Bennelongia Environmental Consultants

Lake Way Potash Project: historical stygofauna sampling and baseline survey results

Prepared for:

Salt Lake Potash

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Final Report

Short-Range Endemics I Subterranean Fauna

Waterbirds I Wetlands

Lake Way Potash Project: historical stygofauna sampling and baseline survey results

Bennelongia Pty Ltd
5 Bishop Street
Jolimont WA 6014

P: (08) 9285 8722
F: (08) 9285 8811
E: info@bennelongia.com.au

ABN: 55 124 110 167

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EXECUTIVE SUMMARY

Salt Lake Potash Limited proposes to develop the Lake Way Potash Project (the Project), south of Wiluna, in the Goldfields region of Western Australia. The Project will involve extracting groundwater brines underlying the Lake Way salt lake system and concentrating them in solar evaporation ponds to produce up to 260 kilotonnes per annum (ktpa) of sulphate of potash product. This report provides the results of the most recent sampling program for stygofauna at Lake Way (undertaken by Bennelongia in March 2020) and also summarises all available historical records of stygofauna and stygofauna samples in the vicinity of the Project. The distributions of species and communities, where known, are also outlined.

Rich subterranean fauna communities occur around Lake Way and six Priority Ecological Communities (PECs) occur in the vicinity and are listed on the basis of stygofauna. The calcretes whose communities have been most intensively sampled and documented are Lake Violet Calcrete, Uramurdah Lake Calcrete, Hinkler Well Calcrete and Millbillillie Bubble Well Calcrete.

Generally speaking, the main potential impact of mining activities on stygofauna species and communities is habitat removal via groundwater drawdown resulting from dewatering or groundwater production. In the case of the Project, the construction of trenches and pumping of brine from the paleochannel bores is predicted to cause some drawdown in surrounding aquifers. The extent of predicted drawdown is largely confined to the lake itself, although there are some relatively small areas of drawdown predicted to extend away from the lake.

Bennelongia undertook sampling for stygofauna at 17 bores around Lake Way in March 2020. The samples yielded 16 species of stygofauna including four species of annelid worm, one species of diving beetle, one species of amphipod, three species of isopod, one species of syncarid, five species of copepod and one species of ostracod. Only six of the bores sampled yielded stygofauna. Three bores sampled on Lake Way playa within the extent of predicted drawdown from brine production did not yield stygofauna.

Taking into account recent and historical sampling, a total of 283 net haul samples from 181 bores have been taken in the within or near the Project development envelope, with majority of samples located within or close to areas of mapped calcrete, which is interpreted as the core habitat for stygofauna.

Approximately 90 species of stygofauna have been collected in and around Lake Way including 12 species of annelid worm, six species of diving beetle, 10 species of amphipod, three species of isopod, 16 species of syncarid, seven species of cyclopoid copepod, 23 species of harpacticoid, 10 species of ostracod and a species of rotifer. There is a high degree of short range endemicity amongst the recorded species and the communities in each calcrete aquifer appear to be quite different from one another in terms of species composition.

Based on the records available, predicted drawdown associated with brine production is unlikely to be a significant threat to any stygofauna species. This is principally due to the likely paucity of species within the drawdown area, which is largely confined to Lake Way itself. An area of prospective habitat to the northeast of Lake Way, east-southeast of the Uramurdah Lake Calcrete, is anticipated to receive drawdown effects in the order of 0.5–1.0 m. However, given the small magnitude of predicted drawdown and the adjacent occurrence of very prospective habitat that is predicted to remain unaffected by drawdown, the likely level of threat to subterranean species in this area is considered to be low.

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1. INTRODUCTION

Salt Lake Potash Limited proposes to develop the Lake Way Potash Project (the Project), south of Wiluna, in the Goldfields region of Western Australia (Figure 1). The Project will involve extracting groundwater brines underlying the Lake Way salt lake system and concentrating them in solar evaporation ponds to produce up to 260 kilotonnes per annum (ktpa) of sulphate of potash product (Salt Lake Potash 2019).

Proposed infrastructure includes evaporation ponds, brine abstraction trenches, palaeochannel brine production bores, permanent brine pumps and pipework, access and infrastructure corridors and excess salt disposal areas. Developments will cover a disturbance area of 2,750 ha within a development envelope of 25,449 ha (Figure 1). The lifespan of the Project will be 20 years (Salt Lake Potash 2019).

This report provides the results of the most recent sampling program for stygofauna at Lake Way (undertaken by Bennelongia in March 2020) and also summarises all available historical records of stygofauna and stygofauna samples in the vicinity of the Project. The distributions of species and communities, where known, are also outlined. The aims of the report are:

- To provide a baseline dataset on which to base future survey and assessment work relating to stygofauna.
- To determine if any species of stygofauna are currently only known from potential impact areas associated with brine production on the lake.

2. SUBTERRANEAN FAUNA FRAMEWORK

The term subterranean fauna includes two groups of underground animals: aquatic stygofauna and air-breathing troglofauna. Both groups characteristically have reduced or absent eyes and are poorly pigmented due to lack of light. Subterranean fauna species in caves have often developed vermiform bodies and elongate sensory structures, although species in tighter, non-cave habitats in the wider landscape do not necessarily share these adaptations. Other typical morphological and physiological adaptations in underground species include the loss or reduction of wings, increased lifespan, a shift towards K-selection breeding strategy and lower metabolic rate (Gibert and Deharveng 2002). Except for a few species of fish and snake, all subterranean fauna species in Western Australia are invertebrates.

Although inconspicuous, subterranean fauna contribute markedly to the overall biodiversity of Australia. The Pilbara, Yilgarn and neighbouring regions of Western Australia are globally important for subterranean fauna, with an estimated 4,500 or more subterranean species likely to occur (Guzik *et al.* 2010; Halse 2018), the majority of which remain undescribed. Most subterranean species satisfy Harvey's (2002) criteria for short-range endemism (SRE), having total range sizes of less than 10,000 km^2 and occupying discontinuous or fragmented habitats.

Many subterranean fauna species are obligate inhabitants of subterranean habitats (stygobites and troglobites), but some have a life-stage in surface and soil habitats (stygophiles and troglophiles). Stygophiles and troglophiles are usually considered to have larger distributions than obligate subterranean species as a result of greater dispersal opportunities. Stygoxenes and trogloxenes are species that use subterranean habitats opportunistically.

Given that species with small ranges are more vulnerable to extinction following habitat degradation than wider ranging species (Ponder and Colgan 2002), it follows that many subterranean species are highly susceptible to anthropogenic threats. In Western Australia the Environmental Protection Authority (EPA) requires consideration of subterranean fauna as part of environmental impact assessment (EPA 2016a, b, c).

