MT COOEE LANDFILL EXPANSION AREA: TERRESTRIAL, WETLAND, AND WATERWAY ASSESSMENT

For WSP

April 2023

REPORT INFORMATION AND QUALITY CONTROL

Prepared for:	WSP On behalf of Clutha District Council

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1 INTRODUCTION

Clutha District Council is applying for statutory approvals to authorise the continued operation of the Mt Cooee Landfill on Kaitangata Highway, Balclutha (Figure 1). The existing resource consents expire on 1 October 2023. Clutha District Council is also considering expansion of the landfill by adding new cells and a recovery centre. The proposed landfill expansion will require several resource consents along with technical assessments to support the consent applications.

Due to recent changes in legislation (particularly the National Policy Statement for Freshwater Management 2020 (NPS-FM) and National Environmental Standards for Freshwater 2020 (NES-FW)), there is a need to ensure that there are no natural wetlands present that could impact on the proposed development of the site.

This report comprises a wetland and waterway assessment of habitats within 100 m of the proposed landfill expansion area.

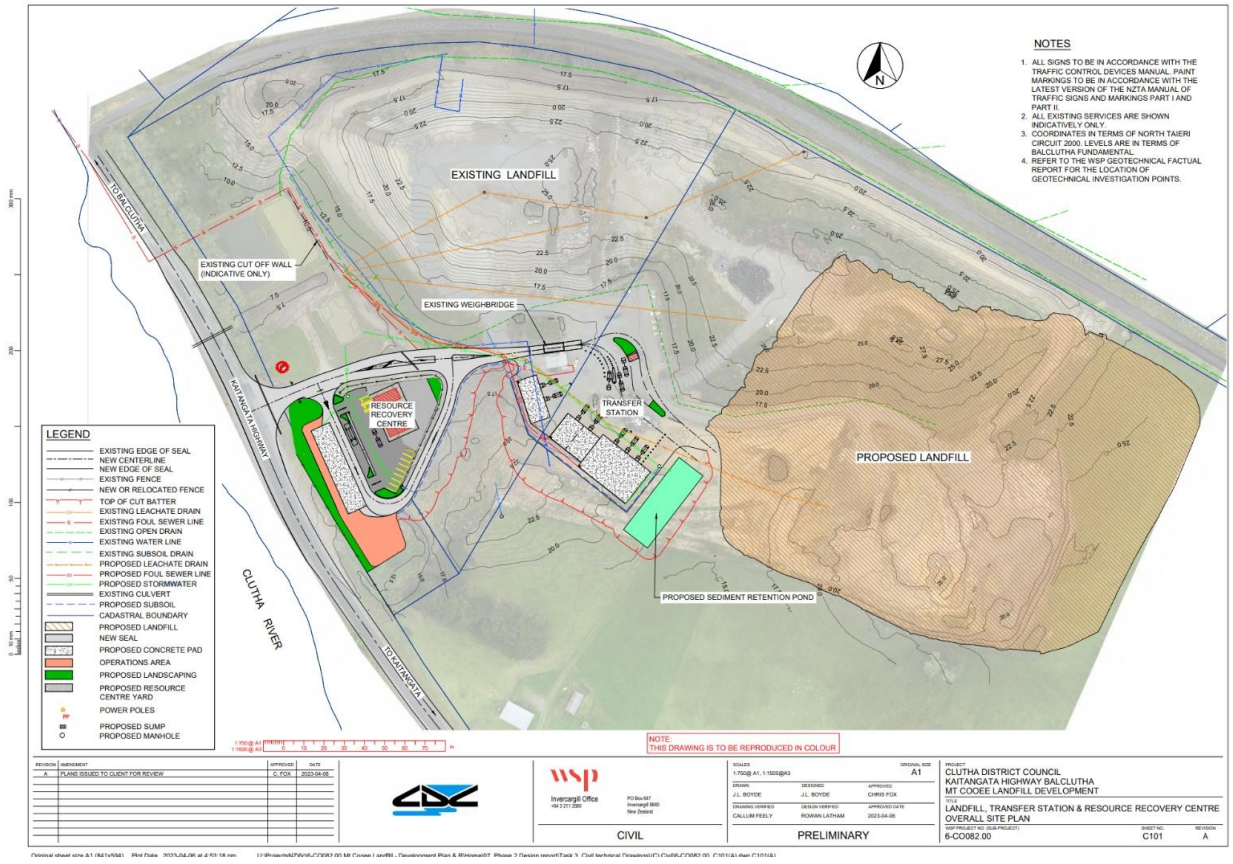


Figure 1: Site plan showing the proposed expansion of the Mt Cooee Landfill (WSP 2023a).

2 PROPOSED WORKS

The proposed expansion of the Mt Cooee landfill in the east of the site would comprise (WSP 2022):

- Development of a fill area of 348,000 m^3 over the "Area for Expansion" and consented "Borrow Area" in Figure 1.
- Placement of excavated surplus fill material immediately to the south of the cells ("Surplus Fill Disposal Area" in Figure 1).
- A base lining of 1.5mm HDPE over a GCL over clay (i.e. a Class 1 landfill liner).
- A main leachate drain extending up into the new fill area which will be buried by the fill.

3 METHODS

Wetlands

The site was visited on 4 November 2022. The site visit occurred during fine weather conditions, however there had been periods of heavy rainfall in the days prior to the site assessment. Rainfall over most of the South Island during October was below (50-79% of normal rainfall) or well below normal (<50% of normal rainfall)[1].

Areas of interest, including low-lying areas and potential wetlands identified from aerial imagery were walked through.

Identification of natural wetlands within and nearby the works areas were assessed in accordance with the NPS-FM 2020. The process for identifying the presence of wetlands is outlined in Appendix A. This includes a desktop phase to assess potential areas of wetlands followed by a site assessment.

The term 'natural wetland' is defined in the NPS-FM to mean wetlands as defined in the Resource Management Act 1991 (RMA), but with several exclusions.

Wetland is defined in the RMA as follows:

"***wetland*** *includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions*".

