Kemerton Power Station Enhancement Project

Transfield Services Kemerton Pty Limited

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 1258
May 2007

Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
11/04/07	**Referral received**	
28/05/07	**ARI Level of Assessment set and EPA report to the Minister for the Environment**	**6**

Assessment No. 1679

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1. Introduction and background

This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment on the proposal by Transfield Services Kemerton Pty Limited to install a wet compression system and associated infrastructure within the Kemerton Power Station and to construct evaporation ponds and a water pipeline to deliver water from an existing offtake located about 4km to the east.

Section 44 of the *Environmental Protection Act 1986* (EP Act) requires the EPA to report to the Minister for the Environment on the outcome of its assessment of a proposal. The report must set out:

- the key environmental factors identified in the course of the assessment; and
- the EPA's recommendations as to whether the proposal may be implemented, and, if the EPA recommends that implementation be allowed, the conditions and procedures to which implementation should be subject.

The EPA may include in the report any other advice and recommendations as it sees fit.

The proponent has submitted a referral document setting out the details of the proposal, potential environmental impacts, and management of those impacts.

The EPA considers that the proposal, as described, can be managed to meet the EPA's environmental objectives, subject to the EPA's recommended conditions being made legally binding.

The EPA has therefore determined under Section 40 of the EP Act that the level of assessment for the proposal is Assessment on Referral Information (ARI), and this report provides the EPA advice and recommendations in accordance with Section 44 of the EP Act.

2. The proposal

Transfield Services Kemerton Pty Limited (TSK) proposes to install a wet compression system and associated infrastructure within the existing Kemerton Power Station (KPS) and to construct evaporation ponds and a water pipeline to deliver water from an existing offtake located about 4km to the east [Figures 1, 2, and 3]. The installation of the wet compression system would enable the KPS to generate additional power at ambient temperatures above International Standards Organisation (ISO) conditions (i.e. 15°C, relative humidity of 60% and atmospheric pressure of 101.3kPa) by eliminating the sensitivity of the installed gas turbines to ambient temperature. This sensitivity causes the power output of each of the KPS's gas turbines to decrease from 155 megawatts (MW) at ISO conditions to 130MW at hot weather maximum (HWM) conditions (i.e. 41°C, relative humidity of 40% and atmospheric pressure of 101.3kPa).

Wet compression is a process in which a large quantity of water, in the form of fine droplets, is sprayed into the compressor inlet of a gas turbine. An inter-cooling effect is achieved as the water evaporates within the blade path of the compressor and cools the

compressed air. The cooler denser air requires less energy to compress and this energy saving results in an increase in the efficiency and power output of the gas turbine.

The wet compression system will be supplied with demineralised water, produced by a new demineralised water treatment plant. The demineralised water treatment plant will consume approximately 27ML of water per year, of which about 21.6ML of water per year will be directed to the wet compression circuit and about 5.4ML of water per year in the form of reject water (concentrate) will be directed to the two evaporation ponds. The proponent will obtain the required water under a Water Supply Agreement with Harvey Water. The water will be sourced from Stirling Dam via the Harvey Weir and will be delivered to the KPS through an approximately 4km long water pipeline that will be connected to an existing offtake on Campbell Road which is maintained by Harvey Water (Figure 3). The water pipeline will be constructed by Harvey Water under a subcontract arrangement with the proponent. It will be constructed from polyethylene and will be located within a 15m wide corridor between the offtake on Campbell Road and the KPS (Figure 3).

The proposal involves the installation of the following infrastructure:

- an approximately 4km long water pipeline that will deliver fresh water to the power station;
- a wet compression injection skid and associated spray rack installed inside the gas turbine compressor air inlet;
- a forwarding pump skid;
- a demineralised water treatment plant;
- a demineralised water storage tank with a storage capacity of 1.0ML;
- two evaporation ponds within the power station site boundary. The two ponds will have a combined capacity of 20.8ML and will be lined with 1.5mm thick high density polyethylene (HDPE);
- additional cooling fans for the generator transformer; and
- associated piping, electrical cabling, and control system.

The main characteristics of the proposal are summarised in Table 1 below.

Table 1: Summary of key proposal characteristics

Element	**Description**			
	Current operation		**New proposal**	
Fuel type.	Natural gas	Liquid fuel	Natural gas	Liquid fuel
Project purpose.	Provide peaking power to the SWIS.		No change.	
Project life.	25 years.		No change.	
Power output per unit (MW).	159 *131* [1]	146 *119* [1]	173 *150* [1]	165 *136* [1]
Power generating capacity (GWh/yr).	240 [1]		345 *297* [1]	
Plant operating modes.	Mode 1 - Peaking plant for 5% of the time at 100% load. Mode 2 - Spinning reserve for 10% of the time at		No change. No change.	

Element	Description			
	Current operation		New proposal	
Fuel type.	Natural gas	Liquid fuel	Natural gas	Liquid fuel
	55% load.			
Operating hours.	Approximately 1000 hours per year (10% liquid fuel).		Approximately 1000 hours per year (10% liquid fuel).	
Estimated capacity factor.	Approximately 10%.		Approximately 10%.	
Facility footprint. Site area including buffer. Water pipeline corridor area.	2ha 28ha N/A		No change. No change. 6ha	
Plant facilities				
Proposed technology. Number of stacks. Height of stacks. Stack diameter. Number of liquid fuel storage tanks. Demineralised water tank. Water treatment. Wastewater disposal.	2 x Siemens V94.2 gas turbine generators. 2 35m 5.5m 1 x 2ML tank. N/A N/A N/A		No change. No change. No change. No change. No change. 1ML Demineralised water treatment plant. Two evaporation ponds with a combined storage capacity of 20.8ML. The evaporation ponds will be lined with 1.5mm thick high density polyethylene (HDPE).	
Inputs				
Cooling water.	None.		27ML/yr sourced from Stirling Dam. Water will be delivered to the power station via an approximately 4km long polyethylene water pipeline connected to an existing offtake on Campbell Road.	
General water requirements.	20kL/day - For dust suppression during construction. 5kL/yr - For domestic use.		5kL/day - For dust suppression during pipeline construction. No change.	
Natural gas.	Approximately 3PJ per year taken from the Dampier to Bunbury Natural Gas Pipeline.		Approximately 3PJ per year taken from the Dampier to Bunbury Natural Gas Pipeline.	
Liquid fuel (backup).	Up to 6ML/yr of ultra low sulphur diesel. Sulphur content of diesel - 50ppm maximum.		As needed subject to gas availability.	
Outputs				
Wastewater.	None.		Reject water (concentrate) from the demineralised water treatment plant directed to two evaporation ponds (up to 5.4ML/yr).	
Predicted noise level.	< 28dB(A) at closest residences.		No change.	
Solid waste.	< 10tpa		No change.	
Air emissions				
Mass flow [1] (kg/s).	531 *455*	531 *473*	546 *472*	546 *488*
Exit volume (wet, actual) [1] [m³/s].	1,229 *1,078*	1,181 *1,088*	1,278 *1,122*	1,228 *1,134*
Exit temperature [1] (°C).	538 *568*	517 *537*	538 *561*	517 *537*
Plume buoyancy [m^4/s^3].	2,471 *2,320*	2,341 *2,187*	2,571 *2,402*	2,435 *2,278*
Nitrogen oxides (NO_X) exit concentration [1] [ppmv @ 15% O_2].	20.1 *20.1*	62.9 *62.9*	16.1 *16.1*	50.3 *50.3*
NO_X emission rate [1] (g/s).	15.8 *11.9*	47.3 *41.4*	14.2 *11.0*	45.3 *39.7*
Carbon monoxide (CO) exit concentration [1] (ppmv @ 15% O_2).	< 25 *< 25*	< 25 *< 25*	< 10 *< 10*	< 10 *< 10*
Sulphur dioxide (SO_2) emission rate [1] (g/s).	Negligible.	1 *1*	Negligible.	1 *1*
Particulates (ppmv @ 15% O_2).	Negligible.	Negligible.	Negligible.	Negligible.
Polycyclic aromatic hydrocarbons (PAHs) [ppmv @ 15% O_2].	Negligible.	Negligible.	Negligible.	Negligible.
Non-methane volatile organic compounds (NMVOCs) [ppmv @ 15% O_2].	Negligible.	Negligible.	Negligible.	Negligible.

Element	Description			
	Current operation		New proposal	
Fuel type.	Natural gas	Liquid fuel	Natural gas	Liquid fuel
Water mass flow in the flue gas [1] (g/s).	23,800 *30,969*	15,600 *19,600*	36,800 *42,697*	28,400 *31,200*
Oxygen (O_2) mass flow in the flue gas [1] (g/s).	82,500 *68,645*	85,200 *75,200*	78,600 *65,828*	79,200 *70,100*
Greenhouse gas emissions.	Approximately 160,000 tonnes of $CO_{2\text{-}e}$ per year (Assuming approximately 900 hours per year operation on natural gas and 100 hours per year operation on liquid fuel).		Approximately 160,000 tonnes of $CO_{2\text{-}e}$ per year (Assuming approximately 900 hours per year operation on natural gas and 100 hours per year operation on liquid fuel).	
Average greenhouse intensity.	667.61kg of $CO_{2\text{-}e}$/MWh (Assuming approximately 900 hours per year operation on natural gas and 100 hours per year operation on liquid fuel).		539kg of $CO_{2\text{-}e}$/MWh (Assuming approximately 900 hours per year operation on natural gas and 100 hours per year operation on liquid fuel).	

