Ecological assesment of wetlands north of Fill Area 3 at Gleeson Huntly Quarry.

Prepared for Paua Planning Ltd / Gleeson Quarries Huntly Ltd

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Documentation

envoco

Specialists in Ecological, Horticultural, Environmental & Civil Work

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1. Introduction

Envoco was engaged by Paua Planning on behalf of Gleeson & Cox Ltd to assess the status of wetlands to the north of a proposed fill area (Fill Area 3). Wetlands were assessed against wetland status under the Resource Management Act (1991), and since they lie within 100m of the proposed fill area it is of interest to determine whether they are classed as natural wetlands under the National Policy Statement for Freshwater Management (MfE, 2020). The result will affect the status of the resource consent application that is currently being lodged to use Fill Area 3 as an overburden and managed fill site for Gleeson Huntly Quarry.

Under the RMA (1991), a wetland is defined as '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.' Under the NPS-FW (2020), a natural wetland is a wetland (as defined by RMA) 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.

The area lies within an old overburden fill site that was formed during the operation of Weaver's pit (coal mine that is now Lake Puketurini). The landscape has been heavily modified over time through infilling of gullies and use of the land for agriculture. Soil data shows this area lies on the border of two soil types; granular (clayey soil of volcanic origin, slowly permeable and typical of Waikato lowlands) and brown (derived from weathered parent rock and occur where drought and waterlogging is not common) (Landcare Research Soils Portal).

Site visits were conducted on the 27/06/22 and 04/07/22 to gather site data/photographs.

Figure 1: Map of hydrological features and boundaries associated with Fill Area 3, Gleeson Huntly Quarry. Google Earth (February 2019).

2. Historical imagery of Fill Area 3 and nearby wetlands. Aerial imagery is sourced from Retrolens and overlaid onto Google Earth.

2.1. Previous landscape characteristics - gully systems

Fill Area 3 and the existing wetland to the north were present within gully systems typical of the local landscape between 1941 and 1957. The appearance of the topography indicates there were watercourses, possibly palustrine wetland systems (possibly seepage and/or ephemeral wetlands), present in low points of the gully areas.

Plate 1: Historic aerial imagery overlaid onto mapped boundary of Fill Area 3 (yellow) and constructed wetland (green).

2.2. Modification of landscape - infilling of gullies

Between 1957 and 1963 coal mining activities from Weaver's pit (now Lake Puketurini) significantly changed the landscape through the filling of gullies with overburden material. The result of these activities left one main flow path down the remaining watercourse that ran north-west of Fill Area 3. Continued backfilling occured between 1963 and 1979, causing further modification and infilling of watercourses. It appears the removal of natural flow paths caused poor drainage, with water accumulating within the dam in Fill Area 3.

