DRAFT REPORT FOR FORTESCUE METALS GROUP

PILBARA IRON ORE MINE SITES

DRAFT COPY

Brenton Knott and Sarah Goater

M092 Zoology
The University of Western Australia
35 Stirling Highway
Crawley
Western Australia 6009.

e-mail: bknott@cyllene.uwa.edu.au
Telephone: 08 6488 2223
Fascimile: 08 6488 1029

TABLE OF CONTENTS

1 INTRODUCTION

In response to the proposal by Fortescue Metals Group (FMG) to establish iron ore mining operations of four mines 345 km southeast of Port Hedland, and construct a port facility at Port Hedland and a connecting railway, the Environmental Protection Authority has requested that FMG investigate the potential impacts of the Project on stygofauna in the Project area. The EPA has requested that knowledge sufficient to "maintain the abundance, diversity and geographical distribution of subterranean fauna" be acquired. The EPA requested specifically that FMG:

Identify any potential stygofauna habitat sites.
Undertake stygofauna sampling in conjunction with drilling for groundwater resources and hydrogeological investigations.
Assess the potential affect on stygofauna from dewatering operations.

The purpose of this report and the associated services of The University of Western Australia (UWA) staff was to conduct and report on field sampling of stygofauna and basic physio-chemical water properties in the Pilbara region as negotiated with Mr Ian Yull, Senior Environmental Consultant, ENVIRON. The scope of the service was defined by the request of the Client, by the time and budgetary constraints imposed by the Client and by the access available to the sites.

Subsequently, 11 sites were sampled during the period 11-13 September, 2004 in the area of interest for FMG in the Fortescue Marsh area of the Fortescue River catchment, Pilbara region, Western Australia. This preliminary sampling was undertaken to familiarise the samplers with the terrain and likely problems to be undertaken in mounting a detailed study of the stygofauna of the area. The immediate objective was to determine whether stygofauna are present in the groundwater to be affected by mine dewatering and for water supply areas in the region to be impacted the project. Such preliminary information may provide some insight into the likely conservation status of any stygofaunal populations present which may be affected by abstraction of groundwater.

The present Report is a summary of the initial sampling for stygofauna in three of the proposed mining areas (Christmas Creek, Mount Lewin and Mount Nicholas) and, based on this experience, lists a number of Recommendations for further stygofaunal studies in the area.

1.1 Subterranean Fauna

Studies by the Department of Conservation and Land Management (CALM) and UWA, investigating the scope of stygofaunal diversity at the regional scale across the Pilbara region of Western Australia are ongoing. The sampling to date has revealed an extensive and diverse fauna from the ground waters of the Pilbara, with >200 species across all taxa being logged. Crustaceans, amphipods, isopods and copepods particularly constitute the major groups and all are widespread across the region. There is still substantial research effort required to validate the taxonomic status of the stygofauna of the Pilbara. However, it can be assumed reasonably that any stygofauna in the areas of interest to FMG will integrate with

the wider Pilbara fauna at higher taxonomic levels although there may be some local species and perhaps even genus endemicity. The zoogeographical significance of the fauna lies in the relictual lineages with Gondwanan, Pangaean and tethyan affinities (i.e. it is ancient fauna).

2 METHODOLOGY

2.1 Background

UWA were provided with 15 sample bore locations selected from the Department of Environment (DoE) Aquabase database. The bores were selected to best cover the proposed mining area, borefield and control areas. On arrival at the site, many of the bores preselected for sampling could not be located either due to wrong co-ordinates and/or inadequate mapping. To enable some sampling to be undertaken, UWA staff consulted with the on-site hydrogeologist (from Aquaterra) to identify bores that intersected the groundwater and that were open for sampling. The bores were selected to provide a geographically dispersed data set and observation bores with potential for future sampling.

In all, 11 sites (Table 1) were sampled, with another 5 sites observed (Table 2) but not able to be accessed although potentially likely to yield stygofauna. Two of the sites sampled were decommissioned windmills, the remainder were RC bores.

