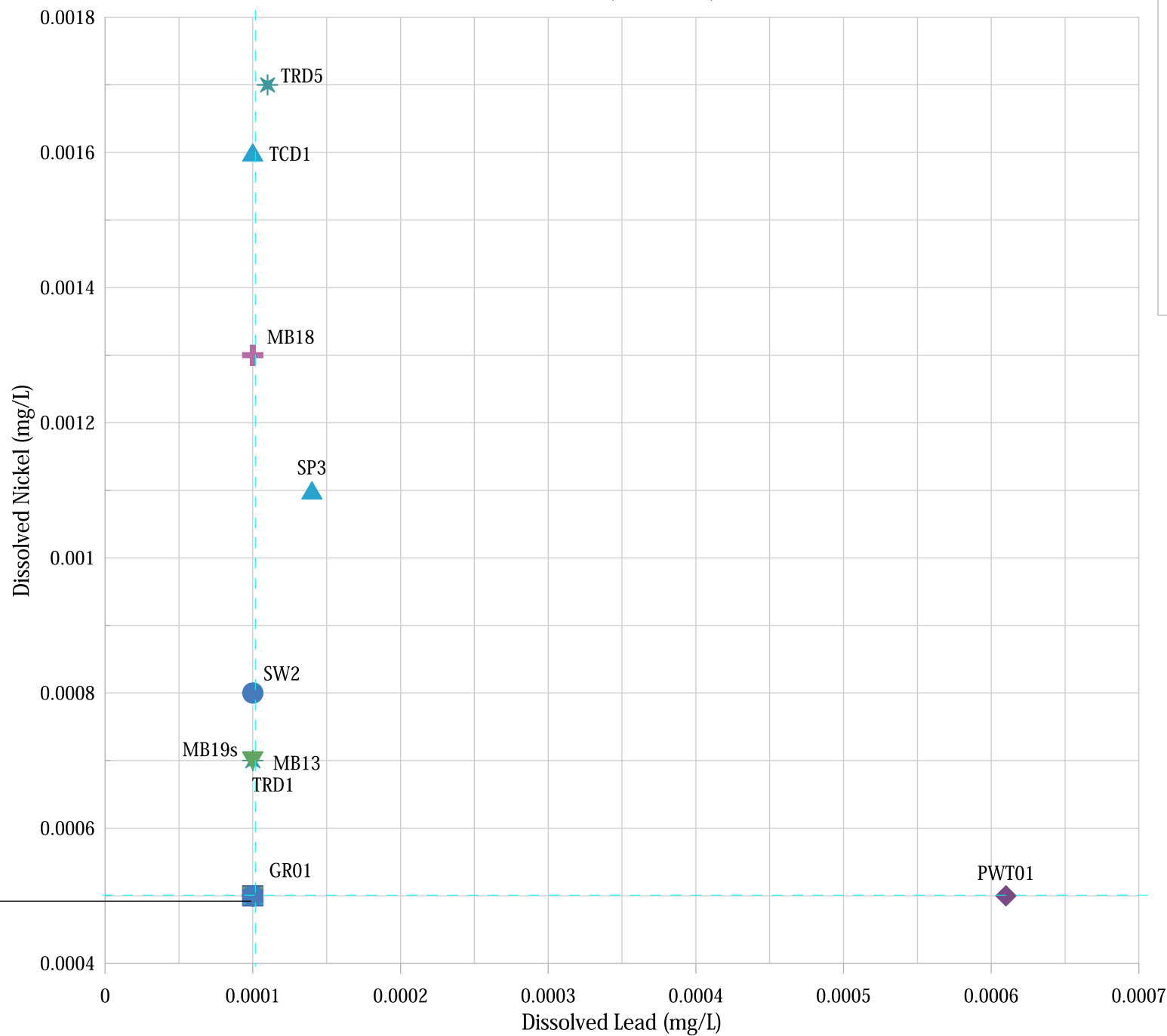




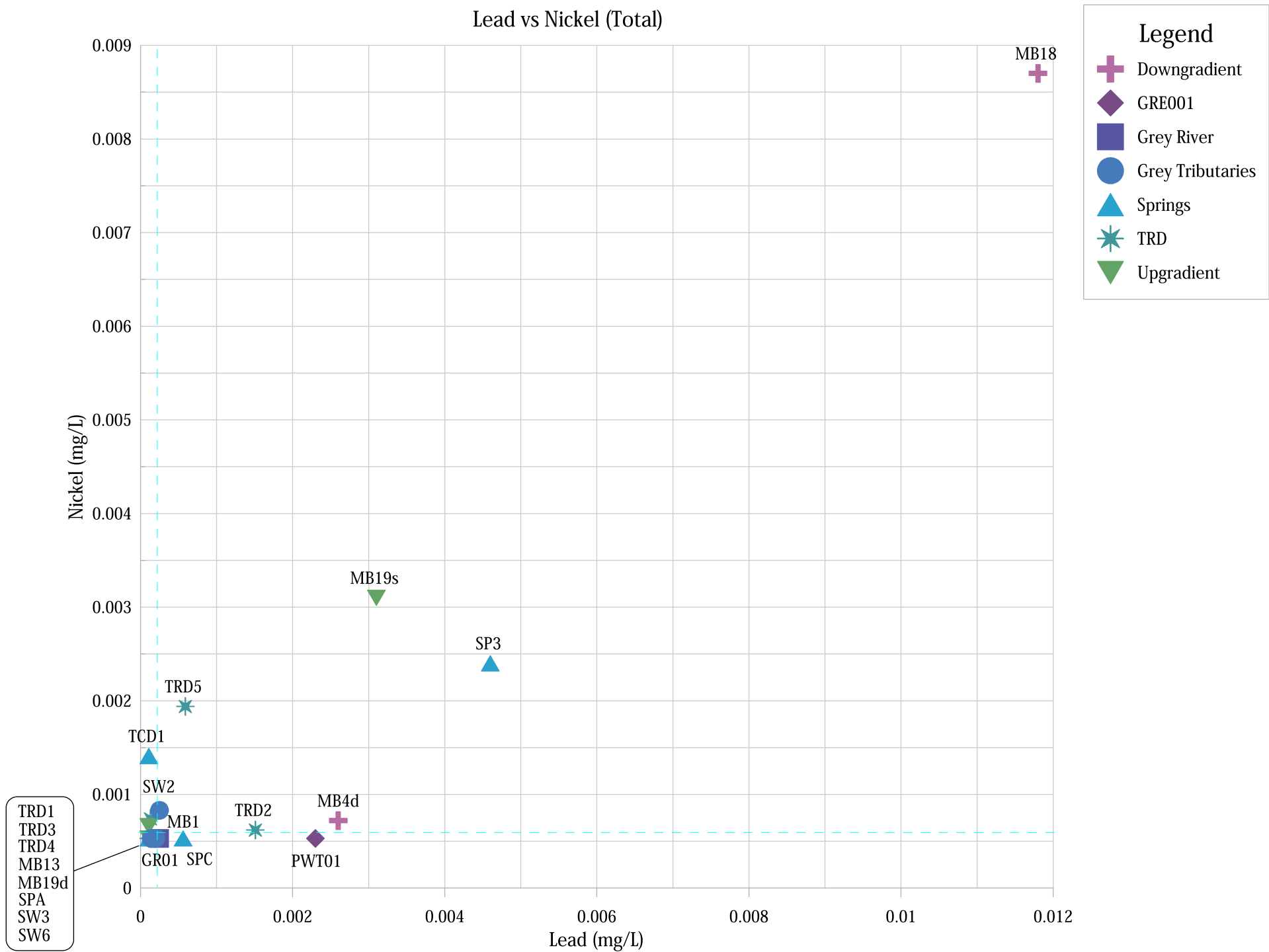
Dissolved Copper, Nickel, Zinc



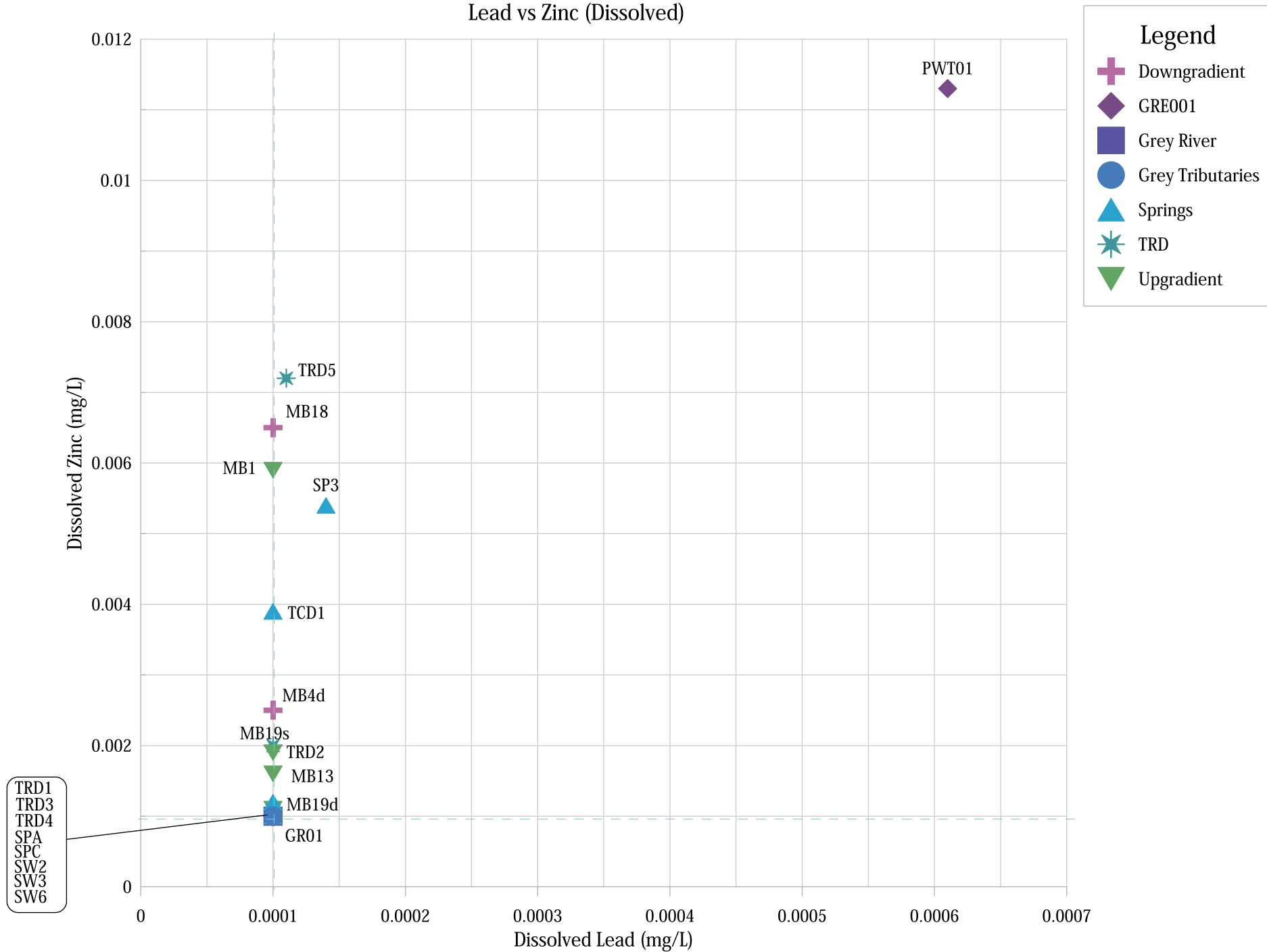
Lead vs Nickel (Dissolved)



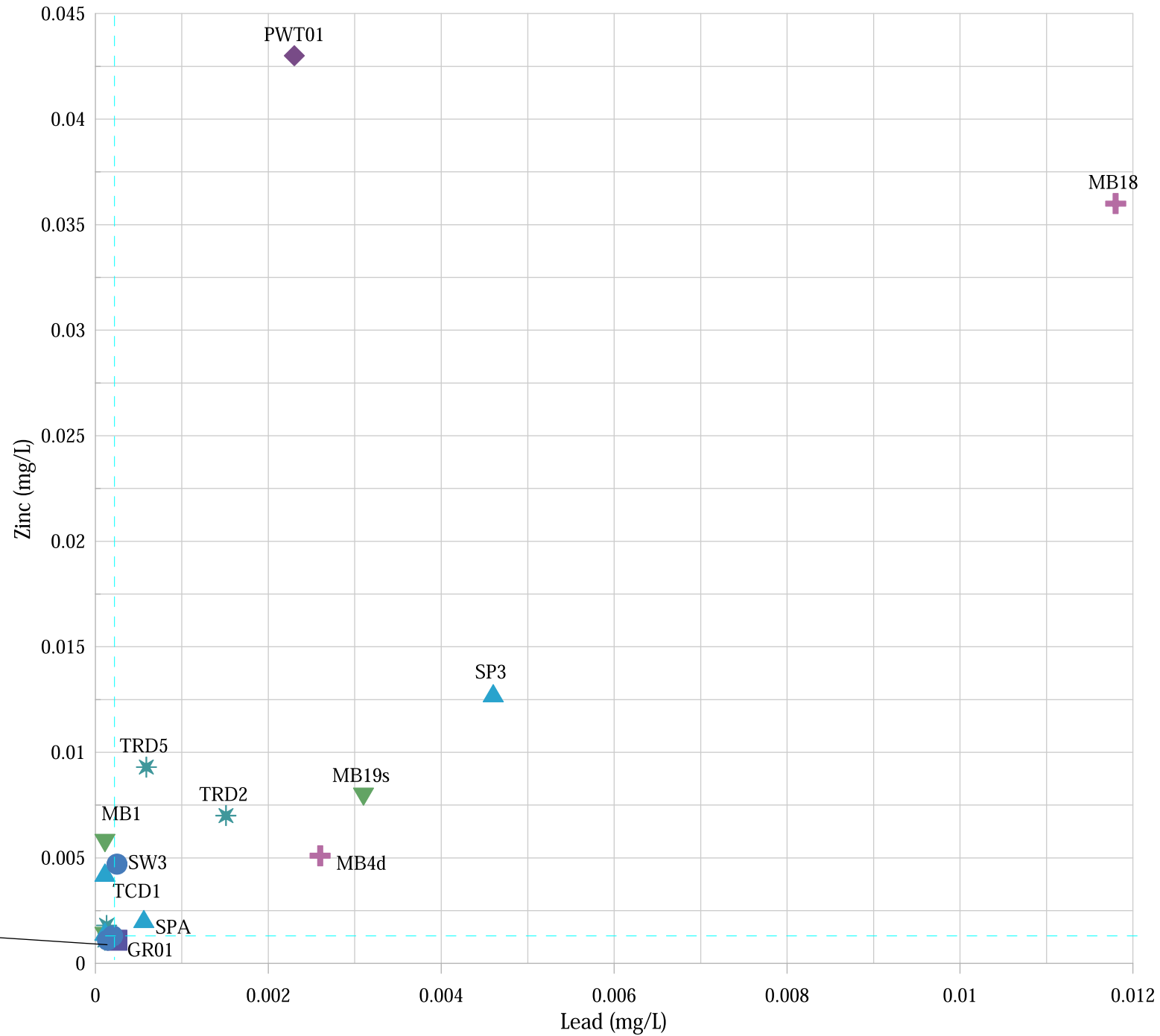
TRD2
 TRD3
 TRD4
 MB1
 MB4d
 MB19d
 SPA
 SPC
 SW3
 SW6



Lead vs Zinc (Dissolved)

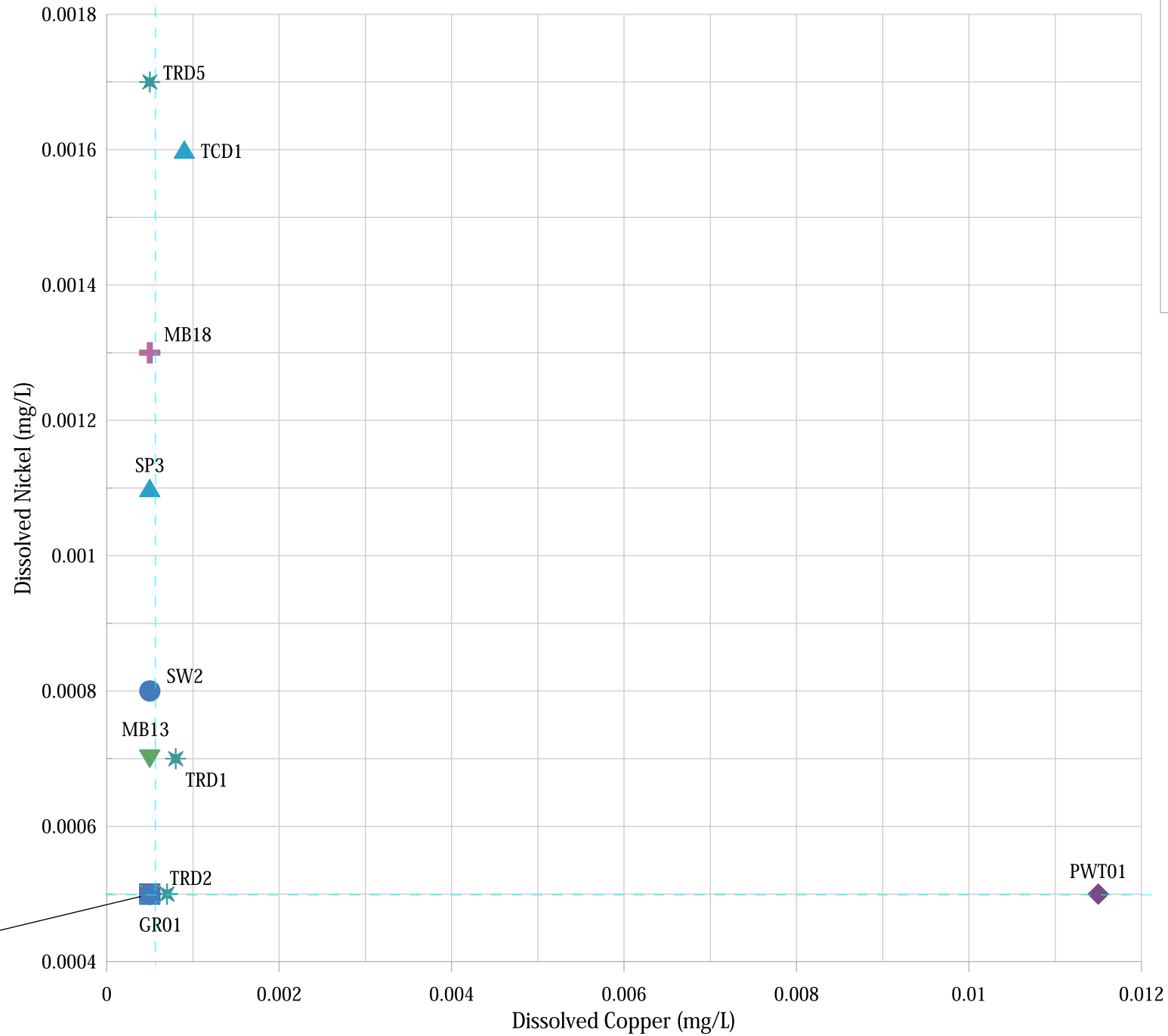


Lead vs Zinc (Total)

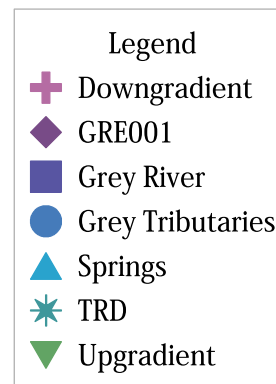
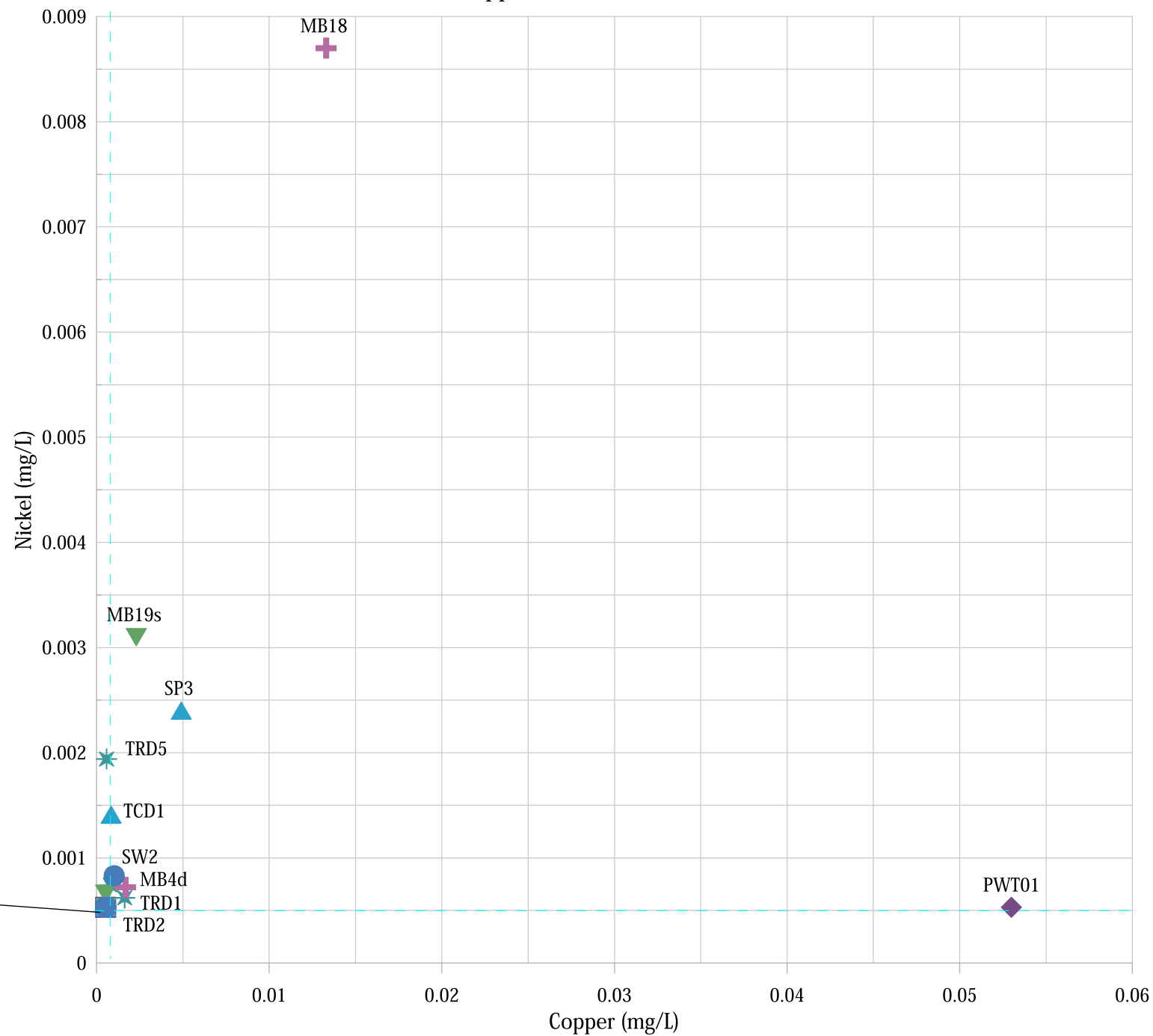