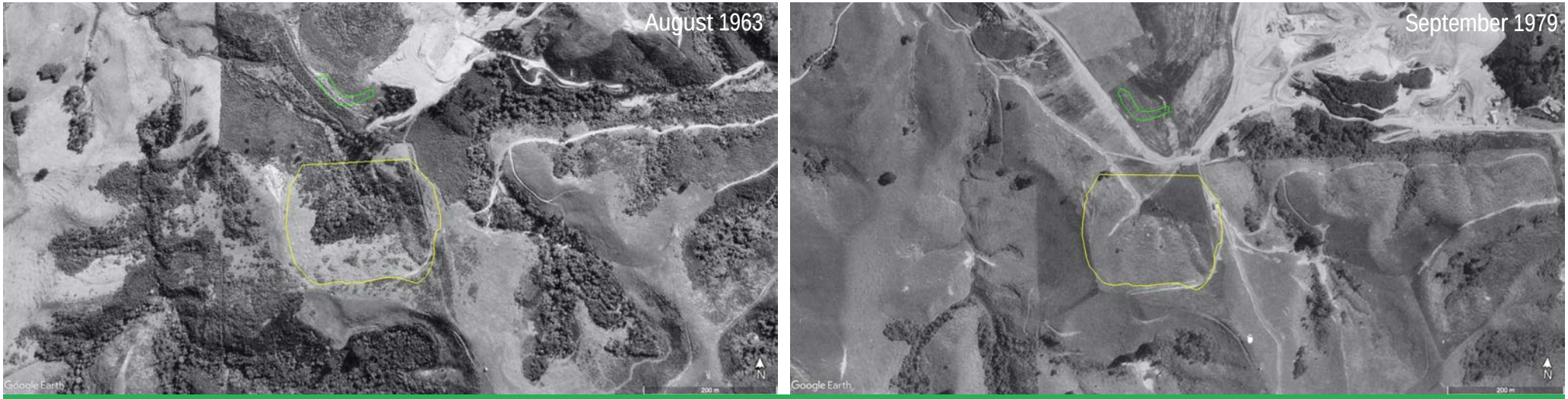

Plate 2: Historic aerial imagery overlaid onto mapped boundary of Fill Area 3 (yellow) and constructed wetland (green).

2.3. Construction of pond

Lack of drainage in the backfill along with landform consolidation (sinking) resulted in a spring formed by compacted clay layers. This spring was problematic being a saturated localised area, and was continuously cleaned out with an excavator to maximise the area of productive farm land (O'Reilly, 2022). The area was eventually re-profiled to create a curved pond for the use of recreational hunting, and has undergone maintenance through tree planting, stock fencing and sediment removal to increase the size of the pond.

Plate 3: Historic aerial imagery overlaid onto mapped boundary of Fill Area 3 (yellow) and constructed wetland (green).

3. Satellite imagery of Fill Area 3 and nearby wetlands post-construction.

4. Constructed wetland summary

The pond was constructed somewhere between 1979 and 1991 for the purpose of increasing the area of productive farmland, and has since been maintained and utilised as a duck pond.

Construction of the pond has resulted in a flat, low-lying area to the east that catches water from the constructed overland flow path that flows down the side of the backfill area. This area is part of managed pasture and contains pasture grasses (>50% of the area) as well as a patchy distribution of facultative wetland species like *Juncus effusus* and *Juncus sarophorus*. The area did not have indicators of hydric soil or wetland hydrology - the water table was not encountered and soil did not display hydric characteristics when examined on site.

The pond is classed as an artificially constructed wetland and is excluded from the NES-F and NPS-FW regulations surrounding natural wetlands.

Figure 2: Drone photograph of constructed pond and adjacent wetland, facing north-west.

Figure 3: Non-hydric soil (left) and typical pasture vegetation (right) in the area east of the pond.

5. Wetland delineation assessment on smaller wetlands

Two small wetlands exist at the foot of a large bund that delineates the edge of the backfill area. The contouring of fill material has resulted in low points in the landscape where water now naturally accumulates. The wetlands do not appear to have been constructed as there is no recent or historical evidence of excavation or maintenance apart from the constructed pond to the north-west. Both sites fit the definition of a wetland under the RMA, but it is of interest whether they meet the natural wetland definition under the NPS-FW. Signs of wetland hydrology are present in both areas, such as surface water, high water tables, soil saturation (present at time of both site visits and evidence of saturation year-round from aerial imagery), and a hydrogen-sulphide odour from disturbed soil.

Presence of hydrophytic vegetation was assessed using the Wetland Delineation Protocols (MfE, 2020) and the Vegetation Tool for Wetland Determination in New Zealand (Clarkson, 2013). Each plant species has a wetland indicator status rating (below) that is used to confirm the presence of hydrophytic vegetation. Raw data sheets can be found in the Appendix.

- Obligate wetland (OBL): Almost always occurs in wetlands under natural conditions (estimated probability > 99%).
- Facultative wetland (FACW): Usually occurs in wetlands (estimated probability 67% – 99%), but occasionally found in non-wetlands (estimated probability 1% – 33%).
- Facultative (FAC): Equally likely to occur in wetlands and non-wetlands (estimated probability 34% – 66%).
- Facultative upland (FACU): Usually occurs in non-wetlands (estimated probability 67% – 99%), but occasionally found in wetlands (estimated probability 1% – 33%).
- Obligate upland (UPL): Almost always occurs in non-wetlands under natural conditions (estimated probability > 99%).

Figure 4: Drone photograph facing east showing locations of smaller wetlands to the north of Fill Area 3.