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Date: 20-05-2020

Legend

- Development envelope
- Indicative infrastructure
- Road

Figure 1. Location and proposed layout of the Lake Way Potash Project

Rich subterranean fauna communities occur around Lake Way and six Priority Ecological Communities (PECs) that occur in the vicinity are listed by the Department of Biodiversity, Conservation and Attractions (DBCA) for the conservation values of their subterranean fauna communities, especially stygofauna (Figure 2). The calcretes whose communities have been most intensively sampled and documented are Lake Violet Calcrete, Uramurdah Lake Calcrete, Hinkler Well Calcrete and Millbillillie Bubble Well Calcrete (e.g. Bennelongia 2013; Cho *et al.* 2006; Karanovic 2004; Outback Ecology 2011, 2012; Watts and Humphreys 2006).

3. POTENTIAL IMPACTS

Generally speaking, the main potential impact to stygofauna species and communities associated with mining is groundwater drawdown resulting from dewatering or groundwater production. In the case of the Project, brine production via trenches on the Lake Way playa and bores in the palaeovalley is predicted to cause some drawdown in surrounding aquifers (Salt Lake Potash 2020). The extent of predicted drawdown is largely confined to the lake itself, although there are some relatively small areas of drawdown predicted to extend away from the lake (Figure 3).

Groundwater drawdown has the potential to remove stygofauna habitat and in turn threaten the persistence of stygofauna species and communities. Species whose distributions are entirely or mostly confined to the volume of habitat affected by drawdown would face potentially significant impacts.

4. STYGOFAUNA SURVEY – MARCH 2020

Bennelongia undertook sampling for stygofauna at 17 bores around Lake Way in March 2020. Fourteen of the bores were located in or near the Lake Violet, Uramurdah Lake and Lake Way South calcretes, outside the predicted extent of groundwater drawdown associated with brine production, while three bores on the lake playa and within the drawdown area were also sampled (Figure 3). Sampling was done by Mike Scanlon and Huon Clark.

4.1. Methods

In keeping with guidelines for subterranean fauna sampling (EPA 2016b, c) Stygofauna were sampled at each bore using weighted plankton nets. At least six hauls were taken at each site, three using a 50 µm mesh net and three with a 150 µm mesh net. The net was lowered to the bottom of the hole, jerked up and down to agitate the benthos (increasing the likelihood of collecting benthic species) and then retrieved slowly through the water column. Substrate in the terminal vial of the net was collected after each haul. All samples were preserved in 100% ethanol and kept on ice prior to refrigeration at the conclusion of each workday. Nets were washed with potable water and Decon90 between holes to minimise contamination between sites.

In the laboratory, samples were elutriated to separate out heavy sediment particles and sieved into size fractions using 250 µm, 90 µm and 53 µm screens. All samples were sorted under a dissecting microscope and stygofauna specimens identified to species level, where possible, using available keys and species descriptions. Animals were dissected and examined under a compound microscope as required for identification. Specimens that did not align with a described or vouchered species were assigned a morphospecies code. Specimens were identified by Jane McRae.

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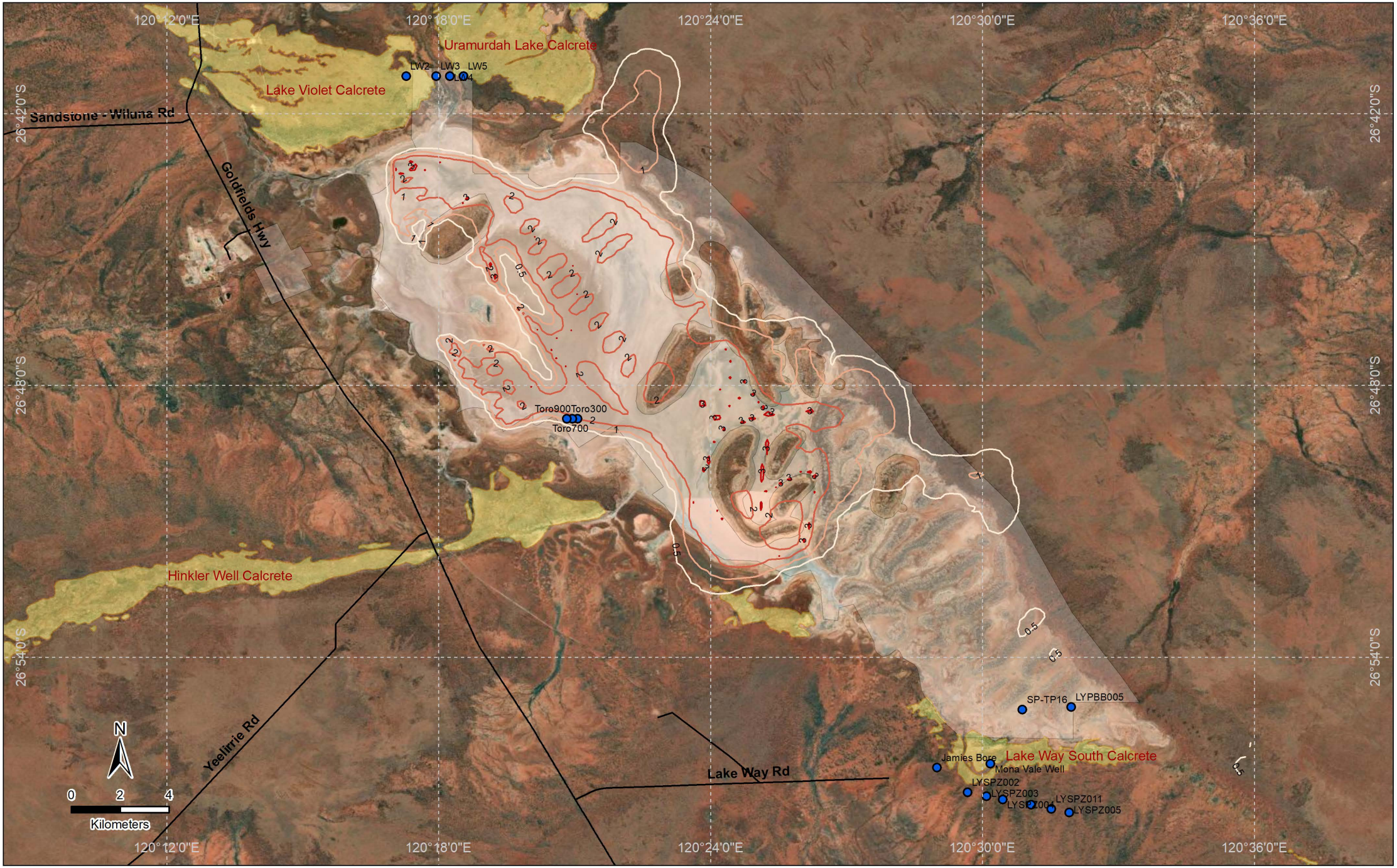
Legend

- Road
- Inferred core habitat - calcrete
- Development envelope

Figure 2. Locations of calcrete aquifers in the vicinity of Lake Way listed as Priority Ecological Communities (PECs) on the basis of stygofauna assemblages



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Date: 02-06-2020

Legend

- Stygofauna sample March 2020
- Development envelope
- Road
- calcrete

Predicted drawdown

- 0.5 m
- 1 m
- 2 m
- 3 m

Figure 3. Locations of bores sampled for stygofauna in March 2020, likely distribution of key stygofauna habitat (calcrete) and predicted drawdown associated with brine production

4.2. Results

Sampling at Lake Way in March 2020 yielded a total of 161 specimens belonging to 16 species of stygofauna including four species of annelid worm (Annelida), one species of diving beetle (Dytiscidae), one species of amphipod (Amphipoda), three species of isopod (Isopoda), one species of syncarid (Syncarida), five species of copepod (Cyclopoida and Harpacticoida) and one species of ostracod (Ostracoda) (Table 1).

