



7. Construction Impacts, Management and Monitoring

The following section details potential impacts, management objectives and strategies and proposed monitoring for key environmental issues associated with the construction phase of the project.

PCF will prepare an Environmental Management System (EMS) as this will allow the Company to maintain its environmental management commitments and enable continuous improvement in environmental performance through the detailed design, construction and operational phases of the project.

An Environmental Management Plan (EMP) for the construction and operation of the project will be prepared that will detail the management objectives, mitigation strategies, responsibilities, monitoring requirements, reporting and corrective actions.

7.1 Biophysical Environment

7.1.1 Flora

Management objective – To maintain the abundance, diversity, distribution and productivity of flora at species and ecosystem levels through the avoidance and management of adverse impacts and improvement in knowledge.

Collie Urea Plant

Four vegetation associations and eight vegetation types were mapped and described at the Site. These have been described in detail in Section 5.10.1. These vegetation areas have been described as:

- » Jarrah – Marri – Sheoak Open Forest
- » Jarrah - Banksia – *Xylomelum* – Sheoak Woodland
- » *Banksia* spp. - Sheoak – Muja Open Woodland
- » *Melaleuca preissiana* – *Taxandria linearifolia* – *Kunzea glabrescens* Low Woodland
- » *Melaleuca preissiana* – *Kunzea glabrescens* – Low Woodland
- » Cleared degraded land - Cleared Paddock
- » Cleared degraded land - Old Sand Quarry
- » Cleared degraded land - Old Shotts Townsite

More specifically, field investigations in 2007 and 2009 identified 297 taxa from in 63 families within the survey area.

The dominant families recorded from the survey area over the two investigations were:

- | | |
|-------------------------------|---------|
| » <i>Papilionaceae</i> (Peas) | 27 taxa |
| » <i>Myrtaceae</i> (Myrtles) | 22 taxa |
| » <i>Poaceae</i> (Grasses) | 20 taxa |
| » <i>Asteraceae</i> (Daisies) | 17 taxa |



- » *Orchidaceae* (Orchids) 16 taxa
- » *Proteaceae* (banksias etc) 15 taxa
- » *Mimosaceae* (Wattles) 14 taxa

Additionally, the dominant genera recorded were:

- » *Acacia* (Wattles) 14 taxa
- » *Drosera* (Sundews) 9 taxa
- » *Hibbertia* (Buttercups) 6 taxa
- » *Stylidium* (Trigger-plants) 6 taxa
- » *Leucopogon* (Beard-heaths) 6 taxa
- » *Caladenia* (Spider-orchids) 5 taxa
- » *Lepidosperma* (Sword-sedges) 5 taxa

One Priority Four flora species *Pultenaea skinneri* was found adjacent to the Site.

The proposed Plant Site will require a cleared area of up to 80 % of the total lease area. Of the 124 hectares, approximately 45 % (55.5 ha) is already cleared as a result of previous quarrying and farming activities. Of the vegetated area (67.5 ha) approximately 46 ha will be cleared. The proposed final layout of the Plant (Figure 6) shows that the plant itself will occupy around 45 % of the available land. The balance is either occupied by existing infrastructure or will be required for 'laydown' of materials and equipment during construction, coal stockpiling thereafter or as buffers.

The plant design will be guided by the following considerations:

- » Vegetation assemblages with a high ecological value are retained where not central to the site;
- » Vegetation patches adjacent to the area where PF has been identified are retained where not central to the site;
- » The area that has been previously cleared land is developed; and
- » Vegetation that has high habitat value is retained wherever possible.



This high habitat value area is shown as Area 1 in Figure 18.

The potential impact associated with clearing includes:

- » Spread of exotic weeds, particularly those already established;
- » Spread of *P.cinnamomi* throughout the remaining vegetated areas;
- » Removal of vegetation linkages for habitat; and
- » Removal of vegetation assemblages that occur with the Site not represented in the remaining vegetation patches.

The total remaining vegetated area on the PCF 124 hectare Site is 67.5 ha. It is estimated that of the total site, 99 ha will be cleared for the Plant and laydown areas.

Further details can be found in the Flora report in Appendix G.

Bunbury Port

There will be no flora impacts associated with the development of the Bunbury Port site at Berth 5.

Management Strategies

Table 24 To minimise the potential impacts on flora at the site, Berth 5 and infrastructure corridors.

Vegetation Aspect	Management Strategy
Clearing plan	A Flora Management Plan will be prepared to finalise the clearing plan for the Site
	The final clearing plan will retain the highest value vegetation area, Area 1, in the south east corner of the Site.
	Guidance will be provided in the Construction EMP to ensure that clearing is undertaken as planned. Land to be cleared will be clearly pegged, therefore highlighting areas that are not to be cleared.
	Where possible and practicable, topsoil will be retained and stockpiled for use in rehabilitation.
	Opportunities for seed collection of significant flora species will be undertaken prior to clearing occurring
Exotic weeds	A Weed Management Plan will be prepared and included in the Environmental Management Plan. This Plan will apply to both the construction and operation phases of the Project.
	All traffic will remain on designated tracks to minimise the spread of weed seeds.
Dieback	A Dieback Management Plan will be prepared and included in the Environmental Management Plan. This Plan will apply to both the construction and operation phases of the Project.
Flora	A spring flora survey will be conducted along the water supply pipeline alignment with a qualified Botanist with authorisation to collect samples from within a National Park. This flora survey will



Vegetation Aspect	Management Strategy
	concentrate on areas where Priority of Declared Rare species are known to occur. This will include assessment of presence of <i>Hemigenia ramosissima</i> and <i>Hemigenia rigida</i> .
Fire	A Fire Management Plan will be prepared to minimise the risk of fire both on-site and off – site, particularly to surrounding State Forest.

Monitoring

During construction and operation of the Urea Plant the following monitoring requirements will be undertaken:

- » All clearing and construction will be supervised by the contract supervisor to ensure that all clearing is undertaken as required;
- » The presence or spread of dieback will be monitored;
- » The presence or spread of weeds will be monitored and weed control actions will be applied where required.

7.1.2 Fauna

Management Objective – To maintain the abundance, diversity, distribution and productivity of fauna at species and ecosystems levels through the management of adverse impacts and improvement in knowledge.

Collie Urea Plant

The project area comprises three habitat types which were identified within the study area as described in Section 5.12.1. These habitat types are:

Jarrah Woodland

Jarrah woodland has a high fauna habitat value. The vegetation within the woodland can be split into three broad vegetation types: Jarrah-Marri-Sheoak Open Forest, Jarrah-Banksia-*Xylomelum*-Sheoak Woodland and Banksia-Sheoak-Muja Open Woodland. The Jarrah woodland has an intact understorey and would provide good habitat for reptiles and small ground mammals e.g quenda.

Pine Plantation

A lack of species diversity within a plantation means the fauna value of this habitat type is diminished. Bird species, including the cockatoo, may feed upon the pines.

Cleared/Disturbed

The cleared/disturbed areas constitute approximately one third of the survey area and provide very poor fauna habitat value. A small number of isolated large trees remain and may be utilised by cockatoos for feeding or breeding.

The survey found five significant fauna species within the survey area. These species are:

- » Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*);
- » Baudin’s Black Cockatoo (*Calyptorhynchus baudinii*);



- » Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*);
- » Chuditch (*Dasyurus geoffroii*); and
- » Western Brush Wallaby (*Macropus irma*).

The potential impacts of the clearing and construction of the plant on fauna and their habitats include:

- » *Habitat fragmentation due to vegetation clearing*: The vegetation within and surrounding the survey area has had a high degree of historical disturbance whilst access tracks, roads and existing infrastructure have dissected the vegetation into a series of relatively narrow blocks. The proposed works will cause further fragmentation to the area.
- » *Habitat loss and damage*: The proposed development will cause a loss of fauna habitat. Of particular concern is the loss of habitat utilised by significant fauna. The survey area contains potential feeding and breeding habitat for Cockatoo species. In addition to habitat for the Chuditch and Western Brush Wallaby.
- » *Death or harm to fauna species*: Any construction works have the potential to cause death or harm to fauna species. Vegetation clearing and vehicle movements are likely to result in an increased incidence of animal death or injury. Slower moving land animals (including mammals, reptiles and amphibians) are most at risk, as they are often unable to vacate disturbed areas of vegetation quickly enough to avoid harm. Animals may become disorientated following destruction of their current habitat ranges. Therefore, clearing in disturbed areas first and working into habitat not to be cleared may steer fauna in a safe direction. The use of a fauna clearance team can also assist in the safe removal of fauna such as the Brushtail Possum, from the disturbance area.
- » *Weed introduction and invasion*: Approximately a third of the survey area has had a high degree of disturbance and contains weeds that are relatively widespread. Disturbance from the proposed activities has the potential to introduce and/or spread weeds to the area directly impacted by, and adjacent to, the clearing. Introduced weeds may alter the availability of suitable habitat for some ground dwelling species.

