ST IVES GOLD MINE -
THE BEYOND 2018 PROJECT

ENVIRONMENTAL REVIEW DOCUMENT -
RESPONSE TO SUBMISSIONS

EPA ASSESSMENT NO. 2113

MAY 2019

DOCUMENT INFORMATION

Document Name	St Ives Gold Mine – The Beyond 2018 Project Environmental Review Document – Response to Submissions		
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Prepared For	Department of Water and Environmental Regulation		
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DISTRIBUTION LIST

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1 INTRODUCTION

1.1 The Beyond 2018 Project

The proposed Beyond 2018 (B2018) Project involves a continuation of gold mining and processing operations at the St Ives operation near Kambalda, Western Australia (Figure 1-1). If approved, the proposal will allow a further ten years of land- and lake-based mining operations on and around Lake Lefroy, a large salt lake.

The current operations involve both open pit and underground mining, construction of waste rock landforms, ore processing and gold production, construction of tailings storage facilities and supporting infrastructure, including haul and access roads, and power and pipeline corridors. The B2018 Project involves a similar approach in the future, with operations continuing to at least 2028.

Given the difficulty in being able to precisely define ore reserves and associated mine plans for a period of up to ten years, the proposal put forward by SIGMC is not based on a defined project footprint but rather an approach that includes both terrestrial and lake-based tenure within a set disturbance limit. This approach maximises operational flexibility over the 10-year operational timeframe for the proposal while minimising the need to revert back to the EPA as new resources and operational areas are defined. This approach did, however, require SIGMC to assess all areas within a broad Development Envelope (DE) (Figure 1-2) and an assessment has been completed on this basis.

The maximum proposed disturbance for the B2018 Project is up to 5,000 ha which consists of:

- Lake based disturbance of approximately 200 ha per year over a ten year period with a total maximum disturbance of up to 2,000 ha; and
- Land based disturbance of approximately 300 ha per year over a ten year period with a total maximum disturbance of up to 3,000 ha.

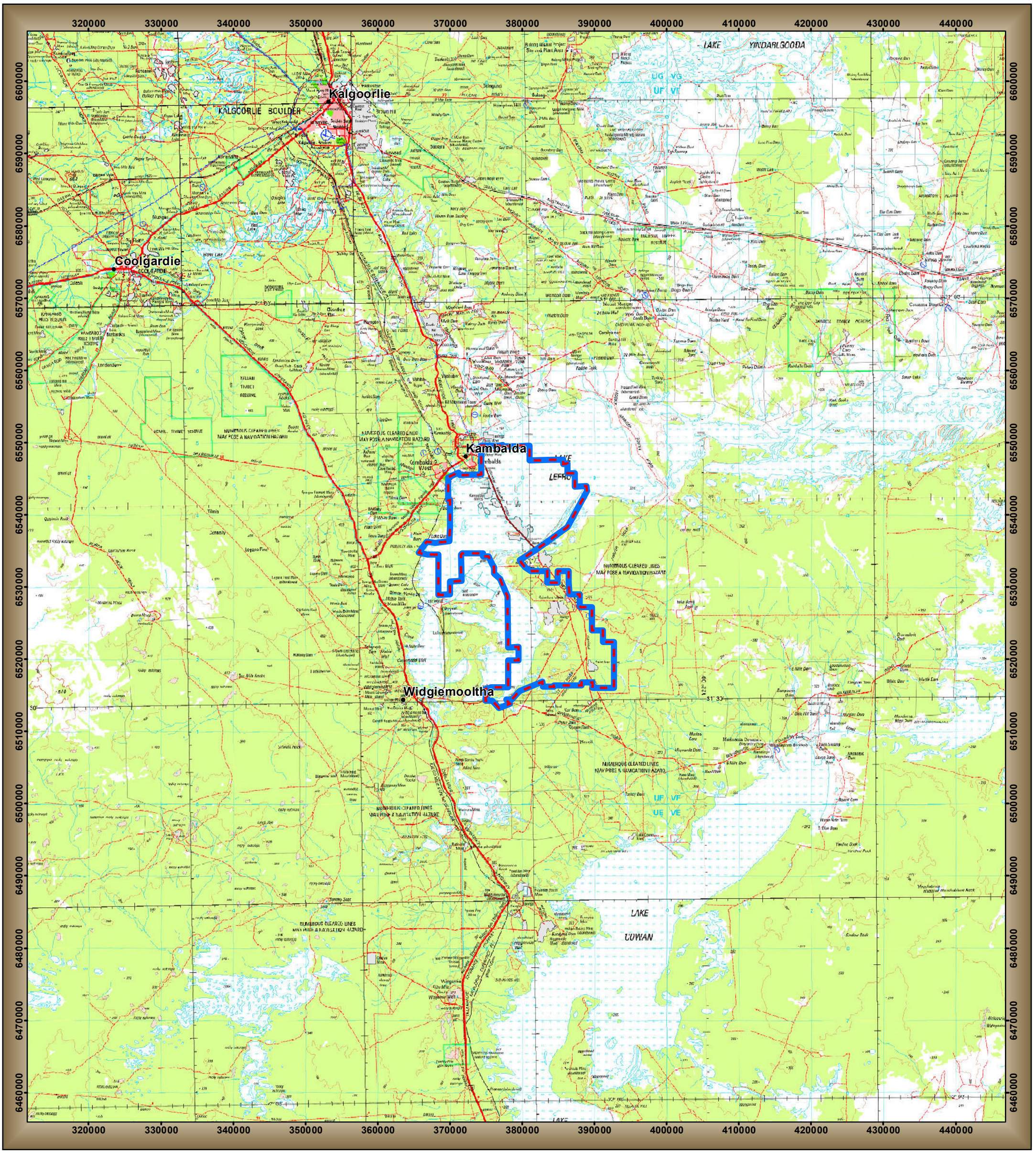
1.2 Assessment under the *Environmental Protection Act 1986*

Assessment of operations at St Ives under Part IV of the *Environmental Protection Act 1986* (EP Act) has occurred previously. The lake-based mining operations that commenced between 2000 and 2010 were originally regulated under Ministerial Statement No. 548 (MS548). MS548 covered mining at open cut pits and underground operations, construction of waste rock dumps, access infrastructure and mining support facilities on the lake. In contrast, all land-based operations to date have previously been managed under the Part V of the EP Act and the *Mining Act 1978* (Mining Act).

A proposal to continue operations (the Beyond 2010 Project) was originally considered by the Environmental Protection Authority (EPA) in 2010 pursuant to Part IV of the EP Act. This assessment was undertaken via a Public Environmental Review (PER) and resulted in the publication of EPA Report No. 1809 which recommended approval of the Beyond 2010 Project subject to a number of conditions. The Minister for the Environment published Ministerial Statement No. 879 (MS879) in November 2011, formally approving the Beyond 2010 Project subject to a number of binding conditions.

Figure 1-1
Regional Location of B2018 Project

GOLD FIELDS
ST IVES GOLD MINE



LEGEND

Development Envelope

0 10 20 30 40

Kilometres

N

Datum: Geocentric Datum of Australia (GDA94)
Map Grid: Map Grid of Australia (MGA)
Projection: Universal Transverse Mercator Zone 51

Prepared:	F Walker
Reviewed:	G Barrett
Checked:	A Mack
Project No:	TE16034
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Date:	8/05/2019

LOCALITY MAP

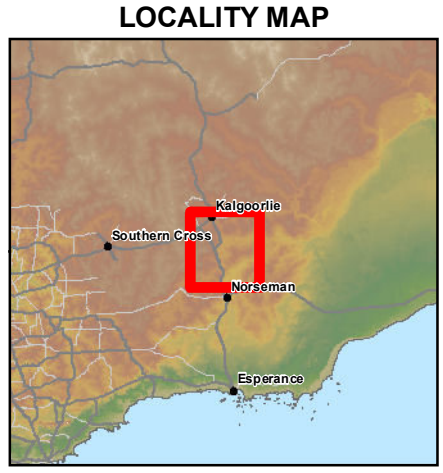

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Figure 1-2
B2018 Project – Development Envelope

GOLD FIELDS
ST IVES GOLD MINE

365000 370000 375000 380000 385000 390000 395000

6550000 6545000 6540000 6535000 6530000 6525000 6520000 6515000

Cave Rocks North
Temeraire
Formidable
Intrepide
Bahama
Santa Ana
Invincible North
Invincible Central
Invincible South
Mars
Agamemnon
Agamemnon South
South Delta
Grinder
Bellerophon
Neptune
Thunderer
A5
Africa
Britannia Footwall
Britannia Orion
Leviathan
Paddys
West Idough
Blue Lode
Clifton
Apollo
Athena/Hamlet
Argo
Diana
Junction

LEGEND

Development Envelope

0 3 6 9 12

Kilometres

N

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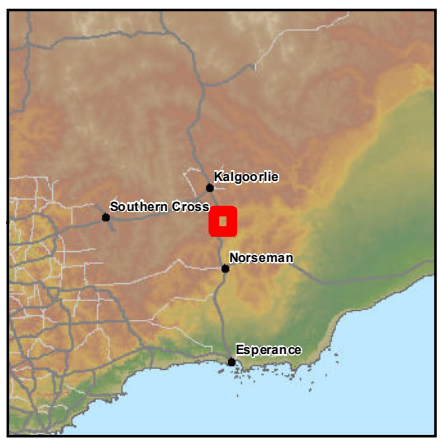

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SIGMC submitted a Referral to the EPA under section 38 of the EP Act on 15 December 2016 regarding the Beyond 2018 Project (Revised Proposal)[1]. Following review of the Referral, the Environmental Protection Authority (EPA) set a level of assessment to 'Environmental Review – 6 week public review' pursuant to section 39(1) of the EP Act on 15 February 2017. The Environmental Scoping Document (ESD) for the Project was prepared by the EPA and, following a number of revisions, was approved on 6 October 2017.

Following the finalisation of various supporting technical reports and a draft Environmental Review Document (ERD), a final ERD was approved for release for public review on 3 October 2018. The release of the ERD was advertised in Perth and regional press. Copies of the ERD were distributed to relevant State Government agencies, land holders and managers in the Kambalda region, the State Library and libraries in Kalgoorlie-Boulder, Coolgardie and Kambalda, and other stakeholders that had expressed an interest in the Project. The public review period closed on 14 November 2018.

This document presents the submissions as summarised by the EPA and provides SIGMC's responses to issues raised within the submissions and resulting from subsequent discussions with the EPA.

[1] Because some of the operations included in the Proposal were previously approved under MS879 it is deemed a 'revised proposal'.

2 SUBMISSIONS RECEIVED

Submissions were received from the following Western Australian government agencies:

- Department of Water and Environmental Regulation (DWER) – Contaminated Sites Branch;
- DWER - Terrestrial Ecosystems Branch;
- DWER - Regulatory Services;
- DWER – RIWI Act;
- Department of Mines, Industry Regulation and Safety (DMIRS)[2];
- Department of Biodiversity, Conservation and Attractions (DBCA); and
- Department of Planning, Lands and Heritage (DPLH).

Submissions were also received from the following non-government organisations:

- Wilderness Society of Western Australia; and
- National Malleefowl Recovery Team.

No submissions were received from the Commonwealth Government, local government or members of the general public.

[2] This submission was originally provided in response to a draft of the ERD. It was resubmitted to also address the final ERD.

3 RESPONSES TO SUBMISSIONS

Issues raised in submissions and responses by SIGMC are provided in the following tables (Table 3-4 through to Table 3-10). Submissions were summarised by the EPA, separated into general comments and then into the environmental factors discussed within the ERD. No issues were raised regarding environmental factors not addressed in the ERD.

The EPA identified the following as key issues raised in submissions:

- Three Short Range Endemic invertebrate taxa are currently known from only within the Development Envelope and have not been shown to be protected in the exclusion areas;
- All terrestrial habitats in the Development Envelope are likely to be suitable for Malleefowl. Lidar surveying and pre-clearance surveys should be carried out prior to ground disturbing activities to mitigate impacts to Malleefowl;
- Assessment of the impacts from dewatering from the proposed activities needs to be undertaken and the monitoring and management these impacts needs to be addressed;
- Concerns relating to the disposal and seepage of metals from mafic and ultramafic waste materials on the lake surface, even if the sulfur is low; and
- The potential impacts from seepage from the TSFs and impacts on water flow regimes and groundwater quality.

In response to each of the above key issues is the subject, a number of changes to the commitments proposed in the ERD have been made as well as a number of additional commitments being put forward which will allow the project to proceed as proposed within the ERD.

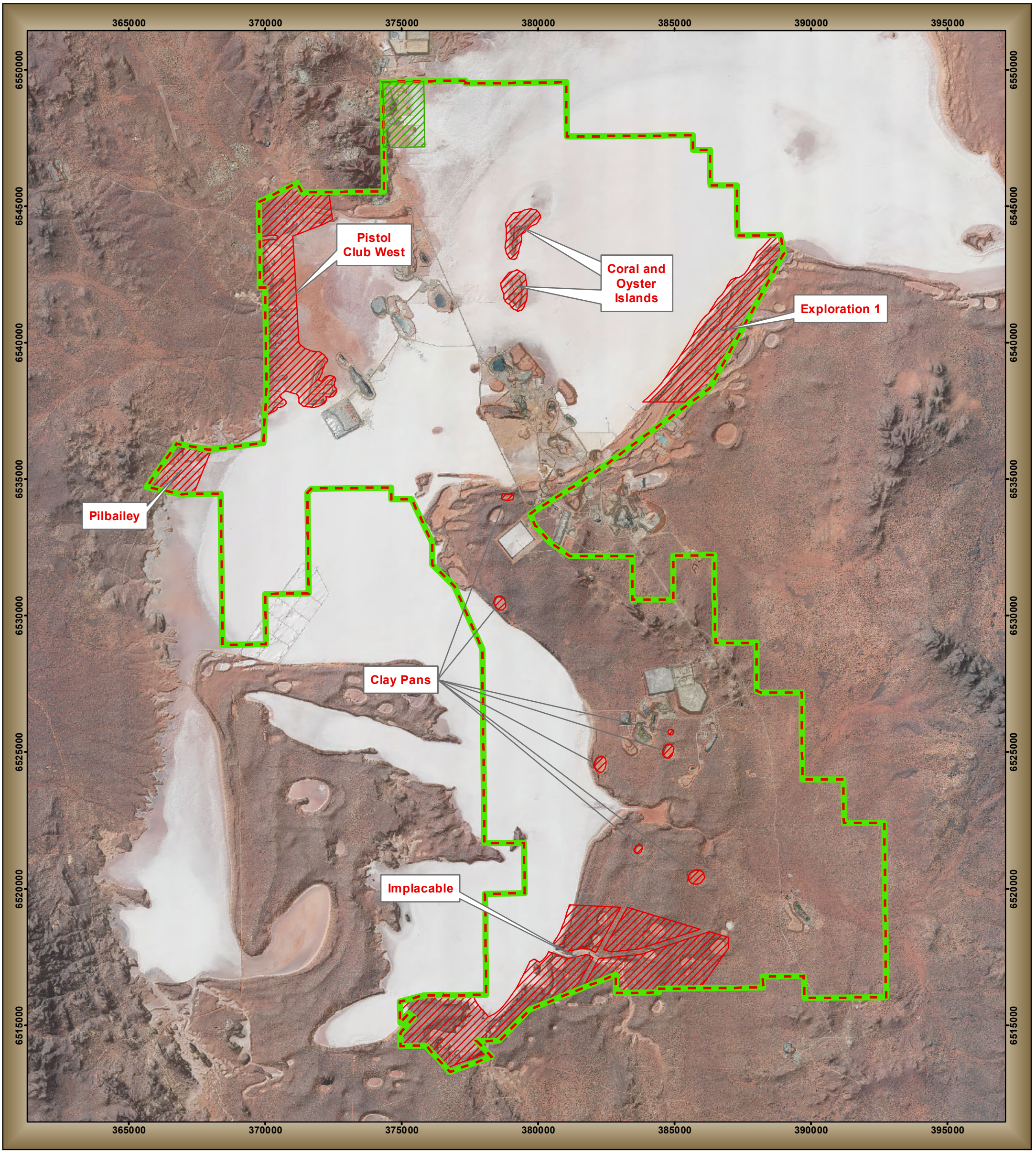
An additional 'no mining' zone has been applied over several tenements at the northern extremity of the Development Envelope (see Figure 3-1), together with a further Exclusion Zone of 95.3 ha. This Exclusion Zone ("Clay Pans") has been developed in recognition of some of the concerns and potential values of the peripheral wetlands within the Development Envelope. This brings the number of Exclusion Zones to six, as shown in the following table and figure:

Table 3-1: Proposed exclusion zones

Exclusion Zone	Area (ha)	Proportion of Development Envelope (%)
Exploration 1	894.8	1.99
Coral and Oyster Islands	108.1	0.24
Pistol Club West	1543.8	3.43
Pilbailey	264.9	0.59
Implacable	2392.6	5.32
Clay Pans	95.3	0.21
Total	**5299.5**	**11.77**

This also results in a revision to Commitment 1.

