22 November 2023

Shay McDonald
Otago Regional Council
Private Bag 1954
Dunedin 9054

Sent via: Shay.McDonald@orc.govt.nz

Response to Section 92 Request: Consent Application RM21.668 – Mt Cooee Landfill, Balclutha

Dear Shay,

Thank you for the Section 92 further information request we received on 27 July 2023 in relation to Clutha District Council's resource consent application RM21.668 to renew resource consents associated with the Mt Cooee Landfill in Balclutha.

Please find our responses to your questions below.

Bird Management

1. *Please update the Bird Management Plan (BMP) and Landfill Management Plan (LMP) to be consistent with each other with respect to the proposed management of birds on site.*

   Response:

   The Bird Management Plan (BMP) has been amended to include two additional sections: Section 6.3.6: Deterrence methods proposed in the Mt Cooee Landfill Management Plan; and Section 6.4.3: Exclusion methods proposed in the Mt Cooee Landfill Management Plan. The two additional sections list the bird management methods proposed by Clutha District Council (CDC) within the Landfill Management Plan (LMP) to ensure the two documents are consistent with each other. It is noted that reference to trialling management methods has been removed from the BMP.

   CDC submitted the BMP as part of their consent application. The BMP was prepared based on specific site assessment and outlined recommended management. CDC will review and update the LMP to ensure it is consistent with the BMP, in particular for the methods described in Section 6.3 of the BMP. The required updates to the LMP include adding two additional deterrence measures indicated in the BMP for V-pits and wires, kites and sonic devices. Bird poisoning as well as shooting will be indicated as a last resort in the LMP, should additional deterrence measures be required for effective bird management.

   CDC will review and update the LMP as part of the annual review (due early 2024), ensuring it is consistent with the BMP, and the updated BMP is attached to this letter.

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2. *Please confirm which bird deterrence methods and which bird exclusion methods will be implemented at the landfill.*

   Response:

   As stated in Section 6.4.3 of the BMP, bird exclusion methods are not proposed at the Mt Cooee Landfill as birds are well established in their behaviours at landfill sites, which means exclusion would be difficult. However, Sections 6.4.1 and 6.4.2 if the BMP include some exclusion methods (baling of waste and bird netting) which can be implemented on the Mt Cooee Landfill in the future, if required.

   Section 6.3.6 of the BMP describes the bird deterrence methods that can be implemented at the landfill site to manage the presence of nuisance of birds, if required. Multiple methods are proposed as part of bird deterrence at the site and the LMP will be updated at the next required review (early 2024) to include these bird deterrence methods. Reviewing and updating the LMP at its next review cycle will mean that all the information from this consent process can be included at one time, rather than making multiple edits.

3. *Please describe the bird monitoring that will be undertaken during the life of the consent, including the qualifications of the person(s) who will be responsible for the monitoring.*

   Response:

   Section 6.6: Bird monitoring of the BMP describes the bird monitoring methods that will be undertaken at the landfill. It is noted that Section 6.6 of the BMP has been amended to include the statement *"Ongoing monitoring will be required for the length of the consent period."*

   It is difficult to determine the necessary qualifications required for personnel undertaking the bird monitoring, as relevant experience may be equal to or more important than a qualification. The qualifier "*at least 5 years' bird surveying / monitoring experience*" has been added to the BMP in Section 6.6 to address this question.

4. *Please update the BMP to reference the Wildlife Act. Where potential bird deterrence or exclusion methods are proposed that would require a permit under the Wildlife Act these should be readily identifiable.*

   Response:

   The Wildlife Act 1953 is referenced in the BMP via a footnote to Section 6.9. However, an additional reference has been added to Section 6.3.5: Lethal methods of control of the BMP.

Terrestrial, Wetland and Waterway

5. *Please provide evidence to demonstrate that the Wetland Delineation Protocols have been applied in the delineation of the wetlands to the south. The information requested includes the location of all sampling points and evidence that the necessary tools of the wetland delineation protocols have been used (vegetation, soils and hydrology tools as necessary).*

In considering this response, it is recommended that the assessment be extended to the surrounding area. Aerial photographs and observations from the site visit would indicate a wider area hydrophytic vegetation has established in the area.

Note also that wetland delineation according to the Pasture Exclusion Methodology (MfE, 2022) should be completed during 'normal circumstances', not after intensive grazing.

Response:

The wetland delineation worksheets showing all of the information collected in the plots, including plot coordinates, is provided separately. The plot location is as shown in Figure 4 of the 'Mt Cooee Landfill Expansion Area: Terrestrial, Wetland, and Waterway Assessment.'

Following MfE (2022a) and MfE (2022b)1, a pasture exclusion test was applied to vegetation within the plots (Figure 1), followed by application of wetland delineation protocols to determine the presence of hydrophytic vegetation (Figure 2). Following these tests, there was no uncertainty regarding the presence of wetland vegetation with the plots either passing the pasture exclusion test or passing or failing the dominance and / or prevalence tests. As such, no further tests for hydrology or soils were required.

Figure 1: Determining if a potential wetland on pastoral land passes the pasture exclusion test

Figure 1: Figure 1 in MfE (2020a).

Figure 1: Simple flow chart of steps for determining an RMA wetland using the hydrophytic vegetation, hydric soils and wetland hydrology tools.

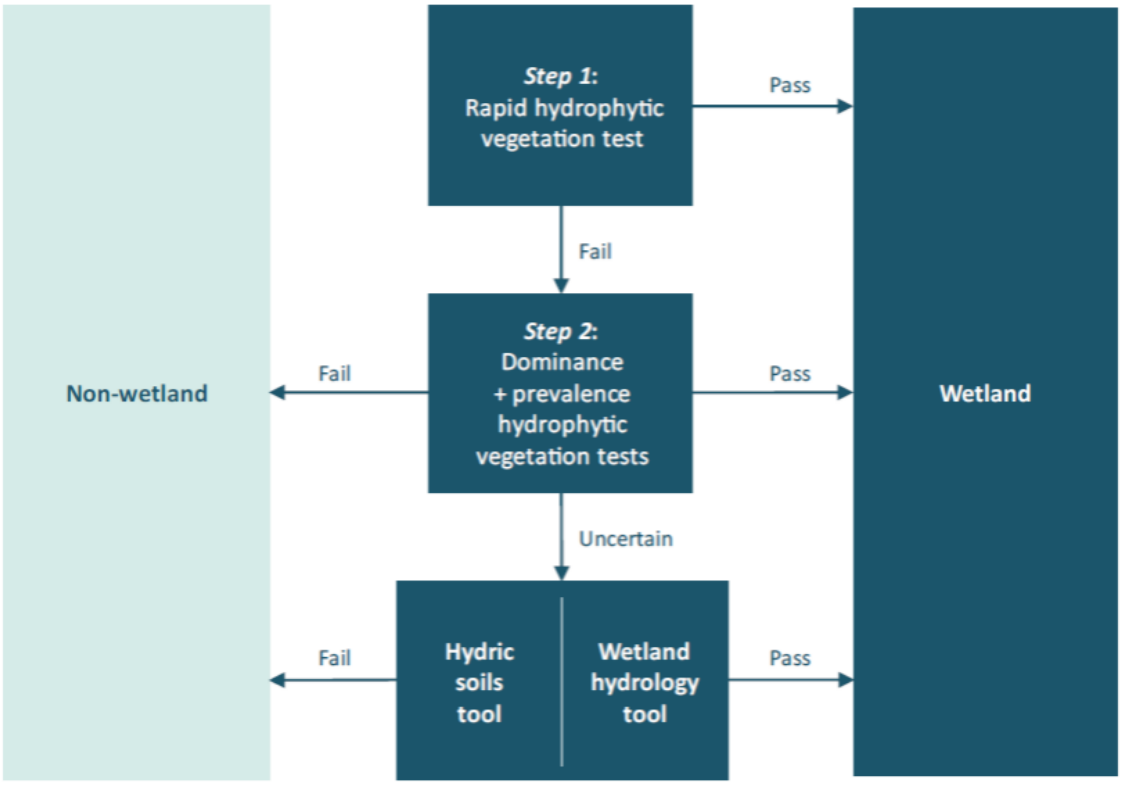

Figure 2: Figure 1 in MfE (2020a).

No plots were established in the area to the west of the mapped wetland vegetation due to the extensive pasture observed in this area; the lower density of rushes; and the presence of cattle (shown in Figure 3 below). Pasture near the areas of rushes was dominated by the pasture species sweet vernal (Anthoxanthum odoratum) and Yorkshire fog (Holcus lanatus), with occasional white clover (Trifolium repens). As the vegetation was similar to areas to the east, which met the pasture exclusion test (Plots B and F, Figure 4), and the density of rushes in this area was much less, it was not considered necessary to undertake additional vegetation plots in this area.

While the site had been subject to grazing, it was not considered to be heavy grazing as it did not impact the ability to identify the distinguishing characteristics of plants to allow for accurate species identification.

Figure 3: Rushes in pasture to the west of the mapped area of wetland. Note the extensive areas of pasture between the smaller clumps of rushes (compared to the larger and denser stands of rushes in the mapped wetland to the east) and the presence of cattle.

Figure 4: Wetland delineation Plot F containing pasture as determined by the pasture exclusion test.

Groundwater and Surface Water

6. *Please undertake further continuous groundwater level monitoring within the 12 groundwater monitoring bores to show the full range of water level responses to different conditions of moisture saturation and leachate production.*

   Response:

   The updated groundwater monitoring record is provided in Figure 5 below. The monitoring record does show an increase in groundwater levels over the winter months.

7. *Based on the additional monitoring, please provide revised estimates of groundwater flux and subsequent estimates of contaminant loads to the catchment.*

   Response:

   For the existing area, leachate leakage was calculated from the leachate collection system pump records; these calculations aren't influenced by a change in groundwater gradients.