The fauna and fauna habitat value of the proposed Plant Site and its surrounds is mostly attributable to the extensive area of State Forest rather than the intrinsic value of the development site. While the impact of clearing will have some impact on those fauna established within the Plant Site and using the Site as a habitat linkage, the extensive area of State Forest that will remain intact will provide habitat and feeding refuges. A detailed assessment of impacts can be found in the Fauna report in Appendix F.

The consequential loss of habitat and fragmentation of habitat as a result of clearance of the plant site and associated construction areas is not significant and can be reduced by selective preservation of habitat where possible.

Bunbury Port

There are no expected fauna impacts from construction at Bunbury Port.

Water Supply Pipeline

Discussion on the requirement of a water supply pipeline and associated considerations is previously presented in Section 4.4.7 of this PER.

In relation to the existing water pipeline corridor:



- » *Habitat fragmentation due to vegetation clearing:* The water supply pipeline corridor is already highly fragmented and subjected to edge effects along most of its route, from the existing pipeline and access track, land clearing for agriculture, urban development, roads, rail and powerlines. Construction of an additional water supply pipeline would slightly increase the already high level of fragmentation within the local landscape, with a higher level of impact most likely arising in the forested areas around Wellington Dam, where the vegetation is mostly intact. Given the current level of fragmentation throughout the majority of the water pipeline route and the presence of an existing pipeline easement, further fragmentation is considered to represent a minor impact.
- » *Barrier to fauna movement:* The pipeline proposed for this Project is anticipated to be constructed parallel to an existing pipeline within an established easement. The existing pipeline is already a barrier to fauna movement. The proposed pipeline will may form a physical barrier to movement of some fauna, particularly large fauna which may not be able to cross under the pipeline if there is insufficient clearance, dependent on pipe elevation. An 800 to 1,200 mm diameter pipe will prevent fauna from crossing over the pipe. Inclusion of fauna crossings in the design and ensuring adequate elevation to allow small fauna to cross under the pipeline will result in only minor impacts. Provision of crossings over the existing pipeline may enhance fauna movement over the existing situation.

7.1.3 Aquatic Flora and Fauna

The nature of pipeline crossings of watercourses will be subject to the outcomes of detailed design studies. It is proposed that for major crossings such as the Collie River, that the pipeline will be suspended over the river and that no excavation works will be required. Subject to terrain limitations, the pipeline may be buried across minor watercourses so as to minimise the risk of damage during floods and to reduce the effects of a barrier across the stream flow.

Potential impacts on aquatic ecology as a result of construction and operation of the water supply pipeline can result from the following:

- » Construction impacts from the proposed pump station to be located at Wellington Dam;
- » Construction impacts associated with installation of a suspended structure over major waterways;
- » Construction impacts from waterway crossings of the water supply pipeline; and
- » Construction impacts associated with the discharge of waters during dewatering and hydrostatic testing.

These are discussed below.

Pump Station Construction Impacts

Whilst pump station specifications will not be finalised until the detailed design phase, it is likely that works will be required within the inundation area of Wellington Dam and as a consequence, potentially result in impacts on the aquatic environment. Any works are expected to be restricted to the area previously used as an intake for the existing pump station. Works may include removal of the existing disused pumpstation infrastructure and installation of a new intake pipe if existing intake pipe systems prove to be unsuitable.

Given works are to be undertaken within an area previously used for an identical purpose, impacts on the aquatic environment are expected to be minor given appropriate environmental management during construction. A Construction EMP will be developed to address construction activities.



Construction Impacts on Waterways

The alignment crosses a number of minor waterways and the Collie River. Two types of crossings may be utilised, a suspended structure or trenched crossings. Trenched crossings would be used only when required by design or terrain considerations and only for ephemeral or minor watercourses.

Suspended Structures

It is intended to duplicate the crossing structures of the existing pipeline, which mostly included a suspended pipeline (Plate 2). Works would consist of construction of supporting structures (typically concrete supports) which will typically be located on opposing banks. This construction methods present reduced risk of aquatic ecosystem impact, as it minimise disturbance to waterway banks and does not physically disturb the bed of the waterway, and therefore lessens the potential for sediment release.

Construction activities for such structures have a small footprint area, particularly given the access track and waterway crossing already exists. Construction impacts from this type of crossing are expected to be minimal and readily managed through the implementation of a Construction EMP.

Open Trench

Open cut trench construction creates a higher level of disturbance of bed and banks of a waterway and would be proposed only when driven by design imperatives. Details on construction methods are provided in Section 4.4.7. Wet and dry open cut construction methods have the potential to impact aquatic ecosystems, as these methods require trenching and therefore the physical disturbance of substrate from the watercourse. This can lead to an increased risk of erosion within the waterway and subsequent sediment loading in the event of rainfall.

Vegetation Removal

The use of trenchless or open trench construction methods will necessitate the removal of vegetation within the working width (maximum 20 m) of each watercourse crossing. The removal of vegetation at watercourse crossing points may result in the following potential impacts:

- » Reduction of local riparian vegetation;
- » Reduction of local habitat for some aquatic species;
- » Destabilisation of surface sediment; and
- » Introduction and/or spread of weed species within riparian zone.

The impact on riparian vegetation may result in the reduction of habitat opportunities for aquatic species inhabiting the area, or those opportunistically utilising the site.

In addition to habitat reduction, the removal of vegetation within the working width requires excavation and subsequent disturbance of subsoil and topsoil. Substrate disturbance associated with vegetation removal leads to destabilisation of soil and mobilisation of sediment with surface water runoff, potentially impacting water clarity within the watercourse.

The removal of vegetation may also lead to the spread of weed species, the seeds of which may be carried on vehicles, work boots or dispersed by the wind or faunal species. Cleared areas are susceptible to weed introduction and growth as these species are typically fast growing and thereby out-competing endemic species. The establishment of weed species in the riparian zone alters the natural composition of the area and thereby impacts the quality of habitat available to aquatic species.



Sites with existing good quality riparian vegetation are most likely to be affected by vegetation removal during the construction phase. Ephemeral or minor waterways would typically experience smaller impact as it is unlikely that the removal of vegetation would significantly affect aquatic species.

Flow Disruption

During the construction phase, the use of either the wet open or dry open cut (using temporary dam and pump over) construction method will require the diversion of water flow. These methods are proposed for crossings traversing dry or pooled drainage lines and creek crossings. The methods involve placing barriers at the crossing point and blocking the movement of water. Water flow is diverted around the construction area and piped back into the watercourse, downstream of the works. This method of construction may result in the following potential impacts:

- » Trapping of aquatic species such as fish; and
- » Mortality of aquatic species through contact with construction equipment (eg. excavators and pump impellers).

As the crossing points designated for this construction method traverse ephemeral watercourses/drainage lines and creeks, it is unlikely that aquatic habitat at these sites will be significantly impacted from flow disruption. Aquatic species such as fish may be impacted through contact with pumps (whilst water is pumped around the construction area), or through becoming trapped within the construction area. To preclude contact with pumps, mesh guarding will be installed at an adequate distance to prevent fish from being caught up in water drawn towards the pump. The disruption to water flow will be over a short temporal scale. For pooled drainage lines there will be only minor impact to water flow during construction activities.

Trenching/Grading

Construction of the proposed pipeline will require trenching for sites where open cut methods are to be used. Sites nominated for open cut methods of construction (ie. ephemeral watercourses and creeks) will require excavation of trenches and topsoil stripping, necessitating the use of trench stockpiles in addition to topsoil stockpiles. In the event of rainfall, surface water runoff has the potential to mobilise sediment in stockpiles as well as substrate disturbed during excavation, and may result in the following impacts:

- » Increased turbidity in waterways; and
- » Deposition of sediment in waterways, influencing water flow and increasing erosion and flood potential.

Surface water runoff carrying sediment, as a result of rainfall events, may impact water quality within both the excavated watercourse (upstream and/or downstream) and adjacent watercourses. Additional sediment load discharged to permanent and ephemeral watercourses may lead to increased turbidity, thus impacting on the primary productivity of ecosystems due to reduced light penetration.

