



# Works Approval

## *Environmental Protection Act 1986, Part V*

**Works Approval Holder:** Electricity Generation and  
Retail Corporation T/A Synergy

**Works Approval Number:** W5867/2015/1

**Registered office:** 15-17 William Street  
PERTH WA 6000

**ACN:** -

**Premises address:** Muja Power Station  
Muja Power Station Road  
COLLIE WA 6225  
Being Lot 5192 on Plan 213624, part Lot 4903 on Plan 167984, Lot 1 on  
Diagram 53100 and portion of State Forest 24, as depicted in Schedule 1.

**Issue date:** Tuesday, 13 October 2015

**Commencement date:** Monday, 19 October 2015

**Expiry date:** Thursday, 18 October 2018

The following category/s from the *Environmental Protection Regulations 1987* cause this Premises to be a prescribed premises for the purposes of the *Environmental Protection Act 1986*:

Category number	Category description	Category production or design capacity	Approved premises production or design capacity
53	Flyash disposal	1,000 tonnes or more per year	200,000 tonnes per annual period

### Conditions

This Works Approval is subject to the conditions set out in the attached pages.

Date signed: 13 October 2015

.....  
Jonathan Bailes  
Manager Licensing (Process Industries)  
Officer delegated under section 20  
of the *Environmental Protection Act 1986*



# Works Approval Conditions

## 1 General

### 1.1 Interpretation

1.1.1 In the Works Approval, definitions from the *Environmental Protection Act 1986* apply unless the contrary intention appears.

1.1.2 In the Works Approval, unless the contrary intention appears:

**'Act'** means the *Environmental Protection Act 1986*;

**'CEO'** means Chief Executive Officer of the Department of Environment Regulation;

**'CEO'** for the purpose of correspondence means;

Chief Executive Officer  
Department Administering the Environmental Protection Act 1986  
Locked Bag 33  
CLOISTERS SQUARE WA 6850  
Email: info@der.wa.gov.au;

**'Premises'** means the area defined in the Premises Map in Schedule 1 and listed as the Premises address on page 1 of the Works Approval;

**'Schedule 1'** means Schedule 1 of this Works Approval unless otherwise stated;

**'Works Approval'** means this Works Approval numbered W5867/2015/1 and issued under the *Act*;

**'Works Approval Holder'** means the person or organisation named as the Works Approval Holder on page 1 of the Works Approval;

1.1.3 Any reference to an Australian or other standard in the Works Approval means the relevant parts of the standard in force from time to time during the term of this Works Approval.

1.1.4 Any reference to a guideline or code of practice in the Works Approval means the current version of the guideline or code of practice in force from time to time, and shall include any amendments or replacements to that guidelines or code of practice made during the term of this Works Approval.

### 1.2 General conditions

1.2.1 The Works Approval Holder shall construct the works in accordance with the documentation detailed in Table 1.2.1:



<b>Document</b>	<b>Parts</b>	<b>Date of Document</b>
Works Approval Application Form	All	28 May 2015
Synergy, Fly Ash Dam – Cell 2B Embankment Raise, Works Approval Supporting Documentation, GHD	All, including Drawings and Appendices	11 May 2015
Synergy, Muja Fly Ash Dam – Cell 2B Design Report – Embankment Raise Rev. B, GHD	All, including Drawings and Appendices	10 April 2015
Letter – Works Approval Application Request for further information – Muja Power Station, signed by Fionnuala Hannon GHD Pty Ltd	All	26 June 2015
Email – DER Works Approval Application Responses 20150703, Additional information required by DER, received from Fionnuala Hannon GHD Pty Ltd	All	3 July 2015

Note 1: Where the details and commitments of the documents listed in condition 1.2.1 are inconsistent with any other condition of this works approval, the conditions of this works approval shall prevail.

## 2 Information

### 2.1 Reporting

2.1.1 The Works Approval Holder shall submit a compliance document to the CEO, following the construction of the works and prior to commissioning of the same.

