

# Limited Scope Peer Review

of matters contained within an

## Ecological Report - Ladies Mile Masterplan

Date: 31 December 2021

Contract Report: NSN 178/21

Prepared for: Queenstown Lakes District Council

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# 1 Introduction

## 1.1 Background

Queenstown Lakes District Council (QLDC) is undertaking a Council-led Masterplan and District Plan Variation as a means of planning for future growth within the Whakatipu Basin ('the Basin').

The Te Putahi/ Ladies Mile corridor extends across a high terrace between Kimi-ākau/ Shotover River and Te Whaka-ata a Haki-te-kura/ Lake Hayes. The Masterplan process is intended to inform decisions regarding how mixed-use medium to high density urban development can be integrated with less intensive land use and sustainable living that promote better outcomes for water quality and ecological systems, among other aspirations<sup>1</sup>.

Natural Solutions for Nature Ltd (NSN) has been engaged by Queenstown Lakes District Council (QLDC) to provide a limited scope peer review of matters contained within an Ecological Report - Ladies Mile prepared by e3Scientific (e3S).

## 1.2 Scope of Brief

The focus of the NSN review is to

1. Provide a wider context of understanding regarding the cumulative impact of the Ladies Mile development on threatened braided river birds.
2. Comment on the e3S recommendation regarding the need for tern and gull monitoring on the Shotover River.

## 1.3 Qualifications and Limitations

NSN provides the ecological services required for this report in a manner consistent with expectations for professional ecological practitioners. This report has been prepared using information available to the author at the time of preparation and includes information gained through the professional and personal experience of the author. Where information has been obtained from other trusted external sources it has been assumed that it is accurate, without independent verification, unless otherwise indicated. No responsibility is accepted by NSN for any errors or omissions by external sources.

## 1.4 Declaration of Potential Conflict of Interest

Ms Palmer is a Trustee of the Whakatipu Wildlife Trust, she is also a member of the Friends of Tucker Beach Wildlife Management Reserve Society Inc. (FoTBWMR) and project director for the FoTBWMR Jobs for Nature project.

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<sup>1</sup> <https://www.qldc.govt.nz/ladies-mile-masterplan>

## 2 Comments on the Ladies Mile Ecological Assessment

The Ladies Mile Masterplan area was identified in public consultation maps available on the Council website and in Figure 2 of the e3S report provided to NSN by QLDC. NSN has relied on this plan as an accurate representation of the Ladies Mile Masterplan area for the purposes of this review.

Based on NSN experience and general knowledge of the Ladies Mile Masterplan area NSN agrees with the assessment of values described in Section 4 of the e3Scientific report.

NSN agrees that the Ladies Mile area provides foraging habitat for Threatened and At-Risk avifauna species – black-fronted terns (endangered), black-billed gulls and South Island pied oystercatcher (At-Risk declining).

However, with respect to the e3S assessment of ecological significance summarised in Section 5 and Table 3 of their report, NSN has the following comments.

1. Since the preparation of the e3S report in December 2020 the Conservation Status of birds in Aotearoa/ New Zealand has been reviewed with revised classifications published in late December 2021.

Table 1 in this report updates the conservation status information provided in Table 1 of the e3S report. The conservation status of terns has not improved, they remain endangered; however the status of black-billed gulls has improved following extensive surveys of nesting colonies (Mischler, 2020), they are now classified as At-Risk declining, South Island pied oystercatcher (SIPO) are unchanged as At-Risk declining (Robertson, et.al., 2021).

2. The e3S assessment of ecological significance (Table 3, page 18) scores the rarity value for avifauna as Very High using the EIANZ criteria. NSN agrees that the rarity criteria have been met due to the confirmed presence (foraging) of Threatened – endangered black-fronted tern which score as ‘very high’, and two At-Risk declining species being black-billed gull<sup>2</sup>, and South Island pied oystercatcher (SIPO) both of which score as ‘high’ under the EIANZ criteria. The later species (SIPO) may nest within the Ladies Mile Masterplan area where the land is maintained with short spring pasture grass. All three species have been observed by the author to forage over the land encompassed within the Ladies Mile Masterplan area<sup>3</sup>.

Section 6 of the e3S report addresses ecological constraints associated with the Ladies Mile Masterplan. Importantly, the e3S ecological report notes that “the level of [ecological] effect of the development of the Ladies Mile area cannot be determined until a plan has been proposed and analysed”. The e3S report notes the potential for continued and cumulative loss of foraging habitat for the threatened and at-risk seasonal migrants. NSN concurs with the potential for this to occur.

The e3S report acknowledges the value of the open land as a foraging corridor between the braided river system, Te Whaka-ata a Haki-te-kura/ Lake Hayes and NSN notes the additional value contributed by other wetlands on the slopes, gullies and the fertile farmed flats surrounding Slope Hill north of the Ladies Mile Masterplan area; the Shotover Country wetland area, the pastures of the broader Whakatipu Basin and those south of the Frankton Flats, some of which have recently been protected by QEII covenants but which may require birds to transit across the Queenstown Aerodrome if they do not fly along the Kawarau River margins.

Section 7.2 of the e3S report provided three recommendations.

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<sup>2</sup> formerly Threatened – nationally critical, now At-Risk declining

<sup>3</sup> <https://ebird.org/atlasnz/checklist/S98467080>

- The avoidance of matagouri removal and
- Off-site Impact management measures to address the loss of habitat for avifauna. The measures recommended are outlined in Section 6 – Ecological Constraints - and include:
  - Monitoring terns and gulls on the Lower Shotover river for 10 consecutive breeding seasons to determine nest productivity and colony counts
  - Implementation of a public awareness campaign targeting cat and dog management and their impacts on breeding birds
  - Enforcement of a dog exclusion bylaw for the [lower] Shotover River during breeding season,
  - Pest control along the Shotover River particularly around breeding colonies.
- That the portions of the Masterplan area not accessible for the primary Ecological assessment be visited in order to determine the potential impacts of a proposed rezoning and consequent development of the land.

The e3S report opined that *“the inclusion of open spaces within the development area can create population sinks for gulls and terns, which are the species most affected by the new subdivision and intensification of the land[use].”*<sup>4</sup>

NSN does not agree that the Ladies Mile Masterplan area would become a population sink<sup>5</sup> for gulls and terns under development, as these species do not normally nest in the habitat within the area; however, SIPO are likely to nest in the area and so would be displaced by intensive development.