Notes:

1. Actual values measured by Siemens during acceptance tests in October 2005 at ambient temperatures and corrected to HWM and ISO conditions. Values in *italics* are related to HWM conditions (ambient temperature = 41°C, RH = 40%, LHV= 44.7MJ/kg, ambient pressure = 101.3kPa). Other values refer to ISO conditions (temperature = 15ºC, RH = 60%) with reference gas composition.

Abbreviations

CO_2	carbon dioxide	kg/s	kilograms per second	ML	megalitres (10^6 litres)
$CO_{2\text{-}e}$/MWh	carbon dioxide equivalents per megawatt hour	kL/day	kilolitres per day	ML/yr	megalitres per year
		kL/yr	kilolitres per year	MW	megawatts (10^6 watts)
dB(A)	decibels (A weighted)	kPa	kilopascals	N/A	not applicable
g/s	grams per second	LHV	lower heating value	PJ	petajoules (10^{15} Joules)
GWh/yr	gigawatt hours per year	m	metres	ppm	parts per million
ha	hectares	m^3/s	cubic metres per second	ppmv	parts per million by volume
HWM	hot weather maximum	m^4/s^3	metres to the fourth power per second to the third power	RH	relative humidity
ISO	International Standards Organisation			SWIS	South West Interconnected System
kg	kilograms	MJ/kg	megajoules per kilogram		

Source: Modified version of Table A1 from ATA Environmental, 2007.

The potential impacts of the proposal are discussed by the proponent in the referral document (ATA Environmental, 2007).

3. Consultation

During the preparation of the referral document the proponent has undertaken consultation with government agencies and key stakeholders. The agencies, groups and organisations consulted, the comments received and the proponent's response are detailed in the referral document (ATA Environmental, 2007).

A number of environmental issues were raised by the stakeholders during the consultation. These included potential impacts of the proposal on air emissions, surface water and groundwater resources, and flora and vegetation. The Kemerton Action Group (KAG) raised a significant number of concerns about the proposal. Table 2 summarises the main issues that were raised by the KAG and details the actions taken by the proponent to address those issues.

Table 2: Summary of issues raised by the Kemerton Action Group during stakeholder consultation

Comment and/or Issue	Response by Transfield
Vegetation/Habitat KAG recognises that the proposed modifications should have a net environmental gain and therefore support the proposal provided the water supply pipeline follows the route outlined in the proposal.	Noted. The pipeline will follow the route supported by KAG.
Vegetation/Habitat The proposal would be opposed by the KAG if the pipeline route was to revert to earlier pipeline routes considered by TSK which could have potential significant impacts on significant wetlands and native vegetation.	Noted the Pipeline will not deviate from the route preferred by KAG. To do so would be a significant change to the proposal and would require re-assessment.
Waste Water Disposal The proposal would be opposed by the KAG if waste water generated from the RO plant was used to irrigate surrounding blue gum plantation.	Noted. The proposal relies on evaporative disposal of waste water. Transfield did consider irrigation of the wastewater because of its inherently high quality but discarded this because the EPA advised it would complicate the assessment process. TSK proposes to install two 1.5mm HDPE lined evaporation ponds to which wastewater from the RO plant will be directed. As the proposal no longer proposes to irrigate the waste water, this concern is not considered a matter for further assessment.
Evaporation Pond KAG raised some concerns relating to the potential for spills from the evaporation pond and the potential for groundwater and surface water contamination.	Noted. Only one evaporation pond was proposed in the original report (ATA, 2007), however this has now been revised to two ponds, to ensure that the ponds are able to dry out in order for solids to be removed. Reject water from the RO plant will have a TDS of ~700mg/L, which is consistent with water of drinking water quality. It is recognised however, that due to evaporation, the concentration of water within the evaporation ponds will increase. The proposed method of operation for these two ponds is such that only one pond is in operation (i.e. accepting RO reject water) in any one year while the second one dries out, ready for removal of accumulated residues at the end of that year. Water balance modelling was performed which took into account rainfall and evaporation data for the Harvey area. Up to 5.4ML of reject water will be directed into one of the ponds on a yearly basis, with a further 3.8ML of rainfall captured within each pond. Evaporation has been modelled at 6.51ML per year, resulting in a maximum of 2.7ML of water remaining in either pond. This represents 26% of the capacity of the smaller of the two ponds. It is considered that the spare capacity offered by the two pond design, the integrity of the 1.5mm HDPE liner and the commitment to construct the two ponds to QA standards in accordance with the relevant standards will ensure that potential surface and groundwater impacts are managed to meet the EPA's objectives in relation to surface and groundwater protection. The risk of overtopping will be addressed by management measures during the Works Approval application process.
Protection of Water Quality in Drain A drainage feature comprising a large ditch passes through a wetland area on route to the Wellesley River and represents a possible transport route to the river should a polluting event occur. The KAG believes this drain should be blocked closer to the power station site to minimise the risk of pollution reaching the Wellesley River and being transported to the Leschenault	The only potential source of spillage into the environment is from the evaporation ponds. As these are lined with heavy duty HDPE liners designed with in excess of 100% spare capacity accounting for input from the plant and rainfall, there is no credible threat of overtopping even in extreme storm events. As a result this action is not considered necessary by

Comment and/or Issue	Response by Transfield
Estuary.	Transfield. In any case the soils on the site are well drained sandy soils so that in the unlikely event that the ponds overflowed, any spillage is likely to infiltrate directly into the soil profile and would not in any case report to the drainage feature. In addition, the drain provides active drainage for the area of the power station and concerns exist that should it be blocked, the power station site may be flooded during the winter period.
Impacts on Surface and Groundwater General concerns were raised regarding the potential for impacts on surface and groundwater.	The project has minimal potential for impact on surface or groundwater given that water is sourced from externally to the site and the disposal of wastewater is by evaporation in sophisticated evaporation ponds. (Also see more detailed responses above).
Air Emissions Concerns were raised about the potential for significant changes to air emissions.	As indicated in the body of the report, the air emissions will not change greatly as there is no additional fuel usage. The greenhouse intensity of the facility will decrease as CO_2 emissions will remain the same but power outputs will increase. NO_X emissions are predicted to decrease slightly and all other parameters will remain largely unchanged.
Flora and Fauna Concerns were raised about the potential for impacts on flora and fauna.	The pipeline route has been carefully chosen to prevent impacts on flora and fauna and as a result there should be no clearing of vegetation. All other infrastructure will be constructed within the cleared building envelope of the power station. As a result there will be no significant impacts on flora and fauna.
Miscellaneous The KAG raised some concerns in relation to the ecological value placed upon wetlands and vegetation to the south of the site, which had been previously identified as a potential pipeline route. The KAG recognises that these issues do not relate to this proposal given the selected pipeline route does not transverse these areas, however their concern was that the investigations and reports conducted by ATA Environmental may be used for future developments, and they wished their concerns to be noted.	Noted these are matters to be dealt with my LandCorp as owner/manager of the Kemerton Industrial Park.

Source: Modified version of Table 9 in ATA Environmental, 2007.

The EPA considers that the consultation process has been appropriate and that reasonable steps have been taken to inform the community and stakeholders on the proposed development.