2.1.2 The compliance document shall:

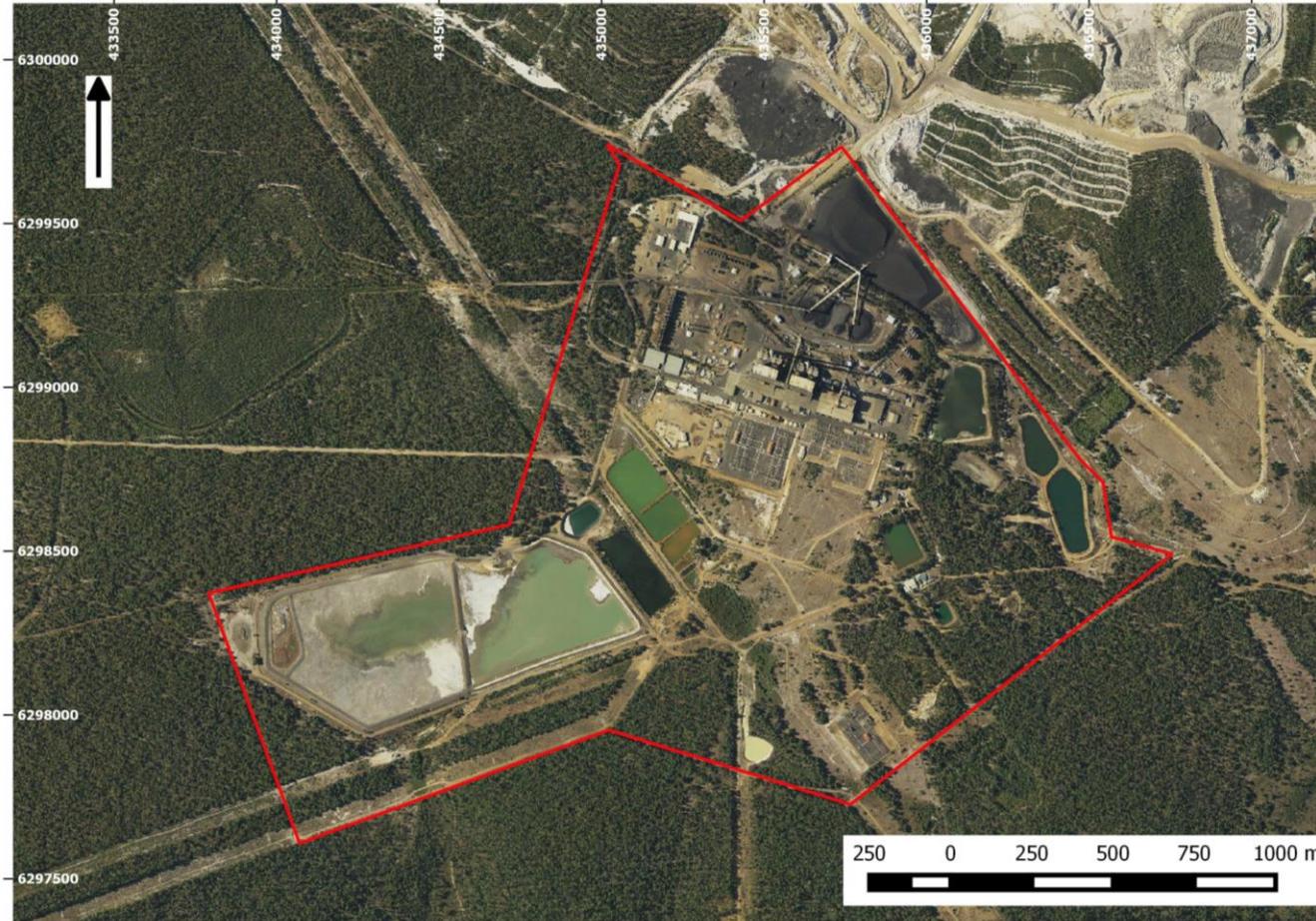
- (a) certify that the works were constructed in accordance with the conditions of the works approval; and
- (b) be signed by a person authorised to represent the Works Approval Holder and contain the printed name and position of that person within the company.



## Schedule 1: Maps

### Premises map

The Premises is shown in the map below. The red line depicts the Premises boundary.







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### 1 Purpose of this Document

This decision document explains how DER has assessed and determined the application and provides a record of DER's decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DER's assessment and decision making under Part V of the *Environmental Protection Act 1986*. Other approvals may be required for the proposal, and it is the proponent's responsibility to ensure they have all relevant approvals for their Premises.