Residential development in the Masterplan area would however further reduce access to currently available foraging habitat for terns and gulls.

The e3S report additionally recommends that birds are “activity deterred from breeding in these [open space] areas” by limiting green spaces, actively manicuring and keeping grass very short. The e3S report opines that this would allow birds [terns, gulls, wader, and waterfowl species] to feed in open spaces but not breed and would provide “opportunity to move on if a predator comes”, presumably achieved by the absence of cover for predators.

Terns are agile, aerial feeders and so less vulnerable to ground predation. Gulls tend to roost and forage in open areas and so are less likely to be ambushed by predators than indigenous and introduced species that rely on the cover of trees and shrubs for nesting and foraging.

NSN considers that the Masterplan process may enable potential improvements in habitat for insectivorous and frugivorous indigenous passerine<sup>6</sup> species and potentially kereru if substantial areas of indigenous planting were incorporated into the open spaces of the Masterplan area. These would complement indigenous plantings by the Wakatipu Reafforestation Trust on the southern margin of Lake Hayes.

In relation to the e3S recommendation for monitoring, a broader scope of consideration would benefit the planning process. To that end, this report provides further context for the relationship between infilling and development and the tern and gull populations seasonally present in the environs of the Lower Shotover River and the Whakatipu Basin.

NSN agrees that there is a need for monitoring the black-fronted tern population and other braided river specialist species including the banded dotterel (not affected by the Ladies Mile Masterplan), black-billed gull, and South Island pied oystercatcher populations. However,

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<sup>4</sup> E3Scientific Ladies Mile Ecological Assessment; Section 6, page 21, 3<sup>rd</sup> paragraph.

<sup>5</sup> In considering habitat heterogeneity and use of habitats of varying quality within a local area; where death and emigration exceeds recruitment and immigration, this area is known as a “sink”; Dias (1996).

<sup>6</sup> Perching, songbird species e.g. bellbirds, tui, fantails, tomtits, grey warblers

NSN considers that the monitoring is required in relation to broader cumulative issues, to which Ladies Mile would incrementally contribute.

E3S recommended a number of “off-site impact management measures” including<sup>7</sup>:

- Monitoring terns and gulls for 10 years to determine if there has been an impact on the population due to habitat loss.
- Monitoring should determine the number of chicks fledged from the total number of breeding pairs, the number of colonies established and a population count.

These matters will be addressed in more detail in Sections 3, 4 and 5 of this review.

NSN opines that it would be very difficult to determine from the suggested monitoring whether changes in the tern and gull populations could be directly attributed to the incremental development of the Ladies Mile given the range of threats summarised in Section 4 of this review.

It would therefore be constructive to this process, to consider the outcomes would we desire from the monitoring data were Council to embark on a programme of monitoring.

It stands to reason that monitoring would endeavour to obtain evidence that local braided river bird populations are stable at the very least and preferably increasing. This would demonstrate that aspirational goals of sustainable living to produced better [biodiversity] ecological system outcomes are effectual.

To do this we must understand the ecology and habitat requirements of terns, gulls and waders.

This report will also discuss:

- The threats faced by local populations of braided river birds – Section 4
- The role of monitoring in managing cumulative effects of greenfield development – Section 5
- Recommendations are provided in Section 6

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<sup>7</sup> E3Scientific Ladies Mile Ecological Assessment; Section 6, page 22

Table 1 Conservation Status Classification (2021)

Species	2002	2005	2008	2012	2016	2021
Black-billed gull	Serious decline		Nationally endangered	Nationally critical		At-Risk declining
Black-fronted tern	Serious decline	Nationally endangered				
Banded dotterel	Gradual decline		Nationally vulnerable			At Risk - declining
South Island Pied Oystercatcher	Not threatened		At Risk - declining			

*2021 criteria and qualification from conservation status review*

The conservation status of bird species is based in part on the rate of population decline over 10 years or 3 generations whichever is longer (Robertson, et.al., 2021).

Black-billed gulls

More than 100,000 mature individuals; low to high 10 - 70% forecast of ongoing decline estimated to occur over 10 years or 3 generations, whichever is longer; CI – likely to be impacted by climate change, CR – requiring conservation research, RF – recruitment failure is an ongoing issue

Black-fronted tern

Moderate population estimated to have 1000 - 5000 mature individuals, high ongoing or forecast decline of 50 - 70 % estimated to occur over 10 years or 3 generations, whichever is longer; CI – likely to be impacted by climate change, CR – requiring conservation research, PD – partial decline (not declining in all areas), RF – recruitment failure is an ongoing issue, Sp – sparsely distributed

South Island pied oystercatcher

Large population estimated to be 20,000 – 100,000 mature individuals, low to moderate ongoing or forecast decline of 10 to 50% over 10 years or 3 generations, whichever is longer; CI – likely to be impacted by climate change.

### 3 Ecology of black-fronted terns, gulls and oystercatchers

Black-fronted terns ('terns') and black-billed gulls ('gulls') are two of six endemic bird species reliant on braided river ecosystems for their breeding habitat. Braided river habitats are inherently unstable, "*Braided rivers are highly dynamic systems characterised by high habitat turnover resulting in a dynamic mosaic of channels, bars, islands, and ponds*" from Hamblin et. al., 2019.

#### 3.1 Nesting habitat

Terns and gulls nest in wide braided river beds on shingle or gravel beaches. Tern nests are often found along or above the driftwood and the debris line left by spring high flows.

SIPO will nest on more consolidated braided river beaches among sparse vegetation and driftwood, on higher terraces with open cushionfield or short, open turfy grassland; and in short spring pastures where their young can mature and fledge before the grass grows too high to inhibit foraging and providing cover for predators<sup>8</sup>, Riegen and Sagar (2020). No detailed studies of the diets of inland birds are available, however their diet is likely to be dominated by earthworms and beetle larvae (Sagar, 2013) and they forage in areas of short grass, silty gravel, river and open wetland margins.

Table 2 provides a summary of the breeding season stages for species of the Lower Shotover River.