The specific definition of a natural wetland in the NPS-FM is:

"*A natural wetland means a wetland (as defined in the Act) that is not:*

a) a wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing or former natural wetland); or

b) a geothermal wetland; or

c) *any area of improved pasture that, at the commencement date, is dominated by (that is more than 50% of) exotic pasture species and is subject to temporary rain-derived water pooling.*"

Recent additional resources, such as the wetland hydrology and hydric soils tools have been incorporated since the NPS-FM release. A draft national pasture exclusion assessment methodology has also been released to inform the pasture exclusion component of the above definition but is yet to be finalised[2].

In order to determine the presence of natural wetlands, several 2 × 2 m wetland delineation plots and pasture exclusion assessments were undertaken in potential wetland habitat (as per Ministry for the Environment (MfE) 2021 and 2022). Where the ground was too wet to place the pegged quadrats (Plots C, C2, and H), the size of the plot was estimated visually. These sites are shown in Figure 3.

Waterways

A small waterway was identified extending from the foot of hillslopes to the Kaitangata Highway under which was a culvert. Riparian and aquatic habitats were described. A kicknet sample was taken at one site just upstream of the culvert.

4 TERRESTRIAL VEGETATION AND HABITATS

The existing landfill area contains buildings, sealed roads, gravel roads, bare earth, open tip face with disturbed waste, two stormwater retention ponds, exotic grasses and herbs, plantings (toetoe, flax, and copper tussock) and patches of exotic trees (including willow, poplar, and eucalyptus) (Figure 2).

[1] https://niwa.co.nz/sites/niwa.co.nz/files/Climate_Summary_October_2022_Final.pdf

[2] Ministry for the Environment. 2022. Pasture Exclusion Assessment Methodology. Wellington: Ministry for the Environment - DRAFT.

Figure 2: Stormwater retention ponds and plantings (left), and buildings and roads (right).

Most of the area proposed for expansion of the Mt Cooee landfill comprises low hillslopes covered in pasture which were grazed by sheep during the site visit (Figure 3). The pasture was dominated by perennial ryegrass (*Lolium perenne*) and sweet vernal (*Anthoxanthum odoratum*) with occasional browntop (*Agrostis capillaris*) and white clover (*Trifolium repens*), and patches of cocksfoot (*Dactylis glomerata*) east of the Borrow Area. A small clump of trees, containing willow (*Salix* sp.), hawthorn (*Crataegus monogyna*), and Lombardy poplar (*Populus nigra*), is present south of the Borrow Area. The hedge just over the boundary with the rail line contains hawthorn, broom (*Cytisus scoparius*), elder (*Sambucus nigra*), and gorse (*Ulex europaeus*), with bracken (*Pteridium esculentum*) and cocksfoot on the ground. A shelter belt, just beyond the edge of the expansion area to the east, comprises tall macrocarpa (*Cupressus macrocarpa*). A list of plant species observed in the survey area is provided in Appendix B.

The Borrow Area, which is part of the existing landfill, but will be partly encompassed by the proposed expansion, largely comprises bare earth, gravel, broken concrete and bricks, and a few small patches of pasture grasses and herbs.

Figure 3: Most of the proposed Surplus Fill Disposal Area comprises grazed pasture, with a small patch of trees near the Borrow Area (right).

5 WETLANDS

A small stream and several wet areas are located to the south of the proposed landfill expansion area. At the time of the site visit, water had pooled in the upper reaches of the small stream and to the southeast amongst tall rushes (*Juncus* spp.). The area was being grazed by sheep and cattle.

Nine wetland delineation plots were established in the area of tall rushes and in the headwaters of the stream (Figure 3). Photographs of the plots are provided in Appendix C and wetland delineation work sheets are provided in Appendix D.

Seven plots were determined to have hydrophytic vegetation present and on this basis a natural wetland is present at these sites. These plots included a moderate to high cover of wetland obligate species and facultative wetland species such as kneed foxtail (*Alopecurus geniculatus*), floating sweetgrass (*Glyceria fluitans*), creeping bent (*Agrostis stolonifera*), and spearwort (*Ranunculus flammula*), and/or a high cover of the facultative wetland species soft rush (*Juncus effusus*) and Edgar's rush (*J. edgariae*).

Two plots met the pasture exclusion test (>50% of pasture species) and therefore did not demonstrate the presence of a natural wetland. These plots were located in areas of relatively low rush density and higher pasture cover.

Based on the results of the wetland delineation assessments, field observations, and an estimation of rush density from aerial imagery, the likely boundary of the natural wetland has been determined (Figure 4). Groundwater level mapping indicated that the wetlands and stream are likely to be groundwater fed and flows are likely to reduce during lower groundwater levels (WSP 2023b).

The proposed landfill expansion area is proposed to be located at least 100m away from natural wetland.

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).

Figure 4: Wetland delineation plots and waterway south of the proposed landfill expansion area.

6 WATERWAYS

6.1 Existing landfill area

6.1.1 Waterways

A channelised, open stormwater diversion drain runs along the northern boundary of the landfill area and this is intended to flow to the existing sediment retention ponds (WSP 2023a). The drain was dry at the time of survey, and there was little vegetation present due to recent spraying with herbicide (Figure 5, left).

An overflow drain from the existing sediment retention ponds flows under the Kaitangata Highway to the Clutha River. Within the landfill area, the drain was dry in its upper reaches with little vegetation present due to spraying with herbicide, although monkey musk (*Erythranthe guttata*) has been recorded here (Opus 2011). Water pools occasionally near the culvert, and is present when the ponds are overflowing (WSP 2022c). On the other side of the highway, rank grass and weeds (such as great bindweed *Calystegia silvatica* and Yorkshire fog) grow on the banks and overhang the channel, and water cress and water are present (Opus 2011, WSP 2022b).

Figure 5: Stormwater diversion drain (left) and detention pond overflow drain (right, arrowed).

