CHAPTER 10 WOOD FIRED POWER STATION

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10. WOOD FIRED POWER STATION - ENVIRONMENTAL MANAGEMENT PLAN

10.1 Wood Fired Power Station Process Description

The Power Station will occupy approximately 15 hectares in the southern area of the Wood Centre (Figure 5). The Power Station has direct access to the internal ring road network. A process flow diagram for the Power Station is shown in Figure 36. The activities conducted in the Wood Fired Power Station will comply with the current best practice environmental management conditions operating throughout Australia.

10.1.1 Description of Operation and Equipment

The Power Station will generate between 30 and 50 MW of electricity by using qualifying wood residue from the forest and wood by-product from the other Wood Centre facilities under the *Renewable Energy Act 2000*. The wood residues and wood by-product will be delivered from forest operations and processing facilities (Figure 36).

Figure 37 illustrates the quantities of wood flowing through the Power Station. Logging residue left in the coupe is currently burnt in order to assist with regeneration and future site management. By harvesting a substantial amount of this residue for use as fuel in the Power Station, the extent and nature of regeneration burns at the coupes will be substantially reduced and smoke generation minimised. Reducing the amount of residue being burnt will not have any impact on future regeneration, as the quantity of ash produced does not greatly affect the regeneration. Where practicable, ash from the Power Station will be returned to the forest and spread over regenerated coupes.

Plate 11 Power Station

The Power Station will require a reliable supply of fuel from the logging residue and/or timber processing wood by-product to operate continuously for 24 hours/day, 7 days/week, 330 to 340 days/year over at least 25 years. In order to ensure reliable wood by-product supply during inclement weather and other potential interruptions, the Power Station will maintain stockpiles on-site of the wood by-product fuel. The stockpiles will contain up to 45 days supply and will consist of both open piles and under-cover storage for weather protection. The processed fuelwood open pile storage will be 3 to 4 m high with a volume of up to 180,000 m^3. The processed fuelwood covered storage facility will be 6 to 8 m high with a volume of up to 90,000 m^3. Including the fuelwood storage and the 50 MW generation Power Station, the facility will occupy approximately 15 Ha. Apart from small quantities of automotive diesel fuel (ADO) for start-up and combustion control no non-wood products will be burnt in the Power Station. A photograph of a typical power station is shown in Plate 11.

Fuelwood Receiving, Sorting and Storage

Forest residues and timber processing wood by-product, up to 333,000 dry tonnes per year, will be processed to size at the merchandising yard fuelwood processor and conveyed to the Power Station. Dry tonnes is defined as 40 to 50% water content. Additionally, if determined suitable as fuel, a conveyor for undersized wood fibre, approximately 23,000 dry tonnes per year, will link the wood fibre mill to the Power Station or alternatively, depending on installation costs, it will be delivered by truck. Any other timber processing wood by-product will be delivered by truck from the sawmill (7,000 tonnes per year) to the merchandising yard fuelwood processor and waste from the merchandising yard (6,000 tonnes per year). Depending on active storage levels in the boiler feed bin and the quality of the wood by-product, the fuelwood will either be conveyed to the bin for direct firing in the boiler or to the temporary storage areas for subsequent reclamation and use.

Sorting, Screening, and Combustion

Processed fuelwood will be sorted and blended as required for quality, with moisture content being the prime factor. The fuelwood will then be reclaimed by mobile equipment (usually a rubber-tyred front loader) when required for boiler operation.

After screening to remove and recycle oversized material, the processed fuelwood will be fired in the boiler. If any oversized material is screened, it will be returned to the fuelwood processor in the Merchandising Yard. Controlled fuelwood feed rates, a water-cooled grate and various air supply locations in the boiler will be used to control combustion. Steam will be generated and superheated within the tube and drum arrangement of the boiler to approximately 100 bar pressure and 510°C temperature for delivery to the turbine.

The hot flue gases will pass through the economiser to heat the boiler feedwater and the air heater to heat the combustion air. The cooled flue gases will then be routed to a coarse filter system to remove large particulates and reduce loading on the fine filter system, an electrostatic precipitator (ESP).

The ESP removes fine-sized particulates by imparting a charge to the small particles (in this case fine particles that make up 'smoke'). These charged particles are then drawn to a collecting plate electrode where they are held. Collected particles gradually pass to the bottom of the electrode and the ESP where the collected particles are conveyed to a holding bin by a screw conveyor. The flue gases are drawn through the induced draft (ID) fan and routed to the approximately 40 m high stack for discharge to the atmosphere. The ESP will be sized to maintain particulate emissions below 80 mg/Nm^3.

The key elements in the design and operation of an effective ESP include:

- Physical size and orientation of the ESP chamber – length versus width, tall and narrow or short and wide;
- Resistivity of the dust – a measure of the electrical charge on the dust particle;
- Velocity of the gas stream – how fast the gas passes through the precipitator;
- Concentration of the dust particles in the gas stream;
- Particle size and percent weight classifications;
- Collecting plate electrode area; and
- Required efficiency.

Steam Generation and Water Treatment

The superheated, high-pressure steam will be directed to the turbine-generator set to generate electric power. The low-pressure exhaust steam from the turbine will be condensed to water in the condenser. Condenser cooling water will be circulated from the cooling tower, through the condenser then back to the cooling tower. By spraying the cooling water, temperature will be maintained at or near atmospheric dew points. Pending economic evaluation, limited amounts of low-pressure steam may be extracted from the turbine and routed to the RPV mill and sawmill located at the Wood Centre for heating and drying processes. Fuel rates will increase by approximately 20,000 dry tonnes/yr (35,000 wet tonnes/yr) to furnish "export" steam.