Table 2 Breeding season of terns, gulls and waders of the Whakatipu Basin<sup>9</sup>

Species	Breeding season	Egg laying	Incubation period	Nestling*	Age at fledging**	Longevity
Banded dotterel	July - January	August – December*	25-28 days	<1 day	35-42 days	12 yrs
Black-fronted tern	August - February	October - January	25 days	1-3 days	28-35 days	11 yrs (banded)
Black-billed gull	August - March	September/ Oct - January	27 days	2-5 days	26 days	25 yrs
SI pied oystercatcher (SIPO)	July - January	August - November	24-28 days	precocial	28-42 days	27 yrs

\* Nestling – unable to leave the nest; most braided river birds are precocial, moving away from the nest within a few days of hatching

\*\* Fledgling – birds able to feed and forage independently, able to fly around the habitat, have immature plumage

Terns usually breed in their 3<sup>rd</sup> to 4<sup>th</sup> year, (Higgins and Davies, 1996).

<sup>8</sup> personal observations

<sup>9</sup> Information source: New Zealand birds online

<https://nzbirdsonline.org.nz/species/banded-dotterel>

<https://nzbirdsonline.org.nz/species/black-fronted-tern>

<https://nzbirdsonline.org.nz/species/black-billed-gull>

<https://nzbirdsonline.org.nz/species/south-island-pied-oystercatcher>

### 3.2 Colony Locations

NSN observations of black-fronted tern colony sites between October 2017 and December 2021 have identified two primary sections of the Lower Shotover where tern and gull colonies establish or attempt to establish each season, these are indicated in Figures 2 and 5. They are within the Tucker Beach Wildlife Management Reserve (TBWMR) and downstream of the State Highway 6 (SH6) bridge.

Black-fronted tern colonies are generally small (2–50 pairs) with nests widely distributed (inter-nest distances of 1–100 m), this makes them difficult to define (Keedwell 2002; Bell 2013) in Hamblin et. al., 2019. NSN has also observed the abandonment and relocation of tern colonies within a nesting season.

Research on black-fronted tern colony dynamics by Hamblin et al., 2019 concluded terns have low site fidelity – defined as a colony returning to a 300 m section of river in successive breeding seasons<sup>10</sup>. However, Keedwell (2002) found reasonably high nest site fidelity in her study of the Ohau River populations.

Increased breeding site fidelity in terns<sup>11</sup> has been linked to past breeding success, colony size and predation rates (after Bell, 2017). Bell and Keedwell both found that nocturnal predation disturbance was a significant cause of nest loss, however, their studies were conducted on rivers with substantially less developed catchments and did not cite or address issues more closely associated with human disturbance. Human disturbance is a factor that NSN considers to be quite pervasive in the Lower Shotover river environment.

The absence of data relating to the return of individual terns to colony locations or whether different terns are attracted to sites based on the year-to-year variations in habitat prevents further conclusions about this behaviour. Further research is needed on this matter.

Bell (2017) found that larger colonies (>25 nests) had higher productivity (chicks/ fledged Young per nest) as did early colonies established before 31st October.

Nests laid after 31 October experience reduced success<sup>12</sup>, Keedwell (2002) and Bell (2017), with nests laid after 30 November considered late, and less likely to succeed than early season nests, Keedwell (2002).

The documented variability in nest site fidelity suggests that terns assess and respond to a dynamic set of criteria within and between each nesting season.

Keedwell (2002) found that measuring juvenile survival through to dispersal rather than fledging gave a better indication of reproductive success. However, an accurate understanding of the causes of recruitment failure<sup>13</sup> is required to initiate a course of appropriately responsive management. Therefore, monitoring causes of nest failure and managing to reduce known causes of nest failure along with undertaking population counts at the beginning and end of the breeding season, would assist in developing a more informed approach to the management of local populations.

Gulls will roost at feeding and colony sites. Where feeding sites are more distant from nesting colonies, the flock may split between feeding and colony sites with bird moving between feeding and nesting sites. Gulls usually range within 5 km of a colony during the breeding season, (Higgins and Davies, 1996).

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<sup>10</sup> From a study of 9 braided rivers in Canterbury, South Island, NZ

<sup>11</sup> The return of birds to previously used nesting sites

<sup>12</sup> Fledglings per nest

<sup>13</sup> The failure of nesting efforts to produce fledged young able to reproduce and contribute to population growth.



NSN will address the need for monitoring further in Section 5 of this report and in the Recommendations provided in Section 6.



Figure 1: Black-fronted tern in flight over Tucker Beach Wildlife Management Reserve, photo Lucas Ross 4/12/2018



Figure 2: Black-fronted tern colony nesting sites (2017 – 2021); personal observations D Palmer.

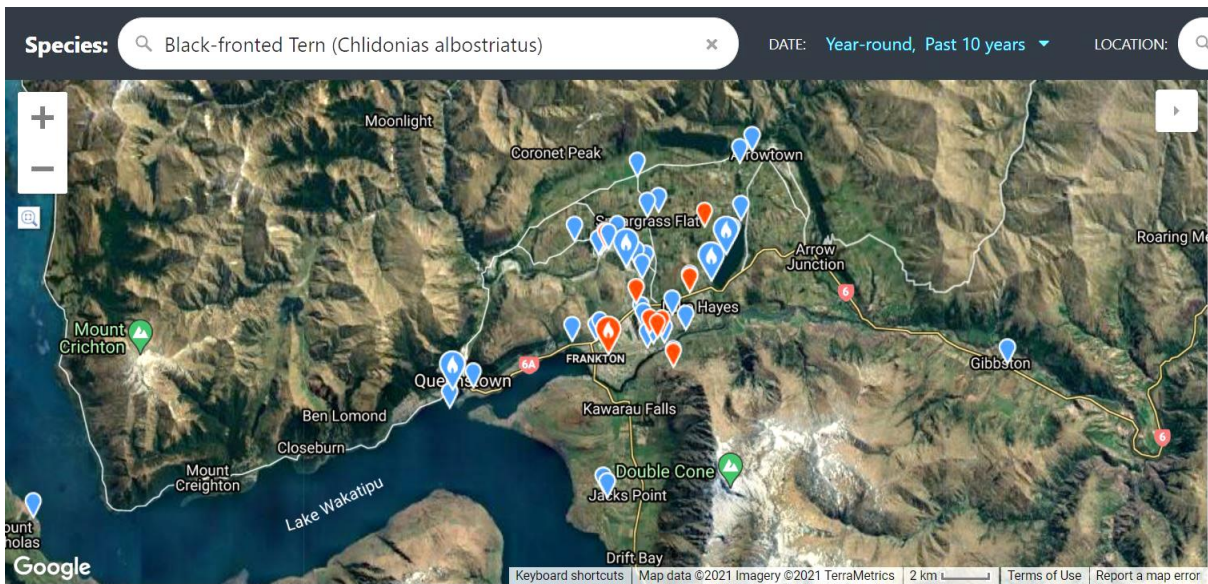


Figure 3: Records of black-fronted terns present year-round (predominantly August – February) each year over the past 10 years

Source: ebird.org.nz<sup>14</sup>



Figure 4: Black-billed gull nesting colony immediately below the State Highway 6 bridge, upstream of the smaller powerlines, true right, Lower Shotover River. Photo – D Palmer, 5/12/2005

<sup>14</sup> Ebird is a citizen science bird reporting database established and curated by the Cornell Lab of Ornithology with the assistance of Birds New Zealand in Aotearoa/ New Zealand.