Of the 17 bores sampled, six yielded stygofauna (Table 1), including the four bores (LW2, LW3, LW4 and LW5) sampled to the north of Lake Way in the vicinity of the Lake Violet and Uramurdah Lake calcretes, one bore in Lake Way South Calcrete (Mona Vale Well) and one bore to the north of Lake Way South Calcrete (SP-TP16).

Yields to the north of Lake Way were high and therefore consistent with the results of previous samples taken in that area (Section 5). In total, the four northern bores produced 119 specimens from 12 species (Table 1). In comparison, yields in the vicinity of Lake Way South Calcrete were very low, with the 10 bores sampled producing only 42 specimens belonging to four species, with just two bores yielding animals (Table 1). No historical data at Lake Way South were identified during reporting for comparison.

The three bores sampled within the predicted extent of drawdown to the northeast of the Hinkler Well Calcrete (Toro300, Toro700 and Toro900; Figure 3) did not yield stygofauna.

Table 1. Stygofauna species collected at Lake Way in March 2020.
Bores not listed did not yield stygofauna.

Higher Classification	Lowest Identification	Collection location					
		Lake Violet/ Uramurdah Lake Calcrete				Lake Way South Calcrete	North of Lake Way South Calcrete
		LW2	LW3	LW4	LW5	Mona Vale Well	SP-TP16
Annelida							
Aphanoneura							
Aeolosomatidae	*Aeolosoma* sp.					2	
Clitellata							
Haplotaxida							
Naididae	Naididae `BOL059`			8			
Tubificidae	Tubificidae `BOL057`		1				
	Tubificidae `BOL058`						6
Arthropoda							
Insecta							
Coleoptera							
Dytiscidae	*Limbodessus wilunaensis*		1				
Malacostraca							
Amphipoda							
Chiltoniidae	Chiltoniidae `SAM1`		24	2	11		
Isopoda							
Scyphacidae	*Haloniscus* `BIS384`			2	10		
	Haloniscus `BIS385`		12				
	Haloniscus `BIS386`			12	1		
Syncarida							
Parabathynellidae	*Brevisomabathynella uramurdahensis*	1					
Maxillopoda							
Cyclopoida							
Cyclopidae	*Halicyclops eberhardi* s.l.		1				
	Halicyclops kieferi		13	2			
	Mesocyclops sp.					4	
Harpacticoida							
Ameiridae	*Nitocrella trajani*		1	6			
Miraciidae	*Schizopera* nr *austindownsi*		11				
Ostracoda							
Popocopida							
Cyprididae	*Strandesia* `BOS1393`					30	

5. SUMMARY OF HISTORICAL SAMPLING

Surveys for stygofauna at Lake Way and in the surrounds for which sampling and species records are available include:

- Monitoring for the Magellan Lead Carbonate Project (Magellan Metals Limited) to the northwest of Lake Way and in the vicinity of the Millbillillie Bubble Well Calcrete (Bennelongia 2013).
- Survey for baseline and environmental impact assessment of the Wiluna Uranium Project for Toro Energy Limited (Outback Ecology 2011, 2012).
- Sampling by Bennelongia in the West Creek Borefield for Salt Lake Potash (Bennelongia 2020).
- The current survey.

5.1. Summary of effort

Including the current survey, a total of 283 net haul samples from 181 bores have been taken in the vicinity of Lake Way (Figure 4), with majority of samples located within or close to areas of mapped calcrete, which is interpreted as the core habitat for stygofauna. Geological units adjacent to the calcretes, such as alluvium, are likely to have some connectivity with the calcrete aquifers and correspondingly are likely to host some of the same species. Only three bores within the extent of predicted drawdown appear to have been sampled (Figure 4).

Between 2007 and 2015 Outback Ecology (Stantec) collected a total of 218 samples from 125 bores, predominantly to the north of Lake Way in the Lake Violet and Uramurdah Lake calcretes and to the West of Lake Way in and around the Hinkler Well Calcrete, but also in West Creek alluvials. They also collected two samples from a single bore in the Millbillillie Calcrete.