   For the proposed expansion area, leachate leakage was calculated in response to rainfall recharge and is not affected by a change in groundwater gradient, therefore no new estimates of contaminants need to be calculated. The original calculation used a highly conservative figure of 0.1 mm/yr leaking through the liner as opposed to the 0.00004 mm/yr calculated from the help model, therefore the original assessment had a conservative sensitivity built in and does not need to be amended.

   Furthermore, the groundwater gradients have not changed substantially using the updated water level data (0.028 cf 0.030 – see Table 1 below).

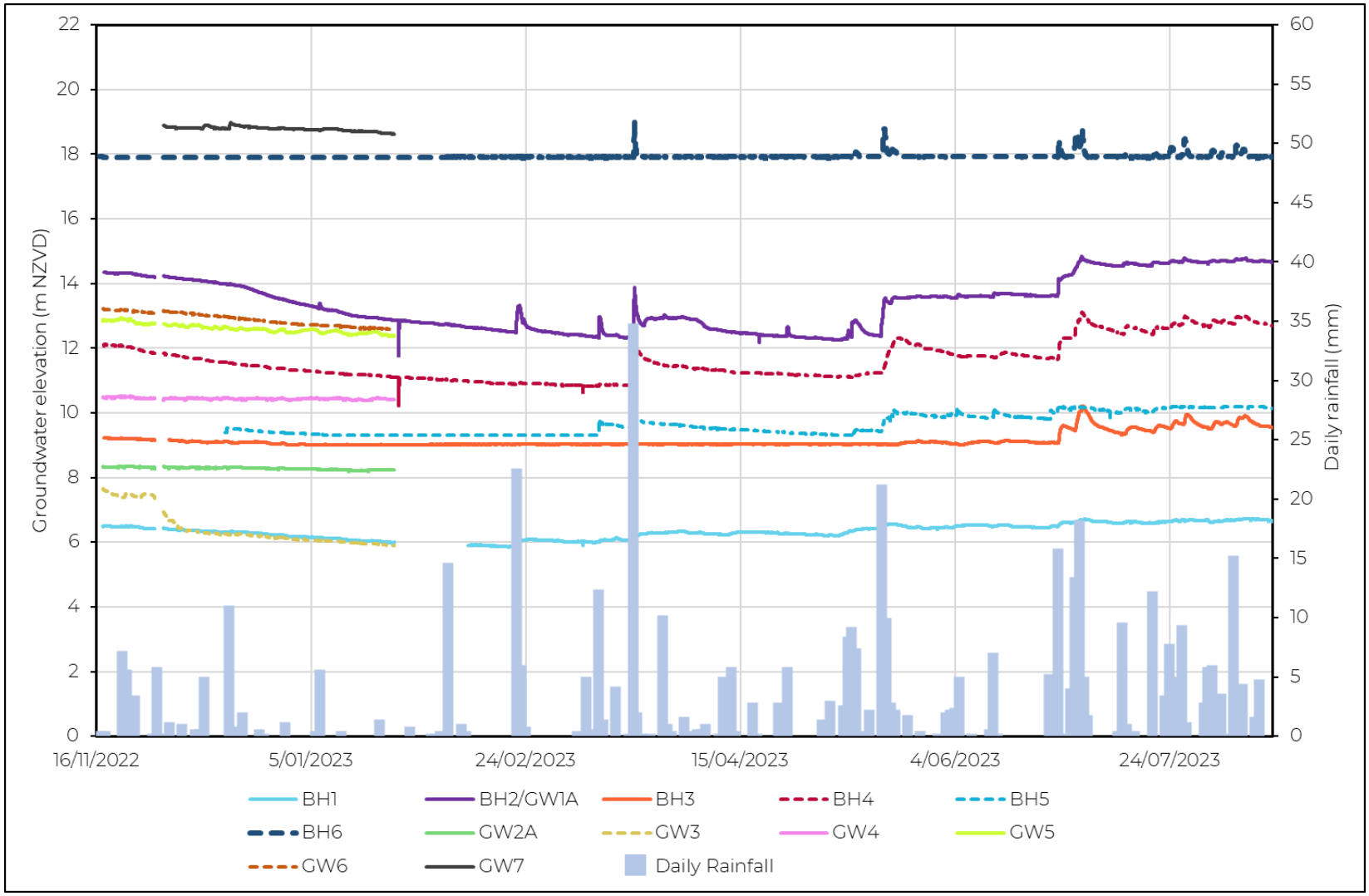

Figure 5: Hydrographic record for Mt Cooee groundwater monitoring wells for the period 16th November 2022 to 17th August 2023.

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Table 1: Groundwater gradient adjustments.

Wells	Head change	Distance	Gradient	Wells	Head change	Distance	Gradient
GW5 and GW7	6.129	210	0.029	GW5 and GW7	6.894	210	0.032
GW5 and GW4	2.226	119	0.018	GW5 and GW4	2.226	119	0.018
GW4 and BH1	4.07	100	0.041	GW4 and BH1	3.76	100	0.038
GW1A and GW2A	5.956	229	0.026	GW1A and GW2A	6.49	229	0.028
GW5 and BH1	6.296	213	0.029	GW5 and BH1	5.986	213	0.028
Average Change	6.13	217	**0.028**	Average Change	6.46	217	**0.030**

Table 2: Re-estimated groundwater flow in the Mt Cooee catchment.

VARIABLE	ADOPTED VALUE	UNIT	DATA SOURCE(S)/JUSTIFICATION
Area (*A*)	54,494	m^2	Saturated thickness x Aquifer width
Saturated Thickness	65	m	Highest elevation 69 m RL minus lowest elevation 4 m RL. Assumed to be reflective of water level in greywacke. Based on Otago 2020 LIDAR.
Aquifer Width	838	m	Average width across defined Mt Cooee catchment
Hydraulic Conductivity (*K*)	7.1×10^{-7}	m/s	Median *K* value from permeability testing in weathered and fresh greywacke units using data from GW1A, BH3, BH4, BH5, BH1, GW7
Hydraulic Gradient (*i*)	0.030	-	Average change in head x Average distance between wells
Average Change in Head	6.46	m	Average change in head between following wells: GW5 & GW7 = 6.13 m GW1A & GW2A = 5.96 m GW5 & BH1 = 6.30 m
Average Distance Between Wells	217	m	Average distance between following wells: GW5 & GW7 = 210 m GW1A & GW2A = 229 m GW5 & BH1 = 213 m
Discharge (*Q*)	36,341.40	m^3/year	*Q* = *KiA* (Darcy's Law)

Table 3: Adjusted contaminant loadings (cf Table 13 from original AEE).

Parameter	Upgradient Water Quality - Average of GW1A & GW7 (mg/L)[1]	Existing Flux Across Total Groundwater Catchment (kg/year) (34,487 m³/year Catchment Flow)	Predicted Flux from Existing Landfill Leachate (kg/year) (674 m³/year Leakage)	Predicted Flux from Existing Landfill Leachate (kg/year) (26,962 m³/year Leakage) using GW4 contaminant set	Predicted Flux from Expansion Landfill Leachate (kg/year) (within 2.61 m³/year Leachate Leakage)
Aluminium[2]	0.01975	0.717742695	27.67016300	8.09	0.10714050000
Ammoniacal Nitrogen	0.6405	23.276668166	365.67755000	21,300.41	1.41592500000
Arsenic	0.0005	0.018170701	0.07414660	2.70	0.00028710000
Boron	0.0428	1.555412018	6.67319400	1,698.64	0.02583900000
Cadmium	0.000025	0.000908535	0.00674060	-	0.00002610000
Calcium	28.25	1,026.644614649	184.63851520	2,777.14	0.71493120000
Chloride	64.95	2,360.374078636	1,236.56307000	30,737.31	4.78804500000
Chromium	0.00025	0.009085351	4.32072460	1.35	0.01673010000
Dissolved Reactive Phosphorus	0.2925	10.629860169	1.56381920	75.50	0.00605520000
Iron	0.175	6.359745400	55.14484860	53.93	0.21352410000
Lead	0.000065	0.002362191	0.07414660	0.27	0.00028710000
Magnesium	15.575	566.017340643	154.41366480	14,020.53	0.59789880000
Manganese	0.64	23.258497465	3.15460080	7.82	0.01221480000
Nickel	0.00175	0.063597454	1.71885300	0.59	0.00665550000
Nitrate-nitrogen	0.01825	0.663230592	0.39095480	0.59	0.00151380000
Potassium	2.915		307.56683740	-	1.19091690000

Silica	25.85	105.935187671	24.26616000	16,716.78	0.09396000000
Sodium	39.75	939.425249157	887.54154260	781.91	3.43661310000
Sulphate	37	1,444.570740966	146.06206140	23,727.04	0.56556090000
Total Kjeldahl Nitrogen	0.995	1,344.631884673	728.99589000	32.36	2.82271500000
Zinc	0.005375	36.159695277	2.50076260		0.00968310000

8. *Please provide further sensitivity analysis of predicted groundwater drawdown to determine whether the stream and wetland will be drained by the landfilling activities. If this cannot be confirmed, the effects management hierarchy (NPS-FM) should be applied and consideration should be given to whether additional monitoring conditions, such as groundwater level monitoring within the wetland are appropriate.*

   Response:

   It is considered that neither the stream nor the wetland will likely be drained by the landfilling activities. There may be a small drawdown effect associated with installing a landfill liner underneath the proposed landfill due to a decrease in overall recharge. However, this will be very difficult to determine with the limited information available. Once the landfill is closed, the stormwater could be diverted back to groundwater to normalise the groundwater levels, if required. It is noted that the small, modified waterway that exits underneath Kaitangata Highway is likely to be a man-made drain.