Figure 5: Black-billed gull colony nesting and roosting locations (2005 – 2021)

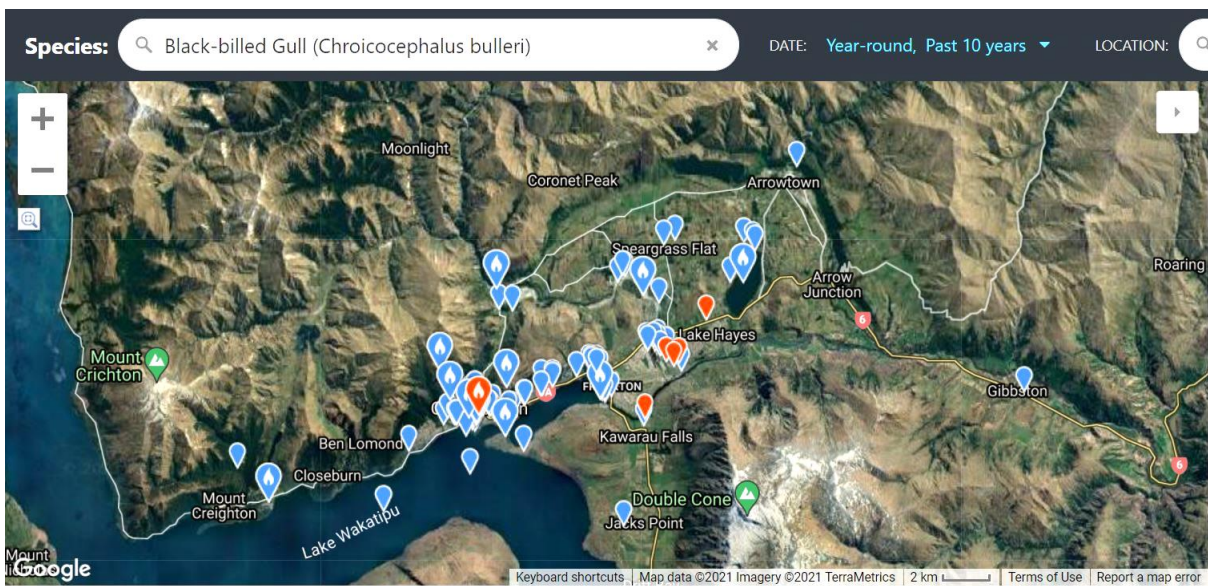


Figure 6: Records of black-billed gulls present year-round (predominantly August – March) each year over the past 10 years  
Source: ebird.org.nz<sup>15</sup>

<sup>15</sup> <https://www.birdsnz.org.nz/birding/ebird> Note, launched in 2002 by the Cornell Lab of Ornithology and National Audubon Society, eBird provides rich data sources for basic information on bird abundance and distribution at a variety of spatial and temporal scales. Birds NZ collaborated with the Cornell Lab of Ornithology in May 2008 to create the NZ eBird portal. Use of the database has increased following the commencement of the New Zealand bird atlas project in November 2019.

### 3.3 Foraging Habitat

#### Black-fronted terns

As described by e3S, black-fronted terns forage over rivers and adjacent pastures during the breeding season. Their use of the properties on the Ladies Mile concealed by hedging could not be confirmed by e3S or NSN but NSN has recorded terns foraging over the Laurel Bank property south of the State Highway, over the ploughed paddocks north of the Robert Lee memorial trough at the eastern end of the Masterplan area, and across the Basin from Malaghans Road to Lake Tewa at Jack's Point. Figure 3 indicates the public citizen science locations recorded over the past 10 years on the ebird.org.nz database managed by Cornell Lab of Ornithology and Birds NZ (formerly the Ornithological Society of NZ). One can therefore reasonably expect that terns and gulls would forage on the fertile paddocks within the Masterplan area north of the State Highway.

Terns are aerial foragers that hunt over a variety of habitats, they search methodically, into the wind. They have four main feeding behaviours: *shallow plunging* dipping their head into the water for food; *dipping* – taking insects or fish from the surface of the water; *gleaning* from the margins of streams and ponds, the surface of saturated paddocks, freshly ploughed ground or over crops either with or without landing briefly; *hawking* – taking emerging insects over shrublands, willows and over mown hay (Higgins and Davies, 1996).

NSN can confirm that they are regularly seen within the Basin foraging over farmland, pasture and crops, especially if freshly ploughed or cultivated, or damp or irrigated. Pierce (1983) and Child (1986) are cited by Higgins and Davies with the view that they very rarely, forage over tussock or scrub however, however, NSN has recorded terns foraging as high as 900 masl over tussock and scattered shrubland on the northern flanks of the Remarkables above the Shotover Delta. Child (1986) questioned whether terns foraging at higher elevations had been “forced” there by loss of appropriate habitat adjacent to rivers. Monitoring birds fitted with transmitters would provide a clearer understanding of the use and limitation of foraging habitat within the broader Basin.

Species taken by terns include mayflies, stoneflies, cicadas, grasshoppers, spiders, moths, beetles, flies, small fish – trout, galaxiids, bullies, earthworms, amphipods and even lizards. Food sources vary as invertebrates emerge during the breeding season with foraging activity responding to the food available.

#### Black-billed gulls

Black-billed gulls feed on ground, in water and in the air, they take ground invertebrates and small fish (McClellan and Habraken, 2013). At wetlands, they feed from, or just below, surface of water, either while swimming or by low plunge-dives. They forage on mudflats in lakes, river deltas and lagoons, and on banks and beds of rivers. They are often seen feeding on wet grassy agricultural land or recreation areas; they will also follow a tractor-drawn plough or harrow. In populated areas they can be found where fed by people in city streets and parks, e.g. in Queenstown Bay and Frankton Beach, and are known to roost near the rubbish transfer station in Glenda Drive. They roost in shallow rivers (personal observation), at the edge of wetlands and lakes (e.g., on grass verges or oxidation ponds), in rafts in shallows, or on islets or promontories in wetlands.

