

6.1.6.2 Impacts**Construction noise impacts**

The greatest potential for construction noise generation will occur during construction of the WBTP and its associated infrastructure. It is noted however that there were no noise complaints received by Santos in relation to the construction of the ponds at Leewood, which was undertaken over about 15 months.

Construction scenarios and their associated significant items of equipment are summarised in Appendix 11. Predicted noise levels for the various construction scenarios are presented in Table 6-13 at the six identified sensitive receivers located within two kilometres of Leewood.

Table 6-13 Predicted construction noise levels

Construction scenario	Noise management level $L_{eq,15\text{ min}}$ dB(A)		Predicted noise level $L_{eq, 15\text{ min}}$ dB(A)					
	Standard hours ¹	Outside of standard hours ²	Residence					
			1	2	3	4	5	6
1 – service location	40	35	21-22	<20-21	20-23	27-32	29-34	21-25
2 – clearing/stripping	40	35	28-30	26-29	28-31	35-40	37-42	28-32
3 – amenities	40	35	21-22	<20-20	<20-22	26-31	28-33	20-24
4 – earthworks	40	35	28-30	27-29	26-30	33-38	36-41	27-31
5 – structures	40	35	25-27	21-25	22-27	30-35	32-37	23-29
6 – mechanical	40	35	25-27	21-25	22-27	30-35	32-36	23-29
7 – electrical	40	35	24-26	20-24	21-27	29-34	31-36	22-28
8 – landscaping	40	35	22-24	20-22	21-24	29-33	31-36	22-26
9 – irrigation area land preparation	40	35	23-30	20-27	26-30	32-44	26-31	25-31
10 – centre pivot installation	40	35	20-26	<20-22	20-25	28-38	<20-25	20-25
11 – subsurface drip installation	40	35	<20-39	<20-34	<20-37	24-47	21-36	<20-35
12 – pump station	40	35	<20-21	<20	<20-22	25-30	23-27	<20-23

Note:

1. Standard hours are defined as Monday to Friday 7.00am to 6.00pm and Saturdays 8.00am to 1.00pm

2. Outside of standard hours are all times not included in Standard Hours.

A summary of the predicted noise impacts for the individual construction scenarios in Table 6-13 indicate that:

- during standard construction hours, an exceedance of the criteria is predicted at R4 for scenarios 9 and 11 and R5 for scenarios 2 and 4
- outside of standard construction hours, exceedance of the criteria is predicted at:
 - R1, R3, R4 and R5 for scenario 11
 - R4 and R5 for scenarios 2 and 4
 - R4 for scenarios 9 and 10
 - R5 for scenarios 5, 6, 7 and 8.

No receivers are expected to be highly noise affected (noise levels above 75dB(A)) at any time during the construction works.

In addition to the above construction scenarios, works may be carried out simultaneously at the WBTP (scenarios 1 – 8) and the irrigation area (scenarios 9 – 12). Construction noise levels for these scenarios were predicted and are presented in full in the Noise and Vibration Assessment (Appendix 11). No receivers are expected to be highly noise affected at any time during the construction works.

During standard construction hours, the noise predictions indicate that:

- works carried out simultaneously for scenario 9 (irrigation area land preparation) and construction of the WBTP may exceed criteria at R4 by up to five dB(A) for scenarios 1-8 and at R5 by up to two dB(A) for scenarios 2 and 4
- works carried out simultaneously for scenario 10 (centre pivot installation) and construction of the WBTP may exceed criteria at R4 and R5 by up to two dB(A) for scenarios 2 and 4
- works carried out simultaneously for scenario 11 (sub-surface drip installation) and construction of the WBTP may exceed criteria at R4 by up to eight dB(A) for scenarios 1-8 and at R5 by up to three dB(A) for scenarios 2 and 4
- works carried out simultaneously for scenario 12 (pump station installation) and construction of the WBTP may exceed the criteria at R5 by up to two dB(A) for scenarios 2 and 4.

Works will be undertaken seven days per week, (i.e. not standard construction hours), however the construction noise management levels at an occupied sensitive receiver are to be met unless there is an agreement in place with the landholder. This applies for both standard construction hours and outside of standard construction hours.

As exceedances of the noise management levels are predicted, noise mitigation measures will be implemented during construction, as outlined in Section 6.1.6.3.

Operational noise impacts

During operation, noise generation will be minor and occur during operation of generators, pumps and other minor infrastructure, as well as harvesting of the irrigation area. Table 6-14 shows that the predicted operational noise levels from the WBTP and harvesting of the irrigation area are generally expected to comply with the project specific criteria.

A marginal one dB(A) exceedance at R4 was identified during harvesting operations. This will only occur when the tractor is at the eastern extent of the irrigation area, closest to R4. This exceedance is not considered significant as a difference in noise level of two dB(A) or less is generally not perceptible. The harvesting operations occur five times a year for a short period, limiting the likelihood of an exceedance. Compliance is predicted at all other receivers during harvesting.

Table 6-14 Predicted operation noise levels from the WBTP and harvesting of the irrigation area

Receiver	Project specific criteria (dB(A))	Predicted noise level $L_{Aeq, 15 \text{ min}}$ dB(A) during neutral weather	Comply
R1	35	<20	Yes
R2	35	<20	Yes
R3	35	<20-21	Yes
R4	35	27-36	Marginal exceedance
R5	35	28-29	Yes
R6	35	<20-22	Yes

Sleep disturbance impacts

It is expected that the major sources of maximum noise level events would be a compressor release/pressure relief, the use of light vehicles door slamming or engines starting and the processing equipment occasionally starting or stopping.