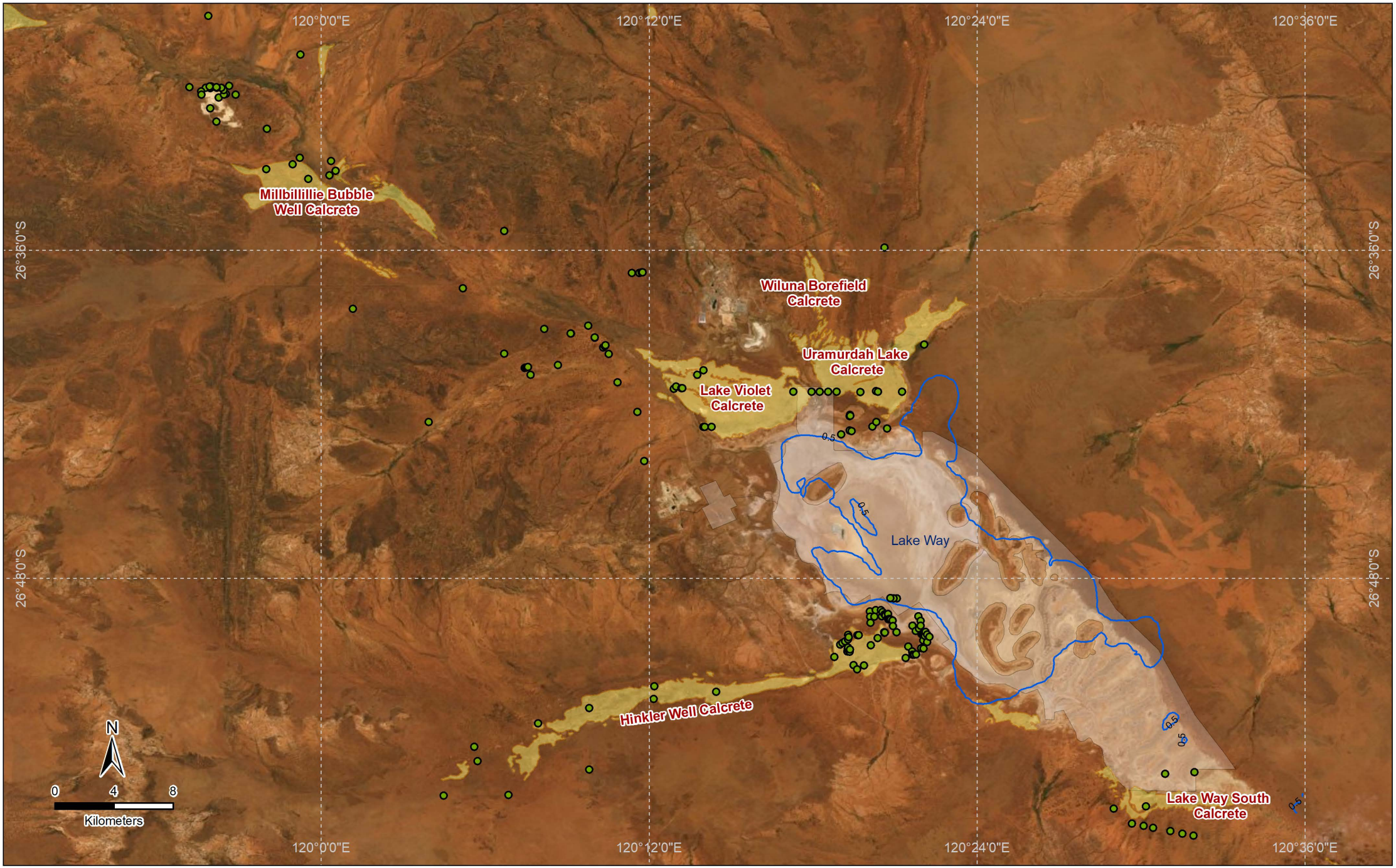
Bennelongia collected 28 samples from 28 bores at and near the Magellan Mine in 2012, including seven bores in the Millbillillie Calcrete. Between 2019 and 2020 Bennelongia have also collected (including the current survey) a total of 36 samples from 36 bores including in the West Creek Borefield and around Lake Way itself. An opportunistic sample was collected by Bennelongia to the north of Uramurdah Lake Calcrete and approximately 12.3 km north of Lake Way at the Gunbarrel Laager in 2004.

5.2. Summary of species

Summaries of all species collected in historical and current sampling are provided as Appendices 1 and 2. Appendix 1 presents the list of species by survey, while Appendix 2 presents the list by broad areas from which each species has been recorded.

Discounting higher order identifications that may belong to other recorded taxa, approximately 90 species of stygofauna have been collected in and around Lake Way including 12 species of annelid worm, six species of diving beetle, 10 species of amphipod, three species of isopod, 16 species of syncarid, seven species of cyclopoid copepod, 23 species of harpacticoid, 10 species of ostracod and a species of rotifer. The actual number of species present and indeed the number recorded in surveys are not possible to clarify with absolute certainty for two main reasons. Firstly, given the large area of prospective habitats, the limited spatial extent of sampling coverage (Figure 4) and the inherently small yields of stygofauna sampling, it is unlikely that all species present in the surveyed area have been collected and documented. Secondly, the use of inconsistent taxonomic frameworks between studies may sometimes have led to multiple names being applied to single species. By the same token, some morphospecies names potentially represent multiple species.

As has been observed at calcrete aquifers throughout the Yilgarn (Cooper *et al.* 2007; Cooper *et al.* 2008; Humphreys 2001), there are high levels of localised endemism amongst the species recorded in the surveyed area. Of the 90 species recorded, two-thirds have only been recorded at a single broad locality (e.g. a single calcrete or the immediate surrounds). To further illustrate the high degree of endemism, of the 39 species recorded across the Lake Violet and Uramurdah Lake calcrete, only 13 species have been recorded at both (Appendix 2).



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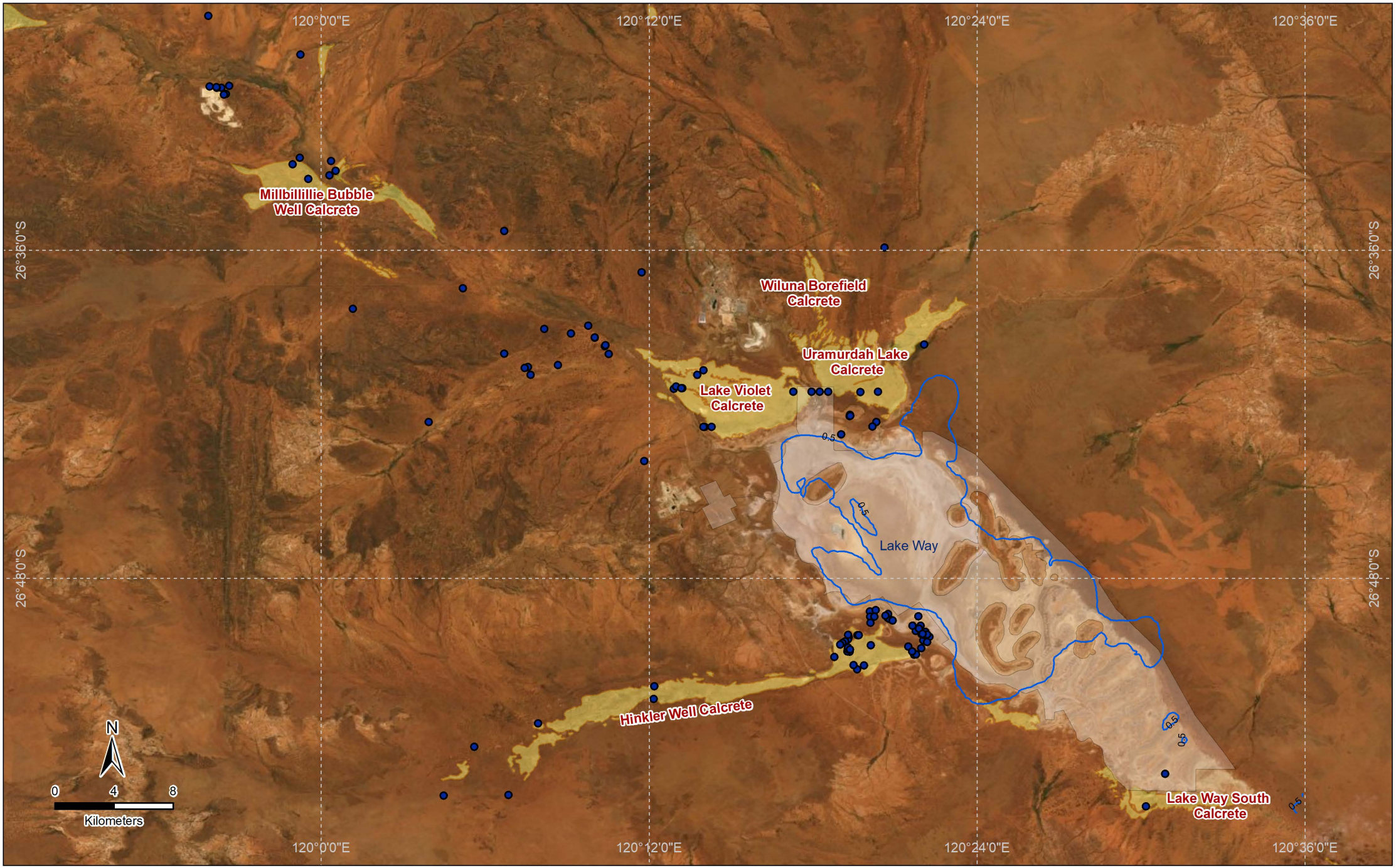
Legend