## 2 Administrative summary

Administrative details									
Application type	Works Approval <input checked="" type="checkbox"/> New Licence <input type="checkbox"/> Licence amendment <input type="checkbox"/> Works Approval amendment <input type="checkbox"/>								
Activities that cause the premises to become prescribed premises	<table border="1"> <thead> <tr> <th>Category number(s)</th> <th>Assessed design capacity</th> </tr> </thead> <tbody> <tr> <td>53</td> <td>200,000 tonnes per annual period</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>	Category number(s)	Assessed design capacity	53	200,000 tonnes per annual period				
	Category number(s)	Assessed design capacity							
	53	200,000 tonnes per annual period							
Application verified	Date: 14 July 2015								
Application fee paid	Date: 14 August 2015								
Works Approval has been complied with	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>								
Compliance Certificate received	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>								
Commercial-in-confidence claim	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>								
Commercial-in-confidence claim outcome	N/A								
Is the proposal a Major Resource Project?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>								
Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the <i>Environmental Protection Act 1986</i> ?	<table border="1"> <tr> <td>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></td> <td>           Referral decision No:            Managed under Part V <input checked="" type="checkbox"/>            Assessed under Part IV <input type="checkbox"/> </td> </tr> </table>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Referral decision No: Managed under Part V <input checked="" type="checkbox"/> Assessed under Part IV <input type="checkbox"/>						
Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Referral decision No: Managed under Part V <input checked="" type="checkbox"/> Assessed under Part IV <input type="checkbox"/>								
Is the proposal subject to Ministerial Conditions?	<table border="1"> <tr> <td>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></td> <td>           Ministerial statement No:            EPA Report No:         </td> </tr> </table>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Ministerial statement No: EPA Report No:						
Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Ministerial statement No: EPA Report No:								
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the <i>Environmental Protection Act 1986</i> )?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Department of Water consulted Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>								
Is the Premises within an Environmental Protection Policy (EPP) Area	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>								
Is the Premises subject to any EPP requirements?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>								



### 3 Executive summary of proposal and assessment

Muja Power Station (MPS) is a coal-fired thermal power station located approximately 220 kilometres (km) south of Perth and 22 km south-east of the town of Collie. The power station commenced operation in 1966 and is owned and operated by Electricity Generation and Retail Corporation trading as Synergy (Synergy). It is operated under licence L4706/1972/17. MPS consists of eight power generating units arranged in pairs (labelled A, B, C and D) with a combined capacity of 1 096 MW. The power station operates as a base load plant and is capable of producing up to one third of the electricity requirements of the South West region via the South-West Interconnected System (SWIS).

MPS is bordered to the north and east by extensive open cut coal mining operations, and to the south and west by State Forest. The nearest residence is 6 kilometres to the east. The premises is within the catchment of the Collie River with the Collie River south branch located approximately 6 km west of the MPS Fly Ash Dam (FAD). Groundwater flow in the vicinity of the FAD is to the west, toward the Collie River south branch. The hydrogeology of the Collie Basin is a complex multi-layered sedimentary aquifer system in which groundwater flows are controlled by lithology, sub-crop zones and fault structures. Large scale dewatering, associated with open-cut mining operations and abstraction for power station water requirements, has led to a significant lowering of groundwater levels in parts of the Collie Basin.

Fly ash and bottom ash are produced as a by product of coal combustion. Fly ash is captured by electrostatic precipitators (Stages C and D) and bag filters (Stages A and B) prior to flue gases being emitted from the chimney stacks. Collected fly ash is conveyed via an ash handling plant into an ash storage silo and then into a mixing tank, where it is mixed with water to produce a slurry comprising approximately 70% water. The flyash slurry is then pumped to the site FAD for disposal. Bottom ash is handled through a separate circuit and is deposited into the site Bottom Ash Dam (BAD).

The FAD is located to the southwest of the power plant. It is a 43.9ha containment dam constructed from compacted clay (partially in-situ material and partially imported material) and bottom ash. It is comprised of two primary deposition cells, Cell 1 (24.8 ha) and Cell 2 (19.1 ha), which are separated by a central wall with decant structures on either side of the central wall. A High Density Polyethylene (HDPE) lined supernatant pond is located adjacent to the FAD for collection of surface water runoff, supernatant water and leachate.

