Memorandum

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Attention:	Catherine Stuart
Company:	Southern Parallel Sports Campus
Date:	8 November 2022
From:	Tanya Blakely, Jessica Schofield
Message Ref:	Re: SPSC Ecological Constraints and Opportunities
Project No:	BM220807A

Introduction

Boffa Miskell Limited (BML) has been engaged by Southern Parallel Sports Campus (SPSC) to prepare a high-level ecological assessment for the proposed Southern Parallel Sports and Equestrian Centre to inform the application for a fast-track consent.

The proposed Southern Parallel Sports and Equestrian Centre (referred to hereafter as 'the Site') is a 65-hectare joint venture located at 279 Stranges Road, approximately 7 kilometres south-west of Ashburton (refer Figure 1). This property is bounded by Huntingdon Avenue (northern boundary), Lake Hood and associated residential area (east), rural properties (south), and Stranges Road (west).

The project masterplan comprises a sports campus in the north of the Site, and an equestrian centre in the south (refer to the Campus Landscape Masterplan[1] for plan design of campus). The sports campus contains two large indoor sports facilities alongside several sports fields. The equestrian centre contains a large indoor arena, motel and cafeteria buildings, a parking area, and polo fields. Additionally, 32 four-bedroom townhouses are proposed within the north-east portion of the Site to be accessed from Huntingdon Avenue. These are to be used as accommodation for the participants in the sports campus programme. To the west of the townhouses a storage pond is proposed, which will capture the stormwater and wastewater from services utilised on site and is proposed to be treated by a BioGill Ultra treatment system[2]. A formed embankment alongside Stranges Road in the northern portion of the Site and near the equestrian arena in the southern portion is proposed to provide shielding from the road. Substantial planting is planned to enhance the amenity of the Site, including native riparian planting along the length of the central waterway on Site allowing for the development of an ecological corridor.

[1] Boffa Miskell, 2022. *Southern Parallel Sports Campus Landscape Masterplan.* Report by Boffa Miskell Limited for Southern Parallel Sports Campus Ltd. Dated 30 September 2022.
[2] BioGill Ultra. https://biogill.com/products/biogill-ultra/.

Scope

This assessment has been prepared to provide a high-level description of the existing ecological values at the Site along with potential ecological constraints and opportunities for enhancement. Detailed design information specifying the construction footprint and methodology were not available at the time of this assessment. Additional assessments may be required once specific detailed design information is available to understand the potential effects of the SPSC on the ecological values.

The objectives of this high-level ecological assessment are to:

- describe the existing environment, including ecological features and values of the site and surrounding environment;
- identify potential constraints and effects on the ecological values of the area that may be impacted by the proposed SPSC development, and
- identify opportunities for potential additional assessments or surveys required to complete a detailed ecological impact assessment.

Methodology

Desktop Review

A desktop review was undertaken to gather the existing ecological information available:

- GIS (spatial) databases and aerials, including:
    - Waterways (river centre lines) shown on New Zealand Topographical Maps;
    - Environment Canterbury Maps: rating units, historic 'black maps', LWRP – Water Quality Management Units, wetlands of representative importance, and historic aerial imagery layers;
    - Ashburton District Council online District Plan maps and 3 Waters Utilities map viewer.
- Existing information on freshwater fish species within or nearby the proposed development:
    - The NIWA-administered New Zealand Freshwater Fish database (NZFFD). This database holds records of freshwater fish distributions and occurrences based on previous surveys. The conservation status of fish species found in the NZFFD records was assessed based on the most recent conservation threat status for New Zealand's freshwater fish (Dunn et al., 2018).
- Existing information on avifauna / bird species within or nearby the proposed development:
    - Data from the Ornithological Society of New Zealand's (OSNZ) atlas was collated from the 10 x 10 km grid square, which encompasses the proposed development;
    - Further literature and website searches were undertaken to obtain additional information regarding bird species know to occur within the surrounding habitats. This included the eBird and iNaturalist citizen science databases;
    - Tonkin & Taylor Limited (2008). Lake Hood extension project joint venture: Assessment of Environmental Effects. Report prepared by Tonkin & Taylor Limited for Lake Hood extension project joint venture, December 2008.

File Ref: BM220807_004_A3P_Waterways.mxd

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Data Sources:
Cadastre sourced from LINZ data service

Projection: NZGD 2000 New Zealand Transverse Mercator

SOUTHERN PARALLEL SPORTS CAMPUS

Waterways

Date: 04 November 2022 | Revision: 0

Plan prepared for Southern Parallel Sports Campus by Boffa Miskell Limited

Project Manager: katie.chilton@boffamiskell.co.nz | Drawn: BMc | Checked: JSc

Figure 1

Site investigation

Dr Tanya Blakely (Senior Principal Ecologist), Cara-Lisa Schloots, and Jessica Schofield (Ecologists) visited the site on the 4th of October 2022, to record the existing ecological condition and readily observable values at the site. This information has been used to assess (at a high level) the terrestrial, riparian, wetland, and in-stream ecological features and conditions present. Refer to Appendix 1 for a series of images from the site visit.

There had been no (0 mm) rain in the 48 hours prior to the site visit, but approximately 15 mm in the previous 5 days[3]. Other than 11 mm on 13 September 2022, very little rain had fallen in the preceding month.

Watercourse classification

It is important to determine whether a watercourse is "artificial" or "natural" because Section 13 of the Resource Management Act restricts certain uses of the beds of lakes and rivers, which only applies to natural watercourses. This includes 'modified natural' watercourses, but does not apply to artificially created or human-made watercourses (such as irrigation canals, water supply races, and farm drainage canals).

In Canterbury, historic wetlands have been drained and natural watercourses straightened and greatly modified. Many natural watercourses now appear to be 'artificial' or human made. However, many are 'modified natural' watercourses.

We used the definitions of 'river', 'artificial watercourse' and 'drain' from the Resource Management Act 1991 and / or Environment Canterbury's Land and Water Regional Plan (LWRP), where:

> ***River*** *means a continually or intermittently flowing body of fresh water; and includes a stream and modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal).*
>
> ***Artificial Watercourse*** *means a watercourse that is created by human action. It includes an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal channel. It does not include artificial swales, kerb and channelling or other watercourses designed to convey stormwater.*
>
> ***Drain*** *includes any artificial watercourse that has been constructed for the purpose of land drainage of surface or subsurface water and can be a farm drainage channel, an open race or subsurface pipe, tile or mole drain, or culvert.*

We reviewed historic aerial imagery from 1940-1944 as available on Canterbury Maps, for historical evidence of ecological features, such as rivers and wetlands present within and directly surrounding the Site.

