Before the Fast-track Panel

Under:	The Fast-Track Approvals Act 2024
In the matter of:	FTA-172 – SH1 North Canterbury – Woodend Bypass Project (Belfast to Pegasus)

Statement of advice

Dr Nicholas Rex Dunn

Freshwater fisheries (Canterbury mudfish)

Senior Science Advisor – Freshwater – Department of Conservation

17 April 2026

Department of Conservation
Te Papa Atawhai

Te Kāwanatanga o Aotearoa
New Zealand Government

Executive Summary

1. My advice addresses the following issue:

    i. The potential presence of Canterbury mudfish in the SH1 North Canterbury – Woodend Bypass Project (Belfast to Pegasus) project area.

Introduction

2. My full name is Dr Nicholas Rex Dunn.

Instruction

3. I am providing expert advice on behalf of the Department of Conservation (DOC) on the SH1 North Canterbury – Woodend Bypass Project (Belfast to Pegasus) Fast-track application. Specifically, the likelihood of Canterbury mudfish and their habitat being present, but unsampled in the project area.

4. My advice specifically informs DOC's Section 53 comments.

Qualification and Experience

5. I am employed by the DOC as a Senior Science Advisor - Freshwater in the Marine and Freshwater Biodiversity Unit of the Biodiversity Heritage and Visitors Group. I have held this role since September 2012. I was employed by DOC as a Technical Support Officer - Freshwater in the Canterbury Conservancy between December 2010 and September 2012.

6. I hold a Bachelor of Science (Earth Sciences) degree from the University of Waikato (2001) where I majored in hydrology and soil science. During this degree I studied freshwater ecology at Karlstad University in Sweden as an exchange student, completing a third-year level dissertation on the effect of drift availability on diet composition of stream resident brown trout.

7. I hold a Master of Science (Environmental Science) (First Class Honours) degree from the University of Canterbury (2004), majoring in freshwater ecology and hydrology. My MSc thesis investigated aspects of the influences of extremes in flow variations on the ecology and dynamics of populations of non-diadromous galaxias fishes.

8. I hold a Doctor of Philosophy degree from the University of Otago (2012). My PhD thesis investigated aspects of the influences of hydrological environments on the morphology, ecology, and spawning biology of non-diadromous galaxias fishes.

9. From 2003-2010 I was a Partner, with Dr Leanne O'Brien, in Ichthyo-niche, a research consultancy specialising in native galaxiid fishes and their habitats, particularly Canterbury mudfish. Dr O'Brien's PhD thesis (O'Brien 2005) focused on the conservation ecology of Canterbury mudfish (*Neochanna burrowsius*). Dr O'Brien and I have co-authored two major publications and a further eight reports detailing Canterbury mudfish, their habitats, and conservation management. During this period, I was involved in work to develop the Canterbury mudfish habitat distribution layer used in the Canterbury Natural Resources Regional Plan and the development of the Critical Habitat mapping for freshwater species incorporated into the Canterbury Land

and Water Regional Plan through Plan Change 7. During this period and during her PhD research I accompanied Dr O'Brien on many visits to Canterbury mudfish habitat and populations across their distribution, to undertake habitat and local population assessments, and translocations.

10. I am a professional member of the Royal Society of New Zealand (MRSNZ) and a member of the New Zealand Freshwater Sciences Society.

11. In my role as Freshwater Science Advisor for DOC, I lead the New Zealand Threat Classification System freshwater fishes' expert panel which undertook the most recent (Dunn et al. 2025) conservation status assessment for these species. My research areas include taxonomic descriptions of non-diadromous galaxias fishes, investigating instream habitat suitability preferences, infield spawning ecology and mapping the distributions of non-diadromous galaxiid fishes, including Canterbury mudfish.

12. As part of my DOC role, I have worked with Te Uru Rākau/New Zealand Forest Service (Ministry for Primary Industries) in developing the Fish Spawning Indicator component of the Resource Management (National Environmental Standards for Plantation Forestry) Regulations 2017 (NES-PF).

13. I have appeared before councils in regional policy statement (e.g. proposed Otago Regional Policy Statement 2021), plan (e.g. Canterbury Regional Council Land and Water Regional Plan 2012, and a number of the Plan Changes (1, 2, 3, 4, 5 and 7), and Hurunui Waiau Regional Plan) and resource consent (e.g. Hurunui Water Project Limited) hearings to give expert evidence on freshwater ecology and ecohydrology matters, especially where these relate to non-diadromous galaxiid fishes, including Canterbury mudfish.