Subsequently, aquatic habitat degradation and sediment deposition may occur, the latter of which has the potential to affect the flow capacity of these waterways, if they are not maintained.

In addition to sediment, surface water runoff may transport the following contaminants:

- » Hydrocarbon contamination from any construction vehicle fuel, oil leaks or refuelling spills;
- » Nutrients from fertiliser use during revegetation; and



» General litter.

Provided the mitigation measures discussed below are implemented, construction of the proposed pipeline impacts on the hydrology or water quality of waterways will be minimised. If trenching is implemented it is expected to be used for ephemeral and minor watercourses only.

Water Discharges During Pipeline Construction

Water pressure testing of the pipeline will be undertaken in sections to test the pipe and joins. Typically water is released at low points along the alignment so that testing water can drain from the pipe. As a risk management measure, it is likely that the pipe would be tested in sections, rather than the whole length at once.

The specific location of these points will be determined during detailed design, once the alignment has been surveyed. Each low point would experience two releases. Each section would typically only be tested once assuming it passes the test. If not, the section would need to be retested.

Water would most likely be sourced from Wellington Dam. Release of testing waters typically occurs at low points such as drainage lines or close to waterways. The releases will be gravity fed (low pressure) and controlled by release valves. Controls will be established around the release point to reduce flow velocities and spread the flow, so as to minimise potential erosion impacts and vegetation disturbance. Structures such as geotextile fabric fences can be used to achieve such effects. The release point will be selected to minimise site impacts during discharge.

The release will be monitored at all times. Should problems be observed during release, the valves can be closed and problems rectified. As the water to be used will water originally sourced from within the catchment and discharged as a ‘once off’ event, potential water quality impacts would be limited to sediment and erosion during release.

Management Strategies

Table 25 Management Strategies for Fauna

Fauna Aspect	Management Strategy
Collie Urea Plant	A Fauna Management Plan will be prepared as part of the Environmental Management Plan to maximise fauna survival during clearing and construction.
	A clearing plan will include opportunities for habitat linkages to be retained with the State Forest adjacent to the Site.
	Clearing will be supervised by the contract supervisor who will attend to the care of fauna that may be injured during the clearing process.
	Where practicable, disturbance of vegetation and the habitats provided by the vegetation will be minimised.
	When required, the use of a fauna clearance team will be used to remove and relocate any disturbed fauna.
	<ul style="list-style-type: none"> » Where practicable, Management measures will minimise the impact upon significant fauna species, these measures will include; <ul style="list-style-type: none"> – Where possible large stags with hollows will be left.



Fauna Aspect	Management Strategy
	<ul style="list-style-type: none"> - If large trees with hollows are removed then the hollows will be salvaged and donated to the Cockatoo care groups to support captive breeding efforts. - To assist in successful breeding events, areas not in use, buffers and areas to be rehabilitated will be planted with desirable feeding species for Cockatoos. <p>The loss of suitable habitat can be offset by regeneration of degraded vegetation or protection of existing habitat, in other areas</p>
	<p>Construction traffic will remain on designated tracks and not traverse through remnant vegetation patches</p>
	<p>All waste that may become a threat to fauna, for example, small packages and wires, will be disposed of according to the Waste Management Plan.</p>
<p>Water Supply Pipeline</p>	<ul style="list-style-type: none"> » Micro-siting the alignment to avoid or minimise loss of any large habitat trees will be adopted wherever possible, to reduce the impact of works in larger, less fragmented tracts of habitat. » Fauna crossing points will be included at regular intervals of approximately 500 m to allow movement under or over the pipeline by large fauna; » Movement 'tunnels' under the pipe will be included to allow kangaroos and other larger fauna to move under the pipe. Clearance of 600 mm should be allowed and 2 – 3 m wide. These clearances can be determined by natural terrain or by digging out under the pipe; » Movement 'bridges' over the pipe should be required to permit emu movement. Bridges should be at least 3 m wide and approximately 20 degree angle. Bridges will be constructed by mounding earth over the pipe; and » Consideration will be given to duplicating these crossing points on the existing pipeline to minimise the existing barrier effect. » If pipeline construction activities occur within private land, existing access points will be used wherever possible from public roadways. » A Fauna Management Plan will be developed prior to the construction phase. The management plan for the pipeline will incorporate measures to prevent mortality of ground-dwelling animals. » A Weed Management Strategy will be developed and incorporated in the Vegetation Management Plan. » Any revegetation/landscaping of temporarily disturbed areas will be undertaken using locally indigenous species that will mature into an



Fauna Aspect	Management Strategy
	approximation of the extant habitat.
Waterway Crossings	<ul style="list-style-type: none"> » Pump station construction will be undertaken within the footprint of the existing pump station, subject to Water Corporation agreement » The hydrostatic water release points will be located to minimise erosion and disturbance to the waterways and adjacent vegetation. » Minimise clearing width of corridor where possible, to retain maximum amount of existing riparian vegetation; » The area to be cleared at any one time at each site is to be minimised; » Rehabilitate cleared area with appropriate native species to width required for pipeline maintenance; » Pumps will be fitted with barriers to prevent aquatic organisms from entering; » Rescues of fish isolated by the barrier will be undertaken; » Pressure testing water will be re-used in other sections of pipe requiring testing as far as practicable; » Revegetation at crossing sites will be undertaken as soon as possible following construction activities; » Erosion control measures are to be installed at each crossing point prior to construction; » Site access is to be limited and controlled, with temporary waterway crossings constructed; » Where possible earthworks operations are to be confined to dry weather periods; and » Stockpiles of removed earth are to be located away from waterways and drainage lines unless adequately protected from erosion.
Waterway Crossings	<ul style="list-style-type: none"> » Implementation of appropriate drainage measures such as berms, grips and sediment settling ponds; » Vehicles are to be regularly maintained and cleaned in order to detect any leakages; » Refuelling areas are to be located away from permanent or ephemeral drainage lines and are to be stored in bunded areas; » Staff are to be trained in spill management and spill clean up kits capable of containing the incident provided on site; and » Fertilisers will be applied at the minimum rate required and mixed or combined with the surface layers of soil or mulch.



Monitoring

During construction the following monitoring programmes will apply:

- » Fauna monitoring will be undertaken during site clearing to remove and relocate any fauna identified. This will be undertaken in consultation with the Department of Environment and Conservation.
- » Prior to any clearing, trees with nesting hollows will be checked for breeding cockatoos.
- » All releases from hydrostatic pressure testing are to be visually monitored for erosion and excessive disturbance.

7.2 Air Quality

Management objective – To ensure that the quality of air emissions do not adversely affect environmental values of the health, welfare and amenity of people and landuse and meets statutory requirements and acceptable standards.

Potential air quality impacts during construction of the Collie Urea Plant and export facility at Bunbury Port will be emissions from heavy vehicle exhausts and dust generation from heavy equipment during earthworks and erosion from disturbed soil surfaces. Further details are provided in the Air Quality Assessment report in Appendix D.

7.2.1 Construction Dust

The impacts of dust emissions fall under two distinct categories, being health and amenity.

Potential health impacts are attributable to the concentration of respirable particles in ambient air. Respirable particles of dust have an aerodynamic equivalent diameter of 10 microns or less (PM₁₀). These fine fractions of dust would have maximum impact under light winds and stable atmospheric conditions. These conditions most frequently occur overnight and very early in the morning, and therefore, become more significant only if construction operations extend outside typical operating hours, which would be during daylight periods.

The presence of larger suspended dust particles, greater than 35 micron, is likely to affect amenity by way of reducing visibility (whilst in the air column) and by soiling of materials via dust deposition. Amenity impacts are most marked in high wind conditions, when larger particles may be displaced and transported a significant distance before being deposited and so soiling surfaces. Mitigation of amenity related dust impacts would in turn act to reduce health impacts due to dust emissions.

The extent to which these emissions may impact on the surrounding sensitive land uses would depend upon a number of site-specific factors.

Dust emissions will arise during construction of the Collie Urea Plant, the export facilities at Bunbury Port and the water supply pipeline. The following construction activities involve the movement and placement of soil, rock etc. and can be the source of dust emissions:

- » Mechanical disturbance: dust emissions resulting from the operation of construction equipment and vehicles; and
- » Wind erosion: dust emissions from exposed and disturbed soil surfaces under high wind speeds during construction.



Extensive inventories (US EPA 2001; NPI 2001) for PM₁₀ and TSP emissions from earth moving machinery are commonly used to characterise the source dust emission rates from activities on-site during the construction phase. At this stage, the reference design has not specified the schedule of operations and the exact type and number of dozers, scrapers, trucks and other earthmoving equipment, so that it is not possible to characterise these sources.

