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Memo

To	David Maclean	Date	25 February 2025
From	Jon Williamson	**Project No**	WWLA0965
Copy	Jamie Whyte; Mark Delaney; Hannah O'Kane; Euan Williams; Jeremy Cooke; Brooke James		
Subject	**Milldale – Wetland Offsetting Stages 10-13**		

1. Introduction

The fundamental premise of the wetland offsetting is that the selected areas for wetland development are not currently wetlands (**Figure 1**), but with very little intervention could become wetlands due to the combination of poorly drained soils in these areas and water retaining bunds constructed at regular intervals.

There were four areas that were assessed, these areas include from west to east, as shown on **Figure 1**:

- Area to the west of Area A;
- Area A (approximately 1.01 ha);
- Area between Area A and Area B;
- Area B (approximately 0.44 ha); and
- Area to the east of Area B (approximately 0.27 ha).

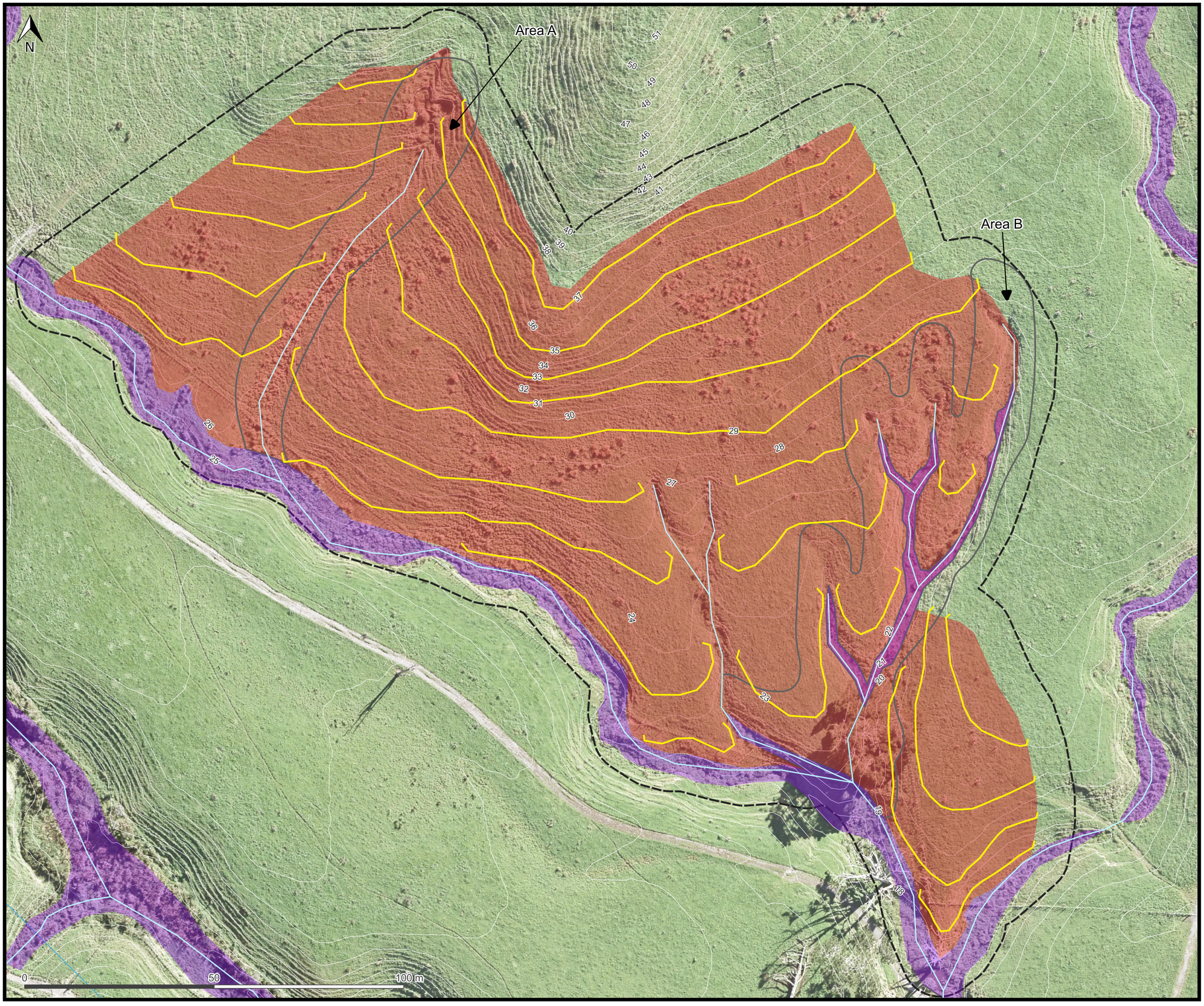
It is proposed that the combined areas mentioned above will create a new wetland with a total area of 2.81 ha. This is a sufficient offset for the target of 2.75 ha of wetland area.

Table 1 presents a summary of topographic characteristics of each area. This is important information that assists in informing an appropriate spacing of the water retention contour bunds. For example, in steeper areas bunds should be spaced closer, while in flatter areas, bunds can be wider spaced or absent as occurs in the natural wetlands.