Figure 36 Wood Fired Power Station Process Flow Diagram

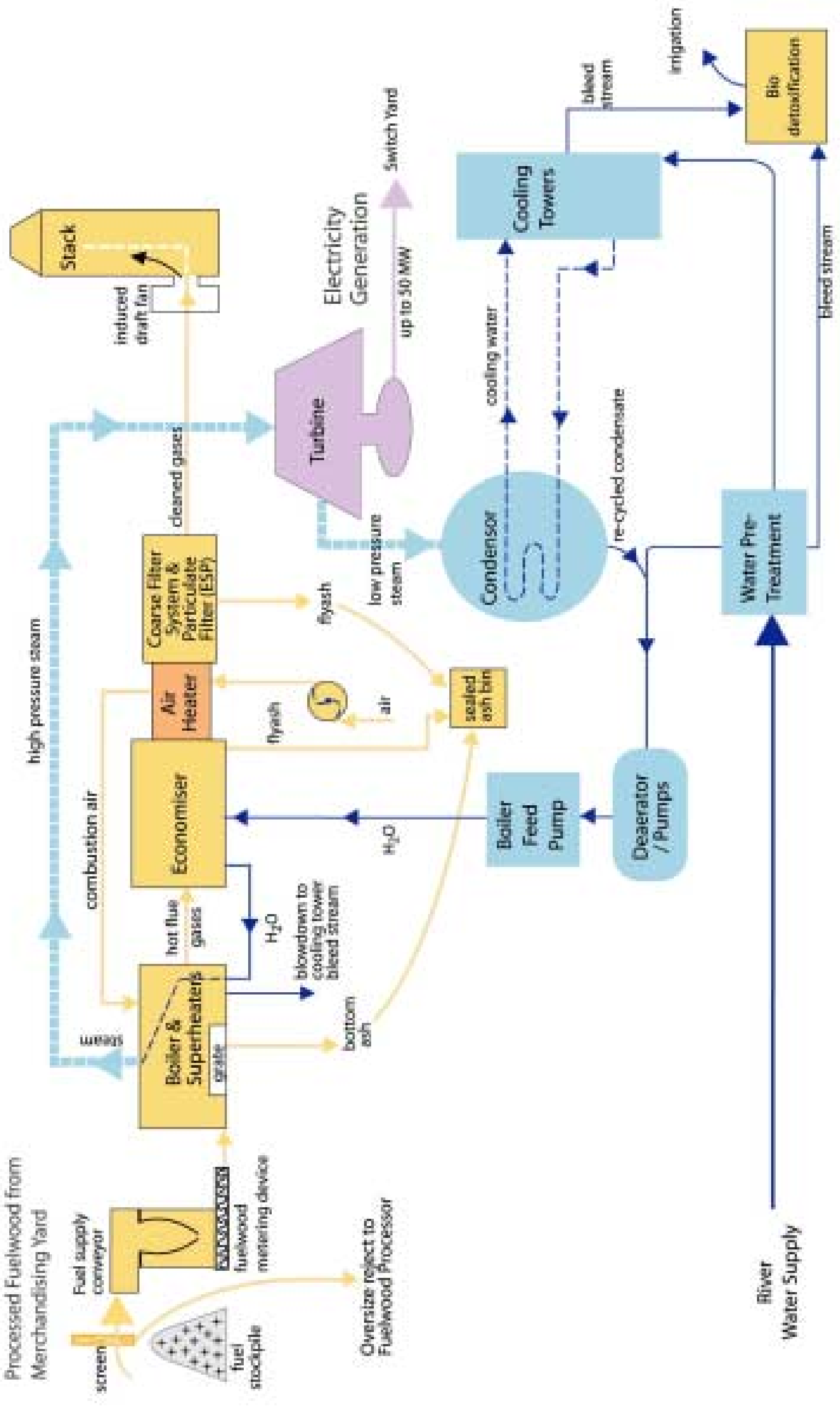
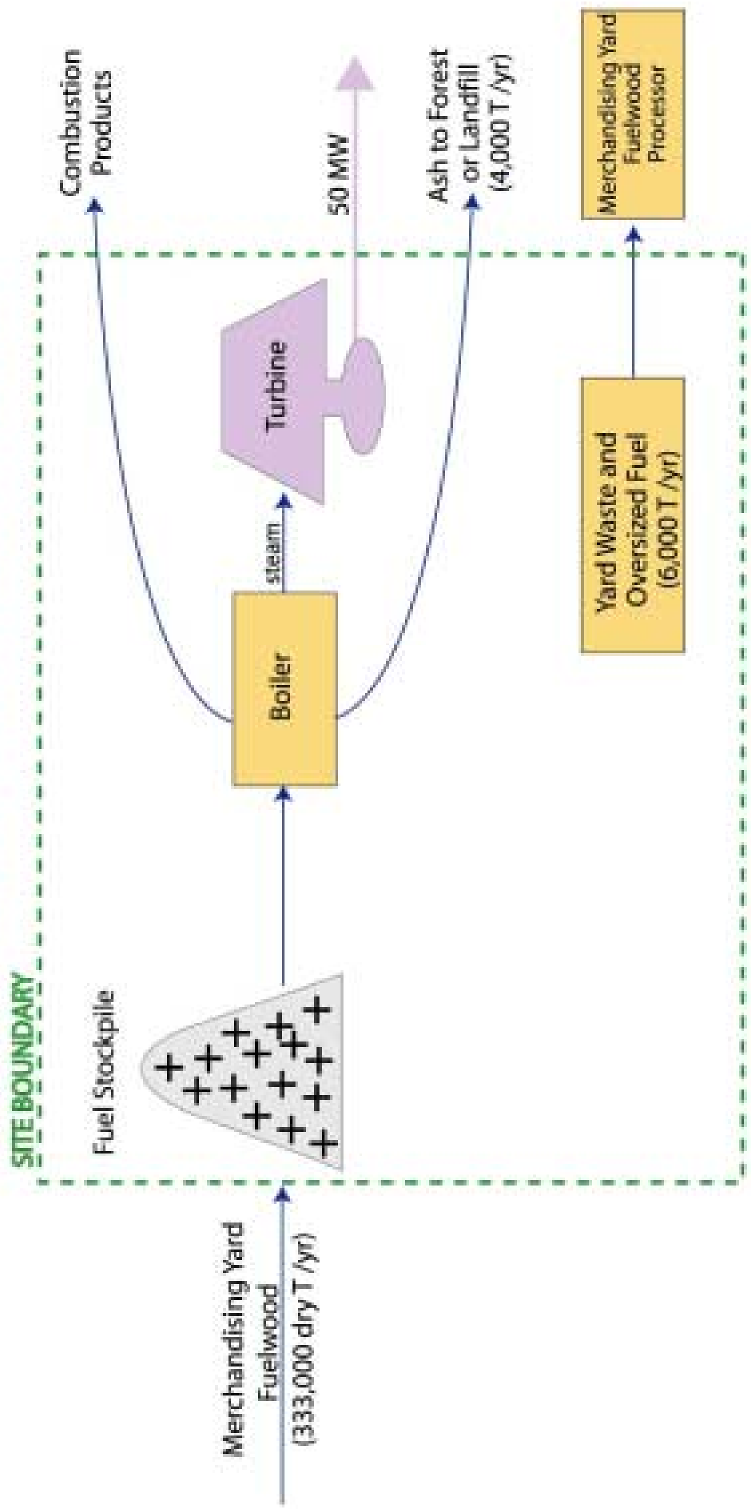


Figure 37 Wood Fired Power Station Wood Flow Diagram



Raw river water will be treated (dosed) with a bromide-based biocide. The treated water will be circulated through the cooling tower and condenser. The cooling tower water will be monitored fortnightly to determine efficacy of biocide treatment and specifically *Legionella* build-up as per Australian Standard AS 3666. Warm water, after circulating through the condenser, will be cooled in the evaporative cooling tower. A bleed stream from the cooling tower will be routed to discharge as wastewater including small quantities of reject water from the water treatment processes and the boiler blowdown. The cooling tower bleed stream will require monitoring for biocide before release for irrigation. A biodetoxification unit will be provided to ensure the pretreated bleed stream to the cooling tower and the bleed stream from the cooling tower is suitable for irrigation (Figure 36).

A small stream of river water will be treated with phosphates, oxygen scavengers and demineralised via ion exchange to produce high-purity boiler make-up water, which is added to the condensate, passed through a deaerator and is pumped into the boiler.

Refer to Figure 38 for distribution of water throughout the Power Station facility.

Ash Management

Ash will be collected at several locations from the boiler. Typical ash production will be 4,000 to 7,000 tonnes annually for a 50 MW Power Station (or 3,000 to 4,000 tonnes per year for a 30 MW Power Station.) Coarse size bottom ash from the furnace will be collected in a wet conveyor system and routed to the sealed ash bin. The finer sized flyash in the flue gases will be collected and removed via bottom discharges from the economiser and air heater, coarse filter system, and the electrostatic precipitator. The dry, collected flyash will also be conveyed to the sealed ash bin.

The ash management will be undertaken in accordance with the waste management hierarchy, with reuse options investigated after commissioning of the Power Station. At this stage it is proposed that ash will be removed from the bin periodically and sprayed with water for dust control as it is loaded into trucks for possible composting or for off-site re-use or disposal. Typically, ash trucks will remove ash once per day for 3 to 5 days per week, depending on truck capacity. There will be no ash ponds on the Power Station site.

Power Generation

The generated power will be frequency regulated and adjusted for voltages within the switchyard where a transformer will be located. PCB-free oils will be used in the transformers which will be situated in bunds. Power exported to the grid will be up to 50 MW at 66 kV or higher voltage, with an additional 3.5 to 4 MW consumed by the Power Station.

10.1.2 Description of Buildings and Associated Infrastructure

The Power Station is located at the southern end of the Wood Centre. There are eleven buildings and structures on the Power Station site. The approximate dimensions and likely construction materials of the buildings and open areas at the Power Station site are outlined in Table 76.

Office / Control and Amenities Building

The Office / Control Building will house the offices, control room, amenities, instrument and the electrical room. The building will be a ground level construction on a concrete slab and will most likely be brick or pre-cast walls, painted to suit its environs with a colourbond roof.

Amenities will comprise a lunchroom, showers and toilets. The building will be heated either from a reticulated steam system or by an electric heating system, with air conditioning for computers as required.

Table 76 Building/Structure Dimensions and Construction Materials

Building	Area (m^2)	Height (m)	Construction Material		
			Floor	Walls	Roof
Office / Control room / Amenities	1,900	5-6	Concrete slab	Brick / Precast Concrete	Steel sheet (Colourbond Trimdek clad)
Workshop / Warehouse	1,500	8-10	Concrete slab	Brick / Pre-cast Concrete	Steel sheet (Colourbond Trimdek clad)
Turbine Hall	1,250	20	Concrete slab	Precast Concrete/Steel Cladding	Steel sheet (Colourbond Trimdek clad)
Stack	-	40	Concrete slab	Steel	N/A
Sealed Ash Bin	-	15	Steel	Steel	Steel sheet (Colourbond Trimdek clad)
ESP with Boiler	440	20	Concrete slab	Open/Steel Cladding	Steel sheet (Colourbond Trimdek clad)
Switchyard	1,690	8	Concrete slab	Open	Open
Water Storage Tank	4,800 kL	10	Concrete slab	Steel	Steel sheet
Water Treatment Plant (WTP)	1,800	5-6	Concrete slab	Open	Steel sheet
Cooling Tower	1,000	20	Concrete slab	Open	

Building	Area (m^2)	Height (m)	Construction Material		
			Floor	Walls	Roof
Covered Fuelwood Storage	Up to 20,000	6-8	-	Open/Steel Cladding	Steel sheet (Colourbond Trimdek clad)
Open Pile Storage	45,000	3-4	-	-	-

Workshop and Warehouse

The workshop and separate warehouse building will be constructed on a concrete slab, with colourbond walls and roof.