TRD1
TRD3
TRD4
MB13
MB19d
SPC
SW2
SW6

Copper vs Nickel (Dissolved)

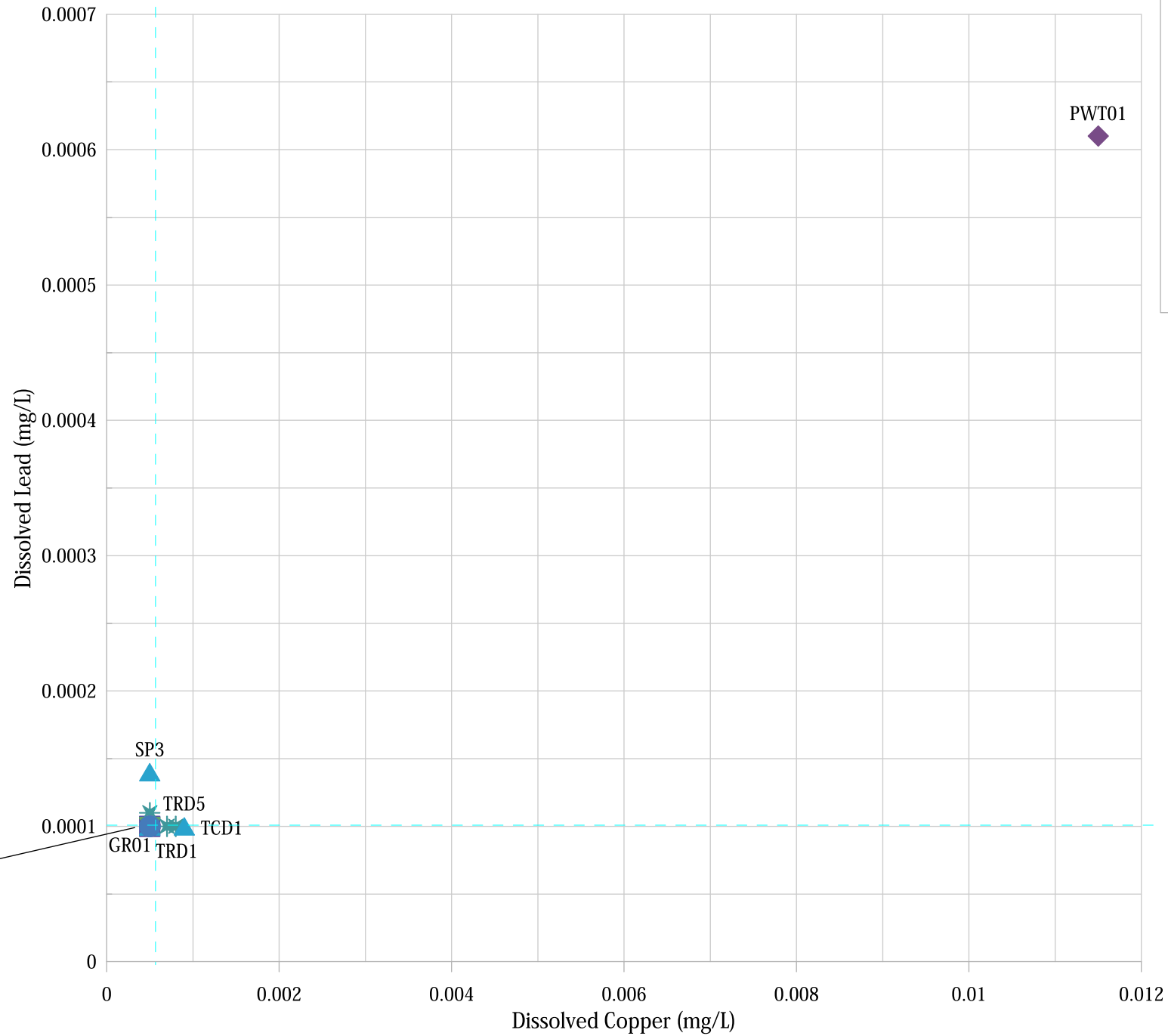


Copper vs Nickel (Total)

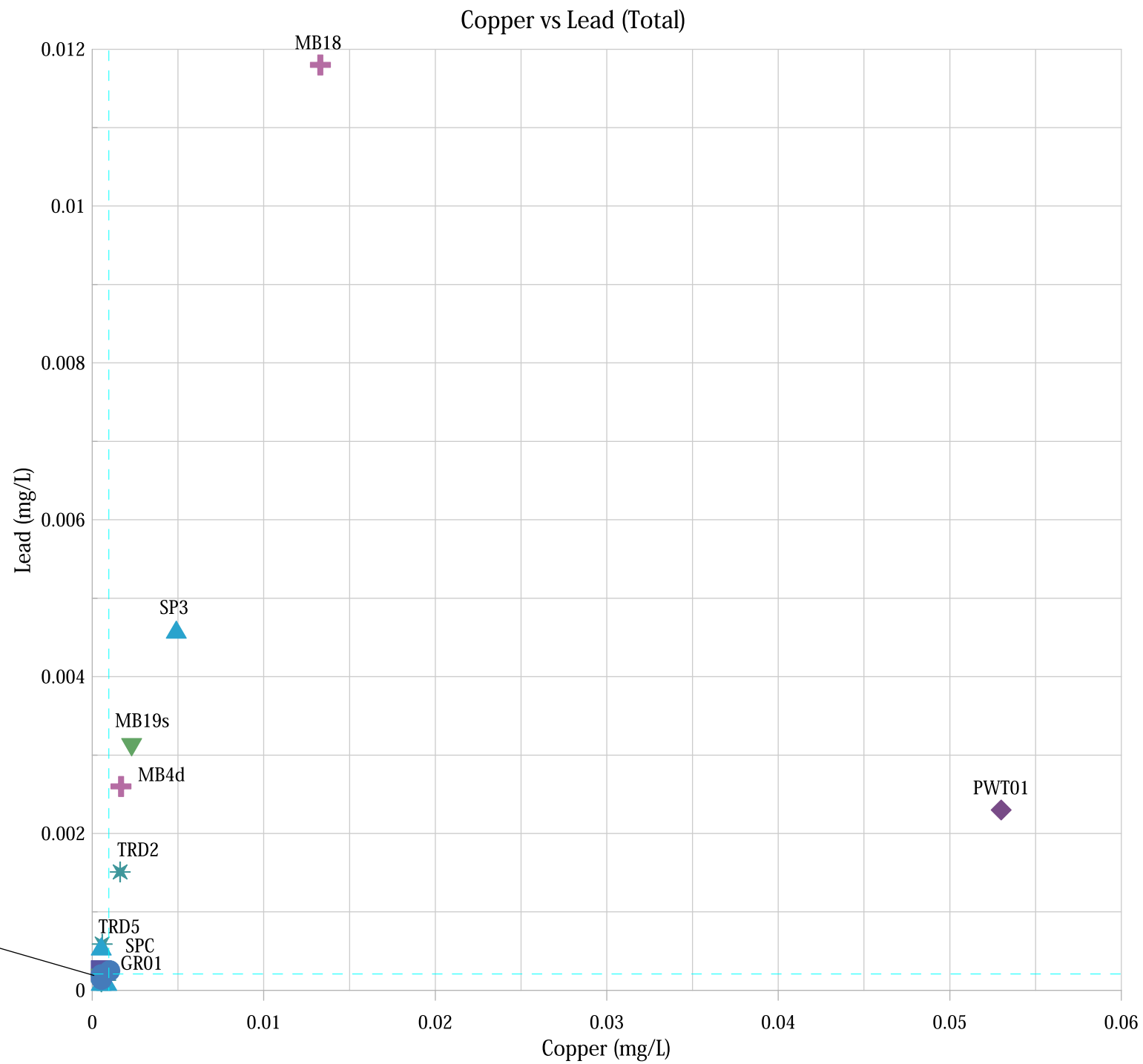


GR01
TRD3
TRD4
MB1
MB13
MB19d
SPA
SPC
SW3
SW6

Copper vs Lead (Dissolved)

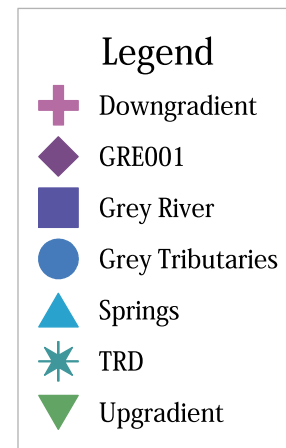
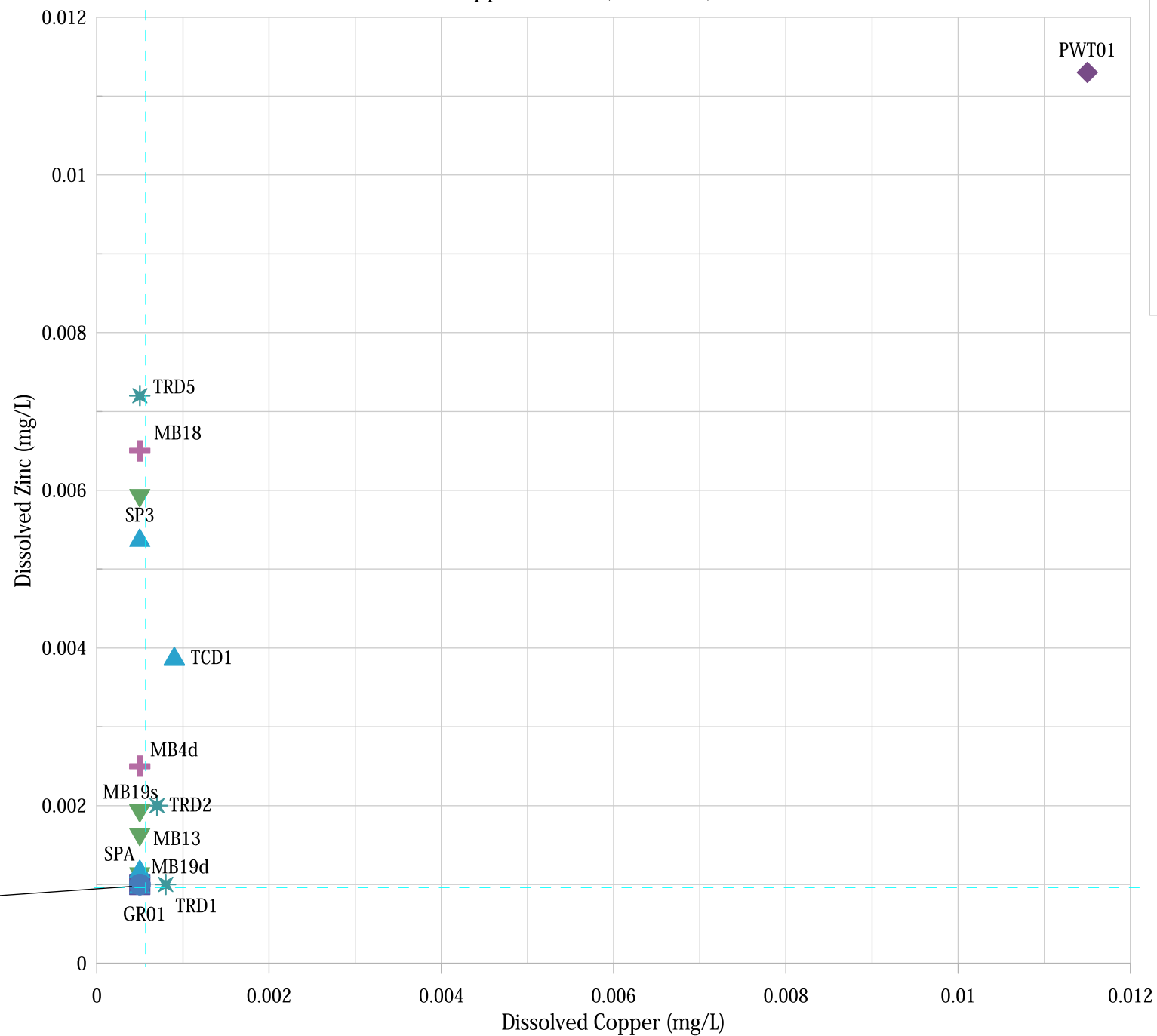


TRD2
TRD3
TRD4
MB1
MB4d
MB13
MB18
MB19s
MB19d
SPA
SPC
SW2
SW3
SW6

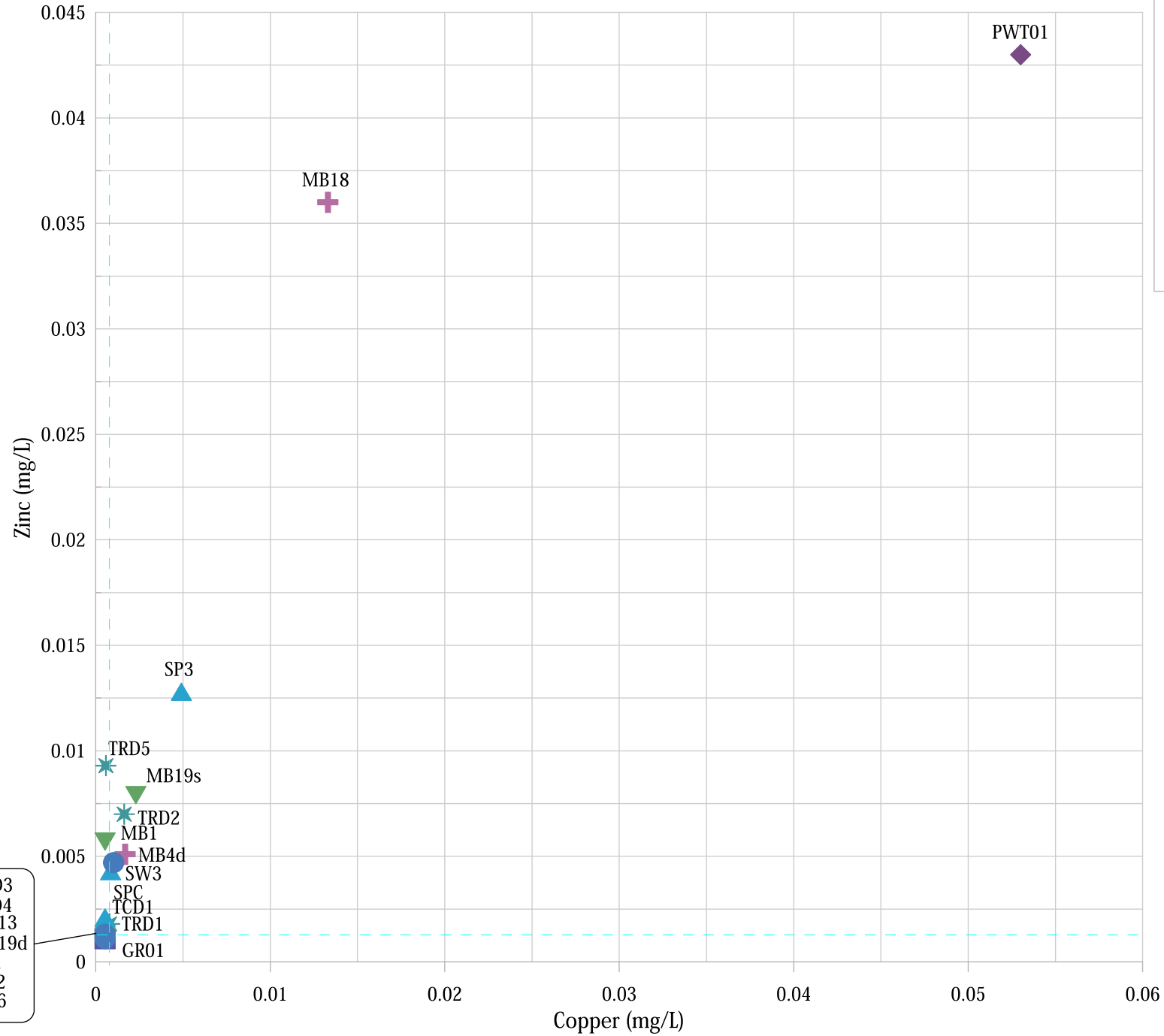


TRD1
TRD3
TRD4
MB1
MB13
MB19d
TCD1
SPA
SW2
SW3
SW6

Copper vs Zinc (Dissolved)



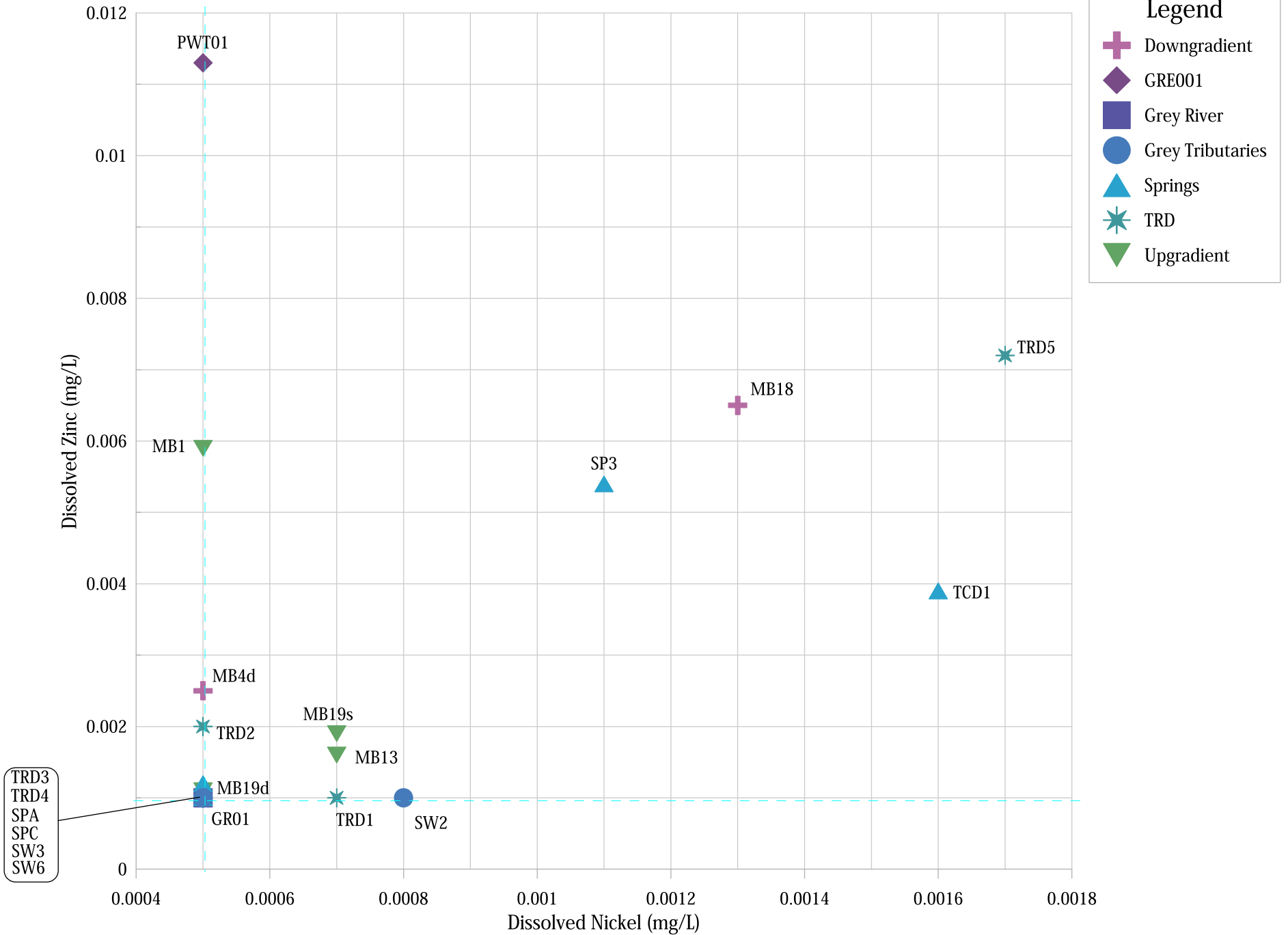
Copper vs Zinc (Total)