Collie Urea Plant

Based on the isolated nature of the Collie Urea Plant site and surrounding land uses, construction dust emissions are not considered significant.

Bunbury Port

As the extent of earthworks at the export facility will be relatively minor, dust emissions at this site are not considered to be significant.

Water Supply Pipeline

Sensitive receptors in proximity to the alignment are primarily restricted to residential properties to the north of Allanson and Collie.

At Allanson, properties along Railway Parade are within 100 m of the alignment, separated by the road and the Collie to Bunbury rail line. Approximately 22 dwellings are located within this area.

Between Allanson and Collie, there are several rural residences off Allanson, Hull and Patstone Roads within proximity to the pipeline alignment. North of Collie there are over 15 dwellings located along Booth Street which are within 100 m of the alignment.

Air quality directly adjacent to pipeline construction may be temporarily impacted during the construction phase as a result of vehicle emissions and dust generation due to earthworks required for levelling of the pipeline alignment, road and other infrastructure crossings and restoration works.

Dust may be generated from vehicle movement on access tracks, movement of soil during excavation and backfilling or from soil stockpiles where required. The extent of impacts will primarily be influenced by wind speed and direction during such works and the distance to sensitive receptors.

Works will be undertaken sequentially, with clearing followed by pipe stringing, construction and restoration works. Any particular site should only be exposed to concentrated construction activities over a period of days, subject to the construction contractor's approach. For any given area, the disturbance will be short term.

Access roads will not be sealed and will potentially generate dust over a longer period as vehicles will be travelling to and from the construction area over an extended period. The length of time a particular access road is utilised will depend on the availability of access along the alignment, property access and site terrain. Adverse air quality impacts such as dust inhalation by construction workers and site personnel, soil erosion, damage to vehicles and reduced visibility will be limited to the immediate area of construction.

7.2.2 Heavy Machinery and Plant

Emissions from heavy vehicles would consist of products of combustion, including NO₂, SO₂, PM₁₀ and volatile organic compounds (VOCs).



At this stage, the reference design does not specify the schedule of operations and the exact type and number of dozers, scrapers, trucks and other earthmoving equipment, so that it is not possible to characterise these sources.

Vehicle emissions will arise from diesel powered equipment used during construction. Emissions from heavy equipment will be minimised by ensuring all vehicles on-site are well maintained and operated in an efficient manner. Construction equipment will be fuelled using biodiesel or a biodiesel blend, where available.

Emissions from vehicles on-site are not considered to represent a significant source of emissions.

7.2.3 Management Strategies

As previously described, the reference design does not specify the schedule of operations and the exact type and number of dozers, scrapers, trucks and other earthmoving equipment, so that it is not possible to characterise construction dust sources. A management framework has been developed and would be applied to ensure dust emissions do not impact on sensitive receptor locations.

Dust emissions would be controlled by application of a dust management process, defined as part of the site Environmental Management Plan. The dust management process would provide real-time monitoring of fine particulate emissions during construction, with agreed trigger points at which mitigation measures must be initiated.

Using this approach, a staged dust management plan for dust mitigation and management measures would be influenced by the proximity of sensitive receptors. In essence, the dust management measures would detail actions for typical and high level dust control and would specify at which locations each set of actions should be followed.

Typical Dust Management and Mitigation Measures

Typical dust management measures are based on the principles found in the *Environmental Guidelines for Major Construction Sites* (Vic EPA 1996). From the identification of potential dust emission sources, appropriate dust management and mitigation measures for a typical level of control would include:

- » All construction and maintenance equipment/vehicles to be operated and maintained to manufacturers specifications in order to minimise exhaust emissions;
- » Defined haul routes to be used wherever it is necessary for vehicles to traverse unsealed surfaces or unformed roads;
- » Vehicular speeds would be limited to 15 km/h on areas of unconsolidated or unsealed soil associated with the project;
- » Prompt mitigation of visible dust emissions, which may involve a combination of:
 - Stabilisation of surface silt content through application of localised water sprays, or the use of appropriate chemical dust suppressants (suitable for access roads which are traversed less frequently);
 - Control of mechanically induced dust emissions (from clearing, scraping, excavation, loading, dumping filling and levelling activities) by application of water sprays;



- Awareness of operational areas more frequently exposed to higher winds and the predominant wind directions in these areas at various times of the year. Temporary wind barriers may be employed where necessary;
- Review of daily weather updates from BoM, or a private meteorology service provider, to give warning of likely strong winds to assist with daily management of wind blown dust from unconsolidated soil surfaces and material stockpiles;
- All haulage vehicles are to have their loads covered while transporting material to the work area; and
- Areas of disturbed soil are to be re-vegetated as soon as practicable.

High Level Dust Management and Mitigation Measures

It is proposed to develop a proactive and reactive dust management regime that makes use of real-time particulate monitoring to achieve a high level of control. This regime may employ one or two real-time aerosol monitors, with PM₁₀ size selective inlets.

These real-time monitors can be configured to provide a warning (via an audible or visible signal or as a communication link) of short-term elevations in concentrations of respirable dust. This is to enable immediate dust suppression and remediation steps to be initiated. It is recommended that reactive mitigation measures include:

- » Application of additional water sprays;
- » Reducing the intensity of operations, including speed limits to 10 km/h, or even zero if required; and
- » Restricting the extent of construction operations until suitable meteorological conditions prevail.

The threshold particulate concentration for alarm/warning activation could be based on an interpretation of SEPP-AQM intervention levels for respirable dust. The 24-hour Intervention Level is 60 µg/m³ but this could be used as the short-term trigger level.

Table 26 lists the typical array of dust control measures that would need to be evaluated and detailed in the dust management process.

Table 26 Recommended requirements for control of dust emissions

Dust Source	Specific Requirements
General	An adequate supply of water would be available at all times.
	Water use for dust suppression shall not create contaminated run-off that could enter surface water bodies.
	Water would not be sprayed at the site access point where mud could be transported onto the surrounding public roads.
	All construction trucks would be kept to designated routes on site.
	Loads would be wet-down when there is potential for unacceptable dust to be generated from the material being transported.
Administrative vehicles	Speed restrictions would be utilised to minimise the generation of dust. As a general rule speeds should be restricted to less than 25 km/h on site.



Dust Source	Specific Requirements
Vehicles leaving and entering the site	All site exits and entrance points for trucks would be paved.
	Sealed entry and exit roads would be swept as required to control the accumulation of dust.
	The tailgates of all trucks leaving the premises would be securely fixed to prevent loss of materials.
	Where sediment or mud is deposited on a public road, the sediment or mud would be cleaned up immediately.
Stockpiles	<p>Sprinklers and water cannons are to be maintained and operational to apply water to the faces where necessary.</p> <p>The sprinkler shall operate out of working hours as required.</p> <p>Dust suppressants to be used to seal surfaces where practicable.</p> <p>The Site Manager would monitor the condition of the stockpiles.</p>
Contingencies in event of dust generation	<p>During periods of the year with higher evaporation rates (October to April), the Site Manager is to obtain daily weather updates from BoM or a private meteorology service provider to provide adequate warning of likely strong wind forecasts to assist with daily management of wind blown dust.</p> <p>Where high winds are predicted, the Site Manager shall implement proactive dust suppression measures such as extra dust suppression of stockpiles and haul routes.</p> <p>When dust generation is noted (either through an alert from monitoring data, or noting visible dust on and/or off site) proactive suppression measures are to be implemented. These include:</p> <ul style="list-style-type: none"> » Increased use of water and dust suppressants; » Reduction of speed on haul roads; and » Halt work in the area generating the dust until effective dust control measures can be applied.

Dust Monitoring Program

Table 27 presents the requirements for the dust monitoring program. Through the use of real-time data, the program is designed to facilitate an adaptive management approach. The operator may amend this program as required following review of the program's effectiveness in assessing performance against compliance benchmarks.

Table 27 Recommended dust monitoring program requirements

Program	Specific Requirements
Inspection Program	The Site Manager would undertake a daily visual inspection of dust suppression.



