20 March 2020

Australian Potash Limited
4 Cook Street
West Perth, WA 6005

Attention: Mr Spencer Shute, Principal Environmental Scientist

Additional Sampling for Aquatic Invertebrates, Tiger Beetles and Shorebirds at Lake Wells

This report is an addendum to Bennelongia (2019) *Lake Wells Potash Project Subterranean Fauna Assessment*.

The Environment Protection Authority (EPA) has advised Australian Potash Limited that more work was required to obtain environmental approvals at the proposed Lake Wells potash deposit. This proposed project will involve the extraction of naturally occurring potassium-rich groundwater brines underlying the Lake Wells salt lake system and their concentration in solar evaporation ponds for the production of sulphate of potash (potassium sulphate), an important plant fertiliser. Additional infrastructure will include salt harvesting and treatment facilities, access and haul roads, an airstrip, accommodation and administration facilities, utility supplies and drainage, and a borefield to produce 'low salinity' groundwater for potash processing and domestic purposes.

The additional work carried out between 12-15 February 2020 was specifically designed to further understand the distributions of, and assess possible impact on:

- Aquatic Invertebrates (especially three species collected in a 2017 survey and known only from the Lake Wells area),
- Tiger Beetles, and
- Shorebirds and other waterbirds.

At the time of survey, the central area of the Lake Wells playa contained little or no surface water. In the north western quarter there was an extensive series of shallow flooded claypans for several kilometres from sites LW 7 to the western extent of the playa. To the south there was a large extent of fresh water in the playa at WPT 91 (see Appendix 2).

Aquatic Invertebrates

Aquatic invertebrate surveys in 2017 identified 1528 individuals from 62 species. Of these, three species were raised as requiring further survey effort and these were

- *Eocyzicus* B01 (found at LW5),
- *Bennelongia* nr *koendersae* (found at LW4 and LW8), and
- *Bennelongia* sp. BOS833 (*nimala* lineage – found at LW3).

Aquatic invertebrates were collected from 5 sites in 2020 and consisted of sweeps using both 50 and 250 micron mesh sweep nets. For more detailed descriptions of methods, please refer to the 2017 aquatics report (Bennelongia 2017). Sites can be seen at Appendix 2.

The *Eocyzicus* B01 collected in 2017 have been identified by Brian Timms (University of New South Wales) as similar to *Eocyzicus argillaquus* and they are referred to here as *Eocyzicus* sp. B01 (nr *argillaquus*). The species has now been found at sites LW5, LW7 and WP 129 at Lake Wells (Figure 1). This is a range expansion for this species but it is still only definitely known from within the project area. However, other specimens identified by Timms as *Eocyzicus* nr *argillaquus* have been collected from

Lake Disappointment and, if the Lake Wells and Lake Disappointment animals are the same species, *Eocyzicus* nr *argillaquus* has a range of more than 1000 km.

Additionally, two other species of *Eocyzicus* were collected during the 2020 survey. These are *Eocyzicus* 'BCN012' and *Eocyzicus* 'BCN013'. Both were found in freshwater claypans and, as a result, are not considered threatened by the project.

Bennelongia nr *koendersae* belongs to the '*nimala*' lineage as recognised by Martens et al. (2015), and was recollected in 2020 at sites WP 92 and WP 93, located in the south of Lake Wells mid-way between LW4 and LW8 (the two sites from which it was collected in 2017) (Figure 1). This species has been collected outside of the project footprint (at site LW4) and based on the known biology of similar *Bennelongia* species, it is expected that *Bennelongia* nr *koendersae* will be distributed further afield than the clay pans in the immediate surrounds of Lake Wells. DNA analysis is currently underway although there is some uncertainty about completion date.

Bennelongia 'BOS833' (*nimala* lineage) was not recollected in 2020 but the collection site from 2017 (LW3) lies outside of the project footprint (Figure 1). Based on the biology of other Bennelongia species, *Bennelongia* 'BOS833' (*nimala* lineage) is not expected to be restricted to clay pans associated with the project. The species appears to have affinities with *Bennelongia pinderi* but DNA analysis is currently underway to clarify relationship with other *Bennelongia* species.