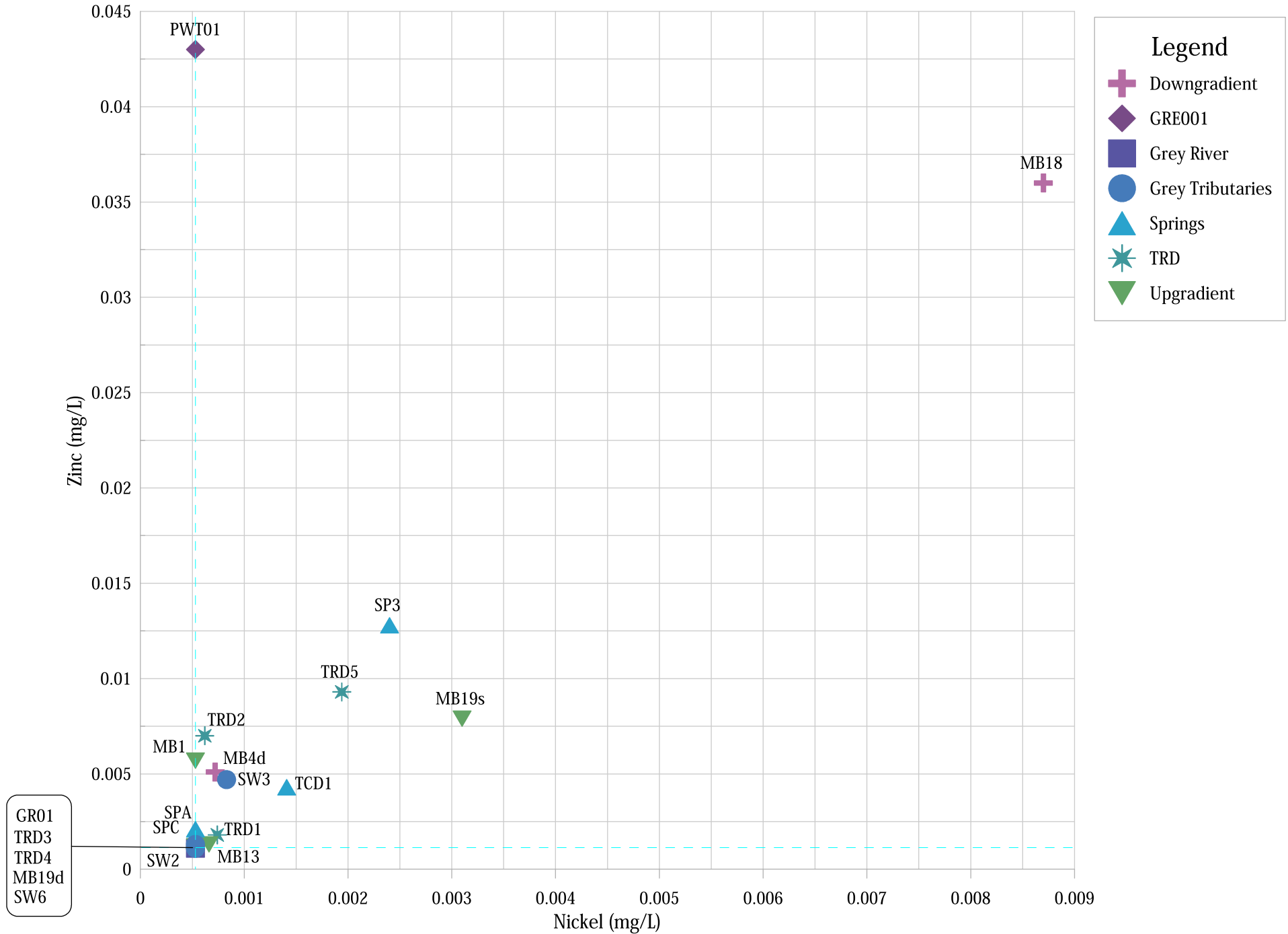
Legend

- + Downgradient
- ◆ GRE001
- Grey River
- Grey Tributaries
- ▲ Springs
- ✱ TRD
- ▼ Upgradient

Nickel vs Zinc (Dissolved)



Nickel vs Zinc (Total)



APPENDIX 2 – EVIDENCE OF CARL STEFFENS

BEFORE THE WEST COAST REGIONAL COUNCIL

IN THE MATTER OF the Resource Management Act 1991

AND

IN THE MATTER OF applications by Taylorville Resource Park Limited for a discharge permit to discharge contaminated water (mixed landfill leachate and stormwater) from a retention pond to land, and to change Condition 11 of its current resource consent RC-2021-0097-V10

EVIDENCE OF CARL STEFFENS

Dated 12 August 2025

Introduction

- 1.** My name is Carl Steffens, I am a Technical Director, Water Resources at Pattle Delamore Partners Ltd (PDP). My qualifications are Post Graduate Diploma in Science (Engineering Geology) and Bachelor of Science (Geology) from University of Canterbury. I am a member of the New Zealand Hydrological Society.
- 2.** I have over 20 years of professional work experience as a hydrogeologist and environmental scientist. I specialise in groundwater assessments and have carried out numerous assessments relating to groundwater resources throughout Canterbury and New Zealand.
- 3.** Since 2004, I have been employed by PDP, an environmental consulting firm, with my specialist focus being groundwater investigations. During my employment with PDP, I have carried out and presented evidence for district and regional authorities, and for water users. I have also presented evidence for arbitration and district court prosecution hearings.
- 4.** I have recently carried out work on other relevant landfill related projects including the following:
 - 4.1.** Advice on site conditions relating to a resource consent application for a proposed 2.5 ha demolition waste site at Kaiata, West Coast. This work included risk assessments of groundwater and surface water contamination and recommendations for managing risks in terms of criteria set out in the WasteMINZ Technical Guidelines for Disposal to Land 2023.
 - 4.2.** Groundwater contamination investigations at a former municipal landfill and current demolition waste and sorting site in Christchurch City. Preparation of a groundwater passive discharge resource consent application.
 - 4.3.** Review of Waimakariri District Council groundwater quality monitoring data from a clean fill disposal site at Fernside and recommendations relating to resource consent compliance.
 - 4.4.** Design and implementation of a groundwater quality sampling program to provide information about the potential effects that land-use activities and stormwater discharges around Logistics Drive may be having on water quality in the springfed Ōtūkaikino Stream, Christchurch.
- 5.** I have recently carried out the following work for West Coast Regional Council (WCRC) relevant to the Taylorville Resource Park Limited (TRPL) landfill site.
 - 5.1.** Review resource consent conditions for RC-2021-0097-01 (land use consent) and RC-2021-0097-02 (discharge to land consent) and advise WCRC regarding compliance with consent conditions, relevant landfill categorisation and appropriateness of resource consent conditions.
 - 5.2.** Review resource consent application by TRPL to vary existing consent RC-2021-0097 to allow operation under WasteMINZ Class 3 Managed Fill guidelines and to discharge water containing landfill leachate. This led to PDP preparing a detailed

request to the applicant for further information and I also visited the site on 20 June 2024, along with other PDP technical staff and Mr Durand (Planz).

- 5.3.** Provide expert opinion to WCRC on the potential and actual impacts of the TRPL leachate management on groundwater, surface water and human drinking water sources including the Grey District Council (GDC) Coal Creek community water supply.
- 5.4.** Review of TRPL short-term consent application to discharge contaminated water from a retention pond to land and change Condition 11 of RC-2021-0097-V10 (the subject of this hearing).

Code of Conduct

- 6.** Although this is not an Environment Court hearing, I note that in preparing my evidence I have reviewed the Code of Conduct for Expert Witnesses contained in Part 9 of the Environment Court Practice Note 2023. I have complied with it in preparing my evidence. I confirm that the issues addressed in this statement of evidence are within my area of expertise, except where I have stated I am relying on the opinion or evidence of other witnesses. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

Scope of Evidence

- 7.** In my evidence I will cover the following matters:
 - 7.1.** A summary of the hydrogeological and hydrological setting.
 - 7.2.** A brief overview of the proposal.
 - 7.3.** The quality of the proposed discharge water.
 - 7.4.** A summary of the ENGEO effects assessments and my review input.
 - 7.5.** My outstanding concerns.
 - 7.6.** My thoughts on the potential effects.

Hydrogeological and Hydrological Setting

- 8.** The site is situated approximately 3.5 km east of Greymouth within approximately 300 m of the Grey River. The site is located on the true right (northern) bank of the river.
- 9.** The site setting is described in Section 2 of the ENGEO Preliminary Hydrogeological Assessment report dated 19 September 2024.
- 10.** In Section 2.2 (Geological Setting) of this report, ENGEO note that the site and surrounds are underlain by Paleogene Kaiata Formation carbonaceous mudstone which has been eroded and overlain by Pleistocene glacial outwash consisting of sandy gravels with varying quantities of fines (e.g. silts and clays).

- 11.** Attachment 1 of my evidence shows the site and surrounding area. This figure is taken from ENGEO Memo 10 dated 17 March 2025. I have added some further labels to show additional features not labelled in the original figure that are relevant to my evidence. Key features shown in Attachment 1 include the following:
- 11.1.** The site boundary and the current landfill extents in the western area of the site, landfill including cells A, B and C. The landfill is situated on an elevated terrace surface compared to the land directly south.
 - 11.2.** Taylorville Road, running along the base of the upper terrace on the southern side of the landfill.
 - 11.3.** Structures marking the location of GDC Coal Creek public water supply treatment plant, which I understand provides the drinking-water supply to Greymouth Township and surrounds. These structures are shown next to the labelled Coal Creek WTP sampling location PWT01.
 - 11.4.** Grey District Council Coal Creek public water supply bores 1 through 3 located on the Recent alluvial gravels beside the Grey River in the south of the figure.
 - 11.5.** Grey Tributary which flows from an approximate location slightly south of the Coal Creek WTP sampling location PWT01 and flows parallel to the Grey River. The confluence with the Grey River is approximately 200 m further west of the figure extents.
 - 11.6.** Noname Creek, beginning at the northern boundary of the site, flowing west, then south-west along the western site boundary, crossing Taylorville Road via a culvert at the approximate location of surface water sampling point SPFDS, prior to flowing into Grey Tributary.
 - 11.7.** Spring TCD1 situated at the western-most extents of the site boundary.
 - 11.8.** The drain starting at TCD1 running along the western side of the access road to the neighbour's property and then running west along the northern side of Taylorville Road to surface water sampling site TRD5. Further west, the flow direction of this drain varies. I understand there is a flow divide at the approximate location of SP3 with flow to the east toward TRD5 and flow to the west toward TRD2. West of TRD2, all flow is to the east (the road climbs to the east from TRD2).
 - 11.9.** Numerous culverts are marked as blue arrows where flow from the northern roadside drain crosses to the southern side of Taylorville Road.
 - 11.10.** Surface water channels on the lower terrace south of Taylorville Road, to the east of the GDC Water Treatment Plant, including the stream referred to as Noname Creek 2 by Dr Gray in his evidence.
 - 11.11.** A drain running along the southern side of Taylorville Road beginning around the location of surface water sampling location SPA.
 - 11.12.** The location of two large water treatment/ retention devices (labelled pond) with a combined capacity of approximately 15,000 m³ for treating leachate and stormwater captured by the TRPL operations.

- 11.13.** The proposed discharge location in the centre of the site adjacent to bore MB13.
- 11.14.** Attachment 1 also shows an inferred geological cross section N-S, that is consistent with the ENGEO geological description as per Paragraph 10 of my evidence.
- 12.** The Taylorville Road cutting is shown in the central region of cross section N-S. The Kaiata Formation mudstone represents the dark brown base rock in the cross section, while Pleistocene glacial outwash is shown in grey, green and orange. Recent Holocene gravels associated with the current location of the Grey River are shown in Yellow.
- 13.** The cross section indicates the landfill is situated on an elevated terrace and has been excavated into the Pleistocene outwash deposits which are relatively thin (see Paragraph 16). I have observed the interface of the outwash deposits and mudstone at locations near the base of the road cutting along Taylorville Road. Groundwater seeps out of the slope can be observed at this interface directly below the landfill.
- 14.** A significant number of boreholes have been drilled at the site which have included the installation of groundwater monitoring bores. Attachment 2 of my evidence shows a figure prepared by ENGEO and presented in their Memo 9, dated 5 March 2025 which shows monitoring bore locations. Furthermore, in Section 2.3 (Hydrological Setting) of the ENGEO Preliminary Hydrogeological Assessment report, depth to groundwater measurements in six onsite monitoring bores is noted to have varied between 4.48 m (TSB1) to 12.4 m (MB4d) below the top of the well casings on 30 July 2024.
- 15.** Attachment 2 shows 13 monitoring bores installed at the site and based on groundwater level measurements taken by ENGEO the figure shows inferred piezometric contours indicating groundwater flows generally to the south-west below the terrace, although near the terrace margin the flow turns and discharges toward the south (and as evidenced by seeps out of the road cutting), in addition to discharges to the west of the site (as evidenced at spring TCD1). I consider these contours provide a good general indication of groundwater flow beneath the site, however I consider it is possible there could be a groundwater divide within the property separating flow to that goes dominantly west to flow which occurs to the south.
- 16.** Borelogs are provided by ENGEO in Appendix 1 of their 30 January 2025 Memo 8, for three monitoring bores (BH13, BH14 and BH19). These logs indicate the glacial outwash is typically described as sandy fine to coarse gravel (although there are some description variations) and these deposits vary between 11.4 m deep at BH014 and 17 m deep at BH013. Thereafter, mudstone is described to the base of the boreholes between 13.68 m deep (BH014) and 18.24 m deep (BH013).

Overview of the Proposal

- 17.** The proposal is described in Section 1 of the ENGEO Preliminary Hydrogeological Assessment. ENGEO describe that TRPL are applying for consent variations to allow the discharge of water from the onsite treatment/retention ponds to land to create freeboard in the ponds and avoid uncontrolled discharges.
- 18.** ENGEO note that based on laboratory analytical results, the proposed discharges contain contaminants exceeding the permitted activity standards outlined in Rule 67(a) of the West Coast Regional Land and Water plan (RLWP) (WCRC 2020).

19. I have previously been engaged by WCRC to review the technical consent application assessments provided by ENGEO.
20. I am aware that TRPL were applying to discharge up to 800 m³/day of contaminated water from the ponds to ground at a general central location within the property as shown in Attachment 1 of my evidence. However, I understand the proposed discharge rate has recently been reduced to 300 m³/day.

Quality of the Proposed Discharge

21. In Table 2 of their Preliminary Hydrogeological Assessment, ENGEO present the water quality parameters they used as input values for modelling the water quality effects of the proposed discharge (using RISC5 software). Full sampling results are provided in Appendix 5 of the Preliminary Hydrogeological Assessment for various locations at and adjacent to the site and for various sampling dates.
22. The Table 2 parameters used by ENGEO for their modelling were taken from laboratory results from samples 'Settlement Stage 2' (the pond from which the proposed discharge will occur) and 'Cell B/C' (samples of leachate from Cells B and C that is pumped to the onsite ponds).
23. For the initial RISC5 modelling, ENGEO state they used the highest concentrations detected in samples collected from locations in the water treatment system in July 2024. However, I note the Preliminary Hydrogeological Assessment shows only a single sample was collected from the settlement pond (31 July 2024) and there are other sample results prior to July 2024 (presented in Appendix 5 of the Preliminary Hydrogeological Assessment) that show significantly higher concentrations of parameters in leachate.
24. Based on all the samples collected from the settlement pond and Cell B and C leachate, I have prepared a table that is presented as Attachment 3 in my evidence which gives the highest concentrations of parameters measured from these sample locations.
25. Given that sampling is limited at the site, I consider the parameters presented in Attachment 3 do not give a reliable indication of the potential quality of the water that is proposed to be discharged to ground.
26. Along with the sampling results, the Attachment 3 table also includes comparison values relating to ecological and drinking-water guideline criteria.
27. Attachment 3 indicates various exceedances of ecological and drinking-water guideline criteria, including exceedances of health based Maximum Acceptable Value (MAV) drinking water values for dissolved manganese, dissolved arsenic and dissolved chromium.

Effects Assessments provided by ENGEO

28. In their Preliminary Hydrogeological Assessment report, ENGEO provided the following effects assessments relevant to the proposal:
 - 28.1. Groundwater mounding assessment.
 - 28.2. Contaminant transport assessment.

- 28.3.** Effects assessment on off-site groundwater quality.
- 28.4.** Effects on groundwater quantity.
- 28.5.** Effects on surface water quality.
- 29.** I consider the range of effects considered are generally applicable to the proposed activity and there are no significant additional assessments that I consider should be carried out (although noting I did ask for some comment on land stability effects based on high mounding predictions).
- 30.** I provide a summary of each of the assessments provided by ENGEO and listed in Paragraphs 28.1 through 28.5, along with my review comments in following sections of my evidence.

ENGEO Groundwater Mounding Assessment

- 31.** The original ENGEO mounding assessment is described in Section 6.1.1 of their Preliminary Hydrogeological Assessment report with the output from the assessment provided in Appendix 7 of that report.
- 32.** ENGEO note they used the Hantush (1967) analytical solution to estimate groundwater mounding below the discharge location. Their assessment included the following input parameters to the analytical model:
 - 32.1.** The proposed soakage area is 10 m x 10 m (100 m²).
 - 32.2.** The recharge rate is 8 m/d and was calculated based on the assumed size of the soakage area and the maximum discharge rate (800 m³/day at that time).
 - 32.3.** A specific yield of 0.13.
 - 32.4.** An assumed horizontal hydraulic conductivity (K_h) of 84 m/d.
 - 32.5.** An aquifer thickness of 8 m.
 - 32.6.** A 1 day infiltration period.
- 33.** Based on the inputs from Paragraphs 32.1 through 32.6, the maximum mounding calculated by ENGEO below the soakage area was 0.55 m at a distance of 5 m from the modelling discharge point and after 1 day of continuous discharge.
- 34.** On review, I was concerned that the adopted hydraulic conductivity value was too high and therefore provided input to a WCRC RFI letter dated 19 December 2024 requesting:
 - 34.1.** Hydraulic conductivity estimates from onsite testing (pump testing and/or slug testing). If slug testing is used, then please provide testing data from at least 3 bore locations on the upper terrace surface.
 - 34.2.** Updated mounding and contaminant modelling simulations using the hydraulic conductivity estimates derived from the requested testing. Based on the testing results, please take into account that the results from testing (particularly slug

testing) may provide local values for hydraulic conductivity but not necessarily be representative of the average hydraulic conductivity over the area of the landfill. Therefore, please provide multiple modelling simulations informed by the testing results using a realistic range of potential hydraulic conductivity values for the strata beneath the upper terrace (i.e. a sensitivity assessment based on varying the hydraulic conductivity that is informed by the testing results).

35. ENGEO responded in their RFI response Memo 8. ENGEO described slug testing at three onsite groundwater monitoring bores (MB13, MB14 and MB19d). They presented a range of hydraulic conductivity estimates from the testing ranging from 1.3×10^{-6} m/s to 1.11×10^{-5} m/s (0.11 m/day to 0.96 m/day).
36. An updated mounding assessment was provided in Appendix 2 of ENGEO Memo 8 which predicted estimated mounding of 6.89 m at a distance 5 m from the centre of the discharge point and after 1 day of discharge. This is considerably more mounding than the initial estimate of 0.55 m and as a result I had concerns that the proposed discharge may not be viable. I noted the calculated mound height was not considerably less than the depth to groundwater measured in MB013 of 7.93 m bgl on 16 October 2024 during slug testing in that bore. I also noted the borelog for MB013 appears to indicate a depth to groundwater of only 6.2 m bgl (less than the predicted mounding) in early October 2024.
37. Following review of the updated results (and other additional information provided by ENGEO) I drafted a memo to Mr Durand on 24 February summarising my review and providing further advice. Given concerns over the significant increase in mounding reported by ENGEO I carried out my own mounding assessment which was detailed in the memo. Relevant details of my mounding review and assessment are as follows:
 - 37.1. The proposed discharge location is in close proximity to BH013. The ENGEO slug testing analysis indicated hydraulic conductivity between 0.13 to 0.16 m/day at BH013. Lower values will result in higher mounding and I noted for the updated mounding assessment ENGEO used a value at the higher end of the results from their slug testing (0.86 m/day). This higher value was obtained at the other tested bore locations away from the proposed discharge location.
 - 37.2. I noted the updated mounding assessment was based on a significantly larger infiltration area (20 m x 20 m instead of 10 m x 10 m) which would result in a very large excavation onsite.
 - 37.3. ENGEO stated in their updated mounding assessment they estimate the infiltration capacity of the of the strata is in the order of 200 to 300 m³/day, however the updated assessment still used a discharge rate of 800 m³/day.
 - 37.4. I noted my own calculations show the predicted mounding will continue to increase significantly for prolonged infiltration periods and ENGEO only modelled the discharge occurring for a single day.
 - 37.5. In late 2024, ENGEO indicated an initial volume of 5,500 m³ of water needs to be removed from the onsite ponds. Assuming that was still a valid volume (rainfall is likely to have increased the volume in the ponds since that time), then 6.9 days of continuous discharge would be required to reduce the pond volume by 5,500 m³ at a discharge rate of 800 m³/day. My mounding calculations indicated that over 20 m of mounding would occur after 6.9 days of discharge at the proposed rate.