Figure 3-1
B2018 Project - Proposed Exclusion Zones



LEGEND

- Development Envelope
- Exclusion Areas
- No Mining Area

0 3 6 9 12

Kilometres

N

Datum: Geocentric Datum of Australia (GDA94)
Map Grid: Map Grid of Australia (MGA)
Projection: Universal Transverse Mercator Zone 51

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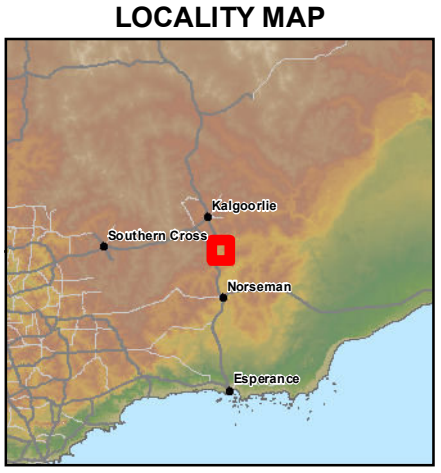
LOCALITY MAP



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The updated key project elements and associated buffers relating to the Exclusion Zones are provided in the following tables:

Table 3-2: Beyond 2018 Project - Location and Proposed Extent of Physical and Operational Elements

Element	Existing Approval (MS879)	Other Approval	Proposed Change	Total Proposed Extent
Physical Elements				
Lake-based operations	2,061 ha	N/A	2,000 ha	4,061 ha
Land-based operations	N/A	2,085 ha (under *Mining Act 1978*)	3,000 ha	5,085 ha
Operational Elements				
Mine dewatering and discharge	N/A	30 GL per annum (regulated under Part V of the *Environmental Protection Act 1986*)	Additional dewatering of up to 10 GL annually.	Up to 40 GL annually (regulated under Part V of the *Environmental Protection Act 1986*).
Area of direct riparian zone disturbance	Up to 90 ha	N/A	Additional 20 ha	Up to 110 ha
Waste rock disposal	A minimum of 95 million tonnes.	Approximately 118 million tonnes (regulated under *Mining Act 1978*).	Approximately 450 million tonnes.	Approximately 663 million tonnes (regulated under *Mining Act 1978*).
Height of waste rock landforms	Up to 40 m	Up to 40 m (regulated under *Mining Act 1978*)	No change.	Up to 40 m.
Ore processing	NA – regulated under Part V of the EP Act and Mining Act.	DWER licensed operational throughput up to 9 Mtpa.	No change.	DWER licensed operational throughput up to 9 Mtpa.
Tailings disposal	N/A	Four above ground TSFs and five in-pit TSFs (regulated under Part V of the *Environmental Protection Act 1986* and *Mining Act 1978*).	Additional above ground or in-pit tailings storage capacity.	Above ground and in-pit TSFs (regulated under Part V of the *Environmental Protection Act 1986* and *Mining Act 1978*).

Table 3-3: Beyond 2018 Project – buffers included in Exclusion Zones

Exclusion Zone	Buffers included
Exploration 1	• 100 m from north-west facing shoreline.
Coral and Oyster Islands	• 100 m from shoreline.
Pistol Club West	• Minimum of 100 m from shoreline.
Pilbailey	• Minimum of 100 m from known locations of sensitive flora and fauna.
Implacable	• 100 m from lake shoreline. • 100 m from road and pipeline corridors. • Minimum of 30 m around clay pans.
Clay Pans	• Minimum of 30 m from surface of each clay pan.

3.1 General Comments

Table 3-4: Beyond 2018 Project – Responses to Submissions – general comments

No.	Submitter	Submission and/or issue	Response to comment
1	Department of Mines, Industry Regulation and Safety (DMIRS)	Alternatives – This section does not detail any other alternatives for the project apart from proceed with the Beyond 2018 proposal or have operations close down. It is identified that 25 tenements proposed to be included in the Beyond 2018 footprint are currently held by other parties, with the ERD stating that if 'a tenement is not held by SIGMC, legal access to the tenement will be organised prior to any disturbance. Access will be achieved via tenement acquisition, a joint venture (JV) arrangement or access agreements as required under Section 118A of the *Mining Act 1978*. There is no consideration as to whether access is denied by a third party.	This comment was provided prior to the finalisation of the ERD and was addressed in the final version released for public consultation. Section 2.3.2 of the ERD was revised to better describe the limitations that apply when considering alternatives, and how some improvements to environmental outcomes may be achieved. Key constraints are the location of ore bodies to be mined in the future, and the limited availability of both sterilised open pits for tailings disposal and discharge options for water from pit or underground dewatering. With regard to tenements held by others, Section 1.4.1 of the ERD outlines the various arrangements under which mining can proceed. In the event that access to mine cannot be legally obtained by SIGMC for any given tenement, SIGMC will not mine on that tenement.
2	Department of Water and Environmental Regulation (DWER)	Page numbers cited in the Executive Summary were amended but remain incorrect.	Noted. The page numbers indicated the first page of each section – appear to be correct to SIGMC.

No.	Submitter	Submission and/or issue	Response to comment
3	The Wilderness Society of WA (TWSWA)	Although the local community was intended to be involved in the process, St Ives Gold Mine Pty Ltd (2016) stated that no local community members attended the information session. The listed potential issues were therefore not able to be raised by the local community. The lack of effort in involving the local community suggests a tokenistic approach taken by the proponent. Potential conflicting land use (which in case, the expansion of a goldmine operation) with the businesses and residents in Kambalda East townsite might occur. TWSWA recommends that the proponent should expand stakeholder engagement opportunities.	During 2016 and 2017, SIGM undertook six community information sessions in relation to the Beyond 2018 Project. Three were held in Kambalda and three in Kalgoorlie-Boulder. Notices for these meetings were posted widely, including in local shopping centres and elsewhere, and in the press. Invitations were sent to stakeholders, including the Wilderness Society. Community stakeholders also had the opportunity to participate in the process by making submissions on the ERD. SIGMC is of the view that adequate opportunity has been afforded for the community to obtain information about the proposed development and to be involved in the assessment process.

3.2 Flora and Vegetation

Table 3-5: Beyond 2018 Project – Responses to Submissions – flora and vegetation

No.	Submitter	Submission and/or issue	Response to comment
1	Department of Biodiversity, Conservation and Attractions (DBCA)	Based on the information presented in the ERD, it appears that the Priority 1 flora species *Tecticornia mellarium* may be subject to significant impacts at a local scale, because of the limited known number of individuals of this species. DBCA is currently unable to confidently ascertain the level and significance of impacts of this proposal on *Tecticornia mellarium* from the information provided. For example, it is difficult to determine whether the number of *Tecticornia mellarium* individuals known to occur in Western Australia, as presented in the document, is an accurate reflection of the total number of known individuals for this species, or represents the number of individuals in populations known to occur within particular areas or regions. It is also unclear how potential indirect impacts of increased salt loading and altered hydrology and hydrogeology associated with the proposal have been considered and incorporated into the impact assessment. Noting the above information, there is a need for precautionary management of the impacts on known individuals in the proposal area by ensuring the implementation of best practice management to protect and maintain the populations of *Tecticornia mellarium* within the exclusion areas. Impacts could also be further reduced by locating infrastructure and other mine related development in a way that minimises impacts on the species outside the exclusion areas.	This submission raises several issues which are addressed separately. <u>No. of individuals of *T. mellarium*</u> Table 4-13 of the ERD (p4-37) states that "The species is known from 12 records (ALA 2016)." This statement refers to all records listed in the Atlas of Living Australia and Florabase. Therefore, it includes the records from the Eastern Goldfield and Eastern Murchison subregions. As indicated in Table 4-13, population sizes for regional populations are not provided in the Florabase records which prohibited an impact assessment for *Tecticornia mellarium* based on numbers of individuals. In light of this limited regional information, SIGMC has focussed on reducing impacts to populations within the DE to an acceptable level. This includes the establishment of exclusion zones that include all substantial populations of *T. mellarium* and 78% of the individuals recorded in the DE. As a result, SIGMC does not consider implementation of the proposal will result in significant impacts to this species at a local scale. <u>Potential indirect impacts of increased salt loading and altered hydrology and hydrogeology</u> Increased salt loading is not expected to occur within the exclusion zones. This will only occur where dewatering discharges occur. Dewatering discharge strategies for each new open pit operation (revised Commitment 6) will take this risk into consideration and will design a discharge strategy that prevents ponding of

No.	Submitter	Submission and/or issue	Response to comment
		Tecticornia mellarium is likely to be occupying a niche habitat aligning with specific physical, chemical and hydrological regimes occurring in particular zones associated with Lake Lefroy. Given the limited information currently available on the ecophysiology of this species in relation to its susceptibility to changes in inundation, salinity tolerances and other soil physical and chemical characteristics, mitigation through reinstatement in rehabilitation and/or translocation is regarded as a risk prone strategy with limited benefit and an unknown likelihood of success.	dewatering discharge in or near riparian vegetation or within exclusion zones. Commitment 6 addressed this concern, and an additional modification to Commitment 6 is made to expressly include Exclusion Zones: **Commitment 6 (revised): A dewatering discharge strategy will be developed for each new open pit operation on the lake, prior to its commencement. The strategy will consider:** • **Existing dewatering practices elsewhere (including engineering and other controls) and impacts, if any;** • **Likely discharge volumes;** • **Potential for localised flooding, including placement of dewatering discharge facilities no closer than 200 m to the riparian fringe;** • **Likely extent and location of salt crust formation;** • **Consideration of the water quality of the dewater discharge for any new pit ahead of discharge; and** • **Potential for impact to Exclusion Zones and the riparian zone generally and, where necessary, measures for protection of these areas.** Similarly, there is unlikely to be any change in inundation of areas following significant rainfall events. Modelling undertaken for this assessment (see Section 4.5 of the ERD) indicated that the level of inundation would not change under a range of dewatering discharge scenarios, essentially because the volume of discharge water on the lake at any one time forms a relatively small proportion of the volume of water that may occur as a result of a significant rainfall event.

No.	Submitter	Submission and/or issue	Response to comment
			The flood modelling work (as described in Chapter 4.5 and Appendix L of the ERD) found that fringing vegetation on Lake Lefroy is only partially inundated under extreme rainfall events, even when dewatering discharge is occurring (see Figures 4-24 and 4-25 in the ERD), and that dewatering discharge volumes are relatively small given the estimated capacity of Lake Lefroy is 270 GL (ERD Appendix L, p28). This means that the composition of flood waters on Lake Lefroy is overwhelmingly the fresher rainfall runoff, although past records indicate salinity of lake increases rapidly after large rainfall events, presumably due to evaporation and dissolution of salts from the lake surface. Changes in groundwater levels are only anticipated around mine voids and are very unlikely to affect *T. mellarium.* Previous assessments of this genus have shown that it is not reliant on groundwater (ecologia Environment 2016). SIGMC concludes that the risk of indirect impacts associated with increased salt loading and altered hydrology and hydrogeology can be managed such that it is low. <u>Populations of *T. mellarium* within Exclusion Zones</u> SIGMC is proposing a precautionary approach and considers the management measure proposed in the ERD to be representative of leading practice. It is SIGMC's objective that vegetation within Exclusion Zones would be unaffected by mining operations (both direct disturbance and indirect disturbance, such as that associated with inundation from dewatering) and that the necessary steps would be undertaken to facilitate this. These steps will include: • Prevention of any direct disturbance within exclusion zones; • All exclusion zones include buffers (i.e. the key

No.	Submitter	Submission and/or issue	Response to comment
			environmental values being protected do not extend to the boundary of the exclusion zone); • Dewatering discharge strategy that includes siting and management that will prevent discharge entering an exclusion zone. SIGMC will also avoid populations of *T. mellarium* outside of Exclusion Zones. For example, a revised management approach has been developed whereby dewatering discharge will only occur a minimum of 200 m from riparian vegetation to avoid localised inundation. Direct disturbance of riparian vegetation through establishment of infrastructure may be also avoided in most cases although direct disturbance would be necessary where an ore body has been identified. In addition, the proposal is limited to an additional 20 ha of disturbance to the riparian vegetation which is not retained in Exclusion Zones, which is a total of 110 ha of such impact when considered in conjunction with the existing approval afforded under MS879. <u>Rehabilitation of *T. mellarium* habitat</u> SIGMC agrees that the re-establishment of habitat suitable for *T. mellarium* is problematic. In recognition of this, SIGMC's management of these areas will focus on avoidance of impacts, both within and outside of Exclusion Zones. That said, T. mellarium and other Tecticornia species have been used successfully in rehabilitation work previously (Barrett-Lennard et al, 2013; Shaygan et al, 2018) although long term survival is not known.
2	DWER	The peripheral wetlands (defined in Appendix O) are areas of potential high biodiversity and restriction from mining disturbance should be considered as a priority.	SIGMC acknowledges the high biodiversity of the peripheral wetlands. SIGMC has considered wetland characteristics both within and beyond the DE. While peripheral wetlands around the