We also explored the "LWRP – Water Quality Management Units and Classes – Rivers" mapped information from Environment Canterbury[4], which shows natural watercourses and groups these into classifications based on similarity of physical and hydrological characteristics (i.e., alpine, hill-fed, lake-fed, spring-fed etc.).

Assessing ecological values

In assessing ecological values, we have followed the terminology and methodology of Roper-Lindsay et al. (2018). This approach involves assessing various attributes (representative, rarity/distinctiveness, diversity and pattern, ecological context) and species known, or likely, to be present at a site or in an area.

[3] Environment Canterbury 2022. Rainfall Data Hinds Plains. https://www.ecan.govt.nz/data/rainfall-data/sitedetails/319602

[4] Canterbury Maps 2017. Water Quality Management Units and Classes (Rivers) Layer as shown in the Land and Water Regional Plan. https://gis.ecan.govt.nz/arcgis/rest/services/Public/LWRP/MapServer/7

Once ecological values had been assessed, the potential ecological constraints associated with the proposed masterplan were identified.

Limitations and assumptions

- This memorandum presents a high-level assessment of the existing environment at the potential SPSC site. The information presented is based on a desktop review of existing data and site walkover to inform the ecological values within the potential work area.

- Detailed quantitative surveys (e.g., detailed in-stream / aquatic, lizard, avifauna, or vegetation / botanical surveys) were outside of the scope of this work and, as such, this assessment of the existing ecological features should not be interpreted as an exhaustive list of terrestrial and freshwater species present within the area.

- Our assessment is based on the general proposed Landscape Masterplan supplied to us by Boffa Miskell (30 September 2022). While this Masterplan has been provided, detailed design has not yet been developed.

- We have not been provided with technical information in relation to water quality or quantity effects from the proposed activities, such as the BioGill treatment system, and treatment and / or discharge of stormwater to the existing watercourses. It is understood that stormwater from the site will be discharged into an excavated storage pond, which will be treated prior to discharge into the Lagmhor Creek.

- The recommendations provided in this memorandum are based on high-level ecological information gathered during this desktop phase, and in the absence of detailed design, and proposed construction and operational activities within the Site. Further advice should be sought when finalising details of the design and construction methodology, particularly with regards to potential ecological effects and measures required to avoid, remedy or mitigate adverse ecological effects.

- This high-level assessment is intended to inform the applicant and design team, and highlight if there are any fatal flaws, major constraints, or opportunities (e.g., ecological areas or values that warrant avoidance) and is not intended to be a full Ecological Impact Assessment (EcIA). An EcIA will be required later, to inform resource consent applications to the regional council.

Ecological context and site description

The Site lies within the Canterbury Plains Ecological Region and the Low Plains Ecological District (McEwen, 1987). Historically, the Site would have been a mosaic of grassland, treeland, flaxland, and scrub, with stony soils in the eastern portion of the Site, however only remnants of that cover remains today(Harding, 2009; Landcare Research, 2019).The majority of land across the district has been disturbed for agriculture and settlement, and large portions of the district is intensively farmed (Harding, 2009).

The Site itself represents a 65-ha highly modified arable farm environment, which has been used to grow crops and for animal grazing. At the time of the site visit, the eastern portion of site was tilled bare earth for crops. The Site is predominantly flat, except where the northern branch tributary and Lagmhor Creek have incised the landscape. Exotic deciduous trees and shelterbelts occur on some boundaries. Surrounding land use is predominantly agricultural, and the Lake Hood residential development is present to the north-east of the Site.

Ecological features and values

Vegetation

The terrestrial vegetation present at the site is almost entirely improved pasture (exotic grasses and a range of exotic pasture weeds), shelterbelts of exotic species, and some weeds such as gorse (*Ulex europaeus*), scotch broom (*Cytisus scoparius*) and crack willow (*Salix fragilis*) along waterways. There is a small number of possibly self-established silver tussock (*Poa cita*) along the western boundary, and kohuhu (*Pittosporum tenuifolium*) along the northern boundary. The gully that encloses the northern branch that enters Lagmhor Creek has some remnants of indigenous vegetation, including harakeke / flax (*Phormium tenax*), tī kōuka / cabbage tree (*Cordyline australis*), bracken fern (*Pteridium esculentum*) and a small number of plants of an indigenous sedge (*Carex* sp.) (Figure 2).

Vegetation is visible in the gully in aerial photographs from as early as 1941 (Local Government Geospatial Alliance, n.d.), so it is possible that this vegetation represents remnant or naturally regenerating vegetation that is representative of what would have historically been found in the Low Plains Ecological District. As there is very little remaining indigenous vegetation in the Low Plains Ecological District and the majority of the Canterbury Plains is classified as an 'Acutely Threatened' land environment (Walker et al., 2007), this vegetation would be considered significant under the Environment Canterbury (2013) Regional Policy Statement (RPS) Appendix 3 significance criteria. This vegetation is proposed to be retained and enhanced as part of an improved ecological corridor.

Due to the agricultural modification resulting in the Site being almost entirely comprised of improved pasture with small pockets of indigenous vegetation, terrestrial vegetation across the Site is assessed as having **Low** ecological value. However, some areas within the Site provide habitat for fauna (see following sections).

Figure 2: Vegetation within the gully area along the northern branch of the unnamed tributary of Carters Creek. Image taken during site visit on the 4th of October 2022.

Avifauna

The desktop review provided a base list of 62 species from the Ornithological Society of New Zealand (OSNZ) square and eBird (EBird, n.d.) records that encompass the Site and the broader area surrounding the Site, particularly near to Lake Hood. This includes eight 'Threatened' and nine 'At Risk' species (Robertson et al., 2021). However, most of these species have only been observed in low numbers (Appendix 2), and the Site may not support all of these species. Formal avifauna surveys were not undertaken, however, multiple native and introduced birds were recorded flying over or directly within the Site during the walkover. The gully vegetation provides suitable habitat for both indigenous and exotic species, including pūkeko, welcome swallows, and mallard ducks.

Of particular note, during the site visit / walkover New Zealand pied oystercatcher (*Haematopus finschi*, At Risk – Declining) and black-fronted tern (*Chlidonias albostriatus*, Threatened – Nationally Endangered) were observed feeding within the paddocks on site (Appendix 2). At the confluence of the western and northern branches of the tributary to Carters Creek, a pūkeko (*Porphyrio melanotus melanotus*, Not Threatened) nest was observed (Figure 3).