- 37.6.** I presented the results of additional assessments indicating that mounding was likely to be a limiting factor regarding the amount of water that could be discharged at the site.
- 37.7.** In my opinion, the available slug testing information (results from BH013 directly beside the proposed soakage location) indicate discharge rates of around 12 m³ per day are more realistic to keep mounding at acceptable levels. At this rate 458 continuous days of discharge would be required to dispose of a 5,500 m³ volume.
- 38.** ENGEO replied to my mounding concerns in their Memo 9. They stated they disagree with the PDP statement that the results of the mound modelling indicate that discharge to ground may not be feasible. They note that while the soakage area may not be able to accommodate the maximum discharge of 800 m³/day, it will still be able to receive discharges to achieve the application objectives without causing a greater than minor offsite effect.
- 39.** Based on the potential for very significant mounding, I also had concerns around stability of slopes subjected to high groundwater pressures due to mounding and this concern was discussed with ENGEO in a meeting between all WCRC and TRPL representatives on 7 March 2025.
- 40.** ENGEO provided a response regarding potential mounding induced stability concerns in their Memo 10. They indicated the lateral mounding extent will be limited to around 20 m beyond the infiltration basin and beyond that distance the mounding effect will be significantly less than the inferred seasonal variability of the water table (< 4 cm). ENGEO noted the proposed discharge area is approximately 100 m away from the head of Noname Creek and approximately 150 m away from the extents of the Pleistocene gravels, which demarcate the nearest sloping ground. ENGEO comment this negligible groundwater response from mounding will not increase the risk of slope stability.
- 41.** It is important to note I am not a ground stability expert, however I can comment on the potential lateral extent of the groundwater mound. I am unsure of how ENGEO has inferred the seasonal variability of the water table to be only 4 cm and expect that while seasonable variations are likely highly uncertain, my view is they may be much greater than 4 cm. However, both the ENGEO and PDP mounding assessments indicate any mounding is not expected to reach within close proximity of any slopes and therefore I was satisfied with this response. However, I still consider the available information indicates the proposed discharge rate into the ground is likely to be considerably less than what ENGEO have assumed, based on the site investigation information they have presented.

ENGEO Contaminant Transport Assessment

- 42.** ENGEO carried out contaminant transport assessments using RISC5 software. Their RISC5 modeling input parameters are described in Section 6.1.1 of their Preliminary Hydrogeological Assessment, while the modelling results and limitations/considerations are described in sections 6.1.2 and 6.1.3 respectively. RISC5 modelling input and output summaries are presented in Appendix 8 of the same report.
- 43.** The relevant modelling inputs described by ENGEO are as follows:

- 43.1.** There is no attenuation of contaminants in the vadose zone (unsaturated zone above the water table).
- 43.2.** A contaminant source area of 10 m long perpendicular to the flow direction and a height of 1 m.
- 43.3.** A pulse duration of 6 months.
- 43.4.** A hydraulic gradient of 0.0018 m/day calculated using measured groundwater elevations between BH1 and TSB1.
- 43.5.** Hydraulic conductivity of 84 m/d as per original mounding assessment.
- 43.6.** Dispersivity was calculated by the model (Gelhar, 1985).
- 43.7.** Fraction organic carbon was 0.001 g/g.
- 43.8.** The source area contaminant concentrations were derived from the highest concentrations detected in samples collected from locations in the water treatment system in July 2024.
- 43.9.** Only contaminants where measured concentrations in the source have exceeded one of more of the health-based assessment criteria (drinking-water Maximum Acceptable Value (MAV) or ecological Default Guideline Value (DGV)) were modelled.
- 43.10.** No contaminant degradation along the flow path was assumed.
- 43.11.** Output concentrations were taken at a hypothetical bore located 310 m downgradient of the soakage area, directly on the flowpath of the plume, and with a screen that intersects the water table.
- 44.** The modelled contaminants and concentrations are provided in Table 2 of the ENGEO Preliminary Hydrogeological Assessment.
- 45.** ENGEO reported the modelling results as follows:
 - 45.1.** Very low concentrations of aluminum, ammoniacal-N, manganese and nitrate-N may reach the hypothetical bore with the concentration maximum taking 1.6 years.
 - 45.2.** The highest modelled concentrations are for aluminium and nitrate-N, however ENGEO report these concentrations are negligible (0.00031 mg/L and 0.00050 mg/L respectively) and below the range of natural variability or analytical error.
- 46.** Based on my initial review of the ENGEO Preliminary Hydrogeological Assessment, I considered the initial modelling may not be relevant as it used the same assumed hydraulic conductivity as the initial mounding calculations. There have been various requests (from myself), responses (from ENGEO) and discussions between us regarding this contaminant transport modelling (as set out in Appendix 1 of my evidence).

47. Following review of all the modeling information provided, I am generally unconvinced by the modelling approach that has been carried out. Based on the information provided, I have concerns regarding the variations in modelling results that have been provided throughout the review process. The table below provides a summary of all the model simulations that have been provided by ENGEO.

Parameter	Model Output Concentrations (mg/l)				
	Prelim Hydrogeological Assessment (19/09/24)	Memo 8 (30/01/25)		Memo 10 (17/03/25)	
		High K	Low K	High K	Low K
Aluminium	3.1×10^{-4}	2.7×10^{-3}	3.3×10^{-4}	2.6×10^{-3}	3.3×10^{-4}
Ammonium-N	5.7×10^{-9}	-	-	9.7×10^{-2}	1.2×10^{-2}
Arsenic	-	-	-	9.7×10^{-4}	1.2×10^{-4}
Chromium	-	-	-	2.2×10^{-4}	2.8×10^{-5}
Copper	-	-	-	1.9×10^{-4}	2.5×10^{-5}
Lead	-	-	-	1.3×10^{-5}	1.7×10^{-6}
Manganese	-	-	-	6.6×10^{-3}	8.5×10^{-4}
Nickel	-	-	-	1.5×10^{-4}	2×10^{-5}
Nitrate-N	5×10^{-4}	6.9×10^{-3}	8.3×10^{-4}	6.4×10^{-3}	8.3×10^{-4}

48. The increase in model output concentrations between the original Preliminary Hydrogeological Assessment and the final modelling simulations presented in Memo 10 is significant. I acknowledge I requested higher input concentrations should be modelled, however the most significant issue appears to be errors in the original modelling methodology, whereby attenuation in the model was occurring for most parameters, even though ENGEO indicated there was no attenuation occurring in the model. The results for the final modelling presented in ENGEO Memo 10 show detectable concentrations for all modelled parameters and as expected, the highest output concentration is for Ammoniacal-N which has the highest input concentration. That was not the case for all the previous modelling simulations.
49. I note the final output concentration of Ammoniacal-N is 0.012 mg/L which is below the ecological DGV of 0.9 mg/L and the Drinking-water AV concentration of ≤ 1.5 mg/L. All other contaminant concentrations are well below the ecological and drinking-water guideline criteria.
50. I note the reported concentrations are at the ENGEO theoretical receptor 310 m away from the discharge location. However, given the very large mounding that could occur at the discharge location I have additional concerns that the mounding could result in local groundwater flow to the head of Noname Creek only around 100 m north of the discharge location. In addition, the mounding could cause a similarly short pathway to occur directly south of the discharge, causing contaminated water to discharge out of the road cutting over a much shorter flow path. Those situations would likely result in higher model output concentrations due to the shorter distance to the receptor. No further consultation was carried out with ENGEO, so this issue was not discussed with them.

Effects on Off-site Groundwater Quality

51. Section 6.2 of the ENGEO Preliminary Hydrogeological Assessment provides an assessment of off-site groundwater quality. ENGEO note that the contact between Pleistocene outwash and Kaiata Formation mudstone is located on the exposed slope (below the landfill on the northern side of Taylorville Road). They state that groundwater that daylights (I assume that seeps out of the slope at the interface of outwash and mudstone) will be captured in the drain that runs around the western property boundary and along Taylorville Road. It is also stated that any water that infiltrates to ground will be confined by the alignment of Noname Creek. Based on this explanation, ENGEO considered there is no hydraulic connection between the site and the off-site Holocene aquifer (the gravel deposits on the southern side of Taylorville Road that are associated with the current alignment and deposition from the Grey River) and the effect of the proposed discharges to off-site groundwater quality is highly likely to be less than minor.
52. My concerns regarding effects to off-site groundwater quality are related to potential effects on the Coal Creek community drinking-water supply. Based on information provided previously by the applicant and ENGEO, I consider there are no private drinking-water supplies at risk from the proposal due to the expected groundwater and surface water flow paths. However, based on the presence of the GDC public supply in close proximity of the site, I did not consider the ENGEO Preliminary Hydrogeological Assessment adequately addressed the risk to this drinking-water supply.
53. Prior to the submission of this short-term consent application, I had suggested that the best way to address risks to the GDC supply is to carry out a drilling and groundwater monitoring and sampling investigation on the GDC land to the south of the site. This recommendation was provided in a PDP letter dated 24 May 2024 to WCM Services (then acting for TRPL), relating to a previous consent application to vary RC-2021-0097-V8 and allow for operation of the landfill under Class 3 Managed Fill guidelines. This application has since been withdrawn. The same recommendation was made in my report to WCRC dated 11 October 2024, where I provided my expert opinion on the potential or actual impacts of the TRPL landfill leachate management on groundwater, surface water and human drinking-water sources including the GDC Coal Creek community water supply. I am aware a copy of this report was provided to TRPL and ENGEO.
54. I consider it is unfortunate that the potential effects on groundwater quality relating to this short-term consent application are being assessed based on an uncertain modelling approach and theoretical assumptions relating to the geology between the site and the southern side of Taylorville Road, particularly given the significance of the public water supply.
55. I consider there are the following potential theoretical pathways for leachate migration from the site to off-site groundwater:
 - 55.1. Groundwater discharge at spring TCD1 at the western site boundary and other potential seepage locations on the western side of the landfill. From here, leachate can migrate to the roadside drain on the northern side of Taylorville Road. Culverts under the road provide passage for water in the drains to flow onto the lower elevation terrace into drains and surface waterways on the southern side of the road where the GDC water treatment plant and water supply bores are located. Via this travel pathway, it may be possible for losses from these drains

and surface water features on the southern side of the road to infiltrate to the underlying groundwater.

- 55.2.** Direct groundwater seepage out of the terrace on the northern side of Taylorville Road (as I have observed), where it could discharge to the roadside drain and follow the same route to off-site groundwater south of the road as described in Paragraph 55.1.
- 55.3.** Direct groundwater flow under the road via a continuous fracture network in the mudstone. I consider this pathway is more unlikely, however given the proximity of the GDC water supply and the potential consequences of contaminating the water supply, I also consider this pathway should be adequately investigated.
- 56.** Regarding the Paragraph 55.3 fracture pathway, I had previously suggested to TRPL a drilling/testing investigation into the mudstone to confirm the presence or not of a fracture network and a continuous groundwater flow path in the mudstone, however such investigations were never carried out and reliance was made on information from literature that may not be relevant to the site, in addition to general assumptions.
- 57.** I have similar concerns about the inadequate and inconsistent approach that has been taken towards evaluating the contamination risk to the nearby GDC source of drinking-water supply, which have shown unexplained concentrations of copper, lead and zinc.
- 58.** My consultation with ENGEO regarding these matters are set out in Appendix 2 of my evidence.
- 59.** Overall, I consider the potential for a fracture network in the Kaiata Formation and the detection of elevated concentrations of metals in the GDC water supply have not been adequately addressed to date.

Effects on Groundwater Quantity

- 60.** I don't consider there are any significant effects on groundwater quantity, other than the available information to date indicates that discharging significant quantities of groundwater to ground may not be feasible at this site and result in very high levels of groundwater level mounding.

Effects on Surface Water Quality

- 61.** My former colleague Dr Gray has prepared evidence that provides comment on potential effects on surface water quality and my current PDP colleague Mr Arthur is presenting that evidence.

Outstanding Concerns

- 62.** Based on the review work I have carried out relevant to the ENGEO effects assessments, my outstanding concerns that have not been addressed to date by ENGEO are as follows:
 - 62.1.** I consider the available information indicates it is unlikely that significant volumes of water from the onsite ponds can be discharged to ground at the site. Therefore, I consider the overall aim of the proposal may not be achievable.

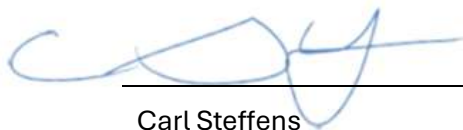
- 62.2.** I remain unconvinced by the RISC5 contaminant modelling due to inaccuracies in the earlier modelling that was carried out. ENGEO stated that the modelling did not include attenuation of the modelled contaminants, but later modelling confirmed that was not the case. I am not currently at the point where I consider the modelling can be relied upon and for this to occur I would need further confirmation that the entire contaminant mass modelled by ENGEO is transferred into the model and remains in the model during the full simulation period.
- 62.3.** I consider groundwater quality samples should be collected directly from the GDC water supply bores to confirm that elevated concentrations of heavy metals detected in a sample from the GDC treatment plant do not represent the source water abstracted into the bores.
- 62.4.** I consider that the potential pathway for contaminants through a fracture network in the Kaiata mudstone has not been resolved. As stated, I consider this pathway to be unlikely, but given the potential high consequences of contaminating a public water supply that provides for a large population (I understand around 10,000 people), I consider that site specific information should have been provided to rule out the potential for fracture flow.

My Thoughts on the Potential Effects

- 63.** Overall, my view of the potential effects of the proposal are as follows:
- 63.1.** I consider groundwater mounding may be a limiting factor for the proposal and the available information indicates it may not be feasible to discharge significant quantities of water from the ponds to ground at the site. If consent is granted, it will be important to control the activity so that mounding does not reach the surface and create surface flooding and runoff.
- 63.2.** I consider the potential scale of mounding could change local groundwater flow directions and cause the discharge to reach receptors at closer distances than the assumed modelling carried out by ENGEO. This could potentially cause discharges of contaminants at the head of Noname Creek and directly south of the discharge location via seeps in the Taylorville Road cutting. This would mean there is less distance for contaminants to attenuate prior to discharging compared to the scenario modelled by ENGEO.
- 63.3.** The highest concentrations of contaminants in pond or leachate samples to date exceed health-based drinking water MAV criteria for dissolved manganese, arsenic and chromium. In addition, concentrations of many parameters without health-based drinking water MAV's are significantly elevated. There are also multiple instances where concentrations have exceeded ecological and drinking water aesthetic criteria.
- 63.4.** Assuming significant quantities of water can be discharged, concentrations will decrease in the surrounding environment with increasing distance from the discharge due to natural processes in the Pleistocene outwash deposits, including dispersion, retardation, attenuation and dilution. The RISC5 modelling carried out by ENGEO is consistent with these assumptions, although I don't consider the modelling to date has been suitably reliable.

- 63.5.** If contaminants were to reach the lower terrace (by any of the flow paths indicated in Paragraphs 55.1 to 55.3 of my evidence), I expect there would be significant dilution of those contaminants once they enter the Grey River gravels adjacent to the supply bores. In addition, if any contaminants were to reach the GDC bore intakes they would be further diluted by the large volume of water drawn into the intakes that comes from all around the bores, including from the Grey River side.
- 63.6.** Based on the summary above, I consider the risks are likely low, however I am also aware that the consequences are very high based on the proximity to the GDC water supply. Therefore, my view is that there should be a very high level of certainty that the effects will be less than minor.
- 63.7.** I don't consider the applicant has adequately addressed all potential issues via their effects assessments given the proximity to the GDC water supply. As a result, I consider there are uncertainties that remain that should have been covered off via the RFI process.
- 63.8.** I remain of the view that additional site-specific investigations should have been carried out, including drilling and groundwater sampling on the GDC land, in addition to site specific investigations to rule out a fracture network in the mudstone underlying the site and surrounds. I also consider a groundwater sample should have been collected directly from the GDC supply bores.
- 63.9.** I note there is only a single sample available from the ponds to characterise the discharge water quality and therefore I consider there is significant uncertainty regarding the actual quality of the water that will be discharged.
- 63.10.** In summary, I consider the risks to the GDC water supply are low, but not all uncertainties have been adequately addressed.
- 63.11.** I have no other concerns regarding potential effects, with the exception of effects on surface water. However that matter is covered in Dr Gray's evidence being presented by Mr Arthur.

Prepared by:



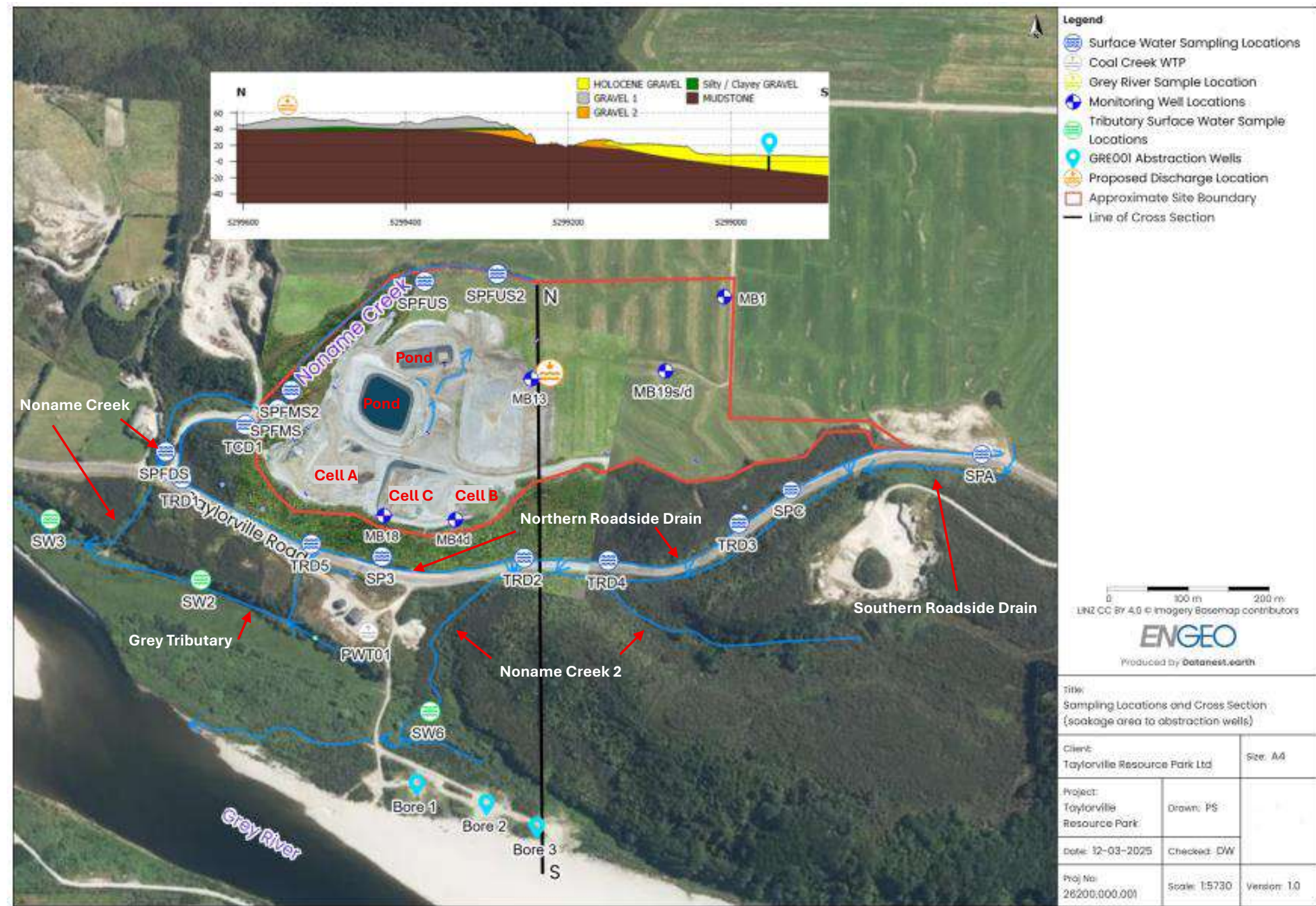
Date: 12/08/2025

Name:

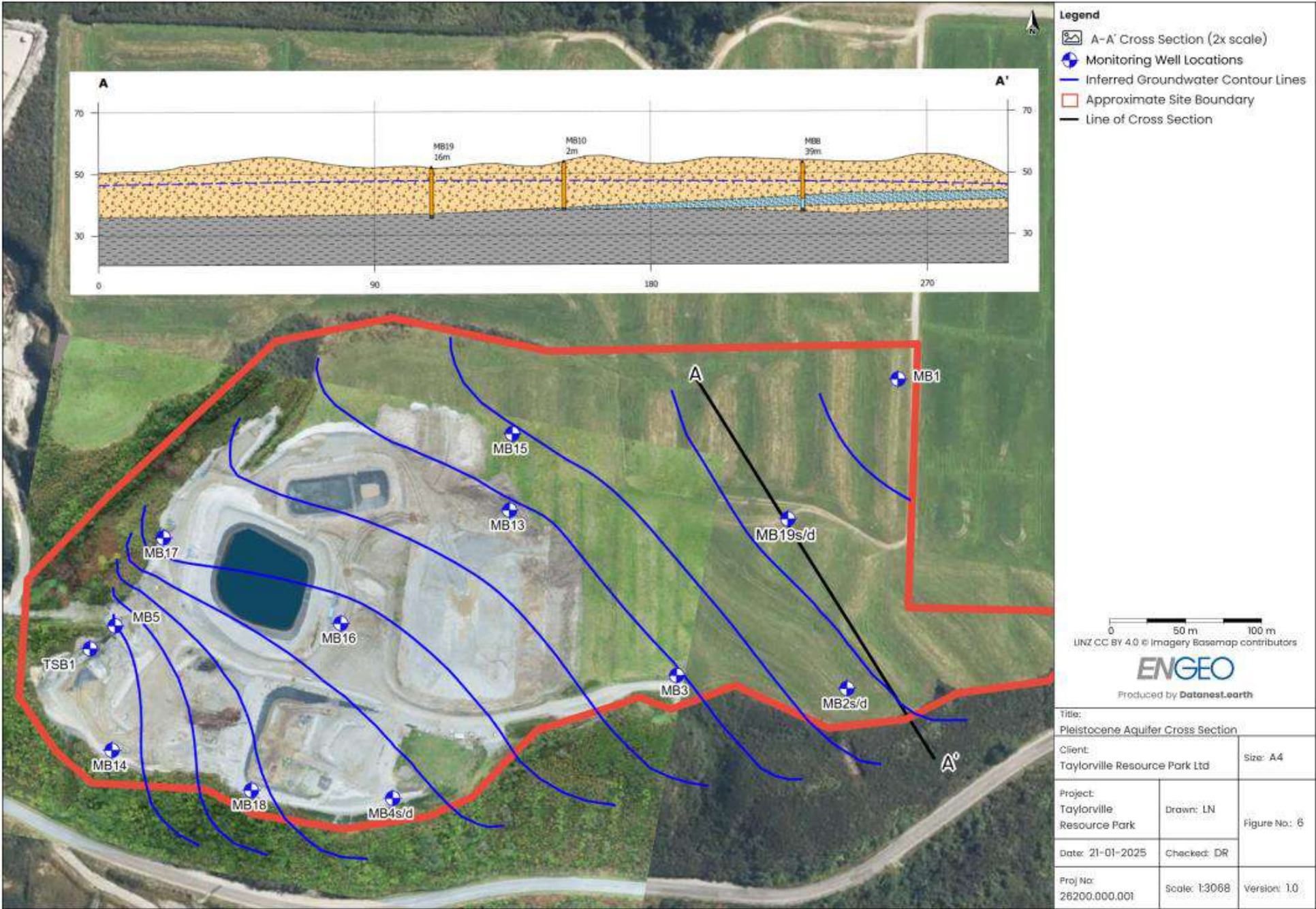
Carl Steffens

Technical Director – Water Resources

Attachment 1 – Site and Surrounding Area



Attachment 2 – Groundwater Monitoring Bores and ENGEO Piezometric Contours



Attachment 3 – Highest Groundwater Quality Concentrations in Samples ‘Settlement Stage 2’ and ‘Cell B/C’