Hazardous goods (except for diesel oil) will be stored near the water treatment plant where all liquids will be stored in sealed tanks and solid powders in sealed bins on concrete pads with bunds in accordance with AS-1940. Many of the smaller tanks will be located in an enclosed facility for weather protection again in accordance with AS-1940. In the event of reagent spillage, the reagent will be reclaimed for reuse and failing that it will be pumped to the water treatment plant for recycling but under no circumstance will it be released beyond the Power Station site boundaries. Large spills will be collected from the sump and transported off-site for proper disposal by a licensed waste transporter.

Any fire fighting equipment and the loader will be kept near the processed fuelwood covered storage.

Car Parking

A hardstand car park (684 m^2) will provide parking for approximately 24 personnel, service, and visitor vehicles.

10.1.3 Source of Wood and Quantity of Production

The fuel source for the Power Station will be wood by-product and processed forest residues supplied from the forest and adjacent processing operations via the fuelwood processor. The fuelwood will qualify as an eligible renewable resource under the *Renewable Energy Act 2000*. When fed into the burner the processed fuelwood will typically be 50 mm x 10 mm in size, with 30 to 45% moisture content and 1 to 2% ash content. The green wood by-products from the Wood Centre will be supplemented as needed, or as available, by processed wood by-products from other local sources, including other sawmills, and discarded wood residues. Only clean non-painted and non-preservative treated wood will be used.

The Power Station will generate and export up to 50 MW to the local grid for typically 8,000 hours per year, producing up to 400,000 MWh/yr. (Production will be less in major overhaul maintenance years, which are usually every sixth year, at approximately 370,000 MWh/yr for 50 MW generation). Pending economic evaluation, up to 15 tonne/hr of low-pressure steam could also be furnished to the RPV mill and sawmill in which case the fuel rates will be increased by approximately 20,000 dry tonnes per year. The volumes of wood by-product from sources on-site are outlined in Table 77.

Table 77 Estimated Volume of Wood By-Product Supplied from Adjacent Facilities to the Power Station (tonnes/pa)

Facility	Yard Waste Dry tonnes	Wood By-Product for Combustion Dry tonnes	Totals Dry tonnes
Merchandising Yard	6,000	0*	6,000
Sawmill		8,000	8,000
RPV Mill	0	0	0**
Wood Fibre Mill	3,000	20,000	23,000
Totals	**9,000**	**28,000**	**37,000**

*The merchandising yard will be the source of sawlog and pulp log wood by-products that will be directed to the fuelwood processor for use in the Power Station. The amounts have been identified by sawmill and wood fibre mill contributions because they come from the wood destined for these facilities. **The wood by-product from the RPV mill will be used in the RPV mill heat plant.

10.1.4 Emission Sources

Emissions from the Power Station will consist of air emissions, wastewater discharges, limited amounts of solid wastes, and noise emissions typical of a small industrial operation.

Air Emissions

The main potential emission sources to the atmosphere associated with the operation include:

- Diffuse wood particulate emissions associated with vehicular movements on-site and wood storage and conveying systems;
- Minor amounts of boiler ash (dust) emissions from the ash truck loading facility;
- Flue gas discharge from the Power Station stack (refer to composition description below);

- Water vapour from the cooling tower; and
- Steam venting to atmosphere when boiler safety valves are tested or activated for safety reasons in the steam system.

The majority of these emissions will come from combustion of the fuelwood. The total amount of material burnt is effectively unchanged with the proposed development because the wood residue includes materials that are normally left on the forest floor and burnt in preparation of an ash bed for the replacement forest and vehicle access.

The 20 metre high cooling tower will emit water vapour containing a small amount of liquid water droplets in the steam. Typical rates of water vapour will be 140 to 150 tonne/hr at 30 to 40^{o}C for 50 MW. Water vapour plumes from the cooling tower and the stack will be visible during periods of low temperature and/or high humidity weather.

Particulate emissions from the boiler flue gases will be controlled with coarse and fine filter systems. Flue gases will be discharged from an approximately 40 m high stack. The typical composition of flue gases from the Power Station is provided below with estimated annual mass emissions based on an 8,000 hr/yr operation:

- 90-100 kg/s flow at 50 MW (or 55-60 kg/s flow at 30 MW);
- 130-150°C temperature;
- 18-20 m/s velocity;
- 19-21 % v/v moisture;
- 60-65 % v/v nitrogen;
- 3-5 % v/v oxygen;
- 10-15 % v/v carbon dioxide (525,000,000 kg/yr);
- Below 100 vppm SO_2;
- Below 80 mg/Nm^3 particulates - dry, corrected to 12 % CO_2 (150,000 kg/yr); and
- Below 500 mg/Nm^3 NO_x (as NO_2) dry, corrected to 7% O_2 (960,000 kg/yr).

Greenhouse Gas Emissions

Given that the same amount of material burnt as a result of forest operations is unchanged, the proposed Power Station represents an overall neutral impact on carbon dioxide emissions. However, there may be some small reduction in other greenhouse gas generation due to a more efficient combustion process than open burning on the forest floor. This will lead to more complete combustion of methane and other hydrocarbons liberated during the combustion of wood. In addition, there will be less methane from wood decomposition. As a result less methane will be released to the atmosphere.

Air emissions, including greenhouse gases, from the Power Station stack have been projected by the boiler vendor's engineer. The maximum particulate emission rate is projected at 80 mg/Nm^3 (dry, corrected to 12% CO_2). The projections for 50 MW generation are summarised in Table 78.

Table 78 Power Station Atmospheric Emissions

Emission	Annual Projection, kg/yr (8,000 hr/yr)
Total Particulates	Below 150,000
Methane, CH_4	Below 20,000
Nitrous Oxide, N_2O	Below 26,000
Nitrogen Oxides, NO_x (as NO_2)	Below 225,000
Carbon Monoxide, CO	Below 1,920,000
Carbon Dioxide, CO_2	Below 525,000,000
Non-Methane VOC's	Below 6,000

Emissions for power generation below 50 MW will be proportionally lower than those shown in Table 78.

Refer to Chapter 5 regarding site-wide greenhouse gas emission management.

Water Emissions

Three kinds of water emissions will emanate from the Power Station site: stormwater, process water and domestic water. Figure 38 illustrates the water flow of stormwater and process water on the site.

<u>Stormwater</u>

Contaminated stormwater run-off collected from paved and unpaved operational areas is likely to contain:

- Suspended wood fibre solids (e.g. cellulosic and lignin materials);
- Suspended sediment from local soils;

- Tannins which provide a distinctive coloration of the water; and
- Trace amounts of hydrocarbons (e.g. fuels and oils associated with vehicle usage on-site).