   As there are no landfilling activities located within 100m of the stream or the wetlands, no resource consents are required under the NES-F for the proposal. As such, we do not consider additional monitoring conditions in relation to the stream or wetlands to be necessary.

9. *Please provide the survey data for the groundwater bores and the actual datapoints used to interpolate the piezometric contours to validate the interpretation of groundwater flow.*

   Response:

   Please refer to Table 4 below for the site survey data.

10. *Please discuss the current state of the Clutha River / Mata-Au with reference to the ORC RPW schedule 15 limits for good water quality as well as the NPS-FM 2020.*

    Response:

    As demonstrated in Table 5 below, the current state of the Clutha River / Mata-Au at sampling point SW2 is well below the water quality thresholds in terms of both the ORC RPW Schedule 15 and NPS-FM 2020.

11. *The contaminant loading calculations (Groundwater and Surface Water Report, Table 13) appear to be incorrect This appears to be the result of incorrect unit conversion: e.g. predicted flux from existing landfill for aluminium would be 41 mg/L (0.000041 kg/L) x 674 m3/year (674,000 L/year) = 27.6 kg/year. Please recalculate and revisit assumptions.*

    Response:

    WSP accepts that these calculations were incorrect; the adjusted calculations are presented below in Table 5.

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Table 4: Borehole Survey Data Summary for Mt Cooee Groundwater Investigations.

Mt Cooee Groundwater Monitoring Wells
Piezometric Survey
Coordinate System: North Taieri 2000
Surveyed Vertical Datum: Otago Metric Datum

Bore ID	X	Y	Z (m TOC) Otago Metric Datum	Z (m Ground Elevation at Well) Otago Metric Datum	Z (m TOC) NZVD 2016	Z (m Ground Elevation at Well) NZVD 2016	WL Measurement Date	WL Measurement Time	Date/Time	WL (m bTOC)	WL (m RL) Otago Metric Datum	WL (m RL) NZVD 2016	Comments
BH1	359506.78	757426.4	109.562	109.028	9.198	8.664	29/11/2022	2:00:00 pm	29/11/2022 14:00	2.788	106.774	6.41	
BH2/GW1A	359745.99	757567.9	116.161	115.7	15.797	15.336	29/11/2022	2:45:00 pm	29/11/2022 14:45	1.53	114.631	14.267	
BH3	359601.8	757246.5	112.241	111.72	11.877	11.356	30/11/2022	9:00:00 am	30/11/2022 9:00	2.411	109.83	9.466	
BH4	359884.87	757164.6	115.789	115.284	15.425	14.92	29/11/2022	1:15:00 pm	29/11/2022 13:15	3.525	112.264	11.9	
BH5	359755.85	757225.2	110.679	109.977	10.315	9.613	29/11/2022	1:00:00 pm	29/11/2022 13:00	1.583	109.096	8.732	
BH6	359789.28	757295.6	121.383	120.782	21.019	20.418							Well dry for all measurements since November, so have not included water level information
GW2	359549.54	757450	110.408	109.803	10.044	9.439	29/11/2022	2:15:00 pm	29/11/2022 14:15	1.733	108.675	8.311	
GW3	359533.01	757392	109.688	109.417	9.324	9.053	29/11/2022	2:00:00 pm	29/11/2022 14:00	1.937	107.751	7.387	
GW4	359605.91	757438.3	116.434	115.698	16.07	15.334	29/11/2022	2:30:00 pm	29/11/2022 14:30	5.59	110.844	10.48	
GW5	359718.22	757400.2	118.558	117.581	18.194	17.217	29/11/2022	11:45:00 am	29/11/2022 11:45	5.488	113.07	12.706	
GW6	359758.32	757528.6	117.836	116.985	17.472	16.621	29/11/2022	12:30:00 pm	29/11/2022 12:30	4.365	113.471	13.107	
GW7	359925.38	757432.6	122.486	121.552	22.122	21.188	29/11/2022	11:45:00 am	29/11/2022 11:45	3.287	119.199	18.835	

Datum conversion:

Otago Metric Datum is the Dunedin Vertical Datum 1958 plus 100 m.

Dunedin Vertical Datum Reference Benchmark	2.732	m
DVD 1958 reference benchmark in NZVD 2016	2.368	m
To convert from DVD 1958 to NZVD2016 subtract:	**0.364**	**m**

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Table 5: Estimated water quality effects from landfill leachate discharge on the Clutha River.

Parameter	Baseline Environment	Loading Calculations			Effects on ultimate receiving environment (Clutha River)			Effects Comparisons
	Upgradient Water Quality - Average of GW1A & GW7 (mg/L)[1]	Existing Flux Across Total Groundwater Catchment (kg/year) (36,341 m³/year Catchment Flow) Using GW1 and GW7	Leachate Water Quality Maximum concentrations of CAE and GW4 samplings (mg/L)	Predicted Flux from Existing Landfill Leachate (kg/year) (26,962 m³/year Leakage) using GW4 contaminant set.	Downgradient Groundwater Water Quality concentrations for comparison. Average of GW2A & GW3 (mg/L).	Clutha River Baseline Concentrations at SW2 monitoring point (mg/L).	Clutha River after leachate additions based on maximum CAE/GW4 loadings	Water Quality Criteria (mg/L) From AEE
Aluminium[2]	0.01975	0.717742695	41.05	8.09	0.01	0.03000	0.03012903	0.055[1]
Ammoniacal Nitrogen	0.6405	23.276668166	790.00	21,300.41	0.27	0.01000	0.01248320	0.2[2]
Arsenic	0.0005	0.018170701	0.11	2.70	0.0005	0.00050	0.00050035	0.013[1]
Boron	0.0428	1.555412018	63.00	1,698.64	0.963	0.00375	0.00394803	0.37[1]
Cadmium	0.000025	0.000908535	0.01	-	0.00004	0.00003	0.00003003	0.0002[1]
Calcium	28.25	1,026.644614649	273.92	2,777.14	68.33	11.20000	11.20086101	
Chloride	64.95	2,360.374078636	1,834.50	30,737.31	37.51	1.60000	1.60576638	
Chromium	0.00025	0.009085351	6.41	1.35	0.0003	0.00030	0.00032015	0.001[1]
Dissolved Reactive Phosphorus	0.2925	10.629860169	2.80	75.50	0.02	0.00200	0.00200880	0.045[2]
Iron	0.175	6.359745400	81.81	53.93	0.13	0.06000	0.06025715	
Lead	0.000065	0.002362191	0.11	0.27	0.00009	0.00010	0.00010035	0.0034[1]
Magnesium	15.575	566.017340643	520.00	14,020.53	26.83	1.00000	1.00163451	
Manganese	0.64	23.258497465	4.68	7.82	3.8337	0.00600	0.00601471	1.9[1]
Nickel	0.00175	0.063597454	2.55	0.59	0.00420	0.00020	0.00020802	0.01[1]
Nitrate-nitrogen	0.01825	0.663230592	0.58	0.59	3.5236	0.03700	0.03700182	2.42[1]
Potassium	2.915	307.56683740	7.63	16,716.78	6.8	0.60000	0.60194884	
Silica	25.85	24.26616000	620.00	970.65	12.2	2.90000	2.90011316	
Sodium	39.75	887.54154260	36.00	35,501.86	51.3	1.90000	1.90413881	
Sulphate	37	146.06206140	1,316.71	5,842.51	43.0	3.50000	3.50068112	
Total Kjeldahl Nitrogen	0.995	728.99589000	216.69	29,160.00	1.03	0.05000	0.05339948	
Zinc	0.005375	2.50076260	1,081.50	100.03	0.011	0.00100	0.00101166	0.008[1]

[1]ANZG. (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Default guideline values for freshwater protection: 95% of species. This applies after reasonable mixing of the discharge.

[2]ORC (2016). Otago Regional Council. Regional Plan: Water for Otago. Schedule 16A: Discharge Thresholds for Discharge Threshold Area

Table 6: Estimated water quality effects from landfill leachate (expansion area) discharge on nearby streams and wetlands.

Parameter	Baseline Environment	Loading Calculations			Effects on ultimate receiving environment (Groundwater discharged to unnamed stream and wetland)		Effects Comparisons
	Upgradient water quality – average of GW1A & GW7 (mg/L)	Existing flux across total groundwater catchment (kg/year) (adopting 36,341 m^3/year catchment flow)	Leachate concentrations using maximum from CAE and GW4 datasets (mg/L)	Predicted flux from proposed landfill leachate (kg/year) using 2.61 m^3/year leachate water volume.	Downgradient groundwater quality concentrations average of GW2A & GW3 (mg/L)	Predicted concentrations in downgradient groundwater (mg/L) mixing in 1,513 m^3/year groundwater flow through	Water quality criteria (mg/L)
Aluminium[2]	0.01975	0.717742695	41.05	0.1071405000	0.01	0.0707880201	0.055[1]
Ammoniacal Nitrogen	0.6405	23.276668166	790.00	2.0619000000	0.27	1.3623029454	0.2[2]
Arsenic	0.0005	0.018170701	0.11	0.0002871000	0.0005	0.0001896878	0.013[1]
Boron	0.0428	1.555412018	63.00	0.1644300000	0.963	0.1086393488	0.37[1]
Cadmium	0.000025	0.000908535	0.01	0.0000261000	0.00004	0.0000172443	0.0002[1]
Calcium	28.25	1,026.644614649	273.92	0.7149312000	68.33	0.4723569909	
Chloride	64.95	2,360.374078636	1,834.50	4.7880450000	37.51	3.1634743713	
Chromium	0.00025	0.009085351	6.41	0.0167301000	0.0003	0.0110536226	0.001[1]
Dissolved Reactive Phosphorus	0.2925	10.629860169	2.80	0.0073080000	0.02	0.0048284155	0.045[2]
Iron	0.175	6.359745400	81.81	0.2135241000	0.13	0.1410759544	
Lead	0.000065	0.002362191	0.11	0.0002871000	0.00009	0.0001896878	0.0034[1]
Magnesium	15.575	566.017340643	520.00	1.3572000000	26.83	0.8967057362	
Manganese	0.64	23.258497465	4.68	0.0122148000	3.8337	0.0080703516	1.9[1]
Nickel	0.00175	0.063597454	2.55	0.0066555000	0.00420	0.0043973070	0.01[1]
Nitrate-nitrogen	0.01825	0.663230592	0.58	0.0015138000	3.5236	0.0010001718	2.42[1]
Potassium	2.915	307.56683740	7.63	0.0199143000	6.8	1.0000000000	
Silica	25.85	24.26616000	620.00	1.6182000000	12.2	0.0620796279	
Sodium	39.75	887.54154260	36.00	0.0939600000	51.3	2.2705796345	
Sulphate	37	146.06206140	1,316.71	3.4366131000	43.0	0.3736676269	
Total Kjeldahl Nitrogen	0.995	728.99589000	216.69	0.5655609000	1.03	1.8649754879	
Zinc	0.005375	2.50076260	1,081.50	2.8227150000	0.011	0.0063976505	0.008[1]

[1]ANZG. (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Default guideline values for freshwater protection: 95% of species.