6.1.2 Aquatic macroinvertebrates

In 2011, all sample sites on the Mt Cooee tributary had MCI-sb and SQMCI-sb scores indicative of poor water quality, with almost no EPT taxa recorded (Opus 2011). As management of the landfill in the intervening period has not changed, and monitoring results for chemical parameters were “fairly consistent” over time (WSP 2022c), it is likely that water quality has remained much the same since then.

6.2 Proposed landfill expansion area

6.2.1 Waterway

A small waterway extends from the foot of low hillslopes to the Kaitangata Highway. The waterway had low flow of water at the time of the survey, with 5-10 cm water depth and the wetted channel about 1 m wide (Figure 6, left). The soft mud substrate was approximately 5 cm deep at the kicknet sample site (Figure 4, Figure 7, left).

In the mid to lower reaches, open areas of water were separated by patches of jointed rush (*Juncus articulatus*), which also extended along the margins of the waterway. Starwort (*Callitriche stagnalis*) and floating sweetgrass (*Glyceria fluitans*) were also present in low abundance.

Little open water was visible in the upper reaches of the waterway, which was covered in dense floating sweetgrass with a few soft rushes (*Juncus effusus*), and occasional patches of spearwort (*Ranunculus flammula*) (Figure 6, right). The upper reaches have been identified as wetland (see section 5 above). The margins of the waterway appeared to have been sprayed with herbicide in some areas.

The waterway is electric fenced from stock in its lower reaches. There is a small wooden bridge/stock crossing near the road.

The waterway passes through a culvert under Kaitangata Highway, after which it joins a drainage ditch running parallel to the road (Figure 3, Figure 7, right).

Figure 6: Lower (left) and upper (right) reaches of the small waterway downslope of the proposed landfill expansion area. 4 November 2022

Figure 7: Culvert inlet (left) and drain on the other side of Kaitangata Highway (right). 4 November 2022.

6.2.2 Aquatic macroinvertebrates

Only 13 macroinvertebrate taxa were recorded within the stream. The invertebrate community was dominated by worms *Oligochaeta* and roundworms *Nematoda*. None of the more sensitive EPT[3] species were recorded. Tolerance scores ranged from 0.7-6.4 with the most abundant taxa having low scores reflecting their tolerance of poor water quality.

The Macroinvertebrate community index (sb-MCI) score[4] of only 69.4 indicated poor water and/or habitat quality potentially from severe enrichment.

The results of the macroinvertebrate sample analysis are included in Appendix E.

[3] Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (mayflies)

[4] Stark, J. D.; Boothroyd, I. K. G; Harding, J. S.; Maxted, J. R.; Scarsbrook, M. R. 2001. Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No. 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5103. 57p.

7 DISCUSSION AND RECOMMENDATIONS

7.1 Existing landfill area

No new impacts are anticipated from the landfill operations which are proposed to continue in this area.

7.2 Proposed landfill expansion area

Terrestrial vegetation

Most of the area proposed for expansion of the Mt Cooee landfill comprises grazed pasture with relatively low ecological values. No indigenous plant species were recorded in the proposed expansion area. Once the landfill is closed, copper tussock will be planted after the fill areas are capped and topsoiled.. Native planting is also proposed along the north western boundary in addition to native tree planting near the centre of the site to assist with screening (Moore, 2023). Therefore, the proposed expansion of the Mt Cooee landfill will have very low adverse effects on terrestrial vegetation over the long term and native planting will positively contribute to local ecology.

Wetland

A natural wetland, albeit of low ecological value, is located at the foot of the slope below the proposed landfill expansion area. As this wetland is proposed to be at least 100 m from the proposed landfill expansion area, the works are not subject to the Resource Management (National Environmental Standards for Freshwater) Regulations 2020.

Silt and sediment control measures shall be adhered to during works to ensure these do not discharge into this wetland.

The Groundwater and Surface Water Assessment (WSP 2023b) does not anticipate any measurable impact on flows to the wetlands from the proposed landfill expansion.

Stream

As the stream is a reasonable distance away (~130m) from the proposed landfill area it is not anticipated to be adversely impacted by the proposal. The Groundwater and Surface Water Assessment (WSP 2023b) states that the small reduction in the catchment upslope of the stream from the proposed landfill expansion is unlikely to affect the small stream.

The stream is already compromised by stock access and has poor water quality as indicated by the low MCI score for the site. It is however important to ensure this will not be further impacted by the proposed landfill expansion. The proposed new stormwater sediment retention pond is proposed to discharge to the existing retention ponds and not to the stream. However, all works shall be designed in accordance with best practice and the area of earthworks managed to minimise potential silt and sediment discharge to the channel.

If the landfill extent were to be closer to the stream than proposed it would be recommended to obtain baseline water quality data on this stream before expansion activities, to ensure any impacts can be detected and managed if necessary.

Impacts on water quality and the management of leachate on the Clutha River have been assessed in a separate water quality assessment[5].

[5] Ryan E. 2022. Assessment of effects on Clutha River water quality. 4Sight Consulting Ltd. Prepared for WSP.

8 REFERENCES

MfE 2021. Defining 'natural wetlands' and 'natural inland wetlands' Guidance to support the interpretation of the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020.

MfE 2022. Draft Pasture Exclusion Assessment Methodology. National Policy Statement - Freshwater Management 2020.

Moore, M 2023. Landscape Mitigation Concept and Effects Assessment Report.

Opus 2011. Ecological effects of Mt Cooee landfill discharge. Survey of Clutha River and Mt Cooee landfill tributary, March 2011.

WSP 2022a. Mt Cooee Landfill: Consenting Strategy. Revision 2.0. Prepared for Clutha District Council.

WSP 2022b. WasteCo NZ (Southern) Limited Mt Cooee Landfill. April 2022 Quarterly Environmental Monitoring Report.