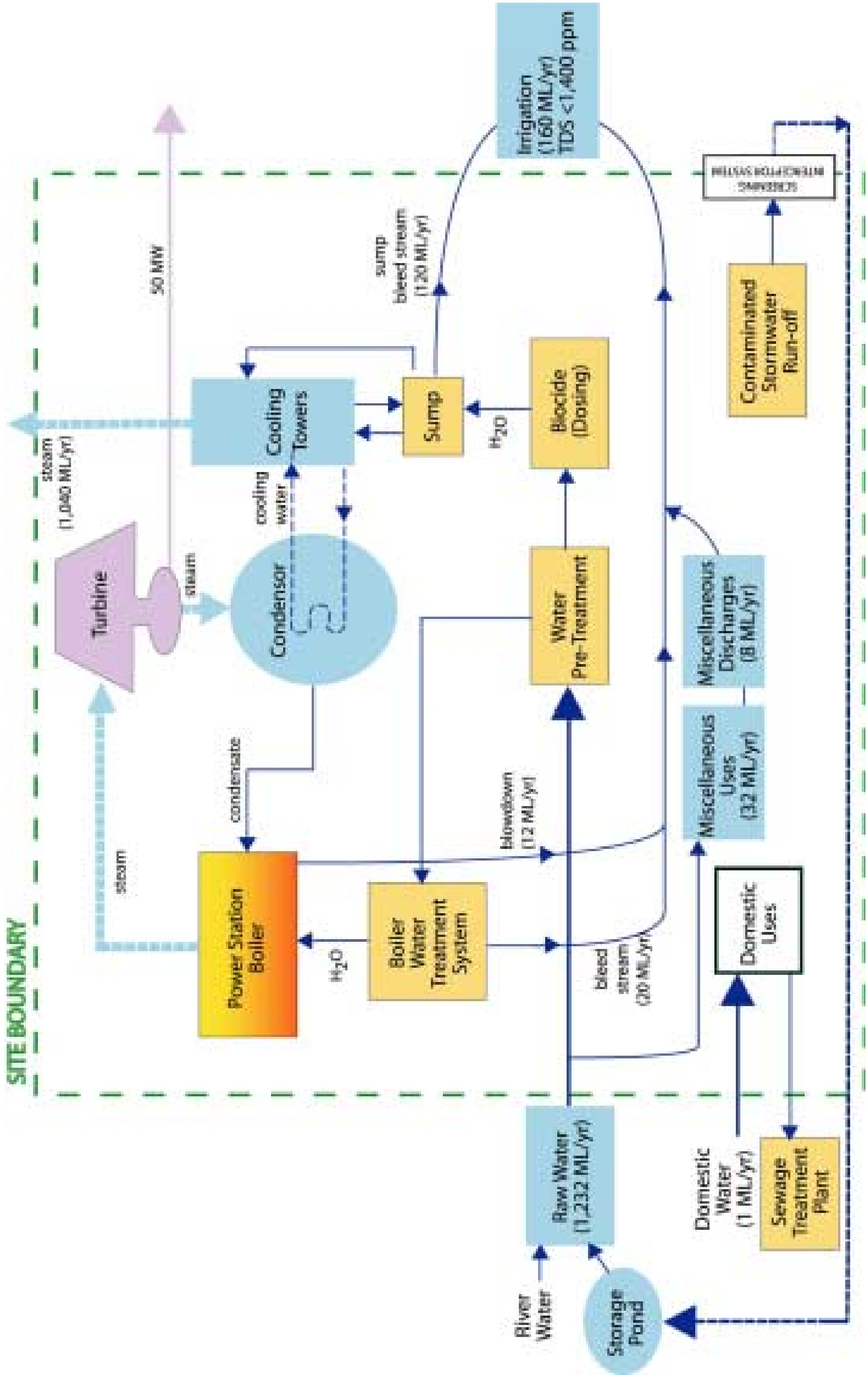
Wastewater

Water from the clean storage pond and/or the river will be furnished at a rate of up to 1,232 ML/yr. As discussed in Chapter 3, the Total Dissolved Solids (TDS) of the Huon River samples taken adjacent to the site were 52 and 56 mg/L in September and October 2000, respectively.

The main potential sources of wastewater associated with the operation of the Power Station include:

- The primary wastewater discharge from the Power Station will be the cooling tower stream (120 ML/yr) with small quantities of reject water from the water treatment processes (20 ML/yr) and blowdown from the boiler (12 ML/yr). The wastewater will be at temperatures of 5 to 10^{o}C above ambient. Typical wastewater flow at less than 1,500 mg/L TDS will be approximately 160 ML/yr. Occasionally the rate will rise as high as 30 kL/hr and the concentration to 2,000 mg/L TDS, not necessarily simultaneously. The salts in the wastewater (TDS) depend on the quality of the raw water and will essentially be the same species, at higher concentrations, as the raw water supply from the river and recycled run-off.
- The backing of the ion exchange column is likely to be undertaken with a mild alkali (e.g. sodium hydroxide) and will produce small volumes of wastewater (compared to the boiler blowdown) containing TDS. This wastewater stream will be combined with the boiler water treatment system stream. The TDS levels will be considerably lower than the levels in the boiler blowdown.
- Domestic wastewater sewer and grey water generated by site employees/personnel. A maximum of 4.5 kL/day of domestic wastewater will be generated on the Power Station site (based on the assumption of 150 L/day per person and up to 30 employees). Annual rates are expected to be less than 1.0 ML.
- There will be no ash ponds on-site, so no water will be discharged from these sources.

Figure 38 Wood-Fired Power Station Water Flow Diagram



Noise Emissions

The main potential sources of nuisance noise associated with the operation of the Power Station include:

- fans, blowers, pumps;
- fuelwood conveyors; and
- transformer.

Solid Wastes

Solid wastes generated by the Power Station will include:

- Boiler ash (including coarse bottom ash and fine flyash). Typical ash production will be 4,000 to 7,000 wetted tonnes/yr at 50 MW (3,000 to 4,000 tonnes/yr at 30 MW).
- General refuse from the wood residue sorting operation (e.g. rock, unusable wood residues, metal and other rubbish/wastes). The quantity is not predictable since it results from random quantities in the delivered wood residues. The latter is expected to be less than 2,000 tonnes per year.
- Filtered solids (including wood fibre solids, soil, tannins and hydrocarbons) from recycled run-off water and other water treatment is expected to be less than 500 tonnes per year.
- Solid waste generated from the boiler water treatment system will be largely dependent on the raw water quality, with the amount generated not considered to be significant. The small quantities generated each day will be collected for disposal and/or reuse at an approved site.
- General refuse from office, amenities and maintenance operations.

10.1.5 Projected Hours of Operation and Employment

The Power Station will operate 24 hours per day, 7 days per week except for scheduled and forced outage periods for maintenance. Typical operation will be 8,000 (± 100) hours per year.

Truck delivery will occur between 7:00 a.m. and 7:00 p.m. six days per week, while the fuelwood conveyor will operate continuously when the Wood Centre is operating.

Approximately every sixth year, there will be an extended period for scheduled maintenance of about six weeks, i.e. major overhaul maintenance years. Typical operation of the Power Station in the major overhaul maintenance years will be 7,400 (± 200) hours per year.

It is predicted that the Power Station will employ 20 to 30 personnel with approximately three operating personnel at nights, weekends and holidays.

10.2 Atmospheric Emissions

Emissions to the atmosphere may arise at various stages in the Wood Fired Power Station process. The potential sources of atmospheric emissions are shown on Figure 20. The emissions may be in the form of:

- Fugitive dust and air;
- Flue gas emissions;
- Water vapour emissions; and
- Vehicle exhaust emissions.

10.2.1 Potential Impact

Fugitive Dust and Ash

There will be some fugitive dust emissions from fuelwood conveying systems during dry periods that will typically be contained within the site with screening barriers and water sprays and will therefore not result in nuisance off-site.

There may also, on occasions, be small amounts of fugitive dust (ash) emissions at the ash-truck loading station.

Flue Gas Emissions

Particulate emissions from fuelwood combustion via the stack will be controlled by the ESP to less than 80 mg/Nm^3 (dry, corrected to 12% CO_2). Particulates have the potential to adversely impact on air quality if they are allowed to disperse in the air.

The other flue gas emissions listed in 10.1.4 above also have the potential to adversely impact on air quality.

Water Vapour Emissions

The cooling tower will emit water vapour containing a small amount of liquid water droplets. Typical rates of water vapour will be 140-150 tonne/hr at 30-40°C for 50 MW. A water vapour plume may be visible from the cooling tower, and from the stack, during periods of cool temperature and/or high humidity weather.

The impact of water vapour emissions will not be cause for adverse impact on air quality and is not considered further.

Vehicle Exhaust Emissions

Diesel powered vehicles will be fitted with standard emission control equipment, well maintained and should not adversely impact on the local air quality. Vehicle exhaust emissions are not considered further.

10.2.2 Management Measures

In order to assess the potential impact of flue gas emissions, air modelling using a standard meteorological data file and the Ausplume model has been undertaken for the Power Station. Emissions from the heat plants have also been included in the air modelling in order to fully assess the stack emissions from the Wood Centre. Refer to Appendix U for a complete description of the assessment. The model will be re-run prior to commissioning when the engineering specifications for equipment become available[1]. This action is intended to verify the results of the model.

The 99.9 percentile[a] worst case for each pollutant plus the second highest[b] predicted values for Glen Huon and Huonville has been recorded in Table 79.

All predicted peak Ground Level Concentrations [GLCs] for the target receptors are below the NEPM objectives in all cases. In the case of CO and NOx, the highest results are recorded from westerly winds. This result is in direct response to the terrain effects acting together with the low inversion levels. Further modelling using increased stack heights or exit velocities did little to alter the predicted location of the worst case GLC although increased velocities and increased stack height did lead to lower GLCs at receptor locations.

Table 79 Worst case effects for Power Station emissions [Hobart.met]

	NEPM objective (mg/m3)	**(ug/m3)**	**Predicted 99.9 percentile GLC (ug/m3)**	**99.9 percentile GLC as a percentage of NEPM**	**Glen Huon (ug/m3)**	**Huonville (ug/m3)**
CO	11.3	11,300	699	6%	11.3	6.28
NOx	0.25	250	167	67%	7.58	2.75
Particulates	0.05	50	12.9	26%	0.14	0.072

[1] Commitment: Undertake air quality modelling for the Power Station and heat plant stack emissions once engineering specifications and site weather data are available.

	NEPM objective (mg/m3) (ug/m3)		Predicted 99.9 percentile GLC (ug/m3)	99.9 percentile GLC as a percentage of NEPM	Glen Huon (ug/m3)	Huonville (ug/m3)
Arsenic	-	-	0.014 4	-	0.000 571	0.000 165
Cadmium	-	-	0.000 869	-	0.000 034 5	0.000 009 96
Lead	-	0.50	0.262	52%	0.010 3	0.002 99
Dioxins	-	0.000 002 [c]	0.000 000 403	20%	0.000 000 0164	0.000 000 006 04

a. 99.9 percentile – the observation used is 99.9th highest reading. This allows for any anomalous results in the model represented by the highest figure. Selecting the 99.9 percentile reflects regulatory convention.

b. The second highest reading is used to allow for anomalous results within the Air Dispersion model.

c. Objective is taken from the EPA Victoria 2000.