- Development envelope
- Road
- Inferred core habitat - calcrete
- Predicted 0.5 m drawdown

Figure 4. Distribution of historical and recent sampling for stygofauna in the vicnity of Lake Way



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Author: A. Mittra
Date: 20-05-2020

Legend

- Bore sampled - stygofauna
- Development envelope
- Inferred core habitat - calcrete
- Predicted 0.5 m drawdown

Figure 4. Distribution of stygofauna records in the vicinity of Lake Way

5.2.1. Species within predicted drawdown

No species of stygofauna has been recorded within the predicted extent of groundwater drawdown associated with brine production (Figure 5). While it is true that only three bores within the extent of drawdown have been sampled (Figure 5), it is also the case that the vast majority of drawdown is predicted to occur on the lake and in lake sediments, which are considered unlikely to host more than a very depauperate suite of stygofauna. This is due to the aquifers under the lake being hypersaline, as well as the sediments being composed of sandy clay and lacking the well-developed pore spaces that would constitute prospective habitat.

An area of prospective habitat to the northeast of Lake Way, east-southeast of Uramurdah Lake Calcrete, is anticipated to receive drawdown effects in the order of 0.5–1.0 m (Figure 3). While it is likely that stygofauna species will occur within the drawdown area here, the magnitude of drawdown is considered highly unlikely to threaten any species in a significant way, with the majority of the aquifer likely to remain saturated. Moreover, more prospective habitat occurs adjacent to the predicted drawdown area in the calcrete (Figure 3). Any species occurring in the drawdown area here is also reasonably likely to occur in unaffected habitat close by.

6. CONCLUSIONS

This report aimed to present the results of the most recent sampling program at Lake Way for stygofauna and summarise the total historical sampling effort for stygofauna at Lake Way and in the surrounds. It also aimed to determine if any stygofauna species were restricted to the predicted extent of drawdown associated with brine production.

Sampling in March 2020 by Bennelongia at 17 bores around Lake Way yielded 16 species of stygofauna including four species of annelid worm, one species of diving beetle, one species of amphipod, three species of isopod, one species of syncarid, five species of copepod and one species of ostracod. Only six of the bores sampled yielded. The majority of species were recorded in the large calcrete PECs to the north of Lake Way, while the smaller PEC to the south of the lake produced only four species across two of 10 bores sampled. Three bores sampled on Lake Way playa within the extent of predicted drawdown associated with brine production did not yield stygofauna.

Taking into account recent and historical sampling, a total of 283 net haul samples from 181 bores have been taken in the extent of the map, with majority of samples located within or close to areas of mapped calcrete, which is interpreted as the core habitat for stygofauna. Approximately 90 species of stygofauna have been collected in and around Lake Way including 12 species of annelid worm, six species of diving beetle, 10 species of amphipod, three species of isopod, 16 species of syncarid, seven species of cyclopoid copepod, 23 species of harpacticoid, 10 species of ostracod and a species of rotifer. There is a high degree of short range endemicity amongst the recorded species and a relatively small proportion of species occur in multiple localities (for example, more than one calcrete).

Based on the records available, predicted drawdown is unlikely to be a major threat to any stygofauna species. This is principally due to the likely paucity of species within the drawdown area, which is largely confined to Lake Way itself. While only three bores within the drawdown area have been sampled, these bores did not yield stygofauna and no species of stygofauna is known to be restricted to the predicted extent of drawdown. Lake sediments are considered to be very poor habitat for stygofauna.

An area of prospective habitat to the northeast of Lake Way, east-southeast of the Uramurdah Lake Calcrete, is anticipated to receive drawdown effects in the order of 0.5–1.0 m. However, given the relatively small predicted magnitude of drawdown in this area and the adjacent occurrence of very prospective habitat that is predicted to remain unaffected by drawdown, the likely threat to stygofauna species is low.

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Appendix 1. Stygofauna species recorded at Lake Way and in the surrounds based on available records.

Asterisks denote higher order identifications.

Higher Classification	Lowest Identification	Survey (no. of specimens)			Total no. of bores	Comments
		Bennelongia[1]	Stantec (Toro)[2]	Magellan[3]		
Annelida						
Aphanoneura						
Aeolosomatidae	*Aeolosoma* sp.*	2	+		2	Known from two bores in West Creek but taxonomic resolution is insufficient to determine actual range.
	Aeolosoma sp. 1 (PSS)			3	1	Recorded at a single bore in the Millbillillie Calcrete. A widely recorded morphospecies that potentially contains many species.
Clitellata						
Enchytraeida						
Enchytraeidae	Enchytraeidae `2 bundle` s.l. (short sclero 2 per seg)	1			1	A morphospecies known from a single bore (West Creek)
	Enchytraeidae `2 bundle` s.l. (short sclero 4 per seg)	2			1	A morphospecies known from a single bore (West Creek)
	Enchytraeus sp. AP PSS2 s.l.*			1	1	Higher order identification, likely to be either Enchytraeidae `2 bundle` s.l. (short sclero 2 per seg) or Enchytraeidae `2 bundle` s.l. (short sclero 4 per seg).
	Enchytraeidae `3 bundle` s.l. (short sclero) (including Enchytraeus sp. AP PSS1 s.l.)	9		16	3	A morphospecies with a recorded linear range within the survey area of 30.8 km (West Creek) althought taxonomic resolution is insufficient to determine actual range.
	Enchytraeidae `OES20`		7		4	A morphospecies with a recorded linear range within the survey area of 14.0 km (Hinkler Well).
	Enchytraeidae sp.*		27		16	Higher order identifications.
Haplotaxida						
Naididae	Naididae `BOL059`	8			1	A morphospecies known from a single bore (Uramurdah Calcrete).
	Naididae `OES3`		+		1	A morphospecies known from a single bore (Hinkler Well).
	Naididae sp.*		2		3	Higher order identification.
Phreodrilidae	Phreodrilidae `OES21`		3		1	A morphospecies known from a single bore (Hinkler Well).
	Phreodrilidae sp.*		5		4	Higher order identifications.
	Phreodrilidae sp. AP DVC s.l.	1		9	2	A morphospecies recorded from two bores in West Creek over a linear range of 20 km.
Tubificidae	*Ainudrilus* sp. WA25 (PSS)			4	2	A morphospecies known from outside the survey area although in reality may contain multiple species. Recorded from two bores at Magellan Mine.
	Tubificidae `BOL057`	1			1	A morphospecies known from a single bore (Lake Violet Calcrete).
	Tubificidae `BOL058`	6			1	A morphospecies known from a single bore (southern end of Lake Way).
	Oligochaeta sp.*	28	+		7	Higher order identifications.
Arthropoda						
Insecta						
Coleoptera						
Dytiscidae	Dytiscidae sp.*		4		3	Higher order identifications.
	Limbodessus hinkleri		41		15	Restricted to Hinkler Well Calcrete.
	Limbodessus macrohinkleri		2		2	Restricted to Hinkler Well Calcrete.
	Limbodessus millbilliensis		+		4	Restricted to Millbillillie Calcrete.
	Limbodessus morgani			4	1	Restricted to Uramurdah Lake Calcrete.