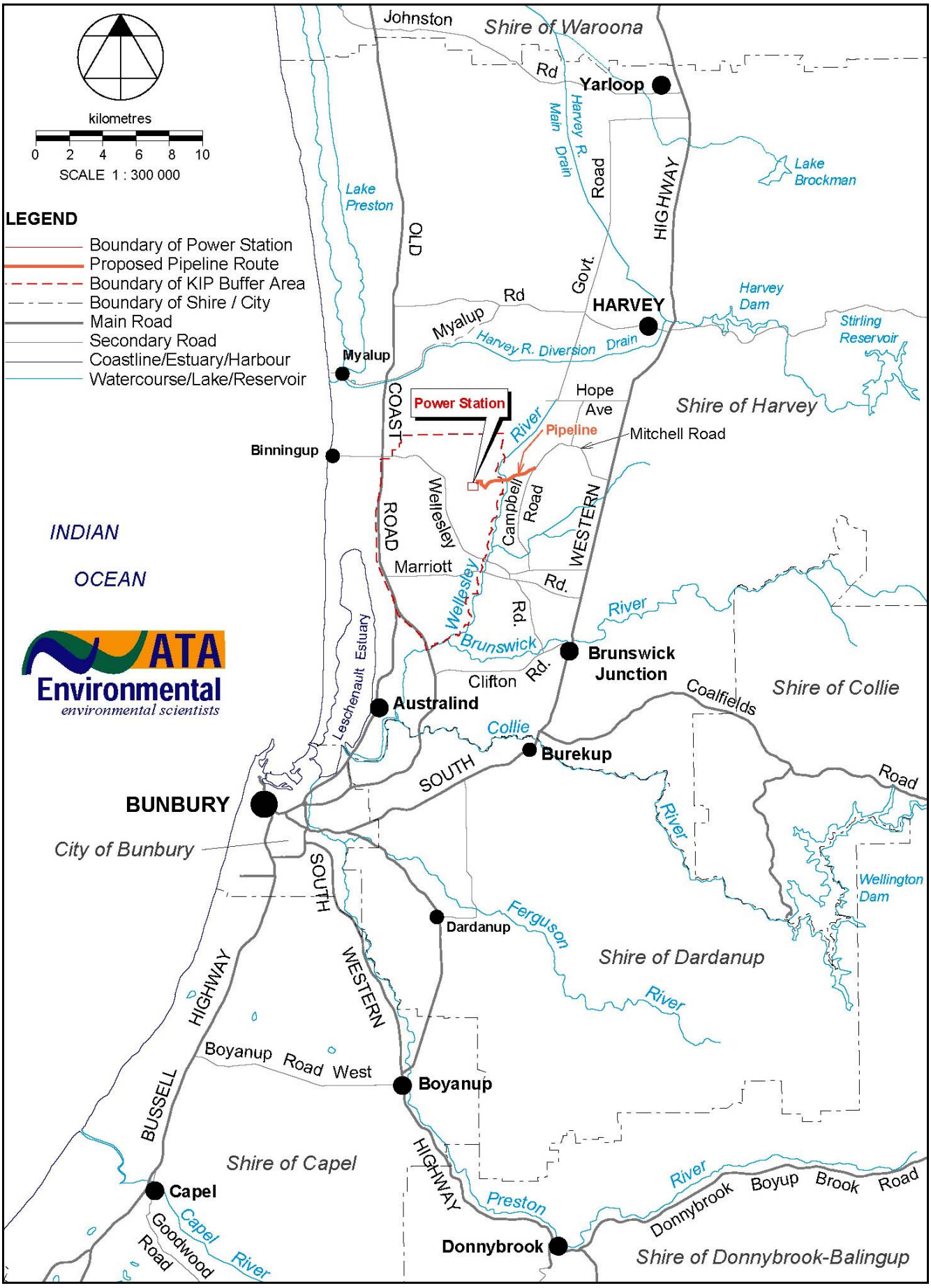
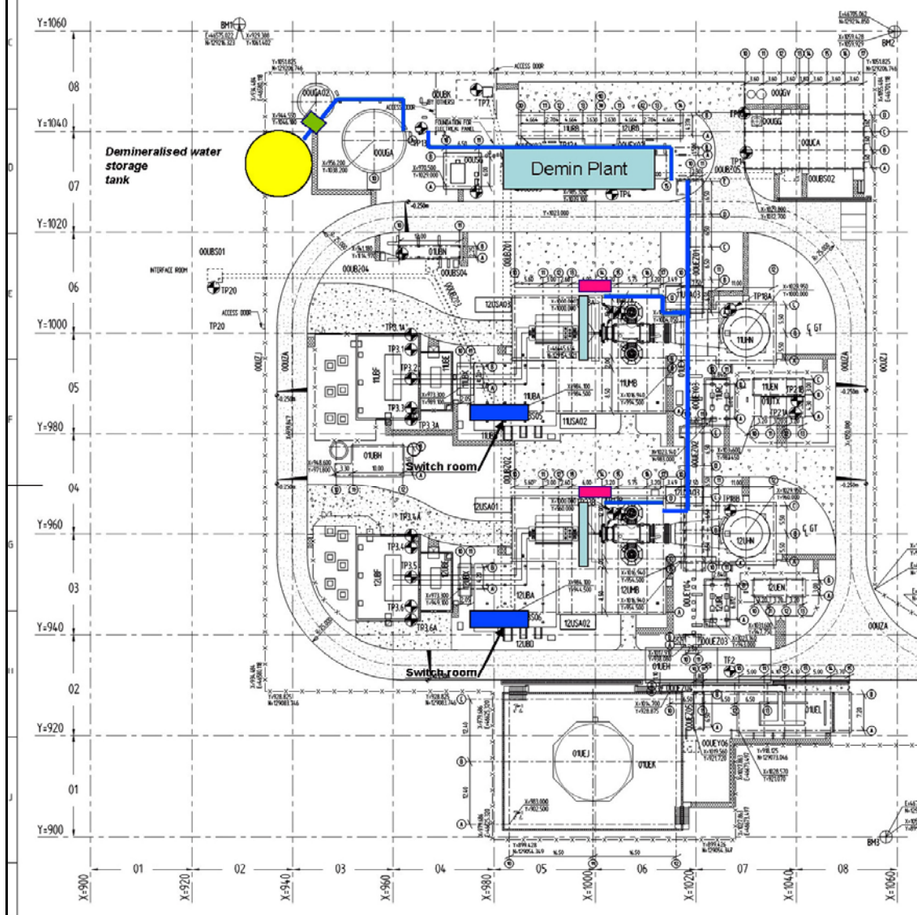


Figure 1 Regional location (Source: Modified version of Figure 1 from ATA Environmental, 2007)

Legend

- Inlet Duct
- Pipeline from demineralised water tank to WetC skids And from WetC skid to Inlet Duct
- Demineralised water forwarding pumps
- Wet Compression Skid (Pump, motor & control system)



LIST OF TERMINAL POINTS

Terminal Point	Description	Local X	Local Y	Local Z	PCG Easting	PCG Northing	PCG Elevation	Remarks
TP1	Fuel Gas (Underground)	1071.520	928.165	- 1.605	46717.154	129083.086	13.895	CL Of Pipe
TP2 (A-D)	Fuel Oil	UEH	UEH	+ 0.560	UEH	UEH	16.060	
TP3.1	330kV-HV-Connection (For Unit-11)	963.575	996.740	+ 13.220	46609.209	129151.361	28.720	
TP3.1A	Earth Shield (For Unit-11)	963.575	999.690	+ 17.220	46609.209	129154.611	32.720	
TP3.2	330kV-HV-Connection (For Unit-11)	963.575	990.940	+ 13.220	46609.209	129145.861	28.720	
TP3.3	330kV-HV-Connection (For Unit-11)	963.575	985.140	+ 13.220	46609.209	129140.061	28.720	
TP3.3A	Earth Shield (For Unit-11)	963.575	982.940	+ 17.220	46609.209	129137.861	32.720	
TP3.4	330kV-HV-Connection (For Unit-12)	963.575	957.230	+ 13.220	46609.209	129112.131	28.720	
TP3.4A	Earth Shield (For Unit-12)	963.575	959.690	+ 17.220	46609.209	129114.611	32.720	
TP3.5	330kV-HV-Connection (For Unit-12)	963.575	951.410	+ 13.220	46609.209	129106.331	28.720	
TP3.6	330kV-HV-Connection (For Unit-12)	963.575	945.610	+ 13.220	46609.209	129100.531	28.720	
TP3.6A	Earth Shield (For Unit-12)	963.575	942.940	+ 17.220	46609.209	129097.861	32.720	
TP4	Demin Water	1003.300	1027.600	+ 0.500	46648.934	129182.521	16.000	CL Of Pipe
TP5	Raw Water	976.500	1027.945	+ 0.410	46622.134	129182.866	15.910	CL Of Pipe
TP6	Access Road	1236.242	933.999	-0.250	46881.876	129088.920	15.250	
TP7	Power Supply For Construction	976.550	1048.450	-----	46622.184	129203.371	----	
TP10	Potable Water	1029.535	1043.830	+ 0.500	46675.149	129198.751	16.000	CL Of Pipe
TP13A	Raw Water at 00UGA Area	965.600	1040.700	+ 0.220	46611.234	129195.521	15.720	CL Of Pipe
TP14	Raw Water at 00UCA Area	1030.000	1035.790	+ 0.720	46675.634	129190.711	16.220	CL Of Pipe
TP17A	Drainage of Gas Turbine False Start Oil	11UMB	11UMB	-----	11UMB	11UMB	----	
TP17B	Drainage of Gas Turbine False Start Oil	12UMB	12UMB	-----	12UMB	12UMB	----	
TP18A	Gas Turbine Diffuser and Stack Drain	1026.780	1004.600	-0.650	46672.414	129159.321	14.850	
TP18B	Gas Turbine Diffuser and Stack Drain	1026.780	964.600	-0.650	46672.414	129119.321	14.850	
TP20	Cable Connection to Relay Room	924.230	1009.520	-----	46569.864	129164.441	----	
TP21A	Ignition Gas	1040.130	984.250	+ 0.655	46685.764	129139.171	16.155	CL Of Pipe
TP21B	Ignition Gas	1040.130	986.550	+ 0.655	46685.764	129141.471	16.155	CL Of Pipe
TP22	Emergency Diesel Daily Oil Tank	UBN	UBN	-----	UBN	UBN	----	
TP23A	Drainage of Gas Turbine Wash Water	11UMB	11UMB	-----	11UMB	11UMB	----	
TP23B	Drainage of Gas Turbine Wash Water	12UMB	12UMB	-----	12UMB	12UMB	----	