5.1. Wetland 1

Two vegetation plots (2x2m) were surveyed in each vegetation type (rushes and grasses/pasture). The rush-dominated area (plot 1) passed the hydrophytic vegetation test whereas the grass-dominated area (plot 2) did not (Tables 1 & 2). The wetland can be delineated by the margin of the rush and pasture community. To investigate whether wetland hydrology was present, three soil holes were dug across an elevation gradient in the wetland. All three sites showed signs of hydric soil, with groundwater present at or within 30cm of the soil surface, reddish mottles along root channels, and a hydrogen sulphide odour. It is important to note that these hydric soil conditions have developed relatively recently (approx. 30 years) on a mixture of clay soils imported from Weaver's pit. The wetland appears to be a seepage as a result of contouring of the fill area, lack of drainage in the fill area and landform consolidation.

Table 1: Wetland delineation assessment summary for Plot 1.

Species	Absolute % cover	Wetland indicator status (Clarkson et al. 2021)
Juncus effusus	98%	FACW
Paspalum urvillei	1%	FAC
Lolium perenne	1%	FACU
Prevalence index	1.03	
Passes hydrophytic wetland vegetation test	Yes	

Figure 5: Wetland 1 showing dominance of Juncus effusus surrounded by exotic pasture species.

Table 2: Wetland delineation assessment summary for Plot 2.

Species	Absolute % cover	Wetland indicator status (Clarkson et al. 2021)
Cenchrus cladestinus	30%	FACU
Lolium perenne	30%	FACU
Ludwigia palustris	15%	OBL
Lotus pedunculatus	8%	FAC
Ranunculus repens	7.5%	FAC
Ranunculus sardous	5%	FAC
Trifoliuim repens	2.5%	FACU
Juncus effusus	1%	FACW
Rumex conglomeratus	1%	FAC
Prevalence index	3.315	
Passes hydrophytic wetland vegetation test	No	

5.2. Wetland 2

Wetland 2 was unable to undergo a hydrophytic vegetation test due to being inundated with water. Facultative wetland species were present in the ponded area (*Persicaria maculosa* (willow weed)), and on the margins (*Juncus effusus* and *Juncus sarophorus*). Pasture grasses (mainly *Lolium perenne*) and *Chendrus cladestinus* (kikuyu) were the dominant species in and around the ponded area. Pasture grasses were seen submerged, and there was no emergent vegetation within the ponded area. Vegetation cover in the form of pasture grasses is present in both ponded and exposed areas which indicates this area is only periodically inundated throughout the year. During both site visits the area was inundated, and due to the size, depth, local topography and presence of algae it is likely to be inundated for more than 7 consecutive days. A soil hole was dug near the edge of the water and showed indicators of wetland hydrology and hydric soil (Figure 7). As with wetland 1, this wetland is a result of contouring of fill material, lack of drainage in the fill area and landform consolidation.

Figure 6: High groundwater table and saturated soil in wetland 1.

Figure 7: Wetland 1 showing dominance of Juncus effusus surrounded by exotic pasture species.

Figure 8: Submerged pasture grasses and algae present in wetland.

Figure 9: Poorly drained soil near wetland 2 with low chroma colours, mottles and high water table.

6. Discussion

Comparisons of historic aerial imagery, satellite imagery and recent photographs show significant changes in the landscape as a result of backfilling gullies with overburden material imported from Weaver's pit. The pond was constructed somewhere between 1979 - 1991 and has since been maintained for recreational hunting. Two smaller wetlands to the south-east appear to be seepages resulting from the contouring of the fill, lack of drainage and landform consolidation.

Past satellite imagery shows soil saturation and occasional ponding of these areas during the growing season; one of the wetlands currently contains standing water, likely a result of recent rainfall and a high water table resulting from poor drainage in the fill. The wetlands do not occur within well-developed wetland soils and are heavily modified due to past changes in the landscape as well as livestock grazing. Under the current wetland definition guidelines they are classed as 'induced wetlands', which are wetlands that have resulted from any human activity, except the deliberate construction of a wetland or waterbody by artificial means. Induced wetlands are captured by the definition of 'natural wetland', meaning the NES-F and NPS-FM apply. Wetland status for all three wetland areas is summarised in Table 4 below.

Table 3: Summary of wetland features and status as assessed under the NPS-FW.