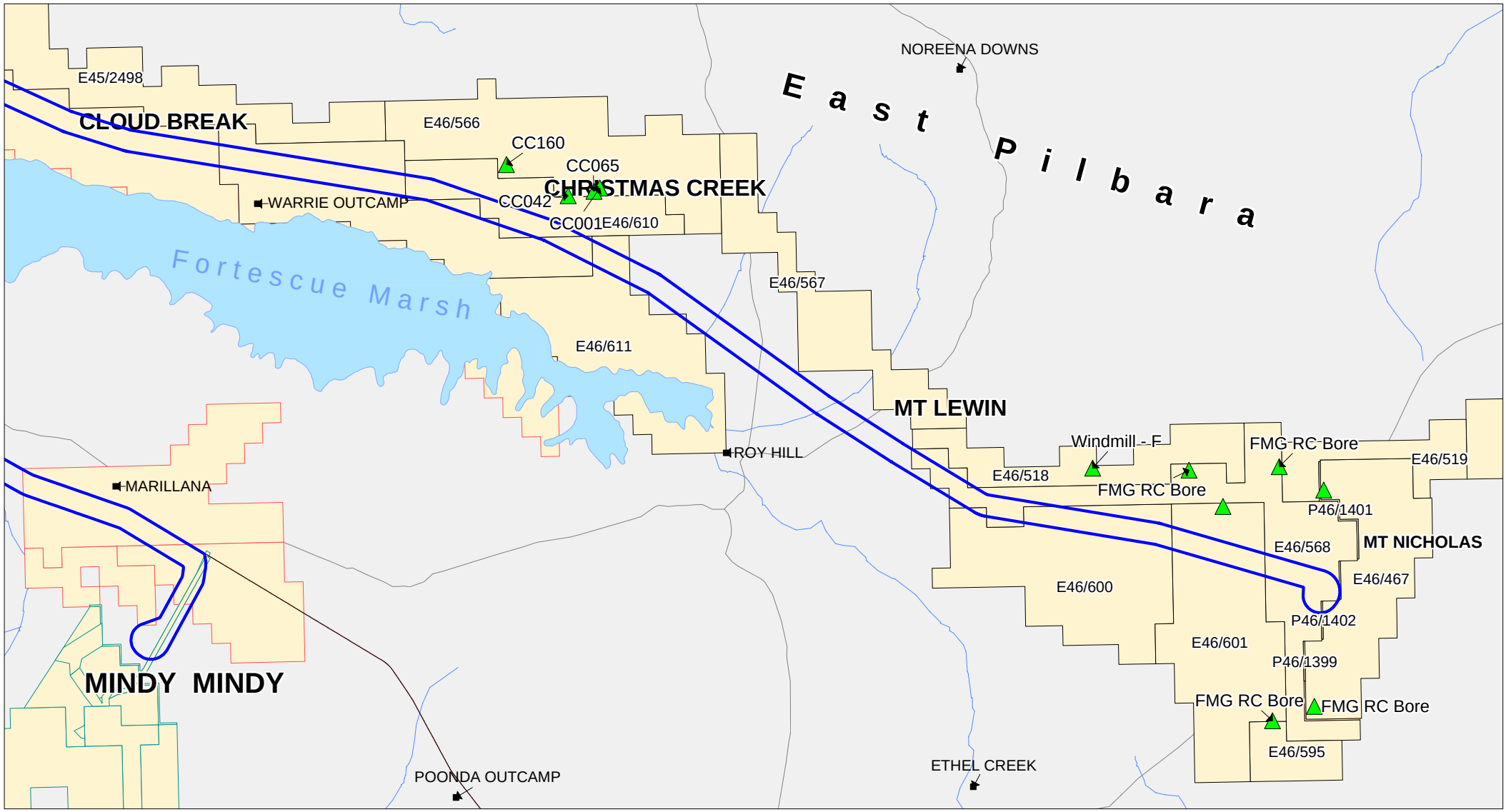
The sites (Figure 1) represented three of the four mining areas, with no sites in the Mindy Mindy area:

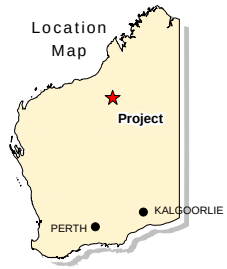
- **Christmas Creek** – 4 sites, CC 001, CC 042, CC065 and CC 160
- **Mt Lewin** – 4 sites, Lewin Creek Bore, Ironstone Bore, WSE 28 and WSE 38
- **Mt Nicholas** – 3 sites, WSE 16, WSE 61 and WSE 64

2.2 Field Sampling

Sampling for stygofauna in nine of the sites involved replicate sampling. The first replicate used a bailer, sampling from the bottom of the bore and the water recovered was used for washing further samples from that bore. The remaining two replicates used a weighted net constructed from 50 µm plankton netting and of diameters appropriate to the bore diameters. Samples were collected on an Endecott sieve of 50 µm mesh using the isotonic ground water and washed into vials from which the water was pipetted off and replaced by 100% AR ethanol to fix any specimens suitable for DNA analysis. Because of an obstruction in the bore of WSE 61, it was not possible to use a net and the bore was sampled using a bailer.