No.	Submitter	Submission and/or issue	Response to comment
		Appendix O notes that inadequate surveys of riparian vegetation in the peripheral wetlands habitat have been completed to date and that potentially six priority species may be present, as well as several locally conservation significant and/or restricted communities. Surveys of the wetlands' riparian zone should be completed prior to any ground disturbance, and conditions should prevent impacts to conservation significant species.	main playa of Lake Lefroy are of high biodiversity, the function and representation of these wetlands is common within the Goldfields, Wheatbelt, Pilbara and more widely. These values will be maintained as over 80% occur either outside of the DE or in exclusion zones (see Figure 3-1), noting that a sixth Exclusion Zone, 'Clay Pans', has been developed and protects a further 95.3 ha from mining as part of this proposal. This additional Exclusion Zone is reflected in a revision to Commitment 1. With regard to potential impacts of the dewatering discharge strategy on peripheral wetlands, SIGMC notes that these wetlands are generally set back from the surface of Lake Lefroy and have limited, if any, hydrological connection to the lake, even under extreme flood events (for example, many of the clay plans in the proposed Exclusion Zone are isolated from other water bodies by dune sands). Furthermore, these wetlands are generally at higher elevations than the lake and receive localised runoff rather than inflow from the lake. In reality, during large rainfall events, they may discharge to the lake (rather than the reverse). Consequently, dewatering discharge on the lake surface is very unlikely to affect these wetlands and the primary focus from an impact perspective is therefore the values associated with the fringing vegetation of Lake Lefroy The presence of Priority Flora in riparian vegetation, differences between vegetation types were considerations and are documented in the ERD. Riparian vegetation around all wetlands has been mapped (see Figures 4-4 and 4-5 of the ERD). Three riparian vegetation types have been identified within the DE, none of which is restricted to one or a few individual wetlands. While Stantec, in Appendix O, state that vegetation in the riparian zones of these wetlands may be diverse and should be adequately surveyed, Phoenix has undertaken (as outlined in Appendices D, F and G of the ERD) a substantial survey effort. Figure 4-3 of the

No.	Submitter	Submission and/or issue	Response to comment
			ERD shows the flora and vegetation survey sites that comprise the survey effort. SIGMC is of the view that the survey effort for riparian vegetation is more than adequate for impact assessment.
3	DWER	The proposed management measures include five exclusion zones within the DE. These five areas appear to adequately exclude the high value flora and vegetation values identified within the DE. A condition for vegetation health monitoring is recommended to ensure that the values set aside for protection are maintained in good health. A combination of permanently marked field-based monitoring points and remote sensing, to be monitored annually is recommended. Similarly, monitoring is recommended for the peripheral wetlands within the DE buffer zone (external, reference sites), as the small ephemeral wetland areas are noted for their ecological significance (combining flora, vegetation and fauna values) and may be indirectly impacted through changes in hydrology associated with the mine development. Further surveys for restricted plant and ecological communities outside of the DE, as committed to by the proponent, are supported and the outcomes reported to the DBCA. With the implementation of the exclusion zones and assuming they have sufficient buffering capacity, then no significant residual impacts should result from the proposed progressive mining and related activities. No comment is provided in regard to rehabilitation, weeds,	The exclusions zones were selected on the basis of flora, vegetation and fauna values determined through a substantial survey effort. SIGMC agrees they offer a high level of protection for the values occurring within the DE. To provide both SIGMC and its stakeholders with confidence that the values within the exclusion zones are being maintained, SIGMC will develop and implement a monitoring program that will consider vegetation health and other environmental variables. The program will commence prior to active mine development in the B2018 Project. In addition, a further Exclusion Zone has been developed, 'Clay Pans', in recognition of the potential environmental value these features have. This provides a further 95.3 ha of area that is quarantined from development as part of this proposal. **Commitment 1 (revised): To protect flora and vegetation, establish six exclusion zones – Exploration 1, Oyster and Coral Islands, Pistol Club West, Pilbailey, Implacable and Clay Pans- within the Development Envelope within which no mine-related activities may occur.** **Commitment 10: SIGMC will develop and implement a vegetation health monitoring program for the six Exclusion Zones.** SIGMC has undertaken annual monitoring of aquatic biota within peripheral wetlands and elsewhere for some years and will continue the monitoring program in the future.

No.	Submitter	Submission and/or issue	Response to comment
		dust and fire which will be managed as per usual business and are unlikely to significantly impact on the DE or immediate surrounding area.	SIGMC also reiterates its commitment to undertake further surveys outside of the DE to improve the sub-regional understanding of flora and vegetation communities (see ERD, Commitment 3).
4	TWSWA	The increase of aridity in the Kambalda region, Western Australia was defined as a gradual process were the impact was mainly described as disorganised drainage system, chain of lakes with some Interconnections channels between the lakes that will be blocked by dunes with increasing aridity, in addition to increasing of salinity basically gypsum concentration. The distribution of vegetation varies and occur in different zones depending on human disturbance and environmental factors as some are tolerant of highly saline soil and ground water while other inhabit low salinity soil lenses overlying saline sediments and ground-water. The limited vegetation communities have essential roles against wind and water action but constantly disturbed by gold and nickel mining and mining- related activities in addition to stock and feral animals grazing, intermittent perturbations through inundation resulting from episodic rainfall events. The vegetation occurring on the surface near the shore of Lake Lefroy with halite crust together prevents major aeolian erosion away from the lake. It was found through a survey near lake Lefroy that a total of 50 vascular plant species was recorded, of which 54% were herbs. The families with most species were the Chenopodiaceae (11 species), Asteraceae (10), Aizoaceae (4), Poaceae (4), Portulacaceae (3) and Frankeniaceae (3). The TWINSPAN classification	SIGMC has committed to: • Limiting clearance of native vegetation to 3,000ha under this Proposal; • Establishment of six exclusion zones within the DE within which no mining activity will occur; and • Undertaking further studies to improve the knowledge of the environment around Lake Lefroy. In response to the submissions received, SIGMC has committed to a new Exclusion Zone, 'Clay Pans', which provides a further 95.3 ha which will not be subject to mining activity as part of this proposal. **Commitment 1 (revised): To protect flora and vegetation, establish six exclusion zones – Exploration 1, Oyster and Coral Islands, Pistol Club West, Pilbailey, Implacable and Clay Pans- within the Development Envelope within which no mine-related activities may occur.** **Commitment 10: SIGMC will develop and implement a vegetation health monitoring program for the six Exclusion Zones.** Regarding 'restoration', SIGMC has committed to rehabilitate both land- and lake-based disturbance. The proposed approach to rehabilitation was outlined in Appendix H (Rehabilitation and Mine Closure Plan) of the ERD. In summary, this plan provides for: • Rehabilitation of all above ground structures, including waste rock landform sand tailings storage facilities; • Backfilling of open pits where this is feasible but otherwise

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		identified seven vegetation communities and indicator species for each. The dune swales (DSS) had the greatest species richness with 32 species and the siliciclastic dune (littoral zone) (SDL) was the poorest with only two species (Halosarcia syncarpa and Gunniopsis septifraga), reflecting the harsh environmental conditions. The importance of vegetation communities in the area is mainly through being soil stabilisers, their usage in rehabilitation of saline areas, and provide shelter and breeding sites for many waterbirds. It was noticed in the report that commitments only include three points (establish five exclusion zones, total clearing of native vegetation is limited to 3,000 ha and Further targeted surveys will be conducted) which raise a concern about if any restoration commitments exist as this needs to be clear and explain for how long restoration will persist after clearing native vegetation of 3,000 ha. Mining is locally destructive and it leads to significant disturbance of natural ecosystems through the removal of soil and vegetation and by the burial or stockpiling of different types of waste. The Millennium Ecosystem Assessment (2005) claimed that large irreversible losses in the diversity of life have been more rapid in the last 50 years than ever before due to various human actions and highlighted five major threats for biological loss. These major threats include habitat destruction, fragmentation, and degradation (ter Steege et al., 2015). Consequently, the mining industry has a significant obligation to undertake the rehabilitation of disturbed lands. TWSWA recommends the establishment of five	ensuring they are safe; and • Removal of all infrastructure when mining and processing ceases (unless otherwise agreed with stakeholders). If the Beyond 2018 Project is approved, the actions outlined in the Rehabilitation and Mine Closure Plan will be incorporated into the next iteration of the site-wide Mine Closure Plan approved under the *Mining Act 1978*.

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		exclusion zones (Exploration 1, Oyster and Coral Islands, Pistol Club West, Pilbailey and Implacable) within the DE within which no mine-related activities may occur; The total clearing of native vegetation should be limited to 3,000 ha on land for the duration of the B2018 Project; and further targeted surveys should be conducted outside the DE during the B2018 Project to build on the understanding of conservation significant vegetation types and flora.	
5	DMIRS	The level of information contained in the documentation does not provide enough detail on the management of operations and how closure and rehabilitation will be undertaken. The commitments contained in the ERD are aspirational, and there is no detail on how these commitments will be met.	Appendix H (Rehabilitation and Mine Closure Plan) outlines how closure and rehabilitation will be undertaken in a level of detail suitable for an impact assessment. If the Beyond 2018 Project is approved, the actions outlined in the Rehabilitation and Mine Closure Plan will be incorporated into the next iteration of the site-wide Mine Closure Plan approved under the *Mining Act 1978*. The latter plan outlines in considerable detail how rehabilitation and closure will be undertaken for SIGMC's existing operations. The operations proposed under the B2018 Project align closely with current operations i.e. no new mining or processing techniques have been proposed. As such, the Rehabilitation and Mine Closure Plan appended to the ERD is consistent with the existing approved MCP.

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6	DMIRS	DMIRS considers that the information presented in the ERD is incomplete or lacking in many areas. The level of detail does not demonstrate that there is enough baseline data to inform what the material/waste characterisation is for the project, nor how rehabilitation and closure will be achieved. At this stage in the mine life it is expected that this information would be well understood. Data presented is not adequate to determine potential impacts from the proposed development. There is also little information on what the actual closure objectives are and how they will be met.	The ERD presented a 2016 report (Appendix P) that outlines the techniques used to characterise acid-producing materials and details of the results to that date. A further report (Appendix Q) provided a summary of all material characterisation work undertaken to July 2018 and referred to well in excess of 3,000 analyses. The classification criteria used for the SIGM geochemical assessments have been developed in accordance with the Global Acid Rock Drainage (GARD) Guide (INAP, 2009) and the AMIRA International Acid Rock Drainage (ARD) Test Handbook (AMIRA, 2002). The criteria also align with the Leading Practice Sustainable Development Program for the Mining Industry Handbook on Preventing Acid and Metalliferous Drainage (DIIS, 2016). SIGMC is of the view that the extent of information on local geology at SIGM is more than adequate to draw conclusions about the geochemical characteristics of waste rock associated with ore bodies in the local area and the likely management requirements. These management requirements are well established for the current operations. Detailed resource definition drilling for the proposed Beyond 2018 Project is yet to be undertaken. The approach described above will be used for material characterisation. Results will be presented in Mining Proposals for review of and approval by the DMIRS under the *Mining Act 1978* prior to the commencement of operations. Regarding closure objectives, they are contained within Table 6-1 of the Rehabilitation and Mine Closure Plan (Appendix H), together with completion criteria, proposed monitoring and performance indicators.
7	DMIRS	Appendix H – Rehabilitation and Closure – identifying objectives and design that are not consistent with	This comment relates to a draft version of Appendix H. The final version released with the ERD provides for encapsulation with 2 m

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		industry standards, and requires further justification (i.e. encapsulating PAF under a minimum of 0.5 metres of competent rock).	of competent rock.
8	DMIRS	The ERD states a Care and Maintenance (C&M) plan will be established within two months of the project going into C&M; however this should be revised or expanded to state how this eventually would be planned for earlier in the process.	Planning for care and maintenance does occur and the current Mine Closure Plan approved under the *Mining Act 1978* lists tasks to be undertaken should this occur. If the Beyond 2018 Project is approved, the actions outlined in Appendix H will be incorporated into the next iteration of the site-wide Mine Closure Plan Note that the Mine Closure Guidelines (DMP/EPA 2015) state that, under the *Mine Safety and Inspection Act 1978*, a Care and Maintenance Plan is required within three months of notification of the suspension of operations. The ERD is proposing that this requirement can be met within two months.
9	TWSWA	Another concern is number of native plant seeds available and suitable for this area to use for restoration after mining. One of the main challenges in restoration ecology is having sufficient amount of seeds for efficient land restoration to cover large scale areas mainly in arid lands. It is well known that mining pose direct and indirect environment disturbance to lands but mainly sever toxic contamination to land and soil. One of the concerns with gold mining is that it brings huge amounts of sulfide-rich ores containing potential elemental pollutants such as arsenic (As) to the surfaces. As example, the way of mining company to deal with waste tailing is by storing them in large dams and either covered or encapsulated them then to stabilize this structure they use plants (phytostabilization) however, plants rarely grow in satisfactory condition	Native plant seed for use in mine rehabilitation is readily available commercially through seed suppliers who collect seed under licence issued under the *Biodiversity Conservation Act 2016*. SIGMC liaises with these suppliers to meet their annual seed requirements for use in rehabilitation. Materials that are potentially toxic to plants (e.g. hypersaline tailings or some types of waste rock) are encapsulated with more benign materials, prior to attempting revegetation. As such, metal or other toxicity in plants used in revegetation is not usually experienced.

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		due to the high toxicity and limited nutrients.	

3.3 Terrestrial Fauna

Table 3-6: Beyond 2018 Project – Responses to Submissions – terrestrial fauna

No.	Submitter	Submission and/or issue	Response to comment
1	TWSWA	The Night Parrot is listed as 'endangered' in Australia and as 'rare or likely to become extinct' in Western Australia. Given the conservational importance placed on the Night Parrot, the Department of Parks and Wildlife has developed survey guidelines for determining the presence of the Night Parrot in suitable habitats. As the SIGMC review acknowledges, the Envelope contains suitable Night Parrot habitats of shrubs and hummock grasses. The review surveyed for the Night Parrot's presence in the Envelope for 'at least seven nights continuously' with no evidence of the bird's calls recorded. However, given the lack of knowledge of the Parrot's habitat use and movements, it is unclear whether this survey covered a long enough period to be conclusive of the Night Parrot's non-presence in the Envelope. A recent study tracking two Night Parrots suggested their roosting and foraging sites can be widely separated. In addition, the study found although the birds generally stayed in the same area, for a twelve day period both relocated, one to an unknown distance. As the report notes, 'further studies are required to determine if night parrots preferentially use a single roost or can use multiple roosts within a large home range'. Therefore it is unlikely a seven night study can definitively rule out the use of the Envelope by Night Parrots, especially as a potential foraging site. The SIGMC review found if the B2018 Project goes ahead there will be a significant reduction in the extent	The targeted Night Parrot survey (Phoenix, 2017a) was conducted in accordance with current DBCA survey guidance for the species which recommends 'at least six nights' recording at any particular site (DPaW, 2017). All sites in the targeted survey were installed for seven or eight nights. The comments by the submitter regarding potentially wide separation of Night Parrot roosting and foraging sites are acknowledged. The targeted survey report noted that no available survey technique can irrefutably demonstrate that the species is absent from a site. It did not definitively rule out use of the DE by Night Parrots and indicated that where habitat is suitable, even if the species was not confirmed to be present, it might still frequent the area at other times. In considering the likelihood of Night Parrots to occur, it is noted that the DE is only within the 'medium priority area for survey' for the Night Parrot (DPaW, 2017) and the spinifex grasslands in the DE were considered to be of limited suitability for roosting and breeding. The comments in the ERD regarding '*excavation of pits and the construction of infrastructure leading to a direct loss of habitat*' and '*fragmentation of the continuous riparian zone into smaller stretches without the ability for dispersal for the specialised fauna may compromise those smaller populations that remain in the less affected parts outside future developments*' were directed more specifically at ground dwelling fauna with poorer dispersal powers, such as SREs.