Parameter	Sample Name		Guideline Values		
	Settlement Stage 2	Cell B/C	DGV ¹	AV ²	MAV ³
pH	8.1	<u>6.9</u>	7.7	7.0-8.5	
Total Alkalinity	340	310			
Bicarbonate	410	380			
Total Hardness	600	550		≤200	
Electrical Conductivity (mS/m)	<u>125.6</u>	<u>523</u>	10.7		
Dissolved Aluminium	0.016	0.22	0.055	≤0.1	1
Dissolved Calcium	220	196			
Dissolved Iron	0.05	0.51		≤0.3	
Dissolved Magnesium	11.6	15.6			
Dissolved Manganese	2.6	2.7	1.9	≤0.04	0.4
Dissolved Potassium	23	29			
Dissolved Sodium	36	34		≤200	
Chloride	19.6	89		≤250	
Total Ammoniacal-N	5.4	98	0.9	≤1.5	
Nitrite-N	0.053	0.37			0.912
Nitrate-N	<u>0.1</u>	<u>0.72</u>	0.092		11.3
Nitrite+Nitrate-N	0.154	0.94			
DRP	<0.004	<u>0.024</u>	0.009		
Sulphate	330	350		≤250	
cBOD5	3	11			
COD	84	114			
Dissolved Arsenic	0.0125	<u>0.96</u>	0.013		0.01
Dissolved Cadmium	<0.00005	<0.003	0.0002		0.004
Dissolved Chromium	<u>0.0065</u>	0.22	0.0033		0.05
Dissolved Copper	<u>0.0077</u>	<u>0.058</u>	0.0014	≤1	2
Dissolved Lead	<0.00010	0.0024	0.0034		0.01
Dissolved Nickel	0.0037	<u>0.016</u>	0.011		0.08
Dissovled Zinc	0.0037	<u>0.041</u>	0.008	≤1.5	

All values reported in units of milligrams per litre (mg/L) unless stated otherwise

1. Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000) Default Guideline Values (DGV) for 95% Species Protection. Where no Toxicant DGV has been derived, values are for physical chemical (PC) stressors (based on MfE REC CX/L)

2. Taumata Arowai Aesthetic Values for Drinking Water Notice 2022, Aesthetic Values (AV)

3. Water Services (Drinking Water Standards for New Zealand) Regulations 2022, Health-based Maximum Acceptable Value (MAV)

6.9 Exceeds DGV

550 Exceeds AV

0.125 Exceeds MAV

Appendix 1 – Correspondence With ENGEO Regarding RISC5 Modelling

- 1.** Following my initial review of ENGEO Preliminary Hydrogeological Assessment and noting the potential issues with the assumed hydraulic conductivity values used by ENGEO in their modelling I provided input to the 19 December 2024 WCRC RFI letter which included requests relevant to the ENGEO RISC5 modelling as follows:
 - 1.1.** The same request as per Paragraph 34.2 of my main body of evidence which was relevant to both the mounding and contaminant modelling. This request was to carry out further modelling simulations using the hydraulic conductivity values estimated from slug testing onsite and also provide a sensitivity assessment.
 - 1.2.** Updated contaminant modelling simulations using input parameters more consistent with high parameter concentrations that have been measured in leachate and wastewater. This was because I noted there has been significantly higher concentrations of parameters measured in leachate and wastewater at times other than those in July 2024 as modelled by ENGEO. Such concentrations have been presented in Attachment 3 of my main body of evidence.
- 2.** Based on these requests, ENGEO carried out additional RISC5 modelling incorporating the following changes described in ENGEO Memo 8:
 - 2.1.** The height of the source area was updated to 8 m (previously 1 m) to account for the significantly higher mounding predicted using the slug testing hydraulic conductivity results.
 - 2.2.** Model simulations were provided using both the highest and lowest slug testing hydraulic conductivity estimates (approximately 0.11 m/day and 0.86 m/day).
 - 2.3.** The input parameters were updated to the highest individual contaminant concentrations previously detected at the site. ENGEO noted they consider it highly unlikely that blended concentrations in leachate (in the soakage area) will contain concentrations equivalent to the highest concentrations detected.
- 3.** ENGEO reported that the updated modelling simulations indicated concentrations at the hypothetical well were either not detectable or orders of magnitude below the human or ecological health-based criteria. The highest modelled parameter concentrations were 0.0069 mg/L for nitrate-N and 0.0027 mg/L for total aluminium. The input and output files from the updated RISC5 modelling were provided in Appendix 3 of ENGEO Memo 8.
- 4.** I included a summary of my review of the updated RISC5 modelling to WCRC in my 24 February memo. I had a number of potential concerns regarding the modelling for which I indicated more information was required. The main issues for clarification were as follows:
 - 4.1.** How does RISC5 account for the input of contaminants in the model?
 - 4.2.** The assumed hydraulic gradient in the model was different between the initial and updated modelling.
 - 4.3.** Differences in outputs between the high versus low hydraulic conductivity modelling scenarios and how dilution impacts on the modelling results. I expected

the higher hydraulic conductivity simulation should result in lower contaminant concentrations which was the opposite of what their modelling results indicated.

- 4.4.** I noted that Nitrate-N was detected in the output of both high and low conductivity simulations, but Ammoniacal-N was not. This was despite the source concentration of Ammoniacal-N (98 mg/L) being much greater than the source concentration of Nitrate-N (6.5 mg/L) and the statement by ENGEO that the modelling assumes no degradation of contaminants. As a result, I considered the results did not make sense and there must be removal of Ammoniacal-N in the model.
- 4.5.** Overall, I had concerns the modelling may not be reliable and this appeared to be supported by the respective output concentrations for Nitrate-N versus Ammoniacal-N.
- 4.6.** To address my concerns I indicated further explanation was needed from ENGEO, or I could carry out my own modelling to compare with the ENGEO modelling.
- 5.** ENGEO provided additional information in their Memo 9 which is summarised as follows:

 - 5.1.** It was explained that the modelling methodology does not use a discharge rate as an input (where I had assumed the modelling included a discharge of a contaminant source at a rate of 800 m³/day). ENGEO confirmed that the model used an assumed saturated contaminant source with a cross-sectional area measuring 80 m² (8 m thickness and 10 m width) and a length of 10 m (800 m³ volume).
 - 5.2.** They noted the difference in hydraulic gradient between the initial and updated modelling and explained that the later adopted gradient was based on updated groundwater level data at the site following installation of additional monitoring bores in October 2024.
 - 5.3.** ENGEO also explained they consider a high conductivity modelling scenario would result in lower contaminant concentrations at the output receptor. They explain that under high conductivity scenarios there will be less diffusion of contaminants which will contribute to more elongation of the plume in the direction of groundwater flow. They also explain there is no retardation in the model which will mean dilution effects will not be significant.
- 6.** I was satisfied with the ENGEO response relative to how the contaminant source was represented in the model, however this raised another potential issue regarding the removal of the contaminant source from the model after a six month simulation time and whether all the contaminant mass would be input into the model.
- 7.** I was also satisfied with the explanation relating to the change in hydraulic gradient between the initial versus updating modelling.
- 8.** I agree with the ENGEO explanation of the model predicting higher concentrations for the high conductivity scenario compared to the low conductivity, given all the other assumptions of the model.

- 9.** I note that ENGEO did not provide a response to my query as to why Nitrate-N in the model output receptor was detected but not Ammoniacal-N, even though the input concentration for Ammoniacal-N was much higher. Given ENGEO indicated the model did not allow for degradation of contaminants in the model, this was the most apparent reason why I still had concerns with the updated modelling.
- 10.** Following my review of ENGEO Memo 9, at the 7 March 2025 meeting between all parties, I recall the main discussion points relative to the RISC5 modelling at the meeting were as follows:

 - 10.1.** The issue regarding detectable Nitrate-N in the model output versus non-detectable Ammoniacal-N. I can't recall whether it was during the meeting or after that ENGEO confirmed the model had been attenuating contaminant concentrations of Ammoniacal-N.
 - 10.2.** The removal of the contaminant source from the model after a six month simulation period. My concern regarding this methodology is whether the entire contaminant mass that will be in the discharge is transferred into the model. I confirmed that I needed clarification of that.
- 11.** Following the meeting, I suggested to Mr Durand that further clarification is required relative to the RISC5 modelling. As a result, he sent an email to Barker and Associates requesting further information relevant to the modelling as follows:

 - 11.1.** How will the modelling methodology, whereby the contaminant source is only applied for a six month period and is then removed, impact on the mass flux of contaminants and the concentrations predicted at the assessment point?
 - 11.2.** Why has the concentration of Ammoniacal-N (much higher input concentration than Nitrate in the model) reduced to a non-detectable concentration in the model output when nitrate has not (assuming no retardation)?
- 12.** A response to these additional questions was provided in ENGEO Memo 10. A summary of the response is provided as follows:

 - 12.1.** ENGEO carried out additional modelling which they indicated incorporated attenuation/degradation or retardation. The output files from the additional modelling were not attached to the memo, however they were provided to me directly by ENGEO via email.
 - 12.2.** ENGEO provided very brief comment regarding the effects of removing the contaminant source from the model after six months.
- 13.** The results of the additional modelling showed all modelled parameters were now detected in the theoretical downgradient bore. This indicated that the previous model simulations were not correct and in fact attenuation/degradation was occurring in the previous model simulations.
- 14.** I don't consider ENGEO clarified whether the entire contaminant mass (equivalent to a direct discharge occurring for six months at 800 m³/day) would be transferred into the model based on the modelling methodology. I expect it may be straightforward to address

this issue, however there has been no further consultation since receipt of Memo 10. This is my main outstanding technical concern regarding the RISC5 modelling.

Appendix 2 - Correspondence With ENGEO Regarding Risks to GDC Water Supply

- 1.** Following review of the Preliminary Hydrogeological Assessment and the 1 November 2024 ENGEO RFI, the 19 December 2024 WCRC RFI request letter included the following requests based on my review:
 - 1.1.** A water quality comparison between water samples collected from the GDC water supply, the Grey River, groundwater upgradient of the landfill north of Taylorville Road and surface water samples collected at TRD2 and TRD4. The samples should include analysis for anions and cations and nitrogen species, in addition to other parameters sampled to date by TRPL. The purpose of the sampling is to inform whether the GDC water supply source is dominantly Grey River water and that there is minimal input to the supply bores from upgradient groundwater and surface drainage.
 - 1.2.** Yield versus drawdown data from the GDC supply bores to confirm the gravel deposits immediately adjacent to the Grey River are of high permeability with a high hydraulic connection to the Grey River.
 - 1.3.** XRD sample analysis from the Kaiata Formation mudstone underlying the landfill to confirm clay mineralogy in the mudstone and confirm ENGEO comments that swelling within any fractures that may be present in the mudstone will block the transmission of groundwater via a fracture network.
- 2.** In response, ENGEO carried out the following, as detailed in their Memo 8:
 - 2.1.** Water quality samples were collected from the raw (untreated) water at the GDC Treatment Plant (sample PWT01 shown in Attachment 1) and the Grey River at (sample GR-01). ENGEO compared the results to those from the most recent (at that time) groundwater samples at the site, presenting laboratory results and Durov Cation and Anion plots in Appendix 5 of their Memo 8.
 - 2.2.** ENGEO provided pump testing analysis results from GDC public supply bore BH02 and borelogs from BH01 and BH02. They stated the hydraulic conductivity is between 3.42×10^{-2} m/s and 1.58×10^{-2} based on data they presented in Appendix 6 of their Memo 8.
 - 2.3.** They presented XRD analysis of a mudstone outcrop at Punakaiki River Gorge, over 25 km distant from the site. Based on this, ENGEO stated the clays in the mudstone comprised kaolinite, illite and vermiculite. This information was provided in Appendix 7 of their Memo 8. Based on this information, ENGEO indicated the mineralogy of the mudstone comprised a mixture of swelling and non-swelling minerals and therefore inferred there is negligible flow through defects (micro fractures). However, they also indicated there is potential for preferential pathways through interbedded layers of non-clay materials (e.g. silts, sands), but that groundwater that intersects these layers will most likely be transported west-southwest, along the dip of the mudstone bedding planes away from the water supply.
- 3.** I provided a response to this additional information in my letter to Mr Durand dated 24 February 2025.

4. With regard to the water quality sampling, ENGEO compared the Grey River (GR-01) and Treatment Plant (PWT01) sample results with groundwater monitoring bore samples from downgradient and crossgradient locations. Extended Durov diagrams of ion comparisons are shown in Appendix 2, Attachment 1 of my evidence and summary comments relevant to these diagrams are provided as follows:
 - 4.1. Samples PWT01 and GR-01 plot closely together indicating similar water composition, although they are not exactly the same.
 - 4.2. There is some deviation in ion chemistry between downgradient groundwater samples and those collected from the Grey River and GDC treatment plant.
 - 4.3. There may be more similarity between samples PWT01 and GR-01 and the crossgradient bore samples compared to those from downgradient locations, with the exception of MB2d, although this bore is screened in the underlying mudstone which could impact the comparison.
 - 4.4. Overall, based on the ion information provided by ENGEO, there is a relatively good match between raw GDC treatment plant water and Grey River water, although the GDC raw water does suggest some influence similar to the water chemistry in the groundwater monitoring bores on the terrace above Taylorville Road.
5. I noted that the sampling did not include analysis for all parameters previously sampled by TRPL as requested in the RFI. For example, samples PWT01 and GR-01 did not include analysis for dissolved aluminium, iron, manganese or DRP. Ideally the samples at PWT01 and GR-01 would have been compared with new groundwater samples collected at the same time (rather than comparison with older samples) and comparison was not provided with TRD2 and TRD4 as requested.
6. I noted that concentrations of copper, lead and zinc in treatment plant sample PWT01 were unexpectedly high and exceed ecological guideline criteria, whereas Grey River sample GR-01 recorded all dissolved metals at concentrations below the laboratory detection level. Together with the slight deviation of sample PWT01 towards the groundwater bore samples, this potentially suggested an influence on water chemistry in the supply bores from the groundwater north of the river.
7. With regard to copper (0.193 mg/L) and lead (0.006 mg/L), the concentrations measured in PWT01 are particularly high compared to all other water samples presented in the applicant's information. Both of these parameters were measured in PWT01 at concentrations well above those measured by TRPL in upgradient groundwater and surface water. Furthermore, the dissolved copper and lead concentrations in PWT01 are also higher than those measured in any of the samples collected from wastewater (0.058 mg/L for copper and 0.0024 mg/L for lead), although presumably these concentrations will vary depending on the different wastes that are being received at any particular time and in response to variations in groundwater levels. While nickel and zinc were also detected/elevated in PWT01, higher (nickel) or very similar (zinc) concentrations have been measured previously by TRPL in upgradient groundwater bores.
8. The groundwater quality results from PWT01 and GR-01 potentially indicate that groundwater north of the Grey River may influence the chemistry of water taken from the GDC community water supply. This is despite the supply bores being situated

immediately adjacent to the Grey River. I considered this a significant finding and indicated it would be helpful (and important) for the applicant to provide comment on the potential cause of the elevated concentrations of copper, lead, nickel and zinc in the water treatment plant sample.

9. With respect to the request for yield versus drawdown data from the GDC supply bores, my 24 February memo response and interpretation of that information was as follows:
 - 9.1. ENGEO provided McMillan Drilling logs for GDC bores BH01 and BH02 (two of the three GDC community drinking-water supply bores) and data from step-drawdown and constant rate pump testing in BH02. The McMillan Drilling report indicated that BH01 has been decommissioned and therefore I assumed the drilling and testing in BH02 was carried out to replace BH01.
 - 9.2. The drillers log for BH02 indicates fill and sand to 1.3 m bgl, underlain by dominantly fine to coarse gravel strata to 8.8 m bgl. Silty clay was observed from 8.8 m to the base of the borehole at 10.5 m bgl. A 2.5 m screen was installed in the bore from 6 to 8.5 m bgl (within the gravel-based strata).
 - 9.3. No bore construction details are provided for BH01, however based on the logs provided it is clear that large thicknesses of relatively fine-grained strata (sand and clay) was observed during drilling of this bore, which is likely to have negatively impacted on the potential yield that could be achieved from BH01.
 - 9.4. Step-drawdown and constant rate testing data is also provided from pumping in BH02, along with some outputs of testing analysis to determine aquifer parameters. I considered the analyses are not valid, as it appears observation bore solutions (Boulton and Neuman) were used to analyse pumping bore data.
 - 9.5. However, yield versus drawdown measurements were provided, indicating that a yield of up to 70 L/s was pumped from BH02 with corresponding drawdown of only approximately 1 m. This indicates highly permeable strata and that large drawdowns in the strata between the GDC bores and the landfill are unlikely to occur. Therefore, I considered this was useful information that suggests operation of the GDC bores (or at least BH02) likely draws very large volumes of water from the Grey River. However, the elevated dissolved metal concentrations in sample PWT01 potentially suggested there was still some other significant influence on the chemistry of water abstracted for the GDC water supply.
10. With regard to the request for XRD sample analysis from the Kaiata mudstone at the site, I noted the information provided was from other locations away from the landfill site. As a result, I consider it may not be relevant. However, assuming it is relevant, I don't consider it supports the earlier assumptions made by ENGEO. The mineralogy of the XRD data provided indicates a mixture of kaolinite, illite and vermiculite. A review of clay swelling behaviour and discussion with geotechnical colleagues at PDP indicates that kaolinite and illite don't appear to have high swelling ability. The swelling potential of vermiculite may be higher (but still not high), although is also highly dependent on temperature. There are also other properties that affect the swelling ability of clay minerals (for example pH, salinity and presence of cations) which have not been discussed by ENGEO.
11. ENGEO also indicated there are layers within the mudstone that may not contain clay minerals, but in those cases groundwater flow will occur along the direction of bedding

away from the GDC water supply bores. However, ENGEO provided no information to confirm there is no potential for fracture networks at other angles to the dip of the bedding. Based on the information provided, I was not satisfied there was no potential for groundwater flow in the direction of the GDC supply bores within fractures in the mudstone.

- 12.** ENGEO responded to my additional concerns in their Memo 9. With regard to the water quality sampling ion comparisons they provided the following:
 - 12.1.** An updated Durov Plot to include drain sampling results from TRD2 and TRD4 as originally requested. Their updated plot provides a comparison with upgradient bores MB1 and MB19s, which is different to the previous plots which compared crossgradient and downgradient bores.
 - 12.2.** ENGEO explained they originally excluded drain locations TRD2 and TRD4 due to the influence of other inputs along Taylorville Road and because water quality in samples collected from monitoring bores MB4, MB14 and MB18 are more relevant to assess inputs from the operations.
 - 12.3.** They provided interpretation of their updated plot in the memo, however I discuss problems with the plots in Paragraph 14 below.
 - 12.4.** ENGEO note there is another deposit of Pleistocene outwash on the south side of Taylorville Road, as indicated in their Preliminary Hydrogeological Assessment. I assume this is based on their inferred depositional sequence as shown in Figure 3, Photo 3 of that report, as per the red Gravel 1 extents on the southern side of the road shown on that figure. They state those gravels are not hydraulically connected to the subject site but consider ambient groundwater quality is likely similar in both deposits (north and south of the road). ENGEO note the GDC abstraction area is approximately 100 m due south of the Pleistocene deposits on the southern side of the road and infer that groundwater discharges from these deposits may be influencing water quality in the abstraction gallery rather than waters from upgradient of the site.
 - 12.5.** With regard to the unexpectedly high concentrations of dissolved metals in the GDC Treatment Plant sample PWT01, ENGEO note the concentrations detected in PWT01 are higher by several orders of magnitude than any concentrations recorded in water samples collected from Taylorville Road Drain, locations in the water treatment system, or monitoring bores located downgradient of the operations. As such, they consider there is no basis to suggest that the concentrations of dissolved metals in PWT01 are related to the operations. ENGEO noted it is beyond the scope of the proposed works to require the applicant to undertake a detailed investigation of all potential inputs to the GDC abstraction gallery, which they consider is upgradient of the operations. They infer the concentrations in PWT01 are naturally occurring (e.g. concentrations in the Holocene gravels) or due to the influence of waters originating at another (offsite) source area.
- 13.** With regard to Paragraph 12.2, I don't consider the coverage provided by the three downgradient bores is sufficient to completely characterise groundwater impacted by the landfill and I also note that groundwater at the site discharges directly to the drains and

therefore consider the quality of the drains is relevant to the onsite activities. Therefore, I disagree with these statements by ENGEO.