The noisiest source is likely to be a compressor release and the maximum noise level assumed was L_{Amax} 120 dB(A).

The noise level at the closest sensitive receiver was calculated using the noise model to be L_{Amax} 44 dB(A). This level is one dB(A) below the sleep disturbance screening criteria and as such no sleep disturbance impacts are expected.

Traffic noise impacts

The project is expected to generate road traffic during both the construction and operation phase. The predicted noise levels were predicted for distances from 10 to 600 metres from the road. The maximum predicted increase in road traffic noise is presented in Table 6-155 for receivers within 600 metres of the subject road.

Predicted increases in total traffic noise levels as a result of project generated traffic for the worst-case construction and operation scenarios are expected to comply with the RNP criteria.

Table 6-15 Predicted maximum increase in traffic noise levels

Road	Condition	RNP Criteria $L_{Aeq, 15 \text{ min}}$ noise levels (dB)	Predicted increase in total traffic $L_{Aeq, 15 \text{ min}}$ noise levels (dB)	
			Construction	Operations
Newell highway	Peak	2.0	0.4	0.1
	Low	2.0	0.4	0.1

Construction vibration impacts

Table 6-166 provides indicative vibration levels for different construction activities. The criteria presented for comparison represent the most stringent criteria applicable to the sensitive land use. For residential receivers, the human comfort criteria are the most stringent and for the SUGAR pits, the cosmetic damage criteria are the most stringent.

The predicted PPV indicates that vibration levels from construction will be well below the most stringent criteria applicable to the sensitive receivers R4 and R5 and at the SUGAR pits. Therefore impacts are expected to be negligible.

Table 6-16 Predicted construction vibration levels

Receiver	Approximate distance to works (m)	Criteria PPV (mm/s)	Predicted PPV (mm/s)		
			Dozer	Roller	Whacker
R4	360	0.14	0.02	0.04	0.03
R5	742	0.14	0.01	0.01	0.01
SUGAR pits	50	15	0.4	0.7	0.6

Operational vibration impacts

No significant operational vibration sources were identified and subsequently the impacts are considered to be negligible.

6.1.6.3 Mitigation measures

Noise from the activity will meet the noise levels in the table below at occupied residences unless a written agreement is in place with the landholder.

Time period		Construction noise (where written agreement is not in place)	Operational noise (where written agreement is not in place)
Day	7am to 6pm Monday to Friday and 8am to 1pm Saturday	See Note 1	35 dB(A) $L_{Aeq}(15min)$
	7am to 8am and 1pm to 6pm Saturday; 8am to 6pm Sunday and public holidays	35 dB(A) $L_{Aeq}(15min)$	35 dB(A) $L_{Aeq}(15min)$
Evening	6pm to 10pm	35 dB(A) $L_{Aeq}(15min)$	35 dB(A) $L_{Aeq}(15min)$
Night	10pm to 7am Monday to Saturday;	35 dB(A) $L_{Aeq}(15min)$	35 dB(A) $L_{Aeq}(15min)$
	10pm to 8am Sunday and public holidays	45 dB(A) L_{Amax}	45 dB(A) L_{Amax}

Note:

1. For construction between the hours of 7 a.m. and 6 p.m. Monday to Friday and 8 am to 1 pm Saturday, 40 dB(A) (or background plus 10 dB(A)) is the noise management level where feasible and reasonable work practices would be implemented.

The following measures will be implemented to minimise noise impacts of the proposed activity:

- community notification will be undertaken prior to commencement of construction
- potentially impacted occupied residences will be informed of the nature of the works, duration of works and a method of contact to raise any complaints
- in the event of a noise complaint, the effectiveness of noise mitigation measures will be assessed and additional feasible and reasonable measures implemented, where necessary. This may include noise monitoring.

6.1.6.4 Potential impact category

The proposed activity will result in a low adverse impact on noise and vibration. Noise generated during operation will generally be within acceptable guideline limits (35 dB(A)). During some stages of construction, the nearest sensitive receivers could experience noise levels in excess of 40 dBA during standard construction hours. Appropriate construction noise management techniques will be implemented accordingly. Ongoing consultation with affected landowners prior to and during construction will ensure impacts are being managed appropriately.

6.1.7 Waste

6.1.7.1 Impacts

Waste generating activities, waste streams and estimated volumes during both construction and operation are identified in Section 2.7.3.

Potential impacts associated with the generation and disposal of these wastes include:

- leaching of chemicals and other pollutants into soils or surface water
- pollution or contamination of land or water due to lack of suitable containment of waste
- littering of the site, surrounding properties or surface waters due to lack of suitable containment of waste
- odours caused by improper storage or treatment of putrescible waste
- use of landfill capacity due to waste storage.

6.1.7.2 Mitigation measures

The following measures will be carried out to minimise waste and potential impacts associated with waste generation and disposal:

- mitigation measures provided in the waste management strategy will be implemented, as outlined in Section 2.7.3
- management of waste, including its transport, will comply with the POEO Act and *Protection of the Environment Operations (Waste) Regulation 2005* (POEO (Waste) Regulation)
- waste identified for recycling will be stored separately from other waste
- waste will be assessed and classified in accordance with the DECC Waste Classification Guidelines
- all site personnel will be made aware of waste management procedures during the site induction and through toolbox talks.

