ATTACHMENT 7

HASTINGS
Technology Metals Limited

Yangibana Rare Earths Project

Minor or Preliminary Works:
Works application

Supplementary documentation

14 May 2018

Document Reference:

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ACRONYMS AND ABBREVIATIONS

ALARP	As Low As Reasonably Practicable
ARI	Average Recurrence Interval
Bq/g	Becquerel per gram (measure of radioactivity)
BoM	Bureau of Meteorology
DWER	Department of Water and Environment Regulation
DFS	Definitive Feasibility Study
DMIRS	Department of Mines, Industry Regulation and Safety
DoEE	Department of the Environment and Energy (formerly Department of the Environment) (Cwth)
DBCA	Department of Biodiversity Conservation and Attractions
EMP	Environmental Management Plan
EMS	Environmental Management System
EP Act	*Environmental Protection Act 1986* (WA)
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
GDE	Groundwater Dependent Ecosystem
GL	Gigalitre
GWL	Groundwater Licence
Ha	Hectare
IBRA	Interim Biogeographic Regionalisation for Australia
Km	Kilometre
mAHD	Metres Above Height Datum
mBGL	Metres Below Ground Level
MCP	Mine Closure Plan
mg/L	Milligrams per litre
Mtpa	Million tonnes per annum
MW	Megawatt
NORM	Naturally Occurring Radioactive Material
REE	Rare Earth Elements
RIWI Act	*Rights in Water and Irrigation Act 1914* (WA)
SQRA	Semi Quantitative Risk Assessment
SRE	Short Range Endemics
WWTP	Waste Water Treatment Plant
TDS	Total Dissolved Solids
TEC	Threatened Ecological Community
TO	Traditional Owner
WC Act	*Wildlife Conservation Act 1950* (WA)

1 INTRODUCTION

1.1 OVERVIEW

The Yangibana Rare Earths Project (the Yangibana Project) is located approximately 270 kilometres (km; 'as the crow flies') east-northeast of the town of Carnarvon on Gifford Creek and Wanna Stations in the Gascoyne Region of Western Australia. The minor or preliminary works phase of the Yangibana Project involves the construction of the access road and accommodation facilities, as well as, a temporary camp and laydown area at the proposed process plant area. Four borrow pits are required to provide road base material. A mobile crushing and screening plant will be utilised in each borrow pit area to ensure consistency and road base specifications of excavated materials are met prior to transport to the respective road construction area.

This application specifically relates to a works approval for prescribed premises as defined by Schedule 1 of the Environmental Protection Regulations 1987 (WA), under the following categories:

- Category 12: *Screening etc. of material: premises (other than premises within category 5 or 8) on which material extracted from the ground is screened, washed, crushed, ground, milled, sized or separated.*

  Production of design capacity - *50,000 tonnes or more per year*

- Category 85: *Sewage facility: premises —*

  (a) on which sewage is treated (excluding septic tanks); or

  (b) from which treated sewage is discharged onto land or into waters.

  Production or design capacity - *More than 20 but less than 100 m^3 per day*

- Category 64: *Class II or III putrescible landfill site: premises on which waste (as determined by reference to the waste type set out in the document entitled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer and as amended from time to time) is accepted for burial.*

  Production or design capacity - *Greater than 20 tonnes or more per year*

Works approvals will be submitted for prescribed premises of the broader project in subsequent applications.

1.2 APPLICANT DETAILS

Hastings Technology Metals Limited (Hastings) is an ASIC listed company and holds tenements, which form the Yangibana Project, under its 100%-owned subsidiaries, Gascoyne Metals Pty Limited and Yangibana Pty Ltd. The Project is located within six tenements currently granted under the *Mining Act 1950*, comprising two mining leases (M09/158 and M09/157), four miscellaneous leases (L09/80, L09/81, L09/70, L09/68) and one general purpose lease (G09/14). The borrow pits (specific to the works application) occur on M09/157, M09/158 and G09/14, the landfill occurs on E09/2018 and the waste water treatment plant occurs on L09/80.

Proof of occupier status and an ASIC company extract are provided in **Attachments 1A and 1B,** respectively.

The underlying land tenure is pastoral lease, with the Project overlying Gifford Creek and Wanna Stations (both stations are owned by the same leaseholder, Bagden Pty Ltd and previously formed the single lease Wanna Station).

The Thiin-Mah Warriyangka, Tharrkari, Jiwarli (TMWTJ) people have a native title claim (WC2016/003) (WAD464/2016) over the Project area and beyond. The native title claimants are represented by the Yamatji Marlpa Aboriginal Corporation (YMAC). Hastings has negotiated a Native Title Agreement with the TMWTJ group, which was ratified in November 2017.

2 PREMISES DETAILS

The prescribed premises occur within the Shire of Upper Gascoyne.

The tenements (M09/158, M09/157, G09/14, E09/2018 and L09/80) are located approximately 270 kilometres (km; 'as the crow flies') east-northeast of the town of Carnarvon and approximately 150 km northeast of Gascoyne Junction in the Upper Gascoyne Region of Western Australia (**Attachment 2**).

3 ACTIVITIES

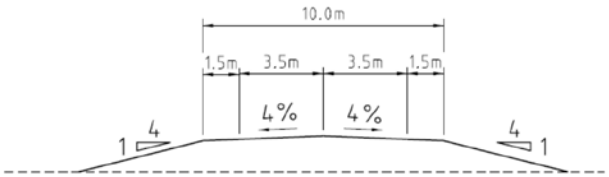
The Yangibana Project site plan presents the proposed location of key activity areas (**Attachment 2**).

3.1 ACCESS ROAD

An unsealed access road (approximately 29.4 km long and 20 m wide) is proposed to provide access to the accommodation village, and then to the temporary camp and laydown area at the process plant area, from the Cobra-Gifford Creek road. A concrete causeway will be constructed to cross the width of the river (Lyons River). Due to the small quantities required, the concrete aggregate will be sourced off-site. There will be culverts at the lower part of the causeway to allow the Lyons River base flow to continue unimpeded underneath the causeway. The construction of the road and causeway is required to enable the safe movement of exploration drilling equipment to and from the site during all weather conditions. Hastings has been granted a Bed and Banks Permit (PMB201193(1)) under the *Rights in Water and Irrigation Act 1914* (WA) by the Department of Water and Environmental Regulation (DWER) to construct the access road across the Lyons River and other drainage channels.

During construction, a temporary vehicle movement track will occur alongside the access road and temporary laydown areas may also be required for culverts, machinery, light vehicles etc.

A typical section of the proposed unsealed access road is shown below:



TYPICAL ACCESS ROAD SECTION
(NTS)

Shallow relief drains (running at an angle of approximately 45 degrees to the road) will also be constructed to direct water off the access road and away from spoon drains on either side during heavy rainfall events. The disturbance footprint includes consideration of minor clearing for the shallow relief drainage along the road.

Vegetation and topsoil will be cleared together to a depth of approximately 200 mm using a lowered blade. The vegetation and topsoil will be stockpiled and reinstated during rehabilitation.

Topsoil collected (in accordance with the Hastings *Land Clearing and Topsoil Stockpile Work Instruction*) from within the access road footprint will be paddock dumped and stored at a height of up to two metres, and has been assigned 0.25 ha every 1.25 km alongside the road. Topsoil storage will require a total area of 5.6 ha.

3.2 BORROW PITS (CATEGORY 12 SCREENING AND CRUSHING PLANT)

Road base materials will be sourced from borrow pits on M09/158, M09/157 and on G09/14. Two types of road base will be sourced from borrow pits. Approximately 45,300m^3 of selected fill material will be excavated from the borrow pits without further treatment. Approximately 85,530m^3 of fill material will require crushing using a mobile crushing and screening plant (similar to that shown in Figure 1). The power generation of the mobile crushing and screening plant will be

integrated, with a diesel engine driving a 70kVA 400V generator set. The maximum design capacity of the borrow pits is approximately 363,000m^3.

The borrow pits are located at the top of the local catchment on relatively flat ground on rocky upland areas. Drainage lines occur within 100m of the southern extent of the borrow pit on M09/158 and within 200 m of the eastern boundary of the borrow pit on G09/14. Access to borrow pits will be on existing exploration tracks, which may require maintenance and upgrading in some locations to allow truck movement.

The borrow pits are approximately 5.5 m deep over an area in total of approximately 21 Ha. Topsoil collected from the borrow pit area will be stored on the upland side of each borrow pit. The borrow pits will require bunding around their perimeter to direct surface water flow (minimal due to their location) around the structure. Land clearing of the borrow pits will occur over a period of approximately 18 months, with one borrow pit being used at a time and at completion (of at least one type of road base), the next borrow pit with then be cleared.

A borrow pit (S1-N; Attachment 3B-i) will also be utilised to place and encapsulate plain soils at closure. Plain soils will be stored alongside the road until the borrow pit is ready for closure. Plain soils collected during clearing activities will be placed in the borrow pit, covered with 20 cm of subsoil and then rehabilitated using the previously stored topsoil. Hastings will follow the mitigation hierarchy for the management and closure of borrow pits.

Figure 1 A mobile crushing and screening plant of similar size to that proposed in this application

3.3 TEMPORARY EXPLORATION CAMP AND LAYDOWN AREA

A temporary exploration camp area, and associated core yard, fuel area, and equipment storage area is proposed to be located at the proposed process plant area. The temporary exploration camp will be built to accommodate a workforce of up to 80 personnel for exploration and investigative works as per the following estimates:

- Water investigations (2 drill rigs – 30 personnel)
- Geotechnical investigations (5 personnel)
- Mineral exploration (2-3 drill rigs – 30 - 45 personnel)
- Environmental assessments (4 personnel)
- Heritage surveys (12 personnel)

Construction personnel will reside at a fly camp within the footprint of the approved s41A application and construction activities will remain separated from the exploration and investigative works activities during the construction period. This will ensure safer traffic movements during the construction period.

It is not expected that all identified personnel will be on-site at any one time. The majority of occupants will be those conducting water investigations and mineral exploration activities while others will be arriving intermittently for short periods of time.

Supporting facilities include a kitchen and dining area, laundry, potable water storage tanks, offices and medic facilities. Hastings shall ensure the exploration camp contractor will comply with the *Food Act 2008* and associated regulations.

In addition, a temporary laydown area for equipment and a core yard will also be included within the footprint. The core yard will be the storage area of all core samples obtained from drilling programs. It will be stored in separated units for easy identifications and retrieval. Passage ways will be left in between units for a forklift to lift core samples. Some samples will be sent to Perth for laboratory analysis whilst new core samples will be stored and logged from recent drillings.

The equipment stored at the laydown will be a combination of exploration spare parts, and an area will be set aside for maintenance and repairs of drill-rigs and other equipment, and the plant long lead delivery items. For example, the rotary kiln will be delivered in 4 circular sections, each approximately 4.5 m diameter and 19 m long. Other components of the rotary kiln will be mechanical items. Another long lead delivery item will be the components for the sulfuric acid production equipment. Concrete footings may also be put in place to aid with storage. It will be delivered in various sizes and shapes, and in many components. Subject to when the main EPA approval is scheduled, there may be other long lead delivery items being stored at this temporary laydown area.

Self-bunded fuel tanks will also be stored on-site. Power will be supplied from diesel-fuelled generators (two 20kVA) using self-bunded temporary diesel storage tanks. Water will also be supplied from an existing groundwater bore and treated to *Australian Drinking Water Guidelines*.

Topsoil storage (Hill soils) will require an area of approximately 2.5 ha (200 mm of topsoil collected from a disturbance footprint of approx. 25 ha and stored at 2m in height).

3.4 SITE ACCOMMODATION VILLAGE

The accommodation facility, located approximately 18km along the proposed access road from the Cobra-Gifford Creek road, is built to accommodate a workforce of up to 100 personnel as per the following estimates:

- Water investigations (2 drill rigs – 30 personnel)
- Geotechnical investigations (5 personnel)
- Mineral exploration (2-3 drill rigs – 30 -45 personnel)
- Environmental assessments (4 personnel)
- Heritage surveys (12 personnel)
- Preliminary and minor works approval (20 personnel)
- Borrow pit investigations and transport (5 personnel)
- Hastings management including H&S Superintendent, Environmental Manager, and Engineers (10 personnel)
- Visitors (Government, investors) (2-6 personnel)
- Accommodation village operators & security (17 personnel)

It is not expected that all personnel will be on site at any one time to fill the maximum capacity of the site accommodation facility. The majority of occupants will be those that are conducting water investigations, mineral exploration activities and accommodation village operators. Other people will be arriving and departing intermittently for short periods of time.

Facilities

The accommodation village will have the following facilities:

- Sleeping Quarters
- Dining/Kitchen
- Wet Mess
- Laundry
- Multipurpose court
- Gymnasium/Recreation Building
- First aid medical and emergency response centre
- Administration and office building
- Raw water treatment plant and potable water storage tanks
- Waste Water Treatment Plant and irrigation field
- Power generation
- Communication facilities

In addition, part of the accommodation facility area will also serve as a laydown area for drill cores, drill rig maintenance facilities, chemical and hydrocarbon storage facilities, vehicles and machinery. Self-bunded fuel storage tanks will also be stored on-site.

Power

Power will be supplied from three diesel fuelled generator sets, each generating 350kVA. The total power for the early works program is as follows:

Aspect	#	Capacity (kVA)	Total (kVA)
Accommodation village	3	350	1050
Crushing plant	1	70	70
Fly camp	1	20	20
Bore (FRW03)	1	20	20
Exploration camp	1	60	60
Core yard (saw)	2	3	6
TOTAL			**1226 kVA**
			1.23 MVA

Fuel for the generator sets will be obtained from self-bunded temporary diesel storage tanks.

Water supply

Water will also be supplied from a groundwater bore and treated to Australian Drinking Water Guidelines.

Land clearing and topsoil management

Vegetation and topsoil will be cleared together to a depth of approximately 200 mm using a lowered blade. The vegetation and topsoil will be stockpiled and reinstated during rehabilitation. Topsoil collected (in accordance with the Hastings *Land Clearing and Topsoil Stockpile Work Instruction*) from within the accommodation village footprint will be paddock dumped and stored at a height of 2m. Topsoil storage will require an area of approximately 0.6 ha.

3.5 LANDFILL (CATEGORY 64)

A small landfill (currently approved under a Programme of Works for the existing exploration accommodation village and a second is under assessment) will continue to operate for disposal of putrescible waste, however a disturbance footprint of 0.15 ha has been allocated to meet any additional volume of putrescible waste from the 100-person accommodation facilities, if required. To-date, exploration and investigative activities have not disposed > 20tonnes per annum due to the intermittent nature of activities on-site.

Only putrescible or inert (type 1 or 2) waste will be disposed in the exploration camp landfill: Putrescible wastes contain organic materials such as food wastes and wastes of animal or vegetable origin, which readily bio-degrade. General camp and office waste will also be disposed of in this landfill. Given the intermittent number of people residing in the accommodation village at any one time, a conservative estimate of no more than 30 tonnes of waste per annum has been allocated.

No construction, chemical waste or hydrocarbons will be disposed of in the landfill as per construction agreements. These will be removed off-site as per the respective contract agreements.

The landfill will involve the progressive construction of a series of four small trenches of 2 m x 20 m in area and 2 m in depth for use as landfill to support exploration and investigative activities. These landfill trenches will be regularly buried with 100mm of soil to prevent feral fauna and odours. The trenches will be backfilled until level with the surrounding ground on decommissioning and rehabilitated.

3.6 WASTE WATER TREATMENT PLANT (CATEGORY 85)

The Waste Water Treatment Plant (WWTP) is a containerised 5 stage treatment train, housed in a 40 foot sea container with external balance and irrigation tanks (Figure 2). The system is designed to treat effluent to Western Australian Class C standards and will be managed in accordance with AS/NS 1547:2012 *On-site Domestic Wastewater Management*.

Inputs

Effluent to be treated by the WWTP will be comprised of sewage and grey water from the accommodation village.