14. I have appeared before the Environment Court to give expert evidence in the Lindis (Plan Change 5A and Lindis Catchment Group resource consents) consolidated proceedings hearing and the directly referred Plan Change 7 to the Regional Plan: Water for Otago proceedings hearing. I have also assisted during Environment Court mediation with Mt Campbell Station and Waikaka Gold Ltd.

Code of conduct

15. Whilst it is acknowledged this is not an Environment Court proceeding, I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023. I have complied with the Code of Conduct in the preparation of this advice. Unless I state otherwise, this advice is within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

Material Considered

16. In preparing this advice I have reviewed relevant aspects of:
    i. Tonkin & Taylor 2025: State Highway 1 North Canterbury—Woodend Bypass Project (Belfast to Pegasus). Substantive Application - Ecological Impact Assessment 11320-AUR-0350-PWI-EC-RPT0010. Prepared for Aurecon New Zealand Ltd and New Zealand Transport Agency Waka Kotahi. Prepared by Tonkin & Taylor Ltd. 167 p.
    ii. I have not undertaken a specific site visit as part of reviewing this application but have used my knowledge of the area to inform my opinion.

Scope of advice and expert opinion

17. I have been asked to provide advice on the likelihood Canterbury mudfish and their habitat are present, but as yet unsampled in the project area by the applicant's consultants, given the close proximity to known habitat and populations.

18. My expert advice will address the following matters:
    i. The conservation status of Canterbury mudfish
    ii. The habitat of Canterbury mudfish
    iii. The probability of Canterbury mudfish habitat and populations being in the project area
    iv. The effect of habitat loss within the project area
    v. Suggested consent approach.

The conservation status of Canterbury mudfish

19. In the most recent New Zealand Threat Classification System (NZTCS) conservation status assessment of freshwater fishes, Dunn et al. (2025, page 16) stated "*Neochanna burrowsius* [Canterbury mudfish] is an endemic taxon that is restricted to Canterbury and Otago on Te Waipounamu/the South Island. *Neochanna burrowsius* has a large number (80 remaining) of high-density, highly fragmented, small (total 28 ha remaining) natural sub-population fragments that are scattered over 17 catchments across a large, highly agriculturally intensified geographical range from the catchments of the Ashley River/Rakahuri to the Waitaki River".

20. As stated by Dunn et al. (2025, page 16) "*Neochanna burrowsius* was assessed as Threatened – Nationally Critical based on it having a very high ongoing or predicted population trend decline. This status was determined by the high percentage of surveyed sub-population fragments that are experiencing population trends with > 70% declines (based on preliminary trend assessments for 24% of sub-population fragments, 58% of which indicated declines of > 70%, representing the highest decline rate among the taxa analysed) and the fact that this taxon has experienced the highest number of recorded sub-population fragment extinctions (49), 37% of which have occurred in the last 10 years".

21. As stated by Dunn et al. (2025, page 16) "*Neochanna burrowsius* has a highly fragmented distribution that continues to contract within areas of Canterbury that have high levels of land-use intensification for agriculture. Core and peripheral populations are compromised by hydrological insecurity, such as climate change influenced drought conditions, and this is exacerbated by the abstraction of ground and surface water for irrigation further modifying hydrological conditions, continued agricultural development leading to the loss of wetland and meandering stream habitats, and the closure of stock water races (McDowall & Eldon 1996; O'Brien & Dunn 2007), as well as a loss of genetic diversity (Davey et al. 2003). *Neochanna burrowsius* was first assessed as Threatened – Nationally Critical in 2009 (Allibone et al. 2010), and little has changed since then to benefit this taxon, despite regional planning provisions and attempts at restoration, so its continued persistence remains precarious across its natural range."