Higher Classification	Lowest Identification	Survey (no. of specimens)			Total no. of bores	Comments
		Bennelongia[1]	Stantec (Toro)[2]	Magellan[3]		
	Limbodessus sp. B03			21	2	Recorded from two bores in and likely to be restricted to Millbillillie Calcrete. Potentially could be *Limbodessus millbilliensis*.
	Limbodessus sp. (including Bidessini sp.)*		7	1	12	Higher order identifications.
	Limbodessus wilunaensis	11	+		3	Restricted to Lake Violet Calcrete.
Malacostraca						
Amphipoda						
Chiltoniidae	Chiltoniidae `SAM1`	37	16		1	Recorded from numerous bores in and around the Lake Violet and Uramurdah Lake calcretes over a linear range of 12.5 km.
	Chiltoniidae `SAM2`		+		1	Known from a single bore (West Creek).
	Chiltoniidae `SAM3`		109		13	Recorded from numerous bores in and around Hinkler Well Calcrete over a linear range of 17 km, with most records in the eastern portion.
	Chiltoniidae `SAM5`		7		2	Recorded from two bores in the western portion of Hinkler Well Calcrete over a linear range of 0.85 km.
	Chiltoniidae `SAM6`		51		2	Recorded from two bores 0.55 km apart to the northeast of Hinkler Well Calcrete.
	Chiltoniidae sp.*		30		5	Higher order identifications.
	Yilgarniella sp. B01			1	1	Recorded from a single bore a Millbillillie Calcrete
Paramelitidae	*Kruptus* `BAM178`	1			1	Known from a single bore (West Creek). Likely to be Paramelitidae `SAM1` as both species recorded from the same bore.
	Paramelitidae `SAM1`		2		3	Recorded from three bores in the Lake Violet Calcrete and West Creek over a linear range of 6.8 km.
	nr *Kruptus* sp. B30			1	1	Known from a single bore at Magellan Mine.
	Paramelitidae `SAM2`		+		1	Known from a single bore in Uramurdah Lake Calcrete.
	Amphipoda sp.*		+	3	2	Higher order identifications.
Isopoda						
Scyphacidae	*Haloniscus* `BIS384`	12			2	Recorded from two bores 0.51 km apart in and just outside the Uramurdah Lake Calcrete.
	Haloniscus `BIS385`	12			1	Known from a single bore in between the Lake Violet and Uramurdah Lake calcretes.
	Haloniscus `BIS386`	13			2	Recorded from two bores 0.51 km apart in and just outside the Uramurdah Lake Calcrete.
	Haloniscus sp.			8	2	Higher order identifications.
Syncarida						
Bathynellidae	Bathynellidae sp.		1		1	The only record of the family Bathynellidae in the vicinity of Lake Way but not identified beyond family. Recorded in a single bore in the Hinkler Well Calcrete.
Parabathynellidae	*Atopobathynella* `OES5`		+		2	Recorded from two bores 4.2 km apart to the west of Hinkler Well Calcrete.
	Atopobathynella sp.*		1		2	Higher order identifications.
	Atopobathynella wattsi		637		6	Known from six bores within and to the east of Hinkler Well Calcrete and also bores In West Creek and the Millbillillie Calcrete (Cho et al. 2006); however, the conspecificity of the Hinkler Well specimens and those from areas further north have not been confirmed genetically.
	Brevisomabathynella `BSY207`	2			1	Known from a single bore (West Creek).

Higher Classification	Lowest Identification	Survey (no. of specimens)			Total no. of bores	Comments
		Bennelongia[1]	Stantec (Toro)[2]	Magellan[3]		
	Brevisomabathynella `OES5`		+		2	Recorded from two bores 1 km apart in between the Lake Violet and Uramurdah Lake calcretes.
	Brevisomabathynella `OES6`		+		1	Known from a single bore (Uramurdah Lake Calcrete).
	Brevisomabathynella `SAM15`		7		1	Known from a single bore (Lake Violet Calcrete).
	Brevisomabathynella `SAM2`		18		4	Recorded from four bores over a linear range of 0.8 km to the east of the Hinkler Well Calcrete.
	Brevisomabathynella `SAM3`		+		1	Known from a single bore (West Creek).
	Brevisomabathynella `SAM4`		+		1	Known from a single bore (West Creek).
	Brevisomabathynella `SAM6`		+		1	Known from a single bore (Lake Violet Calcrete).
	Brevisomabathynella `SAM7`		+		1	Known from a single bore (Lake Violet Calcrete).
	Brevisomabathynella sp.*		+		2	Higher order identifications.
	Brevisomabathynella uramurdahensis	1	+		3	Recorded from three bores in the Lake Violet and Uramurdah Lake Calcretes over a linear range of 5.4 km.
	Brevisomabathynella sp. B01			1	1	Recorded from a single bore near Millbillillie Calcrete.
	Notobathynella sp. B05			41	3	Recorded from three bores at Magellan Mine.
	Parabathynellidae `OES13`		+		1	Known from a single bore (West Creek).
	Parabathynellidae sp.*		11		1	Higher order identifications.
	Bathynellaceae sp.*		+		1	Higher order identification.
Maxillopoda						
Cyclopoida						
Cyclopidae	*Dussartcyclops* (*Dussartcyclops*) *uniarticulatus*	11	27		11	A widespread species known from outside the survey area.
	Fierscyclops (*Fierscyclops*) *fiersi*		440		9	A widespread species known from outside the survey area.
	Halicyclops eberhardi s.l.	1	555	1	40	A described taxon, recorded from multiple locations in the Goldfields and neighbouring regions, but understood to contain multiple cryptic species.
	Halicyclops kieferi	15	102		15	A widespread species known from outside the survey area.
	Halicyclops sp.*		+		1	Higher order identification.
	Mesocyclops brooksi			2	1	A widespread species known from outside the survey area.
	Mesocyclops sp.	4			1	Higher order identifications.
	Microcyclops varicans			8	3	A widespread species known from outside the survey area.
	Pescecyclops laurentiisae		304		1	A widespread species known from outside the survey area.
	Cyclopoida sp.*		+		2	Higher order identifications.
Harpacticoida						
Ameiridae	*Ameiropsyllus* `TK1`		4		3	Recorded from three bores to the east of the Hinkler Well Calclrete over a linear range of 2.8 km.
	Haifameira pori		169	3	12	Recorded from numerous bores at in the Lake Violet Calcrete and also to the northwest in West Creek and in the Millbillillie Calcrete.
	Haifameira sp. B01			2	1	Recorded from a single bore at Magellan Mine.
	Nitocrella trajani	7			2	Known from a two bores 0.5 km apart between the Lake Violet and Uramurdah Lake Calcretes.
	Nitokra `TK1`		28		13	Recorded from numerous bores including in and around both Uramurdah Lake Calcrete and Hinkler Well Calcrete.
	Nitokra `TK2`		43		17	Recorded from numerous bores including in and around both Uramurdah Lake Calcrete and Hinkler Well Calcrete.