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		and quality of suitable Night Parrot habitat, with the project involving 'excavation of pits and the construction of infrastructure leading to a direct loss of habitat' and that the 'fragmentation of the continuous riparian zone into smaller stretches without the ability for dispersal for the specialised fauna may compromise those smaller populations that remain in the less affected parts outside future developments'. Given this serious and long-term, irreversible damage to a suitable Night Parrot habitat, combined with the endangered nature of the bird, the TWSWA recommends the SIGMC acts in accordance with the EPA's precautionary principle. The principle holds 'where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation'.	Taking into account the information collected to date on Night Parrots in the DE, that is: (a) the spinifex grasslands in the DE do not seem to be of high quality for roosting and breeding of Night Parrot; (b) no Night Parrot calls were recorded in sampled suitable habitat during the targeted survey and (c) the location of the DE within the 'medium priority area for survey' (as opposed to 'high priority'), SIGMC is of the opinion that there is low risk of serious or irreversible damage to Night Parrot habitat.
2	TWSWA	The Grey Falcon is listed as a 'vulnerable' species by BirdLife International, with less than an estimated 1000 currently surviving mature birds. Although the Grey Falcon is identified as 'likely' to occur in the DE and utilises four of the five habitat types occurring within the envelope, the SIGMC review notes the Falcon's habitats 'expand beyond the DE boundary', and therefore does not give further consideration to the project's impact on the bird. However, it is thought the Falcon tends to temporarily abandon feeding areas in favour of more bountiful locations in higher temperatures. Although due to its low population there is little research on the Grey Falcon, research suggests it has a very restricted diet, requiring specific species, and that this diet inflexibility is a primary cause of the bird's rarity. So although the review	To date there have been no records of Grey Falcons occurring within the DE; the nearest desktop record is approximately 47 km south of the DE. The evidence suggests that, if the species visits the Lake Lefroy area, it occurs infrequently.

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		suggests there may be other nesting areas nearby, it is important to retain the habitat in the Envelope as a foraging site for the Falcon, especially given its vulnerable status. At the least, further in-depth research should be carried out on the Falcon's feeding habits in the area.	
3	DWER	All of the terrestrial habitats within the DE are likely to be suitable for the Malleefowl, meaning that there is potential for loss of up to 3,000 ha of habitat for this species. The use of pre-clearance surveys to mitigate impacts to Malleefowl, as described by the ERD, is appropriate. However, the proponent should be required to design and conduct these surveys in consultation with, and with the approval of, the Department of Biodiversity, Conservation and Attractions.	SIGMC acknowledges that terrestrial habitats within the DE are prospective for Malleefowl, despite no sightings being recorded during surveys for the Beyond 2018 Project. SIGMC reiterates its commitment to undertake pre-clearing surveys for malleefowl and will consult with the National Malleefowl Recovery Team and DBCA in relation to survey methods.
4	National Malleefowl Recovery Team (NMRT)	The National Malleefowl Recovery Team (NMRT) would like to note that with a noted average annual disturbance of 300 hectares of land over a ten-year period for B2018 in Malleefowl (Leipoa ocellata) habitat (declared Vulnerable under the EPBC Act and WC Act) that this is a significant area of land disturbance. Because the B2018 project site layout is currently unknown (based on current estimates and this is currently unquantified) the NMRT would consider this insufficient for predicting the current or impacted Malleefowl population as a result of the St Ives Gold B2018 mine site proposal. The NMRT also note that given the desk-top research on Malleefowl mounds undertaken so far in this extensive area, the number of mounds detected (i.e. three active	In addition to the above response, it is SIGMC's view that pre-clearing surveys for Malleefowl done in consultation with the NMRT and DBCA will be sufficient in understanding and mitigating impacts to Malleefowl prior to clearing of native vegetation. SIGMC acknowledges the NMRT's recommendations and in response to this submission will implement LiDAR surveying or similar in a staged approach over an approximate two year cycle, that will cover projected areas of disturbance for following two year period. SIGMC proposes the following additional commitment: **Commitment 11: To undertake surveys for malleefowl prior to disturbance of terrestrial habitats, using LIDAR or**

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		and six recently used) undoubtedly represents just a small fraction of the total that would be found if a more detailed search was undertaken. The NMRT recommend that a full search be undertaken by LiDAR, for example, to determine the number of Malleefowl mounds in the proposed mine site. LiDAR is a surveying method that measures distance to a target by illuminating with pulsed laser. Potential Malleefowl mound shapes on the ground are detected via this surveying technique and ground-truth searches confirms identification. Only a thorough survey of the proposed project area and surrounding areas will provide a full understanding of the implications of the proposed native vegetation clearance on Malleefowl. The NMRT would also expect that any offset properties be fully searched for the presence of Malleefowl (including both active and long unused mounds) to establish how suitable such properties would be to enable the number of Malleefowl to increase and offset the loss of a significant population in the mine footprint. The NMRT would need to be assured that environmental monitoring conditions and offsets are suitable as quality habitat for Malleefowl, or would become quality habitat by vegetation improvements as a result of improvements specified through the approval process determined by the Commonwealth. The NMRT would also propose that the St Ives Gold B2018 mine site environmental conditions (and offset areas) include annual monitoring of all mounds in accordance with the National monitoring, a process overseen by the NMRT. A Cybertracker software	**similar technology, and sharing data with the NMRT and DBCA.** Survey work completed by SIGMC has not identified a significant Malleefowl population in the DE (no birds recorded during surveys). Therefore, no offset properties have been proposed for the Beyond 2018 Project given the low density of malleefowl in the project area. SIGMC would be very pleased to participate in the annual monitoring program for any malleefowl mounds on SIGMC tenure (see additional Commitment 11).

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		program is used by the NMRT for all annual Malleefowl monitoring across Australia. This program is freely available and updated annually. Malleefowl monitoring data is submitted to the National Malleefowl Monitoring Database (NMMD) and exclusively accessible to the groups and organisations that provide data. This monitoring data contributes directly to long-term Malleefowl population trend analyses, as well as The National Malleefowl Recovery Plan.	
5	DWER	The locations of short-range endemic (SRE) invertebrates recorded during the field surveys and desktop study (Figure 4-14) have not been mapped with respect to habitats. This information is particularly important for supporting the ERD's claims that some SRE invertebrates currently known only from the DE are also likely to occur in habitats in the broader surrounds. Section 4.3.6 discusses the use of exclusion areas to protect SRE invertebrates known only from the DE. However, the locations of these taxa have not been mapped with respect to habitats and the exclusion areas. In the absence of this information it is not possible to have confidence in the ERD's conclusions around protection of SRE invertebrates and connectivity of SRE invertebrate habitats. The ERD states that additional surveys will be undertaken to ascertain the status of SRE taxa that are currently known only from inside the DE and are not protected by exclusion areas (*Cicindela salicursoria*, *Lychas* 'SIGM132' and, potentially, *Aganippe* sp. indet.). The additional survey work should be conducted, or other supporting evidence should be provided, to clarify the	Regarding the habitats (salt lake and riparian zone habitat), the fauna consultant noted that "some of its inhabiting specialists may utilise only the playa, some only the riparian zone, and others may be dependent on the presence of both." Note also that "little is known about the precise habitat preferences of the potential riparian habitat specialists and such fine-scale differences could not be evaluated here based on the limited number of records of invertebrates around the lake." For these reasons, the fauna study did not divide the salt lake and riparian zone habitat into finer scale units. However, SIGMC has mapped the known extent of riparian vegetation around Lake Lefroy together with the DE and the Exclusion Zones (Figure 3-2). It is important to note that the dataset for riparian vegetation outside of the DE is incomplete. Areas at the northeast and southwest extremities of the lake have not been surveyed. However, based on SIGMC's current knowledge, approximately 436.2 ha (39%) of all mapped riparian vegetation occurs outside of the DE, with an unknown quantity of additional riparian vegetation yet to be mapped. Of the riparian zone located within the DE, 342 ha (50%) is included within an exclusion zone. Under a worst case scenario of all riparian vegetation outside of exclusion zones within the DE

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		distributions of these species to enable adequate assessment.	being disturbed, there is still 778.2 ha (70%) of mapped riparian zone habitat available which will not be disturbed. In addition, the overall increase to the disturbance to riparian vegetation approved under MS879 will only be an additional 20 ha. Commitment 5 states that SIGMC will commit to 'undertake further SRE survey work prior to ground disturbing works to clarify the status of fauna only known from the Development Envelope'. This commitment will involve surveys covering the exclusion zones and areas both inside and outside of the DE. Of the terrestrial invertebrate fauna surveys undertaken, all species were located either partially or completely within the DE. Given this disproportionate survey effort, it is not surprising that some species that may occur outside of the DE appear to only occur within the DE. A revised version of Figure 4-14 (see Figure 3-3) has been prepared showing the SRE records in relation to the DE and the exclusions zones. With regard to the three taxa reported as occurring only within the DE and outside of Exclusion Zones, SIGMC notes the following: • *Cicindela salicursoria*: further investigation revealed that this beetle has been collected from the south west sector of Lake Lefroy ("4 km N of Widgiemooltha") (Sumlin 1987). Therefore, this species is not restricted to the DE. • *Lychas* 'SIGM132': has only been collected from the riparian zone but at three locations around the lake, across a range of in excess of 20 km (see ERD, Figure 4-14). Also, as outlined above, significant parts of the lake have been undersurveyed or not surveyed at all.

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			On this basis, it is unlikely this species is restricted to the DE. • *Aganippe* sp. indet.: this collection was made in woodland, a habitat that is widespread outside of the DE. Therefore, it is unlikely this species is restricted to the DE. In view of the content of the submissions and the additional information on *Cicindela salicursoria,* SIGMC proposes to slightly alter Commitment 5 to ensure the intent is clear. **Commitment 5 (revised): Undertake further survey work for *Lychas* 'SIGM132' and *Aganippe* sp. indet. prior to undertaking ground disturbing works at known locations for these taxa.**
6	DWER	The proposal is unlikely to have a high level of impact on terrestrial fauna assemblages or significant vertebrate fauna; however, up to three SRE invertebrate taxa are currently known only from inside the Development Envelope and have not been shown to be protected by the proposed exclusion areas (*Cicindela salicursoria*, *Lychas* 'SIGM132' and, potentially, *Aganippe* sp. indet.). In the absence of evidence demonstrating that these taxa are likely to occur outside of the Development Envelope or within the exclusion areas, it is not possible to have confidence that the proposal is unlikely to have a high level of impact on SRE invertebrates (which could include the loss of taxa).	See response to previous submission.
7	TWSWA	The review identifies two invertebrates which have so far only been recorded within the Envelope and are not within the proposed exclusion zones - the cicindela salicursoria and	See response to previous submission.

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		the lychas 'SIGM132' (Langley et al., 2017, p. 4-86). To go ahead with the project without taking precautionary principles would run the risk of significantly endangering or making extinct these species, which contradicts the EPA's principle of the conservation of biological diversity and ecological integrity. Given their conservation significance, TWSWA recommends that further research should be undertaken on the project's impact on the species discussed, ensuring this research is carried out by an independent body. Then, if the project proves to have a detrimental impact on these species and their habitat, then it should not be approved. If the project is to go ahead, TWSWA strongly recommends the Envelope's exclusion zone be modified to include these species. Further, and in addition to this, the possibility of attempting a partial relocation of the species could be considered to preserve and extend its existence.	
8	DWER	The proponent has not added impact footprints to Figures 4-11, 4-13 and 4-14 of the ERD (Figures 4-9, 4-10 and 4-11 of the draft ERD). The proponent has not quantified the total areas of disturbance for individual fauna habitats in Section 4.3.4, but instead has aggregated all disturbance using a 2,000 ha cap for lake-based disturbance and a 3,000 ha cap for land-based disturbance. In general, despite the revisions made in response to TEB's comments, the information and maps presented in the ERD are not of high quality and key pieces of information relevant to assessment are not presented as	While the most common approach to proposal scoping for mining activities in Western Australia is on a footprint basis, the development envelope/s approach is a defensible alternative approach. This approach involves identifying and undertaking environmental impact assessment of the maximum area within which a proposal can be located and implemented. SIGMC has identified areas of known and prospective mineralisation within the DE. Known areas include those assessed for the Beyond 2010 Project and approved under Ministerial Statement 879. The Beyond 2018 Project, if approved, will likely involve an expansion of some of the

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		a well-integrated synthesis. In particular, the ERD lacks detail with respect to the delineation and quantification of habitats, and the spatial relationships between habitats, impact footprints, exclusion areas and significant fauna records. Because the proponent has not provided suitably detailed information on the locations and extents of impact footprints and habitats as described above, any consideration of impacts should take a precautionary approach. This would entail proceeding under the assumption that the proponent will clear habitat up to the maximum extent of the clearing caps, anywhere within the DE (but outside of the exclusion areas shown in Figure 4-15), and that all habitats present potentially support significant fauna.	mines which were approved for the Beyond 2010 Project. However, the Beyond 2018 Project primarily involves mining developments for which detailed resource definition, and therefore mine designs, are not yet available. Consequently, and with the agreement of the EPA, SIGMC adopted the development envelope approach and proposed a DE which did not contain indicative footprints. As a result, the assessment was undertaken on a precautionary basis on the premise that any part of the DE could be disturbed, subject to the caps on lake-based and land-based disturbance. While this approach does not enable quantification of potential impacts on particular habitats, it does enable a hypothetical worst case scenario for those habitats to be assessed and conclusions regarding local and subregional scale impacts to be made. It also facilitated the identification of areas of relative importance to be included in exclusion zones. It is therefore also possible to say habitat occurring within exclusion zones would not be disturbed. DWER suggested the assessment should proceed “under the assumption that the proponent will clear habitat up to the maximum extent of the clearing caps”. SIGMC considered this in Table 4-34 of the ERD in which the sub-regional extent of each of three fauna habitats was detailed. A residual impact of Low-Moderate was identified for Shrubland on Dune while the residual impact on the other two habitats was Low. See also following comment and response.
9	DWER	The ERD does not detail the size of the exclusion areas or the extents of habitats within them (Figure 4-15). It is therefore not possible to determine what the ‘worst case’ loss of specific habitat types may be, for example in the case of the Shrubland on Dune habitat which covers only	The size of each of the originally proposed five Exclusion Zone is given in Table 4-18 of the ERD. Furthermore, the addition of a sixth Exclusion Zone, ‘Clay Pans’, provides an additional 95.3 ha of area. This is reflected in the updated Commitments for the project.