[2]ORC (2016). Otago Regional Council. Regional Plan: Water for Otago. Schedule 16A: Discharge Thresholds for Discharge Threshold Area

12. *Please explain why leachate concentrations for CAE (2000) were used in these calculations without comparison to actual contaminant concentrations from leachate sump sampling (where available) and justify on this basis whether the use of the CAE concentrations is conservative. Note that water quality results from GW4 within the landfill suggests that the concentration of contaminants within the leachate may be higher than the CAE values.*

    Response:

    The majority of concentration values are higher for CAE than leaching from GW4, except for Ammoniacal Nitrogen, Boron, Dissolved Reactive Phosphorus, Magnesium and Potassium. CAE was deemed overall a more conservative parameter set to choose. Furthermore, a significant amount of discharge is being removed from the leachate collection system to the Balclutha WWTP, which is seen in the difference in concentrations between monitoring wells GW4 and GW2A. In the contaminant calculations presented in Table 5 and 6 above, a maximum value of either CAE or measured from GW4 has been used.

13. *Please provide further assessment of the cumulative effects of the activities based on the corrected loading calculations and consideration of the actual leachate contaminant concentrations as measured at the landfill.*

    Response:

    An updated effects assessment calculation is provided in Tables 3 and 4 below. Table 3 provides an assessment of water quality effects on the Clutha River from the existing landfill area. Table 4 provides an assessment of water quality effects on the downgradient wetland. In both cases, the most conservative loadings are used (a combination of what is measured on-site and the highest loadings observed in general (CAE values)) to estimate an increase in contaminant concentrations in the Clutha River.

    For the Clutha River, a maximum discharge of 26,962 m^3 per year has been adopted to calculate the maximum loadings of contaminants as opposed to the 674 m^3/yr (2.5%) of leachate leakage used in the previous assessment i.e. this is reflective of all total leachate generation being discharged to the Clutha River. For these loadings, the Clutha River contaminant concentrations have increased by less than 10%, except for ammoniacal nitrogen and zinc concentrations which remain below the water quality criteria (adopted from the previous assessment).

14. *Given the downgradient groundwater quality impacts from the existing landfill, can further justification be provided for the assumed 2.5% leachate leakage rate from the existing landfill?*

    Response:

    We consider that most of the leachate is being removed from the existing landfill and discharged to the wastewater system, however, the mass mixing calculations presented in Table 5 for effects on the Clutha River incorporate total fluxes based on maximum concentrations for either CAE or GW4 mixed with 26,962 m^3/yr of

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leachate. It is intended that this leachate will continue being pumped to the wastewater treatment plant.

15. *Please provide updated proposed consent conditions for the stormwater, surface water, and groundwater monitoring which include the methods, locations, and sampling frequency.*

    Response:

    We have attached a proposed monitoring plan for use in the consent conditions which includes proposed monitoring for stormwater, surface water and groundwater. The sampling / monitoring plan includes the methods, locations and sampling frequency.

16. *Please provide an assessment of the results of the previous stormwater monitoring plan since the stormwater diversion was completed to confirm the efficacy of the current system.*

    Response:

    The unnamed tributary, which previously flowed from the Balclutha Golf Course and under the landfill, was diverted in 2021. The unnamed tributary and its culvert, which now flows around the north of the landfill, has been dry each time the compliance monitoring has been undertaken since 2021 and therefore no samples have been taken due to the dry conditions. The pipe, which is still located under the landfill, captures groundwater which is then intercepted and treated as leachate from the landfill.

17. *Please explain why a groundwater take of 80,000 L per day is considered to be sufficient when records of leachate discharged to the Wastewater Treatment Plant from the last year regularly exceed this volume (refer Mt Cooee Landfill 2023 Compliance Audit Report). Was leachate stored prior to discharge at this time?*

    Response:

    The consent application states that 80,000 litres of leachate will be abstracted per day from the landfill; however, this was meant to be an average volume rather than a maximum volume. CDC seek that the water permit to abstract and discharge groundwater / leachate does not contain a maximum volume limit because CDC's intention is to pump leachate as it is generated, rather than storing it or letting it accumulate. The volume of leachate that will be collected and discharged per day will also depend on weather conditions (i.e. a lot of rain will mean more leachate). In addition, the purpose of the landfill is to collect as much leachate as possible to ensure it does not discharge further downstream to the Clutha River / Mata-Au, therefore no limit should be placed on the volume CDC can abstract and discharge.

    This was discussed with the ORC in a meeting on 20th July 2023 (email attached).

    In response to the second part of the question, no leachate has been stored prior to discharge.

Air Quality and Landfill Gas

18. *The proposed conditions do not specifically require landfill gas (LFG) collection and flaring from the expansion, which appears to be inconsistent with the technical air quality assessment and the NZ Emissions Reduction Plan guidance. Given that LFG collection is a key mitigation measure (both in terms of odour control and Greenhouse Gas effects), why is LFG collection and flaring not proposed at the outset of the expansion? In particular, would it not be appropriate to establish an LFG collection network as new cells are formed?*

    Response:

    The Air Quality Assessment described the LFG collection and treatment options for the future expanded landfill site, and Section 3.6 of the Air Quality Assessment was meant to provide options for CDC if they seek to collect and treat the gas. However, further discussions have progressed with regards to the collection and flaring of LFG and it is not considered appropriate or efficient to establish a LFG collection system for a landfill operation of this size. The proposed annual tonnage at 8,000 tonnes is very small for running an effective landfill gas collection and flaring system. Whether enough gas could be collected to run a flare would need specific assessment. Further confusing the issue is the policy in the Emissions Reduction Plan that "*all municipal landfills shall have landfill gas collection and destruction in place by 2026 where feasible*". To date, the term "where feasible" has not been defined.

    Experience at some other landfill sites is that gas collection wells are in practice best installed 6-12 months after refuse placement because working around wells as the refuse lift comes up is difficult. Given the small fill area and depth that will accrue from 8,000 tonnes, it is considered that then installing wells or trenches as waste is placed is not necessary.

    In light of the above, we suggest including a condition that requires a specific assessment of gas yields and a design of a gas system by 1st December 2025. This will then be consistent with the Emissions Reduction Plan, which will be better defined.

19. *Please specify the location and design aspects of the LFG flare (including failsafe measures and monitoring) to be included in potential consent conditions.*

    Response:

    Should there be sufficient gas to run a flare, then a small, enclosed flare unit such as the Windsor Engineering GF 250 would be installed. This has a maximum capacity of 250Am^3/hr (minimum 80 Am^3/hr) with a retention time of 0.5s and minimum burn temperature of 750 deg C. Ideally a back-up candlestick flare would also be provided. The capital investment and operational complexity required to run a full gas system for such a small flow is substantial.

    We do not consider it necessary to specify the system in detail at this stage as considerable technical work is required on gas modelling and reticulation design. These are matters that are better left to a subsequent design stage and brought under the peer review condition. As stated above, clarity is required in terms of the guidance (not regulation) provided in the NZ Emissions Reduction Plan as it is not clear whether a landfill of this size would require landfill gas collection and flaring, and therefore CDC do not want to commit to this until this has been made clear.

20. *Please describe the LFG monitoring that is proposed. Will the current quarterly monitoring of methane and hydrogen sulphide be continued at the existing and new landfill areas?*

    Response:

    Again, CDC is not proposing to collect and flare the LFG until clarity is provided under the NZ Emissions Reduction Plan as to whether a landfill of this size would require landfill gas collection and flaring.

    The current quarterly monitoring will continue until such time as a gas system is installed. This will cover the entire fill areas, both the existing once capped and the extension area.

    If a gas system is installed, the monitoring required would increase substantially. We would expect weekly surface emissions monitoring will be required to manage capping and minimise fugitive emissions from intermediate capped areas and from around gas wells. This should be covered by a condition requiring the consent holder to prepare a Gas System Management Plan for approval prior to commencing gas abstraction.

Liquid Wastes and Special Wastes

21. *The design report states that the existing liquid waste pit will be decommissioned within two months. Please confirm if liquid wastes (such as septage and DAF sludge) will no longer be accepted at the landfill under the proposal.*

    Response:

    Liquid wastes will no longer be accepted at the Mt Cooee Landfill.