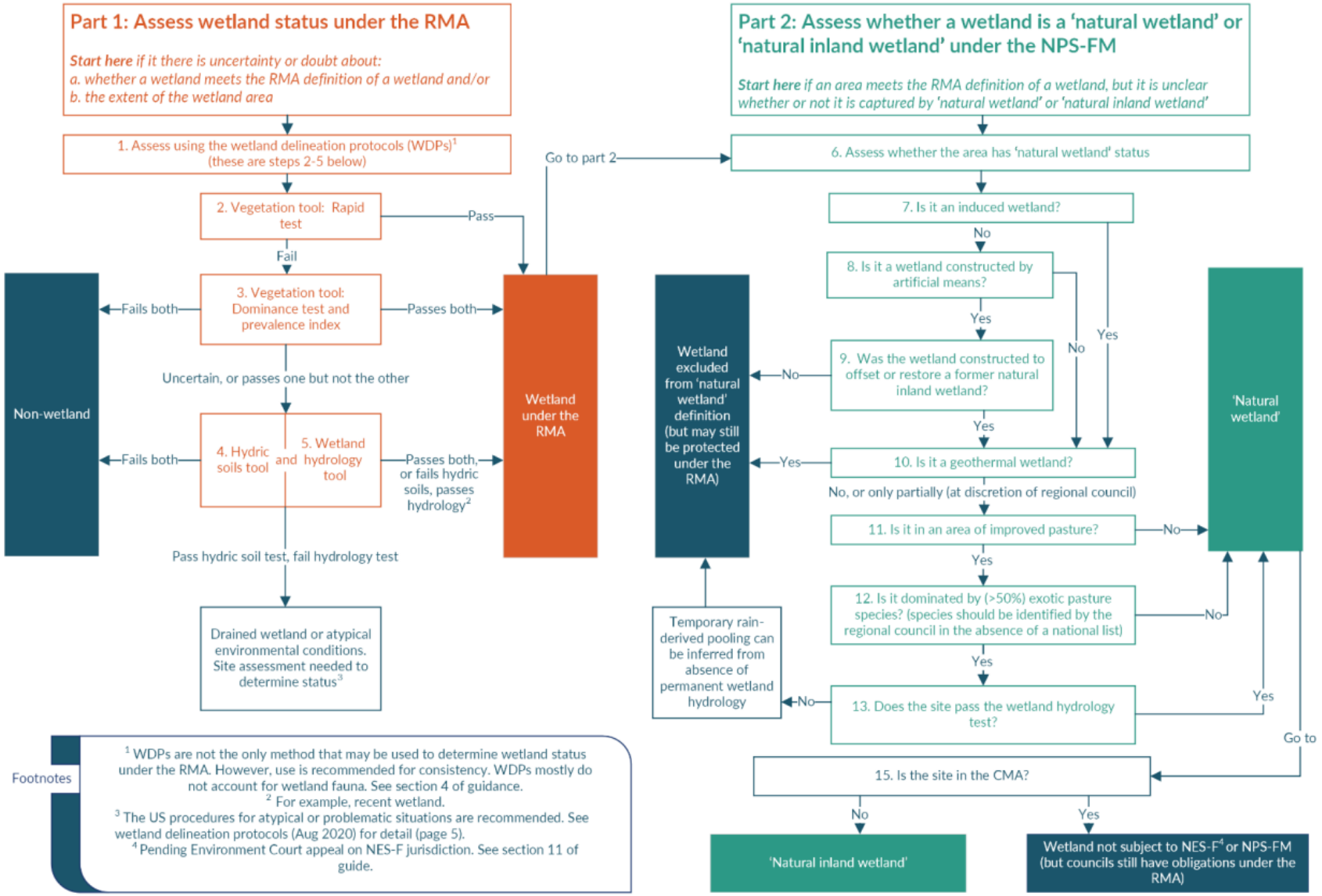
WSP 2022c. WasteCo NZ (Southern) Limited Mt Cooee Landfill. September 2022 Quarterly Environmental Monitoring Report.

WSP 2023a. Clutha District Council, Kaitangata Highway Balclutha, Mt Cooee Landfill Development Civil Consent. Drawing Set. Project No. CO082.00, Date: 2023_04_06.

WSP 2023b. Mt Cooee Landfill Resource Consent Application. Assessment of Effects on Groundwater and Surface Water.

Appendix A:

Wetland Delineation Protocols


Part 1: Assess wetland status under the RMA
Start here if it there is uncertainty or doubt about:
a. whether a wetland meets the RMA definition of a wetland and/or
b. the extent of the wetland area
1. Assess using the wetland delineation protocols (WDPs)[1] (these are steps 2-5 below)
2. Vegetation tool: Rapid test
Pass
Fail
3. Vegetation tool: Dominance test and prevalence index
Fails both
Passes both
Uncertain, or passes one but not the other
4. Hydric soils tool
and
5. Wetland hydrology tool
Fails both
Passes both, or fails hydric soils, passes hydrology[2]
Pass hydric soil test, fail hydrology test
Non-wetland
Wetland under the RMA
Drained wetland or atypical environmental conditions. Site assessment needed to determine status[3]
Go to part 2
Part 2: Assess whether a wetland is a 'natural wetland' or 'natural inland wetland' under the NPS-FM
Start here if an area meets the RMA definition of a wetland, but it is unclear whether or not it is captured by 'natural wetland' or 'natural inland wetland'
6. Assess whether the area has 'natural wetland' status
7. Is it an induced wetland?
No
8. Is it a wetland constructed by artificial means?
Yes
No
Yes
9. Was the wetland constructed to offset or restore a former natural inland wetland?
No
Yes
Wetland excluded from 'natural wetland' definition (but may still be protected under the RMA)
10. Is it a geothermal wetland?
Yes
No, or only partially (at discretion of regional council)
11. Is it in an area of improved pasture?
No
Yes
'Natural wetland'
12. Is it dominated by (>50%) exotic pasture species? (species should be identified by the regional council in the absence of a national list)
No
Yes
Temporary rain-derived pooling can be inferred from absence of permanent wetland hydrology
No
13. Does the site pass the wetland hydrology test?
Yes
Go to
15. Is the site in the CMA?
No
Yes
'Natural inland wetland'
Wetland not subject to NES-F[4] or NPS-FM (but councils still have obligations under the RMA)
Footnotes
[1] WDPs are not the only method that may be used to determine wetland status under the RMA. However, use is recommended for consistency. WDPs mostly do not account for wetland fauna. See section 4 of guidance.
[2] For example, recent wetland.
[3] The US procedures for atypical or problematic situations are recommended. See wetland delineation protocols (Aug 2020) for detail (page 5).
[4] Pending Environment Court appeal on NES-F jurisdiction. See section 11 of guide.