Based on these observations and information gathered from the OSNZ and eBird, the ecological value of avifauna using the Site is considered to range from **Negligible** to **High**.

Figure 3: Pūkeko eggs observed during site visit on the 4th of October 2022.

Herpetofauna

New Zealand grass skinks (Southern grass skink, *Oligosoma* aff. *Polychroma* Clade 5; At Risk – Declining) have been observed on iNaturalist in the wider landscape, within approximately 5 km of the Site. Southern grass skink is considered of **High** ecological value. All native lizards are protected under the Wildlife Act.

Potential lizard habitat is present in the long grass within the Site, including adjacent to the northern branch and along roadside margins and the perimeter of the Site. These areas of rank grassland may provide small, fragmented areas of habitat for native skink, and as such grass skinks may be present in these areas of the Site. There are substantive areas of the Site that are unlikely to provide suitable habitat for lizards.

Wetlands of representative importance

There were no wetlands overlapping the Site on the Wetlands of Representative Importance or Canterbury Wetlands layers on Environment Canterbury online maps. However, on the Ministry for the Environment

online map layer ‘Prediction of wetlands before humans arrived’, the Site is classified as being a historic swamp wetland[5]. Despite this, no areas of potential wetlands were identified within the Site.

Freshwater habitats and fauna

There are multiple connected waterways within the Site (refer Figure 1). Lagmhor Creek[6] enters the site from the western boundary and is a perennial watercourse that brings the majority of flow. The watercourse that enters the Site from the north (hereafter referred to as the “northern branch”), joins Lagmhor Creek within the Site. Lagmhor Creek joins Carters Creek downstream of the Site, before flowing to Ashburton River. Mt Somers Willowby water race runs along the western boundary of the site, parallel to the road[7]. Refer to Appendix 1 for images of the watercourses.

The waterways appear to have a long history of being managed from a drainage and flood conveyance perspective, with macrophyte (and possibly sediment) removal from the bed and maintenance of riparian vegetation common practice.

Based on our interrogation of historic aerial imagery, Lagmhor Creek and the northern branch are present in similar extent and locality to present day location (Figure 4). Upstream of the Site, historic aerials show Lagmhor Creek had a meandering channel, which has been straightened for agricultural and flood conveyance purposes. In this historic imagery, the braid plain of the Ashburton River extends further than present day to the Site’s eastern most boundary.

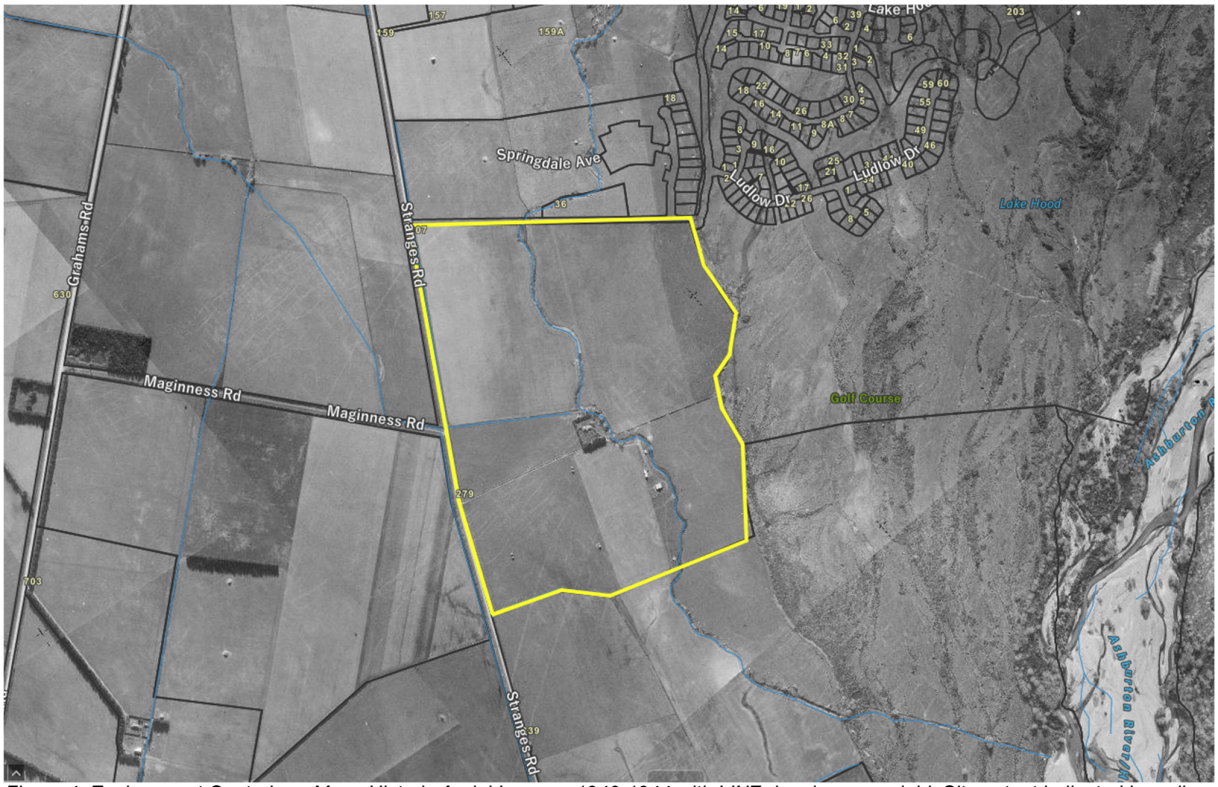


Figure 4: Environment Canterbury Maps Historic Aerial Imagery 1940-1944 with LINZ river layer overlaid. Site extent indicated by yellow line.

In addition to this, both Lagmhor Creek and the northern branch are classified as “spring-fed – plains” natural waterways in the LWRP. Refer to Appendix 3 for the classification of these waterways on Environment Canterbury (2018a) LWRP map.

[5] Ministry for the Environment (2016). Prediction of wetlands before humans arrived. https://data.mfe.govt.nz/layer/52677-prediction-of-wetlands-before-humans-arrived/.
[6] Identified with Environment Canterbury maps layer “Drains and watercourses (Flood Protection and Drainage Bylaw 2013 - amended 2019)”. https://gis.ecan.govt.nz/arcgis/rest/services/Public/PlanningZones/MapServer/3
[7] Identified within Ashburton District Council online 3 Waters Utilities map viewer.