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		1,887.3 ha within the DE (cf. the proposed 3,000 ha cap for land-based disturbance). This information should be provided.	In the case of Shrubland on Dune habitat, there is a total of 1,887.3 ha within the DE. An amount of 707.7 ha is included in Exclusion Zones. Therefore, the maximum possible disturbance of this habitat that would occur under the Beyond 2018 Project is 1,179.6 ha. This amount represents 0.9 % of the sub-regional extent of this habitat (see Table 4-34 of the ERD). Given this habitat is spread widely around the lake and within the DE, it is unlikely that actual disturbance would approach the hypothetical worst case amount. In any event, given the known extent of Shrubland on Dune habitat outside of the DE, a significant impact associated with disturbance within the DE is not likely.
10	DWER	Section 4.3.3.2 summarises the habitat types in the ERD by lumping the salt lake playa and associated riparian zone together, and integrating riparian woodlands and woodlands on rocky hills into the broader Woodland on Plain habitat type. This is inappropriate because it does not allow adequate consideration of the potential loss of unique habitats as a result of the proposal. In the absence of more detailed habitat extent information and mapping a precautionary approach should be taken, assuming a high level of impact to key habitats such as riparian woodlands and the riparian salt lake fringe.	The selection three broad fauna habitats –Salt Lake Playa and Associated Riparian Zone, Shrubland on Dune and Woodland on Plain – is consistent with the definition of habitat ("the natural environment of an animal or assemblage of animals, including biotic and abiotic elements, that provides a suitable place for them to live" - EPA 2016) and were considered adequate for discussion and analysis. There was no data to suggest the "scattered small rocky hills" (Appendix I of the ERD) occurring within the Woodland on Plain habitat were sufficiently different as to represent a distinct fauna habitat. With regard to riparian habitat, the vegetation mapping recognised three riparian vegetation types (see Table 4-20 of the ERD). Within the DE, over 50 % of these vegetation types are included in Exclusion Zones. A further 353.7 ha occur on SIGMC tenure outside the DE. In a hypothetical worst case scenario where all riparian vegetation inside the DE but outside the Exclusion Zones was disturbed, this would amount to 32.6 % of riparian vegetation. Given the broad distribution

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			of riparian vegetation around the lake, this is highly unlikely. See also the response to comment 12 in relation to the Salt Lake Playa and Associated Riparian Zone habitat. In any event, the proposal is limited to an additional 20 ha of disturbance to the riparian vegetation which is not retained in Exclusion Zones, which is a total of 110 ha of such impact when considered in conjunction with the existing approval afforded under MS879.
11	DWER	The designation of exclusion areas is a positive step and will mitigate some of the impacts of the proposal on Terrestrial Fauna. More secure long-term protection would be afforded to these areas, however, if they were excised from the DE entirely.	All areas within the DE, including the Exclusion Zones, are prospective for gold mining. The Exclusion Zones have been established because, based on SIGMC's current level of knowledge, they contain biodiversity values that warrant protection. Further survey work may reinforce their importance or demonstrate that some features are more widespread than previously thought. This may lead to a future reassessment of the Exclusion Zones. As such, excision at this time is not appropriate.
12	DWER	The overall level of clearing may not represent a high level of impact at a regional scale, given the mitigation measures proposed in the ERD. The level of impact associated with loss of areas of individual habitat types is unclear because the ERD does not contain any analysis of cumulative impacts to fauna habitats in the area. In particular, the level of impact to the salt lake riparian zone is difficult to ascertain because the ERD does not differentiate between playa and riparian salt lake habitats (see above, under 'Accuracy of predicted impacts'). The distinction is important; due to their linear nature salt lake riparian habitats are restricted in extent and are easily fragmented, and are therefore much more limiting in the	Cumulative impacts within the DE have been considered - see ERD (Table 4-25) which identifies the current level of disturbance within the DE. We also know that broad vegetation types within the Beyond 2018 Project Study Area are largely intact – see ERD (Table 4-17) which records a total of nine broad vegetation types, all of which are more than 90% intact, and are therefore not materially impacted. The fauna study (Appendix I) considered the differentiation of the playa and the riparian zone as separate habitats. Regarding the salt lake and riparian zone habitat, they noted that "some of its inhabiting specialists may utilise only the playa, some only the riparian zone, and other may be dependent on the presence of both." Note also that "little is

No.	Submitter	Submission and/or issue	Response to comment
		landscape than playa habitats. These habitats are also identified in the ERD as being important for SRE invertebrates. The proponent should detail the extents to which salt lake riparian habitats occur in the DE and to which they may be lost as part of implementation of the proposal, and should provide evidence that this habitat type is adequately represented in the local and regional surrounds.	known about the precise habitat preferences of the potential riparian habitat specialists and such fine-scale differences could not be evaluated here based on the limited number of records of invertebrates around the lake." For these reasons, the fauna study did not divide the salt lake and riparian zone habitat into finer scale units. However, Section 4.2 of the ERD (Flora and Vegetation) did distinguish the riparian zone based on floristic values.

Figure 3-2
Known Extent of Riparian Vegetation Around Lake Lefroy

GOLD FIELDS
ST IVES GOLD MINE

360000 365000 370000 375000 380000 385000 390000 395000 400000

6555000 6550000 6545000 6540000 6535000 6530000 6525000 6520000 6515000 6510000

LEGEND

- Development Envelope
- Exclusion Areas
- No Mining Area

Vegetation Type

- R1
- R2
- R3
- R4
- R5
- R6

0 4 8 12 16

Kilometres

N

Datum: Geocentric Datum of Australia (GDA94)
Map Grid: Map Grid of Australia (MGA)
Projection: Universal Transverse Mercator Zone 51

Prepared:	F Walker
Reviewed:	G Barrett
Checked:	A Mack
Project No:	TE16034
Revision:	A
Date:	8/05/2019

LOCALITY MAP

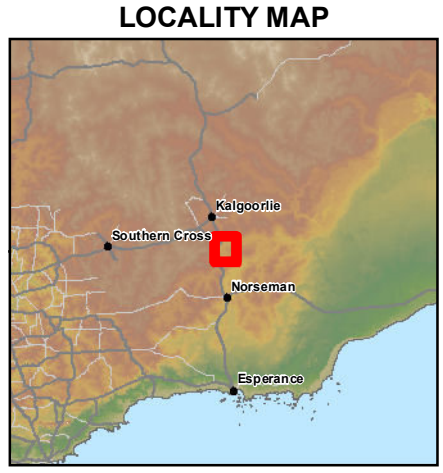

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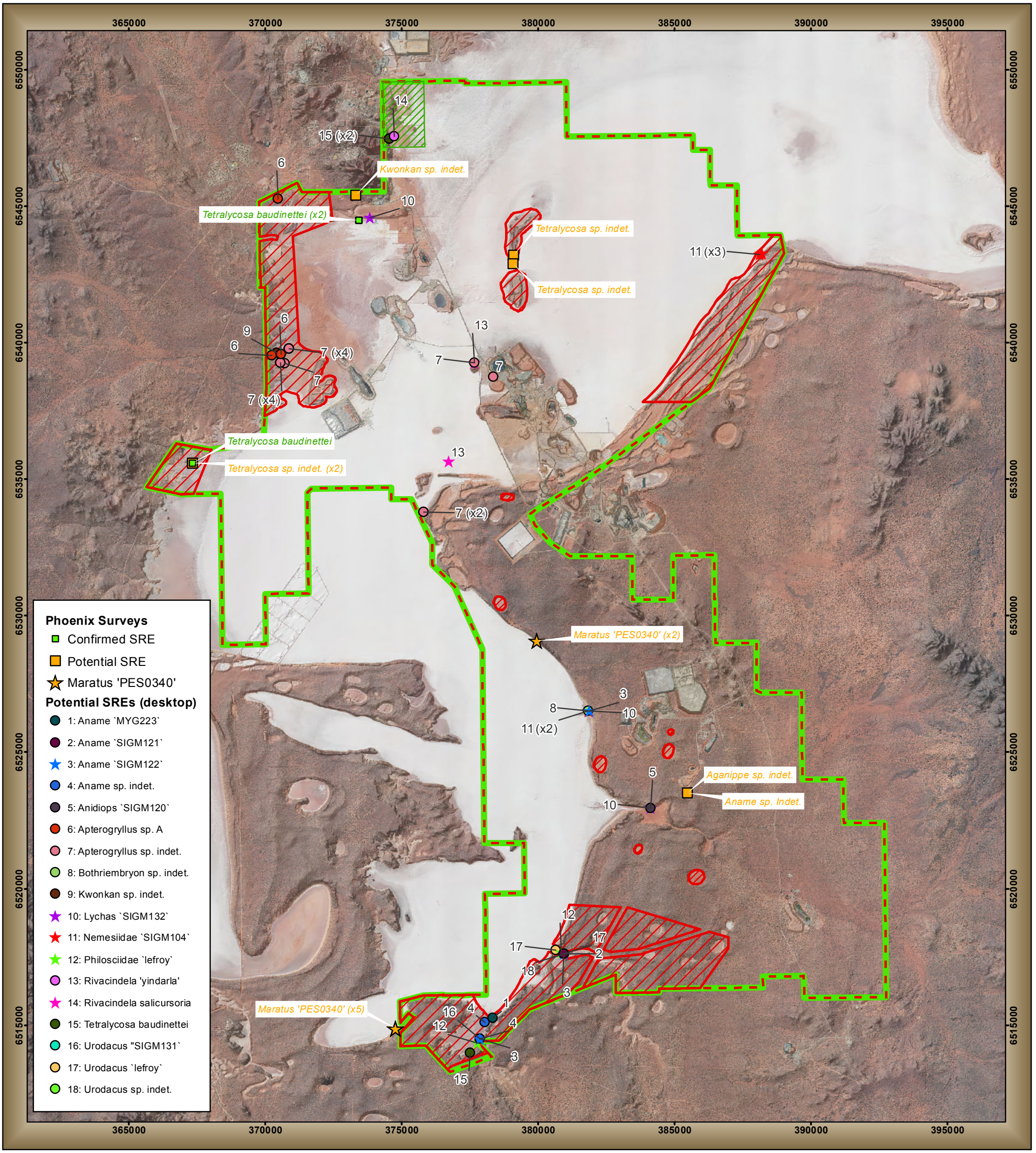
Figure 3-3
Confirmed and Potential Short-Range Endemic Invertebrate Records – Development Envelope and Exclusion Zones

GOLD FIELDS
ST IVES GOLD MINE



LEGEND

- Development Envelope
- Exclusion Areas
- No Mining Area

0 3 6 9 12

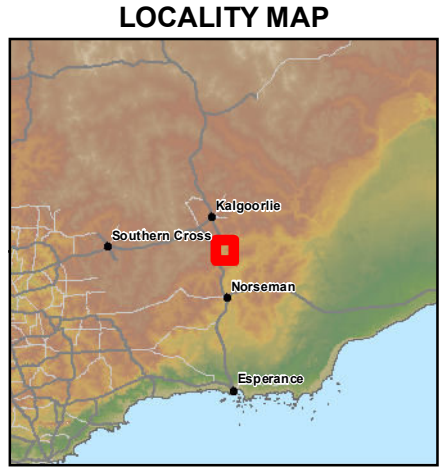
Kilometres

N

Datum: Geocentric Datum of Australia (GDA94)
Map Grid: Map Grid of Australia (MGA)
Projection: Universal Transverse Mercator Zone 51

Prepared:	F Walker
Reviewed:	G Barrett
Checked:	A Mack
Project No:	TE16034
Revision:	B
Date:	8/05/2019

LOCALITY MAP



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3.4 Subterranean Fauna

Table 3-7: Beyond 2018 Project – Responses to Submissions – subterranean fauna

No.	Submitter	Submission and/or issue	Response to comment
1	DWER	Regarding previous TEB advice, the proponent has not added impact footprints to Figure 4-16 of the ERD (Figure 4-12 of the draft ERD).	While the most common approach to proposal scoping for mining activities in Western Australia is on a footprint basis, the development envelope/s approach is a defensible alternative approach. This approach involves identifying and undertaking environmental impact assessment of the maximum area within which a proposal can be located and implemented. SIGMC has identified areas of known and prospective mineralisation within the DE. Known areas include those assessed for the Beyond 2010 Project and approved under Ministerial Statement 879. The Beyond 2018 Project, if approved, will likely involve an expansion of some of the mines which were approved for the Beyond 2010 Project. However, the Beyond 2018 Project primarily involves mining developments for which detailed resource definition, and therefore mine designs, are not yet available. Consequently, and with the agreement of the EPA, SIGMC adopted the development envelope approach and proposed a DE which did not contain indicative footprints.
2	DWER	The ERD relies on historical studies – four desktop studies and one Level 1 field survey – and a contemporary desktop assessment and reconnaissance survey to inform its assessment of impacts to subterranean fauna. The Level 1 field survey involved habitat assessment and limited troglofauna sampling in one area, while the reconnaissance survey involved habitat assessment only. No detailed (Level 2) sampling has been conducted. This level of survey effort provides an adequate basis for	SIGMC concurs that the level of investigation is appropriate given the low level of prospectivity for subterranean fauna.

No.	Submitter	Submission and/or issue	Response to comment
		assessment, given the low level of prospectivity for subterranean fauna habitat in the proposal area. EPA guidance allows for desktop studies and Level 1 surveys in such cases.	
3	TWSWA	The study mentions that, while the occurrence of stygofauna is unlikely throughout the DE, mainly due to the high salinity of the area in general, there are localities where the water salinity is lower and could potentially sustain stygofauna life (p.4-93 in the review). This is outlined in the EPA assessment for the Pilbara 2007, included in the St Ives review, and acknowledges that stygofauna may occur in rather significant levels of salinity, up to 60,000 mg/L TDS. TWSWA notes that the St Ives review recognises the 2007 EPA assessment for the Pilbara and also, that there are local areas within the DE that measure lower than 70,000mg/L TDS. The review document does not mark or mention more exactly where these local areas of lower salinity are or whether any profounder analysis of their potential as stygofauna habitat, present or future, will be undertaken. This needs to be addressed. TWSWA recommends that the <70,000mg/L TDS localities are clearly marked for the study and monitored for potential change. Any area deemed to be <60,000mg/L TDS should be charted and assessed for the potential presence of stygofauna species. If no presence is detected, it should be reassessed after an appropriate amount of time to ensure the continuous unsuitability as stygofauna habitat.	While there have been some groundwater salinity levels within the tolerance range that is generally accepted for stygofauna (<70,000 mg/L TDS), the Phoenix (2016b) desktop review concludes there is a very low prospectivity for stygofauna occurrence in the B2018 study area (the DE). The salinities recorded in the DE below 70,000 mg/L are marginal at best, i.e. they are not distinct pockets of fresh or brackish water within a hypersaline aquifer for example, but more likely to be on the lower end of gradients of a hypersaline aquifer that is mostly above the 70,000 mg/L TDS threshold. SIGMC considers the current level of understanding sufficient and proposes no further action.
4	DWER	The ERD states that while groundwater is present in the proposal area, it has salinity levels over 70,000 mg/L throughout much of the DE. This suggests that stygofauna	SIGMC acknowledges DWER's comment.

No.	Submitter	Submission and/or issue	Response to comment
		are unlikely to be present, as the likelihood of them being found in waters with salinity over 60,000 mg/L is low. This conclusion was supported by each of the three different technical consultants that have conducted the historical studies in the proposal area.	
5	DWER	Regarding previous TEB advice, Section 4.4.3.4 was not amended to include discussion of the previous Level 1 troglofauna survey undertaken in 2011.	The survey undertaken in 2011 is discussed in Appendix K. The survey was undertaken at the West Idough deposit (Outback Ecology 2011b). While the geology is generally unsuitable, a calcrete layer was identified, a formation which has been associated with subterranean fauna in other parts of Western Australia, albeit usually stygofauna when an aquifer is also present. The pilot investigation looked at drill core and failed to find any vugs or voids. The significant distance of the calcrete layer above the water table also meant that humidity levels within the calcrete were very low. Finally, sampling from 15 drill holes failed to record any troglofauna.
6	TWSWA	The general review of the troglofauna occurrence and disturbance has been equally thorough as previous sections in the review. For Lake Lefroy itself, it is unlikely that troglofauna would occur. The only areas where it could potentially occur in the DE is in the peripheral southeast and northwest Quaternary alluvials. It is, however, considered in the review to be of too small an occurrence to bear significance due to the alluvials significant size outside of the DE. TWSWA disagrees from the viewpoint that this mining project has had a phase of expansion to date already. There is little to say that there will not be additional expansion into the surrounding areas in the future with more disturbance and larger areas affected. It is not enough to conclude that there may be a potential habitat affected and that there may be disturbance to it (and adjacent areas) without charting	Any future expansion of the project would need to be assessed. Cumulative impacts would be considered at that time, including those associated with the Beyond 2018 Project, if approved. Regarding the prospectivity of potential troglofauna habitat being disturbed, see response to item 28 where it concludes the level of survey was adequate for the Project.