Appendix B:

Vascular plant species recorded within the survey area

Relative abundance is assessed individually for each site. A: Abundant, F: Frequent, O: Occasional, R: Rare.

Status	Species	Common Name	Growth form	Site		
				Mt Cooee expansion area	Hedges/ shelter belts	Wetland
Indigenous	*Eleocharis acuta*	Sharp spike sedge	Sedge			R
	Juncus edgariae	Edgar's rush; Wīwī	Rush			F
	Pteridium esculentum	Bracken; rārahu	Fern		O	
Exotic	*Agrostis capillaris*	Browntop	Grass	O		
	Agrostis stolonifera	Creeping bent	Grass			O
	Alopecurus geniculatus	Kneed foxtail	Grass			O
	Anthoxanthum odoratum	Sweet vernal	Grass	A		O
	Callitriche stagnalis	Starwort	Herb			R
	Cerastium fontanum	Mouse-ear chickweed	Herb	R		R
	Cirsium vulgare	Scotch thistle	Herb	R		
	Crataegus monogyna	Hawthorn	Tree	R	O	
	Crepis capillaris	Hawksbeard	Herb	R		R
	Cupressus macrocarpa	Macrocarpa	Tree		F	
	Cytisus scoparius	Scotch broom	Shrub		O	
	Dactylis glomerata	Cocksfoot	Grass	R		
	Glyceria fluitans	Floating sweet grass	Grass			O
	Holcus lanatus	Yorkshire fog	Grass			O
	Hypochaeris radicata	Catsear	Herb	R		R
	Juncus articulatus	Jointed rush	Rush			O
	Juncus effusus	Soft rush	Rush			O
	Lolium perenne	Perennial ryegrass	Grass	A		
	Plantago lanceolata	Narrow-leaved plantain	Herb			R
	Poa pratensis	Smooth meadow grass	Grass	R		
	Populus nigra	Lombardy poplar	Tree	R		
	Prunella vulgaris	Self-heal	Herb			R
	Ranunculus flammula	Spearwort	Herb			O
	Ranunculus repens	Creeping buttercup	Herb			6
	Rumex obtusifolius	Broad-leaved dock	Herb			R
	Salix species	Willow	Tree	R		
	Sambucus nigra	Elder	Shrub		O	
	Taraxacum officinale	Dandelion	Herb	R		
	Trifolium pratense	Red clover	Herb			R
	Trifolium repens	White clover	Herb	O		O
	Ulex europaeus	Gorse	Shrub		R	

Appendix C:

Photographs of wetland delineation plots

Wetland delineation Plot A

Wetland delineation Plot B

Wetland delineation Plot C

Wetland delineation Plot D

Wetland delineation Plot E

Wetland delineation Plot C2

Wetland delineation Plot F

Wetland delineation Plot G

Wetland delineation Plot H

Appendix D:

Wetland delineation worksheets

Plot A

Wetland Determination Data Form

Project Site	Mt Cooee
Region	Otago
Sampling Date	4-Nov-22
Applicant/Owner	Clutha DC
Altitude	
Sampling point number	A
Investigator(s)	SR
Nearby town/city	Balclutha
Landform (concave, convex, none)	
Slope	
NZTM easting	
NZTM northing	
Soil Map Unit Name	
Climatic/ hydrological conditionstypical for time of year?	Y
Vegetation disturbed?	N
Soil disturbed?	N
Hydrology disturbed?	N
Normal circumstances present?	Y
Vegetation naturally problematic?	N
Soil naturally problematic?	N
Hydrology naturally problematic?	N

Summary of Findings	Yes/No/N/A
Hydrophytic Vegetation Present?	Yes
Hydric Soil Present?	Not assessed
Wetland Hydrology Present?	Not assessed
Site comprises pasture	No
Is the sample area within a wetland?	**YES**

Stratum	Plot size	Species	Absolute cover (%)	Dominant species?	Indicator Status	Pasture species
Herb	2 x 2m	JUNart	30	Yes	FACW	
Herb	2 x 2m	HOLlan	26	Yes	FAC	Yes
Herb	2 x 2m	RANrep	20	Yes	FAC	
Herb	2 x 2m	RANfla	15		FACW	
Herb	2 x 2m	ALQgen	10		FACW	
Herb	2 x 2m	RUMobt	1		FAC	
Herb	2 x 2m	ANTodo	0.5		FACU	Yes
Herb	2 x 2m	TRIpra	0.5		FACU	Yes

Dominance Test Worksheet		
Number of dominant species that are OBL, FACW, or FAC	3	(A)
Total number of dominant species across all strata	3	(B)
Percent of dominant species that are OBL, FACW, or FAC	100	(A/B)×100

Prevalence Index Worksheet	Total % cover			
OBL species	0	× 1	0	
FACW species	55	× 2	110	
FAC species	47	× 3	141	
FACU species	1	× 4	4	
UPL species		× 5	0	
Column totals	103	(C)	255	(D)
Prevalence index = D/C =	2.48			

Hydrophytic Vegetation Indicators	Yes/No
Dominance Test is >50%	Yes
Prevalence Index is ≤3.0	Yes
Morphological Adaptations (Provide supporting data in Remarks)	
Problematic Hydrophytic Vegetation (Explain)	
Hydrophytic Vegetation Present?	Yes

Remarks

Pasture Exclusion Test	Yes/No
Summed cover of pasture species	27
Pasture species ≥50% cover	No