Throughput

The WWTP (Figure 2) will be used to service the accommodation facilities. The WWTP has the capacity to take a maximum throughput of 90m^3 per day (90 KL/day), which allows for 260L per person per day (i.e. 350-person accommodation village). During preliminary and minor works, there will be up to 100 people residing at the accommodation village, which will increase to 240 people during the construction phase (allowing for a max. 300L/person/day) with an actual throughput of 72m^3 per day.

Figure 2 The proposed Waste Water Treatment Plant (provided by Iconic Water solutions)

Process

The WWTP (layout is shown in **Figure 3**) is a 5 stage Bardenpho treatment process (i.e. utilises very few chemicals). The process proceeds as follows:

- Waste collection (pump station): The raw sewage, gravity fed from its source, is then pumped to the balance tank. This transfer is controlled by pre-set level floats within the pump pits.
- Screening (Spirac screen): From the pump station, the raw influent passes through a Spirac inlet screen which removes inorganic waste in the influent. The inorganic waste is dewatered and disposed of into a bin automatically. The screened influent is gravity fed to the balance tank.
- Mass holding (22kL Balance tank): The Balance tank is a 22kL poly tank designed to handle peak flows from the sewage pump pits over a 12 hour period, providing a controlled flow twice daily into Primary tank one. The flow rate from the balance tank to Primary tank one is set using the flow control valve located in the balance tank (set point is to be determined on site).
- Anaerobic treatment (Primary tank 1): The Primary tank 1 acts as a holding/mixing tank to introduce sludge drawn from the clarifier to the influent. This sludge acts to introduce bacteria to the influent and return the converted nitrates to the anoxic zone to be further converted to nitrogen gas. The mixed influent flows to the Primary tank 2 using a trickle through system to allow the top surface of the water to overflow to the Primary tank two. The Waste water in the tank is kept suspended by a mixer.
- Anoxic treatment (Primary tank 2): This becomes a true anoxic zone for the treatment process allowing de-nitrification to occur. The conditions within the anoxic tank allow anaerobic bacteria to flourish, converting oxidised nitrogen in solution to nitrogen gas. This tank is also kept suspended via a mixer and has a trickle through system, the same as primary 1 tank which flows through to the aeration tank.
- Aeration (Aeration tank): This is where the main part of the treatment process is achieved. Oxygen is provided via a mixing aerator which is controlled via on/off timers set to maintain the dissolved oxygen (DO) levels of between 1-2mg/l. This allows for oxidisation of nutrients, reducing ammonia, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and the like. Return activated sludge (RAS) is kept to a level of approximately 250-400mg/L controlled by the RAS/Waste Activated Sludge (WAS) pump timers. The waste water then flows through to the clarifier.
- Clarification (Clarifier tank): The clarifier tank is where the suspended activated sludge is settled out. As influent enters the clarifier it is dosed and mixed with poly aluminium chloride (PAC) this assists with the process by binding the particles together. The sloping floor and baffles cause the clear supernatant (treated Effluent) to pass through the baffles and into the chlorine contact tank. The settled sludge is removed from the clarifier via a RAS pump, which returns the activated sludge to primary one tank to mix with new incoming raw sewerage. The RAS pump also acts as a wasting pump to assist in maintaining Mixed Liquor Suspended Solids (MLSS) levels. The return line has a 3-way motorised valve which is controlled via a timer to allow wasting as required by the system. The wasted sludge gets pumped into the sludge thickening tank.
- Chlorination (Chlorine contact tank): The Chlorine Contact tank is where chlorine is added via a tablet form to reach and maintain a chlorine residue of around 2mg/L. This tank also allows for 30mins retention and contact time before entering the final irrigation tank.
- Irrigation (22kL Irrigation tank): The Irrigation Tank is the final tank in this Class C system and is controlled using level floats. From the Irrigation tank the treated effluent is either transferred to the Class A polishing unit or is discharged through the irrigation flow meter to

the spray irrigation field (emissions discharge point). The irrigation tank will also receive waste water (500 TDS) from the Reverse Osmosis Plant.

- Sludge Thickening (9.5kL Sludge thickening tank**):** This poly tank is used to thicken excess sludge ready for removal via a waste disposal truck. After the settled sludge has thickened, the clear supernatant is ready to overflow into a sump and be returned to the balance tank during the next wasting.

Outputs

The Class C treated wastewater will be disposed in a fenced irrigation field (approximately 1 Ha in area for the early works phase and to be expanded to 4 Ha for the construction phase). All other waste will be removed from the site and disposed at an approved disposal facility.

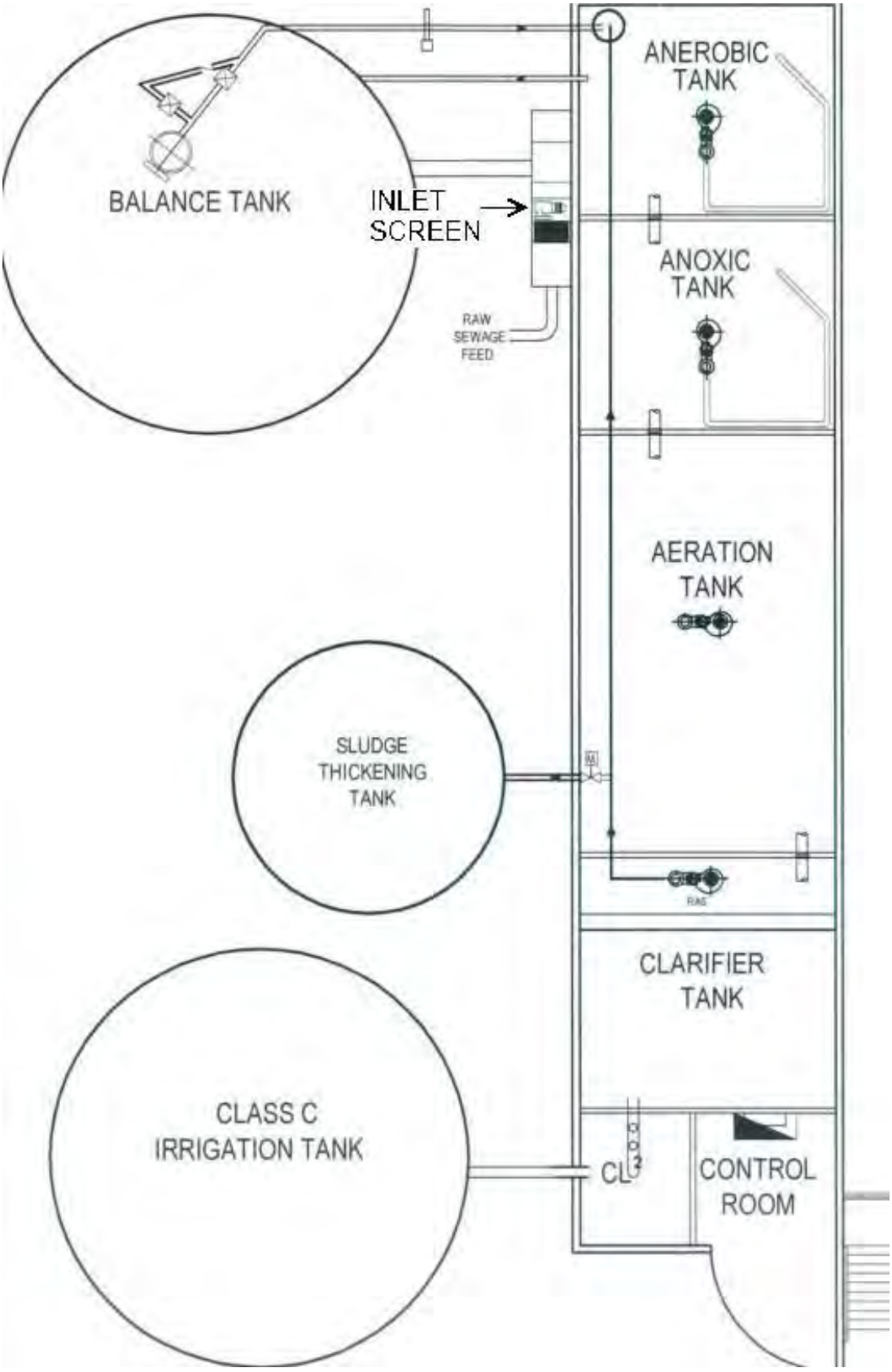


Figure 3 Layout of waste water treatment plant

3.7 WATER ABSTRACTION

A groundwater bore and associated infrastructure, located in the fractured rock aquifer of the Frasers pit area, will abstract 0.28 GL/annum. This water is required during construction of the access road and accommodation facilities:

- As potable water source for personnel;
- to service the accommodation facilities;
- to support construction activities; and
- for dust suppression.

Hastings has been granted a section 5C licence (Groundwater Licence: GWL183285(2)) to abstract water by the Department of Water and Environmental Regulation, as required under the *Rights in Water and Irrigation Act 1914* (WA).

4 DWER APPROVALS AND OTHER APPROVALS

Assessment of environmental legislation relevant to the Project highlighted a number of approvals and licenses, which are required prior to the commencement of the Project. Table 1 summarises the environmental legislative framework for the Project, and outlines approvals sought and /or required for the Project.

Table 1 Environmental Legislative Framework for the Yangibana Project

Relevant Legislation & Regulatory Agency	Environmental Factor Regulated / Affected	Relevant Approval / Requirement
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Commonwealth Department of the Environment and Energy (DoEE)	Matters of National Environmental Significance:	The Preliminary or minor works of this Proposal occur as a component of a larger Project currently assessed as a 'controlled action' under the EPBC Act. Two approvals under section 156 of the EPBC Act approval has been granted for the minor or preliminary works.
Environmental Protection Act 1986, Part IV (EP Act) Environmental Protection Authority (EPA)	Key environmental factors: • Flora and Vegetation • Subterranean Fauna • Terrestrial Environmental Quality • Inland Water Environmental Quality • Human Health	Ministerial approval under Part IV of the EP Act. A S41A(3) approval to conduct the preliminary or minor works has been granted by the EPA Chairman for the entire scope of works.
EP Act, Part V Department of Water and Environmental Regulation (DWER); Department of Mines, Industry Regulation and Safety (DMIRS)	Pollution to land, air and water. Prescribed premises categories that may be applicable include: (12) Screening plant (54 or 85) Sewage facility (64) Landfill Clearing of native vegetation	Works approvals and operating licence / registration under Part V of the EP Act. The category 12 screening plant and the category 85 sewage facility works application is the subject of this application. A Native Vegetation Clearing Permit (NVCP; Purpose Permit 7834/1) has been granted by DMIRS to clear 52.5 Ha on tenements L09/80 and L09/81 for the access road and accommodation village. A second NVCP application (CPS 8050) is currently under assessment for the access road extension, temporary camp and laydown area and two borrow pits.
Rights in Water and Irrigation Act 1914 (RIWI Act)	Water resources (groundwater) Bed and banks (surface water)	Licence to Take Water (5C licence, Groundwater Licence

Relevant Legislation & Regulatory Agency	Environmental Factor Regulated / Affected	Relevant Approval / Requirement
Department of Water and Environmental Regulation (DWER)		(GWL183285(2)) groundwater abstraction limit of 0.28GL per annum within the Gascoyne Groundwater Proclamation Area. A Bed and Banks Permit application to construct a vehicle crossing over the Lyons River and other drainage channels has been approved by DWER (PMB201193(1)).
Radiation Safety Act 1975 Radiological Council *Mine Safety and Inspection Act 1994* DMIRS Safety Division	Naturally occurring radionuclide minerals (NORM) associated with the target mineral resource.	Registration of premises for mineral exploration issued by the Radiological Council. Hastings is implementing an Exploration RMP. Hastings has an approved Radiation Safety Officer for the purposes of mineral exploration drilling. NORM does not apply to the scope of the minor or preliminary works.
Mine Safety and Inspection Act 1994 *Mine Safety and Inspection Regulations 1995* DMIRS Safety Division	Safety of workforce; duty of care	A Project Management Plan (PMP) approval has been granted (PM-312-263173) by DMIRS.
Dangerous Goods Safety Act 2004 DMIRS	Storage of dangerous goods	Contractors will be responsible for ensuring the necessary licenses are in place for the storage of dangerous goods.
Aboriginal Heritage Act 1972 Department of Planning, Lands and Heritage	Aboriginal Heritage – sites and artefacts	Heritage surveys undertaken over the disturbance footprint for Minor or Preliminary Works. No sites of heritage significance occur within the disturbance footprint, however one site occurs within the development envelope of the process plant area. This site will be protected.
Health Act 1911 (Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974) Department of Health (DoH) Shire of Upper Gascoyne	Approval to Construct or Install an Apparatus for the Treatment of Sewage Drinking Water Quality Management Plan	Application to construct a waste water treatment plant (irrigation) is currently under assessment. A Drinking Water Quality Management Plan has been submitted to the DoH for approval.

5 STAKEHOLDER CONSULTATION

Stakeholder engagement is required to ensure stakeholders contribute to the Project development, operations and closure planning process and obtain agreement on the location of infrastructure, mining landforms and the post mining land use.

5.1 STAKEHOLDER ENGAGEMENT STRATEGY

Hastings has implemented an external and community relations strategy, and developed the methodology for ongoing social assessment, engagement, community investment and community consultation.

A Stakeholder Engagement Management Plan has been developed to provide a framework for Hastings to engage in structured, meaningful and effective stakeholder engagement and management. The framework comprises a series of work plans, which together form the company's comprehensive external relations plan for the period 2016 to 2021, including key milestones such as DFS completion, Project go ahead, construction, commissioning, and first shipment.

Hastings is committed to ongoing stakeholder communication, engagement and consultation through the planning and approval phase, and through the construction and operational phases of the Project. The Stakeholder Engagement Management Plan strives to provide access to government, to facilitate community partnering, to enable access to land, and a myriad of other objectives to develop and protect the company's reputation.

Hastings can demonstrate, through research and community consultation, that the company has developed and maintains strong relations with the shires and local communities and, utilising an external relations program, that these relationships will continue to be enhanced for the mutual benefit of the Project and relevant stakeholders.

Hastings has adopted principles from the Ministerial Council on Mineral and Petroleum Resources (MCMPR) *Principles for engagement with communities and stakeholders* (2005):

- Communication: Open and effective engagement involves both listening and talking:
    - Two-way communication
    - Clear, accurate and relevant information
    - Timeliness
- Transparency: Clear and agreed information and feedback processes:
    - Transparency
    - Reporting
- Collaboration: Working cooperatively to seek mutually beneficial outcomes.
- Inclusiveness: Recognise, understand and involve communities and stakeholders early and throughout the process.
- Integrity: Conduct engagement in a manner that fosters mutual respect and trust.

5.2 KEY STAKEHOLDERS

Engagement with the Projects' key stakeholders with respect to implementation of the minor or preliminary works has primarily been a component of the broader Project. Stakeholders identified for the Project are summarised in **Table 2**. Consultation and engagement will continue throughout all future phases of the project.

Table 2 Stakeholders of the Yangibana Project

Category	Group	Key Stakeholder
Internal Stakeholders		
JV employees and contractors	All JV employees and contractors involved with the Yangibana Project	No
External Stakeholders		
State Government departments	Department of Mines, Industry Regulation and Safety (DMIRS), Department of Water and Environment Regulation (DWER)	Yes
Pastoral Leasee – Project within lease	Wanna Station and Gifford Station (Bagden Pty Limited)	Yes
Pastoral Leasee – Project outside lease	Edmund Station, Cobra Station, Yinnetharra Station	No
Non-Government Organisations	Community Groups and Environmental Groups	No
Industry and Business	Carnarvon Chamber of Commerce and Industry	Yes
General Public	Local, Regional, State	No
Relevant Communities	Shire of Upper Gascoyne, Traditional Owners represented by the Yamatji Marlpa Aboriginal Corporation (YMAC)	Yes

5.3 SUMMARY OF CONSULTATION TO DATE

Substantial consultation with state regulatory agencies and the community has been undertaken in the preparation and finalisation of approval documents. A community forum was held at Gascoyne Junction to discuss environmental aspects of the Project to interested members of the community. Hastings will continue to engage relevant stakeholders and involve them during development and planning, construction and operations for the life of the mine. Decommissioning and closure aspects are also actively discussed with relevant stakeholders throughout all phases.