6.1.7.3 Potential impact category

The proposed activity will result in a low adverse impact due to the generation or disposal of gaseous, liquid or solid wastes. A number of waste streams will be generated during construction and operation of the proposed activity. In line with relevant regulations, the low levels of waste will be sorted on site and transported to the appropriate facilities for treatment and disposal. Treated water will be separated and beneficially reused on site. Brine will be stored onsite in ponds and in the longer term, the remaining contents will be sent to the relevant licensed waste facility.

6.1.8 Chemicals and hazardous substances management

6.1.8.1 Impact

Potentially hazardous industry

Chemicals or hazardous substances to be used within the proposed activity include hydrochloric acid and diesel fuel. A full list of chemicals or hazardous substances is listed in the *State Environmental Planning (SEPP) No. 33 – Hazardous and Offensive Development Application Guidelines* (SEPP 33) assessment (Sherpa, 2014) in Appendix 5 and summarised in Section 2.6.3.6.

The proposed activity will require the use of chemicals, fuels and oils, during both construction and operational activities, for uses such as vehicles, plant and machinery, and treatment of produced water and brine at the WBTP, as described in Appendix 5.

The SEPP 33 screening assessment of the proposed activity determined that the proposed activity is not considered to be potentially hazardous, as defined under SEPP 33, and a Preliminary Hazard Analysis or route evaluation study is not required. This is based on the estimated volumes of chemical and hazardous substances to be transported, stored and used on site in comparison to screening thresholds defined in SEPP 33.

While substances are not considered to be potentially hazardous at the volumes which they are proposed to be used, potential impacts may occur due to their improper use, transport or storage, or in the event of an incident such as a spill or leak. Such impacts could include outbreak of fire, or pollution of land, water or air. These impacts have been discussed further in Sections 6.1.1, 6.1.2 and 6.1.3.

Potentially offensive industry

The SEPP 33 Guidelines state that if a proposed activity requires a licence under any pollution control legislation the proposed activity should be considered to be potentially offensive. As discussed at Section 5.2.3, the proposed activity will be required to be included on the EPL for the petroleum activities under the POEO Act. The key consideration in the assessment of a potentially offensive industry is that the EPA is satisfied that there are adequate safeguards to ensure emissions can be controlled to a level at which they are not significant. If the EPA is not satisfied, the proposed activity may be an offensive industry. The minimum test for such development is meeting the requirements for licensing by the EPA.

If the proposed activity is approved, Santos will apply to have EPL 20350 modified to include the proposed activity. The proposed activity will then operate in accordance with the requirements of EPL 20350. As such the proposed activity will not constitute an offensive industry and no further consideration of potentially offensive industry under SEPP 33 is required.

6.1.8.2 Mitigation measures

The measures identified in Section 6.1.1.2 will minimise potential impacts and risks associated with the use of hazardous substances and chemicals. In addition, the following mitigation measures will be implemented:

- all above ground tanks containing material that is likely to cause environmental harm must be bunded or have an alternative spill containment system in place
- a spill kit will be available within the site during construction and personnel will be trained in its use
- chemicals and potentially hazardous substances will be used and stored according to regulatory requirements including the *Work Health and Safety Act 2011* and *Australian Standard 1940–2004; The Storage and Handling of Flammable and Combustible Liquids* or other relevant guidelines
- any dangerous goods will be transported according to regulatory requirements under the *Dangerous Goods (Road and Rail Transport) Act 2008*.

6.1.8.3 Potential impact category

The proposed activity will result in a negligible to low adverse impact due to the use of hazardous substances and chemicals. A small number of chemicals and hazardous substances will be stored onsite during both construction and operation activities. Chemicals will be stored to ensure appropriate separation of chemical classes within storage areas designed in accordance with the relevant regulatory requirements. With the implementation of the proposed mitigation measures, potential impacts would be low.

6.2 Biological impacts

6.2.1 Impacts

An ecological assessment was undertaken for the proposed activity by Eco Logical Australia (refer Appendix 8).

The proposed activity will be likely to result in the removal of 99.6 hectares of the Derived Grassland vegetation community. The largest source of impact will result from the irrigation area for the treated water, with approximately 97.8 hectares proposed to be disturbed. The proposed WBTP, treated water storage area and associated infrastructure will impact on approximately 1.8 hectares.

One EEC, the '*Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions*' (EPBC Act) commensurate with '*Brigalow (Acacia harpophylla* dominant and co-dominant)' (TSC Act), was recorded on Leewood. This area will be retained and protected as part of the proposed activity. The treated water pipeline that will extent to the property boundary will be located as to avoid this listed ecological community.

No impacts to threatened flora are expected from the proposed activity.

Twenty-one threatened fauna species were identified as having potential or are known to occur on the site and have potential to be impacted by the proposed activity. Only one threatened species, the Grey-crowned Babbler, was identified on site during the field surveys. Application of the seven part test found that the proposed activity is unlikely to significantly impact any potentially occurring species listed under the TSC Act, including the Grey-crowned Babbler. Due to the lack of structural diversity in the understorey and ground cover and lack of habitat features such as fallen logs within the area to be disturbed by the proposed activity, the area would primarily be used as foraging habitat for this species. The Grey-crowned Babbler is a mobile species, and the resources within the site are present throughout the immediate and wider area.

Based on the Significant Impact Guidelines (DoE, 2013), assessment under the EPBC Act found that the proposed activity is unlikely to significantly impact on any potentially occurring species listed under the EPBC Act.