Plot B

Wetland Determination Data Form

Project Site	Mt Cooee
Region	Otago
Sampling Date	4-Nov-22
Applicant/Owner	Clutha DC
Altitude	
Sampling point number	B
Investigator(s)	SR
Nearby town/city	Balclutha
Landform (concave, convex, none)	
Slope	
NZTM easting	
NZTM northing	
Soil Map Unit Name	
Climatic/ hydrological conditionstypical for time of year?	Y
Vegetation disturbed?	N
Soil disturbed?	N
Hydrology disturbed?	N
Normal circumstances present?	Y
Vegetation naturally problematic?	N
Soil naturally problematic?	N
Hydrology naturally problematic?	N

Summary of Findings	Yes/No/N/A
Hydrophytic Vegetation Present?	No
Hydric Soil Present?	Not assessed
Wetland Hydrology Present?	Not assessed
Site comprises pasture	Yes
Is the sample area within a wetland?	**NO**

Stratum	Plot size	Species	Absolute cover (%)	Dominant species?	Indicator Status	Pasture species
Herb	2 x 2m	ANTodo	55	Yes	FACU	Yes
Herb	2 x 2m	HOLlan	20	Yes	FAC	Yes
Herb	2 x 2m	JUNedg	15		FACW	
Herb	2 x 2m	RANrep	3		FAC	
Herb	2 x 2m	TRIrep	3		FACU	Yes
Herb	2 x 2m	CREcap	1		FACU	
Herb	2 x 2m	HYPrad	1		FACU	
Herb	2 x 2m	RUMobt	0.5		FAC	

Dominance Test Worksheet		
Number of dominant species that are OBL, FACW, or FAC	1	(A)
Total number of dominant species across all strata	2	(B)
Percent of dominant species that are OBL, FACW, or FAC	50	(A/B)×100

Prevalence Index Worksheet	Total % cover			
OBL species	0	× 1	0	
FACW species	15	× 2	30	
FAC species	23.5	× 3	70.5	
FACU species	60	× 4	240	
UPL species		× 5	0	
Column totals	98.5	(C)	340.5	(D)
Prevalence index = D/C =	3.46			

Hydrophytic Vegetation Indicators	Yes/No
Dominance Test is >50%	No
Prevalence Index is ≤3.0	No
Morphological Adaptations (Provide supporting data in Remarks)	
Problematic Hydrophytic Vegetation (Explain)	
Hydrophytic Vegetation Present?	No

Remarks

Pasture Exclusion Test	Yes/No
Summed cover of pasture species	78
Pasture species ≥50% cover	Yes

Plot C

Wetland Determination Data Form

Project Site	Mt Cooee
Region	Otago
Sampling Date	4-Nov-22
Applicant/Owner	Clutha DC
Altitude	
Sampling point number	C
Investigator(s)	SR
Nearby town/city	Balclutha
Landform (concave, convex, none)	
Slope	
NZTM easting	
NZTM northing	
Soil Map Unit Name	
Climatic/ hydrological conditionstypical for time of year?	Y
Vegetation disturbed?	N
Soil disturbed?	N
Hydrology disturbed?	N
Normal circumstances present?	Y
Vegetation naturally problematic?	N
Soil naturally problematic?	N
Hydrology naturally problematic?	N

Summary of Findings	Yes/No/N/A
Hydrophytic Vegetation Present?	Yes
Hydric Soil Present?	Not assessed
Wetland Hydrology Present?	Not assessed
Site comprises pasture	No
Is the sample area within a wetland?	**YES**

Stratum	Plot size	Species	Absolute cover (%)	Dominant species?	Indicator Status	Pasture species
Herb	2 x 2m	ALQgen	60	Yes	FACW	
Herb	2 x 2m	GLYflu	23	Yes	OBL	
Herb	2 x 2m	AGRsto	10		FACW	
Herb	2 x 2m	RANfla	5		FACW	
Herb	2 x 2m	HOLlan	2		FAC	Yes

Dominance Test Worksheet		
Number of dominant species that are OBL, FACW, or FAC	2	(A)
Total number of dominant species across all strata	2	(B)
Percent of dominant species that are OBL, FACW, or FAC	100	(A/B)×100

Prevalence Index Worksheet	Total % cover			
OBL species	23	× 1	23	
FACW species	75	× 2	150	
FAC species	2	× 3	6	
FACU species		× 4	0	
UPL species		× 5	0	
Column totals	100	(C)	179	(D)
Prevalence index = D/C =	1.79			

Hydrophytic Vegetation Indicators	Yes/No
Dominance Test is >50%	Yes
Prevalence Index is ≤3.0	Yes
Morphological Adaptations (Provide supporting data in Remarks)	
Problematic Hydrophytic Vegetation (Explain)	
Hydrophytic Vegetation Present?	Yes

Remarks

Pasture Exclusion Test	Yes/No
Summed cover of pasture species	2
Pasture species ≥50% cover	No

Plot C2

Wetland Determination Data Form

Project Site	Mt Cooee
Region	Otago
Sampling Date	4-Nov-22
Applicant/Owner	Clutha DC
Altitude	
Sampling point number	C2
Investigator(s)	SR
Nearby town/city	Balclutha
Landform (concave, convex, none)	
Slope	
NZTM easting	
NZTM northing	
Soil Map Unit Name	
Climatic/ hydrological conditionstypical for time of year?	Y
Vegetation disturbed?	N
Soil disturbed?	N
Hydrology disturbed?	N
Normal circumstances present?	Y
Vegetation naturally problematic?	N
Soil naturally problematic?	N
Hydrology naturally problematic?	N

Summary of Findings	Yes/No/N/A
Hydrophytic Vegetation Present?	Yes
Hydric Soil Present?	Not assessed
Wetland Hydrology Present?	Not assessed
Site comprises pasture	No
Is the sample area within a wetland?	**YES**

Stratum	Plot size	Species	Absolute cover (%)	Dominant species?	Indicator Status	Pasture species
Herb	2 x 2m	ALQgen	45	Yes	FACW	
Herb	2 x 2m	AGRsto	35	Yes	FACW	
Herb	2 x 2m	JUNart	10		FACW	
Herb	2 x 2m	RANfla	4		FACW	
Herb	2 x 2m	HOLlan	3		FAC	Yes
Herb	2 x 2m	ELEacu	3		OBL	