Replicates were washed into separately labelled vials for each site and returned to UWA by courier for analysis. Small aliquots at a time of each sample (i.e. vial) were decanted into a Petri dish until the full sample had been scanned for stygofauna. Each subsample in the Petri dish was immersed in the fixative, and scanned for stygofauna in the laboratory using a dissecting microscope at 40x magnification.





Legend

- Bores Sampled
- FMG Tenenment - Granted
- FMG Tenement - Application
- Mind Mindy JV
- Rail - Existing
- Road
- Drainage

N

0 7.5 15 km

Scale : 1: 500 000

Fortescue Metals Group Limited

Stygofauna Sampling September 2004

Author: **FMG**	Date: **26/10/04**
Drawn By: **M.Khan**	Revised:
Fig No.: **1**	Report No.: **FMG 4072**
Projection: **GDA zone 50 & 51**	Scale: **1 : 500 000**

The field sampling was undertaken by Ms Goater, accompanied by Ms Rohan Sibor of FMG

2.2.1 Sampling Equipment

Stygofauna sampling equipment was designed and constructed as a modified version of equipment used by CALM and Biota Environmental Consultants, which are based on EPA guidelines. The stygofaunal nets consisted of cone-shaped plankton mesh (50 μm and 140 μm) and a top opening reinforced with adhesive sail cloth tape folded and stitched around a stainless steel ring. Outer diameters of each ring were made to 96 mm, 76 mm and 46 mm to be used in bores with internal diameters of 100 mm, 80 mm and 50 mm, respectively. The cod end of each net was reinforced with adhesive sail cloth tape, then fitted and fixed between a PVC threaded female faucet adaptor and a small portion of 25 mm PVC pipe (Plate 1).

Due to the narrow internal diameters of bores to be sampled, equipment used by CALM was not universally applicable. Therefore, it was essential to construct a vial that could be used to sample all bore sizes. The vial was made using a male threaded faucet adaptor, 20 mm of pipe and a 20 mm cap. This was then encased in 2 layers of lead flushing and secured with plumbing weld. All joins and interfaces between mesh and PVC were then sealed with Selly sealant 'No more gaps' to minimise bi-catch and cross contamination during the sampling process.

Three lengths of wire fishing trace were looped at each end to provide a centered mechanism for drawing the net vertically through the water column. The lower loops were threaded through the sail cloth tape and secured around the stainless steel ring. The upper loops were used as a contact point between the rope and reel lowering device. An additional three lengths of wire fishing trace were looped around a ring of trace positioned over the female PVC adaptor and also secured around the top stainless steel ring. This was done to minimise damage to the plankton mesh or loss of the lower portion of the apparatus by reducing pressure applied by the weight of the lead vial.

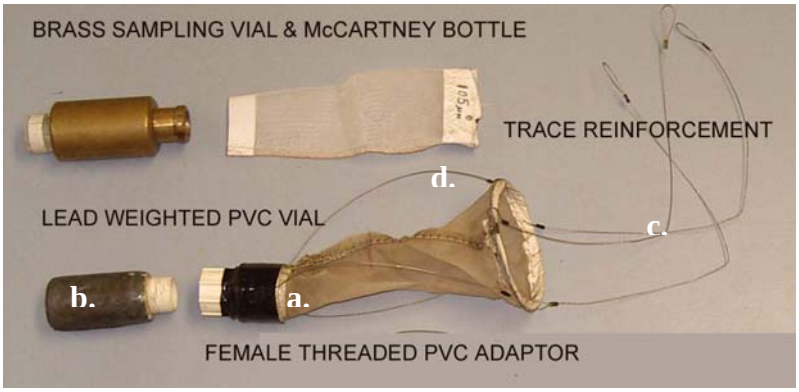


Plate 1: Components of sampling equipment

This figure illustrates various components of the plankton nets designed and made to sample stygofauna within the FMG study area of the Pilbara: a: - net and cod end adaptor; b: - lead weighted vial; c: - centering mechanism; and d: - reinforcing fishing trace.

2.2.2 Sampling Procedure

Stygofauna were sampled to determine density and species composition. For this purpose, the appropriately sized stygofaunal net was lowered to the bottom of each bore on a 200 m rope and reel device. The rope was then raised and lowered approximately 1 m on six separate occasions to agitate the bottom sediment and any possible animals present. Once this was done, the net was brought up through the water column very slowly to minimise any chance of avoidance due to creating a bow wave off the top of the net. At the top of the bore, the net was then moved directly over the same 53 µm Endicott sieve used during the water quality sampling process. The lead-weighted sample vial was removed and emptied into the sieve. Isotonic water was used to flush the net and vial and ensure all debris, organic matter and animals were transferred to the sieve. The contents of the sieve were then washed with 100% ethanol and sample stored in pre-labelled plastic vials.