Cell 1, the two decant structures, and the central wall have previously been raised to a height of RL 258.5 m Australian Height Datum (AHD). Deposition to Cell 1 ceased in 2011 and it has approximately one year of deposition capacity remaining. Cell 2 was raised to a height of 255.5 m AHD in 2011. The cell is currently active but is nearing capacity; therefore Synergy is proposing to increase the height of Cell 2 by three meters to RL 258.5 m AHD as part of this works approval using the centreline construction method. The centreline construction method has been chosen due to the outer embankment of the previous raise having been constructed from bottom ash with high net-acid generation potential. Centreline construction will allow for the outer embankment of the previous raise to be encapsulated to prevent generation of acidic stormwater runoff from the cell. The raise is predicted to provide an additional 480 000 m<sup>3</sup> (approximately five years) of ash storage capacity for MPS.

Clearing is required to develop a clay borrow area to source embankment construction material. A clearing permit (CPS 6578) has been sought under s51E of the *Environmental Protection Act 1986* and is undergoing assessment by DER. The clearing will not impact on any protected flora, fauna or fauna habitats.

The primary emission of significance associated with flyash disposal is seepage of acidic leachate to groundwater which can mobilise heavy metals into the surrounding soil and groundwater. Typical metals likely to be released in the leachate include aluminium, boron, cadmium, copper, cobalt, fluoride, iron, manganese, nickel, strontium and zinc.



## 4 Decision table

All applications are assessed in line with the *Environmental Protection Act 1986*, the *Environmental Protection Regulations 1987* and DER's Operational Procedure on Assessing Emissions and Discharges from Prescribed Premises. Where other references have been used in making the decision they are detailed in the decision document.

DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
General conditions	W1.2.1 L1.2.5	<p><b>Construction</b> Works approval conditions require Synergy to construct the FAD Cell 2 embankment raise in accordance with the application and supporting documents submitted to DER. No further general conditions are required in the Works Approval.</p> <p><b>Operation</b> <u>Emission Description</u> <i>Emission:</i> Potentially contaminated stormwater runoff from the FAD containing elevated salt concentration, metals, sulfate and low pH. <i>Impact:</i> Contamination of surrounding land with potential effects on vegetation due to low pH, high salt and elevated metal concentrations. <i>Controls:</i> As part of the works approval Synergy has proposed to improve the existing surface water drainage system around Cell 2 to prevent drain overflows in high rainfall events, and ponding of stormwater within the toe drains. Ponding of stormwater can affect the stability of the FAD and increase the likelihood of stormwater becoming acidic. The works include increasing the size of the toe drain to accommodate a 24 hour 100 year design annual recurrence event; improving fall to direct stormwater to collection pits; and establishing stormwater collection sumps. Water from the sumps is not expected to be contaminated and is therefore proposed to be discharged to the power station for reuse or to the valley south of the FAD.</p> <p><u>Risk Assessment</u> <i>Consequence:</i> Minor</p>	<p>Application supporting documentation</p> <p>Muja Power Station – Fly Ash Dam Environmental Management Plan, GHD, 2015</p> <p>L4706/1972/17</p>



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p><i>Likelihood: Rare</i> <i>Risk Rating: Low</i></p> <p><u>Regulatory Controls</u> The existing licence includes condition 1.2.5 requiring the licensee to prevent contamination of stormwater where possible. As Synergy has proposed that stormwater runoff will potentially be discharged from the stormwater collection basins if required this condition will be amended to require that that contaminated or potentially contaminated stormwater is treated prior to discharge. Alternatively stormwater will be retained in the collection basins and discharged via natural infiltration.</p> <p><u>Residual Risk</u> <i>Consequence: Insignificant</i> <i>Likelihood: Rare</i> <i>Risk Rating: Low</i></p>	
Premises operation	L1.3.3	<p><b>Construction</b> No premises operation conditions are required in the works approval.</p> <p><b>Operation</b> <u>Emission Description</u> <i>Emission: Accidental release of fly ash, supernatant water or contaminated stormwater to the environment as a result of a pipeline rupture, toe drain overflow or overtopping of the FAD.</i> <i>Impact: Contamination of surrounding land and vegetation stress or death due to elevated salt concentration, low pH and elevated metals in fly ash material, supernatant and contaminated stormwater.</i> <i>Controls: Regular inspections of the FAD and associated infrastructure are undertaken. Synergy has submitted an updated Environmental Management Plan (EMP) for the FAD which includes broad monitoring requirements for the facility and contingency plans. The design report for the FAD Cell 2 embankment raise includes an assessment of Cell 2</i></p>	<p>Application supporting documentation</p> <p>Muja Power Station – Fly Ash Dam Environmental Management Plan, GHD, 2015</p> <p>L4706/1972/17</p>