The waterways (including natural and artificial) within the Site are further discussed in the following sections.

Lagmhor Creek

Lagmhor Creek has a wetted width of approximately 1.5 m to 2.5 m wide, with bed substrate comprised of predominantly silt / sand sediment with a few cobbles. The bank angle is nearly 90 degrees, with small sections of undercut bank observable. Lagmhor Creek is classified as a natural, spring-fed – plains waterway. However, it has been highly modified for flood conveyance and drainage.

A section of this waterway, within the Site, has been straightened and appears to be heavily maintained with frequent clearing of macrophytes. However, downstream of the residential property (see Figure 1), the stream form is more natural (it gently meanders) and less obviously managed for drainage / flood water conveyance, with variable flow habitats, fast run and riffle habitats and small pools present. There were two culverts observed in this downstream section of the waterway, which may become perched in low flows and when water velocity within the channel increases during flood events (Figure 5). Similarly, upstream of Stranges Road (and upstream of the Site), the waterway appears to be less regularly maintained and it has more shading (from exotic weeds), with cobbles present in the channel.

A range of macrophyte species are present within the channel including monkey musk (*Erythranthe moschata*), buttercup, watercress (*Nasturtium officinale*), cocksfoot (*Dactylis glomerata*), dock, gorse, water speedwell (*Veronica anagallis-aquatica*), sweetgrass (*Glyceria maxima*), and duckweed (*Lemna* sp.).

Within the section that flows west-east there were five culvert crossings (for a pivot irrigator) each with an approximately 700 mm diameter pipe. These were spaced c.50 m apart and may restrict the flow (and potentially fish passage) at times. The crossing closest to Stranges Road has a pipe of approx. 5 m in length, providing for a vehicle / farm crossing.

Figure 5: Culvert below confluence of the branches of unnamed tributary to Carters Creek.

Northern branch

The northern branch (Figure 1) is wide, with the cross section along most of its length approximately 5 m wide (or greater). This watercourse is also classified as a natural, spring-fed – plains waterway, but, like Lagmhor Creek, it has been highly modified for flood conveyance and drainage. The northern branch appears to have been dug out or periodically managed to control sediment and freshwater plant growth. The waterway may be intermittent, where surface flow may be absent during times of prolonged dry weather. However, it's unlikely to be classified as ephemeral as there was surface water present, with slow flow four days after rainfall (with the most recent substantial rainfall event 3 months prior). This would need to be confirmed by observing the watercourse during different seasons.

On the day of the site visit, water was pooled within the channel and minimal flow was observed. The channel bed has dense cover of freshwater plants (macrophytes) with buttercup (*Ranunculus* sp.*)*, and dock (*Rumex* sp.) present in many areas along the channel. There is limited shading along its length, provided by some remnant indigenous vegetation.

One culvert and one crossing for a pivot irrigator was sighted within the northern branch (within the Site). The pivot irrigator crossing consisted of some concrete pavers that were submerged under water on the day of our site visit.

Mt Somers Willowby water race

The Mt Somers Willowby water race is an artificial waterway, which comprises part of the Ashburton District Council water race network. The channel is straight and forms the western border of the property, immediately adjacent to Stranges Road. Lagmhor Creek and the water race intersect at the western boundary, directly upstream of the large culvert crossing over Lagmhor Creek.

The water race channel has a wetted width of approximately 1.5 m, with bed substrate comprised of predominantly fine materials (silt / sand), and the bank angle is nearly 90 degrees. Bank vegetation was comprised of bare earth and cut grass, shading of the stream channel was nearly entirely absent, but there was minimal macrophyte biomass observed within the channel at the time of the site visit.

Macroinvertebrates

During the site walkover, the ubiquitous mud snail *Potamopyrgus* and backswimmers were observed within the water race. Freshwater macroinvertebrates vary in their tolerances to pollution and contaminants in waterways and can be good indicators of stream health (Clapcott et al., 2017). Comprehensive macroinvertebrate sampling was not within the scope of this site visit, however, based on the high fine sediment load and macrophytes present it is expected that the macroinvertebrate community will be dominated by pollution-tolerant species and the 'clean-water' taxa, such as mayflies, stoneflies and caddisflies are likely absent.

Fish

There are no fish records in New Zealand Freshwater Fish Database (NZFFD) for the waterways that flow through the Site. However, it's important to note that this does not mean that fish are not present, but instead that this waterway has never been surveyed.

Upland bully (*Gobiomorphus breviceps*) (Not Threatened; non-migratory) has been recorded within Carters Creek, with this species found in that waterway approx. 2 km north of the Site. The Threatened, Nationally Critical Canterbury mudfish (*Neochanna burrowsius*) has also been recorded in a side channel near the outlet from Lake Hood.

Survey of the fish communities within the waterways of the Site is recommended if any works are to occur that will require in-stream works or activities near the waterways, such as river diversions, realignment, installation of new crossings, groundwater or surface water abstraction that may affect baseflows. Understanding the fish fauna present would also be useful to provide guidance for any enhancement activities proposed.

The waterways within the Site include both natural perennial waterways (potentially with some intermittent reaches) (i.e., the northern branch) and human-made / artificial watercourses (i.e., the water race).

The habitat conditions within these waterways are variable and, based on initial observations, likely range from **Moderate** to **Low**. This is based on the straightened and / or widened channel nature (particularly in the upstream parts of the western branch), with limited in-stream habitat heterogeneity, and very limited riparian vegetation. However, it is important to note that the ecological value cannot be fully assessed without site-specific records of macroinvertebrate or fish communities and there is a potential for fish species of High (At Risk conservation status) to Very High (Threatened conservation status) ecological value to be present.

Potential ecological constraints

This section discusses the most likely potential ecological constraints of the proposed SPSC development at masterplan stage, based on our current understanding of the proposed activity.

Vegetation and habitats for fauna

The vegetation present in the gully (northern branch) may represent remnant or naturally regenerating vegetation that is representative of what would have historically been found in the Low Plains ED. While this vegetation is of low value (due to its condition), it meets the test of significance in the RPS (under rarity) (Environment Canterbury, 2013).

Based on our understanding of the proposed development and associated activities, no loss of indigenous vegetation within the gully is proposed as part of the SPSC development and, therefore, no constraint identified. Instead, removal of existing weed species and enhancement planting is likely to have a positive impact on indigenous vegetation communities within the Site. We see this as an opportunity for ecological enhancement, as there is extensive native planting proposed in the masterplan around all waterway channels to allow for the creation of native ecological corridors.