Higher Classification	Lowest Identification	Survey (no. of specimens)			Total no. of bores	Comments
		Bennelongia[1]	Stantec (Toro)[2]	Magellan[3]		
	Nitokra lacustris s.l.		2		3	A described taxon, recorded from multiple locations in the Goldfields and neighbouring regions, but understood to contain multiple cryptic species.
	Parapseudoleptomesochra `TK1`		25		8	Recorded from numerous bores including in and around the Lake Violet, Uramurdah Lake and Hinkler Well calcretes.
	Parapseudoleptomesochra `BHA279` (TK1?)	4			1	Recorded from a single bore in West Creek. Likely to be *Parapseudoleptomesochra* `TK1`.
	Parapseudoleptomesochra `TK2`	32	74		4	Recorded from three bores in West Creek as well as a bore in the Hinkler Well Calcrete over a linear range of 30 km.
	Parapseudoleptomesochra ?`TK2`		1		1	Recorded from a single bore in the Uramurdah Lake Calcrete. Likely to be *Parapseudoleptomesochra* `TK2`.
	Parapseudoleptomesochra rouchi		10	16	2	Recorded from numerous bores in and around the Lake Violet and Uramurdah Lake calcretes and a single bore at Magellan Mine (linear range 43.5 km).
	Parapseudoleptomesochra `BHA279` (*rouchi*?)	1			1	Recorded from a single bore in West Creek. Could potentially be *Parapseudoleptomesochra rouchi* has some morphological differences.
Canthocamptidae	*Australocamptus similis*	28	143		6	A widespread species known from outside the survey area.
Miraciidae	*Schizopera* `TK10`		2		1	Known from a single bore in the Hinkler Well Calcrete.
	Schizopera `TK2`		+		1	Known from a single bore south of the Uramurdah Lake Calcrete.
	Schizopera `TK4`		1		1	Known from a single bore east of the Hinkler Well Calcrete.
	Schizopera `TK7`		9		6	Known from numerous bores in and around the eastern portion of the Hinkler Well Calcrete.
	Schizopera sp. B03			1	1	Recorded from a single bore at Magellan Mine.
	Schizopera austindownsi		32		12	Recorded at numerous bores the Lake Violet, Uramurdah Lake and Hinkler Well calcretes. Species known from outside the survey area at Austin Downs Station. Identifications are based on morphology and probably need to be confirmed with genetics.
	Schizopera nr *austindownsi*	11			1	Likely to be the same species as the records for *Schizopera austindownsi* from Hinkler Well (and possibly Lake Violet and Uramurdah Lake). Some morphological differences between these specimens and the described species *austindownsi*.
	Schizopera uramurdahi		212		28	Recorded at numerous bores the Lake Violet, Uramurdah Lake and Hinkler Well calcretes. Identifications based on morphology and probably need to be confirmed with genetics.
Parastenocarididae	*Kinnecaris lakewayi*		+		4	Recorded in the Hinkler Well Calcrete, West Creek and south of Uramurdah Lake Calcrete.
	Harpacticoida sp.*		+		1	Higher order identification.
Ostracoda						
Popocopida						
Candonidae	*Candonopsis* `IK1`		36		6	Recorded from bores in the Uramurdah Lake and Lake Violet calcretes and a bore in West Creek over a linear range of 17.1 km.
	Candonopsis dani		18	33	4	Recorded from bores in the Lake Violet and Millbillillie calcretes over a linear range of 27.6 km.
	Candonopsis linnaei		15		5	Recorded (and only known) from bores in and near the eastern portion of the Hinkler Well Calcrete.

Higher Classification	Lowest Identification	Survey (no. of specimens)			Total no. of bores	Comments
		Bennelongia[1]	Stantec (Toro)[2]	Magellan[3]		
Cyprididae	Cyprinopsinae sp.	2			1	Recorded in a bore south of West Creek. Insufficient taxonomic resolution to determine range.
	Cyprinotus sp.			1	1	Recorded at a bore in the Millbillillie Calcrete. Insufficient taxonomic resolution to determine range.
	Cypretta seurati			1	1	A widespread species known from outside the survey area.
	Sarscypridopsis ochracea			1	3	A widespread species known from outside the survey area.
	Strandesia `BOS1393`	30			1	Recorded from a single bore in Lake Way South Calcrete.
Limnocytheridae	*Limnocythere dorsosicula*	15			2	A widespread species known from outside the survey area.
	Limnocythere stationis			2	1	A widespread species known from outside the survey area.
	Ostracoda sp. unident.*		+		1	Higher order identification.
Rotifera						
Bdelloidea	Bdelloidea sp. 2:2	45			3	Not usually assessed in EIA.
	Rotifera sp.*		+		2	Higher order identifications.

[1] This study; Bennelongia 2020
[2] Outback Ecology 2011, 2012
[3] Bennelongia 2013

Appendix 2. Stygofauna species recorded at Lake Way and in the surrounds based on available records, presented by broad sampling locality.

Higher order identifications are denoted with asterisks and were not counted in estimates of richness (total no. of species) unless they represented taxa that were not otherwise recorded.

