Solomon Pool Census Report

Solomon Project

April 2015
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EXECUTIVE SUMMARY

At the request of the Environmental Protection Authority (EPA), Fortescue Metals Group Ltd (Fortescue) has conducted a census for all surface water pools within the potential impact area for the Solomon Iron Ore Project – Sustaining Production Proposal to determine where pools are located, what is their hydrological regime and their ecological value.

The census has considered all available data, including the Department of Water’s 2012 pools dataset, aerial imagery available to Fortescue, vegetation mapping, fauna records and rainfall data to identify pools within the potential impact area and assess their values.

The census identified that pools are only found within Fortescue mapped groundwater dependent vegetation, specifically within the Weelumurra, Kangeenarina and Zalamea Creeks, Hamersley Gorge and Powellina pool (located within a tributary of the Lower Fortescue River). The census noted that the surface area occupied by pools within Weelumurra, Kangeenarina and Zalamea creek systems has fallen from previously high levels following a record wet period between the mid 1990’s to the mid 2000’s. In late 2014, pools previously recorded within Zalamea Creek were not present during the driest parts of that year. This has been attributed to catchments upstream of the pools receiving less recharge as a result of lower rainfall levels since the late 2000’s.

Based on the pool status categories defined by the DoW in their 2012 pool census, Hamersley Gorge is considered to be permanent during the study period, whilst some pools within Weelumurra and Kangeenarina Creek are also considered to be permanent during the study period. However, some pools within Weelumurra, Kangeenarina and Zalamea Creek are considered to be semi-permanent as they are not present for 100% of the study period.

The comparative ecological value of all pools have been considered with reference to the pools permanent status. Hamersley Gorge, Weelumurra and Kangeenarina Pools are considered to have greater ecological value than Zalamea Pools due to their permanent status during the study period. Permanent pools are more likely to attract fauna, particularly during the dry season when other semi-permanent or intermittent pools have dried out. Fauna species likely to be attracted to Kangeenarina Pools during the dry season include Northern Quoll and Pilbara Olive Python. These pools are also likely to attract waterbirds, such as the Great Egret (Ardea alba) due to the availability of fish in the pools. However, Zalamea and Powellina pools have less ecological value. Furthermore, Powellina pool appears to be highly degraded by cattle and is unlikely to have any significant ecological value.
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1. **INTRODUCTION**

Fortescue Metals Group Ltd (Fortescue) proposes to extend its current footprint at its Solomon Mine (Solomon) and extend the life of the existing operating mine, located in the Hamersley Ranges, approximately 60 kilometres (km) north of Tom Price in the Pilbara Region of Western Australia.

This extension to the mining footprint has been referred to the Environmental Protection Authority (EPA) and requires formal environmental impact assessment under Part IV of the *Environmental Protection Act 1986* at a level of assessment as a Public Environmental Review (PER).

The EPA have prepared an Environmental Scoping Document (ESD) for the proposal. The ESD identifies Hydrological Processes as a key environmental factor and requests that Fortescue:

> Carry out and provide details of a survey of all pools in the project area, along with a description of the ecological values of each pool and expected impacts related to both the current proposal and the cumulative proposal. Particular detail should be provided regarding the ecological values of any pool to be removed by the proposal. The methodology of this survey should be presented to and agreed with the OEPA prior to carrying out the survey.

A letter was sent to the EPA on 15 April 2015, outlining the methodology to be employed in this pools census, further detailed in Section 3. This census of pools within the Solomon Mine Development Envelope has been undertaken in accordance with the agreed methodology. This report provides the results of the census and discusses the value of those pools to support the PER.
2. PURPOSE

The original Solomon PER identified groundwater-fed water pools at Kangeenarina Creek, Weelumurra Creek and Zalamea Gorge and committed to protecting the hydrological regime of these pools during mining operations. The Ministerial Statement for the original Solomon proposal (MS 862) includes conditions for the protection of groundwater-fed pools at Solomon.