Regular meetings with Bagden Pty Ltd (Wanna and Gifford Creek station owners) has informed the location of infrastructure to preserve high value grazing country, reduce potential impacts of surface water drainage associated with linear infrastructure and the construction of access roads to improve access to areas of the lease.

Hastings has built a good relationship with the Traditional Owners (TOs), and will continue to consult with TOs on all relevant aspects of the Project. Hastings and the Tiin-Mah Warriyangka, Tharrkari, Jiwarli People (WC2016/003) (WAD464/2016) recently ratified a Native Title Agreement over the Project area and beyond. Hastings will continue to work closely with the TOs to survey areas planned for disturbance by the broader Project to identify significant heritage sites. All areas planned for disturbance of the minor or preliminary works have been surveyed for sites of cultural heritage significance.

The stakeholder engagement register is presented in **Table 3**. All consultation to-date has been informative.

Table 3 Stakeholder Engagement Register

Stakeholder Engagement Register					
Date	**Description of Engagement**	**Stakeholders**	**Stakeholder Comments/Issues**	**Proponent Response**	**Stakeholder Response**
16/02/2017	Hastings request to consult with Traditional Owner representatives	Traditional Owners	Thiin-Mah Warriyangka Tharrkari Jiwalli (TMWTJ) agree to consult	TMWTJ commences negotiations	Acceptable
14/03/2017	Negotiation with traditional owners begin.		Details of Project are discussed	Hastings agree to process with negotiations	Acceptable
13/07/2017 to 14/07/2017	Proposed access road and accommodation village area cultural heritage survey		Field survey of access road and village areas and discussion of closure	Closure to be discussed again at the time of Ministers decision	Acceptable
			TO's made the point that they would like the access road to remain if possible at closure	Hastings to determine if a slightly northern location for the accommodation village is possible, taking account of the hydrology assessment.	Acceptable
			TO's would like the accommodation facility to move slightly north of the river (approx. 800m). If not possible to move at this point then the TO's are okay with the current location.	Accommodation village footprint within the S41A location is larger to allow for the assessment of a revised location within the	Acceptable

Stakeholder Engagement Register					
Date	**Description of Engagement**	**Stakeholders**	**Stakeholder Comments/Issues**	**Proponent Response**	**Stakeholder Response**
				pending tenement boundaries	
26/05/2016	Updates on project status	Local Shire	Discuss access road options in details and alternatives. Provided Hastings with MRWA road assessment information to assist in assessment.	Hasting to conduct road assessment as per Local Shires' request.	Accepted
27/06/2017	Updates on project status		Hastings outlines the preliminary and minor works and timing. No issues were raised by council members.	Hastings to keep the council updated of project progress	Accepted
15/12/2017	Update on project		Discussions of timelines for the preliminary and minor works.	Hastings to provide updates on progress	Accepted
28/05/2016	Discussions over site infrastructure locations	Pastoralist (Bagden Pty Ltd)	Pastoralist and Hastings representatives groundtruthed infrastructure locations. Pastoralist provided inputs regarding high value grazing areas, and flood impact areas.	Hastings to submit infrastructure design plan.	Accepted
26/10/2016	Review infrastructure planning and locations to address pastoral leaseholder concerns		Visited and discussed operation locations and likely impact on pastoral activities and how to implement changes to minimise impact. Further changes to layout.	Hastings to revise and resubmit infrastructure plan.	Accepted.

Stakeholder Engagement Register					
Date	**Description of Engagement**	**Stakeholders**	**Stakeholder Comments/Issues**	**Proponent Response**	**Stakeholder Response**
12/05/2017	Land access agreement		Comprehensive land access agreement has been concluded between Hastings and Bagden Pty Ltd that covers all infrastructure of the project, including the access road and accommodation village.	Hastings to give 21 days notice of commencement of construction activities.	Accepted
15/12/2017	Update on project		No comment	Hastings to keep updating on progress	Accepted
15/05/2017	Hastings to meet with DMIRS	Department of Mines, Industry Regulations and Safety (DMIRS)	Kick off meeting as a project under the DMIRS lead agency	Informing the representatives of DMIRS of the Yangibana Rare Earths project	Accepted
18/07/2017	Hastings to seek clarification in regards to water exploration		DMIRS advised that water exploration activities to be considered as minor or preliminary works	Hastings to submit plan for water exploration	Accepted
19/07/2017	Hastings to seek clarification with regards to water		Program of Works (PoW) within the development envelope and is required to consult with the Department of Water and Environmental Regulation (DWER)	Hastings to identify all PoW's within the development envelope.	Accepted
10/01/2018	Updates on Project status. Topics include water studies, stygofauna assessment, radon		Further meeting to be arranged to discuss details of borrow pit locations	Hastings to arrange future meeting	Accepted

Stakeholder Engagement Register					
Date	**Description of Engagement**	**Stakeholders**	**Stakeholder Comments/Issues**	**Proponent Response**	**Stakeholder Response**
	assessment, S41A application, tenure and radiological council				
7/02/2018	Update with regards to soil management		Informing the methods and expectations of soil and management	Hastings to comply with expectations of soil management by implanting management plans and regular audits.	Accepted
17/07/2017	Request for Agreement that Hastings conduct water investigations	Department of Water and Environmental Regulation (DWER)	Assessment of 26D licence on tenements with JV holder, Mojito Resources	Documentation to be completed and sent to DWER	Accepted
	Notification of submission of S41A, S43A and Human health application		Advised that terrestrial environmental quality chapters and fauna and social surroundings to be submitted separately.	Hastings to submit S41A, S43A and Human health but end of July. Human health to be submitted by end of August	Accepted
18/07/2018	Technical discussions of water investigations and number of bores to develop and satisfy DWER of sufficient water		No comment	To commence water investigation	Accepted
13/02/2018	Update on water status		Emphasis on knowing the source of water and whether it is sustainable.	Hastings to continue water investigations.	Accepted

Stakeholder Engagement Register					
Date	**Description of Engagement**	**Stakeholders**	**Stakeholder Comments/Issues**	**Proponent Response**	**Stakeholder Response**
04/05/2018	Scoping meeting for works application		Timing for submission of operating licence, consideration of landfill and power requirements, waste water quality from RO plant. Review of TSF design reports, scope of work for process plant plume study and tailings leach testing study	Finalise and submit works approval application	Accepted
15/02/2017	Survey of proposed access road	Environmental Protection Authority (EPA)	Request Hastings to conduct survey of Flora and Fauna values of the access road	Hastings to plan and conduct Flora and Fauna survey	Accepted
8/06/2017	Subterranean fauna		Advise of the subterranean fauna study requirements	Water source investigation outcomes, next steps and implications to schedule	Accepted
23/06/2017	Meeting with EPA in relation to hydrology program and stygofauna sampling program		No comment	Delays to approvals process resulting from stygofauna sampling program.	Accepted
13/11/2017	Update on project		No comment	ERD chapter status and submission dates	Accepted

6 FIT AND COMPETENT OPERATOR

The directors of Hastings board are:

- Charles Lew (Executive Chairman)
- Guy Robertson (Finance Director and Company Secretary)
- Jean Claude Steinmetz (Non Executive/Commercial Director)

Mr. Charles Lew has not been a director of an Australian company in the past. However, he has extensive experience in investment banking. Mr Lew is Chairman of Muddy Murphy's and a non-executive director of RHB Investment Bank Berhad, and previously held director roles on RHB Capital Berhad, and Singapore Medical Group.

Mr. Guy Robertson is also Secretary, Chief Operating & Financial Officer at Bioxyne Ltd., Secretary at Anchor Resources Ltd., and Secretary at Artemis Resources Ltd. He is on the Board of Directors at Draig Resources Ltd. and Metal Bank Ltd. Mr. Robertson was previously employed as Secretary & Director by Estrella Resources Ltd., Chief Financial Officer, Secretary & Director by Apollo Minerals Ltd., Chief Financial Officer & Secretary by China West International Holdings Ltd., Secretary & Independent Non-Executive Director by HZ Lim Ltd., Chief Operating Officer & Finance Director by Colliers Jardine Holdings Ltd., Chief Financial Officer & Secretary by Evogenix Ltd., General Manager-Finance by Franklins Australia, a Managing Director by Jardine Lloyd Thompson Australia Pty Ltd., Chief Financial Officer & Finance Director by Jardine Matheson Singapore Ltd., Chief Financial Officer & Secretary by Volt Resources Ltd., and Chief Financial Officer & Secretary by WCP Resources Ltd.

Mr. Jean-Claude Steinmetz was previously employed as Chief Operating Officer (COO) by Lynas Corporation Ltd from 2013 to 2016. The Mt Weld Project was in operation during Mr Steinmetz's employment as COO. A works approval and operating licence for the processing plant (category 05) and landfill (category 89) of the Mt Weld Project were implemented during this time (Licence: L8141/2007/2).

7 EMISSIONS

7.1 SCREENING AND CRUSHING PLANT

The emissions to air at the prescribed premise will be:

- Dust generation during excavation of materials from the borrow pit, vehicle movement and operations of the mobile crushing and screening plant.
- Noise from operation of the mobile crushing and screening plant, and other equipment within the prescribed premises boundary.

Industry best practice measures will be implemented to minimise emissions to air. Dust management measures include:

- Using water sprays to water down dust particles on road and soil surfaces
- Limiting vehicle speeds
- Visual monitoring of dust generation

Noise management measures include:

- Limiting construction activities to daylight hours
- Maintenance of equipment to Australian standards and Environmental Protection (Noise) Regulations 1997
- A Safety Management Plan includes consideration of noise for workers.
- Corrective Personnel Protective Equipment (PPE) to be worn by all workers. i.e. hearing protection, ear plugs.

These management measures are incorporated within the Construction Environmental Management Plan, which will be implemented for the broader scope of the minor or preliminary works.

The emissions to surface water may result from sedimentation and erosion. Heavy rainfall events may occur during the summer period when cyclonic events hit the Pilbara coastline and move inland. Erosion and sedimentation is expected to be minor and localised given the relatively flat topography of the prescribed premise and the locale on the higher elevations of the landscape. Surface water management includes:

- A drainage channel occurring within 100m of one borrow pit and a diversion channel will be constructed to ensure surface water drainage is unimpeded and unaffected by the borrow pit.
- Rocks will be used to disperse the kinetic energy of surface water draining from the borrow pit into the surrounding environment.
- Bunding around the borrow pit will ensure surface water does not flow into the borrow pit from the surrounding environment.
- All infrastructure will be inspected after heavy rainfall events for evidence of erosion. Any small, localised erosion events will be rectified immediately.

Small volumes of hydrocarbons will be used at the prescribed facility. Hydrocarbon contamination of land and surface water during heavy rainfall events is possible, although likely to be minor. Industry best practice measures will be implemented to ensure contamination of surface water and soils does not occur:

- Limit volumes of chemicals/hydrocarbons stored on site to that required to maintain machinery operations.
- Secondary bunding of chemicals/hydrocarbons stored on-site.
- Protection of chemical storage areas from adverse weather conditions.
- Spill kits, spill procedure and training of personnel in the use of spill kits.
- Spill matting/trays beneath operating equipment.

7.2 WASTE WATER TREATMENT PLANT

Emissions to surface water from discharges of unplanned overflow or leaks at the WWTP. Mitigation actions will be in place to minimise this risk, including:

- Daily and weekly inspections of the WWTP infrastructure, tank levels and sprinkler field equipment.
- Failure of mechanical components will be raised by alarms and flashing beacons, which will also be triggered when water levels exceed certain limits in the balance tank or irrigation tanks.
- An emergency overflow.
- Bunding around the facility to protect it from flood waters (although it is located in an area that is not inundated during flood events) and to ensure leaks and spills are contained.

Emissions of the class C effluent to land will occur via the irrigation field. The irrigation field will be fenced and signage will ensure all personnel do not enter the area. The irrigation field is located downwind of the accommodation village.

7.3 LANDFILL

Emissions to land include windblown rubbish and odours. Mitigation actions to minimise this risk include:

- Landfill waste will be regularly buried with approximately 100mm of soil to deter feral fauna and odours.
- Bunds will be maintained around the trench.
- Any windblown rubbish that escapes, during disposal, into surrounding areas will be picked up immediately, contained and put into the landfill.
- A 3 m wide firebreak will be maintained around the boundary of the facility.
- During decommissioning and closure, any small costeans will be filled in until level with the surrounding ground, and rehabilitated.

8 SITING AND LOCATION

Environmental values (as per Guidance Statement: Environmental Siting) in the vicinity of the proposed prescribed premises include:

- Priority Ecological Communities (Gifford Creek calcrete PEC)
- Priority flora
- Priority fauna and associated habitat
- Fraser creek and associated drainage channels

The following sections provide further information of the environmental values. The prescribed premises have been located at an appropriate distance from any sensitive receptor.

8.1 CLIMATE

The Bureau of Meteorology (BoM) climate mapping provides an overall indication of the historical climate conditions across Australia. This mapping has been utilised to provide an overview of the expected climatic description for the Project area and summarised in **Table 4**.

Table 4 Climatic description of the Yangibana Project

Mapping	Description
Major seasonal rainfall zone – climate class	Arid, low rainfall
Climate zone based on temperature and humidity	Hot dry summer, mild winter
Average annual rainfall	200-300 mm
Average annual pan evaporation	2800-3000 mm

Source: BoM (2016a)

The nearest weather station with long-term rainfall data is at the Yangibana site 10 km north of the accommodation village. This station has been installed and active since 2015. The site is subject to northern monsoon influences over the summer and early autumn period, and southern frontal influences in late autumn and winter (BoM 2016c). There are two periods of higher rainfall from January to April and June to July, and a drier period from August to December (**Figure 4**). Information regarding the frequency, intensity and duration of rainfall for this site was not available.

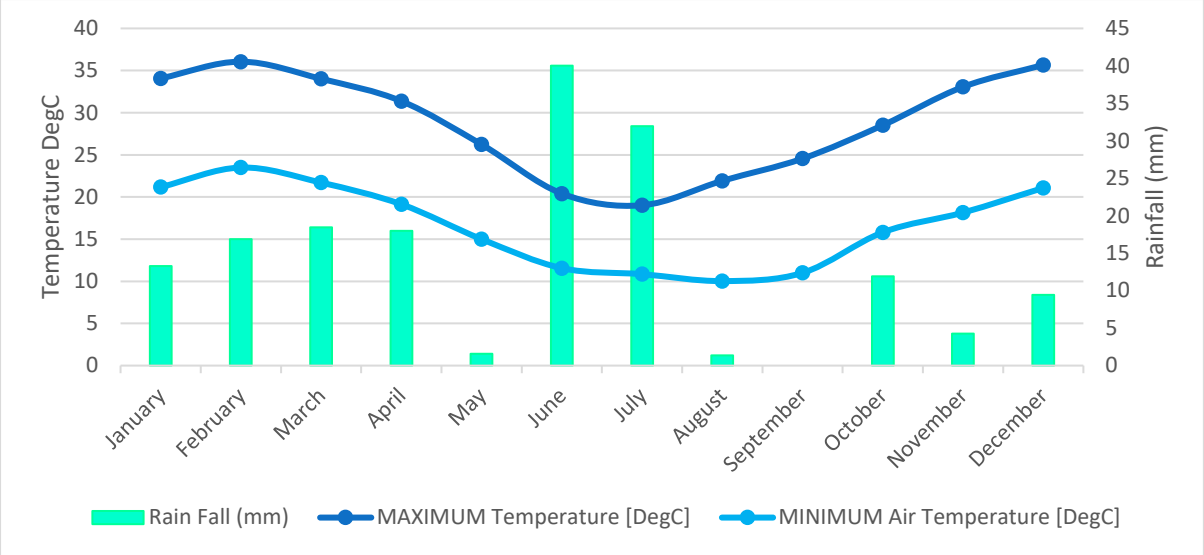


Figure 4 Monthly rainfall and daily maxima and minima for the Yangibana Project 2017

The Yangibana weather station receives a mean annual rainfall of 308 mm. February has the highest temperatures with a mean maximum of 40.5°C and mean minimum of 26.4°C. July temperatures are the lowest ranging from a mean maximum of 21.3°C to a mean minimum of 11.3°C (**Figure 4**).