Table 1. Topographic characteristic of areas assessed.

Parameter	Area west of Area A	Area A	Area between Area A and Area B	Area B	Area east of Area B
Elevation (m)	27-40	25-40	22-41	20-30	18-24
Downslope Distance (m)	97	120	89	143	85
Slope %	13.5	12.5	21.3	7.3	7.1
Vertical (m) : Horizontal (m)	1:7.4	1:8	1:4.7	1:13.7	1:14.2

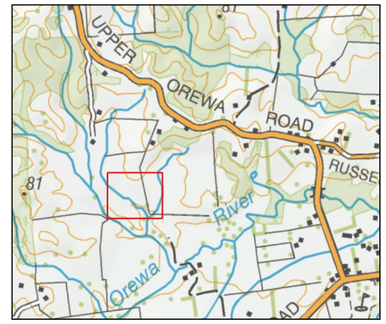
The soils on this site according to New Zealand Soil Classification (NZSC) are Albic Ultic (UE), which are described as strongly weathered soils that have a well-structured, clay enriched subsoil horizon. Ultic soils have slow permeability, and dispersible surface horizons susceptible to livestock treading damage (pugging), and are prone to erosion.



Map Title:
Site Overiew and Proposed Bunds

Project:
Milldale Ecological Offsetting - Stage 10-13

Client:
Fulton Hogan Land Development Ltd



Legend

- 1 m contour
- Bund
- Stream
- Previously suggested wetland offset
- Wetland offset 10 m buffer
- Total wetland offset area
- Exisitng wetland

Data Provenance
Aerial imagery sourced from Land Information New Zealand.

Drawn by: Brooke James
25/02/2025

Layout & Project File
Stage 10-13 Figure 1

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Figure 1.

There are existing wetlands to the south of the areas mentioned above. The aim is to connect the areas with existing wetlands, and to also connect previously suggested wetland offset areas (Area A and Area B) to create a combined larger offset area of approximately 2.81 ha.

2. Method

2.1 Overview

In order to create additional wetlands on the steeper slopes adjacent to existing wetlands, a series of shallow bunds are proposed to be constructed to retain stormwater. The bunds with act as barriers to surface water runoff, when positioned across the waters flow path. The bunds would detain surface runoff, sediment and contaminants from flowing downstream. Runoff held back by the bund will slowly seep into the ground, creating a saturated environment similar to natural wetlands on lower slopped land.

During high intensity rainfall events, runoff may completely fill the depression behind the bund and runoff as it normally would, albeit with some retention and therefore reduction in peak runoff flow rate (a positive environmental outcome).

In this case, a series of small bunds would help to create the wetland environment and connect existing wetlands that have been identified in the south of the proposed site.

2.2 Bund Design

A total of 27 bunds have been proposed at roughly 2 m change in elevation intervals. Each bund follows the natural contour of the slope with each end 'flicking' uphill to prevent water from flowing around (**Figure 1**).

To construct the bunds, it is proposed to excavate a small swale following the natural contour of the slope, with a maximum depth of approximately 0.3 m and swale width of up to 2 m. The material removed to create the swale would then be used to raise the ground level for the bund, minimising work involved. **Figure 2** shows a conceptual schematic of each bund, with pooled water during or after a storm.

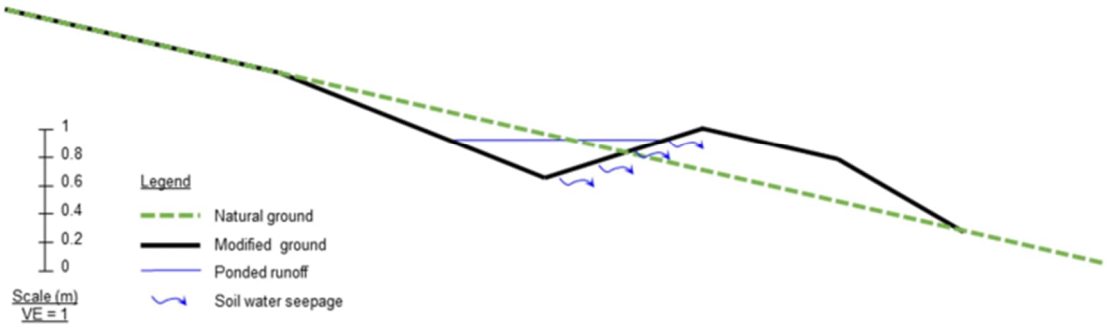

Figure 2. Schematic cross section of proposed bund.

3. Conclusion Remarks

The soils in the area are low permeability and will not require significant intervention to promote wetland soil conditions. With the minor intervention of shallow contour drains as proposed, it is anticipated that the soils will be saturated at or near the surface for at least 14 consecutive days during the growing season in most years, which meets the wetland hydrology definition.

The concept design presented here provides dual benefits of enhancing soil saturation to promote wetland growth, whilst also reducing peak flow events by retaining some stormwater, but because the bunds do not impede overland flow paths, drainage during major runoff events will be largely unaffected.

Yours sincerely,

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