PLANT NORTH

BUILDING LEGENDS

11/12UBA01/02/03	STRUCTURE FOR POWER CONTROL CENTER (PCCs)
11/12UBD	STRUCTURE FOR LV AUXILIARY POWER TRANSFORMERS
11/12UBE	STRUCTURE FOR HV AUXILIARY POWER TRANSFORMERS
11/12UBF	STRUCTURE FOR GENERATOR TRANSFORMERS
01UBH	STRUCTURE FOR OIL-COLLECTING PIT/OIL SEPERATOR
00UBK	STRUCTURE FOR COMMON AUXILIARY TRANSFORMER FOR CONSTRUCTION AND STANDBY TRANSFORMER (SCOPE: TRANSFIELD)
01UBN	STRUCTURE FOR EMERGENCY POWER GENERATING SET
00UBS01-06	STRUCTURE FOR CABLE PULLING PITS
11/12UBX	STRUCTURE FOR GENERATOR CIRCUIT BREAKERS
00UBZ01-05	STRUCTURE FOR CABLE CONDUITS
00UCA	CONTROL ROOM, ADMINISTRATION, WORKSHOP AND STORAGE BUILDING
01UEH	STRUCTURE FOR UNLOADING OF LIQUID FUELS
01UEJ	STRUCTURE FOR STORAGE OF LIQUID FUELS
01UEK	BUND WALL FOR STORAGE OF LIQUID FUELS
01UEL	STRUCTURE FOR FORWARDING OF LIQUID FUELS
11/12UEN	STRUCTURE FOR GAS METERING AND FILTER
00UEY01-06	STRUCTURE FOR PIPE AND CABLE SLEEPER WAY
01UEX	STRUCTURE FOR PRESSURE SUSTAINING STATION
00UEZ01-03	STRUCTURE FOR PIPE AND CABLE DUCT
00UGA	STRUCTURE FOR RAW WATER TANK
00UGC	STRUCTURE FOR DEMINERALIZED WATER STORAGE
00UGG	STRUCTURE FOR POTABLE WATER STORAGE
00UGV	STRUCTURE FOR SEPTIC TANK
11/12UHN	STRUCTURE FOR STACK
11/12UMB	STRUCTURE FOR GAS TURBINE BUILDING
11/12URB	STRUCTURE FOR FIN FAN COOLERS (SERVICE WATER)
11/12URC	STRUCTURE FOR FIN FAN COOLERS (LUBE OIL)
11/12USA01-03	STRUCTURE FOR BUILDING VENTILATION
00USG	STRUCTURE FOR FIRE FIGHTING WATER PUMPS
01UTX	STRUCTURE FOR IGNITION GAS SKID
00UZA	ROADS
00UZJ	FENCING AND GATE

NOTES

1. ALL DIMENSIONS AND LEVELS ARE N METERS, UNLESS NOTED OTHERWISE
2. FINISHED FLOOR LEVEL ±0.00m = +15.50m ABOVE A.H.D
3. FINISHED GROUND LEVEL -0.30m = +15.20m ABOVE A.H.D
4. ROAD TOP LEVELS AT ROAD TERMINAL POINTS TO BE MATCHED PROVIDING GENTLE SLOPE
5. MAIN ROAD IS 6 M WIDE

OUTDOOR ROOM NUMBERING SYSTEM

00 UZT 0101
- 0101 — SITE FIELD NO.
- UZT — KKS
- 00 — UNIT

TRANSFIELD SERVICES

KEMERTON POWER STATION SCPP — AUS379

Wet Compression System Prcposed layout — 1:500 — A1 — UC07 — U

Export classification AL: N ECCN: N
Goods labeled with "AL not equal to N" are subject to European or German export authorization when being exported out of the EU. Goods labeled with "ECCN not equal to N" are subject to US reexport authorization. Even without a label, or with label "AL N" or "ECCN N", authorization may be required due to the final whereabouts and purpose for which the goods are to be used.

Index	Datum	Name	Änderungsinhalt/Grund
e	2005-05-30	BC sgd	SV sgd AXIS FOR 00UGA02 ADDED
d	2005-01-05	BC sgd	SV sgd GENERALLY REVISED
c	2004-11-09	BC sgd	SV sgd REVISED AS MARKED
b	2004-07-23	BC sgd	SV sgd REVISED AS MARKED
a	2004-07-12	BC sgd	SV sgd REVISED AS MARKED

ATA Environmental — environmental scientists

Figure 2 Site plan (Source: Modified version of Figure 3 from ATA Environmental, 2007)

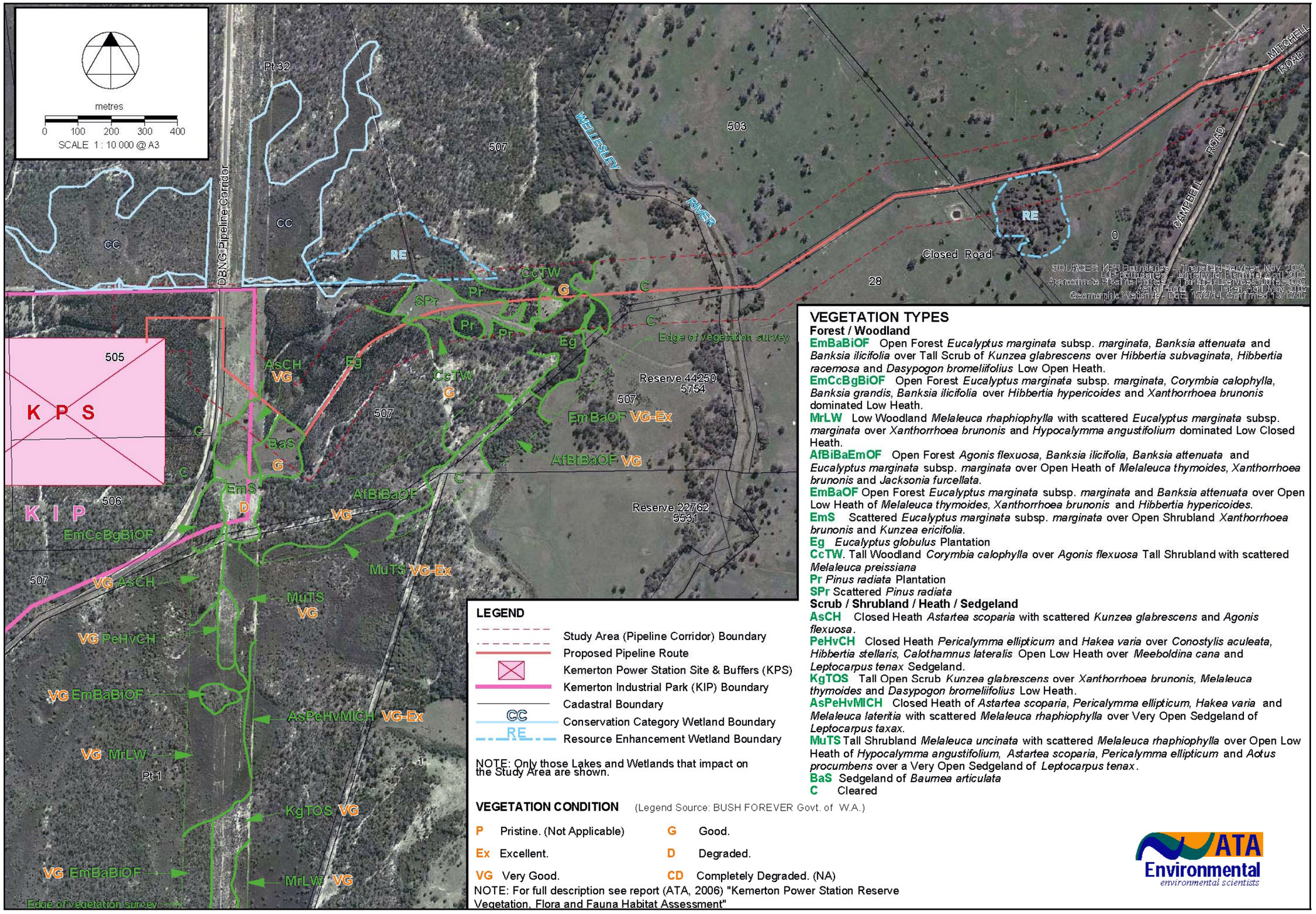


Figure 3 Water pipeline route, wetlands, vegetation and condition (Source: Modified version of Figure 4 from ATA Environmental, 2007)

4. Key environmental factors

It is the EPA's opinion that the following key environmental factors relevant to the proposal require evaluation in this report:

(a) Water supply, surface water, and groundwater; and

(b) Fauna.

The key environmental factors are discussed in Sections 4.1 - 4.2. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is the basis on which the EPA decides whether or not a proposal meets the environmental objective set for that factor.

4.1 Water supply, surface water, and groundwater

Description

Water supply

The proposed development will require approximately 27ML of water per year to be supplied to the KPS. The water will be sourced from Stirling Dam via the Harvey Weir and will be delivered to the KPS through an approximately 4km long water pipeline that will be connected to an existing offtake on Campbell Road (Figure 3). The water pipeline will be constructed by Harvey Water under a subcontract arrangement with the proponent.

Surface water

Following installation of the water pipeline, the trench will be backfilled and the construction area will be recontoured to blend in with the surrounding topography, thus reducing the potential for permanent or long term modifications to existing surface water sheet flows to and from existing wetlands or watercourses.

