# ECOLOGICAL ASSESSMENT OF WETLANDS ON MONK FARM, ARROWTOWN, OTAGO





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Constructed wetland fenced to exclude stock (foreground) with willows in part of a natural wetland in the background.

# **Contract Report No. 6405**

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### 1. INTRODUCTION

Roger Monk owns land at Arrowtown that is currently zoned 'Arrowtown Special Zone' which enables the owner to develop into 17 rural residential lots. Currently an alternative proposal entails preparing a fast track application (via the Covid Fast Track Act) that would allow a great density of residential development. As part of that application advice is required regarding a water course which runs through the site. Specifically, an understanding is needed as to whether it comprises a natural wetland, and therefore what rules may be triggered in the National Environmental Standards – Freshwater Management (NES-FM).

### 2. METHODS

A site visit to the Monk Farm site (Figure 1) was undertaken on 27 May 2022. The weather was fine and frosty, with frost initially making it more difficult to identify plant species. The property was traversed with a particular focus on wetlands. Notes were made on the species composition of wetlands and on the factors responsible for wetland formation. Wetlands were classified according to the 'natural wetland' definitions in the National Policy Statement for Freshwater Management (NPS-FM). Plant species observed in the wetlands were recorded (Appendix 1).

# 3. ECOLOGICAL CONTEXT

#### 3.1 Site description, history and current land use

The Monk Farm site spans a gully immediately south of the Arrowtown urban area. The gully slopes gently up to McDonnell Road in the west, and has a steep scarp on its eastern side, to terraces that extend to Centennial Ave to the east. The gully has a relatively flat floor, and there is evidence that a drainage channel was excavated in the northern part of the gully floor. A small tributary stream enters the gully from the east. Below the Monk Farm property the stream becomes confined to an incised channel.

A personal communication from the landholder (Appendix 2) notes that the site was historically grazed by both sheep and cattle on both sides of a stream that meandered down the gully. Sheep occasionally became stuck, indicating wetland areas were present. Willow trees were present along the most of the stream; those along the southern part were cleared. The creek was dammed at the southern boundary to enable formation of a wetland.

The site was being grazed by cattle at the time of the field survey, and there is evidence of cattle trampling effects in all damp areas of the site. Stock are excluded from wetland vegetation between a central causeway and the southern causeway by a one-wire electric fence.











#### 3.2 Threatened Environment Classification

The Monk Farm site is covered by land environments that retain less than 20% of their original indigenous cover (Cieraad *et al.* 2015). The land is mostly covered by land environments that retain less than 10% of their original cover, with the scarp and adjacent areas comprising land environments with 10-20% of their original cover remaining (Figure 2). These land environments are a priority for ecological restoration.

#### 3.3 Ecological districts

The Monk Farm site is located in the Shotover Ecological District, with takes in the catchments of the Arrow River and lower Shotover River. It has a relatively dry climate, affected by the rain shadow of the Main Divide. Annual rainfall ranges from 650-160 mm per year, with prevailing north-west winds (McEwen 1987). On terraces, fans, moraines, and low hills, the soils comprise shallow to moderately deep droughty soils with loess over alluvium, till and/or schist (McEwen 1987).

#### 3.4 Potential natural vegetation

The site has been mapped as mountain beech forest in potential natural vegetation mapping for Otago Region (Wildland Consultants 2020). This mapping is not at sufficiently fine scale to identify and map small wetlands. In Otago, mountain beech forest is typically the dominant forest type in drier rain shadow areas east of the Main Divide.

### 4. STATUTORY CONTEXT

#### 4.1 Wetland definition

The Resource Management Act (1991) (RMA) defines a wetland as:

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

Section 3.21 of the NPS-FM defines a natural wetland as:

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



#### 4.2 Wetland policies

One policy in the NPS-FM is relevant:

*Policy 6:* There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted.

#### 4.3 Wetland regulations

Two regulations in the NES-FM are relevant to the proposed subdivision.