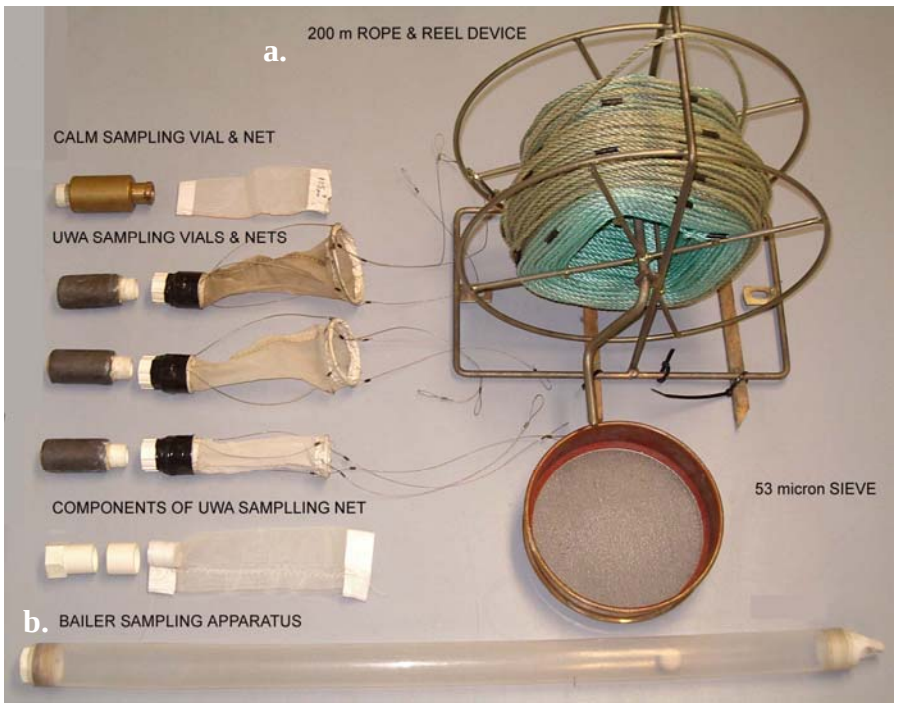


Plate 2: Stygofauna sampling equipment

This process was repeated for a total of three times with a 50 µm net, consistent with sampling methods used by CALM in the Pilbara region. On completion of sampling, nets were decontaminated by scrubbing thoroughly in water with a toothbrush and round brush, rinsed with clean water and hung to dry. Each net was then sprayed with methylated spirits (*sensu* WRC, 2003) to ensure that:

- No live transfer between sampling occurred;
- Dry nets between bores; and
- Reduce risk of damage to nets with chemicals.

When a reducer or organic material within the bore obstructed the designated net to be lowered down the bore, a bailer with an outer diameter of 40 or 25 mm was used as an alternate sampling device. This was lowered to the bottom of the water column as far as possible and decanted at the surface through a 53 µm sieve. This alternate method was

repeated for a total of 3 times at SWL and the bottom of the bore, with the remainder of the sample preservation and storage as described previously.

2.2.3 Laboratory Sorting and Identification

In the laboratory, samples were sorted under a binocular dissecting microscope (40 x magnifications).

2.2.4 Limitations

Limitations of the stygofauna sampling process that need to be considered include:

- Avoidance by swimming fauna;
- Bow wave produced by net;
- Loss of sample in transfer process;
- Different sample procedures where obstructions were encountered;
- The presence of reducers within bores which will alter water volume calculations.

2.3 Water Quality

Water quality data were derived from field measurements using *Hannah* hand held meters, arranged by the Client due to UWA equipment being unavailable given the time constraints imposed. Therefore the findings, observations and conclusions expressed within this report are based solely upon field measurements taken at the time of the investigation. Future studies may require more detailed *in situ* measurements and subsequent data analysis.

2.3.1 Equipment

When available, pH and conductivity readings were recorded during the survey period using a **WCG** Hand held meter. Due to the haste at which the field trip was prepared, the preferred water quality probe of UWA staff was not available and thus prohibited readings from being taken *in situ* within the bore. In order to obtain water quality readings representative of conditions experienced by bottom dwelling fauna, a sample was obtained from the bottom of the water column.