There would be a direct loss of approximately 99.6 hectares of potential foraging habitat for fauna as a result of the proposed activity. However, there is no breeding or roosting habitat on the site for any of the potential threatened fauna species.

The increase in soil moisture as a result of the irrigation has the potential to impact on the flora and fauna habitats within the site. The increase in moisture content may benefit some local weed and pasture species and further increase their presence within native vegetation communities.

Habitat fragmentation is considered to be minimal and connectivity will not be impacted. The site is currently largely cleared and disturbed, with only marginal habitat contained within the site boundary. The areas of habitat in the central portion of the site that will not be impacted by the proposed activity will still be connected to habitat to the south of the site. The proposed activity will not increase fragmentation with the surrounding vegetation being highly connected. No patches of habitat would be isolated as a result of the proposed activity.

Potential indirect impacts to neighbouring native vegetation may arise from spray drift of the treated permeate water during irrigation. To limit the impact of spray drift into the adjoining vegetation, engineering and management solutions will be used. These may include:

- use of low pressure drop nozzles operating at approximately 100 cm above the ground
- variable rate irrigation systems allowing for the shutdown of various spans or individual nozzles in susceptible areas
- regular visual inspections along the boundary of the sprinkler system
- an automated control system linked to an anemometer to shut down the system in unfavourable wind speeds and directions.

The ecological assessment concluded that the proposed activity will be unlikely to have a significant impact on threatened species, populations or ecological communities in the locality providing that the recommended mitigation measures are adopted. The proposed activity does not constitute, and is not part of, a key threatening process under the TSC Act.

6.2.2 Mitigation measures

The site will be rehabilitated in accordance with Section 2.6.4 of the REF. In addition, the following measures will be implemented to further minimise impacts on flora and fauna:

- the site boundary will be clearly marked in the field to ensure all clearing and construction activities occur within the approved footprint
- management measures will be implemented to minimise the potential for spray drift from the irrigation system to impact the stand of Brigalow on the northern boundary of the site will be minimised
- prior to earthworks, weeds listed as Noxious under the NSW *Noxious Weeds Act 1993* that are present on the site would be removed or treated with herbicide to prevent or reduce their spread
- if any hollow-bearing trees are detected on-site and require removal, this will be undertaken with the supervision of an ecologist.

6.2.3 Potential impact category

The proposed activity will result in low adverse biological impacts. Up to approximately 99.6 hectares of land that has been mostly previously cleared for agricultural purposes will be disturbed. The ecological assessment for the proposed activity determined that it is unlikely to have a significant impact on threatened species, populations or ecological communities in the locality.

6.3 Community impacts

6.3.1 Public Safety

6.3.1.1 Impacts

Safety implications of the proposed activity include hazards associated with moving vehicles and machinery; construction and operation of infrastructure and plant; use of chemicals, fuels and oils; and bushfire.

The hazards associated with the storage and use of chemicals and hazardous substances on-site are detailed in Section 6.1.8.

The site is adjacent to the Pilliga East State Forest and contains other areas of reasonably dense vegetation. Parts of the site will be expected to exhibit moderate to high bushfire hazard mainly due to the extent of vegetation cover.

The potential for a bushfire needs to be considered from two perspectives:

- the management activities required should a fire occur
- the risk that the proposed activity contributes to the lighting of a fire due to the presence of flammable substances and potential for accidental ignition by vehicles or machinery.

Santos has developed a Bushfire Management Plan in consultation with relevant agencies and an emergency response plan that details the broad responsibilities and duties of personnel during an emergency event such as a bushfire.

The bushfire management plan provides guidance for onsite responsibilities, actions, reporting requirements and resources required to ensure effective and timely preparedness is undertaken in the prevention of any bushfire incident or emergency at operations sites. The plan is relevant to both private land and State forest.

6.3.1.2 Mitigation measures

Implementation of the mitigation measures identified in Section 6.1.8.2 will ensure impacts in relation to the hazards associated with the storage and use of chemicals and hazardous substances are minimised. Additional mitigation measures to ensure public safety is maintained include the following.

- general site safety protocols, incident management and emergency procedures (including bushfire risk) will be implemented during the construction and operation works
- construction and operational sites will be fenced and locked after construction hours
- the Bushfire Management Plan will be reviewed and updated as required to address the proposed activity
- an induction for staff and contractors regarding the hazards and risks will be implemented.

6.3.1.3 Potential impact category

The proposed activity will result in a low adverse impact on public safety. Risks to public safety during both construction and operation, including bushfire, will be minimised through design and implementation of general site safety protocols, incident management and emergency procedures. This would enable any potential impacts that result to be small and short term.

6.3.2 **Traffic**

An assessment of the potential traffic impacts during construction and operation of the proposed activity was prepared. This section provides a summary of the Traffic Impact Assessment, provided in Appendix 4.

6.3.2.1 Impacts

All construction vehicles and worker vehicles will access Leewood via the Newell Highway and Old Mill Road. The majority of truck arrivals and departures will be via the north, to/ from Narrabri, with minor interstate deliveries expected to also approach/ depart via the south. All trucks would be accommodated within the site for deliveries throughout the construction period.

The proposed activity will generate up to approximately 88 trips on a peak day with 20-25 trips generated during a site activity peak hour throughout all construction work stages, including all worker vehicles, shuttle buses and trucks. Table 6-177 details peak construction vehicle trips during the construction works.