## 4 Threats

A number of threats have been recognised on the Lower Shotover River, many are common throughout the breeding range of braided river birds. These include:

- Gravel extraction prior to or during the nesting season which alters the river dynamics and vulnerability of gravel beaches to flooding and removes substrates containing invertebrates.
- Seasonal fluctuations in river levels which affect nesting habitat and outcomes
- Predation by both introduced mammals, wild, feral and domestic and along with native birds – harriers, southern black-backed gulls and eastern falcon.
- Weed invasion – lupins, buddleia, willow and broom
- Human interference and disturbance
- Access to good quality foraging habitat and food supply

These factors have also been cited as important issues by the most recent review of the conservation status of gulls, terns and waders (Robertson et al., 2021), the research of Hamblin (2019), Keedwell (2002) and Bell (2017) in relation to black-fronted terns and Mischler, (2018) in relation to black-billed gulls.

Understanding the nature and interaction of these threats at a local level provides context for the assertion that off-site impact management is required to balance the effects of loss of tern and gull foraging habitat in the Ladies Mile Masterplan area.

### 4.1 Engineered Substrate Management

In 1994, 1995, 1996 and 1999 the Queenstown Lakes District experienced a series of significant flood events. Following the most significant in 1999 the Queenstown Lakes District Council together with the Otago Regional Council undertook several initiatives to better prepare for and manage flooding.

In 2005 modelling and flood management plans were being tabled and joint strategies were in place by 2006.<sup>16</sup>

Resource Consents were in place (RM081455) to enable gravel extraction to build a flood retention wall across the lower true right of the Shotover Delta and work commenced in 2009; refer to Plates 2, 8 – 10.

The flood retention wall/ training line was constructed in order to prevent the Shotover from backflowing up the Kawarau River into Lake Whakatipu.

The extraction is designed to establish an “improved contour” that trains the River to flow to the true left of the flood plain while allowing the Shotover River to have the widest possible access to the flood plain allowing gravel to be deposited on the lower Delta.

The Shotover River carries an average sediment load of about 1.6 million m<sup>3</sup> per year with approximately 160,000 m<sup>3</sup> per year of sand and gravel<sup>17</sup>. It provides a renewable resource valuable to the construction and roading requirements of the district.

This reduces the potential for deposited gravel to accumulate at the confluence restricting the flow of the Kawarau River past the confluence. Maintenance of the Kawarau River flow past the confluence of the Shotover reduces impedance of the flow from Lake Whakatipu.

However, gravel extraction removes the physical nesting substrates and the invertebrates within while rendering the river at least temporarily more prone to flooding. This may be

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<sup>16</sup> <https://www.qualityplanning.org.nz/sites/default/files/1999%20Queenstown%20Floods.pdf>  
<https://www.orc.govt.nz/media/2955/queenstown-2014-updated-web.pdf>

<sup>17</sup> [https://www.qldc.govt.nz/media/wgkk3lk0/pc41\\_attachment\\_g.pdf](https://www.qldc.govt.nz/media/wgkk3lk0/pc41_attachment_g.pdf)

particularly problematic when extraction is not balanced with natural replenishment. This may occur during a drier year that brings less material downstream and when higher beaches are repeatedly targeted for extraction.

The latter is important because it affects the availability of nesting habitat in the lower Shotover for species whose threat classification status is based in part on recruitment failure. Removal of nesting substrates during or immediately prior to the nesting season without mitigation may be a critical matter in this situation.

Noting the earlier discussion of the influence of nesting outcomes on the likely return of colonies to successful breeding sites and acknowledging the naturally dynamic nature of the river substrates. The balance of the relationship between extraction, the river's natural dynamic processes and colony site selection on the Lower Shotover has not been well studied.

The timing and methods of extraction along with Resource Consent requirements prohibiting the formation of stockpiles piles or islands in the riverbed which could mitigate the effects of extraction, obviously influence the availability of nesting and foraging habitat below the State Highway bridge. Monitoring and review of consent conditions may be helpful in minimising or better managing actual or potential adverse effects on nesting outcomes.

#### 4.2 Seasonal Fluctuations, Floods and Climate Change Impacts:

The colony site selection has been influenced by factors such as:

- Seasonal fluctuations in river levels and high flow events
- Year to year variations in beach erosion and aggradation

These factors may result in a colony moving from a previously successful nesting site or abandoning an initially selected nest location. An example of this occurred in the spring of 2019 when following a wet spring<sup>18</sup> the tern colony moved from the middle beach of the TBWMR to the beach immediately up and downstream of the SH6 bridge where foot traffic is high and dog walking very common. They returned to the TBWMR after being washed out by a 411 cumec flow on 3 December 2019 where they laid 34 eggs into 17 nests by 12/12/2019. All but 3 nests were abandoned by 7/1/2019.

Robertson, et.al., 2021 gave 23 out of the 27 species assessed as At-Risk declining the Climate Impact qualifier, more than any other threatened or at-risk category based on their susceptibility to long-term climate trends or extreme climatic events.

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<sup>18</sup> <https://www.orc.govt.nz/managing-our-environment/water/water-monitoring-and-alerts/kawarau/shotover-river-at-bowens-peak>