	Artificially constructed	Improved pasture and temporary rain-derived pooling	Hydrophytic vegetation present	Hydric soils present	Wetland hydrology present	Meets natural wetland criteria
Pond 97m from FA3 boundary	Yes	n/a	Yes	n/a	Yes	No
Wetland 1 60m from FA3 boundary	No	No	Yes	Yes	Yes	Yes
Wetland 2 78m from FA3 boundary	No	No	No	n/a	Yes	Yes

7. References

Clarkson B.R. et al. (2021). New Zealand Wetland Plant List 2021. Landcare Research Contract Report: LC3975. Prepared for Hawkes Bay Regional Council.

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Ministry for the Environment. (2021). Defining ‘natural wetlands’ and ‘natural inland wetlands’. Wellington: Ministry for the Environment.

Ministry for the Environment (2020). Wetland delineation protocols.

Ministry for the Environment (2020). National Policy Statement for Freshwater Management.

New Zealand Government (1991). Resource Management Act.

O’Reilly, M. (2022). Letter: Gully backfill on Lot 9 DP1278/DP25272 adjoining Lot 8 DP1278 that created a man-made duck pond for recreational hunting in Lot 8.

Appendix 1 – NZ Wetland Determination Data Form

WETLAND DETERMINATION DATA FORM – NEW ZEALAND

Project/Site: Gleeson Huntly Quarry FA3 Region: Waikato Sampling Date: 04/07/22
Applicant/Owner: Gleeson & Cox / Mike O'Reilly Altitude: Sampling Point No: 1
Investigator(s): Ohara McLennan, Jacob Wright Nearby town/city: Huntly
Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%):
Latitude: 37°35'4.31"S Longitude: 175°8'46.06"E Datum: WGS 84
Soil Map Unit Name: YU (Yellow Ultic)
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No
Hydric Soil Present? Yes ✓ No
Wetland Hydrology Present? Yes ✓ No
Is the Sampled Area within a Wetland? Yes ✓ No

Remarks:
Wetland lies on top of overburden fill site (approx. 30yrs old) within highly modified landscape. Wetland appears to be result of fill contouring / bunding, not natural landform. Saturated clayey soils.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:) n/a	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:) n/a			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 2 x 2m)			
1. Juncus effusus	98%	Y	FACW
2. Paspalum urvillei	1%	N	FAC
3. Lolium perenne	1%	N	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100% = Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species 98	x 2 =	196
FAC species 1	x 3 =	3
FACU species 1	x 4 =	4
UPL species	x 5 =	
Column Totals: 100 (A)		103 (B)

Prevalence Index = B/A = 1.03

Hydrophytic Vegetation Indicators:
✓ Dominance Test is >50%
✓ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No

Remarks:

Adapted from US Army Corps of Engineers — New Zealand – Version 1.0

Appendix 1 – NZ Wetland Determination Data Form

WETLAND DETERMINATION DATA FORM – NEW ZEALAND

Project/Site: Gleeson Huntly Quarry FA3 Region: Waikato Sampling Date: 04/07/22
Applicant/Owner: Gleeson & Cox / Mike O'Reilly Altitude: Sampling Point No: 2
Investigator(s): Ohara McLennan, Jacob Wright Nearby town/city: Huntly
Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%):
Latitude: 37°35'4.43"S Longitude: 175°8'46.03"E Datum: WGS 84
Soil Map Unit Name: YU (Yellow Ultic)
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ____ No ✓
Hydric Soil Present? Yes ✓ No
Wetland Hydrology Present? Yes ✓ No
Is the Sampled Area within a Wetland? Yes ✓ No

Remarks:
As per sampling point 1.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:) n/a	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:) n/a			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 2 x 2m)			
1. Cenchrus cladestinus	30%	Y	FACU
2. Lolium perenne	30%	Y	FACU
3. Lotus pedunculatus	8%	N	FAC
4. Ranunculus repens	7.5%	N	FAC
5. Ludwigia palustris	15%	N	OBL
6. Ranunculus sardous	5%	N	FAC
7. Trifolium repens	2.5%	N	FACU
8. Juncus effusus	1%	N	FACW
9. Rumex conglomeratus	1%	N	FAC
10.			
11.			
12.			
	100 = Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 15	x 1 =	15
FACW species 1	x 2 =	2
FAC species 21.5	x 3 =	64.5
FACU species 62.5	x 4 =	250
UPL species	x 5 =	
Column Totals: 100 (A)		331.5 (B)

Prevalence Index = B/A = 3.315

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
X Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:
Site lacks hydrophytic vegetation however hydric soil & wetland hydrology present.

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