Table 6-17 Peak construction vehicle trips

Period of activity	Number of trips			Total
	Trucks	Shuttle buses	Worker vehicles	
Daily	50	20	18	88
Hourly	5-10	10	5	20-25

The traffic volumes detailed above equates to 60 per cent of the projected peak daily traffic generation associated with the previous construction works at Leewood. Given that the extent of traffic-related impacts would be less than that already experienced during the construction of the ponds at the Leewood site, the intersection upgrade made at the intersection of Old Mill Road and the Newell Highway will adequately service the construction vehicle movements for the proposed activity. Despite this, the intersection arrangements were assessed for completeness as part of the Traffic Impact Assessment. The results of this assessment are detailed in Appendix 4.

It is anticipated that the Newell Highway will experience an increase in total traffic volumes of five to six per cent, with an increase in truck volumes of six to seven per cent. The Newell Highway will continue to operate at existing Level of Service B. Impacts to emergency and heavy vehicle movements along the Newell Highway are considered unlikely.

A small on-site staff presence will be associated with the day to day operation of the proposed activity. The worker traffic associated with the Leewood site would be minor, with less than 10 vehicle trips during each of the weekday AM and PM peak hours. In addition, up to 10 trucks per day associated with irrigation, harvesting and crop management would be generated during operation, while deliveries and visitors would be minor and total less than five vehicles per week. As such, the operational traffic impacts associated with the proposed activity will present a negligible impact to the operation of the Newell Highway at Old Mill Road.

Construction and personnel vehicles exiting the site may track sediments and other pollutants onto the Newell Highway.

6.3.2.2 Mitigation measures

The following measures will be carried out to minimise potential impacts associated with traffic generated during construction and operation and potential impacts to the road network:

- access to and from adjacent properties will be maintained for the duration of construction
- parking for staff during construction and operation will be accommodated within the site
- construction traffic will not be permitted to queue or park on Old Mill Road, other State forest roads or the Newell Highway
- all truck movements would be restricted to the direct route via the Newell Highway. Truck drivers will be advised of the designated truck routes to/ from the site
- oversized vehicles required for transporting earthmoving equipment will be undertaken in accordance with the relevant requirements of Roads and Maritime Services
- the site access plan outlined in the transport assessment (Appendix 4) will be implemented during construction and traffic managed accordingly
- construction and operational traffic will only access Leewood via Old Mill Road.

6.3.2.3 Potential impact category

The proposed activity will result in a low adverse impact on traffic. Traffic volumes will be greatest during construction activities, which will be short term. No road/intersection upgrades are required as a result of the proposed activity, and the mitigation measures identified would be effective in minimising risk of potential impact to the community.

6.3.3 **Amenity**

6.3.3.1 Impacts

Amenity impacts associated with the proposed activity will include visual, dust, noise, and traffic impacts.

Visual impacts associated with the proposed activity will mainly be in relation to the WBTP and associated infrastructure, as during operation the cropping activities within the irrigation area are consistent with surrounding land uses.

Plant and equipment at the WBTP and associated infrastructure may be visible during construction and operation, but given its distance from the Newell Highway and neighbouring residences, will have a negligible impact on scenic amenity. In addition, the topography of the surrounding area is relatively flat which will reduce the visibility of the WBTP from surrounding areas.

The proposed activity will result in minor increases in traffic along Newell Highway and Old Mill Road throughout construction. These impacts are addressed in Section 6.3.2.

The proposed activity may temporarily increase dust and noise levels within the vicinity of the site, though these will be controlled with the measures outlined in Sections 6.1.4 and 6.1.6 respectively.

6.3.3.2 Mitigation measures

Mitigation measures to control dust, noise and traffic impacts are addressed in Sections 6.1.4, 6.1.6 and 6.3.2, respectively. Additional measures to manage amenity impacts include:

- Where practicable, existing vegetation along the site boundary will be maintained to provide screening of the site.
- The site will be kept in a clean and tidy manner during site preparation, construction activities and operation.

6.3.3.3 Potential impact category

The proposed activity will result in a low adverse impact on public amenity. The proposed activity is located entirely within the Santos owned Leewood property. Visual amenity impacts are confined to the property and its immediate surrounds i.e. vehicles travelling along the Newell Highway and neighbouring residences. Any visual impacts would be minor in nature and not inconsistent with the surrounding landscape.

6.3.4 **Community services, infrastructure and sites of importance**

6.3.4.1 Impacts

The works are not likely to affect community services or infrastructure, or sites of importance to the local community. All works are located within the Santos owned Leewood property and are not accessible by the public.

There may be some impacts to accommodation availability within Narrabri during construction.

6.3.4.2 Mitigation measures

The consultation activities outlined in Section 2.3 will be implemented.

6.3.4.3 Potential impact category

The proposed activity will result in a low adverse impact on community services, infrastructure and sites of importance. Any impacts will be small and short term, as the temporary construction workforce is small and will be accommodated by existing social infrastructure. Any concerns of the community will be managed through implementation of the stakeholder engagement plan outlined in Section 2.3.1.

6.3.5 Economic impacts

6.3.5.1 Impacts

As the scale of the project is small, the proposed activity is not expected to significantly alter the economic base of the region. The proposed activity may provide minor economic benefits for Narrabri as well as the broader area through employment for construction activities and ongoing operations, as well as the purchase of materials, fuels and consumables.

Many of the site preparation, earthworks and field services employed during this project will be sourced from local suppliers, where practicable. This will have a positive impact on the local economy through direct and indirect means.