Monthly mean wind roses recorded at 9am and 3pm from the Yangibana weather station show that the predominant wind direction varies throughout the day and year. At 9am the predominant wind direction is generally easterly (including north-easterly and south-easterly), with the exception of October where the predominant direction is south-westerly. The 3pm readings show two patterns: January to August the wind direction is relatively evenly distributed from all directions, however from September to December the predominant direction is westerly (including north-westerly and south-westerly). Throughout the year wind speeds are predominantly between 0 to less than 20 km/hour.

8.2 LANDSCAPE

8.2.1 Biogeographic Region

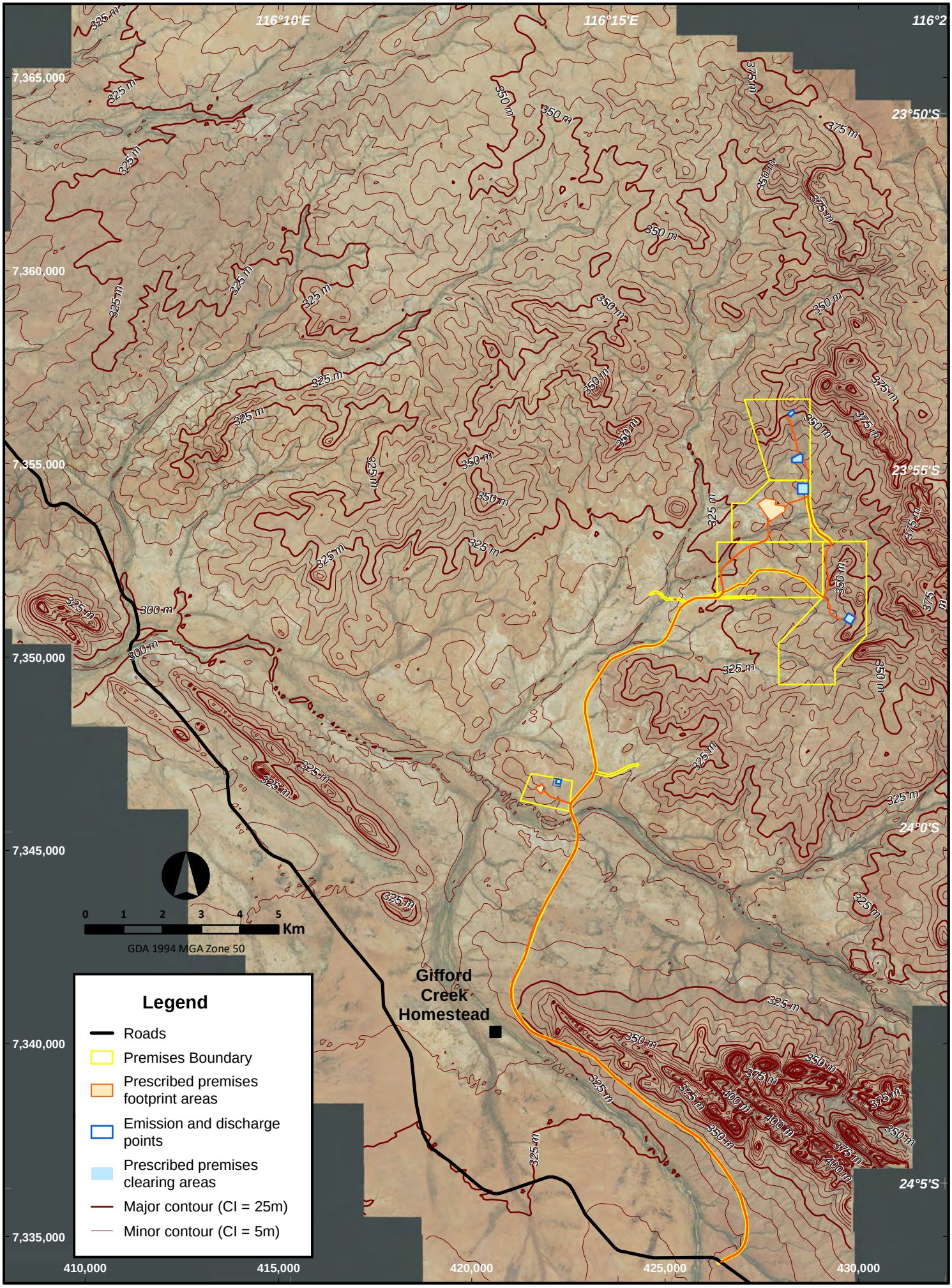
The Interim Biogeographic Regionalisation for Australia (IBRA) classifies the Australian continent into regions (bioregions) of similar geology, landform, vegetation, fauna and climate characteristics (Department of the Environment (DoE) 2014). According to IBRA, the Project lies within the Gascoyne region, with the majority of the Project within the Augustus subregion.

The Augustus subregion comprises (Desmond *et. al.* 2001):

> *Rugged low Proterozoic sedimentary and granite ranges divided by broad flat valleys. Also includes the Narryera Complex and Bryah Basin of the Proterozoic Capricorn Orogen (on northern margin of the Yilgarn Craton), as well as the Archaean Marymia and Sylvania Inliers. Although the Gascoyne River System provides the main drainage of this subregion, it is also the headwaters of the Ashburton and Fortescue Rivers. There are extensive areas of alluvial valley-fill deposits. Mulga woodland with* Triodia *occur on shallow stony loams on rises, while the shallow earthy loams over hardpan on the plains are covered by Mulga parkland. A desert climate with bimodal rainfall. The subregional area for GAS3 is 10,687,739 Ha.*

8.2.2 Topography

The topography in the Project area has been influenced by the Lyons River to the south, to a lesser extent the Edmund River to the east, and a small range of hills to the north of Fraser's and Bald Hill (GRM 2018; Figure 6). The remainder of the area is characterised by subdued topography, with rounded granitic hills and open flat areas, cross cut by small dendritic drainages.



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Topography

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Figure 5

8.3 SOILS

Soil characterisation was undertaken by Landloch Pty Ltd (2016a, Appendix A-1) in accordance with *Guidelines for Mining Proposals in Western Australia* (DMP 2016).

Two main soil types were recorded within the proposed disturbance footprint, distribution of each unit dependent on geology, geomorphology and topographical features, as detailed following:

- Dark brown sandy duplex soils ("Hills soils"): Associated with the extensive granite geology that forms the low hills and rises across the site, specifically the stone mantles and outcrops of granite and ironstone. This soil type can be divided into an A and B horizon overlying a C horizon of decomposing granite. Soil depths vary from ~20cm up to 50cm. It is considered neutral to slightly acidic that does not vary much through the profile or between sample locations. It is characterised by low salinity levels and a maximum exchangeable sodium percentage below 6%, indicating it is a non-sodic soil.
- Dark brown sandy loam over clay loam soils ("Plains soils"): Associated with low relief areas and flood plains of drainage lines. This soil type can be divided into A and B horizons - a thin sandy loam topsoil over clay loam with an overall shallow depth (<30cm). It is strongly alkaline, saline and sodic. Two variations within this soil unit were identified. One variation, associated with drainage lines, will not be impacted by the Project. The second variation has a deeper profile, saline, sodic and clay-rich and has greater mottling. This soil unit variation will interact with proposed mine infrastructure and has the potential to be difficult to manage.

Typical soil unit profiles are presented in **Figure 6**, and the distribution of soil units is presented in **Figure 7**. Indicative soil characteristics are presented in **Table 5**.

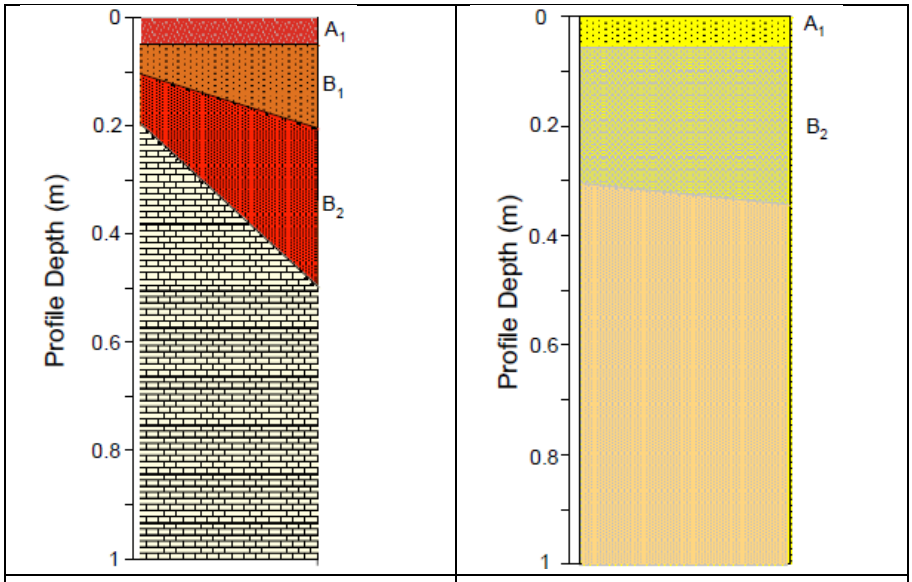
Landloch (2016a) summarise the soil properties as follows:

- Both soils have low fertility (normal for arid zone soils), are clay rich, poorly or not well structured, and represent an erosion risk if used on constructed slopes;
- Limiting factors for each soil type include:
    - Hills soil – presence of a clay-rich subsoil will impact on methods employed for stripping, stockpiling and respreading; and
    - Plains soil – high sodicity has the potential for clay dispersion once free salts are leached from the profile.
- Management requirements of each soil include:
    - Hills soil – treatment for low fertility;
    - Plains soil – specific treatment for sodicity, dispersion risk and low fertility. It has been recommended that this soil type is not disturbed.

Hill soils occur in the locations of the borrow pits. However the access road intersects Plain soils, which will be temporarily stored and then buried in one of the borrow pits at closure of the borrow pit.

Table 5 Average soil characteristics – chemical and physical

Analysis		Unit	Hills Soil	Plains Soil
$pH_{1:5}$ – Water		pH units	6.60	8.30
Electrical Conductivity ($EC_{1:5}$)		dS/m	0.01	4.5
Total Nitrogen		mg/kg	315	275
Total Phosphorus		mg/kg	360	230
Organic Carbon		mg/kg	0.17	0.6
Plant Available Nutrients	Phosphorus	mg/kg	21.9	10.3
	Potassium	mg/kg	215	480
	Sulphur	mg/kg	3.9	20
	Copper	mg/kg	0.7	0.5
	Iron	mg/kg	13.5	8.5
	Manganese	mg/kg	6.4	0.8
	Zinc	mg/kg	0.8	0.3
Exchangeable Cations	Calcium	meq/100g	2.5	9.0
	Magnesium	meq/100g	1.8	1.0
	Potassium	meq/100g	0.3	0.4
	Sodium	meq/100g	0.15	1.0
	Aluminium	meq/100g	0.01	0.01
	Effective Cation Exchange Capacity	meq/100g	4.7	11.5
	Exchangeable Sodium Percentage	%	3.4	17.4
Particle Size Distribution	Coarse sand	%	50	35
	Fine sand	%	32	29
	Silt	%	6	13
	Clay	%	12	23
Dispersion Index		Class	2	2 - 7



A typical Hill soil unit profile	A typical Plain soil unit profile

(Source: Landloch 2016a)

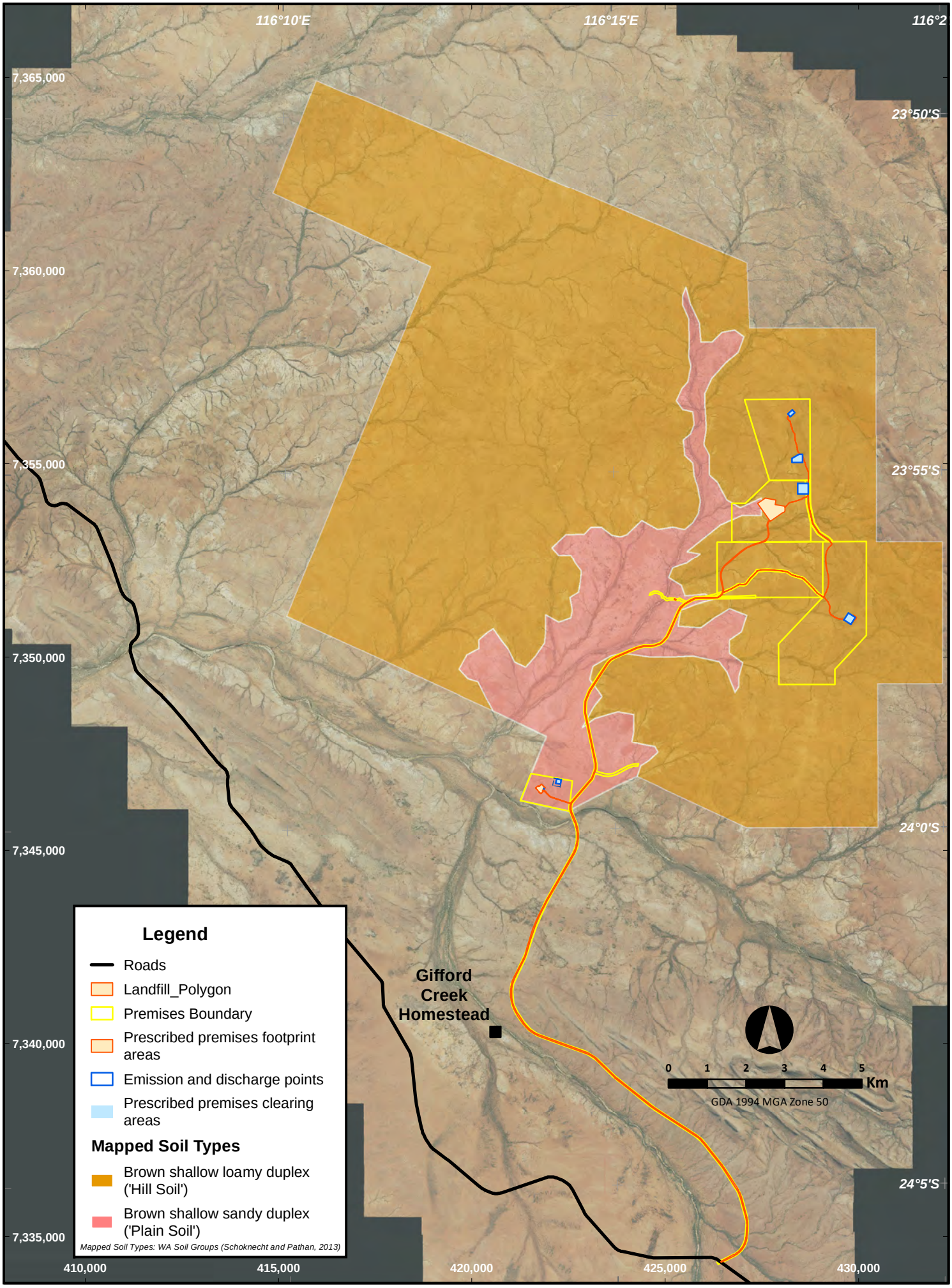
Figure 6 Typical soil profiles of the Yangibana Project

8.4 GEOLOGY

8.4.1 Geology and Mineralisation

The dominant lithologies in the tenement area are the Pimbyana Granite to the north and the Yangibana Granite to the south, and both are members of the Proterozoic Durlacher Supersuite (Johnson *et. al.* 2011a; Johnson *et. al.* 2011b). Rafts of meta-sedimentary rocks including sandstones, calc-silicates and schists occasionally occur within the Project area. The granites are very well exposed and form extensive low rugged hills covered in boulders, tors and whaleback. The mineralisation is hosted in the Gifford Creek Ferrocarbonatite Complex formed by intrusion of ferrocarbonatite dykes, veins and sills into the granites, which are generally southeast to east-southeast trending (Hastings 2016a; Pirajno and González-Álvarez 2013). The majority of the rare earths are hosted by the phosphate mineral monazite, the mineral containing low levels of thorium and uranium and their decay progeny, in approximate secular equilibrium (RadPro 2016a). The presence of these elements is termed Naturally Occurring Radioactive Materials (NORM) as they are derived from a geological source associated with the granite bedrock and successive hydro-thermal emplacement of ironstone dykes. Sinuous ironstone veins and pods are spatially associated with, but likely post-date, the ferrocarbonatite intrusions. They are north-northeast to east-southeast trending, surrounded by narrow haloes of fenitic alteration and are locally anomalously radioactive (Hastings 2016a).