- Careful consideration of weed control methods and enhancement planting with ecologically suitable, indigenous species is recommended as proposed by the masterplan to achieve a positive outcome.

Mortality and disturbance of terrestrial fauna

While habitats for lizards are limited within the Site, the areas of rank grassland may support species such as Southern grass skink.

- Construction activities within the site margins and Lagmhor Creek riparian areas where rank grass is present should be avoided.

- If avoidance of construction activities within these areas is not possible, assessment by a suitably qualified DOC-permitted herpetologist is recommended to manage risk of harm. Note lizards are protected under the Wildlife Act 1953. This may involve confirmation of lizard presence / absence, and / or recommendation of a lizard salvage.

The mobile nature of most avifauna species means that the potential for direct mortality associated with construction will likely be confined to birds breeding within the site, if construction activities occur during the species breeding seasons. Species identified that may nest within the site (and thus be affected by development) include pūkeko and New Zealand pied oystercatcher.

- A suitably qualified ornithologist or avifauna expert should provide advice on any effects management measures required, which may include measures to avoid, remedy or mitigate significant adverse effects on avifauna in particular locations on Site, if works are to be undertaken during breeding season.

Disturbance to in-stream habitat and freshwater fauna

Construction activities may require some works within the waterways across the Site. Construction activities may result in discharge of sediment into the waterways across the Site, which can result in smothering of macroinvertebrate and algae communities, clog the gills of freshwater fauna, disrupt fish feeding behaviours, and impede fish migration.

There is also risk of physical in-stream works resulting in harm to fish and other in-stream fauna present through direct physical disturbance and crushing, and risk of impediment to fish passage. In addition, new subsoil drainage may be required to redirect any shallow groundwater present away from the development, which may result in waterways within the Site being susceptible to reduced flows.

- Advice from a suitably qualified and experienced freshwater ecologist should be sought to inform appropriate management techniques during construction, which may include consideration of:
    - Measures to avoid / minimise discharge of contaminants (sediments, other contaminants) in waterways.
    - Management techniques to avoid significant adverse effects of waterway diversions, dewatering, culvert (or other structure) construction and installation, and other works within or adjacent to waterways.
- If in-stream works, or adjacent activities that may have an adverse effect on riparian or in-stream habitat condition were proposed to occur, specific surveys of the freshwater habitats and fauna are recommended between the months of December and April inclusive (recommended survey period by Joy et al., (2013)). The purpose of this is to confirm the species range present in the affected waterway, and identify appropriate management.
- Avoiding potential for loss or changes to stream extent and values (e.g., through loss of flow permanence, reclamation, piping / infilling) is an explicit requirement of the National Policy Statement for Freshwater Management (NPS-FM) 2020 (Policy 7). Where this is not practicable, a clear approach using the effects management hierarchy to manage the adverse effects on the ecology will be necessary.

Risk of impediment to fish passage

Many of New Zealand's freshwater fish are migratory and, therefore, require unimpeded passage between the sea and freshwater habitats to complete their lifecycles. Even for non-migratory species, it is important that their movement within a waterway is not restricted or impeded.

Any waterway crossings for access into or within the Site proposed need to be carefully considered and designed to ensure they do not present a risk of impediment to fish passage. The waterways within the Site may support fish species, which may include those of conservation interest (e.g., At Risk or Threatened species), and / or taonga and mahinga kai species.

There are currently numerous culverts and crossings within the waterways on Site, and these existing structures may impede fish movement. There is the opportunity to enhance fish passage within the Site, by removing existing structures.

The Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (NES-F) sets out the design standards and monitoring requirements for installation of new culverts (subpart 3, regulation 70.2).

- To meet the permitted activity rules, a culvert must provide for the same passage of fish upstream and downstream as would exist without the culvert, for the lifetime of this structure. Any installation or remediation of culverts will be undertaken with reference to fish passage guidelines (Franklin et al., 2018).

Stormwater and wastewater discharge

Increased impervious surfaces

The proposed SPSC will generally increase the area of impervious surfaces present relative to the Site's current landcover, which is almost entirely grassed landcover or tilled cropland, through the construction of large buildings, townhouses, and associated roads, pathways and carparking areas.

Increases in the area of impervious surfaces can reduce natural flow paths (via infiltration) to waterways during rainfall events, resulting in 'flashy' flows. Contaminants and pollutants (e.g., sediments, heavy metals) from the surrounding urban environment also accumulate on these hard surfaces (e.g. roads, footpaths) and enter waterways during rainfall events. Both of these can have adverse effects on the ecology and health of waterways.

Altered water flow and quality from storage pond discharges

The proposed storage pond is anticipated to discharge treated water from the BioGill system to the northern branch of Lagmhor Creek. This discharge is expected to be appropriately treated by the BioGill system; however, this requires investigation by a suitably qualified expert.

Untreated, or inadequately treated, stormwater and wastewater has the potential to alter in-stream water temperature, water quality and habitat quality, and ultimately risks adverse effects to any freshwater fauna if present downstream of discharge.

- An assessment is recommended of the efficacy of treatment by the BioGill system of stormwater and wastewater runoff produced by the Masterplan development and any adverse ecological effects of the residual discharge of treated water on the receiving environment.
- Once this has been completed, advice from a suitably qualified and experienced freshwater ecologist should be included to determine appropriate management measures.

Artificial light disturbance

The presence of artificial lights across the Site will increase as a result of the SPSC development. However, we note the following from the Boffa Miskell Landscape and Visual Effects assessment[8]:

"The darkness of the night sky, otherwise generally expected in the rural environment, has already been compromised. As part of the proposed activities lighting throughout the Site will only be provided on a permanent basis in the form of low down-lights for pedestrian purposes which will avoid light spill beyond the boundary of the Site. The lighting of sports fields would be intermittent and restricted to events. The proposed lighting masts around the sport field in the north-western quadrant can be retracted to minimise their visual effects while they are not in use".

Therefore, we considered that the risk of impact to nocturnal indigenous freshwater fish and insects (the behaviour patterns of, which may be adversely affected by light spilling near waterways) be already appropriately considered in the current design to avoid light spill.

- Advice from a suitably qualified and experienced freshwater ecologist should be included in the Detailed Design to determine the effects of lighting and any impact management measures required to manage any adverse effects.
- Advice may include recommendations such as: avoiding lighting adjacent to the waterways; and where new lighting is needed, it should designed to avoid light spill onto and over the waterways and riparian vegetation (i.e. using angled mounting and rear shielding). It is also recommended that the use of blue LEDs is avoided where possible, however, noting that further research information is pending on this matter.