No.	Submitter	Submission and/or issue	Response to comment
		the areas. Especially in the southeast, a large portion of alluvials are affected according to Figure 4-17 'Potential Troglofauna Habitat' in the review. If there is an implication that a habitat and/or species may be affected by the human activities of today, if only to a smaller extent, then that extent and the species themselves should be marked today as well – even if only for future reference. The Western Australian Biodiversity Science Institute (WABSI) has been given a research priority for subterranean fauna to close knowledge gaps. Three of the five focus areas for this research are to: improve survey and sampling protocols to optimise the efficiency of survey and monitoring; improve understanding of habitat requirements to better define species distributions; and improve understanding of resilience to disturbance to inform mitigation strategies. TWSWA therefore recommends that there are appropriate studies undertaken to assess and chart the actual occurrence in the southeast and northwest Quaternary alluvials of current troglofauna species and the impact of the disturbance to the alluvials as a subterranean fauna habitat in general – especially considering they fringe most of the DE.	
7	DWER	The ERD states that due to local geology and groundwater characteristics the only potential habitat for troglofauna in the proposal area is represented by areas of Quaternary alluvial deposits that reach into the south-east of the DE (and, to a lesser extent, the north-west). Troglofauna sampling has not been conducted in these areas, although troglofauna sampling in 2011 at 15 uncased holes in the West Idough area obtained no specimens.	As discussed in the response to item 22, resource definition has not proceeded to the point where project footprints can be provided with accuracy. To compensate for this, the entire DE has been surveyed and parts of the DE set aside in Exclusion Zones from development. In addition, a further 95.3 ha has been set aside through the commitment to a sixth and new 'Clay Pans' Exclusion Zone. Section 4.4.5 and Figure 4-18 of the ERD provide clear information about how widespread potential troglofauna habitat is immediately

No.	Submitter	Submission and/or issue	Response to comment
		The ERD states that some loss of potential troglofauna habitat may occur in these areas of Quaternary alluvial deposits. The ERD then concludes that impacts to troglofauna from such habitat loss are likely to be negligible, because these habitats are widespread in the surrounding landscape and the extent of disturbance to these habitats in the DE is expected to be minimal. In addition, the ERD provides mapping to demonstrate that Quaternary alluvial deposits outside of the DE are generally well-connected to those within. Although it may be reasonable, the conclusion is not adequately supported. While the ERD implies that very little of the Quaternary alluvial deposits will be disturbed due to implementation of the proposal, it does not explicitly commit to this by specifying the precise extents and locations of such areas that may be impacted by the proposal. To allow confidence that the proposal is unlikely to result in a high level of impact to troglofauna, the proponent should either provide quantitative data and impact footprints confirming that the extent of impacts to Quaternary alluvial deposits will be minimal, and/or survey data demonstrating that troglofauna assemblages within the Quaternary alluvial deposit habitats, if any, are unlikely to contain range-restricted taxa. Such an approach is consistent with the recommendations of the proponent's technical consultant, who recommended a troglofauna pilot study be conducted it the Quaternary alluvial deposits in the south-eastern part of the DE are intended to be disturbed.	outside of the DE – only 5.7 % of Quaternary Alluvials within a 25 km radius of the Lefroy Mill occurs within the DE. Of this small area, 266 ha occurs in Exclusion Zones, reducing the maximum sub-regional impact to only 366 ha or 3.3 % of potential habitat. Potential troglofauna habitat occurs in the north west and south east sections of the DE. The north west sections occur within Exclusion Zones and will not be disturbed. SIGMC will undertake a pilot troglofauna survey should disturbance exceeding 20 ha be proposed in the habitat in the south east of the DE.

3.5 Inland Waters Environmental Quality

Table 3-8: Beyond 2018 Project – Responses to Submissions – inland waters environmental quality

No.	Submitter	Submission and/or issue	Response to comment
1	DWER	No specific controls have been nominated for protection of peripheral wetlands beyond the exclusion zones. A commitment has been made to develop a dewatering discharge strategy for each new open pit operation prior to commencement. The strategy will consider the potential for impact to the riparian zone, and where necessary, measures for protection of the zone.	SIGMC acknowledges DWER's comment. As noted previously and with regard to potential impacts of the dewatering discharge strategy on peripheral wetlands, SIGMC notes that these wetlands are generally set back from the surface of Lake Lefroy and have limited, if any, hydrological connection to the lake, even under extreme flood events (for example, many of the clay plans in the proposed Exclusion Zone are isolated from other water bodies by dune sands). Furthermore, these wetlands are generally at higher elevations than the lake and receive localised runoff rather than inflow from the lake. In reality, during large rainfall events, they may discharge to the lake (rather than the reverse). Consequently, dewatering discharge on the lake surface is very unlikely to affect these wetlands and the primary focus from an impact perspective is therefore the values associated with the fringing vegetation of Lake Lefroy. The work outlined in the documentation found that fringing vegetation on Lake Lefroy is only partially inundated under extreme rainfall events, even when dewatering discharge is occurring (see Figures 4-24 and 4-25 in the ERD), and that dewatering discharge volumes are relatively small given the estimated capacity of Lake Lefroy is 270 GL (ERD Appendix L, p28). This means that the composition of flood waters on Lake Lefroy is overwhelmingly the fresher rainfall runoff, although past records indicate salinity of lake increases rapidly after large rainfall events, presumably due to evaporation and dissolution of salts from the lake surface. In this regard, the original Commitment 6 commits to a dewatering discharge strategy to be developed for each new open pit operation on the lake, prior to its commencement. This Commitment has now been revised to provide further management measures. The updated strategy will consider:

No.	Submitter	Submission and/or issue	Response to comment
			• Existing dewatering practices elsewhere (including engineering and other controls) and impacts, if any; • Likely discharge volumes; • Potential for localised flooding, including placement of dewatering discharge facilities no closer than 200 m to the riparian fringe; • Likely extent and location of salt crust formation; • Consideration of the water quality of the dewater discharge for any new pit ahead of discharge; and • Potential for impact to Exclusion Zones and the riparian zone generally and, where necessary, measures for protection of these areas. Note that there is no proposal to undertake dewatering discharge to any peripheral wetland/clay pan. All dewatering discharge will occur to discharge structures on the surface of Lake Lefroy only. There is also a buffer of 30m built into the ERD Exclusion Zones for the peripheral wetlands (see Table 3-3) to provide further protection to these features. Furthermore, the proposal is limited to an additional 20 ha of disturbance to the riparian vegetation which is not retained in Exclusion Zones, which is a total of 110 ha of such impact when considered in conjunction with the existing approval afforded under MS879.

No.	Submitter	Submission and/or issue	Response to comment
2	DWER	The conclusions in the ERD for the predicted outcome for Inland Waters Environmental Quality (section 4.6.7) are not supported by the supporting Appendix O; that is that the environmental "values of the peripheral wetlands are common to wetlands in the Goldfields, Wheatbelt, Pilbara and more widely." No assessment of the relative environmental values of these wetlands in the contact of regional wetlands has been completed.	The conclusion in section 4.6.7 indicates that "the representation and function of these wetlands is common", referring to their higher biological diversity and environmental values more broadly, and concluding that they are characteristic of peripheral wetlands surrounding salt lakes in Western Australia. Notwithstanding this, SIGMC has developed a new Exclusion Zone, 'Clay Pans', in recognition of the potential value of these wetlands. This sixth Zone provides a further 95.3 ha which will not be mined as part of this proposal.
3	DWER	The statement that there will be "no expected impact to new described aquatic biota as none is limited to the DE" is not supported. Appendix O recorded one potentially restricted aquatic invertebrate species, Eocyzicus sp. MWH01 within the DE. It was also noted that there was a paucity of aquatic biota survey data from the Lake itself and further study was recommended.	As per Section 2.4.5.2, Appendix O, *Eocyzicus* sp. MWH01 was recorded from within the DE, however, it is also known from freshwater wetlands throughout the Goldfields (Taukulis et al., 2012), based on morphology.

No.	Submitter	Submission and/or issue	Response to comment
4	DWER	Inadequate assessment of the current impact of dewatering discharge on the Lake Lefroy's ecology and the cumulative potential impact of additional dewatering has been conducted to date. Some assessment of the impact of additional salt loading has occurred in Appendix O, (although not adequately summarised in the ERD: see below in italics); however the impact of deposition of additional metals and metalloids has been rated a lower risk due to the expectation that metals would adsorb to the lake's clay sediments and ions and become immobilised and biologically unavailable. This theory requires testing to verify the fate of contaminants at Lake Lefroy. *"Given the high salinity and known low diversity of aquatic biota in Lake Lefroy, the investigation of impacts from the dewatering discharge on aquatic biota is problematic and has not been conducted for this assessment. Although it is likely that the increased salt loads in the discharge water will further reduce the potential for the emergence of aquatic biota, at least in proximity to discharge points."* (ERD, pp. 4-138)	Current knowledge of the hydrogeochemical properties of the lake (high salts, high clay content and natural mineralisation) indicates that metals are unlikely to be bioavailable for uptake by organisms or pose a toxicity risk (ERD; Appendix O, Section 2.4.3). This is because of the occurrence of complexation of metal species to ions, oxides, hydroxides and carbonates, effectively immobilising them in the sediment to form insoluble compounds (Reddy and DeLaune, 2008). In addition, the emergence of aquatic biota on the lake, should it occur, is highly likely to be associated with major flood events, which are rare and short-lived. Therefore, the exposure period for aquatic biota to any contaminants is also short-lived, limits the potential source-receptor-pathway model of movement for any contaminants through the food chain. During major flood events, dilution and dispersal also causes a decrease in metal concentrations, subsequently reducing potential toxicity to organisms. SIGMC concludes that the risk to aquatic biota is very low, based on inherent low levels of biodiversity within the lake itself and the likely geochemical fate of any dissolved metals not retained within dewatering discharge structures. SIGMC acknowledges that peripheral wetlands are significantly more biodiverse that Lake Lefroy itself due to their much lower salinity. SIGMC will not undertake any dewatering discharge to peripheral wetlands and has developed a new Exclusion Zone, 'Clay Pans', in recognition of these concerns providing protection of a further 95.3 ha. This is reflected in the updated suite of Commitments for the project. SIGMC has also committed to undertaking an ecological study of the lake and peripheral wetlands during a major flood event, to address current knowledge gaps and gain an understanding of salinity and metal concentrations, and potential impacts on aquatic biota.

No.	Submitter	Submission and/or issue	Response to comment
5	DWER	To a large extent, the ERD reads as though the proposed extension of the current mining activities on Lake Lefroy is a new proposal, and there does not appear to have been a concerted effort to assess whether current mining activities have caused significant environmental impacts, particularly from the effects of metals and other chemical constituents that have been historically discharged as a result of historical mining activities. Geochemical data have been presented in the ERD about metal concentrations in pumped groundwater from mine dewatering that is discharged to the salt-lake and in salt-lake sediments. However, no information has been presented about whether metals from these water discharges are currently bioaccumulating in organisms in local food-webs, and whether the proposal to greatly increase the rate of dewatering discharges will significantly increase impacts on these organisms. Although the area of the salt-lake that is impacted by mine dewatering discharges is small, discharge areas have the potential to be significant sources of metals for local food-webs. From a geochemical perspective, the most significant impacts of the current and proposed mining activities are likely to be associated with the discharge of mine dewatering effluent to Lake Lefroy.	There is a lengthy history of anthropogenic influences on the lake (including the construction of the causeway) and lack of baseline information (i.e. a product of commencement of mining in the 1980s and environmental practices at that time), which means it is difficult to discern the origin and cause of any ecological impacts, or separate any potential impacts from the natural lake conditions (Appendix O; Section 4). The current ecological values of the lake are known to be low and the hypersaline discharge water (average salinity of >260,000 mg/L) is prohibitive to the emergence and/or persistence of aquatic biota (Appendix O; Section 3 and Section 4), regardless of the level of mineralisation. This limits the exposure period and source-receptor-pathway model of movement for any contaminants through the food chain. The emergence of aquatic biota on the lake is most likely to occur during major flood events, which are rare and short-lived, with dilution and dispersal reducing potential toxicity to organisms. The natural lake characteristics (high salinity, high clay content and naturally high mineralisation) are also likely to immobilise potential metal contaminants such as lead (Appendix O; Section 2.4.3.1 and Section 2.4.4.1). While discharge rates are expected to increase in most years, the additional dewatering volume is not a key factor as existing levels of aquatic biota are very low. Therefore, the limited presence of aquatic biota in the discharge water, natural lake characteristics and discharge volumes are not expected to pose a toxicity risk.

No.	Submitter	Submission and/or issue	Response to comment
		The pumped groundwater is known to be hypersaline and acidic and contain elevated concentrations of some metals, particularly lead which is present at concentrations of about 2-4 mg/L in the discharge water, levels that are several orders of magnitude above criteria that are known to be toxic to many aquatic organisms. The current fate of the lead in the discharge areas is not known, so there is no background information available to assess whether the proposal to significantly increase dewatering discharge rates will increase impacts on organisms that are exposed to this discharge water.	
6	DWER	Although concentrations of lead in the mine dewatering discharge water are high, this metal is unlikely to the chemical constituent of most environmental concern in the St Ives mining project because of the limited capability of this metal to undergo trophic transfer in local food webs. The elements of most environmental concern in this area are likely to be selenium and mercury which do not appear to have been chemically analysed in groundwater that is discharged to the salt-lake. Research on both artificial (e.g. Tanner et al., 1999) and natural (e.g. Wurtsbaugh et al., 2011) closed saline-water systems indicates that selenium and mercury are the contaminants of principal concern in these systems due to the ability of these elements to be biomagnified in food webs that typically develop under conditions where there are high evaporation rates.	The most recent annual environmental monitoring program (Stantec 2018) indicates the concentrations of selenium and mercury are well-below site-specific and available ANZECC trigger values, and do not pose a toxicity risk to aquatic biota. The discharge water is also prohibitive to the emergence and/or persistence of aquatic biota, which may provide an exposure pathway. The natural lake characteristics are also likely to prevent selenium or mercury from becoming bioavailable. In addition, waterbirds, which may be the end point of the food chain for biomagnification, are only known from the peripheral environment of the lake, due to the lack of foraging habitat (and sufficient food source in the form of algae or invertebrates) and hypersaline conditions of the lake (Stantec 2016). Therefore, as well as mercury and selenium being present in concentrations below available triggers, there is also a limited exposure period and source-receptor-pathway model of movement through the food chain.