The proposed extension to mining at Solomon will result in disturbance to the pools at Zalamea Creek (the pools are within the expanded mining footprint). The EPA has identified that this requires further consideration in the PER and has requested Fortescue identify the ecological values of all pools that may be impacted by the Solomon Project to determine the ecological significance of the pools.

The purpose of the Solomon Pools Census is to catalogue all pools that may be impacted by the Solomon Project footprint expansion and determine their ecological value.
3. SCOPE

The Solomon Pool Census considers the potential impacts caused by mining at Solomon, including impacts to groundwater-fed pools from mine dewatering and groundwater abstraction. Disturbance to groundwater-fed pools is most likely within the mining footprint or the drawdown caused by dewatering within the mine envelope.

Aerial imagery of sufficient resolution to be used in the census is only available within the Solomon mining footprint and immediate surrounds for the following periods:

- August 2004 (Landgate low resolution)
- November 2010
- October 2011
- August, November and December 2012
- August 2013 (Landgate low resolution)
- June and November 2014
4. METHODOLOGY

Fortescue has undertaken numerous biological and hydrological surveys at the Solomon Project over the past seven years and has a detailed understanding of the environment surrounding the Solomon Mine.

More recently as a part of the PER process, Fortescue has undertaken the following studies:

- Solomon Hub Flora and Vegetation Assessment (Ecologia, 2014a)
- Solomon Hub Vertebrate Fauna Assessment (Ecologia, 2014b)
- Solomon 2014 Life of Mine Hydrogeological Assessment (Fortescue, 2015a)

In addition to Fortescue’s studies, the Department of Water (DoW) completed a survey of Pilbara pools in 2012, as a part of the Pilbara Groundwater Allocation Plan. This data was collected from 1999 to 2007 and is known as the Pilbara Pools dataset. The pool categories were defined by occurrence percentage during the dry season and are as follows:

- permanent – 100% of the years assessed
- semi-permanent – 60%-99% of the years assessed
- intermittent - <60% of the years assessed

From the flora and fauna studies undertaken at Solomon it can be concluded that the most likely location for pools within the proposed impact area is within drainage lines with groundwater dependent vegetation. This vegetation has been mapped by Ecologia (2014a) within the mine development envelope. Vegetation mapping does not extend over Hamersley Gorge, however, it is known that pools occur within Hamersley Gorge and therefore they have been included in this survey.

Given that the presence of a pool can be dependent on rainfall, a survey over one year would be insufficient to determine if a pool was permanent or temporary. This census will consider the project area using aerial imagery focusing on drainage lines with groundwater dependent vegetation, as mapped by Ecologia (2014a)) and comparing the presence or absence of pools during 2004 to 2014 (subject to the availability of aerial imagery). Note, imagery selected for this census is taken as close as possible to the Pilbara’s dry season, when it could be expected that pool levels would be at their lowest for any calendar year and would represent the most accurate methodology for determining a pools status according to DoW of 2012.

Pool location and area identified through the above methodology are presented in Figures 2-15. In order to discuss the pool’s value and ecological function, the DoW’s categories provided in the DoW (2012) pool survey will be used. The census will also consider the fauna habitat value of the pools to determine its ecological value.

Therefore, the methodology for the survey of pools in the project area will involve the following:
• record the presence or absence of pools in the dry season in drainage lines with groundwater dependent vegetation over the following years:
  o 2004
  o 2010
  o 2011
  o 2012
  o 2013
  o 2014

• plot the DoW pools dataset and assess presence or absence of pools in the dry season over the following years:
  o 2004
  o 2010
  o 2011
  o 2012
  o 2013
  o 2014

• compare changes in pool size in the dry season for each year in relation to regional rainfall data.

• determine likelihood of pools being either:
  o permanent
  o semi-permanent
  o intermittent.

• Compare the fauna habitat values of each pool in relation to its status.
5. LIMITATIONS

The methodology outlined above has some limitations which need to be considered when drawing conclusions from the available data.

5.1 Aerial Imagery

Census by aerial imagery comes with some limitations such as:

- Shadows caused by photographs being taken early morning or late evening
- Images are not necessarily available at the same time of year for each year
- Images do not always cover the same area each year. Comparisons between years is difficult
- Resolution of the image. Some years have lower resolution images making identification of pools more difficult
- Pools located under dense vegetation are obscured from view and are not able to be captured by the census.