The proposed water pipeline will cross the Wellesley River. Although the Wellesley River is a perennial watercourse it is envisaged that pipeline construction will be undertaken during summer and early autumn when water flow is significantly reduced. The water pipeline will be constructed below the river bed in order to prevent long term impacts on the flow and hydrological regime of the river at the crossing. The potential impacts arising from the installation of the water pipeline include the generation of sediment and a localised increase in turbidity in the vicinity of the construction area.

The proposed water pipeline will be located at least 50m away from identified wetlands.

Groundwater

Construction of the water pipeline will involve earthworks and excavations up to 1m deep along the pipeline route. Construction will be undertaken when the groundwater table is low, thereby removing the need for dewatering. However, should dewatering be required, the proponent will obtain an application for a dewatering licence from the Department of Water, and appropriate management measures will be employed to

prevent any impacts from dewatering activities and discharges. Dewatering associated with water pipeline construction has the potential to expose acid sulphate soils.

Construction of the proposed water pipeline has the potential to disturb acid sulphate soils. The land traversed by the water pipeline has been designated as a low to moderate risk area for acid sulphate soils in the Western Australian Planning Commission's (WAPC's) Planning Bulletin 64. However, there is the potential for soils along the Wellesley River to present a high risk. The proponent's referral document indicates that prior to the commencement of construction of the water pipeline a soil sampling exercise will be undertaken to determine the extent and magnitude of acid sulphate soils at the site. It also indicates that the proponent will prepare an Acid Sulphate Soil Management Plan to the satisfaction of the Land and Water Quality Branch of the Department of Environment and Conservation.

Servicing of equipment will not be undertaken on the water pipeline route during construction. Fuels and liquid chemicals will only be stored at the KPS and the construction contractor's offsite depot. Nevertheless, a spill response plan will also be implemented to ensure that any accidental spillages of liquid chemicals will be isolated, contained, and cleaned up to prevent impacts on the surrounding environment.

The wet compression system will require demineralised water which will be sourced from a new demineralised water treatment plant that will be constructed as part of the proposal. The demineralised water treatment plant will generate reject water (i.e. wastewater) at the rate of approximately 18kL/h when the wet compression system is operating and it is expected that the reject water will have a total dissolved solids (TDS) value of approximately 700mg/L. The reject water will be stored in two evaporation ponds that will be constructed on-site. The evaporation ponds will have a 1.5mm thick high density polyethylene (HDPE) liner. The evaporation ponds will have a combined storage capacity of 20.8ML of reject water and will have sufficient freeboard to prevent overtopping during extreme rainfall events. The evaporation ponds will be constructed on an existing plantation area and will be mostly elevated above ground level in order to avoid impacts arising from possible rises of the groundwater table in winter. The use of each pond will be rotated on a yearly basis, whereby one pond will receive reject water from the demineralised water treatment plant, while the second pond is left to dry over that one year period. After one year has elapsed any accumulated residues in the empty pond will be cleaned out. It is anticipated that about four tonnes of solids per year will be removed and disposed of to a suitably classed landfill. Visual inspections and assessments of each ponds liner will be undertaken biannually to determine the integrity of the liner when the ponds are being cleaned out.

The referral document indicates that the proponent will continue to implement the Groundwater Management Plan as part of the currently approved Operational Environmental Management Plan (OEMP) for the KPS. The Groundwater Management Plan and DEC Licence for the power station outline the groundwater monitoring requirements for the site. The monitoring programme for the power station site incorporates two existing groundwater monitoring bores (i.e. GW1S and GW2S) located up hydraulic gradient and down hydraulic gradient of the power station. Monitoring bores GW1S and GW2S are located approximately 400m to the north-west and approximately 200m to the east of the proposed evaporation ponds, respectively.

Assessment

The EPA's environmental objective for this factor is to maintain the quality of surface water and groundwater so that existing and potential uses, including ecosystem maintenance, are protected.

The EPA notes that the proposed development will require about 27ML of water per year which will be sourced from Stirling Dam via Harvey Weir.

The EPA notes that construction of the water pipeline will be undertaken when the groundwater table is low, thus removing the need for dewatering. The EPA understands that should dewatering be required, the proponent will obtain an application for a dewatering licence from the Department of Water, and appropriate management measures will be employed to prevent any impacts from dewatering activities and discharges.

The EPA notes the potential for acid sulphate soils to be disturbed by water pipeline construction and exposed by dewatering activities. The EPA understands that a soil sampling exercise will be undertaken to determine the extent and magnitude of acid sulphate soils at the site prior to the commencement of construction of the water pipeline. The EPA also notes that the proponent will prepare an acid sulphate soil management plan. In order to minimise the potential for water pipeline construction and dewatering activities to disturb and expose acid sulphate soils and to consequently impact on groundwater quality, the EPA recommends that a condition (i.e. Condition 6 in Appendix 2) be imposed on the proponent requiring it to:

- undertake a soil sampling field investigation to determine the extent and magnitude of acid sulphate soils within the water pipeline corridor prior to ground disturbance;
- excavate trenches in lengths that permit trenches to be opened and closed with a 48-hour period; and
- prepare and implement an Acid Sulphate Soil and Dewatering Management Plan prior to trenching and excavation activities.

The EPA notes that the proponent will implement a spill response plan which will cover the isolation, containment and clean up of spillages associated with water pipeline construction.

The EPA notes that the reject water stored in the evaporation ponds will have a relatively low TDS value of approximately 700mg/L and that the evaporation ponds will be lined with 1.5mm thick HDPE. The EPA also notes the operating and cleaning procedures that will be employed for the evaporation ponds.

The EPA notes the locations of monitoring bores GW1S and GW2S with respect to the proposed evaporation ponds. The EPA considers that monitoring bore GW2S is not ideally located to enable leakage of saline water from the evaporation ponds to be readily detected as potentially contaminated groundwater may bypass GW2S given the direction of groundwater flow beneath the site. In view of the above, the EPA recommends that a condition (i.e. Condition 7 in Appendix 2) be imposed on the proponent requiring it to:

- install at least two additional groundwater monitoring bores no further than 20m down hydraulic gradient from the edge of the evaporation ponds to enable saline water plumes to be readily detected; and
- design and construct the additional monitoring bores in consultation with the Department of Environment and Conservation and the Department of Water, having regard for Water Quality Protection Note 30 on Groundwater Monitoring Bores.

The EPA also recommends that the proponent's existing DEC Licence and Groundwater Management Plan be suitably amended to reflect the installation and monitoring of the additional monitoring bores required by recommended Condition 7.

Summary

Having particular regard to the:

- 27ML of water per year that will be required for the proposed development;
- proposed method that would be employed for the construction of the water pipeline and the potential for construction and dewatering activities to disturb and expose acid sulphate soils and to consequently impact on groundwater;
- spill response plan that will be implemented by the proponent;
- proponent's existing Groundwater Management Plan and relevant DEC Licence conditions;
- TDS value of the reject water (approximately 700mg/L) within the evaporation ponds, and the use of a 1.5mm thick HDPE liner for the evaporation ponds; and
- operating and cleaning procedures that will be employed for the evaporation ponds;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor provided that recommended Conditions 6 and 7 are imposed on the proponent, and that the proponent's existing DEC Licence and Groundwater Management Plan are suitably amended to reflect the installation and monitoring of the additional monitoring bores required by recommended Condition 7.

4.2 Fauna

Description

The proposed water pipeline will traverse cleared farmland with a small section of *Corymbia calophylla* Tall woodland with occasional *Agonis flexuosa* over introduced grass species and *Eucalyptus globulus* (Blue Gum) plantations to the east of the power station site. The referral document indicates that these habitats are of limited value to native fauna as they contain little to no understorey. A fauna survey found no evidence of the presence of conservation significant fauna including the Western Ringtail Possum, Quenda, and Black Cockatoos within these habitats. Carnaby's Black Cockatoo may possibly use pine plantations that are located in the vicinity of the water pipeline route as a food source. However, these pine plantations will not be cleared for pipeline construction.

Native fauna may become trapped in open trenches associated with water pipeline construction. Fauna mortality may result if trapped fauna are not removed from pipeline trenches in a timely manner or through drowning in trenches that have become flooded due to high rainfall events.

Assessment

The EPA's environmental objective for this factor is to:

- maintain the abundance, species diversity, geographic distribution and productivity of fauna; and
- protect Declared Rare and Priority Flora, and Specially Protected (Threatened) and Priority Fauna consistent with provisions of the *Wildlife Conservation Act, 1950*.

The EPA notes that the proposed water pipeline will traverse cleared farmland with a small section of *Corymbia calophylla* Tall woodland with occasional *Agonis flexuosa* over introduced grass species and *Eucalyptus globulus* (Blue Gum) plantations. The EPA notes that these habitats are of limited value to native fauna as they contain little to no understorey. The EPA also notes that no evidence of the presence of conservation significant fauna including the Western Ringtail Possum, Quenda, and Black Cockatoos was found within these habitats during the fauna survey.

The EPA notes the potential for native fauna to be become trapped in open trenches and for fauna mortality to occur if trapped fauna are not removed from pipeline trenches in a timely manner or through drowning in trenches that have become flooded due to high rainfall events.