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>capacity to contain a 100 year, 72 hour rainfall event, with freeboard requirements for the FAD based on this assessment.</p> <p><u>Risk Assessment</u>  <i>Consequence:</i> Minor  <i>Likelihood:</i> Unlikely  <i>Risk Rating:</i> Moderate</p> <p><u>Regulatory Controls</u>            The existing licence only includes one condition (1.3.3) pertaining to operational requirements for the FAD. The condition requires Synergy to operate the FAD in accordance with the Muja Power Station Fly Ash Dam Environmental Management Plan (EMP). An updated Fly Ash Dam EMP was submitted to DER on 24 June 2015. The EMP contains limited operational and monitoring commitments as these are more appropriately detailed in a FAD Operating Manual (OM). DER may consider including operational, monitoring and freeboard requirements in section 1.3 of the licence following submission of compliance documentation at completion of the works.</p> <p><u>Residual Risk</u>  <i>Consequence:</i> Minor  <i>Likelihood:</i> Unlikely  <i>Risk Rating:</i> Moderate</p>	
<b>Emissions general</b>	N/A	<p><b>Construction and Operation</b>            There are no significant emissions expected during construction or operation of the FAD Cell 2 embankment raise therefore no emission or discharge limits have been set in the works approval or licence relating to the FAD. No specified conditions relating to emissions are required in the works approval or licence.</p>	Application supporting documentation



<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number W = Works Approval L= Licence</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
<b>Point source emissions to air including monitoring</b>	N/A	<b>Construction and Operation</b> No significant point source air emissions are expected from the construction or operation of the FAD Cell 2 embankment raise. No specified conditions relating to point source emissions to air or the monitoring of these emissions are required to be included in the works approval or licence relating to the FAD.	Application supporting documentation
<b>Point source emissions to surface water including monitoring</b>	N/A	<b>Construction and Operation</b> There will be no point source discharges to surface water during construction or operation of the FAD Cell 2 embankment raise. The nearest surface water body is the Collie River south branch approximately 6 km west of the FAD. Supernatant, decant and surface water runoff are collected for treatment. As part of the construction works, improvements will be made to surface water flows through the toe drain around Cell 2 to ensure surface water runoff from the FAD is drained to collection points for treatment and reuse or release. This is expected to reduce the likelihood of flooding of the toe drains during high rainfall events. No specified conditions relating to point source emissions to water or the monitoring of such emissions are required to be included in the works approval or licence.	Application supporting documentation
<b>Point source emissions to groundwater including monitoring</b>	N/A	<b>Construction and Operation</b> There are no proposed point source emissions to groundwater during construction or operation of the FAD Cell 2 embankment raise. No specific conditions relating to point source emissions to groundwater or the monitoring of point source emissions to groundwater are required to be included in the works approval or licence.  Ambient monitoring requirements for groundwater are discussed in Appendix A.	Application supporting documentation
<b>Emissions to land including monitoring</b>	N/A	<b>Construction</b> No discharges to land are expected to occur during the FAD Cell 2 embankment raise works therefore no specific conditions relating to emissions to land or their monitoring are required in the works approval.  <b>Operation</b> For further details on ambient emissions to land and groundwater due to seepage see	Application supporting documentation  Muja Fly Ash Dam – Cell 2B Design Report,



<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number W = Works Approval L= Licence</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
		DERs assessment of emissions to land and groundwater in Appendix A.	<p>GHD, 2015</p> <p>Muja Power Station – Fly Ash Dam Environmental Management Plan, GHD, 2015</p> <p>Muja Power Station Fly Ash Dam Management Hydrogeological Report, Ultramafics, 2011 and 2014</p> <p>Muja Power Station Fly Ash Dam Plume Studies Flora and Vegetation Studies, Woodman Environmental Consulting, 2012</p>
<b>Fugitive emissions</b>	N/A	<b>Construction</b> Fugitive dust emissions during construction are not expected to be significant and will be	General provisions of the