22. *Is a condition proposed limiting moist wastes received to "spadable sludge" (e.g. maximum 20% moisture)?*

    Response:

    A condition confirming that only "spadable sludge" consistency materials be allowed on site is accepted. Note that a spadable sludge is generally in a range of 15-20% dry solids, not moisture as stated above.

23. *Please confirm that special wastes received will not include material in an odorous condition, such as fish wastes, rendering by-products, dissolved air flotation (DAF) treatment sludge or material that is an anaerobic or putrid condition. What procedures are proposed to ensure that such wastes are not accepted at the landfill?*

    Response:

    In our view, the proposed condition is overly restrictive and does not reflect the realities of running a waste disposal service for a rural community. The key issue here is that any such wastes are handled as special wastes under an approved method as set out in the Site Management Plan. This would cover:

    - Prior approval to receive the waste;

- The landfill reserves the right to refuse acceptance if the quantity is excessive for daily operations or it is delivered in an unsatisfactory manner (e.g. liquid dripping from vehicle);
- A trench is prepared in the landfill face with lime and cover material placed beside; and
- Waste is placed directly into the prepared trench, limed and covered with 0.5m of soil immediately.

To clarify, it is not proposed that the site would be the recipient of large quantities of these wastes e.g. from meat processors. However, occasionally small quantities of odorous waste will arise in the area (e.g. from equipment breakdowns or vehicle accidents) and such wastes will need an appropriate disposal path or problems will just be caused elsewhere.

Leachate Collection

24. *What specific measures are proposed to control potential odour from the leachate collection system? Will the leachate sump be emptied every day by pumping to the treatment plant?*

    Response:

    The current leachate collection system is not a significant odour source. The leachate collection pipework is sealed and only vents to any significant amount at the leachate pump station. If any significant odour issues were to arise, the pump station could be vented through an odour control bark bed,, if necessary. However, as noted above, there are currently no odour issues associated with the system and none are anticipated because of the proposal. The pump station operates on float switches and is cleared every few hours. The pump station is telemetered to the Council's system for alarm levels.

25. *Are regular (e.g. daily) inspections of the leachate sump proposed as part of the odour monitoring programme undertaken at the site?*

    Response:

    Yes. A daily odour sweep at opening is a standard landfill procedure. This would include the leachate pump station.

Dust

26. *The AEE refers to "standard mitigation measures". What specifically are these measures? Will they be included in proposed consent conditions?*

    Response:

    The standard mitigation measures will include using a water cart on the access roads, when and if required. Fixed sprinklers may be used for irrigation of capped areas, if required. Water has generally not been applied at the landfill face in the past as this has not been required.

27. *Is it proposed that a water cart will be held on site at all times to respond to any dust or minor combustion events that may arise?*

    Response:

    No. The site is located close to the Balclutha Township as well as the contractor's depots. The scale of the operation does not warrant holding a water cart on site for normal operating conditions. A water cart would be brought on site for specific construction earthworks, as required / needed.

    The site is located 2 minutes from the Balclutha Fire Station in case of a fire at the site.

28. *Earthworks as part of the landfill expansion are a potentially significant source of dust that have not been specifically assessed. Please describe the dust control measures proposed for this activity. Will these measures be included in proposed consent conditions, or in the Construction, Erosion and Sediment Control Plan?*

    - Note that the discharge of dust to air during construction of landfill is not permitted under rule 7.6.1 of RPWaste.

    Response:

    Dust control measures will be incorporated into the Construction, Erosion and Sediment Control Plan.

Geotechnical

29. *The stability analysis in the Geotechnical Interpretative Report does not appear to consider the geomembrane liner interface shear strengths and translational failure mechanisms on the geosynthetic interfaces. This has the potential to reduce the stability FoS, increase the likelihood of movement of waste and may result in damage to the liner system, which will impact expected leak rates and thus discharge of leachate to groundwater. Please provide technical justification for not considering interface shear strength on the geomembrane interface, and clearly explain if a smooth, mono textured or double textured material is being specified for the lining system on the various liner type areas, as this will impact the waste pile stability and therefore leachate containment.*

    Response:

    Noted. Given the analysis was for the preliminary stage and the exact details of the liner had not been established, the liner was not included in the slope stability analyses. We have revised the analysis by including the liner as a region with lower strength parameters. Based on discussions with the landfill engineer, we have adopted the following lower bound parameters for double textured HDPE liner to be incorporated into the liner:

    - Friction angle range of 16 degrees to 18 degrees for a double textured HDPE liner. This parameter is mainly based on GRI Report #30 2005.
    - Unit weight of 17 kN/m^3

The revised analysis for both Sections 1 and 2 based on the lower bound friction angle of 16 degrees for the liner indicate the factors of safety are still satisfactory under the static case and seismically induced displacements are small (estimated as 15mm maximum based on methodologies by Ambraseys &Srbulov (1994), Ambraseys & Menu (1988) and Jibson (2007), with possibly up to 30mm (i.e. 2 times) based on the yield acceleration ~0.17g).

The analysis outputs are attached to this letter (document titled 'Updated Analyses Outputs – Response to #29').

The Geotechnical Interpretive Report (GIR) will be updated based on the revised analysis outputs and results. Based on discussions with the landfill engineer, we understand that double textured HDPE will be specified for the liner.

30. *It is also unclear in the Geotechnical Interpretative Report where the stability analysis section for the new landfill was taken. Please outline how critical sections were selected including consideration of temporary and final slope profiles during the various stages of landfill development.*

Response:

The indicative alignments of the cross sections are shown on the concept design drawings in Appendix B – refer Drawing C206 of the Consent Application / AEE. These have been further annotated in the attached document titled 'Response to Item #30'.

The critical cross sections were selected in the 'east-west' and 'north-south' directions of the proposed landfill. We acknowledge the sections were not cut perpendicular to the contour lines. However, we manually modified the landfill batters to model the steepest angle of 1(V): 4(H). The level of the crest of the landfill was also manually adjusted to RL36m as the final level of the landfill. The analyses are therefore considered to be representative of the steepest sections of the batters.

All temporary slopes are considered to be 1(V): 4(H) max and therefore expected to be stable.

31. *Please confirm whether or not any new direct fault ruptures have been identified during the site investigations.*

Response:

The site investigations did not identify evidence of any faults across the site.

32. *The in-situ soil and rock parameters adopted seem to be average values. Has consideration been given to the sensitivity if lower strength materials occur in unfavourable locations?*

Response:

For the purpose of preliminary analysis, we have adopted moderately conservative values for the in-situ soils and rocks. The slope stability analysis indicated the critical slips are contained within the refuse and the liner (refer question 29) as the parameters for the refuse are lower than the in-situ soils and rock.

We have carried out a sensitivity analysis for Section 1 using the lower bound parameters for the in-situ soils and rock as specified in the GIR. Please refer to the analysis outputs attached (refer to the document titled 'Updated Analyses Outputs – Response to Question 32). The analysis indicates that the critical slips are still constrained to the landfill refuse / liner and therefore not sensitive to lower in-situ soil and rock parameters.

The analysis for Section 2 (refer response Question 29) also considers lower bound parameters for the refuse. We have adopted the lower bound friction angle of 16 degrees for the double-textured HDPE in all the analyses.

33. *Further justification is required for the Importance Level 2 (IL2) selection in the seismic stability analysis. Landfills are typically considered as IL3 facilities, as a minimum, due to containing hazardous materials (reference NZS1170 Table 3.2), and resultant changes to seismic loading parameters adopted in the stability analysis. Does the council consider the facility as a post disaster critical site?*

Response:

Noted. As you are aware, there are no specific standard currently in New Zealand to assess design earthquakes for a landfill. We had initially considered the landfill to be an IL2 facility but acknowledge that it can fall under the IL3 criteria. We have therefore revised the analysis based on IL3 seismic loads to assess the impacts on the analyses, mainly the slope stability and liquefaction assessments. The revised PGA under the DCLS/ULS case is calculated as 0.29g (in comparison with 0.23g for IL2).

The findings based on the revised analysis indicate the following:

- The seismically induced displacements at the landfill expansion location are still small (typically < 30mm) - refer to the Slope/W outputs in response to Question 29.
- Liquefaction of an approximately 0.5m thick layer of alluvial deposits is anticipated at depths ranging between 4.0m and 4.5m bgl. The seismically induced displacements affecting the existing landfill are expected to range between 60mm and 330mm (and 150mm on average) based on the three adopted methodologies (refer to response to Question 36).

Based on discussions with CDC, the facility is not considered to be a post disaster critical site as there are two other landfills in general vicinity of Balclutha. We will revise the GIR based on IL3.

34. *The application of two different seismic loads for different soil classes on one relatively small site area requires additional justification. Has the sensitivity of the higher seismic load been considered?*

Response:

Bedrock was encountered at shallow depths across the majority of landfill, with the exception of the western section, where thicker alluvial deposits were encountered. Therefore, we have separated the site into Site Subsoil Class C for the western section and B for the remainder of the site.

We have now assessed the seismically induced displacements based on the PGA of 0.29g associated with site subsoil class C (and IL3) and the results indicate the displacements are still small (<30mm). The liquefaction triggering assessments have also been based on the PGA of 0.29g for site subsoil class C.

35. *With the recent release of the National Seismic Hazard Model (NSHM) has the impact of this been considered due to the potential for this model to be incorporated into design standards within the design life of the landfill. Due to the critical performance requirements of a landfill has a Probabilistic Seismic Hazard Analysis (PSHA) been considered?*

    Response:

    We had not assessed the impact of the National Seismic Hazard Model (NSHM), given this guideline is in draft form and the preliminary stage of the project. There is an opportunity to incorporate this as part of the detailed design stage, if agreed with CDC. Given the relatively small seismic loads, we do not consider the higher PGA (estimated as 0.35g based on the NSHM) would make a material difference in the findings from the geotechnical assessments.