In order to reduce the potential for native fauna to be adversely impacted by open trenches associated with water pipeline construction the EPA recommends that a condition (i.e. Condition 8 in Appendix 2) be imposed on the proponent. Condition 8 requires:

- trapped fauna within open trenches to be cleared and recorded by a suitably trained fauna-clearing person no later than 3 hours after sunrise and repeated before sunset. The open trenches are also to be cleared no more than an hour prior to backfilling of trenches;
- the proponent to ensure that basic fauna handling training is provided to the fauna-handling person if they do not possess the skills and experience prior to the fauna-clearing person commencing employment;
- the fauna-clearing person to be experienced in the following:
    - fauna identification, capture and handling (including venomous snakes);
    - identification of tracks, scats, burrows, and nests of conservation significant species;
    - fauna vouchering;
    - assessing injured fauna for suitability for release, rehabilitation or euthanasia;
    - familiarity with the ecology of the species that may be encountered in order to be able to appropriately translocate fauna encountered; and
    - performing euthanasia;

- the fauna handling training to be developed in consultation with the Department of Environment and Conservation;
- open trench lengths not exceed a length capable of being inspected and cleared by the fauna-clearing person within the required times referred to above;
- the proponent to monitor weather forecasts through the Bureau of Meteorology and in the event of a weather forecast indicating rainfall sufficient to cause flooding of trenches or drowning of fauna trapped in trenches, to backfill all lengths of open trench with the potential to be flooded or cause drowning of fauna; and
- the proponent to produce a report on fauna management within the water pipeline corridor at the completion of pipeline construction. The report is to include but not necessarily be limited to details of all fauna inspections, the number of fauna cleared from trenches, fauna interactions, fauna mortalities, and all actions taken.

Summary

Having particular regard to the:

- fact that the proposed water pipeline traverse mainly cleared farmland and Blue Gum plantations;
- fact that the habitats that will be traversed by the proposed water pipeline are of limited value to native fauna as they contain little to no understorey; and
- lack of evidence of the presence of conservation significant fauna within the habitats that will be traversed by the proposed water pipeline; and
- potential for native fauna to be become trapped in open trenches and for fauna mortality to occur if trapped fauna are not removed from pipeline trenches in a timely manner or through drowning in trenches that have become flooded due to high rainfall events;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor provided that recommended Condition 8 is imposed on the proponent.

5. Recommended conditions

Having considered the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Transfield Services Kemerton Pty Limited to install a wet compression system and associated infrastructure within the Kemerton Power Station and to construct evaporation ponds and a water pipeline to deliver water from an existing offtake located about 4km to the east, is approved for implementation. These conditions are presented in Appendix 2.

6. Other Advice

Water supply

The EPA would expect that a formal service agreement by contract between Transfield Services Kemerton Pty Limited and Harvey Water be established as soon as possible in order to ensure the security of water supply for the proposed development.

Weed and dieback management

The EPA understands that water pipeline construction activities have the potential to facilitate the introduction or spread of weeds and dieback into previously unaffected areas. The EPA would expect that the weed and dieback control measures outlined in Section 5.1.3 of the proponent's referral document would be implemented accordingly.

7. Conclusions

The EPA has considered the proposal by Transfield Services Kemerton Pty Limited to install a wet compression system and associated infrastructure within the Kemerton Power Station and to construct evaporation ponds and a water pipeline to deliver water from an existing offtake located about 4km to the east.

The EPA has determined that the relevant environmental factors for the proposal are:

- water supply, surface water, and groundwater; and
- fauna.

Water supply, surface water, and groundwater

The EPA noted that the proposed development will require approximately 27ML of water per year to be supplied to the KPS which will be sourced from Stirling Dam via Harvey Weir.

In order to minimise the potential for groundwater to be impacted by the proposed development the EPA recommended that two conditions (i.e. Conditions 6 and 7 in Appendix 2) be imposed on the proponent. Condition 6 requires the proponent to undertake a soil sampling field investigation to determine the extent and magnitude of acid sulphate soils at the site prior to the commencement of soil disturbance or dewatering, and to prepare and implement an Acid Sulphate Soil and Dewatering Management Plan. Condition 7 requires the proponent to:

- install at least two additional groundwater monitoring bores no further than 20m down hydraulic gradient from the edge of the evaporation ponds to enable saline water plumes to be readily detected; and
- design and construct the additional monitoring bores in consultation with the Department of Environment and Conservation and the Department of Water, having regard for Water Quality Protection Note 30 on Groundwater Monitoring Bores.

The EPA also recommended that the proponent's existing DEC Licence and Groundwater Management Plan be suitably amended to reflect the installation and monitoring of the additional monitoring bores required by recommended Condition 7.

The EPA concluded that the proposal can be managed to meet the EPA's environmental objective for water supply, surface water, and groundwater provided that recommended Conditions 6 and 7 are imposed on the proponent, and that the proponent's existing DEC Licence and Groundwater Management Plan are suitably amended to reflect the installation and monitoring of the additional monitoring bores required by recommended Condition 7.

Fauna

The EPA noted that the proposed water pipeline will traverse cleared farmland with a small section of *Corymbia calophylla* Tall woodland with occasional *Agonis flexuosa* over introduced grass species and *Eucalyptus globulus* (Blue Gum) plantations. The EPA noted that these habitats are of limited value to native fauna as they contain little to no understorey. The EPA also noted that no evidence of the presence of conservation significant fauna including the Western Ringtail Possum, Quenda, and Black Cockatoos was found within these habitats during the fauna survey.

The EPA noted the potential for native fauna to be become trapped in open trenches and for fauna mortality to occur if trapped fauna are not removed from pipeline trenches in a timely manner or through drowning in trenches that have become flooded due to high rainfall events.

In order to reduce the potential for native fauna to be adversely impacted by open trenches associated with water pipeline construction the EPA recommended that a condition (i.e. Condition 8 in Appendix 2) be imposed on the proponent. Condition 8 requires:

- trapped fauna within open trenches to be cleared and recorded by a suitably trained fauna-clearing person no later than 5 hours after sunrise, and at least half an hour prior to backfilling of trenches;
- the proponent to ensure that basic fauna handling training is provided to the fauna-handling person if they do not possess the skills and experience prior to the fauna-clearing person commencing employment;
- the fauna-clearing person to be experienced in the following:
    - fauna identification, capture and handling (including venomous snakes);
    - identification of tracks, scats, burrows, and nests of conservation significant species;
    - fauna vouchering;
    - assessing injured fauna for suitability for release, rehabilitation or euthanasia;
    - familiarity with the ecology of the species that may be encountered in order to be able to appropriately translocate fauna encountered; and
    - performing euthanasia;

- the fauna handling training to be developed in consultation with the Department of Environment and Conservation;
- open trench lengths not exceed a length capable of being inspected and cleared by the fauna-clearing person within the required times referred to above;
- the proponent to monitor weather forecasts through the Bureau of Meteorology and in the event of a weather forecast indicating rainfall sufficient to cause flooding of trenches or drowning of fauna trapped in trenches, to backfill all lengths of open trench with the potential to be flooded or cause drowning of fauna; and
- the proponent to produce a report on fauna management within the water pipeline corridor at the completion of pipeline construction. The report is to include but not necessarily be limited to details of all fauna inspections, the number of fauna cleared from trenches, fauna interactions, fauna mortalities, and all actions taken.

The EPA concluded that the proposal can be managed to meet the EPA's environmental objective for fauna provided that recommended Condition 8 is imposed on the proponent.

The EPA has therefore concluded that the proposal can be managed to meet the EPA's environmental objectives, provided there is satisfactory implementation of the recommended conditions set out in Appendix 2.

8. Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister notes that the proposal being assessed is for the installation of a wet compression system and associated infrastructure within the Kemerton Power Station and the construction of evaporation ponds and a water pipeline to deliver water from an existing offtake located about 4km to the east;
2. That the Minister considers the report on the key environmental factors as set out in Section 3;
3. That the Minister notes that the EPA has concluded that the proposal can be managed to meet the EPA's environmental objectives, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 2; and
4. That the Minister imposes the conditions and procedures recommended in Appendix 2 of this report.

Appendix 1

References

ATA Environmental (2007). *Kemerton Power Station Enhancement Project Environmental Approval Supporting Documentation*. Version 3, Report No. 2006/259. Referral document prepared by ATA Environmental for Transfield Services Kemerton Pty Limited. April 2007.

Department of Water (2006). *Water Quality Protection Note 30 - Groundwater Monitoring Bores*. Department of Water, Government of Western Australia. Perth. February 2006.

Western Australian Planning Commission (2003). *Planning Bulletin No.64: Acid Sulphate Soils*. Western Australian Planning Commission. Perth. November 2003.

Appendix 2

Recommended Environmental Conditions

Statement No.

RECOMMENDED ENVIRONMENTAL CONDITIONS

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

KEMERTON POWER STATION ENHANCEMENT PROJECT
SHIRE OF HARVEY

Proposal: The proposal is to install a wet compression system and associated infrastructure within the existing Kemerton Power Station and to construct evaporation ponds and a water pipeline to deliver water from an existing offtake located about 4km to the east. The installation of the wet compression system would enable the power station to generate additional power at ambient temperatures above International Standards Organisation conditions by eliminating the sensitivity of the installed gas turbines to ambient temperature. The proposal is further documented in schedule 1 of this statement.