5.2 Field Observations

Fortescue staff have observed pool systems within the Solomon area over the life of the Project. Few of these observations have been reported and documented in a systematic way allowing for comparison between years. For this reason, field observations have not been included in the survey as there is no scientific method to the observation and estimates of pool extents are subjective.

One study conducted by URS did measure the extent of pools within Kangeenarina Creek in 2012 and this is discussed in Section 6.2.4.
6. RESULTS

6.1 Groundwater Dependent Vegetation Mapping

The extent of groundwater dependant vegetation mapped by Ecologia is presented in Figure 1. This area is the focus for cross reference with aerial imagery and the DoW’s pools dataset. The exception to this is Hamersley Gorge, where no vegetation mapping has been undertaken by Ecologia, but pools are known to exist.

6.2 Aerial Imagery

6.2.1 2004

Aerial imagery selected for the 2004 census is from Landgate. Coverage is provided by McRae and Wittenoom image sheets. 2004 is considered to be towards the end of a significantly wet period in the Pilbara compared to historical rainfall averages (Fortescue, 2015b) and therefore it is reasonable to say that all pools would be at their largest extent around this time. The following section details the findings of the 2004 aerial imagery review.

Weelumurra Pools

Approximately 4.6 ha of open water has been mapped within Weelumurra Creek in 2004. Note, it is possible that some pools within Weelumurra Creek have not been mapped as parts of Weelumurra are heavily vegetated and the canopy may be obscuring the pool from view (Figure 2)

Kangeenarina Pools

Many pools are visible within Kangeenarina Creek in 2004. The pools have a surface area of 10.7 ha (Figure 3).

Zalamea Pools

Nine pools have been identified within Zalamea Creek in 2004 with a surface area of 0.02 ha. These pools locations are considered indicative only as they may be shadows, but for the purpose of this census have been considered as pools (Figure 4).

Hamersley Gorge

Many pools are located within this well-known Karijini National Park Gorge over approximately 5 km of narrow gorge. Interpreting the size of pools within the gorge is difficult given the area is often in shadow. A surface area of 2.3 ha has been calculated based on what is visible from the aerial image (Figure 5).
Powellina Pool

In August 2004, no surface water is present within Powellina Pool.

6.2.2 2010

The 2010 images are high resolution images taken by Fortescue for its mine planning and reporting purposes. Fortescue have two sets of images for 2010, in May and November. However the images from November are limited to the mine footprint only and do not cover as large an area as the August 2004 Landgate image. Analysis of pool extents in 2010 is complicated by the extent of aerial imagery; merely considering the total surface area of pools in 2010 may be misleading as not all pools can be mapped. Instead, attention is drawn to the area covered by the available aerial imagery in May and November 2010 to determine what changes have been observed in pool size and location.

The following section summarises the findings of 2010 (May and November) aerial imagery review and where possible includes a comparison with the 2004 pool findings.

Weelumurra Pools

Pool extents at Weelumurra Creek are difficult to determine for November 2010 as many of the areas mapped as pools in 2004 are in shadow. However, it is possible to determine that some pools mapped in August of 2004 are no longer present in November 2010 (Figure 6).

Kangeenarina Pools

Images for this year only cover the upper reaches of Kangeenarina Creek. It is observed that some pools mapped in August 2004 are no longer visible in May 2010 and most pools have disappeared by November 2010 (Figure 7). Furthermore, many of the pools mapped in November 2010 are indicative only and may be shadows on the aerial, the image appearing to have been taken late afternoon.

Zalamea Pools

In November 2010, pools at Zalamea are restricted to just two water bodies (Figure 8). These two waterbodies were not present at Zalamea in 2004. This would suggest that the pools Zalamea are highly variable, with pool location likely to be dependent on the movement of loose material in the creek bed during the wet season.