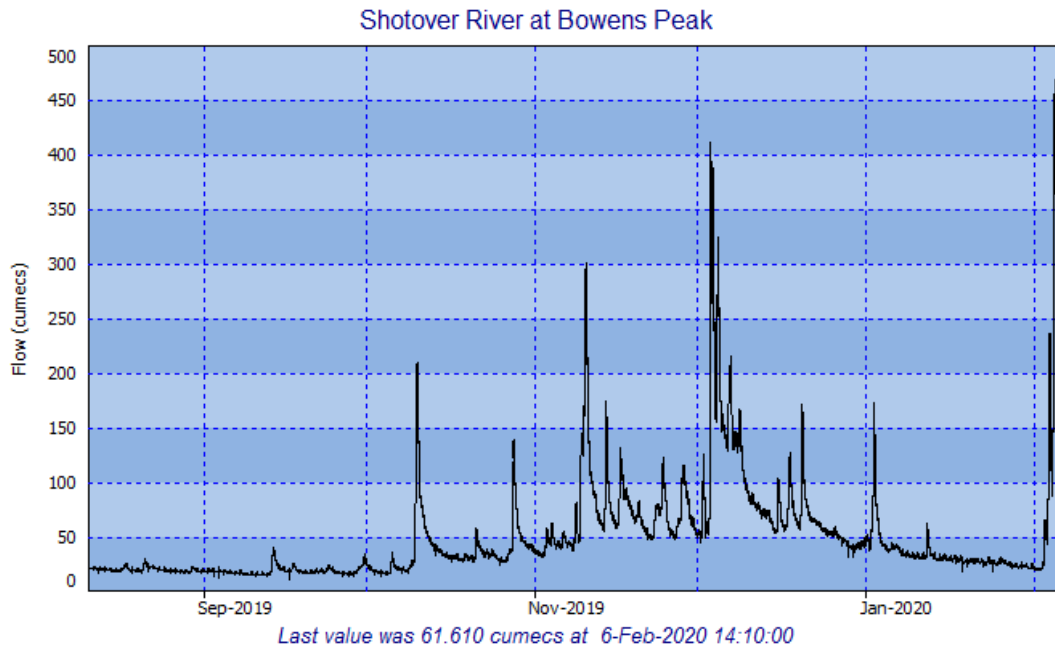


Figure 7: 180 day River flow chart, measured at Bowen Peak, Arthur's Point, 6 February 2020  
Source: Otago Regional Council



Figure 8: Shotover Delta viewed from the Remarkables Road, 4 December 2019. The river peaked at 411 cumecs on 3<sup>rd</sup> December 2019. Source: ORC



Figure 9: Black-fronted tern nest laid in sand surrounded by *Muehlenbeckia axillaris*, on TBWMR between 3 December and 12 December 2019, abandoned by 7 January 2020.

### 4.3 Predation

Keedwell (2002), Bell (2017), Spurr and Ledgard (2016), Mischler (2020) all cite predation as a substantial threat to braided river birds and acknowledge predator control as a beneficial management response for terns, gulls and waders.

Species known to predate braided river birds include ferrets, stoats, cats, hedgehogs, rats, southern black-backed gulls, swamp/ Australasian harriers and falcon.

There are four community trapping groups established on the margins of the Lower Shotover River; KAPOW in Arthur's Point trap down to Big Beach, the Tucker Beach Wildlife Management Group trap both sides of the river through the Wildlife Management Reserve extending down to the Historic Bridge on the true left and down to the confluence with the Kawarau River on the true right. The Wakatipu High School trap line covers the true left of the Kawarau River upstream towards the outlet of Lake Whakatipu. The Predator Free Puahuru - Shotover Country and Lake Hayes Estate community group trap the true left of the Shotover below the historic bridge, and down the Kawarau River to the confluence with Hayes Creek.

The network of community predator control is expanding rapidly with the support of the Whakatipu Wildlife Trust<sup>19</sup>, these efforts are reported using the TrapNZ app. There are additionally private traps in operation throughout the Basin that are not logged or tracked by the TrapNZ database.

The e3S recommendation relating to pest control around breeding colonies is therefore well advanced.



Figure 10: Trap network within the broader Whakatipu Basin – downloaded from the Whakatipu Wildlife Trust oversight map; TrapNZ, accessed December 2021.

### 4.4 Weed Invasion

Invasive weeds, particularly willows, buddleia, lupins and broom are infesting gravel beds and river terraces along the Shotover River suppressing existing indigenous communities of herbs, mosses and cushion plants (e.g., *Epilobium* (willow herbs), *Raoulia australis*, *Raoulia tenuicaulis*, *Raoulia hookerii*, *Muehlenbeckia axillaris* (creeping pohuehue) and inhibiting their spread and natural regeneration on the river terraces and more stable beaches. These species are insect pollinated and therefore provide an attractant for tern, gull and wader foraging.

Willows and buddleia also suppress the sparsely scattered indigenous shrubland species present on the river margins. Species of *Veronica*, *Coprosma*, *Olearia* and matagouri along

<sup>19</sup> Ms Palmer is a Trustee of the Whakatipu Wildlife Trust



with ferns also host invertebrate fauna upon which these birds may feed. The native vegetation along the Lower Shotover corridor is extremely depauperate in native and endemic vegetation.

#### 4.5 Human interference/ direct disturbance

Other factors that may influence the location, success, or failure (abandonment) of nesting colonies include disruption by:

- off-lead dogs,
- human presence – walking through or near the colony,
- motorbikes,
- off-road four-wheel drive vehicles

Community groups have worked alongside the Department of Conservation to sign post areas where breeding is occurring and have liaised with local media to raise awareness of the need to avoid disturbance of nesting colonies (terns and gulls) and the territorial waders – banded dotterels and South Island pied oystercatchers.

The e3S recommendation in relation to this work is also well advanced but requires additional advocacy and a more comprehensive management approach that includes barriers to access and enforcement of the provision of the Wildlife Act, 1953 where and when required. Given the range of land tenure involved, a collaborative or cooperative response between administering bodies is likely to be required.

NSN monitored waders, gulls, and terns in the Tucker Beach Wildlife Management Reserve in response to requests to close the public road into the Reserve to restrict vehicle access into the Reserve. The population of banded dotterels has responded well to the restricted access. Gulls and terns remain vulnerable to uncontrolled dogs, human presence and motorbikes in that Reserve and elsewhere along the river where motorbikes also pose an ongoing threat.

A local bylaw restricting access to breeding areas may be helpful if enforced.

#### 4.6 Greenfield development and residential infilling

The residential infilling and development of fertile farmlands within the Whakatipu Basin and land south of the Shotover Delta towards Woolshed Bay has incrementally reduced access to good quality foraging habitats and food supplies for terns, gulls and waders. However, foraging habitats closest to nesting sites continue to be most valuable to these populations as tern chicks are fed by adults for about 30 days (Higgins and Davies, 1996), and need adults to fend off predators or other threats. Laas (1977) recorded foraging ranges of a few hundred metres from colony sites. Laas (1977) also observed terns to become more territorial when foraging in areas of lower prey density. As noted in Section 3.3 – Foraging habitat – NSN has often observed terns foraging within 5 km of the Shotover River and as far away as Lake Tewa at Jack's Point. It is not known whether these birds were nesting at the time, non-breeding terns will help feed young, (Higgins and Davies, 1996).