Proponent: Transfield Services Kemerton Pty Limited

Proponent Address: GPO Box 1020, BRISBANE QLD 4001

Assessment Number: 1679

Report of the Environmental Protection Authority: Bulletin 1258

The proposal referred to in the above report of the Environmental Protection Authority may be implemented. The implementation of that proposal is subject to the following conditions and procedures:

1 Proposal Implementation

1-1 The proponent shall implement the proposal as documented and described in schedule 1 of this statement subject to the condition and procedures of this statement.

2 Proponent Nomination and Contact Details

2-1 The proponent for the time being nominated by the Minister for the Environment under sections 38(6) or 38(7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal.

2-2 The proponent shall notify the Chief Executive Officer of the Department of Environment and Conservation (CEO) of any change of the name and address of the proponent for the serving of notices or other correspondence within 30 days of such change.

3 Time Limit of Authorisation

3-1 The authorisation to implement the proposal provided for in this statement shall lapse and be void within five years after the date of this statement if the proposal to which this statement relates is not substantially commenced.

3-2 The proponent shall provide the CEO with written evidence which demonstrates that the proposal has substantially commenced on or before the expiration of five years from the date of this statement.

4 Compliance Reporting

4-1 The proponent shall submit to the CEO environmental compliance reports annually reporting on the previous twelve-month period, unless required by the CEO to report more frequently.

4-2 The environmental compliance reports shall address each element of an audit program approved by the CEO and shall be prepared and submitted in a format acceptable to the CEO.

4-3 The environmental compliance reports shall:

1. be endorsed by signature of the proponent's chief executive officer or a person, approved in writing by the CEO, delegated to sign on behalf of the proponent's chief executive officer;

2. state whether the proponent has complied with each condition and procedure contained in this statement;

3. provide verifiable evidence of compliance with each condition and procedure contained in this statement;

4. state whether the proponent has complied with each key action contained in any environmental management plan or program required by this statement;

5. provide verifiable evidence of conformance with each key action contained in any environmental management plan or program required by this statement;

6. identify all non-compliances and non-conformances and describe the corrective and preventative actions taken in relation to each non-compliance or non-conformance;

7. review the effectiveness of all corrective and preventative actions taken; and

8. describe the state of implementation of the proposal.

4-4 The proponent shall make the environmental compliance reports required by condition 4-1 publicly available in a manner approved by the CEO.

5 Performance Review

5-1 The proponent shall submit a Performance Review report every five years after the start of wet compression system operations to the Environmental Protection Authority, which addresses:

1. the major environmental issues associated with implementing the project; the environmental objectives for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those objectives;

2. the level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best available technology where practicable;

3. significant improvements gained in environmental management, including the use of external peer reviews;

4. stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed; and

5. the proposed environmental objectives over the next five years, including improvements in technology and management processes.

5-2 The proponent shall make the Performance Review reports required by condition 5-1 publicly available in a manner approved by the CEO.

6 Acid Sulphate Soil and Dewatering Management

6-1 Prior to the ground disturbance within the water pipeline corridor, the proponent shall undertake field investigations within the site to clearly delineate areas of high, high to medium, medium to low risk acid sulphate soils.

6-2 Within high, high to medium and medium to low acid sulphate soil risk areas the proponent shall excavate trenches in lengths that permit the trenches to be opened and closed within a 48-hour period.

6-3 Prior to trenching and excavation activities, the proponent shall, in consultation with the Department of Environment and Conservation, prepare an Acid Sulphate Soil and Dewatering Management Plan to demonstrate that all practical measures have been included to manage the impacts of acid sulphate soils and dewatering activities, to the requirements of the Minister for the Environment.

6-4 The proponent shall review and revise, as required, the Acid Sulphate Soil and Dewatering Management Plan required by condition 6-3.

6-5 The proponent shall implement and comply with the Acid Sulphate Soil and Dewatering Management Plan required by condition 6-3 and subsequent revisions of the Acid Sulphate Soil and Dewatering Management Plan required by condition 6-4.

6-6 The proponent shall make the Acid Sulphate Soil and Dewatering Management Plan required by condition 6-3 and subsequent revisions required by condition 6-4, publicly available in a manner approved by the CEO.

7 Groundwater Monitoring Bores for the Evaporation Ponds

7-1 Prior to the commencement of wet compression system operation, the proponent shall install at least two additional groundwater monitoring bores no further than 20 metres down hydraulic gradient from the edge of the evaporation ponds to enable saline water plumes to be readily detected.

7-2 The proponent shall design and construct the additional monitoring bores in consultation with the Department of Environment and Conservation and the Department of Water, having regard for Water Quality Protection Note 30 on Groundwater Monitoring Bores.

8 Fauna

8-1 Trapped fauna within open trenches shall be cleared and recorded by a suitably trained fauna-clearing person no later than 3 hours after sunrise and repeated before sunset. The open trenches shall also be cleared and recorded by a suitably trained fauna-clearing person no more than an hour prior to backfilling of trenches.

Note: “fauna-clearing person” means an employee of the proponent whose responsibility it is to walk the open trench to recover and record fauna found within the trench.

8-2 The fauna-clearing person shall be experienced in the following, to the requirements of the Department of Environment and Conservation:

1. fauna identification, capture and handling (including venomous snakes);
2. identification of tracks, scats, burrows, and nests of conservation significant species;
3. fauna vouchering;
4. assessing injured fauna for suitability for release, rehabilitation or euthanasia;
5. familiarity with the ecology of the species that may be encountered in order to be able to appropriately translocate fauna encountered; and
6. performing euthanasia.

8-3 The proponent shall be responsible for ensuring that basic fauna handling training is provided to the fauna-handling person if they do not possess the skills and experience outlined in condition 8-2 prior to the fauna-clearing person commencing employment.

8-4 The fauna handling training as outlined in condition 8-3 shall be developed in consultation with the Department of Environment and Conservation.

8-5 Open trench lengths shall not exceed a length capable of being inspected and cleared by the fauna-clearing person within the required times as set out in condition 8-1.

8-6 The proponent shall monitor weather forecasts through the Bureau of Meteorology and in the event of a weather forecast indicating rainfall sufficient to cause flooding of trenches or drowning of fauna trapped in trenches, the proponent shall in consultation with the Department of Environment and Conservation backfill all lengths of open trench with the potential to be flooded or cause drowning of fauna.

8-7 The proponent shall produce a report on fauna management within the water pipeline corridor at the completion of pipeline construction. The report shall include but not necessarily be limited to details of all fauna inspections, the number of fauna cleared from trenches, fauna interactions, fauna mortalities, and all actions taken. The report shall be provided to the CEO no later than 14 days after the completion of pipeline construction, and is to be made publicly available in a manner approved by the CEO.

9 Decommissioning

9-1 Prior to undertaking ground-disturbing activities, the proponent shall prepare a Preliminary Decommissioning Plan for approval by the CEO, which describes the framework and strategies to ensure that the site is suitable for future land uses, and provides:

7. the rationale for the siting and design of plant and infrastructure as relevant to environmental protection;

8. a conceptual description of the final landform at closure;

9. a plan for a care and maintenance phase; and

10. initial plans for the management of noxious materials.

9-2 At least six months prior to the anticipated date of closure, or at a time approved by the CEO, the proponent shall submit a Final Decommissioning Plan designed to ensure that the site is suitable for future land uses, for approval of the CEO.

The Final Decommissioning Plan shall set out procedures and measures for:

1. removal or, if appropriate, retention of plant and infrastructure agreed in consultation with relevant stakeholders;

2. rehabilitation of all disturbed areas to a standard suitable for the agreed new land use(s); and

3. identification of contaminated areas, including provision of evidence of notification and proposed management measures to relevant statutory authorities.

9-3 The proponent shall implement the Final Decommissioning Plan required by condition 9-2 until such time as the Minister for the Environment determines, on advice of the CEO, that the proponent's decommissioning responsibilities have been fulfilled.

9-4 The proponent shall make the Final Decommissioning Plan required by condition 9-2 publicly available in a manner approved by the CEO.

Notes

1. Where a condition states "on advice of the Environmental Protection Authority", the Environmental Protection Authority will provide that advice to the Department of Environment and Conservation for the preparation of written notice to the proponent.

2. The Environmental Protection Authority may seek advice from other agencies or organisations, as required, in order to provide its advice to the Department of Environment and Conservation.

3. The Minister for the Environment will determine any dispute between the proponent and the Environmental Protection Authority or the Department of Environment and Conservation over the fulfilment of the requirements of the conditions.

4. The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the *Environmental Protection Act, 1986.*

The Proposal (Assessment No. 1679)

The proposal is to install a wet compression system and associated infrastructure within the existing Kemerton Power Station and to construct evaporation ponds and a water pipeline to deliver water from an existing offtake located about 4km to the east [Figures 1, 2, and 3]. The installation of the wet compression system would enable the power station to generate additional power at ambient temperatures above International Standards Organisation (ISO) conditions (i.e. 15°C, relative humidity of 60% and atmospheric pressure of 101.3kPa) by eliminating the sensitivity of the installed gas turbines to ambient temperature. This sensitivity causes the power output of each of the power station's gas turbines to decrease from 155 megawatts (MW) at ISO conditions to 130MW at hot weather maximum (HWM) conditions (i.e. 41°C, relative humidity of 40% and atmospheric pressure of 101.3kPa).