Of particular note is the effect of terrain on westerly winds pushing the plume east from the Power Station. From the location of the Southwood facility and the surrounding terrain the plume tends to impact the surrounding terrain due east and on the ridge north of the facility. It is apparent that Maximum GLC’s are mostly found to be within 2000 metres of the site restricting off-site impacts. The terrain surrounding the Southwood facility has a strong impact on the location of peak GLC’s.

The design and operation of the Wood Centre combustion sources will be undertaken to comply with the four-tiered approach recommended by the Air Quality Management and Policy Development (DPIWE 2000b) for managing and regulating air emissions from industrial facilities[2]. This four-tiered approach is based on:

- Adopting Best Practice Environmental Management;
- Compliance with ambient air objectives;
- Setting limits for Ground Level Concentrations; and
- Setting limits for in-stack emission levels.

The in stack emission levels set out in the Discussion Paper on Air Quality Management and Policy Development (January 2000) (DPIWE 2000b) are outlined in Table 80. These levels will be met as part of the performance requirements.

2 Commitment: Equipment will be designed and operated to comply with the four-tiered approach recommended by the Discussion Paper on Air Quality Management and Policy Development (January 2000).

Table 80 Air Regulation Emission Levels

Parameter	Source Classification	Proposed Air Policy Emission Level (DPIWE 2000b)
Particulates	Any boiler or incinerator	100 mg/m^3 @ 7% O_2
Smoke	Fuel burning plant and equipment	Ringelmann 1 as 20% equivalent opacity
Nitrogen Oxides	Any trade, industry, or process emitting nitrogen oxides Steam Boilers (liquid/solid fuel)	80 mg/m^3 @ 7% O_2
Carbon Monoxide	Any trade, industry, or process	2,500 mg/m^3
Sulphur Dioxide	Other installations	10 mg/m^3 (as SO_3)

Additional specific management measures to be implemented are described below.

Fugitive Dust, Sawdust and Particulate Emissions

Covered conveyors will control fugitive dust[3] during conveying.

Ash will be wetted upon discharge from the ash bin prior to truck loading[4].

All trafficked areas will be paved to minimise dust generation. A street sweeper will be employed to control dust on sealed surfaces if necessary[5]. In addition, dust suppression of highly trafficked unpaved areas will be achieved by watering[6].

Dust will be controlled such that no visible dust will travel across the site boundary[7].

[3] Commitment: Conveyors will be covered to control fugitive dust.

[4] Commitment: Ash will be wetted following discharge from the ash bin.

[5] Commitment: Seal highly trafficked areas of the Power Station and use street sweeper if watering is an inadequate dust control measure.

[6] Commitment: Water highly trafficked unpaved areas to suppress dust.

[7] Commitment: No dust will travel beyond the site boundary as an air emission.

Stack Particulate Emissions

A coarse filter system traps and removes particulate and reduces loading while the electrostatic precipitator (ESP) removes very fine particulate to the bottom discharges. These devices collect and remove particulate emissions from the boiler flue gases. The coarse filter system combined with the ESP will maintain emissions below 80 mg/Nm^3 [8]. Given that the dust particle will actually accept a charge (resistivity) it is possible to design an efficient precipitator to perform at a specified performance level. It is therefore possible to state with a reasonable degree of certainty that the electrostatic precipitator will effectively control the particulate emissions from the Power Station.

The dry flyash will be conveyed to the sealed ash bin.

The Power Station stack will be fitted with an obscuration meter. This meter will provide real time analysis of particulate levels in the stack. The Power Station control panel will be fitted with a display of the obscuration meter level and warning alarms if the recorded level is above the upper control limit. The obscuration meter will be calibrated against in-stack monitoring for particulates using a NATA certified laboratory. The frequency of the calibration test will be every 12 months or at a frequency recommended by the manufacturer of the selected obscuration meter.

The Power Station will be shut down for repairs if the opacity of the stack emissions continually exceeds 20% (Ringelmann 1)[9]. A monitoring system will be set up to an alarm to alert controllers when Ringelmann 1 is exceeded. The remote location of the Wood Centre reduces the impact of the limited emissions on residences and publicly accessed areas.

10.3 Wastewater Emissions

10.3.1 Potential Impact

Refer to Figure 38 for description of the main water flows within the Power Station site.

Contaminated Stormwater

Activities to be undertaken within the Power Station that have potential to result in stormwater contamination include:

[8] Commitment: Installation and maintenance of a coarse filter system and ESP will maintain the emissions below 80 mg/Nm^3.

[9] Commitment: Adjust fuel-to-air ratio immediately if stack emission opacity exceeds 20% and shut the Power Station down for repairs if opacity continues to exceed 20%.

- Vehicular movements;
- Wood fibre storage in stockpiles; and
- Sediment from local soils.

Process Wastewater

As mentioned in Chapter 10, the primary wastewater stream will be cooling tower and boiler bleed streams with small quantities of reject water from the treatment process. This will contain elevated levels of TDS (up to 1500 mg/L). The cooling tower blowdown must be removed from the system to avoid excessive levels of TDS in the cooling water and fouling of the cooling tower.

Domestic Wastewater

The high biochemical oxygen demand, high solids, nutrients and bacteriological contamination of domestic wastewater has potential to adversely impact on the environment if not treated appropriately prior to discharge.

Domestic sewer and grey water from the office and amenities facilities will be directed to an on-site communal wastewater treatment system and will not be considered further in this chapter. Refer to Chapter 5.

10.3.2 Management Measures

Contaminated Stormwater and Process Wastewater

Contaminated stormwater will be collected by earthen or cement stormwater drains depending on factors as slope, soil type and whether the area being drained is hardstand or paved. The stormwater will then pass through a screening/interceptor system on-site. This system will provide initial removal of coarse suspended solids (e.g. soil and wood fibre) as well as some oil and grease that have been entrained in the wastewater stream. The solids will be removed from the screening/interceptor system on a regular basis. The stormwater will then be piped to the site-wide storage ponds for reuse[10]. The facility operator will collect samples of wastewater from the screening/interceptor outlet point to the storage pond system regularly. Analysis will be undertaken for TPHC, TSS and BOD. In addition, continuous flow rate from the site will be monitored to affect efficient use of water.

[10] Commitment: Contaminated wastewater will pass through a screening/interceptor system prior to discharge to the site wide storage ponds.

Irrigation of Process Water

The cooling tower bleed stream will contain:

- Dissolved solids from the raw river water, concentrated approximately 15 times by evaporation in the cooling tower;
- Those chemicals introduced to minimise the buildup of algae within the cooling tower; and
- Those chemicals introduced to minimise the risk of legionella in the cooling water circuit.

As described above, it is proposed to discharge this wastewater stream by irrigation. In order to ensure water quality is suitable for irrigation a detoxification unit will treat water from the bleed streams. A large area of plantation suitable for irrigation is available within a few kilometres of the site, and a properly functional land irrigation system for the bleed stream can be established with suitable performance standards, investigation, design and cost. However, in the detailed design stage of the project alternative disposal routes will be investigated. In terms of each of the latter two bleed stream components described above, it is considered that once dosing requirements (if any) are finalised for the control of legionella, slime and corrosion, that treatment systems can (including possible biocide detoxification) be developed to enable discharge of the wastewater to a natural watercourse such as the Huon River.

In terms of dissolved solids, by far the greatest source in the bleed stream is the river water itself. At the target concentration of 1,250 ppm the bleed stream water is expected to be below normal drinking water standards but otherwise safe for drinking, and possibly slightly salty to taste. Again it is considered that this could be discharge to the Huon River without adverse impact.

A decision on the disposal route finally selected will be determined during the detailed design stage and will be subject to the approval of the DPIWE.

Water Collected in External Hazardous Materials Bunds

If hazardous materials are stored externally in bunds, the bunds will be roofed to minimise stormwater collection within the bund. Water collected in bunds, as a result of a combination of rain and wind, will be visually inspected prior to discharge to stormwater drain to ensure that it is suitable for discharge[11].

[11] Commitment: Undertake controlled discharge of uncontaminated stormwater from external hazardous materials stores.

The management procedure for bund water that is unsuitable for discharge will involve water quality testing, containment, and collection and disposal by a licensed waste contractor if compliance cannot be achieved. Records will be maintained for internal management purposes[12].

10.4 Noise

Noise emissions from the Wood Fired Power Station are not expected to be heard from beyond the boundary of the Wood Centre. To support this contention a worse case scenario model based on noise measurements from another power station has been conducted. The assessment and mitigation measures are discussed below. Figure 20 shows the potential sources of noise from the Wood Fired Power Station.