The Ladies Mile proposal is the latest of the large-scale greenfield subdivisions proposed on the fertile flats of the broader Basin. These developments have gained pace since 2005. Photographic plates 1 to 17 illustrate the impact of residential infilling over time as development within the District has converted fertile pastures to residential use.

The cumulative effects of these landscape scale changes in foraging habitat availability may prove to be consequential for the perpetuation of tern and gull populations. The long-term and cumulative effects of greenfield development on foraging habitat and food availability of terns and gulls are not fully understood. It stands to reason that the availability of good quality

foraging habitat close to nesting colony sites would confer a more advantageous benefit to the nesting populations.

The Ladies Mile Masterplan process and any future development of the area may therefore provide a catalyst for braided river bird monitoring, however the effect on populations of a further incremental reduction in foraging habitat would be difficult to determine by monitoring the parameters recommended by e3S when there are a wide range of threats each of which could substantially undermine the long-term persistence of local tern, gull and wader breeding populations.

NSN addresses the recommendations for monitoring in Section 5 below.

## 5 Monitoring birds

To date monitoring of tern, gull and wader populations has occurred to implement the conditions of Resource Consents, e.g., for gravel extraction in the Lower Shotover. Monitoring undertaken by NSN elsewhere in the Lower Shotover area has not been focused on braided river birds but has recorded these species incidentally. NSN has also undertaken irregular monitoring on a volunteer basis and there are multiple citizen science observations recorded in the ebird.org.nz database, refer Figures 2 to 6.

On 2nd December 2021 a survey of braided river birds from Big Beach near Arthur's Point to the Shotover Delta was undertaken by the staff of the Tucker Beach Jobs for Nature project with the assistance of a staff member from e3S. The last time this survey was undertaken was 1993. A summary of the 2021 survey results is provided in Table 2 below. Figure 5 shows the kilometre sections referred to in Table 2.

It is possible that the survey under-represents the tern population as terns are known to forage across the wider Basin and some adults may have been absent from the colony site at the time of the survey.

NSN considers the development of the Ladies Mile area may adversely affect the availability of foraging habitat for terns. However, NSN considers this matter would require more specific research to determine the magnitude of the potential impact of cumulative loss of foraging habitat on terns, gulls and waders and the importance of the Ladies Mile habitat compared to other foraging areas.

NSN therefore asserts that monitoring and research of terns and gulls should include areas of open farmland and undeveloped land across the broader Basin. Refer Plates 1 to 17 at the back of this report.

Recommendations for monitoring included in the e3S report were described in Section 2 above. NSN recommends the monitoring could be adjusted to include:

- Population counts at the beginning and end of the breeding season before young of the year disperse.
- Monitoring terns fitted with transmitters to obtain a better understanding of their use, seasonal variations in and limitations of foraging habitat within the broader Basin.
  - Data regarding tern use of the Ladies Mile area would be obtained as a subset of the broader results.
  - Monitoring the seasonal use of the habitats within the broader Whakatipu Basin by gulls and waders would also provide data on nesting and foraging habitat for these species.
- Monitoring to identify causes of nest failure,
  - Measuring juvenile survival through to dispersal

- Monitoring the effectiveness of public advocacy, signage and access restrictions in reducing incidents of human disturbance or interference with nesting colonies.

The latter would be obtained as a subset of the data relating to nest failure and survival to dispersal.

A monitoring program of this scale would provide a more comprehensive understanding of the threats to braided river birds and enable more a coordinated and effective management of the Lower Shotover River and surrounding habitats. It would benefit from the joint venture support of ORC, LINZ, QLDC and the Department of Conservation.

Commitment to a long-term study (e.g., 10 years as recommended by e3S) would be beneficial in guiding improved management of the river and Basin habitat.

Outcomes of monitoring and management would partially inform the development of a biodiversity strategy for the Whakatipu portion of the District Council should this be undertaken in the future.

It is also the sort of ecological baseline data that would inform scoping projects that consider the capacity within the district to sustainably absorb development, refer Plates 1 to 17 at the back of this report.

Table 2 Total Count of waders, terns, and gulls on the Lower Shotover (Big Beach to the Kawarau River Confluence); counts include adults, juveniles and chicks. 2<sup>nd</sup> December 2021

***km\* - km count excluded lower Shotover Gorge***

River Section	km*	BFT	BBG	SIPO*	BD
Big Beach TR; view of TL w bins	0-1	0	0	4	37
TBRR "frisbee" - TR & TL	2-3	0	0	0	10
TBWMR - TL	3-4	0	0	0	5
TBWMR - TR (Main, Mid and Mid TL)	4-5	0	0	2	27
Lwr TBWMR - TL & TR	5-6	0	0	4	1
Historic Bridge - gorge	6-7	0	0	0	0
SH6 bridge to willow island E of FH	7-8	4	4	0	2
Queenstown Bay	7-8	0	74	0	0
Frankton Beach	7-8	0	33	0	0
Transfer Station, Glenda Drive	7-8	0	45	0	0
Oxidation Pond	7-8	0	0	0	0
Delta below Willow Island E of FH	8-9	13	77	0	3
Disposal Field	8-9	0	4	1	0
Delta confluence TR - view of TL w bins	9-Confluence	32	3	0	4
TR Delta below flood retention wall	9-Confluence	3	0	0	0
		<b>52</b>	<b>240</b>	<b>11</b>	<b>89</b>

BFT – black-fronted tern; BBG – black-billed gull; SIPO – South Island pied oystercatcher; BD – banded dotterel

\* SIPO – on 5 December 2021 NSN recorded a post-breeding flock of 45 SIPO foraging on the Ladies Mile, 'Laurel Bank' site after a crop was recently cut and baled. A flock of 29 was recorded by NSN on pasture near the intersection of Hunter and Malaghans Road on 24 July 2021. This is believed to be a record of the return of this seasonally migratory species to the Basin.

## 6 Recommendations

The Ladies Mile Masterplan process is intended to inform a proposal for rezoning the land to enable comprehensive mixed-use development.

The following recommendations are made in response to the NSN review of the e3S ecological assessment and the matters raised in Section 2 of this report. They support the Masterplan goals for sustainable living and better outcomes for ecological systems and biodiversity. They are based on the information contained in the e3S report and the concept Masterplan provided within that report rather than a detailed development plan.