Wet compression is a process in which a large quantity of water, in the form of fine droplets, is sprayed into the compressor inlet of a gas turbine. An inter-cooling effect is achieved as the water evaporates within the blade path of the compressor and cools the compressed air. The cooler denser air requires less energy to compress and this energy saving results in an increase in the efficiency and power output of the gas turbine.

The wet compression system will be supplied with demineralised water, produced by a new demineralised water treatment plant. The demineralised water treatment plant will consume approximately 27ML of water per year, of which about 21.6ML of water per year will be directed to the wet compression circuit and about 5.4ML of water per year in the form of reject water (concentrate) will be directed to the two evaporation ponds. The proponent will obtain the required water under a Water Supply Agreement with Harvey Water. The water will be sourced from Stirling Dam via the Harvey Weir and will be delivered to the KPS through an approximately 4km long water pipeline that will be connected to an existing offtake on Campbell Road which is maintained by Harvey Water (Figure 3). The water pipeline will be constructed by Harvey Water under a subcontract arrangement with the proponent. It will be constructed from polyethylene and will be located within a 15m wide corridor between the offtake on Campbell Road and the KPS (Figure 3).

The proposal involves the installation of the following infrastructure:

- an approximately 4km long water pipeline that will deliver fresh water to the power station;
- a wet compression injection skid and associated spray rack installed inside the gas turbine compressor air inlet;
- a forwarding pump skid;
- a demineralised water treatment plant;
- a demineralised water storage tank with a storage capacity of 1.0ML;
- two evaporation ponds within the power station site boundary. The two ponds will have a combined capacity of 20.8ML and will be lined with 1.5mm thick high density polyethylene (HDPE);
- additional cooling fans for the generator transformer; and
- associated piping, electrical cabling, and control system.

The main characteristics of the proposal are summarised in Table 1 below.

Table 1: Summary of key proposal characteristics

Element	Description			
	Current operation		**New proposal**	
Fuel type.	Natural gas	Liquid fuel	Natural gas	Liquid fuel
Project purpose.	Provide peaking power to the SWIS.		No change.	
Project life.	25 years.		No change.	
Power output per unit (MW).	159 *131* [1]	146 *119* [1]	173 *150* [1]	165 *136* [1]
Power generating capacity (GWh/yr).	240 [1]		345 *297* [1]	
Plant operating modes.	Mode 1 - Peaking plant for 5% of the time at 100% load. Mode 2 - Spinning reserve for 10% of the time at 55% load.		No change. No change.	
Operating hours.	Approximately 1000 hours per year (10% liquid fuel).		Approximately 1000 hours per year (10% liquid fuel).	
Estimated capacity factor.	Approximately 10%.		Approximately 10%.	
Facility footprint. Site area including buffer. Water pipeline corridor area.	2ha 28ha N/A		No change. No change. 6ha	
Plant facilities				
Proposed technology. Number of stacks. Height of stacks. Stack diameter. Number of liquid fuel storage tanks. Demineralised water tank. Water treatment. Wastewater disposal.	2 x Siemens V94.2 gas turbine generators. 2 35m 5.5m 1 x 2ML tank. N/A N/A N/A		No change. No change. No change. No change. No change. 1ML Demineralised water treatment plant. Two evaporation ponds with a combined storage capacity of 20.8ML. The evaporation ponds will be lined with 1.5mm thick high density polyethylene (HDPE).	
Inputs				
Cooling water.	None.		27ML/yr sourced from Stirling Dam. Water will be delivered to the power station via an approximately 4km long polyethylene water pipeline connected to an existing offtake on Campbell Road.	
General water requirements.	20kL/day - For dust suppression during construction. 5kL/yr - For domestic use.		5kL/day - For dust suppression during pipeline construction. No change.	
Natural gas.	Approximately 3PJ per year taken from the Dampier to Bunbury Natural Gas Pipeline.		Approximately 3PJ per year taken from the Dampier to Bunbury Natural Gas Pipeline.	
Liquid fuel (backup).	Up to 6ML/yr of ultra low sulphur diesel. Sulphur content of diesel - 50ppm maximum.		As needed subject to gas availability.	
Outputs				
Wastewater.	None.		Reject water (concentrate) from the demineralised water treatment plant directed to two evaporation ponds (up to 5.4ML/yr).	
Predicted noise level.	< 28dB(A) at closest residences.		No change.	
Solid waste.	< 10tpa		No change.	
Air emissions				
Mass flow [1] (kg/s).	531 *455*	531 *473*	546 *472*	546 *488*
Exit volume (wet, actual) [1] [m³/s].	1,229 *1,078*	1,181 *1,088*	1,278 *1,122*	1,228 *1,134*
Exit temperature [1] (°C).	538 *568*	517 *537*	538 *561*	517 *537*
Plume buoyancy [m^4/s^3].	2,471 *2,320*	2,341 *2,187*	2,571 *2,402*	2,435 *2,278*
Nitrogen oxides (NO_X) exit concentration [1] [ppmv @ 15% O_2].	20.1 *20.1*	62.9 *62.9*	16.1 *16.1*	50.3 *50.3*
NO_X emission rate [1] (g/s).	15.8 *11.9*	47.3 *41.4*	14.2 *11.0*	45.3 *39.7*
Carbon monoxide (CO) exit	< 25	< 25	< 10	< 10

Element	Description			
	Current operation		New proposal	
Fuel type.	Natural gas	Liquid fuel	Natural gas	Liquid fuel
concentration [1] (ppmv @ 15% O_2).	*< 25*	*< 25*	*< 10*	*< 10*
Sulphur dioxide (SO_2) emission rate [1] (g/s).	Negligible.	1 *1*	Negligible.	1 *1*
Particulates (ppmv @ 15% O_2).	Negligible.	Negligible.	Negligible.	Negligible.
Polycyclic aromatic hydrocarbons (PAHs) [ppmv @ 15% O_2].	Negligible.	Negligible.	Negligible.	Negligible.
Non-methane volatile organic compounds (NMVOCs) [ppmv @ 15% O_2].	Negligible.	Negligible.	Negligible.	Negligible.
Water mass flow in the flue gas [1] (g/s).	23,800 *30,969*	15,600 *19,600*	36,800 *42,697*	28,400 *31,200*
Oxygen (O_2) mass flow in the flue gas [1] (g/s).	82,500 *68,645*	85,200 *75,200*	78,600 *65,828*	79,200 *70,100*
Greenhouse gas emissions.	Approximately 160,000 tonnes of $CO_{2\text{-}e}$ per year (Assuming approximately 900 hours per year operation on natural gas and 100 hours per year operation on liquid fuel).		Approximately 160,000 tonnes of $CO_{2\text{-}e}$ per year (Assuming approximately 900 hours per year operation on natural gas and 100 hours per year operation on liquid fuel).	
Average greenhouse intensity.	667.61kg of $CO_{2\text{-}e}$/MWh (Assuming approximately 900 hours per year operation on natural gas and 100 hours per year operation on liquid fuel).		539kg of $CO_{2\text{-}e}$/MWh (Assuming approximately 900 hours per year operation on natural gas and 100 hours per year operation on liquid fuel).	

Notes:

2. Actual values measured by Siemens during acceptance tests in October 2005 at ambient temperatures and corrected to HWM and ISO conditions. Values in *italics* are related to HWM conditions (ambient temperature = 41°C, RH = 40%, LHV= 44.7MJ/kg, ambient pressure = 101.3kPa). Other values refer to ISO conditions (temperature = 15ºC, RH = 60%) with reference gas composition.

Abbreviations

CO_2	carbon dioxide	kg/s	kilograms per second	ML	megalitres (10^6 litres)
$CO_{2\text{-}e}$/MWh	carbon dioxide equivalents per megawatt hour	kL/day	kilolitres per day	ML/yr	megalitres per year
		kL/yr	kilolitres per year	MW	megawatts (10^6 watts)
dB(A)	decibels (A weighted)	kPa	kilopascals	N/A	not applicable
g/s	grams per second	LHV	lower heating value	PJ	petajoules (10^{15} Joules)
GWh/yr	gigawatt hours per year	m	metres	ppm	parts per million
ha	hectares	m^3/s	cubic metres per second	ppmv	parts per million by volume
HWM	hot weather maximum	m^4/s^3	metres to the fourth power per second to the third power	RH	relative humidity
ISO	International Standards Organisation			SWIS	South West Interconnected System
kg	kilograms	MJ/kg	megajoules per kilogram		

Source: Modified version of Table A1 from ATA Environmental, 2007.

The potential impacts of the proposal are discussed by the proponent in the referral document (Kemerton Power Station Enhancement Project Environmental Approval Supporting Documentation. Version 3, Report No. 2006/259. Prepared by ATA Environmental for Transfield Services Kemerton Pty Limited. April 2007).