Program	Specific Requirements
Real time dust monitoring program	<i>Real-time aerosol dust monitoring station</i>
	The site would utilise at least one real-time aerosol dust monitoring station to allow for an adaptive dust management strategy.
	<i>Dust deposition gauges</i>
	The site would also utilise several dust deposition gauges as required on the site boundaries to provide an assessment of compliance to the 4 g/m ² /month nuisance dust deposition criterion.
	Dust deposition gauges would be sampled on a monthly basis.
	<i>Locations</i>
	The monitoring station would be located as required, dependent on prevailing winds, to assess potential dust impacts on residences.
	<i>Dust Monitoring Units</i>
	The aerosol monitor would be fitted with:
	A 10 micron size selective inlet matched to the inlet flow rate; A heating coil around the inlet air tube so as to reduce the humidity in the inlet air stream;
On-site anemometer recording wind speed and direction. It can be used to provide real-time indication to the site office on mean and gust wind speed.	
Standards for siting, installation and operation:	
The aerosol monitoring station and dust deposition gauges would conform to <i>AS2922 1987 Ambient Air - Guide for the Siting of Sampling Units</i> .	
The aerosol monitoring station would conform to the relevant components of <i>AS/NZ 3580.12.1 2001 Methods for Sampling and Analysis of Ambient Air Method 12.1: Determination of Light Scattering - Integrating Nephelometer Method</i> and <i>AS2923:1987 Ambient Air – Guide for the Measurement of Horizontal Wind for Air Quality Applications</i> .	
The dust deposition gauges would conform with <i>AS3580.10.1: 1991 Methods for Sampling and Analysis of Ambient Air – Determination of Particulates – Deposited Matter – Gravimetric Method</i> .	
The anemometer station conforms to <i>AS2923:1987 – Guide for Measurement of Horizontal Wind for Air Quality Applications</i> .	
The monitoring station would be secure from vandalism and tampering at all times.	
Monitoring equipment would be maintained and calibrated on a regular basis.	
<i>Alert level</i>	
The unit would be configured to record 10-minute averages of PM ₁₀ . An “alert level” would be determined, an indicative level being 100 µg/m ³ over a 10-minute average.	



Program	Specific Requirements
	The monitoring station would be linked to a computer in the site office. Site staff would be instructed to regularly check dust levels measured by the station via the computer.
Contingency Program	<p>Where the “alert level” is triggered, a contingency program is to be enacted immediately and consequent actions logged. The program shall include:</p> <ul style="list-style-type: none"> » Immediate inspection of the site for signs of dust; » Proactive suppression measures such as use of water carts and water canons; and » Cessation of earth moving/levelling operations.
	<p>All exceedances shall be recorded using the site environmental incident report.</p> <p>The dust monitoring station would be configured to allow for examination of historical records to demonstrate compliance with the criteria.</p>
Dust Deposition Monitoring Program	<p>A minimum of two dust deposition gauges would be installed, in accordance with AS3580.10.1 –1991. These would be located on the site boundary between the works area and the location of sensitive receptors.</p> <p>Samples would be taken from each gauge at monthly intervals for gravimetric analysis in accordance with AS3580.10.1.</p> <p>Annual averaged results of the deposition rates from each gauge would be provided to DEC to demonstrate compliance.</p> <p>Dust deposition monitoring may be discontinued after 12 months of monitoring, subject to clear compliance with the criterion.</p>

7.3 Waste Management

Management objective - To minimise, reuse or recycle waste where possible; to treat onsite or dispose offsite liquid and solid wastes at an appropriate landfill facility; and to manage contaminated materials to minimise risk to public health or potential for groundwater and surface water contamination.

Volumes of solid and liquid wastes (including stormwater) will be generated during the construction phase. Standard management practices will be put in place to mitigate potential on and off-site impacts.

7.3.1 Solid Waste

The discharge of solid waste has the potential to impact water quality and the vegetated areas that have been retained. These wastes could impact fauna habitat and may accumulate in the wetlands or in the State Forest 4.

During construction, solid waste will be comprised of domestic and construction waste from the plant area. Domestic waste quantities are expected to total approximately 1 tonne per day. Construction waste is expected to comprise:

- » Electrical off-cuts and cabling;



- » Plastics;
- » Concrete;
- » Damaged products;
- » Steel and pipe off-cuts;
- » Timber;
- » Packaging material; and
- » Used tyres.

Hazardous solid wastes will not be generated during construction.

All wastes will be collected and disposed by a licensed waste contractor and disposed of in an appropriate licensed recycling or landfill facility.

7.3.2 Liquid Waste

There are no hydrographic features such as wetlands, damplands or waterways occurring on the proposed plant Site. There is however a waterway and associated wetlands occurring along the southern boundary. This waterway is ephemeral in nature, only discharging during rainfall events.

The potential impacts associated with this proposal are:

- » Soil erosion once the Site has been cleared leading to soil loss;
- » Increased sedimentation in nearby waterways and wetlands downslope of the cleared area;
- » Increased surface runoff as hardstand areas are constructed; and
- » Contamination of surface runoff from construction activities such as leaks and spills impacting surface water and groundwater quality.

Prior to construction, approximately 99 hectares of land will be cleared. There is some risk during clearing of some loss of sand to the wetlands and an impact of the ephemeral drainage system in this same location, so measures will be taken to address this.

During construction a labour force of about 1,500 people will be employed at the Site. The construction workforce will not be housed at the Site, however office and amenity facilities will be provided.

During construction liquid waste will comprise domestic wastewater and surface runoff from the planned Plant Site. Surface rainfall will be the main source of runoff although some runoff may occur where water is used for dust suppression.

Management Strategies

The strategies detailed in this section are guided by the Waste Avoidance and Resource Recovery Regulations (2008) and by the recommendations of Water Quality Protection Note 52, Stormwater management at Industrial Sites (DoW 2006).

The potential impacts identified above will be managed by the following strategies:



Table 28 Solid Waste Management

Solid waste source	Management requirement
Construction	<p>Solid waste management plans will be prepared as a requirement of each construction contract.</p> <p>Construction wastes will be segregated and handled separately to maximise opportunities for reuse or recycling. Construction wastes will be separated according to the Waste Avoidance and Resource Recovery Regulations (2008)</p> <p>All solid waste will be recycled or landfilled as per the requirements of the Shire of Collie and DEC requirements to landfill sites with the appropriate classification. Where local services are available, construction related waste will be recycled wherever possible.</p>
Liquid waste source	Management requirement
Clearing	<p>An erosion control plan will be developed prior to the land being cleared to minimise erosion and possible sedimentation in the wetlands located along the southern boundary.</p> <p>A stormwater management plan will be prepared prior to construction that complies with the Standards and recommendations in <i>Water Quality Protection Note 52</i> (DoW 2006).</p> <p>Bunding will be established along the southern boundary adjacent to the wetland to prevent sediment accumulation.</p>
Stormwater	<p>A water quality monitoring programme will be established to ensure that stormwater is discharged according to DoW guidelines (WQPN 52, DoW 2006). This will be prepared for the Plant Site and Berth 5 at Bunbury Port.</p>
Construction	<p>During construction, all infrastructure which potentially could leak or spill contaminated substances will be sealed and banded. Runoff collected from these areas will be treated according to Best Management Practice and discharged into a lined storage area for water quality and testing prior to release into the environment.</p> <p>Sediment traps will be installed at the outlet of diversion drains to minimise erosion and attenuate flows.</p> <p>Fuel storage will be in banded areas.</p> <p>Domestic effluent will be disposed by way of portable containment facilities that are removed and the collected waste treated off-site by a registered Environmental Services contractor.</p> <p>Sediment basin(s) will collect all stormwater from the construction site and will be designed to allow its controlled release off-site once quality is confirmed and is within acceptable limits. If the quality is outside limits a registered Environmental Services contractor will be engaged to remove and treat the wastewater offsite.</p>



7.4 Noise

7.4.1 Water Supply Pipeline

Likely noise levels produced by construction plant typically used for pipeline construction have been sourced from previous projects. Noise levels produced by typical equipment are shown below for a variety of distances to a typical receiver, with neither noise barriers nor acoustic shielding in place and with each plant item operating at full power. As shown in Table 29, noise levels reduce with hemispherical spreading by 6 dB(A) with each doubling of distance.

Table 29 Predicted Plant Item Noise Levels. dB(A)

Plant Activity SWL dB(A)	50 m	100 m	200 m	400 m	800m	1600m
Crane 110	65	59	53	47	41	35
Backhoe 108	63	57	51	45	39	33
Piling Impact Boring 120	75	69	63	57	51	45
Compressor 100	55	49	43	37	31	25
Compactor 110	65	59	53	47	41	35

Construction activity will generally include clearing (bulldozer), excavation (where required), fitting and laying of pipes (pipe laying machinery). The clearing, excavation, pipelaying and backfilling will be done sequentially and progressively. Any particular area of the construction site will experience raised noise levels for only short periods.