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>limited to emissions associated with earthworks and machinery movement during the FAD raise works. Synergy has committed to minimise dust emissions through the use of water carts. Therefore no specified conditions relating to fugitive dust emissions are required to be included in the works approval.</p> <p><b>Operation</b> Fugitive dust emissions are unlikely to occur during operation of the FAD due to the moisture content of the fly ash. Ash remains damp between deposition cycles and is unlikely to generate dust emissions. Therefore no specified conditions relating to fugitive dust emissions are required to be added to the licence in relation to the FAD. The licensee is required to comply with the general provisions of the <i>Environmental Protection Act 1986</i>.</p>	<i>Environmental Protection Act 1986</i>
<b>Odour</b>	N/A	<p><b>Construction and Operation</b> Odour emissions during construction and operation will be limited to those generated by mobile equipment and are not considered to be significant, particularly due to the distance to sensitive receptors. No specified conditions relating to odour or monitoring of odour are required to be included in the works approval or licence.</p>	<p>Application supporting documentation</p> <p>General provisions of the <i>Environmental Protection Act 1986</i></p>
<b>Noise</b>	N/A	<p><b>Construction and Operation</b> There will be a small increase in noise emissions during the construction period resulting from operation of heavy machinery. However, due to the distance to sensitive receptors (6 km), and limitation to day time operation for construction activity, this is not expected to be noticeable. Noise emissions during operation of the FAD are limited to the operation of pumps, which are insignificant in comparison with noise emissions associated with the operation of the power station, and are not expected to change as a result of these works. Therefore, no specified conditions relating to noise emissions or monitoring are required to be included in the works approval or licence.</p>	<p>Application supporting documentation</p> <p>General provisions of the <i>Environmental Protection Act 1986</i></p>



<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number W = Works Approval L= Licence</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
<b>Monitoring general</b>	L3.1.1 – L3.1.2 L3.1.4 - L3.1.5	<p><b>Construction</b> Emission monitoring is not required during the construction phase therefore conditions relating to monitoring are not included on the works approval.</p> <p><b>Operation</b> General monitoring conditions relating to collection, preservation and testing of samples (L3.1.1), monitoring intervals (L3.1.2), and monitoring equipment calibration requirements (L3.1.4-3.1.5) are included in existing licence L4706/1972/17. Biannual monitoring ambient groundwater monitoring requirements are proposed in Appendix A and will require condition L3.1.2 to be amended to define biannual monitoring requirements.</p>	<p>Application supporting documentation</p> <p>L4706/1972/17</p>
<b>Monitoring of inputs and outputs</b>	N/A	<p><b>Construction and Operation</b> There are no inputs or outputs requiring monitoring during construction or operation of the FAD Cell 2 embankment raise therefore no specific conditions relating to monitoring of these are required to be included in the works approval or licence.</p>	N/A
<b>Process monitoring</b>	N/A	<p><b>Construction and Operation</b> There are no process parameters relevant to category 53 activities therefore conditions relating to process monitoring are not required to be included in the works approval or licence.</p>	N/A
<b>Ambient quality monitoring</b>	L3.8.7	<p><b>Construction</b> Ambient quality monitoring is not required during construction of FAD Cell 2 embankment raise therefore no specific conditions relating to ambient monitoring are required to be included in the works approval .</p> <p><b>Operation</b> Details of DER's assessment and decision making in relation to ambient quality monitoring are included in Appendix A.</p>	<p>Muja Fly Ash Dam – Cell 2B Design Report, GHD, 2015</p> <p>Muja Power Station – Fly Ash Dam Environmental Management Plan, GHD, 2015</p>