Hamersley Gorge

No aerial imagery is available over Hamersley Gorge in 2010 for comparison with August 2004.
Powellina Pools

Large areas of surface water are visible at Powellina Pools in November 2010 (Figure 9). This is in contrast to August 2004, where no surface water was visible in this location. Given the time at which the image was taken in 2010, it is likely that early wet season rainfall has fallen over the area prior to the capture of the image.

6.2.3 2011

The 2011 aerial image is a high resolution image taken over the Solomon Project area in October 2011. The image does not extent do Hamersley Gorge or Powellina Pools.

The following section summarises the findings of October 2011 aerial imagery review and where possible includes a comparison with the 2004 and 2010 pool findings.

Weelumurra Pools

There is very little image coverage over Weelumurra Creek in October 2011 and comparisons with previous years is not particularly instructive. Where the image overlaps with August 2004, it is clear that pools mapped in 2004 are not present in October 2011. What is very noticeable is that the vegetation cover in Weelumurra Creek in this area has increased significantly in the period 2004 – 2011.

Kangeenarina Pools

Comparison between 2010 and 2011 extents is difficult as 2010 imagery does not extend as far downstream in 2010. Where 2010 and 2011 imagery overlaps in the upper part of Kangeenarina Creek near the Solomon mining area, pool extents are largely the same between the two years, with 2011 extents possibly slightly larger.

The 2011 imagery overlaps entirely with 2004 imagery and comparing 2004 pool extents to 2011 pool extents reveals that the extent of pools in 2011 is far less than in 2004 (Figure 10). In fact, surface area of pools in Kangeenarina Creek in 2011 is 1.5 ha, compared to 10.7 ha in 2004.

A pool survey was undertaken within Kangeenarina Creek in December 2011. This survey logged the extent of pools within the survey area, a 4 km stretch of the upper Kangeenarina Creek near the active Solomon mining area. These results have been included in the Kangeenarina Pools Supplementation Plan – Northern Pools (600SO-00018-RP-HY-0002). This survey identified 108 pools in upper reaches of Kangeenarina Creek and noted that many of the pools may dry out during prolonged dry spells but would respond quickly to localised rainfall and recharge. It was predicted in the Supplementation Plan that of the 108 pools, 63 pools would remain after 3 months without rainfall, 28 would remain after 6 months without rainfall and only 2 would remain after 12 months without rainfall (FMG, 2013).
The URS study mapped more extensive pools in the upper reaches of Kangeenarina Creek than what is observable from the October 2011 image. The limitations of using aerial imagery to map pools has been highlighted in Section 5.

**Zalamea Pools**

The two pools visible in November 2010 are still visible in October 2011. No other pools are visible in Zalamea Creek. The two waterbodies appear to have linked into one larger pool in the October 2011 image (Figure 11).

**Hamersley Gorge**

There is no imagery at Hamersley Gorge in October 2011.

**Powellina Pools**

There is no imagery at Powellina Pools in October 2011.

### 6.2.4 2012

Aerial imagery in 2012 is not available for the all the creeks in one photo and therefore a patchwork of images taken in August, November and December 2012 has been used for the 2012 assessment.

The following section summarises the findings of 2012 aerial imagery review and where possible includes a comparison with the pools identified in the 2004, 2010 and 2011 aerial images.

**Weelumurra Pools**

The latest image available with coverage over Weelumurra Creek is August 2012. In this image, no pools are visible within Weelumurra Creek, although only a small amount of the creek has aerial coverage. Note, imagery does exist over the same area earlier in February 2012 in which extensive pools are visible. Clearly, this surface water is quickly evaporating or infiltrating into the alluvial aquifer. The creek bed in this area is a mix of sand and gravel and would have high rates of infiltration.

**Kangeenarina Pools**

Aerial imagery is available for the upper reaches of Kangeenarina Creek for November 2012 and for the lower reaches in August 2012. In August 2012, the pools are more extensive than October 2011, whilst some of the smaller pools mapped in 2010 are no longer present. By November 2012 some of the pools are slightly smaller, but still persist. A pattern is beginning to emerge of a series of pools within Kangeenarina Creek that are present in some years, but
absent in others, whilst other pools are present at all times and are likely to be more permanent pools.