No.	Submitter	Submission and/or issue	Response to comment
		The principal sinks for the removal of selenium and mercury from the water column are: • Through co-precipitation with iron oxides and other minerals and burial in the underlying sediment profile (although periodically conditions may occur where these elements are released again into the water column); • Through volatilisation of either elemental selenium and mercury and/or methyl compounds of these elements; and • Through trophic transfer in local food webs and removal in biomass (such as in insects and birds). The magnitude of these sinks has not been determined at Lake Lefroy.	
7	DWER	Another potential sink for the removal of these elements from the pond occurs during infrequent heavy rainfall events when the salt-lake becomes flooded. Under these circumstances, water and sediment from the ponded area is dispersed over a much larger area of the lake bed, and conditions within the pond are 'reset' for the next dry spell. However, these events occur infrequently and cannot be relied upon as a management option for ensuring that mercury and selenium inputs do not cause environmental harm. Closed saline-water systems in mine dewatering discharge areas generally contain algae, brine shrimp, aquatic insects and insect larvae which form a food source for various bird species. The trophic transfer	Refer to previous responses. In addition, site-specific monitoring criteria have recently been revised. The annual environmental monitoring program and planned ecological study of the lake and peripheral wetlands during a major flood event will also provide additional information to understand the potential risk associated with these contaminants, and provide recommendations for management if required.

No.	Submitter	Submission and/or issue	Response to comment
		of selenium and mercury in this food web has the potential to affect bird populations through impacts on developing embryos in eggs. The principal environmental receptors for these elements are therefore birds rather than toxicity to organisms in the water column which is assumed in the ANZECC guidelines. This means that criteria for mercury and selenium levels in water and in biomass in the water body must be developed at a sufficiently low level to ensure bird populations are protected, even if the concentrations in the water column are harmless to aquatic organisms. Consequently, the US EPA has adopted new criteria that include bird tissue sampling for the assessment of some aquatic ecosystems. The extent to which trophic transfer of selenium and mercury could take place in local food-webs in the Lake Lefroy area could be limited by the high salinity of the mine discharge water and the depauperate nature of the aquatic fauna in the discharge area (mostly diatoms). However, investigations would be required to determine whether birds use the discharge areas as a source of food and whether they are bioaccumulating significant concentrations of selenium and mercury. DWER recommends: Investigations to determine the transport and environmental fate of lead, mercury and selenium in water, sediments and biota in the mining area. These investigations will determine whether the disposal of dewatering effluent is causing environmental impacts	

No.	Submitter	Submission and/or issue	Response to comment
		and will enable local water quality criteria to be developed for managing discharges of these elements into the salt-lake.	
8	DWER	Radium concentrations are often elevated in saline groundwater where the pH is less than 6 and consequently there is a risk that significant amounts of this element are being discharged in mine dewatering effluent to Lake Lefroy. Radium in water in an evaporating salt-pan is known to be co-precipitated with barium to form salts with the composition (Ra, Ba) SO_4 (Rosenberg et al., 2013) and with ongoing discharge of saline groundwater to saline water impoundments, radium concentrations in salt crusts progressively increase and can reach levels of environmental concern due to radioactivity and radon emissions from these materials (Zhang et al., 2015). This could mean that salt crusts in dewatering discharge areas would need to be managed in a similar way to TENORM wastes at some oil and gas production sites to prevent ongoing environmental impacts. The potential accumulation of radium in salt crusts from historical and current discharges of mine dewatering effluent to the salt-lake has not been assessed and therefore it is not known whether the proposed increases discharges to the lake will cause a significant radium accumulation problem. Additional investigations would be required to determine whether this is likely to be a significant management issue in the proposed expansion to the current mining activities in the area.	SIGMC has limited data on Ra in groundwater. However, we note that dewatering discharge water routinely has pH values in excess of 6 (Thorpe Groundwater and Environmental Services 2017), not less than 6 as indicated in the submission. However, in response to this submission, SIGMC proposes the following additional commitment: **Commitment 12: An assessment of the dissolved Ra content of groundwater will be undertaken and the result provided to DWER.**

No.	Submitter	Submission and/or issue	Response to comment
		DWER recommends: Investigations to determine whether significant amounts of radium are accumulating in salt crusts in dewatering discharge areas in the salt-lake and (if necessary) the development of a TENORM management plan for these materials.	
9	DWER	Potential impacts associated with the discharge of dewatering effluent also cannot be effectively managed under the *Rights in Water and Irrigation Act 1914* and therefore have not been assessed.	Noted. These impacts will be managed under the *Environmental Protection Act 1986*.
10	TWSWA	Mining operations have contributed to the increasingly high salinity of Lake Lefroy. The high salinity of the lake is responsible for low levels of algae, and is also partly responsible for the low invertebrate diversity. The review states that a range of migratory birds occur within the DE including; Eastern Great Egret, Cattle Egret, Glossy Ibis, Hooded Plover, Common Greenshank, Wood Sandpiper, Red-necked Stint, Sharp-tailed Sandpiper and Curlew Sandpiper. Artemia feed on algae, and many migratory birds feed on small crustaceans and aquatic animals, including artemia. Therefore, increasing salinity of Lake Lefroy, through mine dewatering, is likely to affect the food webs of the development area. Migratory birds are matters of national environmental significance under the EPBC Act 1999 and the Bonn Convention, Japan Australia Migratory Bird Agreement, China Australia Migratory Bird Agreement, Republic of Korea Australia Migratory Bird Agreement and the Ramsar Convention on Wetlands.	The lake already appears to lack a low salinity phase due to substantial salt loading, and therefore does not support a diverse or productive biological community. Extremely hypersaline conditions associated with the discharge water limit primary productivity (algae and macrophytes) and aquatic invertebrate emergence (including *Parartemia* sp.) and persistence (Appendix O; Section 2.3.4 and Section 2.4.3). While migratory waterbirds have been recorded from within the DE, there are no records of these birds foraging or utilising the lake environment directly, due to the lack of food resources. Instead, previous studies have shown that listed migratory and other waterbirds are known to utilise the multitude of low salinity peripheral wetlands surrounding the lake (Stantec 2016). Therefore the lake has relatively low ecological values and provides limited habitat or a sufficient food source for migratory waterbirds.

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		Therefore increasing salinity and further decreasing fauna and flora within the lake is an impact of national significance. TWSWA recommends that the proponent investigates the effect of increasing salinity on algae within Lake Lefroy, and the use of Lake Lefroy and the microorganisms within, as a habitat and food source for internationally protected migratory birds.	
11	DWER	No assessment of the potential impact of the dewater discharges on bird populations has been completed. The ERD chapter on Terrestrial Fauna notes that some migratory and/or vulnerable bird species have been recorded in the DE area or may be expected to visit the area. Appendix O does note that the productivity of aquatic biota of the lake has implications for birds, but has only noted the adverse impact of increased salt loading from dewatering discharge on biota productivity.	Waterbirds were assessed for the closure report for the dewatering discharge points (Stantec 2016), with results summarised in the response above.
12	DWER	DWER has previously provided comments on a draft of the ERD document to EPA Services in May 2018 indicating the potential impacts of disposing of mafic and ultramafic waste-rock materials on the salt-lake surface even if they have a low sulfur content. This is because seepage from these types of rocks that are undergoing weathering can contain elevated concentrations of hexavalent chromium and nickel than can then be discharged to the surrounding environment. This issue has not been addressed in the latest version of the ERD. Instead, the proponents have indicated that the potential for acid and metalliferous drainage (AMD) from waste rock	For assessment of potential impact to surface water receptors from runoff, the adopted trigger values have been determined based on previous studies related to surface water quality of Lake Lefroy. Previous reports adopted trigger guideline values for highly disturbed marine ecosystems (protection of 80% of species) (Dalcon Environmental, 2010a) to assess potential impact to the salt lake ecosystem. The assessment of data against published physical and chemical stressors (pH and salinity) for surface water bodies is not considered to be applicable in the hypersaline salt lake environment. For assessment of impact to groundwater receptors from seepage and infiltration, results have been compared to NEPM groundwater investigation levels (GIL) trigger values for both for moderately to slightly disturbed,

No.	Submitter	Submission and/or issue	Response to comment
		materials in the St Ives project area have been assessed according to industry “best practice” and have mostly reproduced information that was provided in the previous draft version of the document. However, it is generally not considered to be best practice to dispose of mine wastes on or adjacent to an ephemeral wetland, so the risk of seepage impacts from these materials on aquatic receptors needs to be carefully assessed whether or not they have a high sulfur content. Although waste rock testing in this area has largely been undertaken in accordance with current Australian assessment methods, there are potentially some limitations of this approach when applied to the St Ives project area. One of these limitations is that the methods used in waste rock assessment often assume that sulfide oxidation is the only significant source of metals and metalloids that are released in seepage from waste rock to the environment. This is not always the case, particularly in the case of mafic and ultramafic rocks where minerals in these rocks can react with manganese and iron oxides under oxidising conditions to produce highly toxic and soluble hexavalent chromium (Kazakis *et al*., 2015) which can then be transported in seepage to cause environmental impacts. Although this process can occur naturally in areas underlain by greenstone belt rocks in the Goldfields region (Gray, 2003), the rate of hexavalent chromium release to the environment can be greatly increased by the effects of mining and the management of waste	marine and fresh water ecosystems. This approach for assessment of potential impact is considered to be a conservative assessment of elevated levels of metals in seepage and runoff. SIGMC acknowledges DWER’s comments and recommendations and is committed to initiating long-term kinetic testing of representative samples. SIGMC will take DWER’s advice and liaise with the Chemistry Centre prior to undertaking any waste investigations relating to hypersaline conditions. In response to this submission, SIGMC proposes the following additional commitment: **Commitment 13: SIGMC will initiate a kinetic testing program for waste rock and will consider the potential impacts of hypersaline conditions on generation of acid or metalliferous leachate.**

No.	Submitter	Submission and/or issue	Response to comment
		rock materials (Paulukat et al., 2015). Elevated concentrations of nickel may also be released under near-neutral pH conditions from mafic waste rock materials with a low sulfur content and this behaviour may not be detected by conventional AMD testing techniques (Plante et al., 2011). The most effective way of detecting this behaviour appears to be subjecting waste rock materials for kinetic testing for periods of at least a year (Plante et al., 2011). A second possible limitation with assessment methods that are currently used for assessing the potential for the release of chemical constituents from waste rock is that they largely look at water-rock interactions with fresh water. By contrast, above ground waste rock and tailings repositories near the salt-lake are likely to contain a large amount of entrained salts from the use of hypersaline processing water and additional salts from the salt-lake surface are likely to be deposited in these areas by wind action. The salts are likely to accelerate the physical and chemical weathering of minerals in rocks and increase the solubility of many metals through the formation of stable chloride complexes. Due to the limited understanding of water-rock interactions in hypersaline areas, the Chemistry Centre has initiated a research project to investigate these processes. It is recommended that the proponent contacts the Chemistry Centre for further advice about this issue. DWER recommends: • The initiation of long-term kinetic testing (for a period of at least 1 year) of representative	

No.	Submitter	Submission and/or issue	Response to comment
		waste rock and tailings materials from the St Ives mining area, and Investigations to assess the potential for chemical constituents of environmental concern to be leached from waste rock materials under hypersaline conditions. It is recommended that the proponent contacts the Chemistry Centre for advice on the most appropriate methods for undertaking these investigations.	
13	DMIRS	The design concepts proposed in the ERD are considered insufficient to address potential risks of the project (i.e. lack of baseline information to inform proper encapsulation of potential acid forming waste material, design of the waste dumps and tailings storage facilities, etc.).	SIGMC disagrees with this comment. There is substantial in formation in the ERD on the potential for acid formation in waste rock (see ERD, Appendices P and Q). Furthermore, procedures for the design of waste rock landforms and the encapsulation of potentially acid forming waste rock are well established in the current operations.
14	DWER	The geochemical test-work that has been carried out at the site has not assessed the potential for chemical constituents of environmental concern to be leached from waste rock materials under hypersaline conditions.	A comparison of the total metal concentrations within the mine waste has been made against nominated EIL and ISQG trigger values for soil and sediment. The potential for these to be leached under hypersaline conditions was not assessed. Backfilling of lake based open pits is a preferred approach by SIGM where feasible. The potential impact of any exceedances on sensitive terrestrial ecosystems is considered to be low, when waste material is backfilled into an existing open pit void. See commitment 13 above.
15	DWER	Potential impacts on the hydrology of Lake Lefroy from the proposed activities will need to be assessed by the DBCA in accordance with the existing *Department of Water and Department of Environment and Conservation – Wetland, Waterways, and Estuary*	SIGMC has been unable to locate a copy or confirm the status of this document.

No.	Submitter	Submission and/or issue	Response to comment
		Agreement (June 2008) which is still in operation.	
16	DWER	With regard to causeways: • Section 2.5.3.6 of the ERD notes that the hydrology of the lake has been adversely impacted by the North-South Causeway built in the 1960s; no significant drainage has been observed to pass through the causeway culverts. • The Beyond 2018 project will include additional causeways to lake infrastructure but no plans or conceptual designs to mitigate impacts to the lake's surface water hydrology have been included in the ERD. • The construction of additional causeways should not be considered in isolation of the existing causeways. The design and construction of existing and new causeways should be improved to minimise environmental impact. Part V cannot regulate the siting or design of causeways and other ancillary mining infrastructure as these are not prescribed activities.	The scope of the surface water modelling undertaken in support of the ERD did not include design of causeways and culverts. Concept and detailed design will be undertaken during future stages of the project and will include environmental considerations, with a focus on innovative designs to improve culvert operation in low gradient, high saline conditions. While this is not within the remit of Part V, these aspects will be approved through future mining proposals pursuant to the *Mining Act 1978* (WA). It should be noted that the proposed causeways for B2018 Project are temporary measures used during the operational phase of the project and will be removed and rehabilitated at closure. The current modelling considered a scenario where the north-south causeway culverts were assumed to be functioning; model results indicated that water levels across the lake are likely to reach equilibrium when causeways are removed. Unless causeways are located in areas where these will impact on and prevent east-west flow connection across the lake, the impacts of causeways will likely be localised. Localised impacts can be further mitigated using strategically placed culverts. Hydraulic model results will be used to inform placement, numbers and size of culverts required to minimise environmental impacts.
17	DWER	The proponent should adhere to the recommendation given in Appendix O, for siting and engineering of new dewatering discharge outlets so as to reduce erosion, flow, sedimentation and contaminants. No commitments beyond the current practice of installing turkey's nests at discharge points have been given by the proponent in the ERD. The design of dewatering	The current practice referred to in this submission already addresses the issues raised in Appendix O. All discharge water passes through a discharge structure as shown in Figure 2-1 of the ERD. Settling ponds in pit voids and underground operations are used to remove sediments from groundwater prior to pumping to a lake-based discharge structure. These structures remove any remaining sediments through settling or trapping by a geotextile layer. The geotextile allows clean water to pass through the