Martin *et. al*. (2005) subdivided the superficial strata into a set of units linked to the physiographic division in which they occurred, and their provenance. Localised deposits of unconsolidated silt, sand and gravel are present in the creeks dissecting the Project area, however, the most significant superficial strata in the Project area are the calcrete deposits, locally present along the alluvial channels of major drainage lines. The calcrete units are characterised by a hard surface layer of brecciated and partly silicified calcrete underlain by softer more friable material. These units consist mostly of vuggy calcrete with irregular, lenticular, bedding parallel cavities. Veins and cavities can be filled by quartz cement, especially in upper parts of the calcrete profile. The calcrete can be 30 m thick and possibly up to 50 m thick (Thorpe 1990), and is commonly partly eroded and degraded.



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Mapped Soil Types

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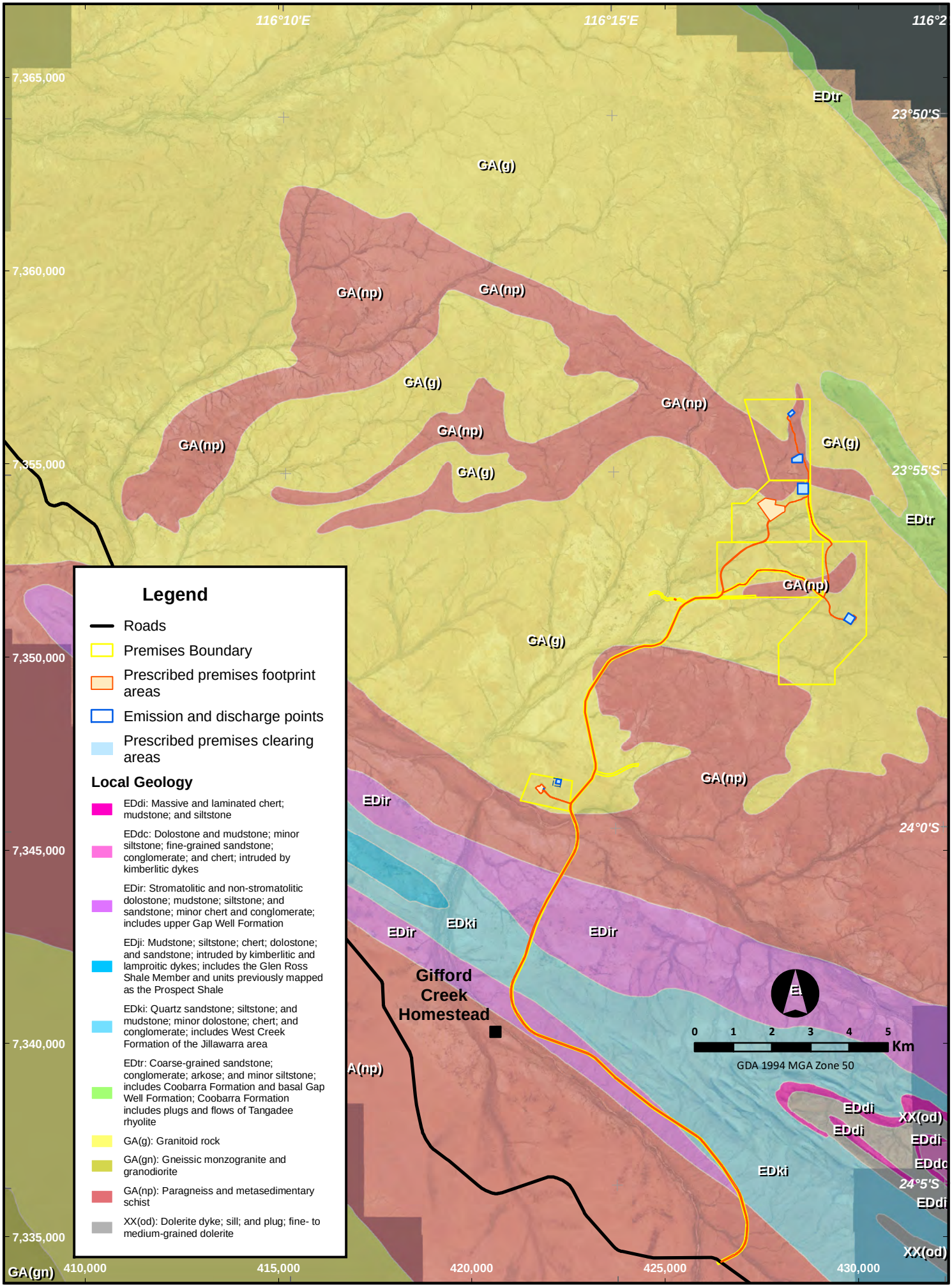
Figure 7



YANGIBANA RARE EARTHS PROJECT

Local Geology

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Figure 8

8.5 NATURALLY OCCURRING RADIOACTIVE MATERIAL

Due to the presence of NORM associated with mineralisation, baseline radionuclide monitoring commenced in 2015 and was conducted by RadPro (2016a).

Baseline monitoring included:

- Gamma surveys;
- Dust assessment;
- Radon and thoron concentrations;
- Soil assessment; and
- Water (surface and groundwater).

Baseline monitoring activities are on-going with recent groundwater and surface water assessments, and radon and thoron assessments undertaken since RadPro (2016a).

Elevated levels of radionuclides are only associated with the mineral resource. Analysis of subsurface materials (up to 1 metre depth) was conducted on samples collected during exploration drilling.

Results, summarised in **Table 6**, indicate that uranium concentrations are relatively consistent across mineralised areas of the Project, while thorium concentrations show a greater variability. This variability is attributed to the association of thorium to the mineralisation. It is important to note samples only represent mineralised areas over deposits, and therefore uranium and thorium concentrations are expected to be lower off-deposit. Average concentrations are considerably higher than the global averages of 10 ppm thorium and 3 ppm uranium (UNSCEAR 2000).

Table 6 Surface materials – uranium and thorium

	Uranium (ppm)				Thorium (ppm)		
Location	**Average**	**Maximum**	**Minimum**		**Average**	**Maximum**	**Minimum**
Bald Hill	10.2	44.6	2.4		142.8	1134.5	18.1
Fraser's	6.7	14.1	1.9		52.5	132.7	20.2
Yangibana North	10.7	26.4	2.5		321.6	1472.5	21.4

RadPro (2016a) report that there is a correlation between surface gamma dose rates and surface soil radionuclide concentrations, further supporting other data collected showing that the surface dose rate is highly influenced by the mineralisation. The scope of the Minor or Preliminary Works program is not associated with the mineralisation and thus do not trigger a requirement to manage radionuclides. However, exploration activities will continue to operate under an Exploration Radiation Management Plan, and Hastings will continue to conduct baseline monitoring as a component of the investigative studies that will be on-going prior to and during the implementation of the broader Project.

8.6 BIODIVERSITY, FLORA & FAUNA, ECOSYSTEM

8.6.1 Flora and Vegetation

The following surveys have informed this assessment:

- *Yangibana Project Biological Assessment: Flora and Vegetation* (Ecoscape 2015)
- *Yangibana Project Biological Assessment: Terrestrial Fauna* (Ecoscape 2016)
- *Yangibana Rare Earths Project Flora and Fauna Survey* (Ecological 2017)

A search of the following databases were undertaken over the proposed disturbance area as components of flora and fauna survey reports (Ecoscape 2015, 2016; Ecological 2017):

- Department of Biodiversity Conservation and Attractions (formerly Department of Parks and Wildlife) NatureMap (40 km buffer zone);
- Department of Water and Environmental Regulation (formerly Department of Environmental Regulation) Environmentally Sensitive Areas database; and
- *Environment Protection and Biodiversity Conservation* Act 1999 (EPBC Act) Protected Matters Search Tool (40 km buffer zone).

The database searches found:

- No communities in the project area constitute a Threatened Ecological Community (TEC) pursuant to the EPBC Act.
- No Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) characterised by a vegetation type occur within the Project area.

Hastings commissioned Ecoscape (2015) and Ecological (2017) to undertake a Level 2 Flora and Vegetation Assessment of the Yangibana Study Area (55,000 ha), which included the borrow pit locations and accommodation village.

No threatened flora listed under the *Environment Protection and Biodiversity Conservation Act 2000* (Cwth) and *Wildlife Conservation Act 1950* (WC Act; WA) were recorded during surveys. Eight priority flora (listed by the Department of Biodiversity Conservation and Attractions (DBCA)) were recorded in the study area:

- *Acacia curryana* (Priority 1 (P1));
- *Rhodanthe frenchii* (P2);
- *Solanum octonum* (P2);
- *Wurmbea fluviatilis* (P2);
- *Gymnanthera cunninghamii* (P3);
- *Sporobolus blakei* (P3);
- *Goodenia berringbinensis* (P4); and
- *Goodenia nuda* (P4).

Six priority species were recorded within the development envelope of the proposed minor or preliminary works (**Table 7 *Summary of impacts to priority flora***). No species of Priority flora were recorded within the proposed disturbance envelope.

Table 7 Summary of impacts to priority flora

Priority flora species	No. within Disturbance Area	No. within Activity Envelope (1077 Ha)	No. within Study Area	% Impact (Proportion of Plants from Study Area within Disturbance Footprint)
***Acacia curryana* (P1)**	0	80+	2,669+	0
***Rhodanthe frenchii* (P2)**	0	12	391+	0
***Wurmbea fluviatilis* (P2)**	0	0	10	0
***Sporobolus blakei* (P3)**	0	0	2	0
***Goodenia nuda* (P4)**	0	0	1	0
***Goodenia berringbinensis* (P4)**	0	0	410+	0

8.6.2 Terrestrial Fauna

No threatened fauna species listed under the EPBC Act were found within the study area (Ecoscape 2016a; Ecological 2017). Two species of conservation significance were recorded in the study area (**Figure 9**):

- *Sminthopsis longicaudata* (Long-tailed Dunnart; listed as a Priority 4 species by the Department of Biodiversity, Conservation and Attractions - DBCA).
- *Pseudomys chapmani* (Western Pebble-mound Mouse; Priority 4 species by DBCA)

An active mound of the Western Pebble-mound Mouse was recorded 1.5 km north of the proposed southern access road (Ecological 2017) and approximately 15km south of the prescribed premise.

In addition, *Falco hypoleuca* (Grey Falcon; listed as a Schedule 3 species under the WC Act) was recorded 20 km south of the borrow pits.

In addition to the species recorded, the likelihood of each species of conservation significant fauna to occur within the study area was assessed. A total of five conservation significant species have a moderate to high likelihood of occurring within the Project area:

- Fork-tailed Swift (*Apus pacificus*, EPBC Marine)
- Eastern Great Egret (*Ardea modesta*, EPBC Marine)
- Yinnietharra Rock Dragon (*Ctenophorus yinnietharra*, EPBC Vulnerable)
- Peregrine Falcon (*Falco peregrinus*, WC Act S7)

Fauna species are likely to be displaced by the prescribed premises. The study area was characterised by five habitat types to the north of the Lyons River (accommodation village), namely rocky plain (includes undulating hills and lower hillslopes), sandy plain, granite outcrop, major river and minor creek line (Ecoscape 2016a) and five habitat types to the south of the Lyons River (access road), namely rocky plain, granite outcrop, minor creekline, rocky slopes and foothills, and claypans (Ecological 2017)(**Error! Reference source not found.**). Of these, the rocky plain is the most widespread habitat type, followed by sandy plain. The remaining habitat types were recorded from isolated areas of smaller extent. All habitat types were also recorded from the wider region and are not unique to the study area (**Table 8**).

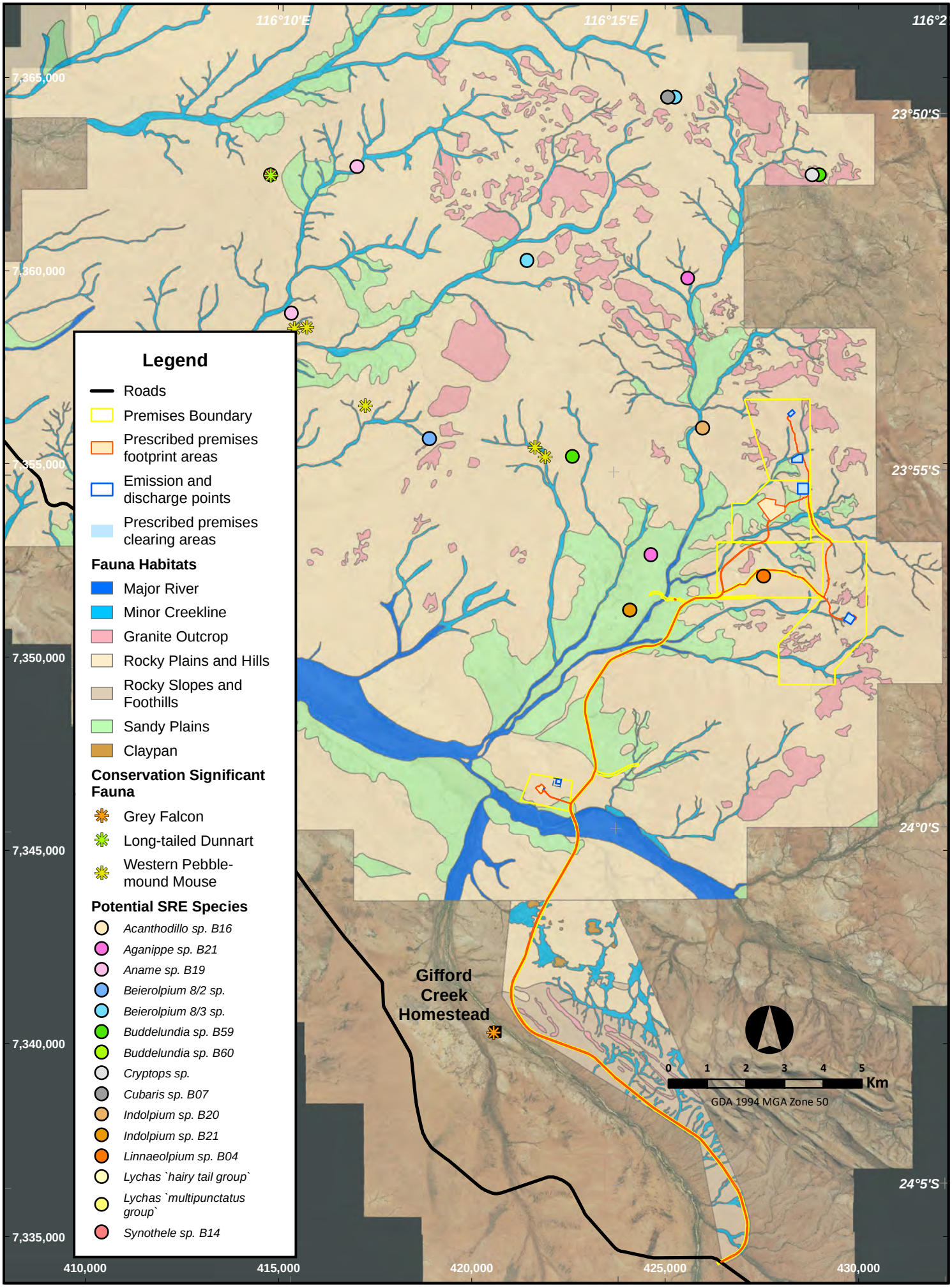
Table 8 Summary of impacts to fauna habitats

Fauna Habitats	Area (ha) within Disturbance Area (63.6 Ha)	Area (ha) within Activity Envelope (1077 Ha)	Area (ha) within Survey/Study Area	% Impact*
Claypan	0.00	0.00	20.32	0.00
Rocky Slope and Foothills	24.78	52.53	875.60	2.83
Major River	1.71	4.78	1,891.76	0.09
Minor Creekline	5.22	73.44	3,314.75	0.16
Rocky Plains and Hills	27.76	755.74	40,965.24	0.07

Fauna Habitats	Area (ha) within Disturbance Area (63.6 Ha)	Area (ha) within Activity Envelope (1077 Ha)	Area (ha) within Survey/Study Area	% Impact*
Granite Outcrop	1.27	53.02	2,681.53	0.05
Sandy Plains	2.74	157.88	5,813.82	0.05

* Proportion of area of fauna habitats from study area within disturbance envelope

The area of each of the habitat types proposed to be cleared is not considered to represent a significant impact. The rocky plain fauna habitat type occurs within the borrow pit areas and the waste water treatment plant area. This is the most extensive fauna habitat type recorded.