[8] Boffa Miskell (2022). Landscape Effects Assessment. Report by Boffa Miskell Limited for Southern Parallel Sports Campus Ltd. Dated 29 August 2022.

Summary

As described in the Scope, the objective of this high-level assessment is to identify ecological values, potential ecological constraints and opportunities for enhancement within the Site. It is intended to provide sufficient information to support the fast-track application for the SPSC, while also providing an indication of further / detailed assessment that may be required to prepare an ecological impact assessment at Detailed Design stage.

Based on the information gathered so far (primarily based on desktop and a brief site walkover), there are no terrestrial vegetation values that preclude the SPSC development, but design and construction elements will need to be carefully considered during the Detailed Design phase. However, there may be Threatened and / or At Risk species (birds, lizards, freshwater fauna) present within the site, and potential effects on these species need to be carefully managed.

Specialist ecological surveys, including of the waterways and in-stream fauna, lizard and bird species, may be required to complete a detailed Ecological Impact Assessment, depending on the detailed design process. Any required surveys will confirm ecological values present, which will allow for the identification of the magnitude and level of effects of the proposed activity on these ecological values, and the provision of subsequent recommendations using the effects management hierarchy, i.e. measures to avoid, remedy and mitigate adverse effects.

We have provided recommendations throughout the Potential ecological constraints section, above; these have not been repeated here.

Ecological Enhancement Opportunities

The following provides some potential opportunities to enhance the ecological value and functioning of the Site, to be considered during the Detailed Design phase.

- Remove weeds in the gully riparian area of the northern branch, keeping any indigenous species (i.e., harakeke and tī kōuka). The removal of willows is recommended, via cut and paste or drill and fill techniques, which would allow for roots to be left in situ to avoid affecting bank stability.
- Create buffer plantings around any exotic deciduous trees remaining or proposed to be planted across the Site. This includes trees along the boundaries. This will help to reduce the quantity of leaves being deposited into waterways, which reduces water and habitat quality.
- Plant dense indigenous (or evergreen exotic) species around the storage pond and waterways, including trees and shrubs). This would provide shading of the waterbodies (to reduce fluctuations in water temperature) and control excessive growth of algae and macrophytes, as well as providing habitat and food resources to the freshwater habitats.
- Plant riparian margins with ecologically suitable species, including locally-sourced native species, avoiding exotic and deciduous species, especially close to the waterway. Use plants with flexible and low-density foliage where it's important to maintain flood capacity, but ensure the riparian margin is well vegetated with a variety of height tiers of native plant species.
- Where possible, avoid locating additional impervious surfaces (e.g., carparks, buildings, roads and pathways) adjacent to waterways to manage stormwater runoff. Create habitat for insects, birds, and lizards through use of node planting or pockets of indigenous plantings around the site.
- Create sinuosity in the straight sections of waterways and variation in bank steepness through regrading banks, creating a gently meandering low-flow channel and / or use of wetland floodplains or terraces.

References

Clapcott, J., Wagenhoff, A., Neale, M., Storey, R. G., Smith, B., Death, R., Harding, J. S., Matthaei, C., Quinn, J. M., Collier, K., Atalah, J., Goodwin, E., Rabel, H., Mackman, J., & Young, R. G. (2017). *Macroinvertebrate metrics for the National Policy Statement for Freshwater Management* (Cawthron Report No. 3073). Prepared by Cawthron Institute for the Ministry for the Environment.

Dunn, N. R., Allibone, R. M., Closs, G. P., Crow, S. K., David, B. O., Goodman, J. M., Griffiths, M., Jack, D. C., Ling, N., Waters, J. M., & Rolfe, J. R. (2018). *Conservation status of New Zealand freshwater fishes, 2017* (New Zealand Threat Classification Series No. 24). Department of Conservation.

EBird. (n.d.). *New Zealand bird atlas: Atlas effort*. https://ebird.org/atlasnz/effortmap

Environment Canterbury. (2013). *Canterbury regional policy statement 2013*. Environment Canterbury. https://www.ecan.govt.nz/your-region/plans-strategies-and-bylaws/canterbury-regional-policy-statement/

Environment Canterbury. (2018). *Canterbury Land and Water Regional Plan: Volume 1*. Environment Canterbury.

Franklin, P., Gee, E., Baker, C., & Bowie, S. (2018). *New Zealand fish passage guidelines for structures up to 4 metres*. National Institute of Water and Atmosphere.

Harding, M. A. (2009). *Canterbury land protection strategy: A report to the Nature Heritage Fund Committee*. Nature Heritage Fund.

Joy, M. K., David, B., & Lake, M. D. (2013). *New Zealand freshwater fish sampling protocols. Part 1: Wadeable rivers and streams* [New Zealand Freshwater Fish Sampling Protocols]. Massey University.

Landcare Research. (2019). *S-map - New Zealand's national digital soil map* [Map]. https://smap.landcareresearch.co.nz/

Local Government Geospatial Alliance. (n.d.). *Retrolens historical image resource*. https://retrolens.nz/

McEwen, W. M. (Ed.). (1987). *Ecological regions and districts of New Zealand. Booklet to accompany Sheet 3: Descriptions of districts in central New Zealand, from eastern Wairarapa to Akaroa, also Chathams, not shown on map* (3rd rev. ed. in four 1:500 000 maps). Department of Conservation.

Robertson, H. A., Baird, K. A., Elliott, G. P., Hitchmough, R. A., McArthur, N., Makan, T. D., Miskelly, C. M., Sagar, P. M., Scofield, R. P., Taylor, G. A., & Michel, P. (2021). *Conservation status of New Zealand birds, 2021* (New Zealand Threat Classification Series No. 36). Department of Conservation.

Roper-Lindsay, J., Fuller, S. A., Hooson, S., Sanders, M. D., & Ussher, G. T. (2018). *Ecological impact assessment (EcIA). EIANZ guidelines for use in New Zealand: Terrestrial and freshwater ecosystems* (2nd ed.). Environment Institute of Australia and New Zealand.

Walker, S., Cieraad, E., Grove, P., Lloyd, K., Myers, S. C., Park, T., & Porteous, T. (2007). *Guide for users of the threatened environment classification* (Ver 1.1).

Appendix 1: Site Photos taken during site visit on 4th October 2022.