**Zalamea Pools**

Aerial imagery over Zalamea Creek is available for August 2012. The two pools identified in 2010 are not visible in August 2012 and no other pools are present within the creek (Figure 12).

**Hamersley Gorge**

Aerial imagery is available over Hamersley Gorge for August 2012. There is no visible change in pool size from August 2004 to August 2012. The area captured in 2012 has actually increased to 3.3 ha but this may be attributable to better resolution on the image rather than an increase in the extent of the pools.

**Powellina Pools**

There are no pools present at Powellina Pool in December 2012.

### 6.2.5 2013

Aerial imagery for 2013 is provided by Landgate and is available across all sites. The aerial imagery was taken in August 2013.

The following section summarises the findings of 2013 aerial imagery review and where possible includes a comparison with the pools identified in the 2004, 2010, 2011 and 2012 aerial images

**Weelumurra Pools**

Due to the lower resolution aerial imagery, it is difficult to determine whether many pools mapped in Weelumurra Creek between 2010 and 2012 persist in August 2013. However, it appears that there are some pools identified in 2004 are no longer present in 2013, particularly in the upper reaches of the creek (Figure 13).

**Kangeenarina Pools**

Given the low resolution aerial imagery in August 2013, the most appropriate comparison of pool size is with the 2004 image. Pools covered 10.7 ha in 2004 and 0.9 ha in 2013 (Figure 14). It would appear that in the 9 years since 2004, the area covered by pools has reduced and this is likely to be a product of reduced rainfall in the intervening years and/or mine dewatering.
Zalamea Pools

The pool visible from 2010 have returned in August 2013 after being absent in 2012, however, it appears to have reduced in area and is now just one smaller pool rather than two separate pools (Figure 15).

Hamersley Gorge

There has been no change to the extent of pools within Hamersley Gorge between 2004 and 2013 with the extent of pools remaining at 2.6 ha.

Powellina Pools

Pools are visible at Powellina Pools in August 2013. However, they are not as extensive as November 2010. As previously described, no pools were present at the same period in August 2004 and in December 2012, suggesting that any surface water present is the result of recent rainfall.

6.2.6 2014

Aerial imagery in 2014 is represented by high resolution images over the Solomon Mining area and the Hamersley Rail Line. High resolution imagery extends over Hamersley Gorge and Powellina Pool.

The following section summarises the findings of 2014 aerial imagery review and where possible includes a comparison with the pools identified in the 2004, 2010, 2011, 2012 and 2013 aerial images

Weelumurra

Aerial imagery over Weelumurra Creek was taken in June 2014 and covers a similar area to 2012. Only a few, minor pools are located within the area covered by imagery. This is consistent with previous year’s imagery in this area.

Kangeenarina

Aerial imagery over Kangeenarina Creek taken in November 2014 covers only the upper reaches of the creek near the active mining area. Imagery is available for a further 1 km downstream for June 2014. Pool sizes are approximately the same as 2013 and 2012 levels. It is important to note however, in accordance with the requirements of MS 862, supplementation of Kangeenarina Creek Pools began in mid-2014.

Zalamea

No pools are visible in Zalamea Creek in November 2014 (Figure 16).
Hamersley Gorge

Aerial imagery is available over Hamersley Gorge in June 2014. Pool extents at this time are similar to those of previous years.

Powellina Pools

Water is present at Powellina Pools in November 2014 at similar extents to 2010.

6.3 DoW Pools Dataset

The DoW dataset from their Pilbara Pool Census of 2012 has been overlayed with the topography of the Solomon mining area and Ecologia’s groundwater dependant vegetation mapping (Figure 17). No points identified as pools in the DoW dataset correlate with the groundwater dependant vegetation mapping. Furthermore, through interrogation of all aerial imagery, none of these points are associated with any pools. The DoW pools dataset is therefore of no value for this study and will not be used.
7. DISCUSSION