2.3.2 Procedure

Water quality readings were obtained using a bailer lowered on a 200 m rope and reel device prior to stygofauna sampling. The rope was marked at 1 m intervals to allow for depth at the water surface and bottom of bore to be recorded. Once the bailer was retrieved, its contents were slowly decanted (to minimise excessive mixing) into a container. The Hand held meters were fully submerged while readings were taken. Once finished, the probe was removed, rinsed with de-ionized water for transportation between sites. Once readings were completed, the water sample was then decanted into a 53 μm Endicott sieve. The container was then rinsed with distilled water to ensure any animals that may have been obtained within the water sample were not discarded.

2.3.3 Limitations

Consideration of water quality parameters that may have been affected by bailer abstraction and decantation needs to be made. The preferred method of measuring pH, dissolved oxygen (DO), conductivity, salinity, temperature and turbidity *in situ* through the water column could not be made due to the equipment being unavailable for this project due to time restrictions in place.

3 RESULTS

All relevant sampling data are listed also in the accompanying Table 1. The water in bore CC065 was black and the top of the bore casing was broken. Consequently, after the first bailer sample was extracted, it was determined on site that the bore was unsuitable to sample and therefore no further samples were extracted because of the broken bore condition and the very low water quality Of the 10 effective sites sampled, two were windmills, and eight were FMG RC bores. Water depth varied as follows: surface to water table, 7 - 48.6 m, surface to bottom of the bore, 34 - 115 m; length of water column in the bores, 1 - 79.3 m. None of these values are unduly deep, so it can be reasonably expected that there will be some connection between the surface and the subterranean water, which would enhance the chances of finding stygofauna.

In spite of the sampling methodology used, no stygofauna was seen or recorded.

Table 2 provides additional sites that were observed, but could not be accessed. Table 3 provides an indication of additional sites that may be suitable for future sampling.

4 DISCUSSION

Given the widespread occurrence of stygofauna through the Pilbara, the lack of any stygofauna in the samples was unexpected. However, being widespread does not mean that fauna are distributed uniformly across the area and, indeed, stygofauna notoriously can be patchy in its distribution, and can be difficult to sample. In sampling bores near Perth early in 2004, only 3 of 150 bores yielded stygofauna. Admittedly this is lower than a ‘rule of thumb’ sampling success rates in the Pilbara: Dr Terrie Finston, for example, confirms that the success rate for good hauls of stygofauna in the Pilbara is about 1 in every ten bores sampled. Of the 11 bores sampled, only two wells had characteristics which indicated they were likely to yield stygofauna (Lewin Creek Bore and Ironstone Bore)

Given this, the absence of stygofauna may reflect a very limited sampling size. It is unlikely to be due to sampling methodology: Ms Sarah Goater has acquired considerable experience through 2004 in sampling bores for stygofauna and knows the sampling methodologies well.

Nevertheless, neither reason is likely to solely account for the absence of forms on this occasion. Rather, it is likely that the unsuccessful sampling resulted from a number of other causes. Nine of the bores were recently installed RC bores which had been positioned to expedite knowledge of the geology of the area and not necessarily to tap into suitable

stygofaunal habitat. These bores are unlikely to yield stygofauna for some considerable time, if ever. The siting of these bores, for geological and not biological reasons means that they may occur in areas of geological interest and consequently not tap into potentially suitable groundwater. Further, these RC bores had been installed comparatively recently (approximately two months previously). Typically it takes many months before stygofauna are recorded from a new bore. Therefore, it is likely there had been insufficient time for colonisation by stygofauna, even if the bores intersected suitable ground water.

A further, major problem encountered during the field sampling was the lack of reliable, accurate information on bore sites making the exact location of some bores uncertain. To ensure a more thorough and satisfactory outcome, clarification of bore locations needs to be addressed **well prior** to the commencement of field activities.

5 RECOMMENDATIONS

The Pilbara, generally, is known to harbour a diverse and zoologically important stygofauna, and despite the results of this study, stygofauna is likely to occur through the areas of interest to FMG. Consequently, the relevant tenements should be surveyed for stygofauna. In this context, the sampling in September 2004 was a valuable experience, particularly for identifying problems to be resolved before any further sampling is undertaken.

AR grade ethanol is classified as a Class 3 Flammable Liquid, and cannot travel in a plane to the field site. Sufficient quantities will need to be forwarded by courier well ahead of time.

ENVIRON will need to organise the requisite permits from CALM under Regulation 17 to take Fauna for Scientific Purposes in order to continue their sampling programme on stygofauna.