    A Probabilistic Seismic Hazard Analysis (PSHA) has been outside the scope of the project at this preliminary stage. Given the relatively low seismicity of the region, we do not consider that a PSHA is warranted.

36. *Is there any impact to the liquefaction assessment from the seismic load condition changing? Liquefaction assessment appears to be related to BH01 with only one plasticity test result used as justification for determining material as non-liquefiable. How does this relate to the landfill site as it appears to be founded on a different geological profile?*

    Response:

    We appreciate the preliminary liquefaction analyses are based on limited investigation data (mainly BH1) and laboratory testing at this stage. We have assessed the liquefaction susceptibility of soils based on the borehole log descriptions and laboratory testing results – refer to the attached document titled 'Annotated BH1 Log'.

    We have revised the liquefaction analysis based on an increased PGA of 0.29 g (refer to revised analysis outputs). Please note the outputs presented in the current GIR had the incorrect SPT depth intervals and these will be revised in the final issue of the GIR.

    The findings from the revised liquefaction analysis are as follows:

    - Liquefaction of an approximately 0.5m thick layer of alluvial deposits is anticipated at depths ranging between 4.0m and 4.5m bgl.
    - Seismically-induced displacements are estimated to range between 60mm and 330mm (and 150mm on average) based on the three adopted methodologies and the yield acceleration of 0.05g. We consider these displacements to be moderately conservative as they do not consider any pinning effect from the existing sheet pile wall and therefore the actual

displacements on site are expected to be smaller. These displacements are not expected to result in releasing landfill contaminants, but may cause some cracking of the capping soils that may need to be re-profiled/topped up.

We consider the estimated settlements to be moderately conservative due to the following reasons:

- The alluvial deposits are likely to be highly variable and interbedded and therefore liquefiable layers are unlikely to be laterally or vertically continuous across the site. We have currently allowed for a continuous layer in the models, which is likely to be conservative.
- Any pinning effect from the sheet pile cut off wall has been ignored in the stability analyses.

The relevant sections of the GIR (namely liquefaction and slope stability) will be updated to reflect the above changes.

Landfill Design

37. *There appears to be sufficient detail on the new site access/resource recovery centre in the design drawings. The conceptual design detail on the landfill liner and drainage system however are absent from the drawings. Please provide information on the subsoil drainage system, landfill liner, leachate drainage system and capping details, and present these in the application drawings so that the landfill design concepts, that would be required to assess the proposed liner performance, can be evaluated and potentially be included in the consent conditions. These concept details would typically include:*

    a. *Liner typical details for landfill base, side slope and piggy back over existing landfill.*
    b. *Liner connection detail between liner types and landfill stages.*
    c. *Preparation of rock surface to receive the liner components.*
    d. *Subsoil drainage concepts and general layout, if required.*
    e. *Leachate collection system layout plan.*
    f. *Any typical liner penetrations such as leachate outlet if gravity draining.*
    g. *Design measures to manage the risk of translational failures on the geomembrane interface, for both intermediate and final waste footprint.*
    h. *Landfill final capping typical details, including capping layers, stormwater drainage on waste.*
    i. *Overall stormwater drainage around the new lined extension, and connection into the existing system, around eastern and southern portion of the new extension.*

Response:

Please refer to the attached design plans (Sheet Numbers C209 – C212) which show the concept details requested.

38. *Fill over an existing section of landfill with a new lined landfill will likely result in differential settlement which will likely place the composite liner in the piggy back area under both tensile and compressive strains. How are tensile strains being limited on the GCL/HDPE composite liner in the piggyback slope sections of the landfill? This could impact the liner containment and potential for leachate discharge from the new landfill development.*

Response:

There are a number of aspects to this question. Yes, differential settlement could occur on the batters of old refuse leading to localised "scallops" or depressions in the formation. We acknowledge that organic material (of which there is likely to be plenty) can experience considerable secondary consolidation, which can cause settlements that exceed that due to primary consolidation. The new liner would then potentially have to bridge these areas. Our comments in this regard are:

(a) The consequences of liner damage on the old batters are low. Any leakage through that liner is into existing refuse and becomes part of the existing leachate collection system contained by the sheet pile wall. The consequences of leakage through the "piggy back" liner sections are much less than for leakage through the new landfill floor. Equally, leachate from the old cells could flow the other way through any defect and into the new cell and be captured by the new cell leachate collection system. In fact, if seeps from the old refuse were identified during construction that would be tapped and brought into the new cell.

(b) We considered whether it was even necessary to line the existing refuse batters. However, we opted for a conservative approach to lessen the leachate flowing through the existing fill.

(c) There are two distinct zones of the side batters. Adjacent Stage 3 (Section 06 Sheet C212), the refuse fill is relatively old (5-10 years). It has intermediate capping in place. A degree of settlement will already have taken place.

(d) Adjacent Stage 1 the batter is more irregular and waste is still to be placed (Section 05 Sheet C212). Filling in this area will be managed to ensure a uniform consistency of waste without pockets of segregated organic wastes.

(e) Prior to placing liner, these batters will be trimmed to shape, intermediate cover placed (if not already done) and then track rolled with heavy plant. Any soft spots which are identified by the track rolling would be backfilled with additional soil.

(f) If there are any soft spots identified during proof rolling, then we can determine sizing of a geosynthetic reinforcement that is appropriate for the given site conditions. If there are soft spots identified, then we would be looking to extend reinforcement elements well beyond the localised area. The extent and size of reinforcement would be determined in detailed design.

(g) With the above treatment, the strains imposed on the liner due to settlement are expected to be within the tolerance of the liner.

(h) We have had a high level look at the empirical methods provided within the Asadi et al. paper (email of 4th October from Tonkin & Taylor's Jonathan Shamrock). The calculation methodology relies upon a number of assumptions and inputs that we cannot accurately quantify at this stage, particularly the diameter of the soft spots. Therefore, it is speculative to design for them at this stage.

39. *Landfill gas (LFG) will be generated by the old waste under the piggyback liner sections. How will this be captured and where will this drain/be emitted to? Similarly, how will LFG pressures below the liner system, and related tensile strains in the geosynthetics, be managed until waste is in place?*

Response:

Please refer to the Staging plans. Fill is initially taken to the top of the existing landfill platform for Stages 1, 2 and 3. A specific assessment of gas flows from the existing batters will be made at the time of final design for these stages. At this stage, we envisage the following construction procedure:

- Strip off existing vegetation from batter.
- Track roll and fill any irregularities in the batter surface with intermediate cover soil as necessary to leave a smooth surface.
- Place gas drainage strip on a 5 m grid.
- Place GCL.
- Place HDPE.

Until the Stage 4 overlay is built, the gas drainage can vent to atmosphere at the top of the slope. As the waste comes up, the surcharge load will confine any gas pressure.

Once Stage 4 is built, the liner and drainage metal will confine the waste and act in the same manner as a GCL layer in a landfill cap. Note that Stage 4 is a long time in the future and that gas flows will have largely diminished by that stage.

40. *Has the impact of PFAS in leachate, and future acceptance of leachate for disposal at the WWTP been investigated? Is there a limit as to how much leachate can be discharged into this system? Is there a requirement for continued on site attenuation storage capacity, and if so, will the existing 770 m3 pond be lined? This is highlighted as the site will continue to generate leachate, even if the leachate can't be disposed of to sewer, and if that happens it could spill into the environment if there is no attenuation storage/treatment capacity on site. The existing pond is located downstream of the cut-off wall, so any leachate stored in it will seep to groundwater as the pond is currently only clay lined.*

Response:

The existing pond is in the process of being lined with an impermeable geomembrane.

41. *Are the any monitoring results for PFAS/PFOA compounds in the existing leachate?*

Response:

The existing leachate has not been monitored for PFAS. We expect that PFAS will be present in the leachate given its ubiquitous presence in municipal refuse. PFAS / PFOA in New Zealand fall under the umbrella of the National Environmental Plan for PFAS (NEMP). This is a joint Australia / New Zealand document. Version 2 has been adopted by MfE. Version 3 contains more specific provisions for the wastewater industry. Version 3 is currently in draft format and is undergoing a review and adoption process. At such time as Version 3 is adopted on a national basis, we expect that the wastewater consent and leachate discharge from Mt Cooee will be reviewed for consistency with Version 3. We agree that PFAS in the leachate may prove at some future point to be a constraint on disposal to the Balclutha WWTP. But this would also be the case in every other WWTP in New Zealand and where else the leachate would go would become the question. At that point, the options for the site will need to be assessed. These could include closure of the site or a specific PFAS treatment step for the leachate.

In the meantime, it is proposed that CDC take a proactive stance and monitor for PFAS in the leachate on a six-monthly basis. ORC will need to provide guidance on testing. NEMP Version 3 Section 15.4.1 (Lines 3163-3168) does flag some issues around testing methodologies. "*Details of biosolids sampling requirements to ensure characterisation is representative should be determined by each jurisdiction*" (Line 3153).

42. *Please provide a plot of the estimated groundwater level superimposed on the base of liner level (top of liner less liner thickness). This is required to demonstrate separation of groundwater to the base of liner, and the need or not for a subsoil drainage system in the new lined extension. Elevated groundwater could impact liner construction and potentially damage the liner system if the groundwater level is above base of the liner.*

Response:

This response will be addressed as part of the wider Groundwater Report updates which are currently being undertaken and will be provided to the ORC as soon as possible.

43. *The groundwater report uses an assumed maximum leachate leakage rate of 0.1 mm/year. This equates to an estimated leak rate of 2.7 l/ha/day, with the site being 3.23 ha, a total leak rate of 8.8 l/day. In terms of expected leak rate, this does not appear to take account of the impact of liner wrinkles and measured leak rates from operational facilities described in the research literature. Please provide technical justification for this. Additionally, what construction quality assurance and control is proposed for the landfill liner material and installation, as this can have a significant impact on the expected leak rates?*

Response:

This response will be addressed as part of the wider Groundwater Report updates which are currently being undertaken and will be provided to the ORC as soon as possible.