No.	Submitter	Submission and/or issue	Response to comment
		discharge infrastructure can be regulated under Part V; however requirements for siting of infrastructure may be best addressed via Part IV.	discharge structure walls and onto the lake surface where it evaporates. Revised Commitment 6 of the ERD aims at formalising these practices and by developing a dewatering discharge strategy for each new open pit operation.
18	DWER	Further survey and research into the salinity of the lake under flooding conditions needs to be completed to refine the existing knowledge. Only data from two flooding events has been collected since 1999. It appears that the lake does not maintain a low salinity phase and hence is less attractive to birds, but further research is required to support this.	Significant rainfall events are relatively infrequent so monitoring data is limited. However, a study by URS (see ERD, p4-116) noted that "the salinity of water on the main body of Lake Lefroy does not go below 100,000 mg/L TDS, even when a significant rainfall event occurs." As stated in Appendix I of the ERD "The lack of records of migratory shorebirds and waterbirds on Lake Lefroy reflects the lack of a freshwater phase during the filling cycle of the lake. The lake of this phase limits the aquatic invertebrate productivity of the lake and therefore attracts fewer shore and waterbirds". SIGMC has committed to undertaking an ecological study of the lake and peripheral wetlands during a major flood event, to address current knowledge gaps and gain an understanding of salinity and metal concentrations, and potential impacts on aquatic biota.
19	DWER	The impact of the seepage from Tailings Storage Facilities (TSFs) was noted in the previous section 4.5 'Hydrological Processes'. Groundwater mounding in the vicinity of TSFs and the resulting potential impact on vegetation is addressed via a commitment that the construction of TSFs will be informed by detailed hydrogeological and hydrological assessments, and designed to minimise seepage. Mounding from TSFs has also been observed to impact on clay pan hydrology, causing groundwater to discharge to an adjacent clay pan, potentially altering the surface water quality of the clay pan (Appendix O, section 2.4.3.1). An indirect impact of contaminants entering	Future tailings storage facilities will require approval under the *Mining Act 1978* in addition to Part V. Design would include detail on local soil conditions and the potential for seepage. Any seepage will be hypersaline in keeping with the quality of local groundwater. SIGMC agrees with the premise that, as a precaution, tailings storage facilities should be located away from peripheral wetlands. As a precaution and in response to this submission, SIGMC proposes the following commitment: **Commitment 14: Future tailings storage facilities will be located a minimum of 1,000 m from any peripheral wetlands.** The peripheral wetlands have been mapped and are shown in Figure 4-32

No.	Submitter	Submission and/or issue	Response to comment
		peripheral wetlands from seepage was also noted (ERD, section 4.6.4.3). However no data has been provided on the expected water quality of seepage from TSFs. Providing TSFs are sited away from peripheral wetlands, the requirements for TSF design may be managed through Part V regulation of the Premises.	of the ERD. Further to this, SIGMC has committed to a new Exclusion Zone, 'Clay Pans', which provides further protection for these features and sets aside another 95.3 ha from development.
20	DWER	The proposed mitigation and management measures are adequate to manage impacts from groundwater abstraction and dewatering.	Noted. The company's responsibilities under the *Rights in Water and Irrigation Act 1914* are acknowledged.
21	TWSWA	As stated in the review, the Kalgoorlie region contains only minor groundwater supplies. The review also states that external groundwater recharge is restricted and occurs during heavy rainfall events in limited areas. The proponent has been granted a groundwater licence of 30GL per year. However, according to the review, consideration has not been given to the impact of climate change and rainfall patterns in the area, with the predicted nature of these patterns varying between studies. Without clarity on long term impacts of climate change on rainfall patterns and groundwater recharge in the region it is not possible to know the impact of taking 30GL annually from groundwater. Groundwater licences of this size should only be issued after significant research into long term impacts on groundwater supplies is completed, taking into account the most recently available relevant data and climate change impact projections. TWSWA recommends that the proponent address the potential impacts of climate change on groundwater	While there are limited supplies of freshwater and low salinity groundwater in the Kalgoorlie region, there are substantial yields of hypersaline groundwater within Palaeovalley aquifers. This is the case for the Lefroy Palaeodrainage (and several principal aquifer units; basal sediments within the Tertiary palaeovalleys), which require dewatering to allow mining (Appendix M). Based on the hydrogeological assessment completed for the ERD (Appendix M), SIGMC is the only licensed user within the potential impact area of the B2018 Project. Hypersaline groundwater will be simultaneously discharged to the lake, and drawdown limited to within the lake perimeter, with negligible effects on vegetation (Appendix M). Previous groundwater data from 2010 to 2016 indicates an average salinity (TDS) of >260,000 mg/L, with average abstraction rates of close to 9.3 GL/a, with rates for the B2018 Project ranging from <6 GL/a up to 20GL/a, typically well below the expected 30 GL/a license condition (Appendix M; Section 4 and Section 7.9.7). The most recent annual environmental monitoring program (Stantec 2018b) indicates groundwater levels have recently recovered and there are no impacts on riparian vegetation associated with dewatering. In addition, there is evidence to suggest the presence of Groundwater Dependant

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		recharge, and the impacts of incomplete aquifer recharge, as well as monitoring the threshold response for groundwater dependent species throughout the entire groundwater extraction period.	Ecosystems (GDE's) in the DE are limited. *Tecticornia* for example, are more likely to be more reliant on periodic recharge of the vadose zone. *Melaleuca* and *Eucalyptus* species are also highly unlikely to access the extremely saline groundwater (ERD Section 4.2.3.6, page 4-28). Climate change predictions suggest that there will be a decrease in winter and spring rainfall but with potential for an increase in total rainfall attributed to short-term intensive events (Watterson *et al*. 2015). This may lead to increased recharge of groundwater over the longer-term. Therefore it is suggested that the existing annual monitoring of groundwater and the lake environment, which includes riparian vegetation, will be sufficient to assess potential impacts associated with changing groundwater levels and climate change.

3.6 Social Surroundings

Table 3-9: Beyond 2018 Project – Responses to Submissions – social surroundings

No.	Submitter	Submission and/or issue	Response to comment
1	Department of Planning, Lands and Heritage (DPLH) (p1)	The Department of Planning, Lands and Heritage (DPLH) has reviewed the ERD and notes that Aboriginal heritage is addressed in the Social Surrounding section of the ERD. DPLH notes the following information: • A total of 35 heritage surveys (archaeological and ethnographic) have been undertaken within the DE, which is within the Native Title Claim of the Ngadju People. There are still unsurveyed areas within the DE, within which St Ives will ensure future heritage surveys are undertaken in consultation with the Ngadju People. • St Ives has implemented a Heritage Management Plan (HMP) to mitigate any potential impact to Aboriginal sites and Aboriginal heritage places. The HMP is intended to provide high level guidance for the management of heritage through the life of the Proposal. • In the event that disturbance to Aboriginal sites and Aboriginal heritage places is unavoidable, statutory applications (section 18) under the *Aboriginal Heritage Act 1972* will be submitted. Based on the above, DPLH considers that Aboriginal heritage has been adequately addressed.	SIGMC will continue to manage Aboriginal heritage issues and meet the requirements of the *Aboriginal Heritage Act 1972* during the implementation of the Beyond 2018 Project (if approved).

No.	Submitter	Submission and/or issue	Response to comment
2	TWSWA	The review stated that research helps predict the location and assess the significance of any archaeological sites, however, there is very little evidence confirming whether all sites have been inspected or not. It was also emphasised that the heritage survey has not been collated or synthesised. Under the Heritage Act, the results of a heritage survey allow the government's decision regarding heritage protection for organisations to enter the local heritage register and which specific areas is needed for protection. Carrying out a heritage survey is essential in maintaining care for heritage places for Aboriginal and Torres Strait Islander people. The heritage survey would in turn provide a 29 No. Submitter Submission and/or issue Response to comment consolidated final report which would include a systematic investigation of heritage resources and sacred sites associated with the Aboriginal tradition or Island custom and places that are connected to their history prior to the settlement of Europeans. Hence, it is recommended the proponent carry out a heritage survey and provide the consolidated report before taking further steps. The review also mentions that the ground disturbance associated with the proposed project may have an impact on the previously undisturbed, undiscovered or in situ archaeological deposits and that there will be a major impact on any archaeological remains at or near the surface because such material, if it is present, would either be damaged by heavy machinery or removed from its stratigraphic context. TWSWA recommends the proponent first carry out a complete heritage survey and provide the consolidated report before taking further steps. Should any cultural heritage site be discovered, TWSWA recommends the project not go ahead to ensure all archaeological remains are preserved in situ.	As outlined in Section 5.1.3 of the ERD, 35 archaeological and ethnographic surveys have been conducted in and around the DE. Where early surveys presented information that was of medium or low confidence, the sites were revisited and reassessed in 2017. The reference to the heritage survey that “has not been collated or synthesised” relates to survey of the Ngadju native title determination area (100,000 km^2) as a whole and not to heritage sites within the DE. SIGMC considers that the area has been adequately surveyed for Aboriginal heritage values and DPLH shares this view (see item 59). SIGMC will continue to manage Aboriginal heritage issues and meet the requirements of the *Aboriginal Heritage Act 1972* during the implementation of the Beyond 2018 Project (if approved).

No.	Submitter	Submission and/or issue	Response to comment
3	TWSWA	New proposed boundary in close proximity (approximately 2 km) to Kambalda East townsite which has a high risk for creating amenity issues for the residents. The close distance of the expanded mine operation to the townsite is also in opposition to the Shire of Coolgardie's objectives for rural land as specified in the Local Planning Scheme, where it specifies that the rural character of the town should be retained. Points of concern from the expansion of mining operations regarding amenities are as follows: • Impacts on Kambalda East residents from noise and air pollution from an increase in vehicles servicing the mine site and also mining equipment associated with the proposed expansion of the gold mine; and Increased risk for other road users near the Kambalda East townsite from increased traffic.	The ERD included investigations into noise. All modelled scenarios in relation to the mine operations were predicted to comply with the *Environmental Protection (Noise) Regulations 1997*. Nonetheless, the ERD identifies a number of noise mitigation measures that will be implemented during the Beyond 2018 Project. If approved, the Beyond 2018 Project will be implemented gradually as existing mining operations are completed. Employees and contractors from existing mines will be reassigned and significant changes to the workforce numbers are not anticipated. Similarly, a significant change in traffic volume in Kambalda East is not anticipated.

No.	Submitter	Submission and/or issue	Response to comment
4	TWSWA	Extension of operation also suggests the potential for more onsite employees, which would require extra accommodation needs in the Townsite. As the number of potential extra employees is not classified in the EPA review, there should be considerations of amenity issues that relate to the expansion of the mining workforce in the townsite. The Shire of Coolgardie should determine whether they have the capacity in Kambalda East townsite for extra mining accommodation. The proposal presented to the EPA not only did not address these amenity issues, nor did it did acknowledge the possibility of these amenity issues occurring and the close proximity of the expansion to the Kambalda East Townsite. TWSWA recommends that the proponent should address the issues of increased noise, pollution, road use and a decrease in visual amenity.	See previous response regarding the number of employees.

3.7 Air Quality

Table 3-10: Beyond 2018 Project – Responses to Submissions – air quality

No.	Submitter	Submission and/or issue	Response to comment
1	TWSWA	With specific consideration of the Climate Council IPCC summary and the fact that global warming has already occurred to 1°C and any further warming would be devastating to the climate, it may be argued that even minimal emissions from the St Ives Gold Mine are not acceptable. There appears to be no evidence that the St Ives Gold Mine project has any interest in investing in new forms of lower-emissions mining and transportation methods or machinery. The EPA encourages practices such as “proposal design, technology and operation that ensure emissions are minimised”. The IPCC report states that "by 2030 global emissions must be down by at least 45% from 2010 levels", and that "we are not on track to achieve this woefully inadequate target" The projection results predict a total of 259,589,702 Tonnes CO 2 – e for the years 2018-28, which certainly does not align with targets of emissions reduction by 2030. If emissions continue at their current rate, by 2030 global warming will exceed 1.5°C between the years 2030 and 2052. The Climate Council has urged in their summary the need for "a deep and rapid transformation of economic, technological and social systems, beginning immediately". It is in this light that we find the expansion of the St Ives mine objectionable. If all other countries around the world were to follow Australia's abysmal targets, the Climate Council writes, "warming could reach over 3°C and up to 4°C". There is also evidence to suggest that there is an impending “long-term decline in ore grade, which increases energy	The main sources of energy in use at SIGMC are electricity from the local grid and diesel-powered vehicles and generators. SIGMC expects greenhouse gas emissions during the Beyond 2018 Project to closely track total material moved (see ERD, Figure 5-4). SIGMC’s parent company, Gold Fields Ltd, has issued a Climate Change Policy Statement which includes commitments to reduce greenhouse gas emissions. In this policy context, SIGMC is open to the adoption of developing technologies that decrease emissions and increase efficiency.

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		consumption". As the St Ives mine in 2012 only achieved a 4% progress ratio in mining recovery processes "to maintain or decrease the energy consumption during mining operations", the mine must increase its efficiency to justify the emissions it is projected to create within the next decade. If this does not occur, the justification for an extended period of mining is flawed. Additionally, the air quality concerns surrounding mining and mining areas must be addressed. If pollution occurs in the form of dust or particles equal to or smaller in size than PM_{10}, it poses a threat to human and animal life. Such particles become trapped in the cilia that lines airways in the human body, which can stick to mucus that "can then be swallowed or coughed up. TWSWA recommends that further research is required regarding sustainability practices outlined by the proposal which directly address reductions in emissions.	

4 SUMMARY OF REVISED COMMITMENTS

The Beyond 2018 Project ERD contained nine commitments that SIGMC agreed to meet if the proposal is approved. Following consideration of the submissions received, SIGMC has modified some commitments and added a further five. The final proposed commitments are as follows:

Commitment 1 (revised): To protect flora and vegetation, establish six exclusion zones – Exploration 1, Oyster and Coral Islands, Pistol Club West, Pilbailey, Implacable and Clay Pans- within the Development Envelope within which no mine-related activities may occur.

Commitment 2: The total clearing of native vegetation is limited to 3,000 ha on land for the duration of the B2018 Project.

Commitment 3: Further targeted surveys will be conducted outside the Development Envelope during the B2018 Project to build on the understanding of conservation significant vegetation types and flora.

Commitment 4: To protect terrestrial fauna, establish three exclusion zones – Exploration 1, Pilbailey and Implacable - within the Development Envelope within which no mine-related activities may occur.

Commitment 5 (revised): Undertake further survey work for *Lychas* 'SIGM132' and *Aganippe* sp. indet. prior to undertaking ground disturbing works at known locations for these taxa.

Commitment 6 (revised): A dewatering discharge strategy will be developed for each new open pit operation on the lake, prior to its commencement. The strategy will consider:

- Existing dewatering practices elsewhere (including engineering and other controls) and impacts, if any;
- Likely discharge volumes;
- Potential for localised flooding, including placement of dewatering discharge facilities no closer than 200 m to the riparian fringe;
- Likely extent and location of salt crust formation;
- Consideration of the water quality of the dewater discharge for any new pit ahead of discharge; and
- Potential for impact to Exclusion Zones and the riparian zone generally and, where necessary, measures for protection of these areas.

Commitment 7: SIGMC will commence routine monitoring of salt crust formation around lake discharge points.

Commitment 8: To protect peripheral wetlands, establish three exclusion zones – Exploration 1, Pistol Club West and Implacable - within the Development Envelope within which no mine-related activities may occur.

Commitment 9: Continue to refine datasets to progress the understanding the ecological values of the peripheral wetlands and the lake within a regional context.

Commitment 10: SIGMC will develop and implement a vegetation health monitoring program for the six Exclusions Zones.

Commitment 11: To undertake surveys for malleefowl prior to disturbance of terrestrial habitats, using LIDAR or similar technology, and sharing data with the NMRT and DBCA.

Commitment 12: An assessment of the dissolved Ra content of groundwater will be undertaken and the result provided to DWER.

Commitment 13: SIGMC will initiate a kinetic testing program for waste rock and will consider the potential impacts of hypersaline conditions on generation of acid or metalliferous leachate.

Commitment 14: Future tailings storage facilities will be located a minimum of 1,000 m from any peripheral wetlands.

5 REFERENCES

NOTE: *In-text references have been kept consistent with the ERD (e.g. Outback Ecology (2011b), despite 2011a not being referenced in this response to submissions).*

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