Tiger Beetles

A more detailed and targeted search for tiger beetles on dry parts of the lakebed, both inside and outside the evaporative pond network, was conducted in 2020 as a part of the requested additional work. This involved active searching throughout playas in the project area. Daytime active searches included catching free roaming animals and burrow excavations, while night work included spot lighting and light trapping. For more detailed description of SRE methodology, please refer to the Lake Wells SRE report (Bennelongia 2018). Sampling in 2017 resulted in the collection of one species of tiger beetle identified to the tribe Megacephalini at the time, and now *Pseudotetracha corpulenta* s.l., which was found at site LW5 (Appendix 2)

After the 2020 survey, a total of 15 specimens of tiger beetle from Lake Wells were sent to Peter Hudson at the South Australian Museum for formal identification. In addition, 10 tiger beetle specimens from Lake Way were sent for comparison and possible range extension of species. This resulted in the identification of 5 species lineages of tiger beetle at Lake Wells (Table 1).

Table 1: Tiger beetle species collected at Lake Wells and indicative ranges.

Species	Sites Collected at Lake Wells	Range
Cicindela semicincta	LW7, WP 93	most of Australia and beyond
Cicindela mastersi	LW7, WP 93	widely in eastern Australia
Pseudotetracha corpulenta s.l.	Site 5, WP 91, Camp	Wongan Hills, Meekatharra, Leonora
Pseudotetracha helmsi s.l.	WP 91, LW1a, Camp	Murchison
Pseudotetracha pulchra s.l.	LW1a, LW7	Murchison

All of the tiger beetle species found at Lake Wells were collected from multiple sites within the project area (Table 1; Figure 2). Two of the (*Pseudotetracha* lineages (*Pseudotetracha corpulenta* s.l. and *Pseudotetracha helmsi* s.l.) were also collected at Lake Way.

There is much greater conservation focus on *Pseudotetracha* than *Cicindela*. It is currently considered that all lineages of Australian *Pseudotetracha* comprise multiple species (Lopez-Lopez et al. 2016). As a