10.4.1 Potential Impact

As discussed in Chapter 6, when assessing the potential noise impacts of the Wood Centre operations, Terts (2001) has taken into consideration the following matters:

- The existing noise climate in the Wood Centre;
- The predicted operating noise levels at the residences in other ownership, 6 kilometres from the Wood Centre;
- The weather conditions at the time of measurement (i.e. no rain and little or no wind);
- Possible DPIWE permit conditions for noise;
- Assessment of the predicted noise levels against possible DPIWE noise limits; and
- Noise mitigation measures.

The methodology used to predict the noise levels likely to be encountered at 6 kilometres is described below (Terts 2001).

Distant noise level data was obtained for existing operating facilities located in Tasmania (sewage treatment plant, merchandising yard, saw mill, veneer mill and wood fibre mill), and from a manufacturer (wood fired power station, and portable wood fibre plant).

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[12] Commitment: Test potentially contaminated bund water and organise for its approved disposal.

The following formula was then used to determine the attenuation of sound over flat and gently undulating ground.

Attenuation, dB(A)=6dB(A)/dd+ 3dB(A)/km

Where dd=doubling of distance.

It should be noted that the calculations obtained by using this model, do not include the attenuation provided by topographical features such as hills, which are prevalent around the Wood Centre. As such the predicted noise levels at the nearest residence are extremely conservative, and represent the worst case.

The calculated noise levels are then compared to the existing ambient noise levels in the area. Whether the calculated noise levels are intrusive or not depends on the following factors:

- The level of the background noise;
- The level of the intruding noise;
- Whether the noise has tonal components;
- Whether the noise has impulsive components; and
- The time of day or night the noise occurs.

<u>Steam Turbine</u>

The total sound power level of a 50 MW Wood Fired Power Station without noise control is estimated to be approximately SWL ~ 118 dB(A) and with maximum noise control approximately SWL = 95 dB(A) (Terts, 2001). The turbine and generator will be enclosed in a building (the turbine hall) and will not be a noise source beyond the building.

The expanded noise level from other items of equipment including pumps blowers, fans and conveyors is shown in Table 81.

Table 81 Typical Noise Levels Expected from the Site Equipment

(Terts 2001)

Source	Noise at 250 m (dB(A))	Noise at 6000 m (dB(A))
Pumps blowers, fans, conveyors.	60	15.1

If an allowance is made for tonal components due to forced draft and induced draft fans, an additional 5 dB(A) should be added to the 15.1 dB(A) to give a noise level of 20.1dB(A). It is considered that due to the ambient noise level this is unlikely to be heard at 6 kilometres from the Wood Centre. It should be noted that this noise level represents the worst-case situation with no noise controls in place.

Safety Steam Release

The safety steam release noise has been measured from an 8 MW boiler with a stack height of 30 metres. The measurement was taken at a distance of 860 meters in a direct line of sight with the stack. The noise level measured ranged from 48 to 62 dB(A). Terts (2001) estimates that a 50 MW boiler may generate a noise level 11.9 dB(A) higher than the 8 MW boiler, with the maximum noise level potentially experienced at 6 kilometres, of 42 dB(A).

This noise level can be reduced with the use of appropriate attenuation equipment such as silencers.

Transformer

A 50 MVA transformer is anticipated to have a sound power level of 100.8 dB(A) or sound pressure of 70 dB(A) (Terts, 2001). At 6 kilometres (the nearest residence), the sound pressure level has been calculated as –0.8 dB(A) (Terts, 2001), and so will not be heard.

10.4.2 Management Measures

Although the noise assessment has demonstrated that noise emissions from the Power Station are unlikely to be heard at the nearest residence a number of management measures will be implemented, to ensure environmental best practice is achieved.

The only exception to this may be the boiler safety valve noise. However, this is an infrequent operation (less than a daily basis), and would generally have duration of no more than 15 minutes. Safety valves will vent through a silencer and venting will only occur during day-time hours[13].

The steam turbine, generator, and associated equipment will be enclosed in a building (Turbine Hall), which will attenuate noise from the high-speed equipment. In addition,

[13] Commitment: Safety valves will vent through a silencer and venting will only occur during day-time hours.

the Turbine Hall openings will be oriented away from the nearest residences.[14]. Other sources of noise emitted from the Power Station will be the fans, blowers, pumps and conveyors. Silencers will be installed in the stacks, on steam safety valves and other steam vents to reduce noise emissions and equipment will be selected and maintained to minimise noise emissions[15]. Stack design will allow for tuning stubs to be installed if necessary[16].

Following the final selection of equipment noise modelling will be undertaken, to verify the predicted noise levels[17].

In addition, all noise complaints will be investigated, and the complaints and actions taken will be recorded[18].

10.5 Solid Waste Generation and Disposal

10.5.1 Potential Impact

There is a potential for solid waste from the Power Station to contribute to fugitive air emissions and water contamination if allowed to accumulate in an uncontrolled manner on-site. Other solid wastes such as office waste and packaging materials may cause litter related problems if not adequately managed. Refer to Figure 36 for a description of the overall process and Figure 37 for description of the main wood flows on the Power Station site.

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[14] Commitment: Utilise soundproofing and orientate openings toward the Wood Centre.

[15] Commitment: Install silencers on equipment as appropriate and select and maintain equipment to minimise noise emissions.

[16] Commitment: Stack design will allow for tuning stubs to be installed if necessary.

[17] Commitment: Undertake noise modelling when final equipment selection has been made.

[18] Commitment: Investigate and apply appropriate mitigation measures if a noise complaint is received.

10.5.2 *Management Measures*

The Wood Centre is organised to minimise the production of solid waste. By incorporating the Power Station in the facility, any surplus wood residue from the Wood Centre that is suitable as fuel will be used for the production of electricity. This use of wood by-product maximises productivity of the wood fibre and minimises solid waste production.

The primary solid waste produced by the Power Station will be boiler ash (wood ash). Coarse size bottom ash will be collected in a wet trough-conveyor sub-system and the fine-sized flyash will be collected, dry, in a coarse filter system and the ESP. All ash will be conveyed to a sealed ash bin for subsequent discharge to trucks, with spray water for dust control. The ash will be removed from the site for composting additive, or disposal in approved landfills, and for occasional use by local industry, or as soil conditioner back to the forests as allowed or required.

As described in 10.1.4, solid waste generated from the boiler water treatment system will be largely dependent on the raw water quality, with the amount generated not considered to be significant. The small quantities generated each day will be collected for disposal and/or reuse at an approved site.

From time to time, there will also be small quantities of rock, unusable wood residues, metal and other rubbish/wastes that will be removed by a licensed contractor from the yard for disposal into a licensed landfill[19]. The amount of wastes can not be estimated at this stage however every effort will be made to ensure that waste management is undertaken in accordance with the waste management hierarchy with reuse options investigated after commissioning of the Power Station[20].

Contaminated stormwater will be passed through a screening/interceptor system on-site[21]. This system will provide initial removal of coarse suspended solids (e.g. soil and wood fibre) as well as oil, grease and fuel residues that have been entrained in the wastewater stream. The solids (approximately 300 tonnes per annum) will be utilised in compost, disposed of in a landfill or recycled through the fuelwood processor in the merchandising yard to the Power Station. The wastewater will then be piped to the site-

[19] Commitment: Ash and unusable solid waste will be removed from the site to a licensed landfill or for appropriate reuse.

[20] Commitment: Ensure solid waste minimisation by following the waste management hierarchy and investigating all options for reuse upon commissioning.

[21] Commitment: Regularly dispose of screening/interceptor solids and oils to beneficial reuse operations and/or approved landfill.

wide storage ponds for reuse.

10.6 Hazardous Materials

10.6.1 Potential Impact

As noted for the other proposed facilities for the Wood Centre development, other than fuel, there will be limited hazardous materials stored or used on-site as part of the operation of the Power Station. Hazardous materials stored or handled on-site during the operation of the Power Station are detailed in Table 82 and Table 83. The storage locations are shown in Figure 20.

Table 82 Hazardous Materials Annual Use Rate

Reagent	Use	Typical Annual Rate
Oxidising Biocide (Bromide chemistry)	Biocide	<20 tonne/yr
Sodium Bicarbonate or Lime	pH adjustment	10-25 tonnes/yr
Aqueous Ammonia (25% solution)	Boiler water treatment	5 kL/yr
Sodium Triphosphate (3.5% solution)	Boiler water treatment	2 kL/yr
Carbohydrazine (6% solution)	Oxygen scavenger	2 kL/yr
Activated carbon	Water filtration for organic matter	10-20 tonne/yr
Fuel Oil	Boiler Start-up	80-120 kL/yr
Diesel Oil [Must have diesel stored near to emergency generator]	Emergency Generator, Mobile Equipment	50 kL/yr
Other (lubrication and turbine oils, corrosion inhibitors, anti-scaling agents, ion-exchange resins, standard machine shop and maintenance materials).		

The potential risk associated with hazardous material storage is the leakage of hazardous products into the environment that can cause significant short and long-term contamination of soils, groundwater and/or indirect contamination of surface waters if allowed to enter the wastewater stream and released untreated.