Rock breaking, (similar to that employed for preparation of house foundations), will be avoided if possible and would only be expected in the rougher terrain around Wellington Dam in locations where it is necessary to bury the water pipeline. Where rock is encountered and cannot be avoided, rocks will be broken using a standard excavator mounted rock breaker as required. This will be the noisiest equipment.

Construction hours will be limited to typically 7am to 5 pm. Work hours may be restricted in areas where sensitive receptors means construction works are likely to cause nuisance.

Based on the above, and given that the equipment used is typical of that used in an urban environment for general infrastructure construction, detailed noise assessment is not warranted and has not been undertaken for pipeline construction. Residential areas in proximity to the alignment will experience some daytime noise impact but this will be temporary, and spread out over a short period. Overall, noise impacts from construction of the pipeline are expected to be low.



7.4.2 Management Strategies

Table 30 Noise Management Strategies

Noise	Management requirement
	Construction equipment will be in good condition.
	All combustion engine plant, such as generators, compressors and welders will be checked to ensure that they produce minimal noise with particular attention to residential grade exhaust silencers.
	Where practical, machines will be operated at low speed or power and will be switched off when not being used rather than left idling for prolonged periods.
	Machines found to produce excessive noise compared to industry best practice will be removed from the site or stood down until repairs or modifications can be made.

7.5 Transport

7.5.1 Collie Urea Plant

Traffic

Traffic volume data for 2008 on the Coalfields Road show average counts of around 4,000 to 5,000 vehicles per day.

The traffic conditions of major roads and intersections can be quantified in terms of their operating level of service. Level of Service is defined by Austroads (1988) as a qualitative measure of features that include speed, travel time, traffic interruptions, freedom to manoeuvre, safety, driving comfort, convenience and operating costs. Level of Service (LOS) ranges from A to F as described below:

- » LOS A Generally free flow conditions with vehicles unimpeded in manoeuvring in the traffic stream.
- » LOS B Stable flow with manoeuvring traffic stream only slightly restricted with the possibility of slight delays.
- » LOS C Stable flow with manoeuvring becoming more restricted however any delays are acceptable.
- » LOS D Approaching unstable flows with delays common but tolerable.
- » LOS E Unstable flow with traffic stream congested and with intolerable delays.
- » LOS F Forced flow with movement of traffic stream at very slow speed.

For a single lane carriageway such as the Coalfields Road, a LOS C can be achieved with a daily vehicle count of approximately 12,000 vehicles per day.

Even assuming all construction workers drive their own vehicle and all travel down the Coalfields Road, traffic volumes on the Coalfields Road will remain well below a LOS C threshold.

Traffic volumes on the Collie Kings Lake Road are significantly lower. The potential increase in traffic volume as a result of construction activity will similarly not affect the LOS for this road.



As possible impact will be greatest during shift change times, PCF will implement management strategies such as coordinating with other industries to stagger shift change times, supporting buses or car pooling for workers, placing curfews on heavy vehicle movements during shift times and driver road safety awareness. PCF has joined and contributed funding to the Industry Road Safety Alliance, which involves a number of key stakeholders such as Main Roads WA, WA Police, the Shire of Collie and industries in the Collie region.

Pre-assembled Modules

PCF propose to construct a number of elements of the plant as pre-assembled modules. These will potentially be constructed off-shore and shipped to Bunbury for road transport to the Shotts Industrial Park. Modules may include water treatment units, air separation units, PSA units and electrical sub stations.

Modules are expected to have dimensions in the order of height 7-8 m, width 7-8 m, length 60 m and weight 400 t.

Modules will be shipped and transported individually. PCF will coordinate the routes and timing with Main Roads and the Western Australian Police. Appropriate permits will be sought from Main Roads. It is likely modules would be road transported during the night so as to avoid shift times and minimise traffic impacts.

Movement of large loads on the Coalfields Road has been undertaken previously and with the appropriate permits and safeguards are expected to have minor and manageable traffic impacts.

7.5.2 Bunbury Port

Construction activity at the Bunbury Port is expected to only require a relatively small workforce which will not generate any significant additional traffic volumes. The majority of construction materials can be brought to site using standard transport.

Large plant such as the ship loader will be transported by sea and will not impact local traffic.

7.5.3 Water Supply Pipeline

The traffic and access impacts associated with the construction of the water supply pipeline will be localised. The activities associated with its construction may have the following potential impacts on the surrounding road network:

- » Additional traffic, including heavy vehicle traffic on the surrounding road network; and
- » General traffic disruptions and temporary road and access restrictions.

Construction of the water supply pipeline is estimated to take between 10 and 16 months subject to the size and type of pipe used. The rate of construction will vary from 30 to 100 m per day depending on the pipe specifications and site conditions.

The pipe will be transported to the area of construction on a daily basis and will result in approximately 1 to 3 truck movements per day, subject to vehicle type, the number of pipes which can be transported in a single load and the speed at which the pipeline is constructed. Alternatively, a laydown area will be identified closer to the construction site.



The construction of the water supply pipeline will increase the volume of heavy vehicular construction traffic along the main road network and the roads to be utilised for construction. However, the impacts to any one area will be for short periods, as the construction of the pipeline progresses along the pipeline route. The movement of specialist construction equipment will require the use of public roads, generally for short distances. In such cases, controlled traffic conditions may be put in place for short periods.

At about 13 kms from the dam end of the pipeline, the pipeline will cross under the Coalfields Road and Collie to Bunbury rail line. Consultation with Main Roads and WestNet will be required to discuss an approach to construction for this section, to minimise impacts on the rail system. If possible, trenchless construction techniques may be employed here.

Road closures may be required to allow construction of the pipeline under local roads. In such instances, appropriate detours or temporary access tracks will be used. Impacts in each case will only be for short periods.

Access to some properties may be restricted for short periods during construction. Affected landowners will be consulted with regard to the provision of access during such periods.

Protocols for accessing properties will be established with all affected landowners.

7.5.4 Management Strategies

Table 31 Transport Management Strategies

Transport	Management requirement
	Measures to monitor and improve employee driver behaviour have been implemented as part of the Industry Road Safety Alliance and companies are using car pooling and buses to alleviate congestion and make commuting safer.
	Coordination will occur with Main Roads and WA Police regarding transport of pre-assembled modules from Bunbury Port to the Industrial Park.
Water Supply Pipeline	A traffic management plan will need to be prepared in accordance with AS 1742.3 and Main Roads Traffic Management for Works on Roads Code of Practice to facilitate the diversion of traffic and cyclists.
	Relevant permits will be obtained for all road closures necessary for the pipeline crossing of a road.
	Coordination with Main Roads and WestNet will occur regarding crossings under the Coalfields Road and Collie to Bunbury rail line respectively.



7.6 Amenity

7.6.1 Collie

Collie is a neat, attractive town with a mix of historic buildings such as the Post Office and modern facilities such as the Visitor Centre and Library. The Shire and community have invested considerable effort over time to maintain the amenity of the town and in 2006 the town was granted a prestigious National Tidy Town award.

While Collie residents are clearly proud of their town, Collie is physically divided by the railway line, restricting access to the businesses and community infrastructure distributed on either side. The Shire is planning an upgrade of the central business area (Shire of Collie, 2008).

Sensitive receptors in Collie and at locations downwind of the proposed plant are of sufficient distance not to be affected significantly by urea particulates and other air emissions. PCF will nonetheless monitor and manage any amenity impacts and will report regularly to the community through publicly accessible project updates and local information channels, particularly when climatic conditions are unfavourable.

Regarding general or cumulative amenity impact, increased traffic movements through Collie during construction and operation of the Plant, and associated noise, emissions and dust impacts, are likely to add to the effects already being experienced in Collie from other industrial projects in the area. PCF will use fully enclosed rail cars for the transport of urea which will ensure no urea dust issues arise during rail operations through Collie township.

7.6.2 Shotts Industrial Park

The Collie Basin forms a north westerly trending valley in the Darling Plateau and is characterised by bedrock outcrops and a dissected topography (DoW 2007). The area consists of a combination of gently undulating uplands and broad valley floors. A small granite outcrop occurs on the southern edge of the area (GHD 2008).

Land use in the area includes farming and forestry, with industrial use predominately open cut coal mining and power generation. The Shotts site is located adjacent to the Ewington coal mine. Muja coal mine and Premier mine are located within 10 km of the Shotts site. The Shotts site is within 5 km of the existing Collie power station and Bluewaters power station at the Coolangatta Industrial Estate. The Muja power station is located approximately 9 km to the south east.