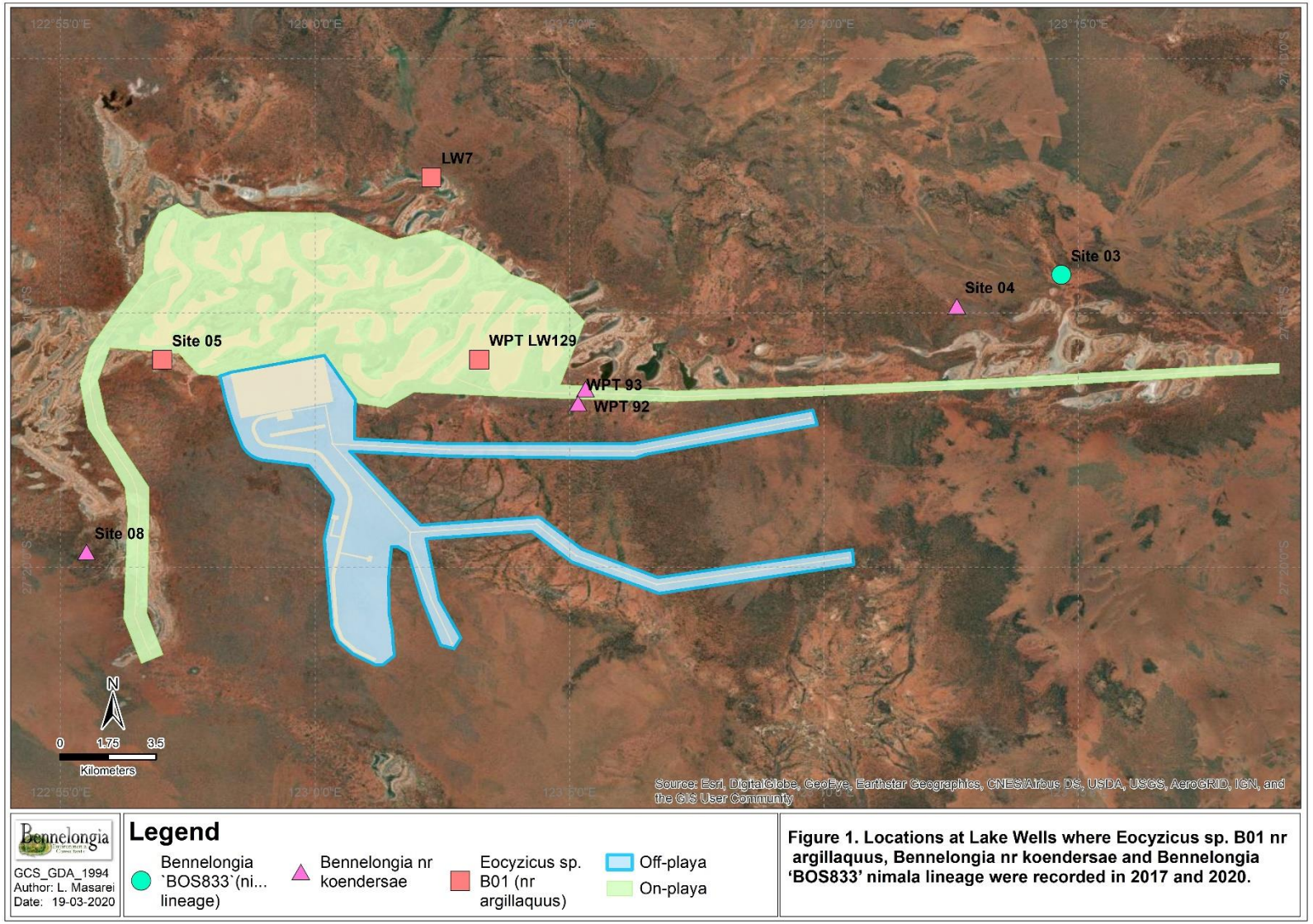


Figure 1. Locations at Lake Wells where *Eocyzicus* sp. B01 (nr *argillaquus, Bennelongia* nr *koendersae* and *Bennelongia* 'BOS833' (*nimala* lineage) were recorded in 2017 and 2020.