<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number W = Works Approval L= Licence</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
			<p>Muja Power Station Fly Ash Dam Management Hydrogeological Report, Ultramafics, 2011 and 2014</p> <p>Muja Power Station Fly Ash Dam Plume Studies Flora and Vegetation Studies, Woodman Environmental Consulting, 2012</p>
<b>Meteorological monitoring</b>	N/A	<p><b>Construction and Operation</b> Meteorological monitoring is not required to manage or monitor the impacts of emissions or discharges from the FAD during construction or operation of the facility. Specific conditions relating to meteorological monitoring are therefore not required to be included in the works approval or licence.</p>	N/A
<b>Improvements</b>	N/A	<p>No conditions relating to improvements are required on the works approval. Consideration may be given to including improvement conditions in the licence. Further information is included in Appendix A.</p>	Application supporting documentation
<b>Information</b>	W2.1.1-W2.1.2 L5.1-L5.3	<p><b>Construction</b> Standard Works Approval conditions have been included in the works approval requiring</p>	L4706/1972/17



<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number W = Works Approval L= Licence</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
		<p>Synergy to submit a compliance document to DER once construction of the Cell 2 FAD embankment raise is complete and prior to commissioning the works. Subsequent to the submission of the compliance document a licence amendment will be required to include the recommendations relating to licence conditions outlined in this decision document.</p> <p><b>Operation</b> Standard recording, reporting and notification conditions are included in the current licence L4706/1972/17. No changes to these conditions are required for operation of the FAD following completion of embankment raise works.</p>	
<b>Licence Duration</b>	N/A	The works approval will be issued for the standard three year duration	N/A



## 5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
24/08/2015	Application advertised in West Australian (or other relevant newspaper)	No comments received	N/A
21/08/2015	Application referred to the Shire of Collie	No comments received	N/A
05/10/2015	Proponent sent a copy of draft instrument	Comments received 12 October 2015 requesting changes to the text in Appendix A to reference the fact that the 2014 hydrogeological study suggested that the seepage plume is thinning and moving deeper over time.	No changes made to the decision document as the requested changes do not significantly alter DER's assessment of this works approval application. The impacts of seepage will be further assessed after receipt of the compliance certificate indicating completion of the works.



## 6 Risk Assessment

*Note: This matrix is taken from the DER Corporate Policy Statement No. 07 - Operational Risk Management*

**Table 1: Emissions Risk Matrix**

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Severe
Almost Certain	Moderate	High	High	Extreme	Extreme
Likely	Moderate	Moderate	High	High	Extreme
Possible	Low	Moderate	Moderate	High	Extreme
Unlikely	Low	Moderate	Moderate	Moderate	High
Rare	Low	Low	Moderate	Moderate	High



## Appendix A

### Emissions to land and groundwater including ambient monitoring

The principal emission of concern for the FAD is seepage of acidic leachate which can mobilise heavy metals into the surrounding soil and groundwater. Fly ash from the MPS produces an acidic leachate when slurried with water. Typical metals likely to be released in the leachate include aluminium, boron, beryllium, cadmium, copper, cobalt, fluoride, iron, manganese, nickel, strontium and zinc. The FAD has been constructed at the head of a small shallow valley in an area of saprolitic clayey soils in the eastern part and sandy deposits in the western part. Substrate in the western part of the FAD is more permeable and is therefore more likely to be affected by seepage. There is limited baseline groundwater quality data available for the area where the FAD is located however it has been generally characterised as pH 4-6, salinity (as TDS) 3 000 to 5 000 mg/L and a chloride:sulfate ratio greater than 10:1.

#### ***Emission Risk Assessment – Operations***

##### Emission Description

*Emission:* Seepage of leachate from the FAD with characteristics including low pH and elevated salinity, sulphate and metals.

*Impact:* Contamination of groundwater and/or soils due to elevated heavy metals, salinity and sulfate, and reduced pH. Groundwater mounding due to seepage may also impact on the root zone of surrounding vegetation with potential to cause stress, kill or prevent germination.