Given the scale of the preliminary sampling, but acknowledging the fact that the sampling programme will be expanded and conducted in conjunction with drilling for groundwater resources and hydrogeological investigations in accordance with the principles outlined in the EPA Guidance Statement No. 54 on sampling subterranean fauna, there needs to be much more extensive identification of sampling sites, and confirmation of the location of and access to each **well before** the field work is undertaken. This will require gaining permission from pastoralists before access to windmills on their property, and from the Main Roads Department for access to their water bores (which requires keys), before the sampling is undertaken.

Current experience in the Pilbara is that windmills and Main Roads bores are access points into the groundwater most likely to yield stygofauna, and particularly those situated near established watercourses. Such sites within the areas relevant to FMG should be identified well before the next sampling is undertaken. Three windmills were identified in this sampling period as potentially good sites to sample, namely Limestone Bore, Kullawarri Well and Eleven Mile Bore, all situated on Roy Hill Station (GPS details are included in Appendix, Table 3, along with digital images of the sites). Since Limestone Bore and Eleven Mile Bore are functioning windmills, it will be essential to gain permission from the owner to dismantle the mill infrastructure during sampling.

Information on bore characteristics (diameter, access) should be established before the field work is undertaken.

To ensure a more thorough and satisfactory outcome, all of the above logistical issues need to be addressed prior to the commencement of field activities.

Sampling should include sites within and outside the areas subject to change as a result of the mining activities, including the zones of dewatering.

Sampling should be undertaken at least twice yearly for two years to gain some estimation of changes in seasonal abundance.

Fauna collected will need to be preserved with a view to being used in genetic studies.

Depending on taxonomic issues with the stygofauna, voucher specimens should be prepared with photomicrographs as a minimum level of species delineation, but if the stygofauna is complex, then full species descriptions will need to be prepared. The detailed taxonomic and genetic studies recommended here will facilitate all later consultation with representatives from CALM and the Western Australian Museum.

Knowledge from 8) should be used to write a long-term monitoring programme.

Genetic studies will need to be based in Perth, but it would expedite the ongoing monitoring for FMG to establish a suitable laboratory on site, equipped with good compound and dissecting microscopes, and for personnel to be trained in basic recognition of the stygofauna. This will reduce the day-to-day contact with Perth-based personnel.

The sampling methodology described above using plankton net hauls will facilitate analysis of the level of risk associated with project hydrological changes.

6 ACKNOWLEDGEMENTS

We acknowledge with appreciation the assistance of the following people:

Ms Rohan Sibor – FMG Field Tech
Mr Bruce Cochran – FMG Field Supervisor
Mr Fancis Ponchinito – FMG Geologist
Mr Tony Brown – FMG Field Tech
Mr Richard Toll – Aquaterra Hydrolygist
Mr Ian Yull – ENVIRON Project Facilitator