14. Regarding Paragraph 12.3, while comparing the ENGEO Memo 8 and Memo 9 Durov plots I noted that between each of the two memos the Grey River and GDC treatment plant samples plotted in different locations. The latter ENGEO Memo 9 Durov plot is provided as Appendix 2, Attachment 2 to my evidence. As a result, I was not able to consider the results presented or the inferences made by ENGEO, as I was not sure which of the memos plotted the data correctly.
15. I note the ENGEO comments referenced in paragraph 12.4 seem to be contradictory to those discussed in paragraph 12.5. In paragraph 12.4 ENGEO indicate that Pleistocene deposits on the southern side of Taylorville Road may be influencing the water quality in the GDC supply, whereas based on the information in paragraph 12.5 they suggest the concentrations in PWT01 are naturally occurring, potentially from the Holocene gravels (recent deposits associated with current Grey River deposition).
16. I consider the ENGEO assumptions as to the source of high dissolved metals concentrations in sample PWT01 to be speculative. If the hydraulic conductivity of the Pleistocene deposits on both sides of the road are similar (generally low), I would expect it is the groundwater within the much more permeable recent gravel deposits associated with the current alignment of the Grey River that is more likely to have a chemical influence on the water quality in the GDC abstraction bores. I also consider these deposits are potentially vulnerable to discharges from the landfill via the flow pathways discussed in paragraphs 55.1 to 55.3 in my main body of evidence.
17. I consider ENGEO's point regarding the concentrations of dissolved metals in PWT01 being much higher than those in any of the samples collected at the site (including in wastewater) to be valid. However, given the consequences of contamination to a public water supply, my concerns are that sampling onsite is limited and the results have been highly variable. In addition, there were no samples collected from the downgradient bores or drains at the same time as the sampling in the Grey River and the Treatment Plant. While I consider ENGEO's point valid, I also believe the results from the Treatment Plant should be further investigated to confirm there is no contribution from the landfill activities. This issue was further discussed with ENGEO at a meeting (presumably on 7 March 2025), where I suggested it would be best to collect samples directly from the GDC abstraction bores, which would confirm whether the elevated metals detected in PWT01 were actually in the source water or somehow making their way into the supply water in the treatment plant.
18. With regard to the potential for fracture flow in the mudstone, it is my view that further information provided by ENGEO in Memo 9 relevant to this point is generally unsatisfactory. While I consider there is low likelihood for this contaminant pathway, in my opinion ENGEO has continued to rely on assumptions to rule out this potential flow pathway. Previous assumptions they have made during the application process have turned out to be inaccurate (for example the hydraulic conductivity of the Pleistocene outwash deposits). Given there is a public water supply in cross proximity to the landfill, I consider some sort of onsite testing and investigation should have been carried out to characterise the onsite properties of the mudstone. I had suggested I consider onsite investigations to be the best method for ruling out this flow pathway on previous occasions, however ENGEO has continued to take a theoretical approach to this issue. The information I consider relevant to resolving this issue is confirmation or not of a well

established, open fracture network in the mudstone and confirming the onsite clay composition of the mudstone. This work could have included onsite drilling and core logging and/or investigation of mudstone outcrops at or directly adjacent to the site, in addition to onsite XRD analysis.

- 19.** My last correspondence with ENGEO relevant to the samples collected from the treatment plant and fracture flow in the mudstone was at the meeting on 7 March 2025 where I discussed the following:
 - 19.1.** The difference between the locations of the Grey River and Treatment Plant samples plotted on the Memo 8 vs Memo 9 Durov Plots.
 - 19.2.** My concerns with the assessment of fracture flow to date.
 - 19.3.** I also note ENGEO suggested they could provide further assessment of the water quality sample results they collected from the Treatment Plant and the Grey River.
- 20.** Following that meeting, further information relating to these issues was provided in their Memo 10 as follows:
 - 20.1.** ENGEO compared the proportions of metals in the sample collected at PWT01 to groundwater samples collected at the site, Taylorville Road drain, the Grey River and samples from river tributaries. They noted the solubility of metals is dependent on pH and presence of anionic species (e.g. hydroxide, sulphate); however, in general, at a neutral pH (7), the copper will be relatively insoluble followed by zinc, lead and nickel (most soluble). ENGEO noted that if the concentrations at PWT01 originated from any of the other sample locations, the proportion of soluble metals (e.g. nickel) would be higher than insoluble (e.g. copper) relative to the source. They plotted the relative metal concentrations in Appendix 4 of Memo 10 and report the inverse condition of the expected solubility exists.
 - 20.2.** Regarding differences between the Memo 8 versus Memo 9 Durov plots, it appears that ENGEO may have misinterpreted my query in this regard. In Memo 10 they discuss the difference in the datasets that were plotted between Memo 8 and Memo 9 rather than the differences in plotted locations between PWT01 and GR-01 between the two memos. They do however note that the axis titles for the anions were incorrectly placed in the figures provided on 30 January and this was corrected in Memo 9.
 - 20.3.** Additional comment is provided regarding the potential for fracture flow, however as per previous information it is based on investigations at other sites. However, they do state that based on field observations made by ENGEO along exposures of the Kaiata Mudstone, the formation is massive with little evidence of fracturing. They note there is no confining pressure at the site or natural force that would cause significant quantities of groundwater to migrate vertically from the much higher permeability Pleistocene gravels into the lower permeability mudstone. ENGEO provide another theoretical assessment of the potential for fracture flow which I don't consider useful.
 - 20.4.** They note I suggested a lugeon test could be carried out, but consider it would not differentiate different flow pathways (e.g. bedding vs. fracture), it will not

determine the orientation and angle of any fractures and it will not determine the connectedness of any flow paths between the site and the abstraction wells. As a result, ENGEO consider it is most appropriate to address this risk through a logic test, whereby they consider it highly unlikely that groundwater will migrate through the mudstone from the site to the abstraction bores.

21. Regarding the additional information discussed in Paragraph 20.1, some of the ENGEO plots comparing metal concentrations are provided as Appendix 2, Attachment 3 to my evidence. I consider this information is useful and it is clear that the proportions of metals in PWT01 are typically considerably different to all other samples collected to date.
22. Regarding Paragraph 20.2, I note the differences between the Memo 8 and Memo 9 Durov plots may possibly be a mistake in the plotting of axis titles, however I remain unclear whether that is the case and therefore I have not been able to give additional consideration to the Durov plots.
23. I don't consider the additional information provided in Memo 10 relevant to fracture flow adds significant clarity to the potential for this flow pathway. However, I do potentially find the statement that ENGEO has made field observations along exposures of the Kaiata Mudstone and found the formation is massive with little evidence of fracturing useful. Such comments relative to the actual outcrops or underlying strata at or adjacent to the site is potentially the type of assessment I had been requesting.
24. I disagree with the comments by ENGEO stating there is no confining pressure or natural force that would cause significant quantities of groundwater to migrate vertically from the much higher permeability Pleistocene gravels into the lower permeability mudstone. This potential pathway requires a downwards hydraulic gradient into fractured mudstone. There is no relative groundwater pressure data to compare relative pressures in the Pleistocene outwash deposits and the underlying mudstone and therefore I don't consider ENGEO have any relevant information relative to this issue. However, mounding assessments indicate there is likely to be a very large induced downwards gradient during the proposed discharge to ground.
25. Regarding Paragraph 20.4, I disagree with the reasons given as to why lugeon testing would be unsuitable. Such testing would confirm whether or not significant quantities of groundwater can be abstracted from the mudstone. If that proved to be the case, it is likely to be through a fracture network in the mudstone as the primary permeability can be expected to be low. If not, and together with observations of the onsite mudstone, it may be reasonable to confirm that the fracture flow pathway is not viable. The point of lugeon testing (or drilling/observations) would not be to determine a direct link between the site and the GDC supply, but to confirm whether or not there could be significant secondary permeability in the mudstone. If there was, that would raise the risk profile of the proposal

Figure A5.2 Extended Durov Class Scatter

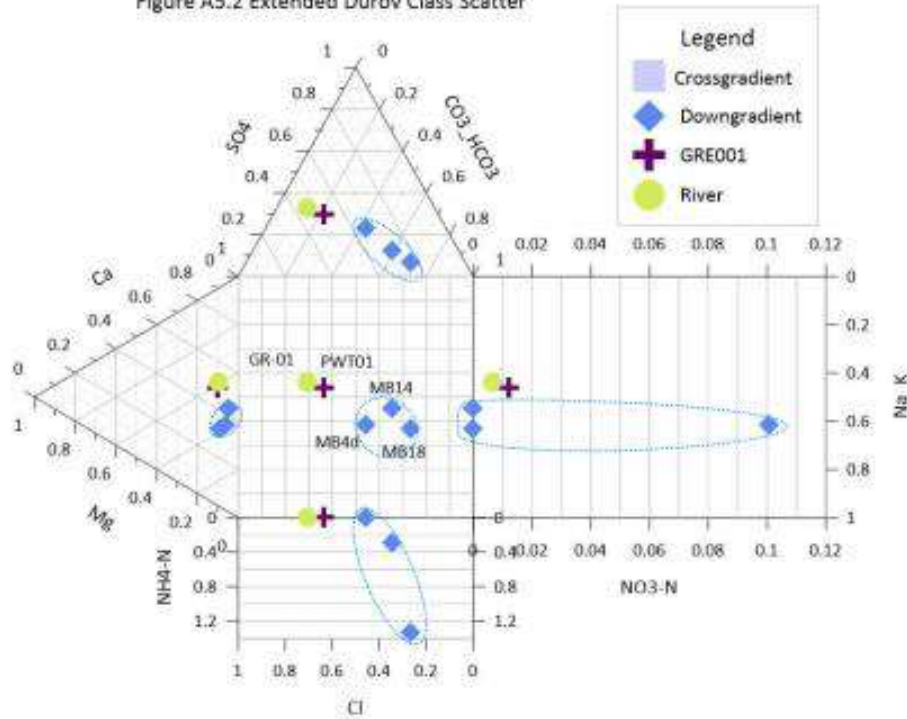
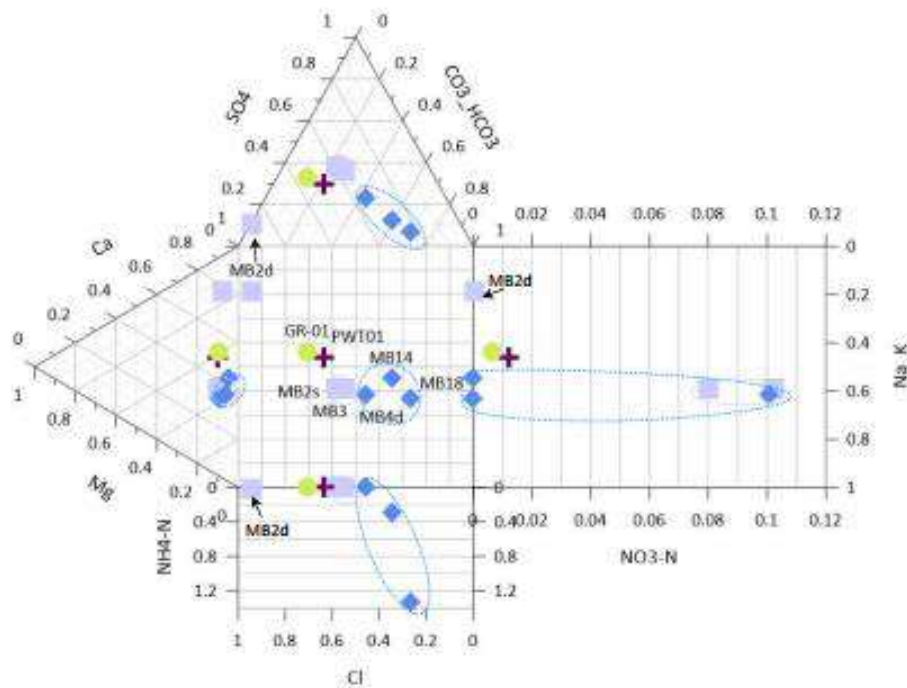
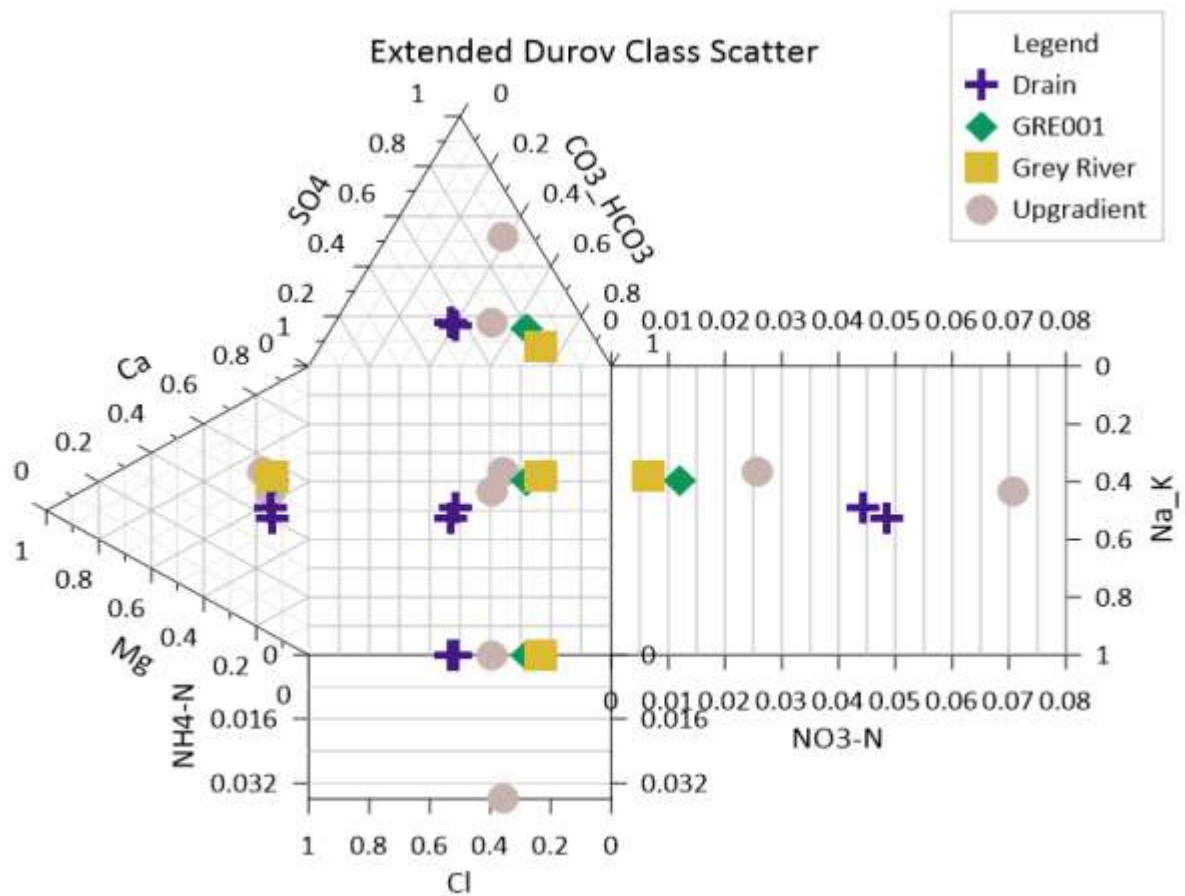
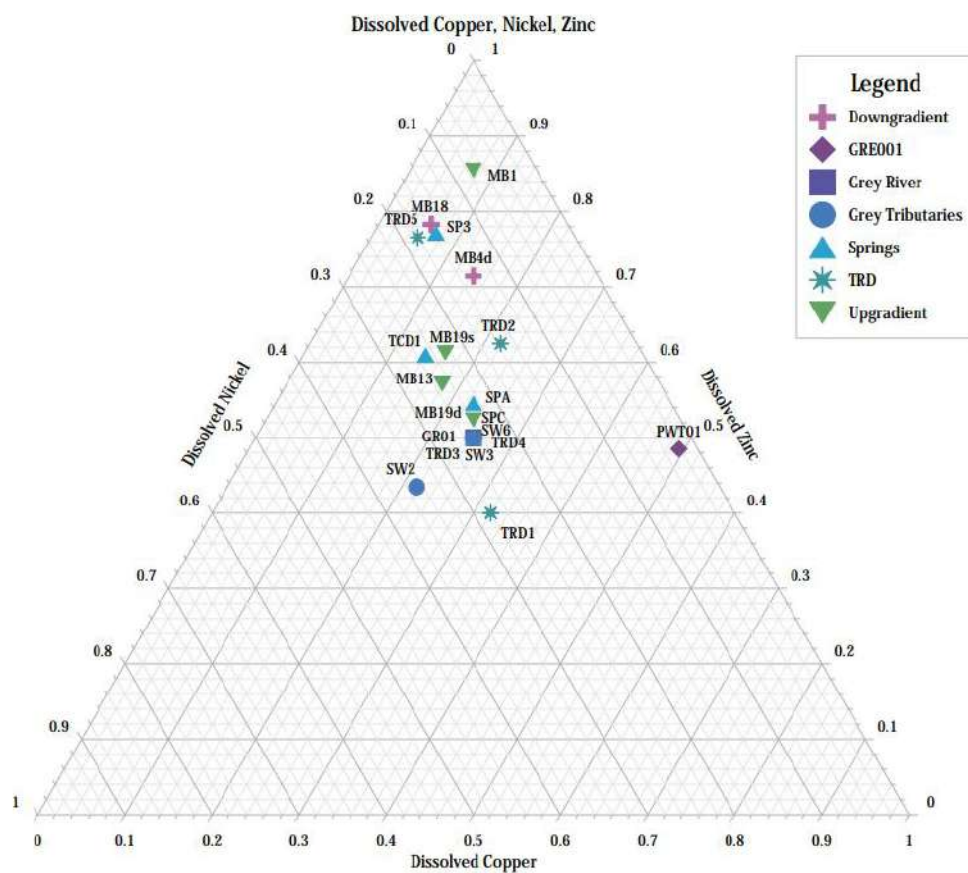
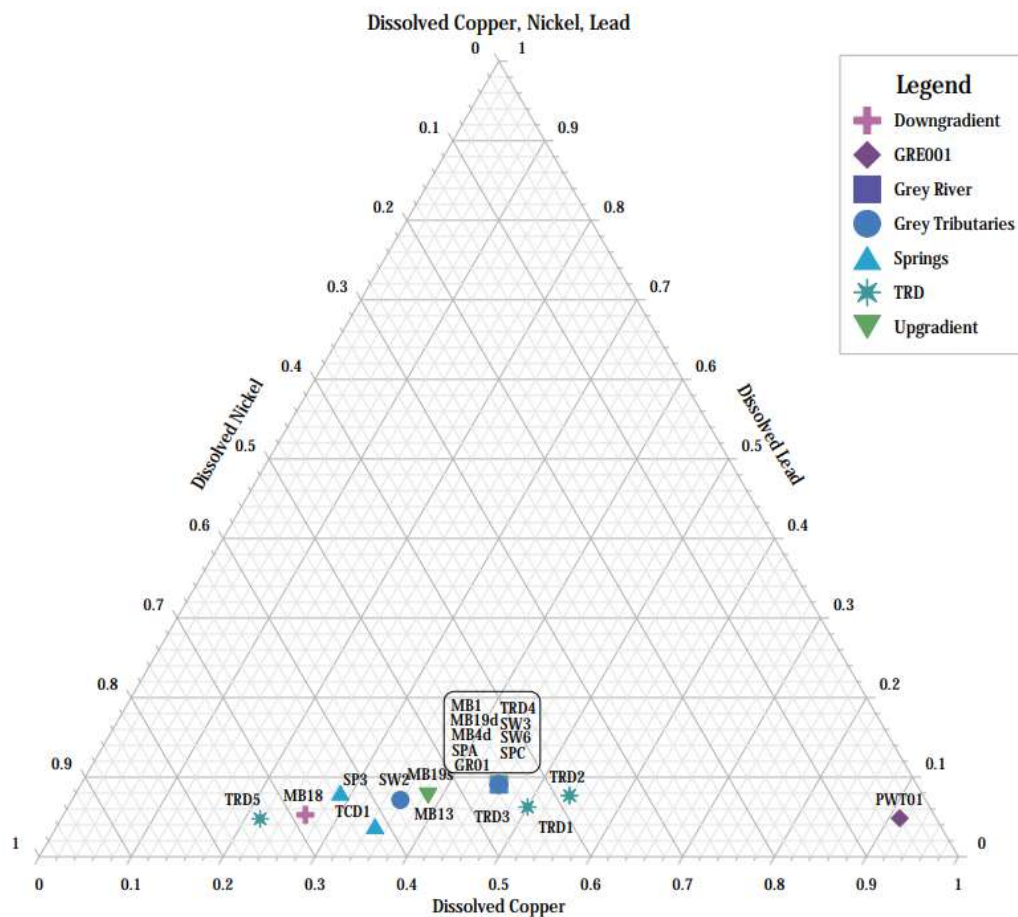


Figure A5.3 Extended Durov Class Scatter





Appendix 2 – Attachment 2 – ENGEO Durov Plot from ENGEO Memo 9



APPENDIX 3 – EVIDENCE OF DUNCAN GREY

BEFORE THE WEST COAST REGIONAL COUNCIL

IN THE MATTER OF the Resource Management Act 1991

AND

IN THE MATTER OF applications by Taylorville Resource Park
Limited for a discharge permit to discharge
contaminated water (mixed landfill leachate
and stormwater) from a retention pond to
land, and to change Condition 11 of its current
resource consent RC-2021-0097-V10

EVIDENCE OF Duncan Peter Gray

Dated 12 August 2025

Introduction

Qualifications and Experience

1. My full name is Duncan Peter Gray. I am employed as a Technical Director – Ecology at Pattle Delamore Partners (**PDP**).
2. I hold an MSc Hons and PhD in stream ecology from the University of Canterbury and am a member of the New Zealand Freshwater Sciences Society (**NZFSS**).
3. I have 20 years' experience in freshwater ecology.
4. On completion of my PhD in 2009, I worked for two years as a consultant ecologist for Golder Associates in Christchurch. In this role, I was primarily involved in the provision of expert advice to Environment Canterbury (**ECan**) on the review of flow and allocation regimes, particularly regarding the Wainono Lagoon catchment, Selwyn/Te Waihora catchment, and the Orari and Waiau Uwha rivers. I was also involved in assessing the ecological impacts of development projects, such as wind farms and coal mining operations.
5. Following that, I commenced my role at ECan. I worked for eleven years on the development of Variation One of the Canterbury Land and Water Regional Plan (**LWRP**), and sub-regional processes for the South Canterbury Coastal Streams, Upper and Lower Waitaki, Wairewa and assorted Omnibus amendments. These sub-regional plans have variously dealt with both the flow and water quality impacts upon the ecological value of streams and rivers.
6. I joined PDP in March 2024 to take on the role of Technical Director – Ecology.
7. I have published eight peer-reviewed scientific papers and a number of reports detailing original research on invertebrates, fish and water quality. I have carried out and presented evidence for district and regional authorities, and for water users. I have also presented evidence for arbitration and criminal prosecution
8. I remain actively involved in research through my association with the New Zealand Freshwater Sciences Society, various universities and Crown research institutes. I was lead chapter author on an update of Advances in New Zealand Freshwater Sciences.
9. I have recently carried out work on other landfill related projects including an Appeal to Environment Court for the construction of a landfill and associated facilities near Oxford, Canterbury by Woodstock Quarries Ltd. I provided a baseline aquatic ecology assessment and

undertook and assessment of the effects of leachate and stormwater discharge to streams and wetlands.