No existing jobs will be lost as a direct result of the proposed activity. This includes employment opportunities in the agricultural industry which has historically been one of the main economic drivers for Narrabri. The proposed irrigation area may provide minor agricultural employment and economic development due to the conversion of low productivity pasture land to productive agricultural activities.

6.3.5.2 Mitigation measures

The current procurement and logistics policy would apply to this project and gives preference to local businesses, suppliers and labour.

6.3.5.3 Potential impact category

The proposed activity is considered to have a minor positive impact on the economy due to the scale of the project.

6.4 Natural resource & land use impacts

6.4.1 Impacts

Leewood is a Santos owned property which is designated Zone RU Primary Production under the Narrabri LEP 2012.

Leewood is not currently used for agricultural purposes and is located on land with low potential for commercial agricultural use. An AIS has been prepared to evaluate the impact of the proposed activity on agricultural resources and production at Leewood and within the surrounding Narrabri LGA (Appendix 7).

Based on the Agricultural Impact Risk Rating System, the proposed activity has been classified as a low to medium risk activity due to the following:

- it is not located on or near BSAL or CIC under the SRLUP
- it is located on land with a current low value commercial agricultural land use
- the proposed irrigation regime will increase the net productivity of the area from the current low productivity pasture
- all surface disturbance areas will be fully rehabilitated to the pre-existing land condition, except across the irrigation area if to be retained, subject to requirements of future land use.
- there will be no permanent land capability reduction of agricultural resources
- there are potential impacts on groundwater or surface water resources, however these are the subject of appropriate mitigation measures as outlined in Sections 6.1.2.2 and 6.1.3.2 respectively.

The lucerne, or alternate crop, will be cut and bailed approximately five times per year. As the irrigation area is only 97.8 hectares and the irrigation scheme will run for up to approximately five years, the removal of agricultural support infrastructure and services from within the region is considered minimal.

Once gas from the existing WPPS pipeline is connected to the site, power will be supplied by a 1.4 megawatt gas-powered generator. The natural gas from this pipeline will be sourced from the CSG pilot wells within Santos' existing and proposed exploration and appraisal activities within PEL 238 and PAL 2. Approximately 63,000 gigajoules per year of natural gas will be used onsite during operation of the proposed activity.

6.4.2 Mitigation measures

Implementation of the mitigation measures identified in Section 6.1.1.2 will ensure impacts to soils (and future agricultural potential at Leewood) are minimised. In addition, works associated with the proposed activity will not impact on agricultural production at any adjacent properties.

6.4.3 Potential impact category

The proposed activity will result in a low adverse impact on natural resources and land use. While there are potential impacts on groundwater and surface water resources, as identified in Sections 6.1.2 and 6.1.3 respectively, the proposed irrigation regime will also improve the productivity of the site. There would be no ongoing impacts on natural resources or land use.

6.5 Aboriginal cultural heritage impacts

6.5.1 Impacts

Up to approximately 99.6 hectares of ground surface would be disturbed for construction of the proposed activity.

A due diligence Aboriginal cultural heritage investigation was carried out for Leewood and is provided as Appendix 9. No registered Aboriginal cultural heritage items occur within or near the site, nor do any features that conform to a highly sensitive landscape. As part of the investigation an archaeological field survey of the site was undertaken, and two scarred trees and two isolated quartz artefacts were identified.

The proposed activity, including construction of the treated water pipeline, would not have a direct impact on the identified objects as the Avoidance Principle will be applied, as follows:

- the two scarred trees would be avoided by their inclusion in the exclusion area designed to protect them

and other native vegetation at the northern end of the site (Brigalow Woodland community exclusion zone)

- the two isolated stone artefact (quartz) flakes would be avoided by fencing that has been installed around each location to ensure no disturbance of those areas was to occur during the proposed activity.

These sites will be managed in order to avoid any impact during the project and an Aboriginal Heritage Impact Permit (AHIP) under section 90 of the *National Parks and Wildlife Act 1974* will not be required.

Due to the presence of Aboriginal objects on-site, notably the isolated stone artefacts, the potential exists for previously unidentified Aboriginal objects/sites to be identified during the proposed activity.

6.5.2 Mitigation measures

The following measures will be implemented to reduce potential impacts on Aboriginal heritage:

- no works will be undertaken in the vegetated (Brigalow) area in the north-east corner of the site to avoid the scar trees (refer Figure 2-1)
- the isolated stone artefact (quartz) flakes will remain fenced off with a three metre buffer around each location
- project staff and contractors will be made aware of their statutory obligations for heritage under the NPW Act and the Heritage Act, as well as the location of the identified cultural objects through the site induction and toolbox talks
- monitoring will be undertaken immediately following earth-moving activities in the vicinity of the isolated quartz artefacts. This will consist of two persons jointly nominated by the Narrabri LALC and the Gomeroi native title claim group
- if any previously unidentified Aboriginal site/s are identified during works, then works in the immediate area will cease, the area will be cordoned off and the OEH Enviroline 131 555 will be contacted. A suitably qualified archaeologist will be contacted so that the site can be assessed and managed
- in the event that skeletal remains are uncovered, work must cease immediately in that area and the proponent, Santos must contact the NSW Police Coroner to determine if the material is of Aboriginal origin. If determined to be Aboriginal, the OEH Enviroline 131 555 and relevant Aboriginal stakeholders must be contacted to determine an action plan for the management of the skeletal remains prior to works re-commencing.