TABLES

TABLE 1
Bores Sampled for Stygofauna

AQWABase Name	Feature Type	Easting	Northing	Grid T No.	Location	date sampled	Cap ID (mm)	Casing type	Stick (mm)	previous site	SWL (~m)	total depth (~m)	water column (~m)	depth WQ readings	Callibration	pH	Ec (ms/cm)	Salinity (ppt)	temp (°C)	Net size	Ring OD (mm)	Reducer/obstruction	stygofauna observed	Stygofauna found	Comment
LEWIN CREEK BORE	Windmill - F	220390	7494276	n/a	Mt Lewin	11/09/2004	80	steel	n/a	0	n/a	n/a	n/a	n/a	Yes	7.4	2	1.18	28.1	50 µm net	96	No	No	No	Couldn't remove infrastructure from bore hole - sampled running water entering tank. A net was held over the pipe entering tank for 4 minutes each, then sieved as per normal methods. GPS co-ords provided not correct, new co-ords here.
IRONSTONE BORE	Windmill - NF	232470	7490725	9	Mt Lewin	11/09/2004	115	steel	230	Lewin Bore	7	46	39	bottom	Yes	7.2	0	0.21	29.9	50 µm net	96	Yes	No	No	Old mill & tank no longer functioning. Bore hole underneath 1/2 44 galon drum. Clay nest approximately 2 m down. Removed. Access through dense spinifes and accacia scrub. No rosad access found. Beyond line 8 of grid.
WSE 38	FMG RC Bore	229321	7494091	10	Mt Lewin	11/09/2004	50	pvc	200	Ironstone Bore	35.74	115	79.26	bottom	Yes	7.6	1.82	0.91	23.9	50 µm net	46	No	No	n/a	Bore constructed only a few months prior to sampling (~April 2004). Water increadibly turbid and filled sample net to brim with sediment. Not suitable for stygofauna sampling until bore water has settled or water has been pumped and cleared to allow for groundwater flow into bore.
WSE 61	FMG RC Bore	237053	7470870	18	Mt Nicholas	12/09/2004	50	pvc	300	0	20.5	48	27.5	bottom	Yes	7.2	1.4	0.73	26.2	bailer	n/a	Yes	No	No	Bore obstructed/bent during construction. The preferred method of using nets could therefore not be applied. Instead, 3 replicates were taken using a bailer both at the SWL and the bore floor. These were then sieved as per normal methods. Only small amounts of water could be obtained using the smaller bailer. Located off Mt Divid Rd after the Ethel ck junction on RHS.
WSE64	FMG RC Bore	240930	9472200	19	Mt Nicholas	12/09/2004	50	pvc	380	WSE 61	30.21	41	10.79	bottom	Yes	7.3	2.39	1.19	18.9	50 µm net	46	Yes	No	No	Bore depth supposed to be 90 m but both bailer and net only went down to 41 m. Possible obstruction present, however water was very clean. Located off Mt Divided Rd near southern sediment farm. GPS co-ordinates provided incorrect. New co-ords provided here.
WSE 16	FMG RC Bore	241798	7492256	5	Mt Nicholas	12/09/2004	155	pvc	n/a	WSE 64	31	90	59	bottom	Yes	7.8	0.95	0.47	29.9	50 µm net	96	No	No	No	Bore depth hard to determine so have used bore construction depth of 90 m. Located on T5 off the end of airstrip @ Mt Nicholas Camp.
WSE 28	FMG RC Bore	237677	7494412	7	Mt Lewin	12/09/2004	50	pvc	600	WSE 16	48.63	106	57.37	bottom	Yes	7.8	1.12	0.56	29.5	50 µm net	46	No	No	No	Located on T7 of line 37 just past Kalawarri bore. Lots of pvc shavings present in sample, water very clear.
CC001	FMG RC Bore	792561	7520898	n/a	X-mass Ck	13/09/2004	160	pvc	100	0	36.12	111	74.88	bottom	Yes	7.4	0.76	0.38	24.7	50 µm net	96	No	No	No	Bore originally constructed for water source for Drillers camp. Camp has now moved and bore in unused. No plug in bore therefore open to the elements. Surprisingly no insects were found.
CC042	FMG RC Bore	789602	7520297	19	X-mass Ck	13/09/2004	160	pvc	230	CC001	46	58	12	bottom	Yes	6.7	0.71	0.30	28.4	50 µm net	96	No	No	No	Lots of clay present in this sample. Possible been scraped of the inside of the bore wall on retrieving net. Located off line 19.
CC160	FMG RC Bore	784001	7523398	12	X-mass Ck	13/09/2004	160	pvc	300	CC042	33	34	1	bottom	Yes	7.5	0.73	0.37	29.9	50 µm net	96	No	No	No	Located off line 12 - Ran out of ethanol provided on completion of this site.
CC065	FMG RC Bore	792001	7520602	22	X-mass Ck	13/09/2004	160	pvc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Bore water was black and casing broken at top. One bailer of water was retrieved but due to the condition of the water considered unsuitable to continue sampling.

Table 2
Observed Stygofauna Sampling Sites

AQWABase Name	Easting	Northing	Map Code	1:250,000 Map Code	River Basin	Owning Authority	Comments
LIMESTONE BORE	246641	7481374	SF51-9	SF51-9	708 - Fortescue River	Roy Hill Station	GOOD POTENTIAL FOR SAMPLING. NEEDS PERMISSION TO REMOVE INFRASTRUCTURED FROM PROPERTY OWNERS. WINDMILL NOT IN USE WHEN OBSERVED. TANKS OVERFLOWING.
KULLAWARRI WELL	237604	7496984	SF51-9	SF51-9	708 - Fortescue River	Roy Hill Station	GOOD POTENTIAL FOR SAMPLING.NO INFRASTRUCTURE. NEEDS A PLUG ON BORE CASING.
CEMENT BORE	229400	7499810	SF51-9	SF51-9	708 - Fortescue River	Roy Hill Station	CAN'T BE SAMPLED - STEEL PIPE OBSTRUCTING SAMPLING POINT
ELEVEN MILE BORE	204574	7490300	SF51-9	SF51-9	708 - Fortescue River	Roy Hill Station	GOOD POTENTIAL FOR SAMPLING. NEEDS PERMISSION TO REMOVE INFRASTRUCTURED FROM PROPERTY OWNERS AS WINDMILL STILL IN USE.
NICHOLAS CA MP BORE	245695	7492935			708 - Fortescue River		