10. I am familiar with the environment and ecology of the West Coast having provided advice and monitoring service to the mining industry on a regular basis over the last 20 years

Background and involvement

11. Taylorville Resource Park Limited (TRPL) are applying for consent for the temporary discharge of leachate-contaminated water to land (RC-2024-0122).
12. Bioresearches was engaged by ENGEO, on behalf of their client Taylorville Resource Park Limited (TRPL), to undertake an Ecological Impact Assessment (EclA) for the temporary discharge. The Bioresearches assessment is presented in a memo dated 7 February 2025. That ecological assessment was in response to a s92 RMA request sent by the West Coast Regional Council (WCRC; dated 19 December 2024) to address questions raised during consent processing. The assessment considered the broad ecological values present and the potential effects of leachate contamination derived from the temporary discharge of leachate-contaminated water to land.
13. ENGEO provided a Preliminary Hydrogeological Assessment (as part of the original effects assessment provided with the resource consent application dated 19 September 2024) and a later memo that detailed water quality results from samples collected in January 2025.
14. I was asked by WCRC to review the ecological effects assessments provided as part of the consent application. I have not visited the site.

Scope of evidence

15. The scope of my evidence is to review material supplied by the applicant that pertains to ecological values at site and the potential effects on receiving environments of contamination derived from the temporary discharge of leachate-contaminated water to land.
16. In addition to the material described above, my evidence was informed by conversations with Carl Steffens (PDP), whom has undertaken a formal review of hydrogeological issues relevant to the application on behalf of WCRC.
17. I have read all other relevant evidence prepared for the Applicant. I explain in my evidence where I refer to or rely on that assessment or evidence.

Code of conduct

18. I have read and agree to comply with the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2023. This evidence is within my area of expertise, except where I state that I am relying on material produced by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in my evidence.

Site layout

19. The Bioresearches EclA is a brief document informed by a site walk-over and images provided by an unknown party. It is not apparent that Bioresearches visited the site or what technical assessments were undertaken. Figure 1 of the EclA report (provided below as Figure 1) indicates that macroinvertebrates and fish were surveyed, but that information is not presented in the document. Throughout the report, there are statements made about values that have little to no basis or supporting material and are counter to my own interpretations of the limited information provided.
20. I note that the alignments of streams shown by Bioresearches (Figure 1) is incorrect and I have included what appears to be a correct interpretation of waterways presented in an ENGEO report from 17 March 2025 (see **Error! Reference source not found.** below). Further references to waterways in this evidence are as shown in Figure 2.
21. Noname Creek drains a gully to the north and north-west of the landfill site, crosses under Taylorville Road, and drops down to the Grey River flats. There it is joined by Grey River Tributary, which appears to arise on the flats at the base of a bank below Taylorville Road. The Taylorville Road roadside drain is the only obvious headwater to the Grey River Tributary (flowing into it via a culvert passing under the road). The stream is assumed to be otherwise groundwater-fed along the flats.
22. The roadside drains collects water from the western edge of the landfill and along the adjacent access road to the neighbour's property, in addition to receiving groundwater seepage via a spring at the head of the drain (western boundary of the landfill). At the intersection of the neighbour's driveway and Taylorville Road (west of the landfill), the roadside drain also collects water from along the Taylorville Road at the base of a terrace below the landfill site.
23. Further east along the road, the flow in the roadside drain changes direction on two occasions. Drain water flowing in opposite directions converges at culverts shown at the locations on Figure 2. The culvert at TRD5 drains water under the road into the Grey River Tributary as described above, while other culverts transfer water to another stream situated on the lower terrace surface below the road and which drains land to the east and south of the Grey District Council (GDC) Coal Creek water treatment plant. For the purpose of this review, the stream to the east of the GDC treatment plant is referred to as the Noname Creek 2 (Figure 2).
24. Noname Creek 2 and associated drains collect water from an eastern catchment, but also receive water from the roadside drain directly below the southern flanks of the landfill terrace via the culverts. This section of the roadside drain is also close to the proposed TRPL discharge to land site.
25. We note that Bioresearches Figure 1 indicates that the Noname Creek 2 and the Grey River Tributary are connected, and that the lower section of the Noname Creek 2 on the Grey River floodplain are not shown. In addition, the Bioresearches figure does not show the culverts beneath Taylorville Road that provide a pathway for drain water on the northern side of Taylorville Road to enter into the Noname Creek 2

26. Our understanding is that in fact Noname Creek 2 ultimately flows across the flats on the floodplain of the Grey River in the vicinity of the GDC Coal Creek water supply bores before discharging to the Grey River. I note the ecological value of the Noname Creek 2 has not been assessed despite being in relatively close proximity to potential groundwater and surface water flow paths that could be affected by the proposed discharge to land.

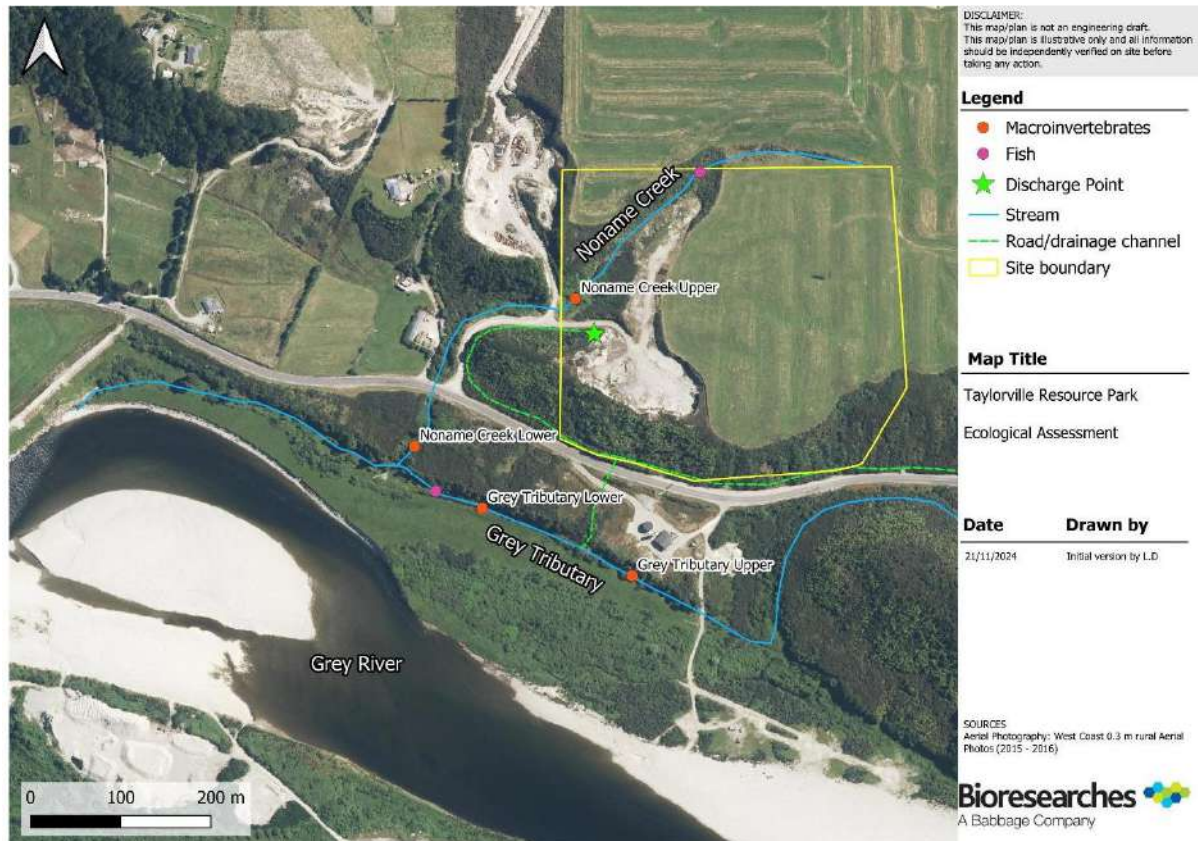


Figure 1. Bioresearchers Figure 1 showing an erroneous interpretation of the stream networks and locations of sampling sites that were not subsequently reported.

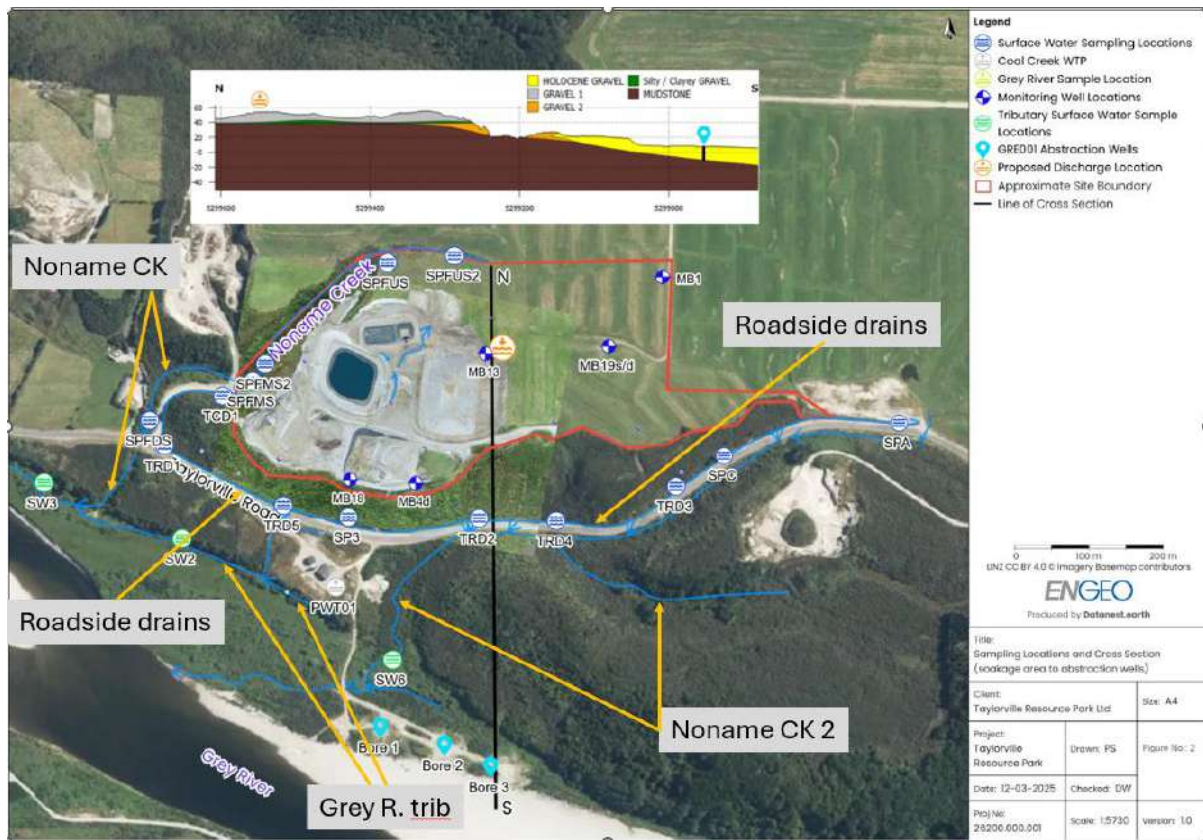


Figure 2. Correct layout of surface water bodies at and adjacent to the Taylorville site presented in an ENGEO report from 17 March 2025. Note the location of the proposed discharge point of leachate to ground.

Ecological values

27. Noname Creek is described by Bioresarches as a small waterway with a generally cobble/gravel bed and dense riparian vegetation that is a mix of native and exotics. Bioresarches describe that some fine sediment is present on the bed, but no formal assessment of deposited sediment has been made to determine if that sediment would be likely to impact aquatic ecosystems. Based on the description, I consider this stream would offer good habitat to a diversity of fish and macroinvertebrates.
28. Water quality results taken from Noname Creek are reviewed by ENGEO in their preliminary hydrogeological assessment and presented in Appendix 5 (Table A6.4 and 6.5) of that report. Those results indicated that in general the water in Noname Creek was of good quality albeit with consistently elevated nitrate-N concentrations and occasional spikes in total aluminium and zinc. The concentrations of Nitrate-N peaked at 1.44 mg/L at the upstream site (sample site SPFUS) and such concentrations might contribute to the growth of undesirable algae in the stream where it is less shaded. However, in terms of toxicity the recorded concentrations

are suitable for a moderately disturbed system with effects on 5 % of sensitive species (Hickey, 2013; MfE, 2023).

29. Subsequent information provided in an ENGEO memo dated 17 March 2025 provides updated water quality results for the Noname Creek. The ENGEO memo (March 2025) describes how elevated parameter concentrations in wastewater peaked during January 2023 and were likely due to the inappropriate deposition of a large volume of organic matter (tomato plants) in Cell C. We note this was the same time that the concentrations of nitrate-N peaked in Noname Creek. It is possible that the effects of that organic matter may have passed and no longer persist (or have temporarily reduced due to seasonal changes in groundwater and rainfall interaction within Cell C).
30. Based on the above, the elevated nitrate-N concentrations (1.44 mg/L in January 2023) may not be representative of Noname Creek over the longer term. January 2025 results for nitrate-N peaked at 0.25 mg/L in the downstream Noname Creek site. This indicates that Noname Creek water quality and ecological health, in terms of nitrate-N, may be better than indicated by the initial data derived from ENGEO in their preliminary hydrogeological assessment and that was used by Bioresarches.
31. Given the descriptions of water quality and habitat for the Noname Creek, I am unable to agree with the description of the stream as having low ecological values or likely a depauperate fish community. The Noname Creek discharges to the Grey River within 5 km of the Tasman Sea. A large proportion of New Zealand native fish are diadromous meaning they must migrate between the ocean and freshwater to complete their lifecycle (McDowall, 1998). Consequently, the number of fish species likely to be found in a stream is strongly regulated by distance to the ocean.
32. In the absence of barriers to fish passage, I would expect Noname Creek to provide habitat to a broader array of fish than described by Bioresarches, including some 'At Risk', 'Threatened' or culturally valuable species. In addition to eels (two species) and any of several bully species, I suggest that migratory and non-migratory galaxiids, lamprey and torrentfish could be present in the stream.
33. The most likely additional inhabitants of the Noname Creek are the galaxiids. Koaro (*Galaxias beivipinnis*) is classified as 'At Risk – declining' (Dunn et al., 2018), banded kokopu (*Galaxias fasciatus*) is classified as 'Not Threatened', and shortjaw kokopu (*Galaxias postvectis*) is classified as 'Threatened – nationally vulnerable'. Each are capable of ascending relatively steep obstacles to access streams.
34. Giant kokopu (*Galaxias argenteus*) is classified as 'At Risk – declining', and īnanga (*Galaxias maculatus*) is classified as 'At Risk – declining'. These species are less competent climbers, although the īnanga can jump. Each would be more likely to occur in the Grey River Tributary than the steeper Noname Creek. The dwarf galaxias (*Galaxias divergens*) is classified as 'At Risk – declining' and is non-migratory meaning it resides permanently in the stream and is typically less affected by barriers to fish passage. The lamprey (*Geotria australis*) is classified as Threatened – Nationally Vulnerable, and is an accomplished climber. Torrentfish

(*Cheimarrichthys fosteri*) is classified as 'At Risk – declining' and is more of a fast water specialist with a lesser climbing ability. The latter is least likely to reside in Noname Creek.

35. Bioresarches suggest that a fish barrier may be present where the Noname Creek passes under Taylorville Road, but provide no images or in-field assessment. I note that fish passage barrier assessments can be routinely undertaken and uploaded to a national database administrated by Earth Sciences New Zealand free of charge¹. A further fish passage barrier may occur where the Grey River Tributary flows into the Grey River. Passage at this point has not been assessed, but is likely to be partial. This is because whilst the Grey River Tributary may flow within porous river gravels during periods of low flows, elevated flows in either the Grey River or Grey River Tributary will allow passage.
36. In summary, the Noname Creek and its characteristics described by Bioresarches has the potential for a diverse macroinvertebrate and fish community with the caveat that there may be barriers to fish migration. Accordingly, I would consider that in the absence of information to the contrary, the Noname Creek would have the potential for at least moderate ecological values.

Grey River Tributary

37. The Grey River Tributary appears to arise on the Grey River flats, fed by groundwater at the base of terraces, but also the roadside drains and the Noname Creek. Based on the map provided by ENGEO (**Error! Reference source not found.**), it does not have an upstream connection to Noname Creek 2. The area where it arises on the flats, appears to be more wetland/pond habitat than a stream, but the waterway is described as subsequently becoming narrow and swift further downstream. The slow flowing, wide reaches of the stream are natural deposition areas for fine sediments, and so the predominance of sand and silt is not necessarily an indication of degradation. Sand and silts would derive from upstream erosion or potentially inundation from the Grey River during times of high flow and sediment load.
38. Bioresarches describe the Grey River Tributary as having a variety of flow types (run, riffle, pool) and a diversity of riparian vegetation. As such, the stream provides a spectrum of habitats for both fish and macroinvertebrates. In particular, the slow flowing wetland reaches of the tributary would be favoured habitat for giant kokopu, shortfin eel and īnanga. Bioresarches describe fish passage into the stream as being limited by topography but provide no other detail or assessment other than to state that only climbing species could gain access. Bioresarches decline to list or consider those climbing species at any point in the EclA. In the absence of a meaningful assessment of fish passage or fish communities, it is prudent to assume that a more diverse community may be present than described in the Bioresarches assessment.

¹ <https://fishpassage.niwa.co.nz/>. The Fish Passage Assessment Tool has been developed to provide an easy to use, practical tool for recording instream structures and assessing their likely impact on fish movements. Data is collected using the Fish Passage Assessment Survey available in the NIWA Citizen Science app. A User Guide for the Fish Passage Assessment Survey is available [on NIWA's website](#). The information collected using the app is automatically uploaded to a national fish passage database.

39. Water quality in the Grey River Tributary during January 2025 shows evidence of some contamination from landfill leachate (based on Table 2 of the ENGEO March 2025 memo). Noname Creek 2 (sample site SW6), here used as a reference site, had low sulphates² (12.7 mg/L), whereas the Grey River Tributary downstream of the roadside drain discharge at TRD5 (SW2) had much higher concentrations (197 mg/L). Further downstream in the Grey River Tributary at site SW3 (slightly downstream of the Noname Creek discharge into the Grey River tributary), sulphate levels had begun to decline (58 mg/L).
40. The same pattern was seen for a number of other parameters, indicating that water quality impacts from the landfill can migrate significant distances along the surrounding surface water features. While these January 2025 results suggest a source of contamination from the landfill to the Grey River Tributary, the measured concentrations at that time are unlikely to have caused significant negative effects on stream ecology. However, based on earlier water quality results in Noname Creek during 2023, it is possible that contaminant concentrations in the Grey River Tributary may at times have been higher.
41. The Grey River Tributary, based on Bioreserches descriptions, is likely to contain a diversity of fish and macroinvertebrates and there is no basis for determining its ecological value to be low as per the EcIA. On the basis of the descriptions available, I suspect the headwaters of the Grey River Tributary constitute a natural inland wetland as suggested by the ENGEO report, however a formal assessment would be required to confirm that determination.

Roadside drains

42. The roadside drain is described as artificial with limited flow or habitat heterogeneity. Being artificial does not automatically mean a waterway has low, very low or negligible ecological values, but based on the images and description in the EcIA, I agree with that conclusion. The fish passage assessment is undescribed with no basis provided for the conclusion of limited passage. Nonetheless, there appeared to be very limited habitat available on the day images were taken. The key concern about the roadside drain is the collection of potentially contaminated groundwater and its subsequent conveyance to natural water bodies such as the Grey River Tributary and Noname Creek 2. Water quality data collected by the applicant confirms that elevated concentrations of landfill-derived contaminants have been measured in the drain.