Regulation 52

- (1) Earthworks outside, but within a 100-metre setback from, a natural wetland is a **non-complying activity** if it—
  - (a) results, or is likely to result, in the complete or partial drainage of all or part of a natural wetland; and
  - (b) does not have another status under any of Regulations 38 to 51.
- (2) The taking, use, damming, diversion, or discharge of water outside, but within a 100-metre setback from, a natural wetland is a **non-complying activity** if it—
  - (a) results, or is likely to result, in the complete or partial drainage of all or part of a natural wetland; and
  - (b) does not have another status under any of Regulations 38 to 51.

Earthworks within a 100-metre setback from a natural wetland can occur, but must not result in the complete or partial drainage of the natural wetland. Earthworks also must not dam or divert the natural wetland.

#### Regulation 54

The following activities are **non-complying** if they do not have another status under this subpart:

- (a) vegetation clearance within, or within a 10-metre setback from, a natural wetland:
- (b) earthworks within, or within a 10-metre setback from, a natural wetland:
- (c) the taking, use, damming, diversion, or discharge of water within, or within a 100metre setback from, a natural wetland.

Any vegetation clearance, earthworks, or discharge of water within 10 metres of a wetland has non-complying status.



# 5. WETLAND ASSESSMENTS

#### 5.1 Overview

Three kinds of wetland are present on the Monk Farm site. A constructed wetland is present at the southern end of the gully, formed behind a raised causeway across the gully. Upstream of this is a natural wetland, partly vegetated in willows. A very small natural wetland is present in the stream tributary that flows in from the east. Other wetlands that meet the 'improved pasture' exemption in the natural wetland definition are also present. These areas are described in more detail below.

#### 5.2 Constructed wetland

The constructed wetland is formed by a causeway approximately built up approximately 1 metre from the gully floor and was deliberately created with the intention of flooding the upstream area to form a wetland (Appendix 2). A culvert discharges water through the causeway into the incised stream below. This wetland meets natural wetland exemption (a), being a wetland created by artificial means.

This wetland includes small islands, and the islands and open water margins are densely vegetated in pūkio (*Carex secta*) sedges (Plate 1) with occasional soft rush (*Juncus effusus*), creeping buttercup (*Ranunculus repens*), and broad dock (*Rumex obtusifolius*). Blackberry (*Rubus fruticosus*) is occasionally present. One island has tall willow or poplar trees. It is possible that some of the pūkio sedges in this wetland were planted; alternatively, they may have naturally colonised the constructed wetland from upstream habitats.



Plate 1: The lower part of the constructed wetland.



#### 5.3 Natural wetlands

Upstream of the central causeway, a natural wetland is present, and was assessed in frosty conditions. This wetland may have been partly induced by pugging from stock, but very likely had a natural origin on gently-sloping land in the upper gully (Plate 2). The past excavation of a drain down the centre of the gully suggests that wetland vegetation was historically present. The lower part of the wetland is covered by crack willow (*Salix fragilis*) with scattered pūkio and blackberry beneath, while the upper part has local groves of pūkio, scattered soft rush, and abundant jointed rush (*Juncus articulatus*). Other species include Yorkshire fog (*Holcus lanatus*), water forget me not (*Myosotis laxa*), white clover (*Trifolium repens*), *Epilobium brunnescens*, water cress (*Nasturtium microphyllum*) and what appeared to be *Carex sinclairii* on the wetland margins. Occasional crack willow regeneration is also present. This wetland is not dominated by improved pasture or subject to temporary rain-derived ponding and therefore is defined as a natural wetland.

A smaller natural wetland is present in the eastern tributary stream. The wider wetland was mostly formed by pugging from cattle, and supported improved pasture species, but in one part of the wetland, dense rushes of soft rush, hard rush (*Juncus edgariae*), water forget me not, jointed rush, floating sweet grass (*Glyceria fluitans*), creeping buttercup, white clover, and Yorkshire fog are present (Plate 3). In this area the cover of improved pasture species is relatively low so the improved pasture exemption does not apply. The wetland area to the south is dominated by improved pasture, was grazed in September 2020, and may also be subject to temporary ponding of water.

#### 5.4 Wetlands exempted as 'improved pasture'

Wetlands exempted from the 'natural wetland' definition include the wetland pictured in the rear of Plate 3, the scattered rushes and sedges in pasture on the eastern side of the gully (Plate 4), and a wetland created by stock pugging in the bed of the eastern tributary stream (Plate 5) just before it meets the gully floor.