The habitat of Canterbury mudfish

22. Canterbury mudfish are wetland specialists (O'Brien & Dunn 2007; Dunn 2024; Allen et al. 2025;). Their habitats are still or very slow-flowing, meandering, swampy streams with deep pools, seepage streams, spring fed streams, scour holes and stockwater races. The diverse range of habitats in which Canterbury mudfish are now found may be, in part, a consequence of the removal of the once extensive wetlands that covered the Canterbury Plains which has forced mudfish to occupy whatever habitat remains that they can tolerate (O'Brien & Dunn 2007).
23. Canterbury mudfish typically do not co-occur with other fish species and may not tolerate competition or lack predator avoidance traits (O'Brien & Dunn 2007). Their ability to tolerate hydrological extremes, such as droughts, through behavioural and physical adaptations allows them to occupy habitats that other freshwater fish, such as *Anguilla* eels may not. Thus, their occurrence may be characterised as being in "fragments of a larger wetland or lake system and in isolated pockets of habitat which, nonetheless, are connected during high flow and flooding" (O'Brien & Dunn 2007, page 38).

The probability of Canterbury mudfish habitat and populations being in the project area

24. I have been asked to provide an opinion on whether habitat shown in photos within section 5 of Tonkin & Taylor (2025) may be suitable habitat for Canterbury mudfish and thus present in the project area, but presently unsampled for this species by the applicant's consultants.
25. While the distribution of Canterbury mudfish is generally known, as stated by O'Brien and Dunn (2007, page 16) "areas of suitable habitat are now generally small, fragmented and modified, and thus easily overlooked".
26. Moreover, many areas that could contain habitat and local populations of the species have not been surveyed, largely because of land tenure. In fact, in the assessment described by Dunn (2025), 97% of known habitats of non-diadromous galaxiid fishes,

including Canterbury mudfish, occur wholly off public conservation lands and water, i.e. they largely occur on private land.

27. To identify potential habitat that may contain Canterbury mudfish, a prediction model was developed by DOC (2008). This landscape based Boosted Regression Tree model used nine variables from the Land Environments of New Zealand (Leathwick et al. 2002) dataset which describe climate variables related to temperature, solar radiation, evaporation and transpiration, landcover, and soil drainage. In my opinion, this model is accurate in indicating potential Canterbury mudfish habitat.
28. To manage data on freshwater fishes, the New Zealand Freshwater Fishes Sub-population Assessment System has been developed (Dunn and O'Brien 2022) enabling analyses and reporting on the status and trend of freshwater fish populations and distributions in a transparent, reproducible, and reliable manner at different spatial scales. While primarily developed to inform NZTCS conservation status assessments (see paragraphs 19-21), this system can also be used in assessments of Resource Management Act, Fast-track, and Conservation Act applications.
29. To make an assessment of the likelihood of Canterbury mudfish habitat being present in the project area I have used data from the New Zealand Freshwater Fish Database (NZFFD), the prediction model (paragraph 27), the habitat fragments (paragraph 28), and mapped historic wetlands (Leathwick et al. 2010).
30. Based on NZFFD records and habitat fragments, Canterbury mudfish are known to occur in habitat in close proximity to the project area, particularly in the Taranaki Stream subcatchment of the Ashley River catchment and increasingly in areas to the south and southeast of here as new locations are sampled and understood. The Ashley River catchment contains the northern most known natural subpopulation of Canterbury mudfish, with 3 recognised habitat fragments, 2 of which are considered extinct. A total of 0.16 ha of habitat is considered to remain in the Taranaki Stream subcatchment representing 0.56% of the species known remaining habitat, and a habitat fragment area of 1.8 ha for those subpopulation fragments considered to be extinct in the subcatchment.
31. Based on the prediction model (Figure 1), there is a high probability (areas in red) that Canterbury mudfish habitat occurs within the project area, particularly near Woodend, particularly within areas mapped as historic wetlands (Figure 2) as given in the Freshwater Ecosystems of New Zealand (Leathwick et al. 2010).
32. In combination, using the data and information described in paragraphs 29-31, and examination of photos in Tonkin & Taylor (2025) which do appear to show Canterbury mudfish habitat, I consider that there is a high likelihood that Canterbury mudfish could be present in habitats within the project area, but which have not been surveyed to determine if this species is present or not.

The effect of habitat loss within the project area

33. If habitat containing Canterbury mudfish is present in the project area, its further modification or loss would result in further sub-population fragment extinctions (see paragraph 19 above) and move the species closer to the next NZTCS category of Extinct.
34. Any habitat and subpopulation fragment located and protected in the project area would increase the likelihood of persistence of Canterbury mudfish in this northern most area of its known natural distribution.