Ecological Impact Assessment

43. My understanding, based on discussion with Carl Steffens, is that contaminated water proposed to be discharged to land at the location shown in Figure 2 will likely cause significant mounding of groundwater beneath the point of discharge, potentially causing a local increase in groundwater level by up to 8 m (groundwater may reach near the ground surface at the discharge point). This will affect local groundwater flow directions with potential

² Sulphates are considered a useful indicator of leachate from the Taylorville Landfill. WCRC Selva Selvarajah pers. Comm. May 15, 2025.

flow from the discharge point occurring radially in all directions. This could cause local migration of contaminants in the discharge in a northerly direction toward the upper reaches of Noname Creek, as well as in the natural direction of groundwater towards the roadside drains and Noname Creek 2. Therefore, PDP's view is that the inferred contaminant flow path indicated by ENGEO (i.e., towards the landfill in a west to south-west direction) may not be accurate.

44. PDP considers there is the potential for contaminants from the discharge to reach the headwaters of Noname Creek, the existing landfill cells, spring discharges and drains that occur in and along the roadside cutting on the northern side of Taylorville Road (including as far east as TRD4). As a result, contaminants incorporated in the discharge may potentially reach all the drains and streams described this evidence.
45. Carl Steffens has indicated that contaminant concentrations will decrease in groundwater with distance from the discharge point, however he considers that information provided to date by ENGEO has not adequately confirmed the scale of reduction in contaminant concentrations prior to discharge of the contaminant plume to surface water. He considers the surface water bodies where contaminant discharges from the proposal may potentially be highest are Noname Creek (near its headwaters) and the roadside drains in the vicinity of TRD2 and TRD4.
46. At TRD2 and TRD4, any discharges of contaminants from the proposal only need to travel a short distance through the Taylorville Road culverts into Noname Creek 2. The Grey River Tributary is expected to be less likely to be impacted from contaminant discharges from the proposed discharge due to dilution, however as discussed previously, water quality sampling indicates a potential impact in the Grey River Tributary from existing general landfill activities.
47. While a far field and large water body such as the Grey River is unlikely to show any demonstrable effect of relatively small volumes of contaminants, the uncertainty around the pathways and eventual fate and concentrations of contaminants at this site is of general concern.
48. ENGEO provide indicative estimated concentrations derived from the mixing of the discharge with flow in the Noname Creek. Their estimates are presented in Table 3 of the ENGEO Preliminary Hydrogeological Assessment and we have used those estimates to consider potential outcomes for near field receiving environments at the site.
49. I note that ENGEO has carried out more recent RISC5 contaminant modelling to estimate contaminant concentrations at the nearest offsite receptor (310 m away as reported by ENGEO). Carl Steffens has informed me he considers the modelling cannot be relied upon based on the level of detail provided by ENGEO to date. In addition, taking into account the mounding discussed previously, he also considers the nearest receptors may be closer (potentially more akin to 100 m distant from the discharge point).
50. Further to the above, the ENGEO text describes the generation of Table 3 using maximum values of stormwater and leachate (Table 3: column 2), but those values don't match the maximum values in the raw data presented in ENGEO Table A6.1. For example, Table 3 uses

a maximum value of 16.1 mg/L of total ammoniacal nitrogen collected in cell B/C, while the actual maximum value from cell B/C is 98 mg/L. The value used by ENGEO for their later RISC5 modelling was 98 mg/L. Therefore, we have concerns that their estimates presented in Table 3 of their report may not be conservative enough.

51. Despite the issues described above, and significant uncertainty with regard to potential contaminant discharge concentrations, we have used the information provided in Table 3 from ENGEO to make an initial assessment of potential effects.
52. ENGEO Table 3 contaminant concentrations are presented alongside measured maximum values from the downstream site in Noname Creek (Table 1). As discussed above, there is the suggestion that maximum values measured in the Noname Creek may be representative of an inappropriate deposition of organic matter into the landfill and not representative of long-term natural stream conditions. The effects of that organic matter are considered potentially to have passed (although it can't be ruled out that future interactions between rainfall, groundwater and the fill within the landfill cells may result in further periods of significant stream impacts). Therefore, water quality results at the downstream Noname Creek site collected in January 2025 have also been used in Table 1 to indicate water quality.
53. It is important to note that none of these concentrations are adjusted for bioavailability (e.g., toxicity adjustments based on pH, dissolved organic carbon or hardness) and that the concentrations shown are total metals, not the bioavailable dissolved fraction conventionally used for toxicity assessments. The latter option was chosen because Table 3 ENGEO only provided total concentrations and lacked estimates of any of the toxicant modifying factors.
54. Measured maximum values in Noname Creek were typically less than the thresholds for protection of 95 % of species from toxicity effects and would be considered suitable for a moderately impacted stream. Exceptions were the maximum concentrations of nitrate-N, total aluminium, total chromium and total zinc. However, maximum aluminium and zinc concentrations were an order of magnitude greater than the three other samples collected, while the nitrate-N concentration was not out of character for the creek during 2023-24.
55. Concentrations recorded in January 2025 were in some cases lower than the maximums by an order of magnitude. A high level of species protection was provided by concentrations of all contaminants other than total aluminium, arsenic (V) and chromium (VI) that provided 95 % protection. These latest results suggest that water quality in the Noname Creek is generally good and would support diverse ecological communities.
56. Assessment undertaken by ENGEO indicated that under the proposed discharge, many contaminant concentrations could increase relative to the measured maximum values, including ammoniacal-N, total manganese, total arsenic, total chromium, total copper, total lead, total nickel and total zinc. In some cases, the extent of the potential increase is such that ANZG (2018) would indicate the site is a highly disturbed system and measurably degraded with chronic toxicity effects on more than 80 % of species. The level of impact is greater when the January 2025 Noname Creek water quality data is used which we consider is likely more representative.

Table 1. Comparison of modelled and measured contaminant concentrations in Noname Creek at site SPFDS. Numbers in parentheses show the thresholds for the next most protective protection level up for context.

	Noname Creek maximum (SPFDS)		Noname Creek Jan 2025 (SPFDS)		Table 3	
Contaminant	Max Concentration (mg/l)	ANZG Protection level (and threshold, mg/l)	Concentration (mg/l)	ANZG Protection level (and threshold, mg/l)	Concentration (mg/l)	ANZG Protection level (and upper threshold, mg/l)
Total Ammoniacal N	0.014	>99 %	<0.010	>99 %	5.07	<80 % (2.3)
Nitrate N	1.33	>90 % (1)	0.25	>99 %	0.11	>99 % ³
Total ⁴ aluminium	0.26	<80 % (0.15)	0.044	>95 % (0.027)	0.066	>90 % (0.055)
Total manganese	0.039	>99 %	0.0127	>99 %	0.82	>99 %
Total arsenic (AsV)	0.0012	>95 % (0.0008)	<0.0011	>95 % (0.0088)	0.02	>90 % (0.013)
Total chromium (Cr VI)	0.00102	>90 % (0.001)	0.0006	>95 % (0.00001)	0.0052	>90 % (0.001)
Total copper	0.00123	>95 % (0.001)	0.00088	>99 %	0.056	<80 % (0.0025)
Total lead	0.00074	>99 %	0.00012	>99 %	0.0012	>95 % (0.001)
Total nickel	<0.00053	>99 %	<0.00053	>99 %	0.018	<80 % (0.017)
Total zinc	0.0103	>90% (0.008)	0.0024	99 %	0.066	<80 % (0.031)

³ Note the ANZECC 2000 default guideline for Nitrate was erroneous and ANZG (2018) refer to the grading guidelines in (Hickey, 2013).

⁴ Metal toxicity is typically compared against concentrations of the dissolved fraction rather than total. As such this comparison is inherently conservative.

Summary

1. There is considerable uncertainty around the ecological values of receiving environments potentially affected by the proposed TRPL discharge. I do not agree that the ecological values of the receiving environments that have been assessed can be determined as low. In contrast, based on the information available I would consider values likely to be at least moderate, but assessments to date have not been adequate to allay uncertainty. Values in Noname Creek 2 have not been assessed in any assessment.
2. There is further uncertainty around the flow paths of contaminant-laden groundwater to receiving environments, in particular in the event that groundwater mounding results in leachate and stormwater being discharged to Noname Creek and the Taylorville Road drains that are in relatively close proximity to the discharge location.
3. Finally, the concentrations of contaminants that reach receiving environments are uncertain, although previous estimates by ENGEO suggest potential effects would result in a degradation of ecological values. We note ENGEO has carried out more recent modelling of contaminant discharges at surface water receptors using RISC5, however we don't consider the outputs from that modelling can be relied upon.
4. In light of the available information, it seems there is the potential for demonstrable effects on the ecological values of Noname Creek, as well as Noname Creek 2 and the Grey River Tributary. Due to the large dilution available, there are highly unlikely to be effects observed or detectable in the Grey River. While it is realistic that contaminant concentrations will reduce with distance from the discharge point, we don't consider that ENGEO has reliably demonstrated to date that concentrations will reduce to a level whereby there are no potential effects in nearby surface water bodies. In addition, based on the ENGEO Preliminary Hydrological Assessment, the potential effects in Noname Creek would be significant.

References

- Dunn, N., Allibone, R. M., Closs, G. P., Crow, S., David, B., Goodman, J., Griffiths, M., Jack, D., Ling, N., Waters, J., & Rolfe, J. (2018). *Conservation status of New Zealand freshwater fishes, 2017* (New Zealand Threat Classification Series 24, p. 15). Department of Conservation.
- Hickey, C. W. (2013). *Updating nitrate toxicity effects on freshwater aquatic species* (HAM2013-009; Issues HAM2013-009). Prepared for the Ministry of Building, Innovation and Employment by NIWA.
- McDowall, R. M. (1998). Fighting the flow: Downstream-upstream linkages in the ecology of diadromous fish faunas in West Coast New Zealand rivers. *Freshwater Biology*, 40, 111–122.

MfE. (2023). *National Policy Statement for Freshwater Management 2020, February 2023* (p. 75).

Ministry for the Environment.

APPENDIX 4 – LATE PART OF SUBMISSION FROM GDC

From: [Michael Durand](#)
To: [Jonathon Sylvester](#); [KerstinG@barker.co.nz](#);
Cc: [Geraldine Biggs](#); [ray.singer@taylorville.co.nz](#);
Subject: RE: Submission by Grey District Council on the Taylorville Resource Park Consent Applications RC - 2024-0122 and RC 2021-0097 V10
Sent: 15/07/2025 3:54:00 pm

Kia ora Jonathan

Thanks for coming back to me.

WCRC has gone through a comprehensive assessment of RC-2024-0122, which includes detailed scrutiny my assessments as to the appropriate process. Section 91 will not be engaged now, as the criteria for engaging it are not met. I will not be preparing advice to WCRC to revisit that decision. I will, however, provide advice on the matter in the s42A report, which the panel will consider along with GDC's submission.

Thanks



Michael Durand - Consultant Planner

M: 021 035 2593 E: michael@planzconsultants.co.nz W: planzconsultants.co.nz
P: PO Box 1845, Christchurch 8140 A: 79 Lichfield Street, Christchurch 8011

Notice: The information in this email is confidential and is intended only for the use of the addressee named above. If you are not the intended recipient, you are hereby notified that any dissemination, copying or use of this information is strictly prohibited. If you have received this email in error, please reply to the author by return email, and delete the original message. Thank you.

Please consider the environment before printing this email.

From: Jonathon Sylvester <Jonathon@cflaw.co.nz>
Sent: Tuesday, 15 July 2025 2:34 pm
To: Michael Durand <michael@planzconsultants.co.nz>; KerstinG@barker.co.nz
Cc: Geraldine Biggs <Geraldine@cflaw.co.nz>; ray.singer@taylorville.co.nz
Subject: RE: Submission by Grey District Council on the Taylorville Resource Park Consent Applications RC - 2024-0122 and RC 2021-0097 V10

Dear Michael

Thank you for your email.

We confirm that our previous email is part of GDC's submission.

In relation to your third point, we highlight that a deferral under s 91 of the RMA needs to be determined by WCRC as the consent authority prior to a hearing. Section 91 is a procedural power to enable the consent authority to defer the application so that the proposed activity can be better understood in the context of the further applications. As previously stated, and as set out in the GDC's submissions, GDC considers that to be the case here.

A decision to defer a hearing cannot be made at the hearing as by that point it is too late. If a decision on whether to defer is outside of your scope, we would be grateful if you could please forward this request to the appropriate persons at WCRC for their consideration.

Thank you.

Regards

Jonathon Sylvester

Senior Solicitor

CORCORAN FRENCH

74 Armagh Street, Christchurch 8013

PO Box 13001, Christchurch 8140

(03) 371 1061

cflaw.co.nz

CAUTION: This email message and any attachments contain information that is CONFIDENTIAL and may be LEGALLY PRIVILEGED. If you are not the intended recipient any use, disclosure or copying of this message or attachments is strictly prohibited. If you have received this email message in error, please notify us immediately and destroy all copies of the message and attachments. You should scan this email and attached files for viruses. Corcoran French do not represent or warrant that the files attached to this email are free from computer viruses or other defects. Any attached files are provided, and may be used, on the basis that the user assumes responsibility for any loss, damage or consequence resulting directly or indirectly from the use of the attached files.

From: Michael Durand <michael@planzconsultants.co.nz>
Sent: Monday, 14 July 2025 4:26 pm
To: Jonathon Sylvester <Jonathon@cflaw.co.nz>; KerstinG@barker.co.nz
Cc: Geraldine Biggs <Geraldine@cflaw.co.nz>; ray.singer@taylorville.co.nz
Subject: RE: Submission by Grey District Council on the Taylorville Resource Park Consent Applications RC - 2024-0122 and RC 2021-0097 V10

Kia ora Jonathan

Thank you for your email. I make the following points:

- I can confirm the content of GDC's submission is noted;
- The s42A report will include my advice to the independent hearings panel on procedural matters; and
- I expect the panel will either make directions or otherwise address procedural matters in the hearing.

In the interim can you please confirm whether you intend the email below to form part of GDC's submission?

Kind regards



Michael Durand - Consultant Planner

M: 021 035 2593 E: michael@planzconsultants.co.nz W: planzconsultants.co.nz
P: PO Box 1845, Christchurch 8140 A: 79 Lichfield Street, Christchurch 8011

Notice: The information in this email is confidential and is intended only for the use of the addressee named above. If you are not the intended recipient, you are hereby notified that any dissemination, copying or use of this information is strictly prohibited. If you have received this email in error, please reply to the author by return email, and delete the original message. Thank you.

Please consider the environment before printing this email.

From: Jonathon Sylvester <Jonathon@cflaw.co.nz>
Sent: Monday, 14 July 2025 3:26 pm
To: KerstinG@barker.co.nz; Michael Durand <michael@planzconsultants.co.nz>
Cc: Geraldine Biggs <Geraldine@cflaw.co.nz>; ray.singer@taylorville.co.nz
Subject: RE: Submission by Grey District Council on the Taylorville Resource Park Consent Applications RC - 2024-0122 and RC 2021-0097 V10

Dear Michael and Kerstin

Our client (GDC) has considered Kerstin's email and remains of the view that deferral of the temporary discharge and s127 applications should occur so that they can be heard alongside, what is referred to as the comprehensive application.

The test for when a variation should be considered to be a new activity is whether the original activity is the same activity that was taking place under the conditions. In *Te Rūnanga o Ngāti Awa v Bay of Plenty Regional Council* [2022] NZCA 598 the Court of Appeal considered that a variation of consent conditions is not the appropriate procedure when the character of the adverse effects that would be generated by the change of conditions would be different to the existing activity. That applies here.

The proposed variation to condition 11 and grant of discharge permit would fundamentally change the discharge to land activity from one that does not release contaminants to the surrounding environment to one that does. The applicant appears to have been producing a large amount of leachate (for which it has been subject to abatement notices for discharging it to land) that is now stored in a retention pond. This was not considered as part of the existing consented activity. The s127 application seeks a change in conditions to enable the applicant's operation to occur in a manner that was not considered when it was consented. While that may be the current activity that is in fact occurring, it is not the activity for which consent was granted.

GDC understands that WCRC previously gave notice to the applicant of its intention to carry out a review of the existing consents RC 2021-97/01 and 2020-97/02 under s128 on the basis of adverse effects occurring to the environment that had been identified and that needed to be dealt with, and because information provided by the applicant to the WCRC had been identified to contain inaccuracies that materially influenced the decision and the effects of the exercise of the consent. GDC understands however that the s128 review was not completed. The reasons for the review remain. The fact it did not occur despite being identified as necessary by WCRC, only heightens the need for a comprehensive approach to be taken to all consent applications. Deferral and joint consideration of all applications would enable this.

GDC's position is that it is inappropriate to consider the present applications in isolation from the information that will be available under the comprehensive applications. The fact that this consent could be surrendered when the comprehensive consents are issued, further highlights that this discharge is a necessary part of those wider activities. Further, the present applications should be deferred to avoid predetermining what effects are accepted in this environment.

Finally, GDC is concerned by the reference to "emergency" and queries what exactly the emergency is, and how it has come about. It queries what steps the Applicant has taken to manage the urgency that it says has remained in place since September 2024.

If there has been a continued state of affairs since September 2024, that would seem to indicate there is no emergency, as the measures taken by the applicant during that time can presumably continue to avoid an emergency arising. If there is now an emergency however, that would alternatively suggest the applicant has failed to appropriately manage this for upwards of 9 months. Either way, the applicant needs to take other measures while the applications are determined. GDC does not consider it to be an appropriate answer to any urgency that is of the applicant's making, for significant quantities of leachate to be discharged, without a full consideration of the applicant's current and proposed activities and their effects. An integrated approach is needed that allows for all relevant information to be considered.

Regards

Jonathon Sylvester

Senior Solicitor

CORCORAN FRENCH

74 Armagh Street, Christchurch 8013

PO Box 13001, Christchurch 8140

(03) 371 1061

cflaw.co.nz

CAUTION: This email message and any attachments contain information that is CONFIDENTIAL and may be LEGALLY PRIVILEGED. If you are not the intended recipient any use, disclosure or copying of this message or attachments is strictly prohibited. If you have received this email message in error, please notify us immediately and destroy all copies of the message and attachments. You should scan this email and attached files for viruses. Corcoran French do not represent or warrant that the files attached to this email are free from computer viruses or other defects. Any attached files are provided, and may be used, on the basis that the user assumes responsibility for any loss, damage or consequence resulting directly or indirectly from the use of the attached files.

From: Geraldine Biggs
Sent: Thursday, 10 July 2025 4:44 pm
To: 'Kerstin Ghisel' <KerstinG@barker.co.nz>; Michael Durand <michael@planzconsultants.co.nz>
Cc: Ray Singer <ray.singer@taylorville.co.nz>
Subject: RE: Submission by Grey District Council on the Taylorville Resource Park Consent Applications RC - 2024-0122 and RC 2021-0097 V10

Dear Kerstin and Michael

Thank you for your email Kerstin. We will respond on behalf of Grey District Council shortly.

Regards

Geraldine Biggs

Partner

CORCORAN FRENCH

74 Armagh Street, Christchurch 8013

PO Box 13001, Christchurch 8140

(03) 371 1022

cflaw.co.nz

CAUTION: This email message and any attachments contain information that is CONFIDENTIAL and may be LEGALLY PRIVILEGED. If you are not the intended recipient any use, disclosure or copying of this message or attachments is strictly prohibited. If you have received this email message in error, please notify us immediately and destroy all copies of the message and attachments. You should scan this email and attached files for viruses. Corcoran French do not represent or warrant that the files attached to this email are free from computer viruses or other defects. Any attached files are provided, and may be used, on the basis that the user assumes responsibility for any loss, damage or consequence resulting directly or indirectly from the use of the attached files.

From: Kerstin Ghisel <KerstinG@barker.co.nz>

Sent: Thursday, 10 July 2025 4:14 pm

To: Michael Durand <michael@planzconsultants.co.nz>

Cc: Ray Singer <ray.singer@taylorville.co.nz>; Geraldine Biggs <Geraldine@cflaw.co.nz>

Subject: Submission by Grey District Council on the Taylorville Resource Park Consent Applications RC - 2024-0122 and RC 2021-0097 V10

You don't often get email from kersting@barker.co.nz. [Learn why this is important](#)

Dear Michael,

In response to the GDC submission on Taylorville Resource Park Limited's application to the West Coast Regional Council for a temporary discharge permit and a s127 application, the applicant provides the following response in regards to the procedural matters raised as sections 71-76 of the submission. The applicant does not accept there is a need for any further delaying in the processing of this application.

- Paragraphs 71 and 72: The only new activity, which the applicant is seeking consent for, is for the temporary discharge of water from the onsite retention pond to land, via a soakpit (RC-2024-0122). The variation (the s127) is to a consent condition for the existing consented activity (RC-2021-0097). Notwithstanding this, any concerns regarding this can be addressed at the hearing.
- Paragraphs 73: There is no justification for a s.91 delay. As noted above, the proposed discharge relates to the existing onsite activity. Furthermore, the application is for a temporary discharge to enable a freeboard to be created within the onsite sediment pond. It is for emergency purposes and is temporary in nature. This temporary consent can also be surrendered once the applicant obtains its comprehensive consent from the WRCRC.
- Paragraph 74 and 75: The temporary discharge application was lodged with Council back in September 2024, and the urgency of dealing with the proposal remains, whereas the comprehensive application was only lodged at the end of May 2025. There is no need to wait and hear all the applications together as the nature of the temporary discharge application differs from the comprehensive application, which is looking into the future development of the application site and not addressing an immediate situation. Furthermore, the comprehensive application already addresses the future management of onsite leachate.

Kind regards,
Kerstin

Ngā mihi | Kind regards,

KERSTIN GHISEL
Senior Associate
027 203 0901
KerstinG@barker.co.nz

PO Box 1749,
Christchurch 8140
Level 3, 61 Cambridge
Terrace,
Christchurch Central
City, Christchurch
8013



Kerikeri | Whangārei | Warkworth |
Auckland | Hamilton | Cambridge |
Tauranga | Havelock North | Wellington
|
Christchurch | Wānaka & Queenstown

barker.co.nz 

This email and any attachments are confidential. They may contain privileged information or copyright material. If you are not an intended recipient, please do not read, copy, use or disclose the contents without authorisation and we request you delete it and contact us at once by return email.