Northern branch of unnamed tributary of Carters Creek

Straightened section of the western branch of unnamed tributary of Carters Creek

Unnamed tributary of Carters Creek downstream of the residential dwelling and below the confluence of the northern and western branches

Mt Somers Willowby water race, which runs inside the Site along the western boundary

Northern branch of unnamed tributary, at the upstream extent of the Site near Huntingdon Avenue

Woody debris near Huntingdon Avenue

Tī kōuka / cabbage trees and harakeke / flax present wihtin the Site, including in the gully surrounding the northern branch, which may represent remnant or naturally regenerating vegetation historically present in the Ecological District

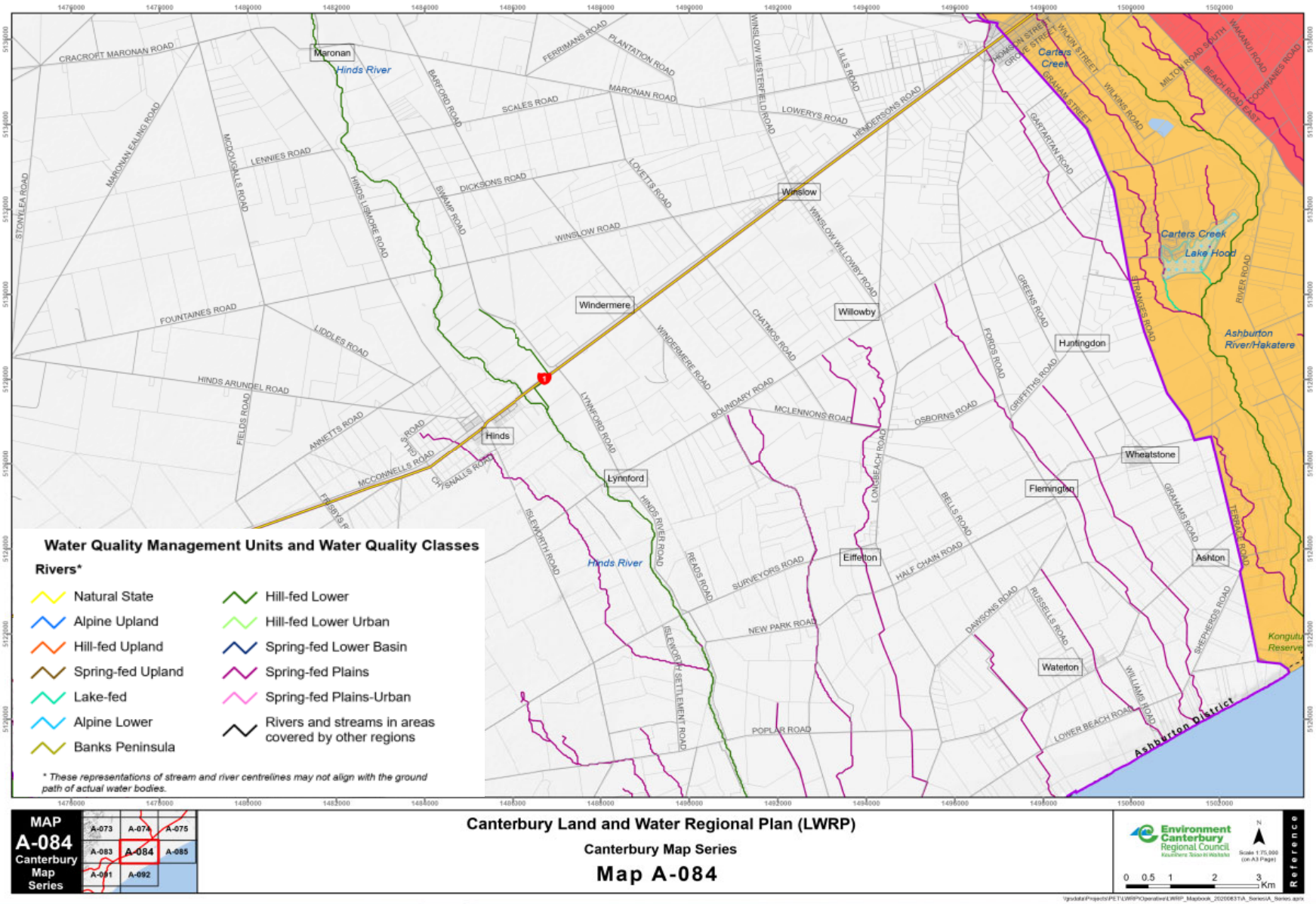
One of the culvert crossings on the western branch

A culvert crossing in the unnamed tributary to Carters Creek, downstream of the confluence of the northern and western branches