The site of the proposed Collie Urea Plant, within the proposed Shotts Industrial Park, is between two working coal mines that are existing stark features of the landscape. While the Collie area is highly forested, mining is well-established in the landscape and can be seen when out of town approaching from the west along the Coalfields Highway. Visual accessibility tends to be governed by the undulating terrain of the study area, and the industrial parts of the landscape become most apparent when in close proximity on the Coalfields Road.

Visual user groups include employees commuting to work in the existing industries, occupants of the offices of these industries, local residents travelling between Collie and Darkan, tourists passing through the area to the Collie Darkan Rail Trail, visitors to Stockton Lake, users of the Stockton MotorCross circuit and a small number of residences in the area. The number of people using the area is limited by access restrictions to the mine areas and to the State Forest adjacent to the site, but informal public access is reported to occur on most roads and tracks throughout the area (DEC 2009).

The highest parts of existing mines and mine infrastructure can be seen from some locations, including from points adjacent to Stockton Lake, but are mostly filtered by roadside vegetation and local topography. From many of the lower points, that is, on the shores of Stockton Lake itself, the industrial features of the landscape are largely not visible and do not impact upon the visual qualities of the site.

The plant will be a major physical feature, consisting of a mix of structures up to 100 m in height and cover an area of 99 ha. **Error! Reference source not found.** shows an artistic impression of the plant.

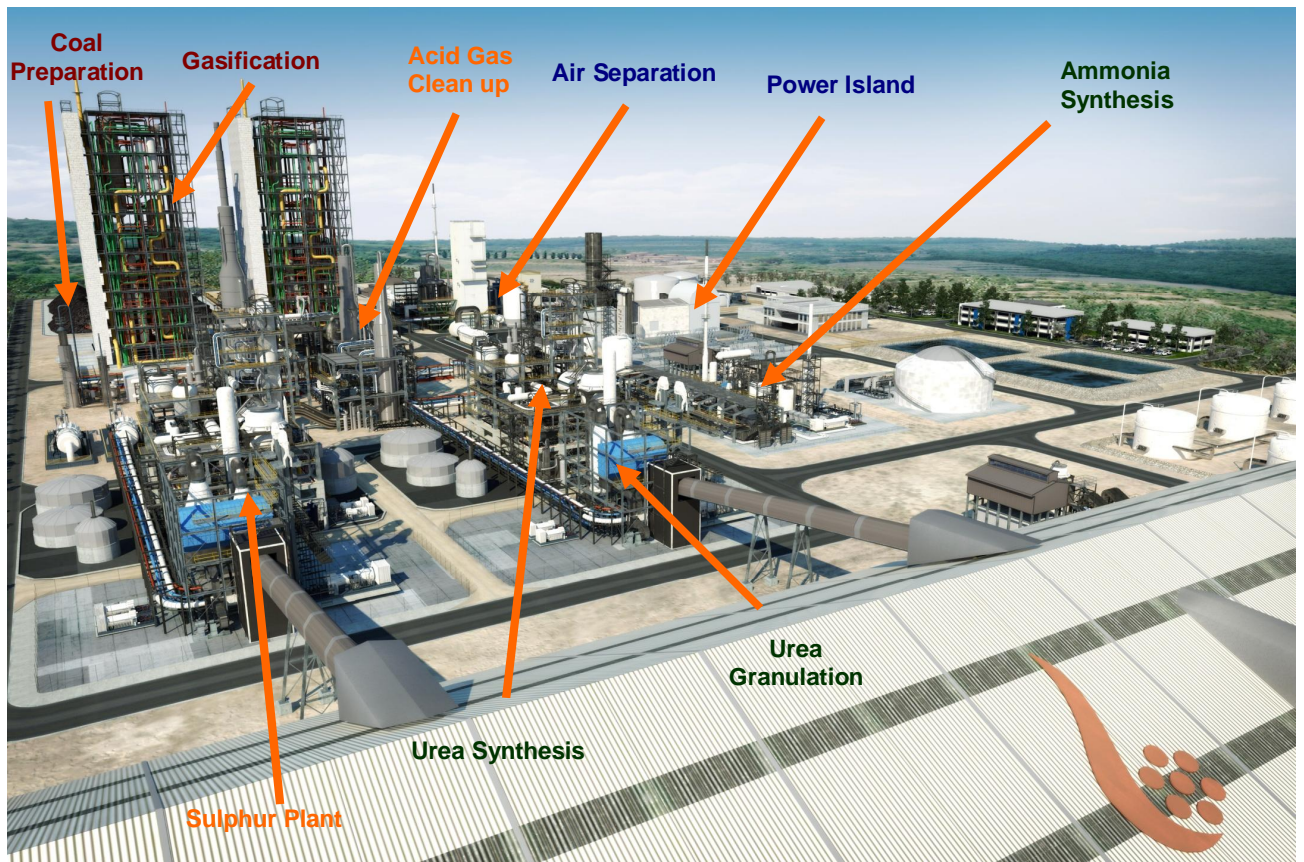


Figure 26 Artistic Impression of the Plant

Visual impacts associated with the plant are considered to be minor as it is to be located between two working coal mines that are existing stark features in the landscape. The plant will occupy a much smaller footprint than the mines and will therefore be visually less dominant. While the Collie area is highly forested, mining is well-established in the landscape and can be seen at several points when approaching from the west along the Coalfields Highway.

A site investigation revealed that the plant may be visible from a small section of Coalfields Road when approaching from the west, and within 500 metres of the site, however the local topography limits visibility and such views would be followed closely by those of the existing coal mine to the north of the



site. Views in this immediate area are also expected to be modified by other development in the Shotts Industrial Park. Visual accessibility surrounding Shotts tends to be limited by the undulating terrain of the study area and roadside vegetation. The industrial parts of the landscape become most apparent when in close proximity on the Coalfields Road. Visual impacts are therefore likely to be largely localised.

At present, mines and mine infrastructure can be seen from some locations, including from high points adjacent to Stockton Lake, but are mostly filtered by roadside vegetation and local topography. The highest parts of the plant infrastructure therefore may be seen from these points but will not be dissimilar to existing views. From lower elevation viewing points, that is, on the shores of Stockton Lake itself, the industrial features of the landscape are invisible and do not impact upon the visual qualities of the site.

Light spill likewise will be minimised by the undulating topography and vegetation, but is likely to be less localised, and a small number of residences in the area may experience minor impacts. It is noted that contemporary lighting technology such as that to be installed at the Urea plant greatly reduces light spill.

7.6.3 Bunbury Port

Additional train movements to Bunbury Port, and specifically to Berth 5, are expected to add to noise at the Port. PCF intends to adopt continuously rail unloading operations to avoid unnecessary noise generation such as that which occurs as a result of stop-start rail car shunting.

Ship loading facilities will be provided by Bunbury Port. This facility will be enclosed such that urea may be unloaded from trains and loaded onto ships in all weather conditions. Dust (urea) generated in this process will be contained within this facility.

The Bunbury Port Authority (BPA) consults on most issues regarding Port operations, through regular presentations to the Port Community Liaison Committee (PCLC), which it manages. The PCLC represents a broad cross section of the Bunbury community, particularly residents who have been impacted by noise and dust from Port operations in the past. Members of the PCLC include residents of the Port area, City of Bunbury Councillors, representatives of the Bunbury Wellington Economic Alliance and the Bunbury Port Authority.

Interviews were conducted with the Bunbury Port Authority regarding potential amenity and health impacts, and feedback was sought from the Port on concerns raised by the PCLC. A number of aspects were raised by the group in relation to the Collie Urea Project:

- » Urea product – size, dust, solubility and hazard rating;
- » Transport – noise from additional rail movements, number of trains per day, timing of movements and unloading timing;
- » Amenity impacts of infrastructure and operations – visual impact of ship loader, number of ships and timing of loading; location of storage shed, visual impact (i.e. colour) and ventilation; noise levels of operations; product management on conveyors and loaders and in the shed;
- » Security – alarm system;
- » Lighting – light spill;
- » Environmental protection – spillage control; storm water management; site monitoring processes (monitoring shallow ground water); and
- » Site administration.



The Port Authority maintains a real time ambient dust monitoring system and during 2007/2008 no port related exceedances were recorded (Bunbury Port Authority 2008). Interviews with the Port Authority revealed that complaints from local residents about dust and noise associated with Port activities have decreased in recent times but have been issues in the past. Dust and noise complaints peaked approximately four years ago, with 54 contacts regarding noise in the 2004/2005 financial year and 25 regarding dust. In the past few years they have decreased significantly, with seven contacts regarding noise in the 2007/2008 financial year and one regarding dust. The drop in complaints is attributed to better management and a decrease in rail movements.