Suggested consent approach

35. I am of the opinion that further survey work should be undertaken within the project area, in areas that appear suitable for Canterbury mudfish, such as still or very slow-flowing, meandering, swampy streams with deep pools, seepage streams, spring fed streams, wetlands and isolated pools/ponds.
36. Sampling for Canterbury mudfish should follow the methods described by Ling et al. (2013) using ⅛ inch (circa 3 mm) Gee's minnow traps set overnight.
37. If Canterbury mudfish are located within the project area, then a management plan should be developed in consultation with DOC to protect existing habitat and/or relocate fish to alternative habitat.

Dr Nicholas Rex Dunn

17 April 2026

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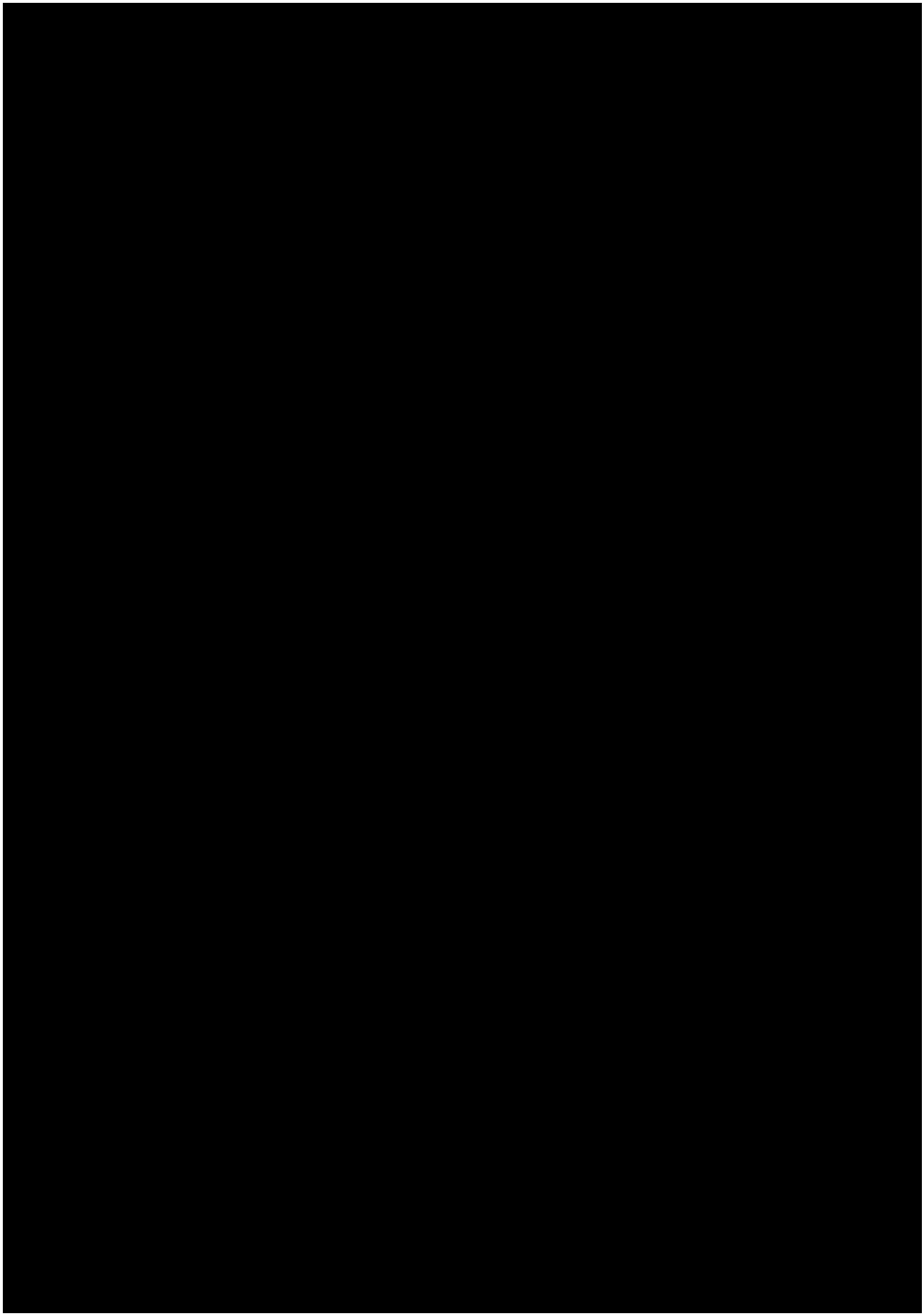

Figure 1. Predicted and known Canterbury mudfish in and around the project area. Areas of high probability of Canterbury mudfish habitat are shown in red.