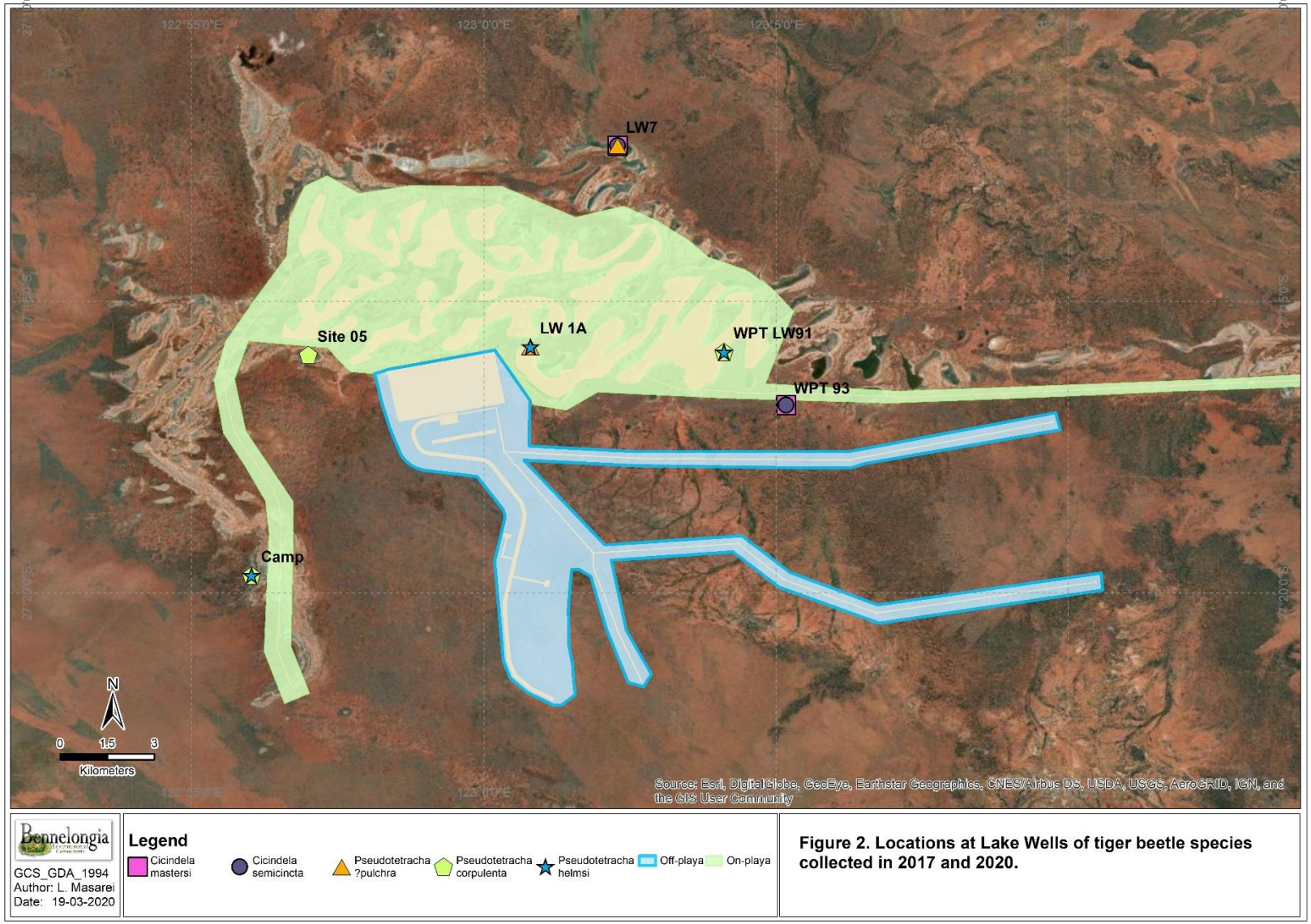


Figure 2. Locations at Lake Wells of tiger beetle species collected in 2017 and 2020.

result, it is unclear whether *Pseudotetracha corpulenta* s.l. and *Pseudotetracha helmsi* s.l. at Lake Wells and Lake Way are the same species and it is unknown whether any of the *Pseudotetracha* have ranges extending beyond Lake Way and its satellite waterbodies. At the very least, DNA sequencing is required to assist in determining the status of Lake Wells animals. This work is underway and should show whether the species of *Pseudotetracha corpulenta* s.l. and *Pseudotetracha helmsi* s.l at Lake Wells and Lake Way are the same. Understanding the true distribution of species and characteristic range patterns of *Pseudotetracha* is likely to involve a much larger study that incorporates morphologyl as well as genetics (Lopez-Lopez et al. 2016).

Both *Cicindela* species appear to be widespread, although this is possibly a reflection of limited recent taxonomic review.

Shorebirds and Waterbirds

Recent rain at Lake Wells provided an opportunity to conduct waterbird and shorebird surveys in 2020 in conjunction with the additional aquatic invertebrate sampling. Initially, an aerial survey was conducted at a height of 25m and speed of 60 knots using a Robinson 44 helicopter to ensure complete coverage of the lake. Additional ground counts were then using spotting scopes at sites where flocks of birds were observed from the air and at each invertebrate sampling site (Appendix 3). Opportunistic observations were made while travelling between sampling sites. The complete list of birds seen, with scientific names, is given in Appendix 1.