YANGIBANA RARE EARTHS PROJECT

Conservation Significant Fauna Species and Fauna Habitats

Figure_14_Fauna_Habitats.mxd
14 May 2018

Figure 9

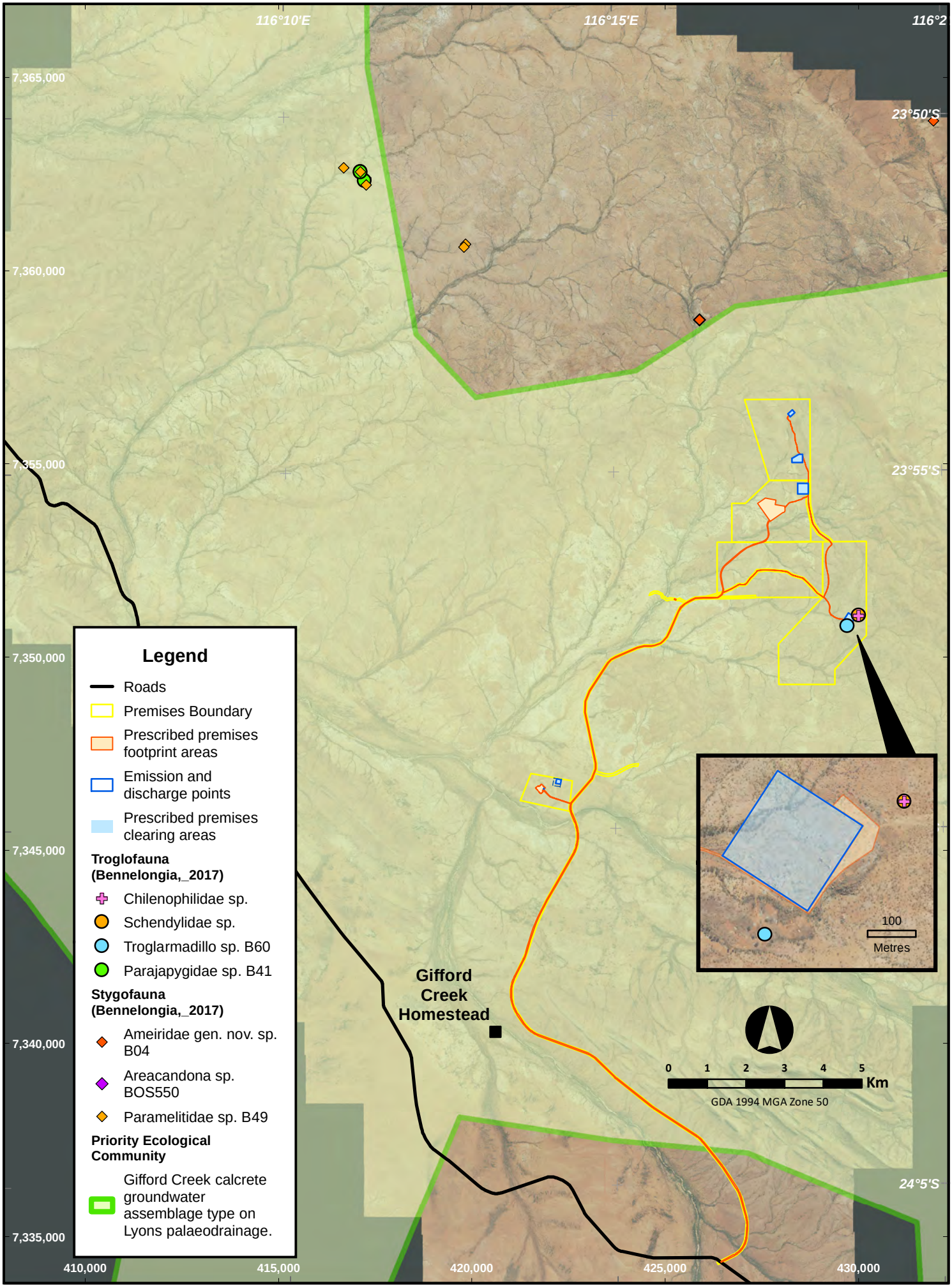
8.6.3 Subterranean Fauna

A DBCA listed Priority Ecological Community (PEC) occurs within the study area, and the development envelope intersects the northern portion of this PEC. The PEC is listed as:

> *Priority 1 (P1) Gifford Creek, Mangaroon, Wanna calcrete groundwater assemblage type on Lyons palaeodrainage on Gifford Creek, Lyons and Wanna Stations.*

DBCA refer to the PEC as the "Gifford Creek Calcrete PEC", which comprises unique assemblages of invertebrates (stygofauna) that have been identified in the network of groundwater calcretes. Stygofauna occur within both the fractured rock aquifers across the broader Project areas as well as the calcrete aquifers within the PEC footprint (Ecoscape 2016b; Bennelongia 2017**; Figure 10**). Specifically, the bore for water abstraction occurs within the Frasers pit fractured rock aquifer. Ecoscape (2016) found no stygofauna within the Frasers pit area despite collection of four samples over two phases of surveying. Bennelongia sampled the Frasers pit fractured rock aquifer again in 2017, and also found no stygofauna in this area.

The prescribed premises do not intersect the shallow calcrete aquifer and will not be excavated below the groundwater table. The nearest calcrete is approximately 2 km from the nearest borrow pit and within 500 m of the WWTP.



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YANGIBANA RARE EARTHS PROJECT

Subterranean Fauna

Figure_10_Subterranean_Fauna.mxd
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Figure 10

8.6.4 Clearing Principles

The location of the accommodation village and associated WWTP falls within the 52.5 Ha footprint of a Native Vegetation Clearing Permit (CPS 7834). Specifically, the clearing of no more than 1.5 Ha for the WWTP and irrigation field within the development envelope of 12,050.25 ha is approved under S41A of the *Environmental Protection Act 1986* (WA).

Schedule 5 of the *Environmental Protection Act 1986* defines 10 clearing principles against which the potential impacts of the removal of native vegetation should be assessed. Clearing for the proposed minor or preliminary works within the Yangibana Project, that were not previously assessed as a component of the Native Vegetation Clearing Permit (NVCP) were two borrow pits and some track upgrade areas, which will utilise clearing exemptions of 10 Ha per annum. These have been assessed against the 10 clearing principles as described in **Table 9**.

Table 9 Assessment against 10 Clearing Principles

Clearing Principle	Assessment
(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.	The proposed track maintenance/borrow pit activities are not located within any Environmentally Sensitive Area or known Threatened or Priority Ecological Community, as characterised by native vegetation. No Priority flora species will be impacted by the road maintenance activities.
(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	A small proportion of three potentially significant fauna habitats (i.e. the Eastern Great Egret, Grey Falcon and Rainbow Bee Eater) are proposed to be cleared: up to 1.16% of the total 'major river habitat' (potential breeding sites for Grey Falcons and foraging habitat for the Eastern Great Egret and Fork-tailed swift), up to 0.27% of the 'minor creeklines' (along with 'major river habitat' as the most suitable habitats for invertebrate SRE fauna) and up to 15.03% of the 'rocky plains' habitat (as suitable habitat for the Western Pebble-mound Mouse) in the broader study area. The habitat of the Yinnietharra Rock Dragon is the granite outcrops, of which there will be no impact as a result of implementing the proposed minor or preliminary works. The area of each habitat types proposed to be cleared is not considered to represent a significant impact.
(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	No threatened flora pursuant to the EPBC Act or listed as declared rare under the *Wildlife Conservation Act 1950* were recorded during flora surveys.
(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.	The proposed disturbance is not located within any Environmentally Sensitive Areas or known Threatened or Priority Ecological Community, as defined by native vegetation.
(e) Native vegetation should not be cleared if it is significant as a remnant	The proposed clearing is unlikely to impact significant remnant native vegetation.

Clearing Principle	Assessment
of native vegetation in an area that has been extensively cleared.	
(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	The proposed clearing of native vegetation does not represent Groundwater Dependent Ecosystems identified during surveys.
(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The area to be cleared is unlikely to cause appreciable land degradation in the local environment.
(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	The proposed area to be cleared is not located within or adjacent to conservation areas and thus will not have an impact on the environmental values of a conservation area.
(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	The track maintenance/borrow pit activities is unlikely to impede natural water drainage and will not result in additional sediment loads during heavy rainfall events. A soils assessment has highlighted Plains topsoil is unsuitable for use in rehabilitation due to its saline and sodic nature, and is highly erodible. This soil type will be harvested and buried in borrow pits, and will not be used for rehabilitation activities.
(j) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	The scale of track maintenance/borrow pit activities is such that they will not exacerbate the incidence or intensity of flooding.

8.7 HYDROLOGY

8.7.1 Surface Water

The Proposal is located within the Gascoyne River catchment, which occurs within the Gascoyne Surface Water Proclamation Area and the Gascoyne Groundwater Proclamation Area. There are no wetlands of international importance within the development envelope or in close proximity to the minor or preliminary works.

The access road crosses the Lyons River and the accommodation facilities occur in close proximity to the Lyons River. The Lyons River is ephemeral and only flows following rainfall. Two semi-permanent pools occur within 5 km of the proposed Preliminary or Minor Works.

The environmental values of surface water flow in the area are riparian vegetation, ephemeral pools with associated groundwater dependent ecosystems (GDEs) and the network of shallow calcrete aquifers associated with the Gifford Creek PEC.

8.7.1.1 Surface Water Quality

Water quality analysis was also conducted at two ephemeral pools in the Lyons River (LC - Pool 800US) and Frasers Creek (FR – Pool). These samples were collected at the end of the dry season and thus parameters measured will vary depending on time since last rainfall. Due to the intermittent nature of rainfall in the Gascoyne region and ephemeral nature of stream flows, surface water samples have been obtained by Hastings from two temporary pools within the Lyons River and Fraser Creek following a large rainfall event in October 2016. The physical and chemical parameters (**Table 10**) reported from these pools is not considered representative of surface water quality of flowing streams.

As part of on-going hydrological assessment, surface water samples will be obtained at varying timeframes following rainfall events to further understand the stochastic variation in physical and chemical parameters. During the minor or preliminary works program, samples will be obtained, where possible, from within the proposed mine activity envelope, as well as up-gradient and down-gradient of proposed disturbance areas following rainfall events of sufficient magnitude to generate a surface water flow.

Table 10 Surface water quality in intermittent pools

Analyte (mg/L)	Lyons River Pool	Fraser Creek Pool	Australian Drinking Water Guideline
Chloride	430	30	250
Sulphate	290	<1	250
Nitrate	<0.01	<0.01	50
Sodium	290	23	180
Potassium	23	22	-
Calcium	38	43	-
Magnesium	88	17	-
Iron	0.08	0.45	0.3
Aluminium	<0.01	<0.01	0.2

Analyte (mg/L)	Lyons River Pool	Fraser Creek Pool	Australian Drinking Water Guideline
Arsenic	0.001	0.002	0.01
Cadmium	<0.002	<0.002	0.002
Chromium	<0.01	<0.01	0.05
Copper	<0.01	<0.01	2
Lead	<0.01	<0.01	0.01
Nickel	<0.01	<0.01	0.02
Selenium	<0.001	<0.001	0.01
Thorium	<0.001	<0.001	-
Uranium	0.004	0.001	0.017
Zinc	<0.01	<0.01	3
TDS	1200	330	600

Notes:Shading indicates analytes exceeding Australian Drinking Water Guidelines (NHRMC 2011)
TDS – Total Dissolved Solids

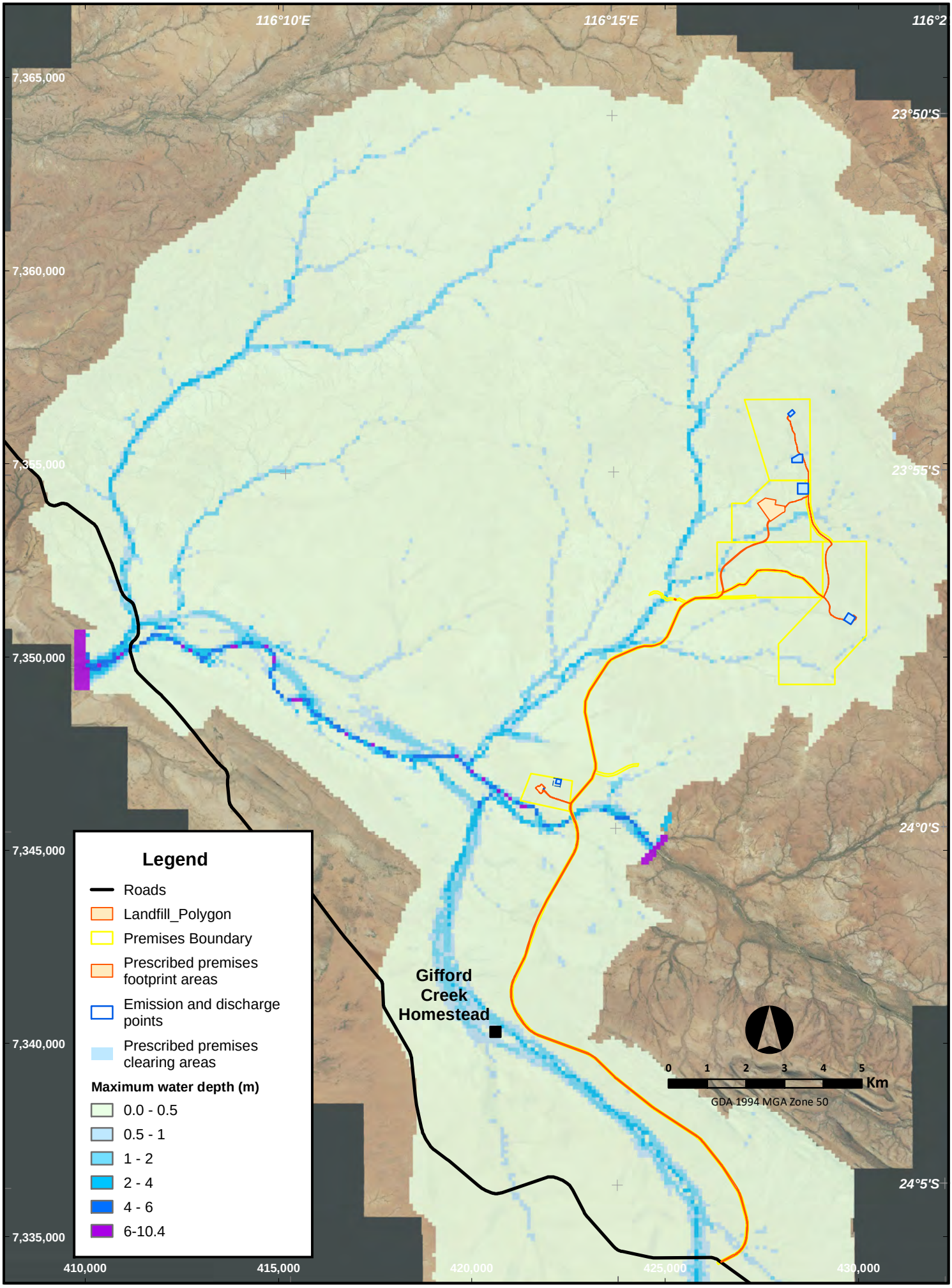
8.7.1.2 Regional Hydrological Assessment

A preliminary hydrological assessment was undertaken by JDA Consultant Hydrologists (JDA 2017) to assess the impacts of the Lyons River, Yangibana Creek and Fraser Creek on the broader Project design. The Lyons River hydrological model was developed to generate flow hydrographs for a detailed hydrodynamic model of the Fraser Creek and Yangibana Creek catchments. This detailed model assessed flood conditions that are likely to impact on proposed mine infrastructure of the Project during operations and post closure.