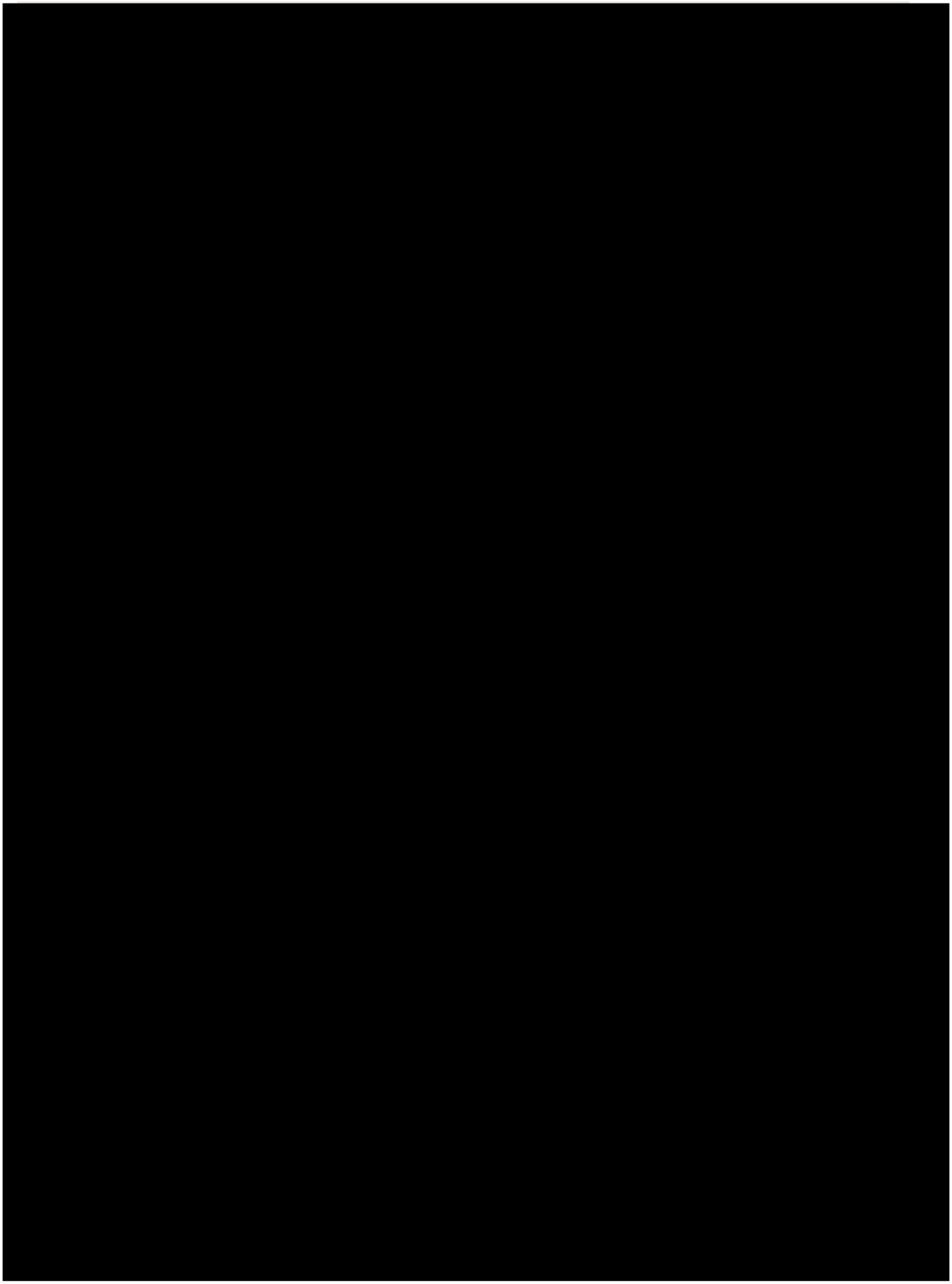

Figure 2. Known Canterbury mudfish and mapped historic wetlands in and around the project area.