6.5.3 Potential impact category

The proposed activity will result in a negligible to low adverse impact on Aboriginal cultural heritage. Four items of potential Aboriginal cultural heritage significance were identified within the site, however the proposed activity has been designed to avoid these items. The area of disturbance is relatively small (approximately 99.6 hectares) within a previously disturbed agricultural property. Implementation of the mitigation measures will minimise impacts on identified and unidentified potential Aboriginal cultural heritage material on-site.

6.6 European cultural heritage impacts

6.6.1 Impacts

No registered cultural heritage items occur within or near Leewood. The archaeological survey noted items of potential heritage significance within Leewood including the SUGAR stations and the TSR.

The proposed activity would not have a direct impact on the identified remains of the SUGAR array.

The TSR is located outside the proposed activity and as such, there would be no direct impact on the TSR. There is low potential for artefacts associated with the TSR to be identified within the site.

The treated water pipeline that will extend to the property boundary will be located as to avoid the identified remains of the SUGAR array and TSR.

There is considered to be no potential for inadvertent impacts to the SUGAR array and TSR. The proposed activity is not near the SUGAR pits and they are fenced off. In addition, the activities are located on the eastern side of the ponds and will not impact them. The TSR is not located on the property and is on the other side of the road.

6.6.2 Mitigation measures

The following measures will be implemented to reduce potential impacts on European heritage:

- the temporary barriers erected around the SUGAR pits will remain in place until the completion of rehabilitation activities. No works will occur within these fenced areas
- if any previously unidentified European cultural heritage material is identified during works, then works in the immediate area will cease, and advice sought from a suitably qualified archaeologist.

6.6.3 Potential impact category

The proposed activity will result in a negligible impact on European cultural heritage. Two items of potential European cultural heritage significance were identified within the site, however the proposed activity has been designed to avoid these items. The area of disturbance is relatively small (approximately 99.6 hectares) within a previously disturbed agricultural property. Implementation of the mitigation measures will minimise impacts on identified and unidentified potential European cultural heritage material on-site.

6.7 Matters of National Environmental Significance

The proposed activity will not impact any MNES as detailed in Table 6-188.

Table 6-18 Matters of National Environmental Significance

MNES	Overview
World Heritage Properties	The proposed activity is not located in or within close proximity to a World Heritage area.
National Heritage Places	The proposed activity is not located in or within close proximity to a National Heritage Place.
Wetlands protected by international treaty (the RAMSAR convention)	The proposed activity is not located within a RAMSAR listed wetland area.
Nationally listed threatened species and ecological communities:	<p>A number of threatened species listed under the EPBC Act have been recorded within a 10 kilometre radius of Leewood.</p> <p>None of the species listed were recorded during the field surveys. The likelihood of occurrence and potential impact of the abovementioned species is assessed in the Ecological Assessment (Appendix 8) and is discussed in Section 6.2.1. It is considered unlikely that the proposed activity will have a significant impact on any of the species.</p> <p>One threatened ecological community listed under the EPBC Act, Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant), was recorded at Leewood. This ecological community will be retained and protected as part of the proposed activity.</p>
Migratory species	Three migratory bird species listed under the EPBC Act were identified having the potential to occur within the site. None of these species were identified during the field surveys. Impacts to these species are considered unlikely.
Commonwealth marine areas	The proposed activity will not impact any Commonwealth marine areas.
Great Barrier Reef Marine Park	The proposed activity will not impact the Great Barrier Reef Marine Park.
All nuclear actions	The proposed activity does not involve a nuclear activity.
Water Resources from CSG development and large coal mining development	N/A – According to the <i>Significant impact guidelines 1.3: Coal seam gas and large coal mining developments—impacts on water resources</i> (DoE, 2013), if there is no extraction of CSG involved as part of the proposed activity, it is not a 'CSG development' or 'large coal mining development' for the purpose of the water trigger.

6.8 Cumulative impacts

The Narrabri Shire is recognised for its coal seam gas and mining resources. A number of mining exploration and production licences cover the area.

Existing and proposed mining occurs at a number of Whitehaven Coal mines approximately 28 kilometres south of Narrabri and at the Boggabri coal mine approximately 15 kilometres north of Boggabri. The Maules Creek Mine (Whitehaven Coal) has recently been granted approval and would extract up to 13 million tonnes of run-of-mine coal each year for 21 years. Expansion plans for these mines include a rail spur and coal handling facility.

Narrabri Sewage Treatment Works is an existing sewage treatment facility near the township of Narrabri. The facility is licensed to discharge to water and/or a discharge utilisation area. Discharges to waters are limited at 20 megalitres per day.

Wilga Park power station is an existing 16 megawatt gas-fired power station about 15 kilometres north of Leewood. Approval to expand Wilga Park power station to 40 megawatt capacity was approved in December

2008. The installed generating capacity at Wilga Park is currently 16 megawatts, however the power station rarely operates at full capacity due to limited fuel gas supplies.

The potential for cumulative impacts between the proposed activity and other existing or proposed projects in the public domain is considered to be minor. These developments are large in scale compared to the proposed activity, not located within the vicinity of the proposed activity, and, in the case of the coal mines, will utilise a purpose built workers camp minimising impacts on the Narrabri township.

The cumulative impact assessment has therefore considered:

- operation of the Leewood produced water and brine management ponds. Construction activities associated with this activity will be completed prior to construction commencing for the proposed activity
- other proposed exploration and appraisal activities within PEL 238 and PAL 2, particularly when construction will occur concurrently or where similar vegetation types have been or will require clearing.