Surveys conducted in 2017 identified 28 individuals from five species of waterbird including grey teal (five), white-necked heron (one), red-capped plover (17), black-tailed native-hen (3) and Australian shelduck (2) (Bennelongia 2017). The 2020 survey recorded three species seen in 2017: grey teal (284), Australian shelduck (163) and red-capped plover (51). An additional six species were recorded in 2020: Australian wood duck (93), hoary-headed grebe (13), hardhead (2), pink-eared duck (1), red-necked avocet (2), and white-faced heron (1). One unidentified medium-sized shorebird was seen at site WP121 (Appendix 3). In total of 612 individuals of 11 species were seen in 2020. The unidentified medium shorebird was too far away for a positive identification but other independent surveys have recorded the marsh sandpiper at the lake (Harewood 2017).

An independent two-phase fauna survey by Harewood (2017) recorded 11 species of waterbird and shorebird including chestnut teal, Australian wood duck, black swan, pink-eared duck, hoary-headed grebe, white-faced heron, marsh sandpiper (already mentioned), black-winged stilt, red-necked avocet, red-kneed dotterel and banded lapwing. To the north of Lake Wells, the Lake Carnegie System is recognised as a wetland of national significance due to its importance as a breeding site for black swan, as well as 23 other waterbird species (Cowan 2001).

The occurrence of the unidentified shorebird at WP 121 in 2020 and marsh sandpiper was recorded by at a large freshwater lake near the northwest boundary of the Project area in April 2017 shows that there is some usage of the lake system by migratory shorebirds, which are listed under the Biodiversity Conservation Act (Schedule 5) and international agreements. However, numbers appear to be low and the system is unlikely to be an important site under the Environment Protection and Biodiversity Conservation Act 1999 Policy 3.21.

References

Bennelongia (2017) Lake Wells potash project: wetland ecology baseline survey. Report 2017/295. Bennelongia Pty Ltd, Jolimont, 27 pp.

Bennelongia (2018) Lake Wells potash project: assessment of short range endemic invertebrate values. Report 2018/330. Bennelongia Pty Ltd, Jolimont, 40 pp.

Harewood, G. (2017) Fauna Survey (Level 2). Phase 1 (September 2016) and Phase 2 (April 2017). Lake Wells Potash Project. Report 01-000017-1/2. Greg Harewood, Bunbury, 122 pp.