Table 83 Hazardous Materials Stored/Used On-Site – Power Station Facilities

Hazardous Materials	Active Ingredient	Dang. Goods Class & Sub. Risk (as appropriate)	Hazchem Code / Emergency Guide	Packaging Class	Container Size	Max. Quantity Stored on-site	Storage Type and Location
Fuel Oil	Petroleum distillate	3 [Y]			20 kL	20 kL	Bunded roofed storage adjacent to boiler.
Sodium Bicarbonate or Lime	Sodium Bicarbonate or Lime	-	-	-	1 tonne	1-2 tonnes	Bunded roofed tank at WTP
Aqueous Ammonia (25% solution)	Ammonia	8	2P / 8A1	III	200 L	0.25 kL	Bunded roofed sealed drum at WTP
Sodium Triphosphate (3.5% solution)	Sodium Triphosphate	-	-	-	200 L	0.25 kL	Bunded roofed sealed drum at WTP
Carbohydrazine (6% solution)	Carbohydrazine	-	-	-	200 L	0.25 kL	Bunded roofed sealed drum in Workshop
Oxidising biocide	Bromide						Bunded roofed tank at WTP
Automotive Diesel Fuel	Petroleum	3 [Y]	-	-	5 kL	10-20 kL	Bunded sealed tank in Workshop
Activated carbon	Activated Carbon	4.2	1[Z] / 4A2	III	1 tonne	5 tonnes	Bunded sack in Workshop
Other (lubrication and turbine oils, corrosion inhibitors, anti-scaling agents, ion-exchange resins, standard machine shop and maintenance materials).						<0.5 T or 0.25 kL each.	Bunded sealed drums in Workshop

WTP: Water treatment plant

10.6.2 *Management Measures*

In order to limit diesel storage on each site, diesel will generally be stored in the communal diesel store (45,000 L) operated by the site-wide manager. Additionally, a fuel oil storage of up to 20,000 L will be located on the Power Station site primarily for boiler start-up purposes.

The fuel storage facility will have a bund with impervious base, locked valve and roof. To reduce the risk of release to the environment, all hazardous substances will be stored with signage and fire control measures according to the Dangerous Goods Act and Regulations and the Australian Standards (AS-1940)[22].

A secure fully bunded hazardous materials store will be established for the storage of small quantities of oils and grease. The building will be of the same structure and cladding as other buildings on-site and will have a concrete floor.

Bunds will be used in this facility for the storage of minor chemicals, and the containment of potential spills. Material safety data sheets will be displayed where hazardous materials are stored and appropriate occupational health and safety equipment will be provided to meet appropriate standards and regulatory requirements[23].

The above ground diesel and fuel oil tanks will be located in a bund in accordance with AS-1940.

An inventory will be kept of any hazardous materials stored and handled on-site, including the location of storage, their quantities, and their material safety data sheets[24].

Any fluids released during machinery maintenance operations will be captured for reuse or appropriate disposal. Waste lubricating oils will be collected in one or more 205 L drums for recycling along with the oil recycled from the adjacent operations[25].

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[22] Commitment: All hazardous substances will be stored with signage and fire control measures according to AS-1940.

[23] Commitment: Store hazardous substances in a secure safe building or bund with material data safety sheets and signage in storage locations.

[24] Commitment: Maintain an inventory of hazardous substances on-site.

[25] Commitment: Collection of waste oil in drum(s) for removal and recycling by waste contractor. Maintain a record of quantities.

Waste oil drums will be stored within an area where spillage can be contained, and/or collected by the wastewater management system.

In the event that a significant spillage breaches the containment facilities and enters the wastewater stream, wastewater will be directed to a storage pond where treatment options can be implemented, or the spilled material can be temporarily contained within the interceptor sumps and collected by waste contractor for treatment.

As discussed in Chapter 5, an emergency response plan will be designed for the Power Station facility and training of staff will be undertaken to ensure all are familiar with the plan and responsibilities[26]. A component of the plan will be the location of and handling of the spill kit to be maintained at an appropriate location for containment and clean-up of materials in the event of spillage[27]. Licensed waste contractors will be employed on an as needs basis to collect and dispose of spilled material that has been collected in bunds[28].

In the event that a spillage occurs within the facility there are contingency measures in place to mitigate off-site affects. These measures are presented in Chapter 5.

All spillage incidents of hazardous materials with potential to harm the environment will be reported to DPIWE[29]. Where an emergency emission exceeds a statutory requirement (according to either regulation or Permit conditions), notification will be given to the Director of Environmental Management (DEM) as soon as reasonably practicable and within 24 hours of becoming aware of the release of the pollutant in relation to that Power Station activity[30].

10.7 Preliminary Hazard Analysis and Risk Assessment

10.7.1 Introduction

A preliminary hazard identification and risk assessment was conducted on the Power Station. The potential hazards were systematically identified using a preliminary

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[26] Commitment: Design an emergency response plan for the Sawmill site and provide training.

[27] Commitment: Maintain a spill-kit on-site and contain spills.

[28] Commitment: Employ licensed clean-up crew when required.

[29] Commitment: Report significant hazardous material incidents with potential to cause environmental harm to DPIWE.

[30] Commitment: Report accidental emission to DEM within 24 hours.

HAZOP study, in conjunction with the process flow diagram for the Power Station Figure 38. The Preliminary Hazard Analysis and Risk Assessment is provided in Appendix T.

10.7.2 Principal Site Hazards

The HAZOP study identified the following areas of the Power Station as having the potential to kill, injure, or cause significant engineering and environmental damage, resulting from abnormal operating conditions or accident based activities:

- Boiler;
- Steam Lines;
- Turbine;
- Cooling Tower;
- Particulate Filter System; and
- Chemical Storage.

Each of these identified areas have been assessed under the RERAC method described below.

10.7.3 Risk Assessment

The Hazard Identification above was then used to assess the risk of the most critical hazards present within the power plant site. The Rapid Environmental Risk Assessment Checklist (RERAC) methodology was used to quantify the likelihood and severity of an incident or hazard. This resulted in a ranking of each hazard in terms of total assessed risk (TAS). Events which are ranked the greatest TAS should be given the highest priority in terms of preventative action.

Total Assessed Risk (TAS) = Likelihood x Severity

The acceptability of the hazards was then decided for the particular activity depending on which of the three following categories they fall in Table 84.

Table 84 Hazard Categories

CATEGORY	DESCRIPTION	TAS
Category One	Immediate action required to reduce TAS to 9 or below.	>14
Category Two	Medium term action required to reduce TAS to 9 or below.	9-14
Category Three	Action depends on company policy and resources. Long term target should be for all TAS scores to be <5.	<9

The likelihood (L) score (Table 85) and severity (S) (Table 86) are based on the frequency of the event (RERAC method) and the length of time that an impact will be felt. These are outlined in Table 87. The hazard activities which have a TAS ranking of <4 have not been included in Table 87 because these hazards are deemed to be of insignificant consequence.

Table 85 Likelihood Score, (Frequency of Possible Cause)

Event Probability	Score
Frequent Event (25 times per year)	5
Probable Event (5 times per year)	4
Occasional Event (1 time per year)	3
Remote Possibility (1 time per 5 years)	2
Improbable Event (1 time per 25 years)	1

Table 86 Severity Score Real Hazard Index

Severity	Description	Score
Critical	Major long-term engineering & environmental impacts and/or damage usually resulting in fatalities, multiple injury victims and/or highly visible to the public.	5
Major	Major short-term engineering & environmental impacts and/or significant human injury or injuries potentially fatal.	4
Significant	Minor short-term engineering & environmental impact and/or short-term human injuries and/or low public visibility.	3
Marginal	Marginal short-term engineering & environmental damage and/or minor human injuries.	2
Negligible	No measurable effect on the engineering or environmental condition on-site, no effect on workforce, not visible to the public.	1

Table 87 Hazard Category Summary for selected critical areas within the Power Station

Category One Hazards (TAS>14)

Activity	L	S	TAS	Consequence	Preventative Action
NIL	0	0	0	NIL	NIL

Category Two Hazards (9<TAS<14)

Activity	L	S	TAS	Consequence	Preventative Action
Boiler water feed pump failure	4	2	8	No water flow into the boiler, resulting in release of hot flue gases at the stack, and may cause thermal damage to equipment down stream.	There will be a backup pump. Switch over is automatic. Proper control alarms will warn of deviation in temperature, or water flow, alert operators, before damage is caused.
High pressure steam line weld or joint failure	4	2	8	Line rupture, venting material may cause electrical and structural damage, and injure nearby workers.	Regularly scheduled maintenance on all piping infrastructure, and structural testing.