Appendix 2: Avifauna species present, or likely to be present

SPECIES		CONSERVATION STATUS			Native forest	Exotic Forest	Scrub / shrubland	Farmland / open country	Freshwater / wetlands	Coastal / Estuary	Oceanic	Urban/Residential	Observed during site visit?	
Black shag	*Phalacrocorax carbo novaehollandiae*	Native	At Risk	Relict										
Pied shag	*Phalacrocorax varius varius*	Endemic	At Risk	Recovering										
Little shag	*Phalacrocorax melanoleucos brevirostris*	Native	At Risk	Relict										
Black-fronted tern	*Chlidonias albostriatus*	Endemic	Threatened	Nationally Endangered									✓	feeding
Australasian crested grebe	*Podiceps cristatus australis*	Native	Threatened	Nationally Vulnerable										
Caspian tern	*Hydroprogne caspia*	Native	Threatened	Nationally Vulnerable										
Eastern falcon	*Falco novaeseelandiae novaeseelandiae*	Endemic	Threatened	Nationally Vulnerable										
Grey duck	*Anas superciliosa*	Native	Threatened	Nationally Vulnerable										
Banded dotterel	*Charadrius bicinctus bicinctus*	Endemic	At Risk	Declining										
White-fronted tern	*Sterna striata striata*	Native	Threatened	Nationally Vulnerable										
Black-fronted dotterel	*Elseyornis melanops*	Native	Threatened	Nationally Endangered										
Grey duck - mallard hybrid	*Anas superciliosa x platyrhynchos*	Hybrid	Not Threatened	Not Threatened										
Rifleman	*Acanthisitta chloris chloris*	Endemic	Not Threatened	Not Threatened										
South Island tomtit	*Petroica macrocephala macrocephala*	Endemic	Not Threatened	Not Threatened										
Black-tailed native-hen	*Gallinula ventralis*	Native	Vagrant	Vagrant										
Australasian little grebe	*Tachybaptus novaehollandiae novaehollan*	Native	Coloniser	Coloniser										
Helmeted guineafowl	*Numida meleagris*	Introduced	Introduced	Introduced & Naturalised										
Peafowl	*Pavo cristatus*	Introduced	Introduced	Introduced & Naturalised										
Muscovy duck (domestic)	*Cairina moschata*	Introduced	Introduced	Not Established										
White-faced heron	*Egretta novaehollandiae*	Native	Not Threatened	Not Threatened									✓	
White heron	*Ardea modesta*	Native	Threatened	Nationally Critical										
Black swan	*Cygnus atratus*	Native	Not Threatened	Not Threatened										
Canada goose	*Branta canadensis*	Introduced	Introduced	Introduced & Naturalised										
Paradise shelduck	*Tadorna variegata*	Endemic	Not Threatened	Not Threatened									✓	
Mallard	*Anas platyrhynchos*	Introduced	Introduced	Introduced & Naturalised									✓	
Grey teal	*Anas gracilis*	Native	Not Threatened	Not Threatened										
Australiasian shoveler	*Anas rhynchotis*	Native	Not Threatened	Not Threatened										
NZ scaup	*Aythya novaeseelandiae*	Endemic	Not Threatened	Not Threatened										
Australiasian harrier	*Circus approximans*	Native	Not Threatened	Not Threatened									✓	
California quail	*Callipepla californica*	Introduced	Introduced	Introduced & Naturalised									✓	
Pheasant	*Phasianus colchicus*	Introduced	Introduced	Introduced & Naturalised										
Pukeko	*Porphyrio m. melanotus*	Native	Not Threatened	Not Threatened									✓	breeding
South Island pied oystercatcher	*Haematopus finschi*	Endemic	At Risk	Declining									✓	feeding
Pied stilt	*Himantopus h. leucocephalus*	Native	Not Threatened	Not Threatened										
Spur-winged plover	*Vanellus miles novaehollandiae*	Native	Not Threatened	Not Threatened										
Black-backed gull	*Larus d. dominicanus*	Native	Not Threatened	Not Threatened									✓	
Red-billed gull	*Larus novaehollandiae scopulinus*	Native	At Risk	Declining										
Black-billed gull	*Larus bulleri*	Endemic	At Risk	Declining										
Rock pigeon	*Columba livia*	Introduced	Introduced	Introduced & Naturalised										
Shining cuckoo	*Chrysococcyx l. lucidus*	Native	Not Threatened	Not Threatened										
Little owl	*Athene noctua*	Introduced	Introduced	Introduced & Naturalised										
Kingfisher	*Todiramphus sanctus vagans*	Native	Not Threatened	Not Threatened										
Skylark	*Alauda arvensis*	Introduced	Introduced	Introduced & Naturalised									✓	
Welcome swallow	*Hirundo n. neoxena*	Native	Not Threatened	Not Threatened									✓	
NZ pipit	*Anthus n. novaeseelandiae*	Native	At Risk	Declining										
Dunnock	*Prunella modularis*	Introduced	Introduced	Introduced & Naturalised										
Blackbird	*Turdus merula*	Introduced	Introduced	Introduced & Naturalised									✓	
Song thrush	*Turdus philomelos*	Introduced	Introduced	Introduced & Naturalised										
Grey warbler	*Gerygone igata*	Endemic	Not Threatened	Not Threatened										
South Island fantail	*Rhipidura fuliginosa fuliginosa*	Endemic	Not Threatened	Not Threatened										
Silvereye	*Zosterops lateralis lateralis*	Native	Not Threatened	Not Threatened										
Bellbird	*Anthornis m. melanura*	Endemic	Not Threatened	Not Threatened										
Yellowhammer	*Emberiza citrinella*	Introduced	Introduced	Introduced & Naturalised										
Chaffinch	*Fringilla coelebs*	Introduced	Introduced	Introduced & Naturalised									✓	
Greenfinch	*Carduelis chloris*	Introduced	Introduced	Introduced & Naturalised										
Goldfinch	*Carduelis carduelis*	Introduced	Introduced	Introduced & Naturalised										
Redpoll	*Carduelis flammea*	Introduced	Introduced	Introduced & Naturalised										
House sparrow	*Passer domesticus*	Introduced	Introduced	Introduced & Naturalised										
Starling	*Sturnus vulgaris*	Introduced	Introduced	Introduced & Naturalised										
Magpie	*Gymnorhina tibicen*	Introduced	Introduced	Introduced & Naturalised									✓	
Australian coot	*Fulica atra australis*	Native	At Risk	Naturally Uncommon										
Cape barren goose	*Cereopsis novaehollandiae*	Introduced	Introduced	Introduced & Naturalised										

Appendix 3: Canterbury Land and Water Regional Plan Map with River Water Quality Classes


Water Quality Management Units and Water Quality Classes
Rivers*
Natural State
Alpine Upland
Hill-fed Upland
Spring-fed Upland
Lake-fed
Alpine Lower
Banks Peninsula
Hill-fed Lower
Hill-fed Lower Urban
Spring-fed Lower Basin
Spring-fed Plains
Spring-fed Plains-Urban
Rivers and streams in areas covered by other regions
* These representations of stream and river centrelines may not align with the ground path of actual water bodies.
Maronan
Hinds River
Winslow
Windermere
Willowby
Hinds
Lynnford
Eiffelton
Huntingdon
Wheatstone
Flemington
Ashton
Waterton
Carters Creek
Carters Creek Lake Hood
Ashburton River/Hakatere
Ashburton District
MAP A-084 Canterbury Map Series
A-073
A-074
A-075
A-083
A-084
A-085
A-091
A-092
Canterbury Land and Water Regional Plan (LWRP)
Canterbury Map Series
Map A-084
Environment Canterbury Regional Council
0 0.5 1 2 3 Km
Reference

About Boffa Miskell

Boffa Miskell is a leading New Zealand professional services consultancy with offices in Whangarei, Auckland, Hamilton, Tauranga, Wellington, Nelson, Christchurch, Dunedin, and Queenstown. We work with a wide range of local and international private and public sector clients in the areas of planning, urban design, landscape architecture, landscape planning, ecology, biosecurity, cultural heritage, graphics and mapping. Over the past four decades we have built a reputation for professionalism, innovation and excellence. During this time we have been associated with a significant number of projects that have shaped New Zealand's environment.