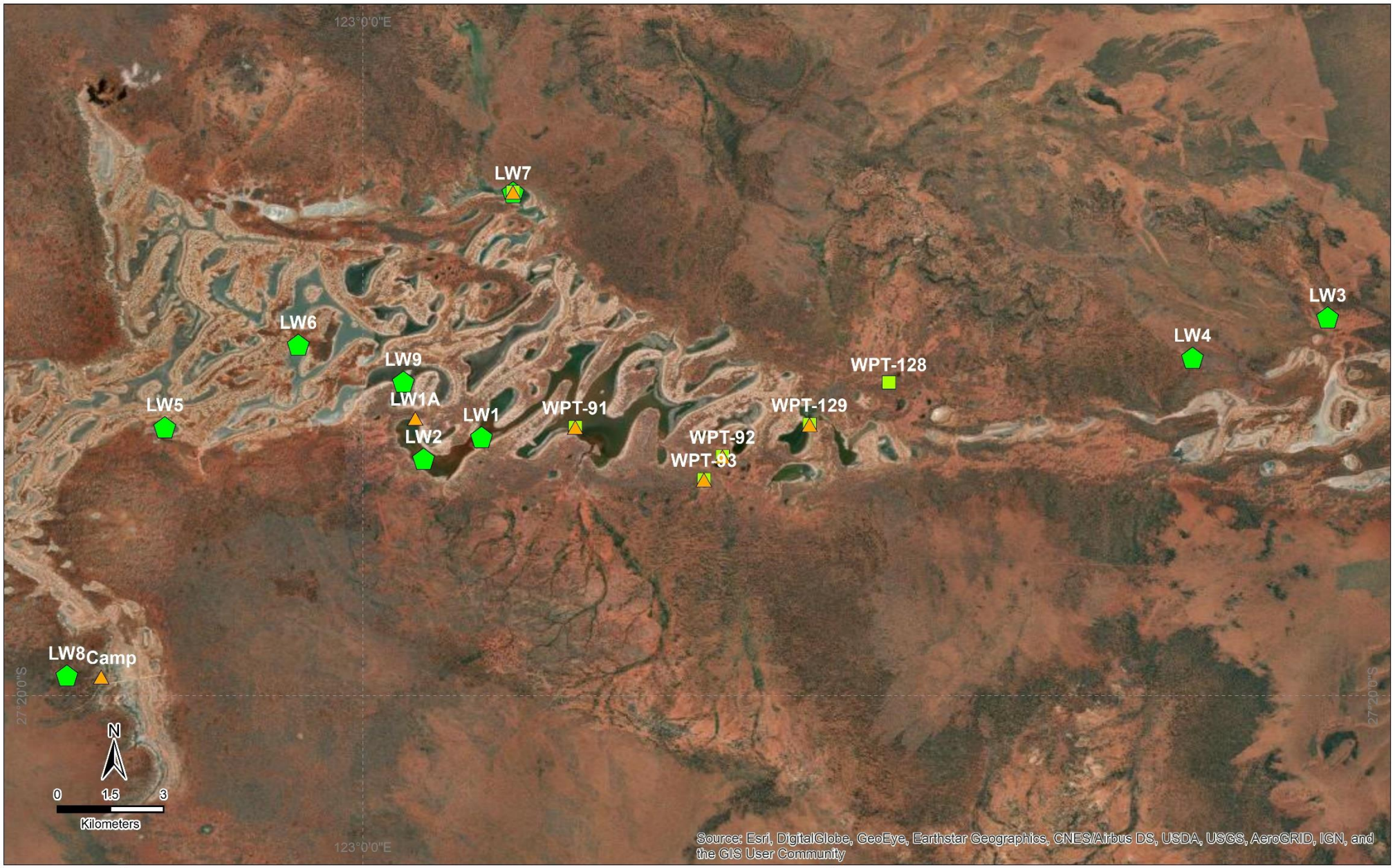
López-López, A., Hudson, P., and Galián, J. (2016) Islands in the desert: Species delimitation and evolutionary history of *Pseudotetracha* tiger beetles (Coleoptera: Cicindelidae: Megacephalini) from Australian salt lakes. *Molecular Phylogenetics and Evolution* **101**, 279-285.

Martens, K., Halse, S., and Schon, I. (2015) On the *Bennelongia nimala* and *B. triangulata* lineages (Crustacea, Ostracoda) in Western Australia, with the description of six new species. European Journal of Taxonomy 111, 1-36.

Appendices

Appendix 1: Complete list of waterbirds observed at Lake Wells by Bennelongia in 2017 and 2020. *

Common Name	Scientifi Name	Conservation Status	Number
Grey Teal	*Anas gracilis*	Least Concern	284
Hardhead	*Aythya australis*	Least Concern	2
Hoary-headed Grebe	*Poliocephalus poliocephalus*	Least Concern	13
Australian Wood Duck	*Chenonetta jubata*	Least Concern	93
Pink-eared Duck	*Malacorhynchus membranaceus*	Least Concern	1
Red-capped Plover	*Charadrius ruficapillus*	Least Concern	51
Red-necked Avocet	*Recurvirostra novaehollandia*	Least Concern	2
Australasian Shelduck	*Tadorna tadornoides*	Least Concern	163
White-faced Heron	*Egretta novaehollandiae*	Least Concern	1
Unidentified medium shorebird	*Calidridae sp.*	Probably Schedule 5	1



Bennelongia Environmental Consultants

GCS_GDA_1994
Author: L. Masarei
Date: 19-03-2020

Legend

- Aquatic, 2017
- Carabid, 2020
- Aquatic, 2020

Appendix 2. Sample sites for different taxa at Lake Wells.

Bennelongia Environmental Consultants

GCS_GDA_1994
Author: L. Masarei
Date: 19-03-2020

Legend

Helicopter Tracks

Waterbird Locations

Appendix 3. Sample sites for waterbirds at Lake Wells.