Table 3
Potential Stygofauna Bores

AQWABase Name	Feature Type	Easting	Northing	Map Code	1:250,000 Map Code	Location Address	River Basin	Comments
IRONSTONE BORE	Unknown	232369	7490744	SF51-9	SF51-9	ROY HILL STATION	708 - Fortescue River	SAND. REPT QUALITY RECORDS GOOD STOCK. HYDR0 BALFOUR DOWNS 4-MILE
WHITE BORE	Unknown	217927	7489253	SF51-9	SF51-9	ROY HILL STATION	708 - Fortescue River	HYDR0 BALFOUR DOWNS 4-MILE
SIDI BARRANNI BORE	Unknown	231292	7480148	SF51-9	SF51-9	ROY HILL STATION	708 - Fortescue River	SAND. HYDR0 BALFOUR DOWNS 4-MILE
KENTS BORE	Unknown	239696	7472737	SF51-9	SF51-9	ROY HILL STATION	708 - Fortescue River	SAND-OUTWASH-NULLAGINE SHALES. REPT QUALITY RECORDS GOOD STOCK. HYDR0 BALFOUR DOWNS 4-MILE
MT NEWMAN RLWY NO 64	Borehole or Well	735837	7498928	SF50-12	SF50-12		708 - Fortescue River	WATER CUT AT 60FT GRAVELLY SILT TO CALCRETE. ELEVATION RECORDED AS AN APPROXIMATION
RW 52 MT NEWMAN RLWY	Unknown	753562	7488817	SF50-12	SF50-12		708 - Fortescue River	D/D 80 FEET
OLD WOOLSHED BORE (A32)	Borehole or Well	755231	7492208	SF50-12	SF50-12	MARILLANA	708 - Fortescue River	WINDMILL. VISITED BY E P O'DRISCOLL SEPT 73. AGWA RANGELAND SURVEY 9/5/96 - EASTING: 755183, NORTHING: 7492180.
NELSON BORE (A21)	Unknown	744725	7492965	SF50-12	SF50-12	MARILLANA	708 - Fortescue River	WINDMILL. VISITED BY EP O'DRISCOLL 9/73
NULLAGINE BORE (R12)	Unknown	805850	7509817	SF50-12	SF50-12	ROY HILL STATION	708 - Fortescue River	WINDMILL.
SALT WELL (R4)	Borehole or Well	785975	7515307	SF50-12	SF50-12	ROY HILL STATION	708 - Fortescue River	ABANDONED. REPT QUALITY:- BAD STOCK.
GORGE BORE (R5)	Unknown	794405	7518232	SF50-12	SF50-12	ROY HILL STATION	708 - Fortescue River	WINDMILL.
XMAS CREEK BORE WEST (R7)	Unknown	792655	7510570	SF50-12	SF50-12	ROY HILL STATION	708 - Fortescue River	WINDMILL. 2400 PPM XMAS CREEK NO 1, 2460 PPM XMAS CREEK NO 2. REPT QUALITY:-GOOD STOCK.
NULLAGINE BORE (R12)	Unknown	805850	7509817	SF50-12	SF50-12	ROY HILL STATION	708 - Fortescue River	WINDMILL.
SALT WELL (R4)	Borehole or Well	785975	7515307	SF50-12	SF50-12	ROY HILL STATION	708 - Fortescue River	ABANDONED. REPT QUALITY:- BAD STOCK.
GORGE BORE (R5)	Unknown	794405	7518232	SF50-12	SF50-12	ROY HILL STATION	708 - Fortescue River	WINDMILL.
XMAS CREEK BORE WEST (R7)	Unknown	792655	7510570	SF50-12	SF50-12	ROY HILL STATION	708 - Fortescue River	WINDMILL. 2400 PPM XMAS CREEK NO 1, 2460 PPM XMAS CREEK NO 2. REPT QUALITY:-GOOD STOCK.
LEWIN CREEK BORE	Borehole or Well	220390	7494276	SF51-9	SF51-9	ROY HILL STATION	708 - Fortescue River	NULLAGINE SHALES. AGWA RANGELAND SURVEY 26/7/96 - EASTING: 220232, NORTHING: 7494055, LOCATED ADJACENT TO LARGE CREEK. HYDR0 BALFOUR DOWNS 4-MILE
SEVENTEEN MILE WELL	Borehole or Well	213275	7485897	SF51-9	SF51-9	ROY HILL STATION	708 - Fortescue River	ALLUVIUM. REPT QUALITY RECORDS GOOD STOCK. HYDR0 BALFOUR DOWNS 4-MILE