The findings have been used to determine where surface water management structures are required or inform the location of infrastructure to reduce the cost of management and maintenance, and to reduce the potential for environmental impacts.

The modelled scenario most applicable to assessing possible impacts to post closure landforms, particularly TSFs, is the Probable Maximum Flood (PMF) inundation depth.

Figure 11 presents the PMF inundation depth in relation to the proposed site layout.



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100 Year Inundation Depth

Figure_11_100yr_Inundation.mxd
14 May 2018

Figure 11

8.7.2 Groundwater

The water requirements for the minor or preliminary works are approximately 280,000 kL/annum (0.28 GL/annum). Water will be sourced from a confined ironstone fractured rock aquifer (GRM 2016). Water quality analyses indicates a pH range of 7.8 to 8.5 and a salinity range of 920 to 1,200 mg/L total dissolved solids.

Pastoral stations are the only other groundwater users in the vicinity of the Proposal, with water used for domestic and stock purposes. The nearest pastoral bore is approximately 1-2 km from the prescribed premises. Water quality parameters from eight pastoral station bores were variable depending on location. pH ranged from 7.2 to 8.6 and salinity ranged from 600 to 2,800 mg/L TDS.

8.7.2.1 Regional Hydrogeology

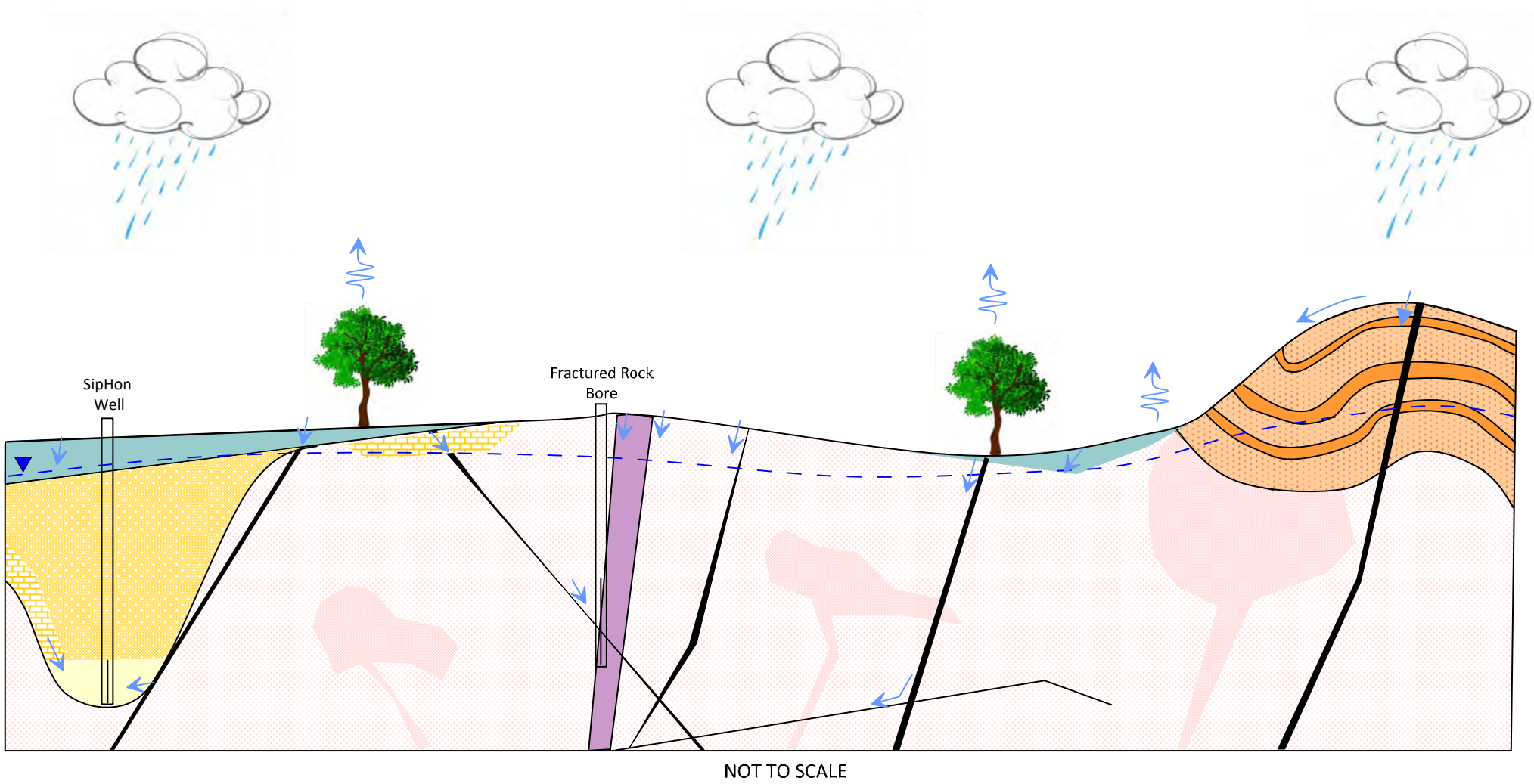
A conceptual appraisal of the hydrogeology of the Project area was undertaken by Global Groundwater (2016).

The Project area is characterised by local superficial aquifers and underlying fractured and weathered basement rock aquifers. Across the Project area, it is considered that aquifers will be mostly unconfined with confined conditions occurring locally. Three aquifer types are described as follows:

- Superficial units: calcrete and alluvium, of low permeability and/or unsaturated. Only alluvium units in proximity to recharge along the main drainage lines will form aquifers with potential to supply usable, sustainable quantities of groundwater. Both units will have a high variable permeability, predominantly where solution channels and cavities are present within the calcrete and lowest where the strata is clayey. Groundwater is likely to be generally unconfined but confined groundwater will be present locally where the aquifer is overlain by low permeability units (clay sections of calcrete or alluvium).
- Basement rocks: fractured and weathered basement rocks, forming isolated and effectively disconnected aquifers. Some degree of hydraulic connection will occur locally depending on geological structure, weathering, landscape position and aquifer geometry. Permeability will be low, and could be regarded as effectively impermeable throughout much of the Project area. Zones of very high permeability will occur in the vicinity of bedding plane partings, fractures and where solution cavities and channels have developed in the ironstone veins.
- Palaeochannel systems occur at depth and may have connectivity to superficial units (described above) where recharge occurs. This unit has low permeability and is mostly confined where the aquifer is overlain by low permeability units (i.e. clays).

Figure 12 presents a schematic conceptual cross-section of the relationship between geological and hydrogeological units within the Project area (GRM 2018).

The depth to groundwater ranges 31.9 m at Fraser Well, (nearest pastoral bore to prescribed premises), 33.80 m at FRW03 (bore for early works, next to the borrow pit on M09/158) and 26.52m at BHW05 (M09/157; GRM 2018). However, Global Groundwater (2016) reported from a desktop assessment that the depth of groundwater is likely to be as shallow as 10 m or less in creeks and the Lyons River, where shallow calcrete aquifers are known to exist.



Yangibana DFS (J1709R01)		**SCHEMATIC CONCEPTUAL MODEL**
Hastings Technology Metals		
KM	Nov 17	**FIGURE 6**

GROUNDWATER RESOURCE MANAGEMENT

FILE://Jobs17/J1709_YangibanaFS/figures/surfer/conceptual cross section.srf

8.7.2.2 Groundwater quality

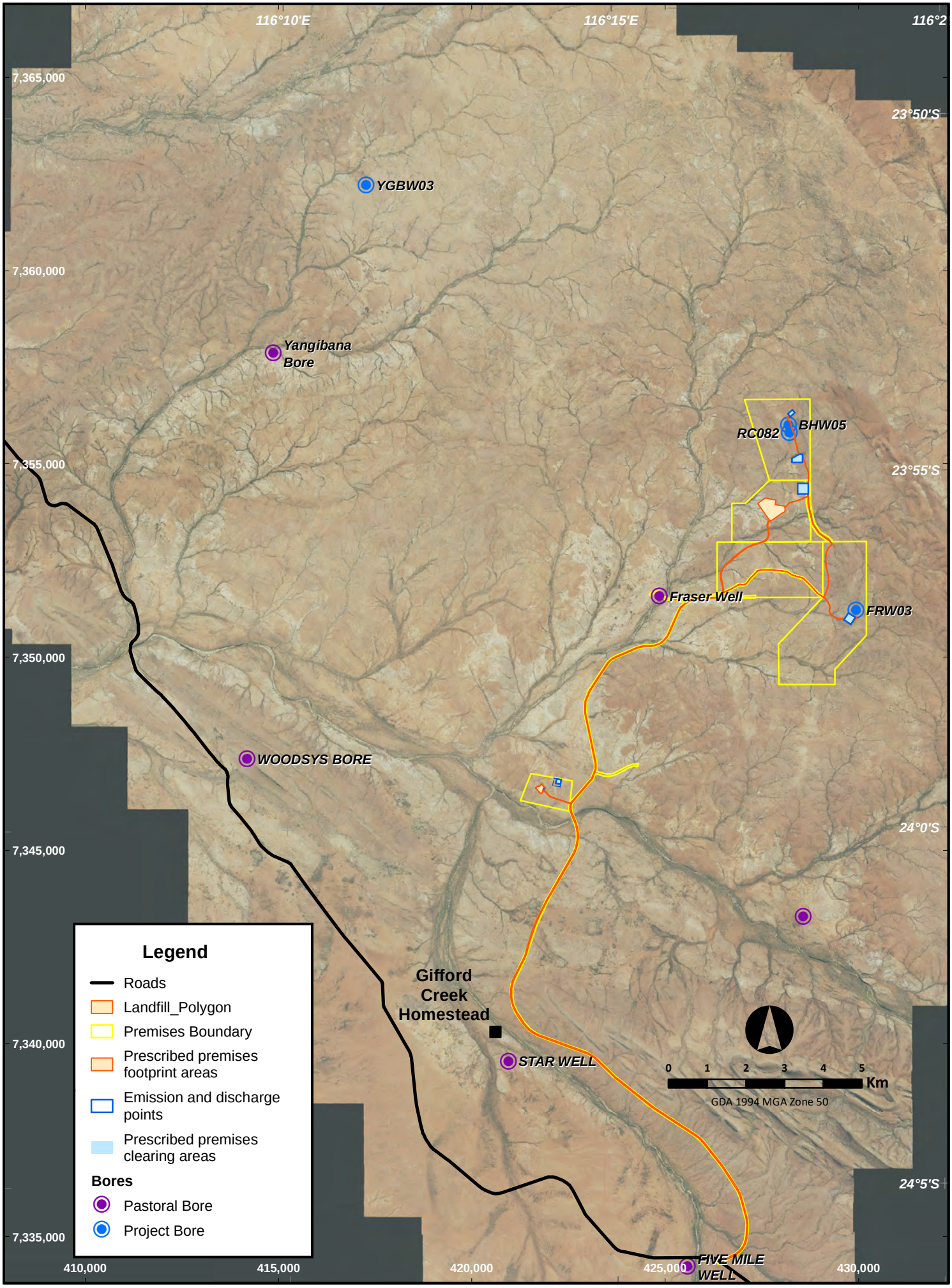
Groundwater samples have been collected by ATC Williams (2015), Hastings (2016) and GRM (2016) from existing pastoral bores, and a limited number of bores and drill holes (**Figure 13**) associated with the Project.

Groundwater salinity in the Project region is variable ranging from 600 to 2,800 mg/L TDS. The pH is neutral to slightly alkaline, ranging from 7.2 in the Red Hill 2 Bore to 8.6 in the Edmund Homestead Bore. The groundwater reports concentrations above detection limits of arsenic, boron, copper, iron, molybdenum, silicon, vanadium, tin, strontium, selenium and uranium. However, these values are below the ANZECC water quality guidelines for stock.

Groundwater from the fractured rock aquifers in the immediate vicinity of the borrow pits is:

- slightly alkaline, reporting a pH of 8.0 to 8.5;
- fresh to slightly brackish, with TDS ranging from 1,000 to 1,200 mg/L TDS; and
- of sodium chloride type.

Table 11 summarises groundwater analytical results for regional pastoral bores and project investigation bores.



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Project and Pastoral Bores

Figure_13_Bores.mxd
14 May 2018

Figure 13

Table 11 Groundwater quality pastoral and Project bores

Analyte (mg/L)	Minga Well	Edmund HST Bore	Contessis Bore	Edmund Well	Fraser Well	Fraser Well	Yangibana Bore	Woodsys Bore	Red Hill 2	YGBWB1 *	Bald Hill RC081 *	Windmill Bore	Bald Hill Bore	FRW03 *	BHW05 *	YGWB03 *	Australian Drinking Water Guideline
Sample Date	Jun-15	Jun-15	Jun-15	Jun-15	Jun-15	Oct-16	Jun-15	Jun-15	Jun-15	Jun-15	Jun-15	Oct-16	Oct-16	Dec 17	Dec-16	Dec-16	
Chloride	110	270	95	810	570	510	530	590	710	240	410	460	320	400	330	250	250
Sulphate	110	330	45	320	160	170	180	250	830	73	100	360	110	160	100	89	250
Nitrate	6.5	8.97	0.05	17	12	11	18	12.98	<0.01	11	21	15	17	23	65	63	50
Sodium	150	280	70	610	550	420	350	380	620	150	340	280	240	160	240	180	180
Potassium	-	-	-	-	-	9.1	-	-	-	-	-	15	11	14	9.0	7.5	-
Calcium	39	66	30	79	47	53	120	110	250	61	60	160	86	73	81	85	-
Magnesium	58	90	48	100	40	41	75	110	130	38	43	88	52	59	51	44	-
Fluoride	2.3	1.4	2.5	2.9	3	-	2.2	1.3	4	2.1	3	-	-	2.6	-	-	1.5
Silica	36	32	30	23	24	-	23	26	31	24	20	-	-	52	72	91	-
Iron	<0.01	0.07	<0.01	<0.01	<0.01	0.84	<0.01	<0.01	0.19	<0.01	0.26	<0.01	0.19	0.02	0.009	0.005	0.3
Aluminium	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.8	<0.1	<0.1	<0.1	<0.005	<0.005	0.2
Antimony	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	-	-	0.03
Arsenic	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	<0.001	0.001	<0.001	<0.001	-	-	0.01
Barium	0.04	0.02	0.16	0.04	0.04	-	0.03	0.03	0.07	0.23	0.08	-	-	0.03	-	-	2
Beryllium	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.01	-	-	4
Boron	0.5	1	0.26	1.4	0.83	-	0.55	0.8	2.1	0.36	0.61	-	-	0.62			4
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	0.002
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	0.05
Copper	<0.01	<0.01	0.02	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	2
Cobalt	<0.01	<0.01	0.02	0.04	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	
Lead	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	0.01
Manganese	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.87	0.07	0.01	-	-	<0.001	<0.001	<0.001	0.5
Molybdenum	0.01	<0.01	0.01	0.01	0.02	-	<0.01	<0.01	0.01	0.03	0.02	-	-	0.02	-	-	0.05
Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	0.02
Selenium	0.003	0.007	<0.001	0.003	0.005	0.005	0.005	0.003	<0.001	0.005	0.008	0.009	0.009	0.004	0.007	0.006	0.01