7.1 Weelumurra Creek

The pools census has demonstrated that there are permanent pools in the lower reaches of Weelumurra Creek downstream of Valley of the Queens. However, many pools tend to migrate upstream or downstream with movement of creek bed sediments. Pools often join up in some years and are separate in others. There are a few pools that are large enough and deep enough to remain constant throughout the census period. However, overall, there has been a trend for less pool surface area between 2004 and 2013. Pools mapped in 2004 covered a surface area of 4.6 ha. Pools mapped in 2013 covered a surface area of 1.13 ha. Most notable is the loss of pools in the upper reaches of the creek, which are completely absent in 2013. Therefore, the majority of pools within Weelumurra Creek would be considered either semi-permanent or intermittent, with permanent pools located downstream of the Valley of the Queens.

7.2 Kangeenarina Pools

The pools census has demonstrated that there are permanent pools within Kangeenarina Creek, although smaller pools and waterholes are semi-permanent or intermittent. Total pool surface area in Kangeenarina Creek has reduced from August 2004 to November 2013 and it is considered that this is a product both of reduced rainfall and mine dewatering higher in the catchment. Direct comparison of surface area of pools in hectares is difficult given the lack of aerial coverage for the lower reaches of the creek for most years. However, for the two years where consistent coverage is available (2004 and 2013), surface water area in Kangeenarina is approximately 10.4 ha in 2004 and 4.9 ha in 2013. Note, pool supplementation commenced as reinjection bores in 2013 and as surface supplementation in mid-2014.

7.3 Zalamea Pools

Pools within Zalamea Creek are not considered to be permanent pools. Pools present in 2004 are no longer present in 2014. New pools identified in 2010 are also not present in 2014, after experiencing a reduction surface area over the intervening years. Based on the DoW’s definition, the Zalamea Pools are considered to be semi-permanent. However, there is a clear trend over the 10 years of the study suggesting pools in Zalamea Creek are contracting and may become intermittent in the coming years. This may be dependent on future rainfall.

7.4 Hamersley Gorge

Aerial imagery is available over Hamersley Gorge for years 2004, 2012, 2013 and 2014. It is considered that Hamersley Gorge is a permanent pool and there has been little change in pool size in the 9 years covered by the census.
7.5 **Powellina Pools**

Analysis has determined that the pools located at Powellina are clay pan type billabongs that are present immediately after rainfall but are likely to quickly dry out and are not groundwater-fed. The absence of the pools in August 2004, their presence in November 2010 and absence in December 2014 is evidence of their intermittent status.

7.6 **Influence of Regional Rainfall**

Fortescue has analysed the historical annual average rainfall from regional gauges to identify regional rainfall trends (Fortescue, 2015). Given that there is a large spatial variability of rainfall in the Pilbara, a number of regional gauges have been considered. These gauges are all within the vicinity of the Hamersley Ranges, on pastoral stations surrounding Solomon and also considers recent rainfall recorded at Solomon since late 2010.

Regional rainfall gauges are present at Hamersley, Mt Florance, Mulga Downs, Wittenoom and Coolawanyah stations, and encompass an area in excess of 250 000 ha, surrounding the Solomon Mine. These gauges have recorded rainfall over 107 year period from 1907-2014. The data however is not always continuous and there is rainfall data missing from some of the stations, most notably Coolawanyah Station (missing 1926 – 1949) and Hamersley Station (missing 1927-1933), and Wittenoom records do not begin until 1952. Over the period of 1911 – 2011, these stations have an annual average rainfall between 350 mm – 450 mm (Charles, et al., 2013).

The available results for the annual totals for the five rainfall stations were averaged in order to attempt to remove the effect of localised spatial variability. The following sets of results were analysed:

- **Long term** – Average annual total rainfall from Hamersley, Mt Florance and Mulga Downs stations between 1907 – 2014. Assessed using a 10 and 15 year moving average
- **Medium term** – Average annual total rainfall from Hamersley, Mt Florance, Mulga Downs, Coolawanyah and Wittenoom stations between 1950 and 2014. Assessed using a 5 and 10 year moving average.