44. *Please provide justification for not including a separation geotextile layer over the leachate drainage stone. Not including this will result in physical clogging of the leachate drainage aggregate by fines from the waste disposed of over the drainage stone and thus blockage of the drainage layer, leading to a leachate phreatic head build up in the landfill, which will impact waste pile stability and liner leak rate.*

Response:

The definitive assertion above that *"..will result..."* is arguable. Providing a separation geotextile over the drainage aggregate is not a universal practice in New Zealand. It is not done at Broadlands Road (Taupo), Puwera (Whangarei), Bonny Glen or Hampton Downs landfills, as examples. Leachate drainage systems at these large sites continue to function well after 20-25 years. The counter argument to including the geotextile is that it adds another layer with fine pore size that can potentially clog due to biological or chemical processes and therefore impede drainage in the fill. More important is the type of waste placed initially against the drainage layer. This should be kerbside or bagged refuse.

45. *What basis will be used to specify the protection geotextile, as the report only states that this will be "specified accordingly" What basis will be used to determine the geomembrane strains from the leachate drainage stone at the expected waste pressures? What cut-off maximum strain for the HDPE geomembrane will be deemed allowable?*

Response:

We have not yet confirmed the source and specification (size and angularity) for the drainage metal. If a rounded aggregate in the general 20-40mm range is available, we would use the standard calculation methodology as described by Koerner in Section 5.6.7 of Designing with Geosynthetics (2012), applying a factor of safety of 3.0.

If the aggregate is a more angular material, then we would use physical testing. We typically use the ASTM D5514 test method (Standard Test Method for Large-Scale Hydrostatic Puncture Testing of Geosynthetics). TRI Australasia (Gold Coast, Australia) commercially provide this testing using the "Pizza method" where the proposed aggregate stones (use the actual site delivered aggregate) are set into a resin and the strains are measured off a thin metal disk by laser scanning of the disk to allow calculations of the strains. Geofabrics Australia can also do the testing at their laboratory.

Acceptance criteria are based on the type of geomembrane and for PE type, we consider the limits proposed by Peggs 2003 and apply factors (we have used 2.0) as per Brachman 2018 (J Geotech and Geoenviron 144(6)). The Peggs 2003 strain values are adopted by the NSW and Victoria EPA landfill guidelines (and likely others in

Australia). Strain values are given in the table below.

Table 2: Maximum allowable strains for various geomembrane materials

Geomembrane type	Maximum allowable strain
HDPE smooth	6%
HDPE randomly textured	4%
HDPE structured profile	6%
LLDPE density <0.935 g/cm^3	12%
LLDPE density >0.935 g/cm^3	10%
LLDPE randomly textured	8%
LLDPE structured profile	10%

Source: EPA Victoria, 2015, page 75, adopting values from Peggs 2003.

46. *It is not clear if LFG monitoring is being undertaken around the perimeter of the existing landfill, and if new monitoring wells are being considered for the new expansion? Are additional perimeter landfill gas migration monitoring points being considered to monitor the impact of the existing, unlined, landfill and to address the risk of lateral gas migration from this when it is capped or when sections of the old site is covered by the piggyback liner of the new landfill? Please explain your answer.*

Response:

As part of the Gas management plan, a monitoring regime will be established. The main risks for migration we see are in the new transfer station area and against the landfill boundary against the property to the east. Provisionally, we propose two bores on the eastern boundary and 1-2 in the transfer station area. The surrounding ground to the new landfill cells is in situ greywacke with a generally low permeability. Therefore, we assess the risk from gas migration offsite to be low.

47. *Have the subsoil pipes below the existing landfill been incorporated into the existing pumped leachate manhole? Are these being monitored for quality and flow?*

Response:

Yes, they drain to the leachate system. The subsoil pipes are not accessible and are not monitored. The overall leachate flow is monitored for quality and quantity. Note that the pump station flow includes both the original subsoil pipes and the diverted old stormwater line (now in effect a leachate pipe).

48. *As the leachate pump manhole is located in the area identified for possible inundation/flooding in large storm events is consideration being given to raising and sealing this manhole so that it is higher than the expected inundation level? Will the power supply/pump control panel also be raised? Is there a contingency plan in place to have a standby generator/power supply in order to allow the pump to work if there is a protracted period of power failure?*

Response:

The leachate pump station is in the process of being reconstructed. The top of the chamber and the control panel will be above 1% AEP flood level.

49. *What is the long-term planning for ongoing leachate management during the post closure phase of the existing, and new facility. As leachate will gravity drain to the pump manhole from the new extension, is the intension to maintain this as an active pumped system after closure until deemed acceptable to stop operation or in perpetuity?*

Response:

Leachate will be pumped to the Balclutha WWTP until such time as testing determines it to be benign for direct discharge to the river. This will be many years into the future. This situation is no different to most other landfills in New Zealand.

50. *The selection of a design life of 50 years needs further justification. The landfill will need to perform acceptable containment for a period significantly longer than 50 years, and this will have resultant changes to the seismic loading parameters adopted in the stability analysis.*

Response:

Apologies for an incorrect statement. The design life of all the landfill liner and drainage components will be 100 years plus. The materials used will be to normal landfill specifications as used on other landfills in New Zealand.

51. *It seems to be unclear if any of the site soils will be reused for landfill construction. Will the intended liner, daily cover and final cover materials be predominately imported, or site sourced?*

Response:

Quantities of fine-grained soils suitable for daily cover, intermediate cover and liner construction on the site are limited. Granular fill in the form of partially weathered greywacke is readily available. The estimates have been based upon bringing liner soil from Blackhead quarry 5km from the site up Clutha Valley Road. The materials balance is primarily an economic factor for CDC to consider in the landfill business case and does not impact upon discharges. Traffic impacts are a CDC matter.

Contaminated

52. Please prepare a conceptual site model for the site in accordance with section 8.4 of the WasteMINZ Technical Guidelines for Disposal to Land 2022. This is required to design and recommend a suitable monitoring programme for the landfill.

Response:

We do not consider this to be necessary, but we will submit this to the ORC as soon as possible.

53. Will waste from wastewater treatment plants continue to be received at Mt Cooee?

Response:

Yes. Biosolids from the oxidation ponds may be received periodically. Biosolids would be dewatered to around 18% solids prior to acceptance. The NEMP v3 for PFAS would apply. Screenings and rags may be accepted as special wastes.

Landscape

54. **Please clarify whether there are any provisions in the Regional Policy Statement (Operative and Proposed), Water Plan or Waste Plan or other ORC plans and policy relevant to this landscape assessment and consider effects in this context.**

    Response:

    Mike Moore, Landscape Architect, sought the expert advice from WSP planners as to whether there are provisions relevant to the landscape effects of the activity in the documents listed in Question 54 above. Mike Moore states in his Section 92 response (attached to this letter) that this has confirmed that there are no relevant provisions in the Partially Operative Otago Regional Policy Statement 2019, the Proposed Otago Regional Policy Statement 2021, the Otago Regional Plan: Water 2004, or the Otago Regional Plan: Waste 2022.

    With regard to the Clutha District Plan (CDP), page 7 of the Landscape and Visual Assessment Report references the relevant provisions when addressing landscape values. Given that the Mt Cooee Landfill is designated under the CDP, assessment against CDP provisions (e.g. relating to the Rural Resource Area) is not required.

55. **Please refer to findings from the Terrestrial Wetland and Waterway Assessment to support / expand slightly on the identification of natural character value.**

    Response:

    In terms of natural character, the Landscape and Visual Assessment Report found that:

    "The portion of the site that remains under pastoral land use contributes to rural character and contains a natural wetland which whilst modified, retains some natural character value."

    In assessing the effects of the proposed development against Section 6a of the RMA, the Landscape and Visual Assessment Report stated:

    "The wetland is not identified as a regionally significant wetland by ORC[1] and as confirmed in the Terrestrial Wetland and Waterway Assessment, is degraded."

    Mike Moore states in his Section 92 response (attached to this letter) that he considers that the Terrestrial Wetland and Waterway Assessment[2] (TWWA) supports these statements and quote excerpts from the TWWA as follows:

[1] www.orc.govt.nz/managing-our-environment/water/wetlands-and-estuaries/clutha-district

[2] 4Sight Consulting, 2023, Mt Cooee Landfill Expansion Area: Terrestrial Wetland and Waterway Assessment.

"The ecological values of the identified natural wetland are likely to be low as parts are dominated by exotic species, fauna values appear low, and it is very small and therefore unlikely to be able to provide sufficient buffering of the waterway from the current land use (as evidenced by the heavy sediment load in the waterway and stock access to the wetland)."

"A natural wetland, albeit of low ecological value, is located at the foot of the slope below the proposed landfill expansion area..."

Discussing the small stream in the southern part of the site, the TWWA states:

"The stream is already compromised by stock access and has poor water quality as indicated by the low MCI score for the site."

56. Please clarify the field of view shown in each image which conform to standard image reading distances to assist with an accurate understanding of the appearance/visibility of the Site from as seen from their respective viewpoints.

Response:

Mike Moore states in his Section 92 response (attached to this letter) that the photographs in the graphic supplement to the Landscape and Visual Assessment Report (Figures 2 – 10) are provided to support and generally illustrate his written descriptions. They do not include simulations of visual effects and are not intended to be relied on in place of a site / viewpoints visit. Never-the-less and as requested, the approximate fields of view for each stitched photograph are as noted in the table below:

Figure	*Horizontal field of view (degrees)*
2	173 (wide-angle)
3	93
4	68
5	67
6	75
7	63
8	94
9	97
10	102

57. Please confirm/clarify the difference between the existing natural landform and proposed additional height including identifying if/where it varies.