Analyte (mg/L)	Minga Well	Edmund HST Bore	Contessis Bore	Edmund Well	Fraser Well	Fraser Well	Yangibana Bore	Woodsys Bore	Red Hill 2	YGBWB1 *	Bald Hill RC081 *	Windmill Bore	Bald Hill Bore	FRW03 *	BHW05 *	YGWB03 *	Australian Drinking Water Guideline
Sample Date	Jun-15	Jun-15	Jun-15	Jun-15	Jun-15	Oct-16	Jun-15	Jun-15	Jun-15	Jun-15	Jun-15	Oct-16	Oct-16	Dec 17	Dec-16	Dec-16	
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	0.01	-	-	0.1
Strontium	0.41	0.76	0.3	1.1	0.52	-	0.92	0.82	2.2	0.52	0.58	-	-	-	-	-	-
Thorium	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	-	-	-	-
Tin	<0.01	<0.01	0.02	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-
Titanium	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	0.02	-	-	-	-	-	-
Uranium	0.004	0.004	0.02	0.038	0.025	0.029	0.029	0.009	0.079	0.016	0.014	0.038	0.029	0.011	-	-	0.017
Vanadium	0.05	0.04	<0.01	0.03	<0.01	-	<0.01	0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-
Zinc	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	-	-	3
TDS	920	1400	600	2200	1600	1400	1600	1800	2800	870	1300	1600	980	1100	1000	920	600

Notes: Shading indicates analytes exceeding Australian Drinking Water Guidelines (NHRMC 2011)

* denotes Project related production bore / drill hole

TDS – Total Dissolved Solids

9 COMMISSIONING PLAN

9.1 MOBILE CRUSHING AND SCREENING PLANT

The following commissioning of the mobile crusher is expected to occur over a period of three days:

1. Revalidate the mobile crusher operator to have a valid appropriate operating license.
2. Confirm location of mobile crusher.
3. Internal audit of clearing footprint i.e. bunding around borrow pit, no obstruction of drainage channels. This will be repeated for each borrow pit.
4. Un-pack from transport position to working position. Secure the position of this mobile equipment.
5. Hook up mechanically and electrically any optional items required.
6. Check storage of hydrocarbons is setup on self-bunded containers, spill kit is present and spill procedure is with the spill kit. This will be repeated at each borrow pit.
7. Add the diesel fuel.
8. Do a pre-start check
9. Start the engine. After a period of time, observe for hydrocarbon drips or leaks. Note areas that require spill matting. This will be repeated at each borrow pit.
10. Test the individual components of the complete mobile crusher for correct rotations and movements.
11. Test drive the mobile crusher over a short distance.
12. Commission with actual load:
    - Observe dust generation and trial wetting of materials prior to entering crusher.
    - Adjust the crushing size if required.
    - Check the screening operations.

9.2 WASTE WATER TREATMENT PLANT

The following commissioning actions will be undertaken on the WWTP:

1. Mechanical and electrical checks over a period of approximately three days for proper installation of the infrastructure:
    - Plumbing connections secure and good condition.
    - External valves from the system are all open.
    - Continuity tests of all electrical, instrument and control cables.
    - Rotation checks of all pumps.
    - Alarms and warning lamps are functional.
    - Pumps are primed.
    - Pump overloads are set to pump rating.
    - Check all switches are functioning correctly.
    - Check pumps in aerator tank for correct rotation.
    - Check silencer operation.
    - Check mixers for proper operational mixing.
2. Dry commissioning of system using clean water:
    - No hydrocarbon leaks at pumps and power supply

- No water leaks from the system itself
- Sprinklers are operational and no flooding within spray field

3. Load the chlorine and bacteria into the appropriate tanks. Wet commissioning using site effluent will occur over a three-month period:

    - Water sample collection approximately every 2 weeks, laboratory analysis and verification of measurements within specified limits. Requires 6 consecutive of compliant samples of effluent to confirm that the WWTP is compliant with the Department of Health requirements.
    - No odours observed (over the 3-month period)
    - Check for effluent leaks (over the 3-month period)
    - Check for hydrocarbon leaks (over the 3-month period)
    - Check effectiveness of spray field

9.3 LANDFILL

The following commissioning actions shall be undertaken for the landfill:

1. Confirm location and clearing footprint
2. Establish correct depth of the trench
3. Establish presence of bunding around the perimeter of the landfill
4. Establish presence of a fire break around the perimeter of the landfill
5. Initiate waste disposal to determine the landfill performance and adequate controls

10 FEE CALCULATIONS

10.1 MOBILE CRUSHING AND SCREENING PLANT

The following costs have been determined for the mobile crushing and screening plant:

Plant hire	$345,000
Labour hire	$216,000
Transport of plant to site	$168,480
TOTAL	**$729,480**

The fees calculator was used to determine the works approval fee using the following parameters:

- Category 12
- Capacity Range: >500,000 – 5,000,000 tonnes per annum
- Premises construction cost: $500,000 - $1,000,000
- Rate: 125

Total works approval fee = $4,450.00

10.2 WASTE WATER TREATMENT PLANT

The following costs have been determined for the WWTP:

WWTP	$282,013
Infrastructure to and from WWTP	$28,200
TOTAL	**$310,213**

The fees calculator was used to determine the works approval fee using the following parameters:

- Category 85
- Capacity Range: 20 – 100 cubic metres per day
- Premises construction cost: $300,000 - $350,000
- Rate: 85

Total works approval fee = $3,026.00

10.3 LANDFILL

The following costs have been determined for the landfill:

Landfill earthworks	$6,500
Operational costs (e.g. fuel)	$3,500
TOTAL	**$10,000**

The fees calculator was used to determine the works approval fee using the following parameters:

- Category 64
- Capacity Range: not more than 5,000 tonnes per annum
- Premises construction cost: less than $20,000
- Rate: 15

Total works approval fee = $534.00

11 ENVIRONMENTAL MANAGEMENT SYSTEM

Hastings aims to conduct its business in an efficient and environmentally responsible manner, meeting the expectations of its community, shareholders and relevant government agencies. Hastings recognises that environmental responsibilities go beyond those required under statutory requirements and include social obligations, leadership in sustainable development and climate change, and conserving biodiversity.

Hastings plans to further develop and implement the Environmental Management System (EMS), based on the AS/NZS ISO 14001 (2004) Environmental Management System standard. The EMS will be structured such that it addresses requirements detailed in *Guidelines for Mining Proposals in Western Australia* (DMP 2016), similar to that presented in **Figure 15**. However, it will also be integrated with Health and Safety, as well as, Community to form a broader Health, Safety, Environment and Community (HSEC) Management System.

The EMS will apply to all aspects of the exploration, development, construction, operation and closure phases of all Hastings activities. It will also incorporate Hastings port and road operations. It shall be implemented by all personnel working for and on behalf of Hastings.

Hastings management commitment to the EMS includes the respective management team and their responsibilities for implementing the EMS and improving environmental performance.

Hastings Environmental Policy, relevant to the current status of the Project, is the overarching document of the EMS (Appendix M), and will be reviewed and updated to reflect the development status of the Project. The Environmental Policy encompasses the environmental performance aspirations of the company, and is the foundation of environmental management for all of Hastings activities.

The Hastings HSEC framework has five defined sections as shown in **Figure 14**:

1. Hastings vision and shared values,
2. Policies,
3. HSEC Management Standards,
4. Management Plans including statutory EMP's and licence conditions, and operational procedures, and
5. Individual area/ site specific/ contractors HSEC Management Plans and systems that are established and implemented to deliver the requirements in the Hastings HSEC Management System.

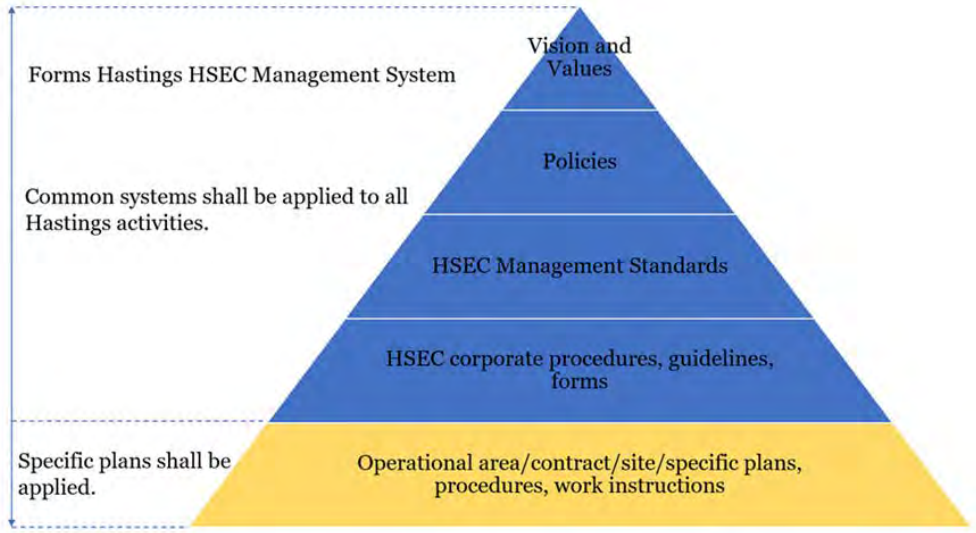

Figure 14 Hastings HSEC Management System

11.1 PLANNING

Environmental laws are established to protect the environment. Compliance with legal requirements should effectively lower the risk to the environment and the business. Legal and other requirements relevant to Hastings activities are identified (SOP *Legal and Other Requirements Procedure*) and documented in a *Legal Obligations Register*. These requirements form an important component of Hastings risk management process, which also involves the systematic identification of environmental aspects of its activities, which have the potential to impact the environment.

The environmental risk assessment approach follows the risk management process described in this Mining Proposal. Risk assessment takes into consideration the potential for pollution, inability to achieve targets and non-compliance with legal or other requirements (*Risk Assessment Work Instruction*).

Significant risks are addressed through the setting of objectives and targets, and the implementation of Environmental Management Plans. The risks associated with changes to process, plant, organisation, personnel or procedure are identified and managed in the same way (SOP *Change Management Procedure*).

In the case where there is a change of site personnel, Hastings will provide an *Environmental Handover Guideline* to the new site environmental personnel to follow when transitioning into their new role. This will reduce the likelihood of a non-conformance in data collection, monitoring or reporting.

The *Environmental Handover Guideline*, will include (but not limited to) the following:

- Historical information of the project and approvals;
- Key environmental receptors;
- High priority action items e.g. monitoring for the week, month, and year; and
- Location of project documentation (e.g. *Legal Obligations Register*).

11.2 Implementation and Operation

To ensure that risk management requirements are effectively implemented, personnel who may have a significant impact on the environment will be experienced, qualified or trained to competency in managing their environmental risks (*Training Procedure*). Internal and external communications are maintained to facilitate discussions on risks and environmental performance (*Communications Procedure*).

Aspects associated with significant environmental risks are documented in Environmental Management Plans with Work Instructions to be used in conjunction with SOPs to minimise impacts arising from inconsistent work practices. These documents and records, essential to the EMS, are maintained and controlled as per the *Document Control Procedure* and *Records Procedure*.

The potential for environmental emergency situations to arise has been recognised. Such scenarios are identified (*Emergency Preparedness Response Procedure*) as well as response and preparedness requirements addressed in the *Emergency Response Plan*. Other requirements expected of the Contractor are determined and detailed in contractual documents (*Contractor Management Procedure*).

11.3 Checking and Corrective Actions

Environmental performance is monitored at various levels (*Monitoring Procedure*) through the reporting, investigation and analysis of incidents and non-conformances (*Incident and Non-Conformance Management Procedure*) and regular inspections and audits (*Inspections and Audits Procedure*). Corrective actions are implemented to address the non-conformances.

11.4 Management Review

Performance results are discussed at the management level to ascertain the appropriateness of the Environmental Policy, objectives and targets, and the adequacy and effectiveness of the elements of the EMS (*Management Review Procedure*).

11.5 Continual Improvement

The cyclic nature of the EMS structure described above facilitates continual improvement in environmental performance, and provides the mechanism for managing significant risks, achieving targets and complying with legal and other requirements.

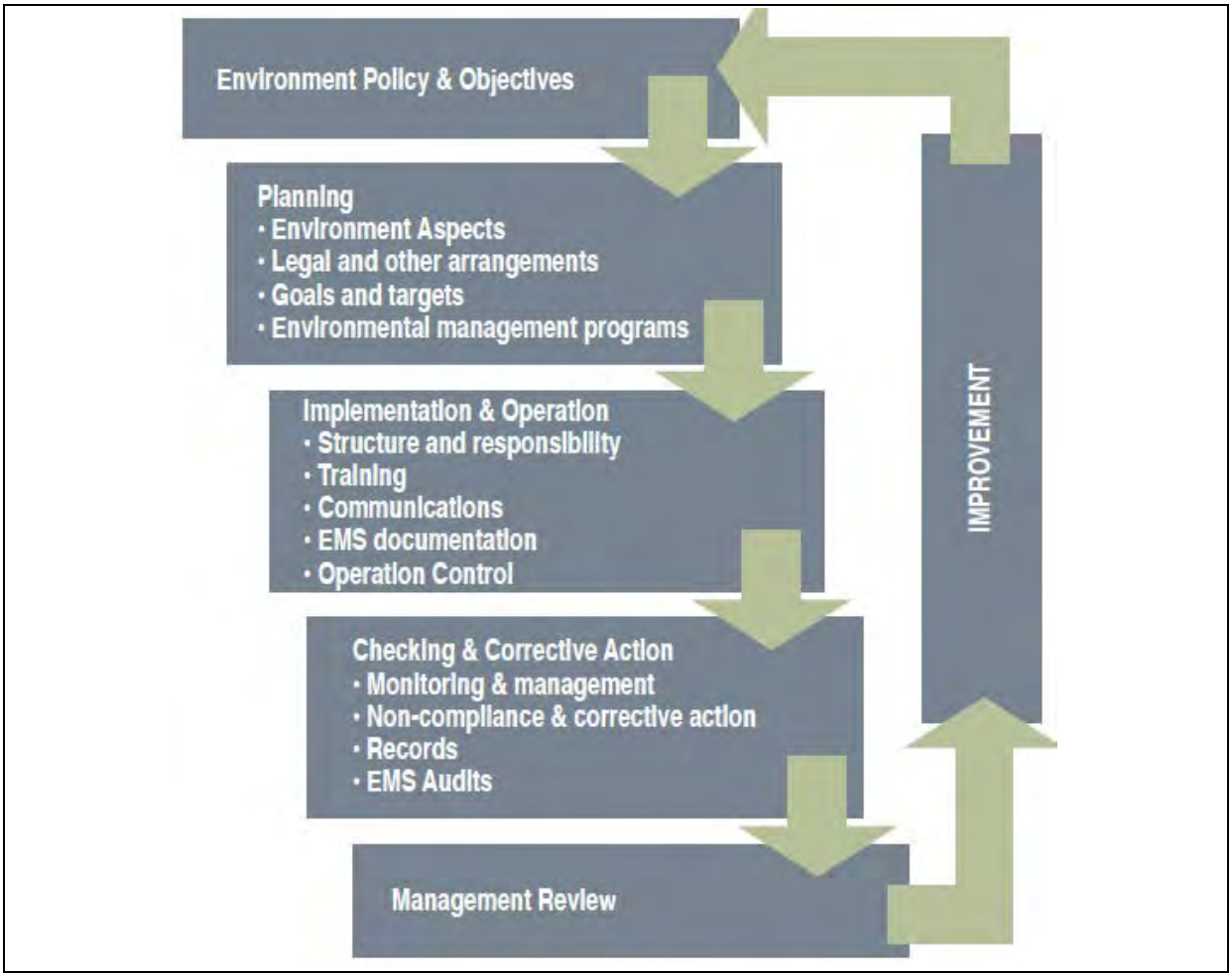

Figure 15 Example Environmental Management System

(Source: DMP 2016)

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