Plate 2: Natural wetland vegetation at the northern end of the gully. Jointed rush was the dominant species between the taller rushes.



Plate 3: Natural wetland (foreground) with dense rushes, while in the background within the red rectangle the wetland is dominated by improved pasture.





Plate 4: Grazed margins on the eastern side of the gully support scattered rautahi (*Carex coriacea*) but a predominance of improved pasture.



Plate 5: A wetland formed by cattle pugging where the eastern tributary meets the gully floor. The vegetation is dominated by improved pasture species.







### 6. CONCLUSIONS

Three kinds of wetland are present on Monk Farm, comprising natural wetlands, a constructed wetland, and non-natural wetlands dominated by improved pasture and subject to temporary rain-derived ponding (not mapped). Earthworks within 100 metres of the natural wetlands will need to ensure they do not cause drainage, damming, or diversion of these wetlands to avoid non-complying status. The small natural wetland in the eastern tributary could potentially be developed as the effects of clearance of this wetland would be relatively minor. In addition, there would be scope to increase natural wetland extent on the eastern side of the larger natural wetland, to ensure consistency with NPS-FM requirements for no further loss of wetland extent. An aquatic offset could be implemented to ensure a net gain in natural wetland extent and of natural wetland values.

# ACKNOWLEDGMENTS

Jenny Carter (of Carter Planning Ltd) is thanked for provision of guidance around the site.

# REFERENCES

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- McEwen M. 1987: Ecological regions and districts of New Zealand. Booklet to accompany Sheet 4. *New Zealand Biological Resource Centre Publication No. 5*. Department of Conservation, Wellington.
- Wildland Consultants 2020: Mapping of potential natural ecosystems and current ecosystems in Otago Region. *Wildland Consultants Ltd Contract Report No. 5015a*. Prepared for Otago Regional Council. 20 pp.



### VASCULAR PLANT SPECIES RECORDED IN WETLAND VEGETATION AT THE SITE

Species	Common Name	Plant Type
Carex coriacea	Rautahi	Sedge
Carex secta	Pūkio	Sedge
Cirsium arvense*	Californian thistle	Dicot herb
Cirsium vulgare*	Scotch thistle	Dicot herb
Digitalis purpurea*	Foxglove	Dicot herb
Epilobium brunnescens	Willow herb	Dicot herb
Glyceria fluitans*	Floating sweetgrass	Grass
Holcus lanatus*	Yorkshire fog	Grass
Juncus articulatus*	Jointed rush	Rush
Juncus effusus*	Soft rush	Rush
Juncus tenuis*	Slender rush	Rush
Myosotis laxa*	Water forget-me-not	Dicot herb
Nasturtium microphyllum*	Watercress	Dicot herb
Ranunculus repens*	Creeping buttercup	Dicot herb
Rumex obtusifolius*	Broad-leaved dock	Dicot herb
Salix ×fragilis*	Crack willow	Tree
Solanum dulcamara*	Bittersweet	Vine
Trifolium repens*	White clover	Dicot herb



# PERSONAL COMMUNICATION RELATING TO HISTORIC LAND USE

From: Roger Monks 9(2)(a)Sent: Tuesday, 24 May 2022 9:11 pm To: JennyCarter s 9(2)(a)Subject: Unamed creek on McDonnell road .

Hi Jenny,

In the 1960's the stream meandered from the northern boundary of the house block to its southern boundary adjacent to No2 tee of the Arrowtown Golf Course. Sheep and cattle grazed the entire length of the stream on both sides though there was the odd place sheep became stuck and had to be rescued. The stream was entirely encased in mature willow trees from above the house to the southern end of the golf course.

In the late 1980's I removed the majority of the willow trees from my southern boundary as far north as the woolshed. This was followed by the damming of the creek at my southern boundary and the installation of a sluice gate to the culvert pipe to enable the flooding of the area forming a wetland as far upstream as far as the woolshed and is as it stands today. The necessary damming and discharge permits were sought from the appropriate authority.

Regards,

Roger





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