Triennial hydrogeological studies conducted at the FAD in 2011 and 2014 identified the presence of a seepage plume emanating from the FAD in a north westerly direction. The plume is just below the water table at a depth of approximately 15-20 m below ground level and is relatively thin ranging from 1-10 m thick. Three chemical indicators have been used to identify the presence of the seepage plume. These include increasing salinity, low (<2:1) or decreasing chloride:sulfate ratios and increasing strontium concentration. Based on these indicators the seepage plume has been detected at ambient groundwater monitoring locations to the west and north of the FAD, MB5-MB8, MB11B, and MB31-MB34. MB 31-MB34 are located in the State Forest adjacent to the western premises boundary illustrating that the plume extends beyond the premises boundary. The studies estimate the plume is enlarging at a rate of 100 kL/day and travelling approximately 50 m/year. There are no sensitive receptors in the immediate vicinity of the FAD which will be impacted by the seepage plume as the MPS is surrounded by State Forest and coal mining operations. Groundwater use in the Collie region is primarily for the purposes of mine dewatering and power supply and there are no domestic groundwater users in close proximity to the MPS.

*Controls:* The FAD has been constructed with an in-situ and imported clay liner to reduce the likelihood of seepage however the permeability of the liner is unknown. Sound construction and operational practices will also reduce the likelihood of seepage occurring. Embankment design has been undertaken by GHD who have relevant experience in the design of storage facilities. The facility has been designed in accordance with requirements of the Australian National Committee on Large Dams (ANCOLD) Guidelines on Tailings Storage Facilities 2012, to ensure a safe and stable structure (Muja FAD Cell 2 Design Report). Testing of construction materials and compaction will be undertaken throughout the construction phase to ensure a stable embankment is constructed from suitable materials which also reduces the likelihood of seepage occurring.

The main operational control to minimise the likelihood of seepage occurring is to reduce the volume of supernatant water on the FAD thereby reducing the hydraulic pressure on the structure and allowing adequate time for drying and consolidation of the fly ash. Previously, supernatant water was removed from the FAD surface to the supernatant dam via a gravity fed pipeline from the decant which limited the supernatant abstraction rate. As part of the works approval Synergy are proposing to replace the gravity fed pipeline with a submersible pump in the decant to increase the supernatant abstraction rate and reduce the supernatant pond on the FAD.

Other controls proposed as part of the works approval to reduce the likelihood of seepage include improvements to the stormwater drainage system around FAD Cell 2 to drain stormwater flows



from the face and toe of the cell to collection sumps for treatment. Synergy has also proposed to install an underdrainage system around the perimeter of Cell 2 to intercept and transport leachate into storage tanks for return to the FAD or supernatant dam.

Plume recovery has been trialled at MB7B from 2004 to 2011 but the abstraction rate was insufficient to make a significant impact (3 kL per day). Due to the bore drying, abstraction ceased in 2011 and has not been recommenced. The hydrogeological studies suggest lowering the recovery pump in the bore to continue plume abstraction.

#### Risk Assessment

*Consequence:* Minor

*Likelihood:* Likely

*Risk Rating:* Moderate

#### Regulatory Controls

Synergy has undertaken studies to identify the presence and extent of the seepage plume from the FAD and has proposed controls within the works approval application to reduce the likelihood of seepage occurring. However, there are currently no remedial controls in place to recover or contain the identified plume.

The licence does not currently contain a requirement to continue to conduct triennial hydrogeological assessments of the FAD. As the seepage plume has not yet been controlled and continues to expand beyond the premises boundary it is necessary to continue undertaking triennial hydrogeological assessments of the FAD during operation of the facility to monitor the extent of the plume. This requirement will be included in section 1.3 of the licence.

Ambient groundwater monitoring is required to monitor for the presence and impact of the FAD seepage plume. Ambient groundwater monitoring requirements are included in condition 3.8.7 (Table 3.8.4) of existing licence L4706/1972/17. The monitoring suite requires extension to include recognised seepage plume indicators strontium and chloride, and additional metals which are likely to be present in fly ash from the MPS. It is also considered that the quarterly monitoring suite can be reduced to parameters which will be affected most rapidly by seepage including pH, EC, TDS, sulfate, chloride and standing water level. Monitoring of an expanded metals suite on a biannual basis is considered sufficient to detect trends which could indicate seepage impacts. The expanded suite shall include all metals currently listed in Table 3.8.4 and aluminium, beryllium, boron, cobalt, fluoride, magnesium and strontium.

The impacts of seepage will be further assessed after receipt of the compliance certificate indicating completion of the works. Consideration may be given to including further conditions in the licence to better manage the impact of seepage.

#### Residual Risk

*Consequence:* Minor

*Likelihood:* Likely

*Risk Rating:* Moderate