Category Three Hazards (4<TAS<8)

Activity	L	S	TAS	Consequence	Preventative Action
Fuel feed flow rate deviation	3	2	6	Incomplete combustion resulting in the generation of undesirable gaseous compounds such as CO, and increased levels of particulate matter.	Continuous monitoring of feed flow rates, as well as CO levels leaving through the stack.
Non-functional cooling tower	3	2	6	Build-up of low pressure steam due to little or no condensation activity leading to line ruptures.	Recommendations detailed in the HAZOP section should be implemented.
Non-functional air circulation system	3	2	6	Incomplete combustion will occur, resulting in coarse size particulates generated, as well as CO, NO_x, and other combustion by-products.	Temperature, oxygen, and CO alarms will alert the operators of the deviation. Compliance to a regular maintenance schedule will prevent this from occurring.
Inoperative ESP	2	2	4	Fine dust particles will be released with the effluent gas, through the stack.	An air emission monitor will alert the operators, should the particulate level rise beyond the set point level required by EPA guidelines.
Inadequate Turbine Maintenance	1	4	4	Accelerated wear of turbine components, eventually leading to lower power generation and ultimately, to mechanical damage.	A proper and rigorous maintenance procedure will be implemented and complied to.
Fork lift accidents at the chemical storage area	2	2	4	Loss of containment of boiler water treatment chemicals due to rupture of tanks or pipes.	Appropriate bunding and protection on all sensitive equipment in the storage area. Chemical spill kits readily available in immediate vicinity.

As detailed in Table 87, there were no Category One hazards (requiring immediate action) identified. The vast majority of all RERAC assessments fell under a TAS ranking of 5, the recommended level for industry operations.

Only one hazard fell under Category Two (requiring medium term action), which was the hazard of ruptures in lines containing high pressure steam. Line ruptures pose a direct hazard to operators and electrical equipment. Implementation of the recommended control measures will significantly reduce the likelihood and severity of these events. There are no direct environmental effects associated with this hazard.

Category Three hazards are deemed minor, and company policy should dictate that a long term goal be set to reduce the TAS scores to below 5.

10.7.4 Conclusion

This preliminary RERAC study did not identify any catastrophic environmental hazard event scenarios. Based upon the HAZOP and RERAC studies, it was concluded that if the actions and recommendations outlined in Appendix T are acted upon, then there is little risk associated with hazards, which have significant environmental consequences. A detailed HAZOP study will be undertaken prior to the commencement of Power Station construction[31].

10.8 Monitoring, Reporting and Review

10.8.1 Monitoring

To ensure the operation of the Power Station is in accordance with the EMP and best practice environmental management the following monitoring programs will be implemented.

Dust

High traffic areas within the Power Station site will be paved and monitored visually[32].

Process Wastewater and Contaminated Stormwater

The collection and distribution of stormwater and process wastewater from the site to the communal facility will be checked on a weekly basis to ensure the screening/interceptor system is operating effectively. The solids removal system will be checked daily or on a more frequent basis during rainstorms[33]. The frequency of

[31] Commitment: Conduct a detailed HAZOP study prior to commencement of Power Station construction.

[32] Commitment: Visually monitor dust emissions and control dust by watering.

[33] Commitment: Where practicable, daily inspection and removal of the solids from the solids removal system.

the inspections will be modified after six months of operation based on inspection results[34].

The contaminated stormwater flow from the site passing through the screening/interceptor system will be sampled on a regular basis. If the results of the monitoring are consistent with on-site operational requirements the frequency of sampling may be reduced to monthly. Monitoring will be undertaken for TPHC, TSS and BOD in accordance with standard industry practice. In addition, continuous flow rate from the site will be monitored to affect efficient use of water. Monitoring data for wastewater discharge from the site will be reported to the Director of Environmental Management on an annual basis[35].

The cooling tower water will be monitored fortnightly to determine efficacy of biocide treatment and specifically Legionella build-up as per Australian Standard 3666. Once proven effective the monitoring may be decreased to monthly.

Stack Emissions

The boiler stack emissions will be continuously monitored by a regularly calibrated opacity meter, which will record the particulate density in the waste gas as a percentage of the light obscuration value. The instrument will be set to sound an audible alarm if the value exceeds a specific level (less than 20%). If opacity continually exceeds 20%, repairs will be made as appropriate[36]. In addition, air sampling downwind of the Power Station can be conducted if complaints are received.

Monitoring data for the Power Station will be reported to the DEM on an annual basis[37].

Noise

A record of noise emission complaints will be kept in a complaint register for the site,

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[34] Commitment: Weekly inspection of wastewater screening/interceptor system to ensure effective operation. Review system after six months of operation.

[35] Commitment: Monitor water quality (TPHC, BOD and TSS) regularly and flow rate from the screening/interceptor system outlet continuously and report to the DEM annually.

[36] Commitment: Monitoring of boiler stack emissions and modification of boiler operation if opacity exceeds 20%.

[37] Commitment: Annual reporting of Power Station stack monitoring results to the DEM.

together with details of investigations and actions[38].

Other

Oil supplied and waste oil returned for re-use will be recorded.

Monitoring data for the wastewater and stack emissions will be reported to the DEM on an annual basis. For emergency or abnormal emissions, a special report will be submitted within 5 days to the DEM detailing the extent of the emission, the likelihood of environmental harm, the cause of the event, procedures applied to minimise the environmental harm, monitoring results, and the system introduced to avoid any repetition[39].

A general incident response and notification protocol will be developed and implemented along with reporting procedures for the Power Station[40].

10.8.2 Reporting

The Wood-fired Power Station proponent will establish and maintain a procedure to monitor, measure and report key characteristics of its operations and activities that have potential to have a significant impact on the environment. Reports are to be forwarded to the Site Wide Manager. This will comprise the incident reporting protocol and will allow the Site Wide Manager to determine the effectiveness of environmental measures implemented in reducing impacts on the environment and/or to determine the extent of potential environmental harm. The measures ensure the management of the activity will achieve ongoing minimisation of the activity's environmental harm through cost effective measures.

Environmental harm is defined, for the purposes of the *Environmental Management and Pollution Control Act 1994*, as any adverse effect on the environment (of whatever degree or duration) and includes an environmental nuisance. The responsibilities for reporting environmental incidents are as follows:

- The person discovering a reportable environmental incident, as described below, on the proponent's site must report it to the proponent;

[38] Commitment: Record noise emission complaints with details of investigations and actions.

[39] Commitment: Submit monitoring data to the DEM annually. In the case of an emergency emission full details will be submitted within 5 days.

[40] Commitment: Develop and implement an incident response and notification protocol.

- The proponent may report the incident to external organisations that are needed to provide response support, e.g. State Emergency Services;
- The proponent gathers details about the incident and supplies them to the office of the Site Wide Manager and Environmental Committee; and
- The Site Wide Manager is responsible for reporting environmental incidents to relevant external organisations (e.g. DPIWE) who are not involved in immediate response.

The activities on the Wood Centre are Level 2 activities and therefore incidents must be reported to DEM as soon as reasonably practicable, but no later than 24 hours, after becoming aware of the release of a pollutant occurring as the result of an emergency, accident or malfunction in relation to that activity.

When an incident occurs so that serious or material environmental harm from pollution is caused or threatened in the course of an activity undertaken by a person, the person must, as soon as reasonably practicable, but no later than 24 hours, after becoming aware of the incident, notify DPIWE of the incident, its nature, the circumstances in which it occurred and the action taken to deal with it. A person is not required to notify DPIWE of such an incident if the person has reasonable grounds for believing that the incident has already come to the notice of DPIWE or any officer engaged in the administration or enforcement of the *Environmental Management and Pollution Control Act 1994.*

Good practices as outlined below will ensure that environmental incidents will be minimised.

The proponent's responsibilities include but are not limited to:

- Developing and implementing Environmental Action Plans (EAP);
- Developing clear communication arrangements, taking into account after hours and holiday periods;
- Clearly defining roles and responsibilities;
- Maintaining, modifying, reviewing and analysing all monitoring procedures, so that overall trends in environmental performance are assessed and recorded;
- Requesting that additional monitoring or testing be conducted to confirm or negate the original recordings;
- Determining if EAPs or amendments to Operating Procedures are required; and

- Ensuring the maintenance and calibration of monitoring equipment.

Monitoring defined in EAPs will address:

- Water quality and quantity;
- Visual observations;
- Noise; and
- Hazardous materials handling.

EAPs will also address:

- Triggers for implementing monitoring;
- Sampling and analysis;
- Interpretation and corrective action;
- Recording and maintaining monitoring data;
- Monitoring reviews;
- Control actions as a result of monitoring;
- Selecting monitoring equipment;
- Maintenance and calibration of monitoring equipment; and
- Calibration records.

By effectively implementing the Incident Reporting Protocol, the facility may be able to decrease its impact on the environment.

10.8.3 Review

An EMP review for the Power Station will be undertaken, as described in Chapter 5, within 12 months of the commencement of operations and at agreed intervals thereafter in accordance with the requirements of DPIWE[41].

41 Commitment: Review EMP after 12 months of operation and as agreed with DPIWE thereafter.