### *Wider context and cumulative effects*

1. The Ladies Mile Masterplan represents the most recent landscape scale greenfield development proposal, refer Plates 1 to 17. The preparation of a District Biodiversity Strategy would usefully support the consideration and incorporation of ecosystem processes into urban planning processes.
2. Measures that can be applied within and beyond the Ladies Mile Masterplan area to support nesting and foraging habitats of At-Risk and threatened waders, terns and gulls include :
  - a) Predator control – also recommended by e3Scientific – this is occurring through a number of community groups, refer to details provided in Section 4.3 above.
  - b) Removal of invasive weeds, particularly willows, buddleia, lupins and broom from the river margins, terraces and beaches. This requires a systematic approach and some replacement with indigenous vegetation, Refer Section 4.4 above.
  - c) Maintenance of open spaces within the Masterplan area and where possible the open spaces closest to the Shotover and Kawarau Rivers to provide foraging habitat for terns, gulls and waders (SIPO); this can be achieved through
    - i) maintenance of short grass throughout the breeding season
    - ii) irrigation of short grassland to improve foraging outcomes
    - iii) ensuring soils are healthy and able to support dense and diverse invertebrate populations.

### *Tern and Gull monitoring – efficacy of recommended off-site impact management measure*

3. If we are to ensure the local braided river bird populations are sustained or improved alongside the continued development of the Queenstown Lakes District, then management measures to support black-fronted tern, black-billed gull, and SIPO should be informed by a robust monitoring program.
4. While monitoring could occur as an off-site impact management measure relating to the development of the Ladies Mile as a stand-alone measure, as recommended by e3S, NSN is of the view that the work should be undertaken as part of a more comprehensive multi-agency project proposal.
5. However, with the latter approach, there is an ongoing risk that no monitoring will occur if this is not incorporated into a Resource Consent decision due to the multi-organisational<sup>20</sup> legal framework and the enabling, facilitating or restricting

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<sup>20</sup> The administering authorities include Otago Regional Council (ORC), Department of Conservation (DOC), the Queenstown Lakes District Council (QLDC) and Land Information New Zealand (LINZ).

mechanisms that influence outcomes for Resource Consents (RMA processes) and concessions (Conservation Act processes). If the monitoring measures recommended in Section 5 above can be coordinated among the administering organisations, a more informed approach to management of and decision making aimed at protecting these populations can be developed and consistently applied by the relevant agencies through their respective administrative processes.

6. Monitoring may provide improved understanding of foraging range, seasonal variations in preferred habitat and the influence of gravel extraction, farming and property management regimes throughout the breeding season. It is important to note that the identification of foraging habitat through monitoring may not result in improvements in quality or security of that habitat.
  
7. NSN considers that given the complex and interactive nature of the threats faced by braided river birds (refer Section 4 above), it is unlikely that trends in the tern and gull populations detected through monitoring could be directly attributed to loss of foraging habitat in the Ladies Mile Masterplan area if confined to the recommendations outlined in the e3S report.

*Habitat protection and ecological enhancement within the masterplan area*

6. Reinstating indigenous vegetation on the margins of open spaces, in the Ladies Mile Masterplan area, will improve foraging opportunities for a range of other bird and lizard species.
  
7. The reduction of hawthorn hedges may reduce starling, blackbird and thrush populations which spread hawthorn. These species also compete with the foraging braided river species for ground invertebrates.

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Plate 1: View from Remarkables Road over Lake Hayes Estate and eastern Ladies Mile and the Threewood subdivision area. D Palmer, 12 February 2006



Plate 2: View from Remarkables over Shotover Delta and Shotover Country/ western Ladies Mile; infilling of Quail Rise subdivision infilling; Gravel extraction at the confluence. D Palmer, 29 January 2007



Plate 3: View of Whakatipu Basin including Ladies Mile Area. 21 January 2013. D Palmer



Plate 4: View from the Remarkables Trig over the Shotover Delta, Whakatipu Basin and the Ladies Mile – Shotover Country – Lake Hayes Estate area. Willows have been removed from the Lower Shotover and the downstream side of the confluence with the Kawarau River. D Palmer, 4 January 2016.





Plate 5: View from the Remarkables Trig over the Shotover Delta, Whakatipu Basin and the Ladies Mile – Shotover Country – Lake Hayes Estate area. Excavation of the river deposits along the true left side of the Lower Shotover enables the river braids to flow through this area. D Palmer, 18 April, 2019



Plate 6: View from the Remarkables Trig over the Shotover Delta, Whakatipu Basin and the Ladies Mile – Shotover Country – Lake Hayes Estate area and the development of Bridesdale. High river flow floods lower gravel beaches. D Palmer, 7 February 2020.



Plate 7: View from the Remarkables Trig over the Shotover Delta, Whakatipu Basin and the Ladies Mile – Shotover Country – Lake Hayes Estate area, Bridesdale and Kawarau Heights subdivision. 20 December 2021. D Palmer



Plate 8: View over the Kimi-akua / Shotover Delta; Willows have been removed from upstream of the confluence, the flood retention wall was constructed in 2011. D Palmer, 21 January 2013.



Plate 9: Excavation of true left river beach underway, infilling of Shotover Country subdivision and construction of the Five Mile and PaknSave/ Mitre 10 shopping areas underway. D Palmer, 4 January 2016



Plate 10: Shotover Disposal field installed; infilling of Shotover Country. A broad portion of the flood plain vulnerable to inundation. A high flow of about 450 cumecs occurred in the first week of February 2020. D Palmer 7 February 2020, D Palmer



Plate 11: View from Remarkables Trig: Extraction between willow islands and SH6 bridge occurred during the breeding season. Location of black-fronted tern colony indicated (blue circles). D Palmer, 20 December 2021



Plate 12: Frankton Flats. D Palmer, 12/2/2006



Plate 13: Frankton Flats, D Palmer, 5/3/2013



Plate 14: Frankton Flats, D Palmer, 20/12/2021



Plate 15: View South from Remarkables Trig, Jack's Point subdivision construction underway; D Palmer, 4/1/2016



Plate 16: View south from Remarkables Trig, Hanley Downs subdivision underway, development around Lake Tewa in the Jack's Point development underway. D Palmer, 7/2/2020



Plate 17: View south from Remarkables Trig, development of the Coneburn Special Housing Area underway; D Palmer, 20/12/2021