Higher Classification	Lowest Identification	Hinkler Well	Lake Violet	Lake Way South	Magellan	Millbillillie	North of Uramurdah Lake	Uramurdah Lake	West Creek and surrounds	No. of Localities
Annelida										
Aphanoneura										
Aeolosomatidae	*Aeolosoma* sp.			2					0	2
	Aeolosoma sp. 1 (PSS)					3				1
Clitellata										
Enchytraeida										
Enchytraeidae	Enchytraeidae `2 bundle` s.l. (short sclero 2 per seg)								1	1
	Enchytraeidae `2 bundle` s.l. (short sclero 4 per seg)								2	1
	Enchytraeus sp. AP PSS2 s.l.*				1					1*
	Enchytraeidae `3 bundle` s.l. (short sclero) (including *Enchytraeus* sp. AP PSS1 s.l.)				16				9	2
	Enchytraeidae `OES20`	7								1
	Enchytraeidae sp.*	15	0					1	11	4*
Haplotaxida										
Naididae	Naididae `BOL059`							8		1
	Naididae `OES3`	0								1
	Naididae sp.*	1						0	1	3*
Phreodrilidae	Phreodrilidae `OES21`	3								1
	Phreodrilidae sp.*	5	0						0	3*
	Phreodrilidae sp. AP DVC s.l.					9			1	2
Tubificidae	*Ainudrilus* sp. WA25 (PSS)				4					1
	Tubificidae `BOL057`		1							1
	Tubificidae `BOL058`			6						1
	Oligochaeta sp.*		0			0	28		0	4*
Arthropoda										
Insecta										

Higher Classification	Lowest Identification	Hinkler Well	Lake Violet	Lake Way South	Magellan	Millbillillie	North of Uramurdah Lake	Uramurdah Lake	West Creek and surrounds	No. of Localities
Coleoptera										
Dytiscidae	Dytiscidae sp.*	4								1*
	Limbodessus hinkleri	41								1
	Limbodessus macrohinkleri	2								1
	Limbodessus millbilliensis		0						0	2
	Limbodessus morgani					4				1
	Limbodessus sp. B03					21				1
	Limbodessus sp. (Bidessini sp.)*	3	4			1		0		4*
	Limbodessus wilunaensis		1						10	2
Malacostraca										
Amphipoda										
Chiltoniidae	Chiltoniidae `SAM1`		40					13		2
	Chiltoniidae `SAM2`								0	1
	Chiltoniidae `SAM3`	109								1
	Chiltoniidae `SAM5`	7								1
	Chiltoniidae `SAM6`	51								1
	Chiltoniidae sp.*	30								1*
	Yilgarniella sp. B01					1				1
Paramelitidae	*Kruptus* `BAM178`								1	1
	Paramelitidae `SAM1`		2						0	2
	nr *Kruptus* sp. B30				1					1
	Paramelitidae `SAM2`							0		1
	Amphipoda sp.*		0			3				2*
Isopoda										
Scyphacidae	*Haloniscus* `BIS384`							12		1
	Haloniscus `BIS385`		12							1
	Haloniscus `BIS386`							13		1
	Haloniscus sp.*					8				1*
Syncarida										
Bathynellidae	Bathynellidae sp.	1								1
Parabathynellidae	*Atopobathynella* `OES5`	0								1
	Atopobaithynella sp.*	1								1*

Higher Classification	Lowest Identification	Hinkler Well	Lake Violet	Lake Way South	Magellan	Millbillillie	North of Uramurdah Lake	Uramurdah Lake	West Creek and surrounds	No. of Localities
	Atopobathynella wattsi	637								1
	Brevisomabathynella `BSY207`								2	1
	Brevisomabathynella `OES5`		0					0		2
	Brevisomabathynella `OES6`							0		1
	Brevisomabathynella `SAM15`		7							1
	Brevisomabathynella `SAM2`	18								1
	Brevisomabathynella `SAM3`								0	1
	Brevisomabathynella `SAM4`								0	1
	Brevisomabathynella `SAM6`		0							1
	Brevisomabathynella `SAM7`		0							1
	Brevisomabathynella sp.*		0							1*
	Brevisomabathynella sp. B01					1				1
	Brevisomabathynella uramurdahensis		1					0		2
	Notobathynella sp. B05				41					1
	Parabathynellidae `OES13`								0	1
	Parabathynellidae sp.*	1	7					0	3	4
	Bathynellaceae sp.*	0								1*
Maxillopoda										
Cyclopoida										
Cyclopidae	*Dussartcyclops* (*Dussartcyclops*) *uniarticulatus*	2	0						36	3
	Fierscyclops (*Fierscyclops*) *fiersi*	434	0						6	3
	Halicyclops eberhardi s.l.	514	21			1		6	15	5
	Halicyclops kieferi	1	87					28	1	4
	Halicyiclops sp.*							0		1*
	Mesocyclops brooksi				2					1
	Mesocycliops sp.*			4						1*
	Microcyclops varicans				2	6				2
	Pescecyclops laurentiisae	299	5						0	3
	Cyclopoida sp.*	0								1*
Harpacticoida										
Ameiridae	*Ameiropsyllus* `TK1`	4								1
	Haifameira pori		117			4			51	3

Higher Classification	Lowest Identification	Hinkler Well	Lake Violet	Lake Way South	Magellan	Millbillillie	North of Uramurdah Lake	Uramurdah Lake	West Creek and surrounds	No. of Localities
	Haifameira sp. B01				2					1
	Nitocrella trajani		1					6		2
	Nitokra `TK1`	28						0		2
	Nitokra `TK2`	29	1					13		3
	Nitokra lacustris s.l.	1	0					1		3
	Parapseudoleptomesochra ?`TK2`							1		1
	Parapseudoleptomesochra `BHA279` (*rouchi*?)								1	1
	Parapseudoleptomesochra `BHA279` (TK1?)								4	1
	Parapseudoleptomesochra `TK1`	14	0					11		3
	Parapseudoleptomesochra `TK2`	1							105	2
	Parapseudoleptomesochra rouchi		9		16			1	0	4
Canthocamptidae	*Australocamptus similis*	6						10	155	3
Miraciidae	*Schizopera* `TK10`	2								1
	Schizopera `TK2`							0		1
	Schizopera `TK4`	1								1
	Schizopera `TK7`	9								1
	Schizopera austindownsi	28	3					1		3
	Schizopera nr *austindownsi*		11							1
	Schizopera sp. B03				10					1
	Schizopera uramurdahi	27	125					51	9	4
Parastenocarididae	*Kinnecaris lakewayi*	0						0	1	3
	Harpacticoida sp.*	0								1*
Ostracoda										
Popocopida										
Candonidae	*Candonopsis* `IK1`		36					0	0	3
	Candonopsis dani		0			33			18	3
	Candonopsis linnaei	15								1
Cyprididae	*Cypretta seurati*				1					1
	Cyprinopsinae sp.								2	1
	Cyprinotus sp.					1				1
	Sarscypridopsis ochracea				7	3				2
	Strandesia `BOS1393`			30						1

Higher Classification	Lowest Identification	Hinkler Well	Lake Violet	Lake Way South	Magellan	Millbillillie	North of Uramurdah Lake	Uramurdah Lake	West Creek and surrounds	No. of Localities
Limnocytheridae	*Limnocythere dorsosicula*								15	1
	Limnocythere stationis				20					1
	Ostracoda sp. unident.*	0								1
Rotifera										
Bdelloidea	Bdelloidea sp. 2:2								45	1
	Rotifera sp.*	0								1*
Total no. of species		**33**	**29**	**4**	**13**	**13**	**1**	**25**	**33**	**91**