Dominance Test Worksheet		
Number of dominant species that are OBL, FACW, or FAC	2	(A)
Total number of dominant species across all strata	2	(B)
Percent of dominant species that are OBL, FACW, or FAC	100	(A/B)×100

Prevalence Index Worksheet	Total % cover			
OBL species	3	× 1	3	
FACW species	94	× 2	188	
FAC species	3	× 3	9	
FACU species		× 4	0	
UPL species		× 5	0	
Column totals	100	(C)	200	(D)
Prevalence index = D/C =	2			

Hydrophytic Vegetation Indicators	Yes/No
Dominance Test is >50%	Yes
Prevalence Index is ≤3.0	Yes
Morphological Adaptations (Provide supporting data in Remarks)	
Problematic Hydrophytic Vegetation (Explain)	
Hydrophytic Vegetation Present?	Yes

Remarks

Pasture Exclusion Test	Yes/No
Summed cover of pasture species	3
Pasture species ≥50% cover	No

Plot D

Wetland Determination Data Form

Project Site	Mt Cooee
Region	Otago
Sampling Date	4-Nov-22
Applicant/Owner	Clutha DC
Altitude	
Sampling point number	D
Investigator(s)	SR
Nearby town/city	Balclutha
Landform (concave, convex, none)	
Slope	
NZTM easting	
NZTM northing	
Soil Map Unit Name	
Climatic/ hydrological conditionstypical for time of year?	Y
Vegetation disturbed?	N
Soil disturbed?	N
Hydrology disturbed?	N
Normal circumstances present?	Y
Vegetation naturally problematic?	N
Soil naturally problematic?	N
Hydrology naturally problematic?	N

Summary of Findings	Yes/No/N/A
Hydrophytic Vegetation Present?	Yes
Hydric Soil Present?	Not assessed
Wetland Hydrology Present?	Not assessed
Site comprises pasture	No
Is the sample area within a wetland?	**YES**

Stratum	Plot size	Species	Absolute cover (%)	Dominant species?	Indicator Status	Pasture species
Herb	2 x 2m	ALOgen	40	Yes	FACW	
Herb	2 x 2m	JUNedg	35	Yes	FACW	
Herb	2 x 2m	HOLlan	30	Yes	FAC	Yes
Herb	2 x 2m	RANrep	3		FAC	
Herb	2 x 2m	TRIrep	2		FACU	Yes

Dominance Test Worksheet		
Number of dominant species that are OBL, FACW, or FAC	3	(A)
Total number of dominant species across all strata	3	(B)
Percent of dominant species that are OBL, FACW, or FAC	100	(A/B)×100

Prevalence Index Worksheet	Total % cover			
OBL species	0	× 1	0	
FACW species	75	× 2	150	
FAC species	33	× 3	99	
FACU species	2	× 4	8	
UPL species		× 5	0	
Column totals	110	(C)	257	(D)
Prevalence index = D/C =	2.34			

Hydrophytic Vegetation Indicators	Yes/No
Dominance Test is >50%	Yes
Prevalence Index is ≤3.0	Yes
Morphological Adaptations (Provide supporting data in Remarks)	
Problematic Hydrophytic Vegetation (Explain)	
Hydrophytic Vegetation Present?	Yes

Remarks

Pasture Exclusion Test	Yes/No
Summed cover of pasture species	32
Pasture species ≥50% cover	No

Plot E

Wetland Determination Data Form

Project Site	Mt Cooee
Region	Otago
Sampling Date	4-Nov-22
Applicant/Owner	Clutha DC
Altitude	
Sampling point number	E
Investigator(s)	SR
Nearby town/city	Balclutha
Landform (concave, convex, none)	
Slope	
NZTM easting	
NZTM northing	
Soil Map Unit Name	
Climatic/ hydrological conditionstypical for time of year?	Y
Vegetation disturbed?	N
Soil disturbed?	N
Hydrology disturbed?	N
Normal circumstances present?	Y
Vegetation naturally problematic?	N
Soil naturally problematic?	N
Hydrology naturally problematic?	N

Summary of Findings	Yes/No/N/A
Hydrophytic Vegetation Present?	Yes
Hydric Soil Present?	Not assessed
Wetland Hydrology Present?	Not assessed
Site comprises pasture	No
Is the sample area within a wetland?	**YES**

Stratum	Plot size	Species	Absolute cover (%)	Dominant species?	Indicator Status	Pasture species
Herb	2 x 2m	JUNeff	60	Yes	FACW	
Herb	2 x 2m	HOLlan	25	Yes	FAC	Yes
Herb	2 x 2m	TRIrep	8		FACU	Yes
Herb	2 x 2m	ANTodo	6		FACU	Yes
Herb	2 x 2m	RANrep	2		FAC	
Herb	2 x 2m	AGRsto	1		FACW	
Herb	2 x 2m	JUNart	1		FACW	

Dominance Test Worksheet		
Number of dominant species that are OBL, FACW, or FAC	2	(A)
Total number of dominant species across all strata	2	(B)
Percent of dominant species that are OBL, FACW, or FAC	100	(A/B)×100

Prevalence Index Worksheet	Total % cover			
OBL species	0	× 1	0	
FACW species	62	× 2	124	
FAC species	27	× 3	81	
FACU species	14	× 4	56	
UPL species		× 5	0	
Column totals	103	(C)	261	(D)
Prevalence index = D/C =	2.53			

Hydrophytic Vegetation Indicators	Yes/No
Dominance Test is >50%	Yes
Prevalence Index is ≤3.0	Yes
Morphological Adaptations (Provide supporting data in Remarks)	
Problematic Hydrophytic Vegetation (Explain)	
Hydrophytic Vegetation Present?	Yes

Remarks

Pasture Exclusion Test	Yes/No
Summed cover of pasture species	39
Pasture species ≥50% cover	No