Response:

Mike Moore states in his Section 92 response that as shown in Figure 12c of his Landscape and Visual Assessment Report, the proposed landfill will result in an

eventual increase in the height of the current landform within its footprint area, and the increase will vary across the area with specific location.

Mike Moore states that there has not been surveyed height information to a high degree of detail available for this area, however, in consultation with WSP staff, Mr Moore states that he understands that the maximum current height within the proposed landfill footprint is approximately 28.5m. The final height of the landfill will be 36m, making the overall height increase from the current high point 7.5m. Mr Moore states that this is consistent with the height relationship shown in Section 01 in Figure 12c of the Landscape and Visual Assessment Report.

58. **Three key mitigation and remediation measures are described: limits to expansion, final rehabilitation, and screen plantings. The progressive landform screening approach appears to limit the location of the active working face. Please update the landscape assessment to refer to any limits to the size of the active working face, if they are proposed, or use of daily cover to help reduce potential visual effects.**

Response:

Mike Moore states in his Section 92 response (attached to this letter) that daily cover of the fill face with soil is an important operational measure to mitigate adverse effects of the landfill activity, including visual. Mr Moore states that he understands that this is consistent with best landfill management practice, is already done, and will continue to be done.

Mike Moore states that a maximum area for the active working face would potentially be an effective additional measure to further ensure visual effects are well mitigated. Mr Moore states that he would support a maximum area condition for the working face if this is acceptable to the applicant. The applicant would need to advise what a workable area would be.

59. **Please provide an indicative or maximum height of the resource recovery centre building so that the extent to which planting on the Kaitangata Highway frontage will screen and visually soften the views of the resource recovery centre can be assessed.**

Response:

Building heights for the Resource Recovery Centre have not yet been defined. However, Mr Moore received advice from WSP that an indicative height of 4m for the podium and re-use shop / education centre would be reasonable.

60. **Please clarify whether the final form of the landfill will integrate in this setting with minimal / neutral effects or whether long term effects will be adverse / moderate-low (or low/minor and less than minor as stated in the AEE pp 62 and 66) or, if both assessment findings apply, explain how they are different i.e. Does the statutory provisions assessment reflect a comparison between what is proposed and what exists?**

Response:

Mr Moore states that on page 22 of the Landscape and Visual Assessment Report, in discussing the landscape effects in relation to Section 7(c) and (f) of the RMA, Mr

Moore has commented that the final landform associated with the expanded landfill will integrate well in this setting, and rated landform effects as adverse / minimal - neutral. Mr Moore states that he acknowledges that giving a rating to the effects on landform is unhelpfully focused on one aspect and creates potential confusion. It would be best if this rating was disregarded.

Mr Moore states that the assessment of relevance is given on page 20 of the Landscape and Visual Assessment Report and addresses the effects on landscape values of the proposed expanded Mt Cooee Landfill generally. This is that long term effects (once rehabilitated), will be adverse / moderate-low (minor).

Planning

61. **Record of title OT4C/67 appears to be for a property in Wanaka. Please supply the correct title.**

    Response:

    Please find attached to this letter the correct Certificate of Title for land parcel Part Lot 61 DP 2254 (OT4C/367).

62. **There is no permitted activity rule authorising the discharge of dust and contaminants to air during earthworks to create the new cells. This discharge is a discretionary activity under RPWaste rule 7.6.1(3). Please confirm whether you agree to apply for consent under this rule.**

    Response:

    Yes we confirm that Clutha District Council is applying for a discharge permit to authorise the discharge of contaminants, such as dust, into air during the construction of the new cells at the Mt Cooee Landfill.

    The table in Section 1 of the AEE seeks a discharge permit for the discharge of dust into air under Rule 7.6.1 of the Waste Plan for a duration of 35 years, and this request is repeated in Section 6.4.1 of the AEE, which states that the proposed construction and operation of the landfill, including the proposed expansion, will include discharges of contaminants to air (such as dust) which require a resource consent as a **discretionary activity** under Rule 7.6.1 of the Waste Plan.

63. **Please explain whether there will be any diversion of water, including stormwater, occurring within 100 m of the natural wetland? Taking into consideration your answer to question 5 of this request for information, please also confirm whether there will be any earthworks, vegetation clearance, groundwater take, or discharges within 100 m of the natural wetland areas.**

    Response:

    We confirm that there will be no earthworks, vegetation clearance, groundwater take or discharges within 100m of the natural wetland areas on the landfill site, as per Figure 12 in the AEE (which is included below). Any stormwater that will be diverted within the site to the sediment retention ponds during the construction of the cells and then the operation of the landfill will be at least 100m away from the two natural wetlands.

There is a possibility that when the landfill is capped and remediated (i.e. grassed), stormwater runoff will discharge towards the wetlands as that is the original flow path (all stormwater would be considered clean and essentially rainwater). However, this will not be known until the Landfill Closure and Aftercare Plan is developed, and if a consent is required then, it will be sought by CDC.

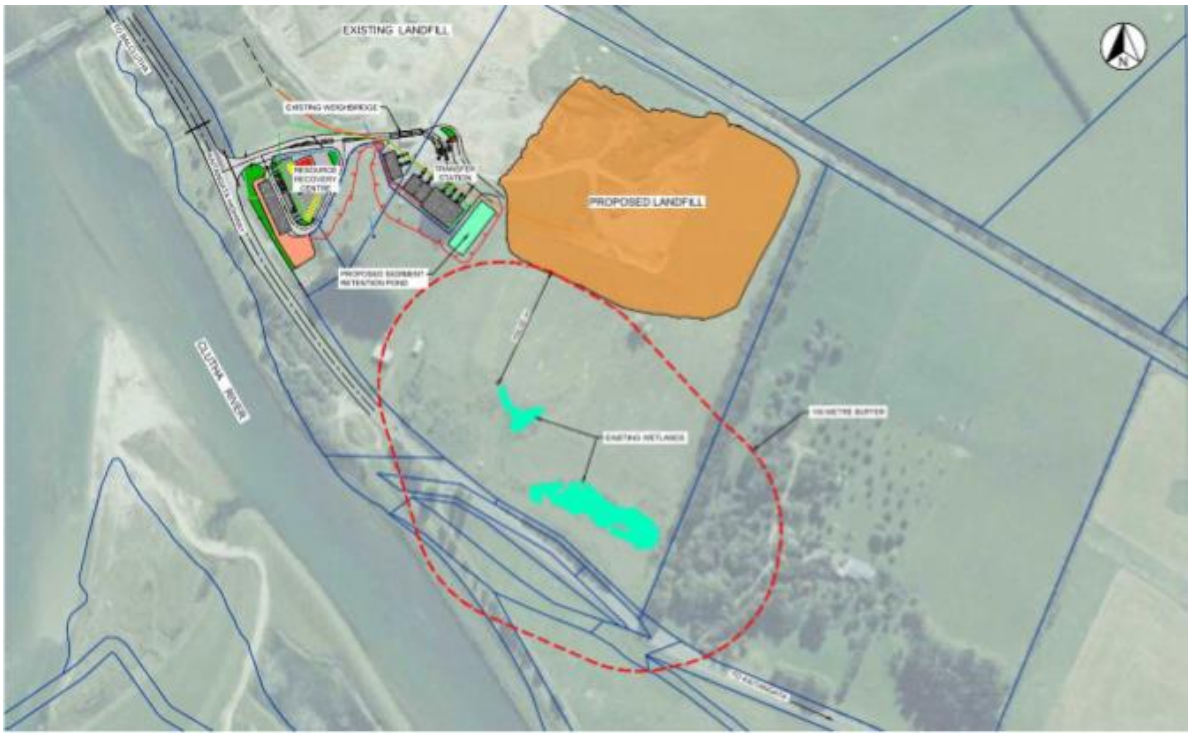

Figure 6: An excerpt of Figure 12 from the consent application / AEE showing all activities will be at least 100m away from the two natural wetlands located on site.

64. The assessment of the application against Policy 13 of the National Policy Statement for Freshwater Management assessment states that affected waterbodies will be monitored throughout the life of the resource consents, but this does not appear to be reflected in the proposed conditions. Please clarify whether monitoring of surface waterbodies is proposed, and if so, please include proposed conditions.

Response:

Our assessment against Policy 13 of the NPSFM related to visually monitoring the surface waterbodies within the site (such as the two natural wetlands and the unnamed tributary). CDC will visually monitor these surface waterbodies for any conspicuous change in the colour or visual clarity of the waterbodies, but as there are no discharges proposed to these waterbodies, CDC does not propose to undertake regular monitoring and sampling of these waterbodies.

65. Please assess the proposed groundwater take against RPW policy 6.4.1A to confirm whether the groundwater take should be allocated as groundwater under part (d) of this policy or instead as groundwater and part surface water under part (c) of this policy.

Response:

The proposed groundwater take should be allocated as groundwater under part (d) of RPW Policy 6.4.1A as the take will not deplete any nearby waterbody by more than 5 L/s. It is noted that the take itself is on average, less than 1 L/s and therefore any depletion of nearby waterbodies will be less than 1 L/s.

66. **Please provide GPS coordinates (NZTM2000) for the pump station and all locations where stormwater is discharged from the site.**

Response:

The map coordinates for the existing leachate pump station are E1350065 N4873851. The map coordinates for the point where stormwater is discharged into the Clutha River / Mata-Au, after going through the stormwater retention ponds, is E1349960 N4873787.

If you have any queries or require further information, please contact me (phone 03 373 2031 direct or email aileen.craw@wsp.com). I look forward to your response.

Kind regards,

Aileen Craw
Senior Planner