Table 32 Contacts received by BPA regarding port activities

	Number of contacts received in financial year			
	2004/2005	2005/2006	2006/2007	2007/2008
Dust	25	25	17	1
Noise	54	33	21	7

Source: BPA

Noise has been a significant issue in the past, particularly for Austral Parade residents less than 100 m south-west of Berth 5. In response, the Port Authority considered building a 3 to 3.5 m high wall on the estuary side of the Port along a 600 m stretch of the Koombana Drive boundary, but wall plans were set aside when rail movements and noise complaints decreased. The Port may need to reconsider the wall option closely again in the context of additional rail movements from the Collie Urea Project.

Development of the PCF facilities at the port will include a large (60 - 100,000 tonne capacity) storage shed and a ship-loader at Berth 5, on the south-west side of the Inner Harbour. The storage shed is expected to be approximately 285 m long and 27 m high. In comparison to the current woodchip pile, the shed will be similar in height and will therefore be partly visible from Koombana Drive and from the public open space and residences across the Leschenault Inlet.

However, because these structures are consistent with the types of existing port structures, visual impacts associated with the port infrastructure are considered to be minor. A number of mechanisms for mitigating these impacts will be considered such as the colour of the shed (advice from the Bunbury Port Authority is that green is typically the most preferable colour), use of screening vegetation between the shed and Koombana Drive and architectural design solutions such as panelling to break up the solid structure.

7.6.4 Water Supply Pipeline

Construction of the pipeline will involve clearing up to a 20 metre wide corridor (subject to site conditions), levelling of soil, stringing and joining the pipes, construction of an access track and rehabilitation of the disturbed area. Rehabilitation will primarily consist of sowing appropriate low growing vegetation commensurate with the surrounding vegetation. Trees and large shrubs will be prevented from growing adjacent to the pipeline, in order to avoid potential damage or restrict access.

The level of visual intrusion will be lower along existing easements (pipeline, road, rail transmission lines) and greatest in areas of higher visual values such as Wellington Dam and Wellington National Park.

There are five broad landscapes through which the pipeline will traverse. These are:



- » Beside Wellington Dam;
- » Forested areas;
- » Cleared agricultural land;
- » Road and transmission line easements; and
- » Rural residential areas.

The visual assessment considers the rehabilitated easement (rather than the freshly disturbed construction area) as this represents the long-term impact.

As the pipeline will run next to the existing water pipeline, amenity impacts will not significantly change as a duplicated pipeline does not represent a new visual element in the landscape and does not significantly alter the scale of impact over that of the existing pipeline. The urea plant pipeline may be up to twice the diameter of the existing pipeline.

Wellington Dam and related existing infrastructure is central to the provision of water at a local and regional level. The construction of a new pipeline is consistent with the history and function of the Dam and does not introduce a new visual element to this landscape.

Construction of the pipeline will in part require clearing, in sections, of the existing easement, most notably in the State Forest and National Park around Wellington Dam where a cleared easement has not been maintained. Whilst the pipeline itself is not incongruous with this easement, the additional clearing will create a further opening of the canopy than currently exists. However, other than single crossings of Wellington Dam and Polo Roads, the easement in this area is not visible to visitors to the Dam or the one residence adjacent to the Dam respectively.

Where the pipeline crosses cleared agricultural land, it will run parallel to the existing pipeline and not significantly alter the visual environment.

North of Allanson, the alignment parallels the existing pipeline, railway and Railway Parade. Again, amenity will not be significantly altered.

North of Collie, the alignment runs along property boundaries and local roads. In some locations, clearing may be required within the existing easement. In some instances this may be in proximity to dwellings. The loss of a small number of trees in these areas may have noticeable visual impacts where views from dwellings are towards the alignment. The urea plant pipeline itself is unlikely to have a significant impact on amenity given the existing pipeline.

Based on the above, visual obtrusiveness will be minimised. Visual impacts from pipeline structures are considered to be minor.



7.6.5 Management Strategies

Management strategies to mitigate amenity impact are shown in Table 33.

Table 33 Management strategies to maintain amenity

Amenity	Management requirement
Collie Urea Plant	PCF will use fully enclosed rail cars for the transport of urea which will ensure no urea dust issues arise during rail operations through Collie township.
	Maintain and enhance screening vegetation along the Collie Kings Lake Road.
	Employ lighting design to reduce light spill from the urea plant.
Bunbury Port	Fully enclose all urea handling facilities to contain urea dust.
	Employ lighting design to reduce light spill from the storage shed and loading facilities.
	Include a continuous unloading facility to unload rail wagons and reduce noise from 'clanking' wagons.
	Consider colour and design solutions to minimise the visual intrusion of the storage shed.
Water Supply Pipeline	Maintaining existing native vegetation screening where possible around the pump station and other structures.
	Landscaping around any structures with indigenous vegetation species;
	Painting the pipe with matt colours to best blend into the background.
	Minimising the clearing width of the construction corridor where practicable.
	Maintaining screening vegetation between the pipeline and nearby residences.
	Removing construction equipment from the corridor as soon as practicable after works have been completed.
	Commence rehabilitation as soon as possible after construction.

7.6.6 Monitoring

PCF will monitor and manage any amenity impacts and will report regularly to the community through publicly accessible project updates and local information channels, particularly when climatic conditions are unfavourable.



7.7 Aboriginal Heritage

7.7.1 Collie Urea Plant

An Aboriginal Heritage survey was undertaken of the Urea Plant site in June 2009 to determine if there were any sites of significance to the Nyungar people which may be affected by the project.

As a result of this survey and consultation held with 11 members of the Gnaala Karla Booja WC98/058 Native Title Claim group as determined by the South West Aboriginal Land and Sea Council, no sites of significance as defined by Section 5 of the Western Australian *Aboriginal Heritage Act* (1972) were identified to be located within the area proposed for development.

As no previously recorded sites or new archaeological site were located within or in close proximity to the proposed development, there will be no known impact upon an archaeological site from the proposed Plant development.

7.7.2 Bunbury Port

There are no heritage impacts associated with the development of storage and loading facilities at Berth 5.

7.7.3 Water Supply Pipeline

An Aboriginal Heritage survey will be undertaken for the pipeline corridor subject to confirmation of the alignment following detailed design.

A search of the on-line Aboriginal Heritage Enquiry System (Western Australian Department of Indigenous Affairs, July 2009) was undertaken to identify any known Aboriginal heritage sites along the proposed alignment.

The alignment crosses the Collie River (Site ID 16713) which is a mythological site.

The alignment passes in the vicinity of Old Aboriginal Reserve (Site 4604) and Harris River Road (site 17286) to the west of Collie. Both sites were camp sites.

To the east of Collie, the alignment passes in the vicinity of Eight Mile Pool (Site 4690) which is a ceremonial and mythological site and an artefact scatter on Griffin Coal mine (Site 5304).

The alignment of the pipeline will be reviewed in light of the Aboriginal heritage survey to be conducted on the corridor. Given the alignment is following the existing pipeline, it is expected that the easement has already been subject to significant disturbance and the urea plant pipeline construction is considered a low risk of disturbing specific sites.

7.7.3.1 Management Strategies

The most likely areas where archaeological sites, in particular, artefact scatters or burials, may occur are banks of creeks, swamps and exposed sandy deposits. The removal or excavation of large quantities of sediment increases the risk of disturbing archaeological sites that may lie beneath the ground surface. It is recommended that by Perdaman inform any project personnel of their obligation to report any archaeological material, should this be encountered during earthmoving, as outlined under Section 15 of the Western Australian Aboriginal Heritage Act 1972.



Table 34 Heritage Management Strategies

Aboriginal Heritage	Management requirement
General	All construction workers should be informed as part of site induction of their obligation to report any archaeological material, should this be encountered during earthmoving.
	If an archaeological site is located in the process of survey or ground excavation, it is recommended that work cease in the immediate area. Any skeletal material should be reported to Department of Indigenous Affairs and the Western Australian Police Service. Any artefactual material should be reported to Heritage and Culture Division, Department of Indigenous Affairs.
Water Supply Pipeline	An Aboriginal heritage survey will be undertaken for the pipeline corridor once detailed design has confirmed a p-referred alignment.
	Management measures will be developed based on the Aboriginal heritage survey