The data was filtered where there was no rainfall recorded and outliers that were exerting significant influence on the average from other stations. Observations from the data were as follows (Graph 1):

- The annual average up to the 1960’s was between 300-350 mm
- There was an apparent step change in the 1960’s increasing annual average to 350 – 450 mm. The average for this period is consistent between medium term and long terms
records. This appears to be due to the apparent increase in the frequency of wet years (with rainfall well above average)

- The period from the mid 1990’s to the mid 2000’s is the wettest period on record. There are significant spikes in all trend lines. Averages range between 400 mm – 600 mm for the 10 and 15 year averages. The 5 year average peaks at over 650 mm. These spikes recede near to present records, although it is unclear where the present average is as the trend lines do not yet converge.

![Average Annual Rainfall](image)

**Graph 1:** Annual rainfall moving averages 1907 - 2014

Analysis of the rainfall data shows that groundwater-fed pool areas observed in the 2004 aerial imagery are likely to be at their fullest extent as groundwater levels are likely to be at their highest. It has been observed that rainfall averages for the last five years have fallen and as a result groundwater resources feeding the pools have received less recharge. This is likely to account for the reduction in pool sizes observed from 2004 to 2014, particularly at Weelumurra Creek and Zalamea Creek, where pools observed in 2004 and 2010 are no longer present during the dry season.

### 7.7 Fauna Habitat Values

The presence of permanent pools within Weelumurra Creek, Kangeenarina Creek and Hamersley Gorge will attract fauna to the area for foraging, including Pilbara Olive Python, Northern Quoll and Pilbara Leaf-nosed Bat which have all been recorded from Kangeenarina
Creek (Ecologia, 2014b), as well as migratory fauna such as the Eastern Great Egret and other waterbirds. The pools would also be important water sources for other fauna.

In comparison, the semi-permanent pools at Zalamea Creek have recorded the presence of a Pilbara Olive Python in 2010 when pools were present but would have less fauna habitat value due to the pools semi-permanent nature. Pools that regularly dry out are less likely to attract fauna, which would favour permanent water sources, particularly in the drier months prior to the wet season.

The intermittent pools at Powellina occur in the grazing lands of the Lower Fortescue Valley and would experience degradation from cattle.

As a result, Weelumurra, Kangeenarina and Hamersley Gorge are considered to be of higher fauna habitat value than Zalamea and Powellina pools. Hamersley Gorge in particular occurs within a rocky gorge and is likely to support denning habitat Northern Quolls and would be suitable habitat for Pilbara Olive Pythons. Note, whilst modelling of the abstraction of groundwater from the Southern Fortescue Borefield shows that there may be a 1 m drawdown at Hamersley Gorge, Fortescue have committed to managing the abstraction to ensure that there will be no impact to Hamersley Gorge as a result of the Solomon Iron Ore Project – Sustaining Production Proposal.

All conclusions should be considered with reference to the limitations of using aerial imagery to catalogue pool extents.
REFERENCES


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Mine Development Envelope

LEGEND

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Data Source(s):
Aerial, AAM, Nov 2010

See Inset A
See Inset B

INSET A
INSET B

2004 Pools vs 2010 Pools
Weelumurra
Figure 7: Kangeenarina Pools 2010 extents compared to 2004 extents
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Figure 8: Zalamea Pools 2010 extents compared to 2004 extents
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Figure 9: Powellina Pools 2010
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Figure 10: Kangeenarina Pools 2011 extents compared to 2004 extents
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Figure 11: Zalamea Pools 2011 extent compared to 2010 extents
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Figure 12: Zalamea Pools 2012 extents compared to 2010 extents
LEGEND

- Zalamea Extent November 2010
- Groundwater Dependent Ecosystems
- Potential Groundwater Dependent Ecosystems
- Mine Development Envelope

Data Source(s):
FMG Aerial, AAM, Aug 2012

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Scale: 1:20,000
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Figure 13: Weelumurra Pools 2013 extents compared to 2004 extents
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Figure 14: Kangeenarina Pools 2013 extents compared to 2004 extents
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Figure 15: Zalamea Pools 2013 extents compared to 2010 extents
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Figure 16: DoW Pools dataset compared to GDE mapping
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