Plot F

Wetland Determination Data Form

Project Site	Mt Cooee
Region	Otago
Sampling Date	4-Nov-22
Applicant/Owner	Clutha DC
Altitude	
Sampling point number	F
Investigator(s)	SR
Nearby town/city	Balclutha
Landform (concave, convex, none)	
Slope	
NZTM easting	
NZTM northing	
Soil Map Unit Name	
Climatic/ hydrological conditionstypical for time of year?	Y
Vegetation disturbed?	N
Soil disturbed?	N
Hydrology disturbed?	N
Normal circumstances present?	Y
Vegetation naturally problematic?	N
Soil naturally problematic?	N
Hydrology naturally problematic?	N

Summary of Findings	Yes/No/N/A
Hydrophytic Vegetation Present?	No
Hydric Soil Present?	Not assessed
Wetland Hydrology Present?	Not assessed
Site comprises pasture	Yes
Is the sample area within a wetland?	**NO**

Stratum	Plot size	Species	Absolute cover (%)	Dominant species?	Indicator Status	Pasture species
Herb	2 x 2m	ANTodo	60	Yes	FACU	Yes
Herb	2 x 2m	JUNedg	25	Yes	FACW	
Herb	2 x 2m	HOLlan	10		FAC	Yes
Herb	2 x 2m	PRUvul	3		FACU	
Herb	2 x 2m	TRIrep	2		FACU	Yes
Herb	2 x 2m	CERfon	1		FACU	
Herb	2 x 2m	RANrep	1		FAC	
Herb	2 x 2m	CREcap	0.5		FACU	
Herb	2 x 2m	PLAlan	0.5		FACU	
Herb	2 x 2m	JUNart	0.5		FACW	

Dominance Test Worksheet		
Number of dominant species that are OBL, FACW, or FAC	2	(A)
Total number of dominant species across all strata	2	(B)
Percent of dominant species that are OBL, FACW, or FAC	100	(A/B)×100

Prevalence Index Worksheet	Total % cover			
OBL species	0	× 1	0	
FACW species	25.5	× 2	51	
FAC species	11	× 3	33	
FACU species	67	× 4	268	
UPL species		× 5	0	
Column totals	103.5	(C)	352	(D)
Prevalence index = D/C =	3.4			

Hydrophytic Vegetation Indicators	Yes/No
Dominance Test is >50%	Yes
Prevalence Index is ≤3.0	No
Morphological Adaptations (Provide supporting data in Remarks)	
Problematic Hydrophytic Vegetation (Explain)	
Hydrophytic Vegetation Present?	No

Remarks

Pasture Exclusion Test	Yes/No
Summed cover of pasture species	72
Pasture species ≥50% cover	Yes

Plot G

Wetland Determination Data Form

Project Site	Mt Cooee
Region	Otago
Sampling Date	4-Nov-22
Applicant/Owner	Clutha DC
Altitude	
Sampling point number	G
Investigator(s)	SR
Nearby town/city	Balclutha
Landform (concave, convex, none)	
Slope	
NZTM easting	
NZTM northing	
Soil Map Unit Name	
Climatic/ hydrological conditionstypical for time of year?	Y
Vegetation disturbed?	N
Soil disturbed?	N
Hydrology disturbed?	N
Normal circumstances present?	Y
Vegetation naturally problematic?	N
Soil naturally problematic?	N
Hydrology naturally problematic?	N

Summary of Findings	Yes/No/N/A
Hydrophytic Vegetation Present?	Yes
Hydric Soil Present?	Not assessed
Wetland Hydrology Present?	Not assessed
Site comprises pasture	No
Is the sample area within a wetland?	**YES**

Stratum	Plot size	Species	Absolute cover (%)	Dominant species?	Indicator Status	Pasture species
Herb	2 x 2m	JUNeff	50	Yes	FACW	
Herb	2 x 2m	HOLlan	20	Yes	FAC	Yes
Herb	2 x 2m	RANrep	20	Yes	FAC	
Herb	2 x 2m	ANTodo	8		FACU	Yes
Herb	2 x 2m	TRIrep	5		FACU	Yes
Herb	2 x 2m	AGRsto	3		FACW	
Herb	2 x 2m	RUMobt	0.5		FAC	
Herb	2 x 2m	JUNart	0.5		FACW	
Herb	2 x 2m	CALsta	0.5		OBL	

Dominance Test Worksheet		
Number of dominant species that are OBL, FACW, or FAC	3	(A)
Total number of dominant species across all strata	3	(B)
Percent of dominant species that are OBL, FACW, or FAC	100	(A/B)×100

Prevalence Index Worksheet	Total % cover			
OBL species	0.5	× 1	0.5	
FACW species	53.5	× 2	107	
FAC species	40.5	× 3	121.5	
FACU species	13	× 4	52	
UPL species		× 5	0	
Column totals	107.5	(C)	281	(D)
Prevalence index = D/C =	2.61			

Hydrophytic Vegetation Indicators	Yes/No
Dominance Test is >50%	Yes
Prevalence Index is ≤3.0	Yes
Morphological Adaptations (Provide supporting data in Remarks)	
Problematic Hydrophytic Vegetation (Explain)	
Hydrophytic Vegetation Present?	Yes

Remarks

Pasture Exclusion Test	Yes/No
Summed cover of pasture species	33
Pasture species ≥50% cover	No

Appendix E:

Aquatic macroinvertebrates

TAXON	MCI score	MCI-sb score	Mount Cooee stream
COLEOPTERA			
Liodessus	5	4.9	20
Scirtidae	8	6.4	1
COLLEMBOLA	6	5.3	320
CRUSTACEA			
Ostracoda	3	1.9	120
DIPTERA			
Chironomus	1	3.4	20
Culicidae	3	1.2	1
Orthocladiinae	2	3.2	360
Psychodidae	1	6.1	40
Stratiomyidae	5	4.2	20
NEMATODA	3	3.1	4820
ODONATA			
Austrolestes	6	0.7	20
OLIGOCHAETA	1	3.8	5800
PLATYHELMINTHES	3	0.9	20
Number of taxa			13
Number of EPT taxa			0
% EPT taxa			0
% EPT abundance			0
MCI score			72
SQMCI score			2.5
MCI-sb score			69.4
SQMCI-sb score			3.4