Cumulative impacts during operation of other exploration and appraisal activities are expected to be minor as activities are of a sufficient distance to not generate cumulative noise, air quality, surface or ground water or any other impacts.

Cumulative impacts, where expected, are summarised in Table 6-19. Any community concern regarding potential cumulative impacts will be addressed through ongoing consultation.

6.8.1 Mitigation measures

Santos will work with Narrabri Shire Council to ensure issues relating to increased pressure on labour resources, temporary and permanent accommodation, road infrastructure and telecommunications as a result of cumulative Santos activities are addressed appropriately.

Table 6-19 Potential cumulative impacts

Area of impact	Potential cumulative impacts	
	<i>Construction and operation activities at Leewood</i>	<i>Other proposed exploration and appraisal activities</i>
Soil quality and land stability	The land area cleared at Leewood will increase with the construction of the WBTP increasing the potential for erosion. The sediment and erosion plan developed to manage impacts during construction will accordingly take into consideration all activities occurring at Leewood.	No cumulative impacts expected.
Groundwater	No cumulative impacts expected.	No cumulative impacts expected.
Surface water	No cumulative impacts expected.	No cumulative impacts expected.
Air quality	Air quality impacts during operation for both activities are expected to be minimal and well within acceptable air quality standards.	No cumulative impacts expected.
Greenhouse gas emissions	Scope 1 GHG emission estimates for the operation of existing and currently planned exploration and appraisal activities including the proposed activity are 220 and 230 kT of CO ₂ ^e annually for flaring and on site power generation. The proposed activity contributes 1.95 per cent to this total. These contribute marginally to NSW and Australian emission targets.	
Noise	Noise impacts during operation for both activities are expected to be minimal and well within acceptable regulatory limits.	No cumulative impacts expected.
Waste	Potential impacts relate to addition to landfill and capacity of management, disposal or recycling facilities to cope with the cumulative volumes produced. Given the very low volumes of waste to landfill contributed by construction and operation of the Leewood produced water and brine management ponds, cumulative impacts are expected to be minimal.	The proposed activity treats produced water to minimise this waste stream across all exploration and appraisal activities.
Chemicals and hazardous substances management	No cumulative impacts are expected. The operation of the produced water and brine ponds do not require the storage or use of hazardous chemicals.	No cumulative impacts expected.
Biological	A total of 41.4 ha of derived native grassland was removed for construction of the Leewood produced water and brine management ponds. With the addition of the proposed activity, an estimated 144 ha of derived grassland will be cleared at Leewood. Within PEL 238, approximately 158,384 ha of derived grassland exists. The removal of less than 0.10 per cent is expected to have a negligible cumulative impact. No other vegetation type will be cleared for the proposed activity.	A total of approximately 74.9 ha of derived grassland has been removed for exploration activities within PEL 238 since 2002. With the addition of the proposed activity, an estimated 177.5 hectares will be cleared. Within PEL 238, approximately 158,384 ha of derived grassland exists. The removal of less than 0.15 per cent is considered to have a negligible cumulative impact.
Community safety	No cumulative impacts expected.	No cumulative impacts expected.

Area of impact	Potential cumulative impacts	
Traffic	Traffic volumes during the operation of Leewood are expected to be significantly less than construction. Accordingly the upgraded intersection of Old Mill Road and Newell Highway will easily accommodate operational traffic movements.	An additional 44 daily and 14 hourly trips along the Newell Highway may be generated. This equates to a less than eight percent increase on existing traffic volumes along the Newell Highway. The Newell Highway has been assessed as having spare capacity in accommodating such additional traffic volumes. Therefore cumulative traffic impacts are considered minor.
Visual amenity	Cumulative impacts to visual amenity are expected to be minimal as the produced water and brine management ponds are not visible from the Newell Highway or dwellings to the north.	No significant cumulative impacts expected, as the cleared areas for pilot wells and other infrastructure are spread throughout the Pilliga forest and are generally set back from the road network and not in view from neighbouring properties. They would have a minor visual impact when viewed from the air.
Community services, infrastructure and sites of importance	Employees associated with the operation of the produced water and brine management ponds are all locally based and do not rely on temporary accommodation needs.	There may be pressure on temporary accommodation in Narrabri area, due to the increased presence of construction workers however the Westport drillers camp will minimise these impacts.
Economic	No cumulative impacts expected.	No cumulative impacts expected
Natural resource and land use	Approximately 41.4 ha of agricultural land were impacted by construction of the produced water and brine management ponds. The proposed activity will convert about 97.8 ha of land from low potential for commercial agricultural land use to high intensity agricultural activities. Therefore, a positive cumulative impact is expected.	Approximately 52 ha of agricultural land will be impacted by other exploration activities however the proposed activity will convert about 97.8 hectares of land from low potential for commercial agricultural land use to high intensity agricultural activities.
Cultural heritage	No cumulative impacts expected.	No cumulative impacts expected.

7.0 Summary of impacts

The potential impacts associated with the proposed activity are summarised in Table 7-1.

Table 7-1 Summary of primary potential impacts

Aspect	Potential impacts	Potential impact category (with mitigation measures)
Soil quality and land stability	<ul style="list-style-type: none"> Improvement in soil quality and structure due to water and soil amendments. Increase in soil erosion and sediment loss. Increase in soil compaction and waterlogging. Increase in soil salinity. Land contamination in event of a leak or spill. 	Negligible
Groundwater	<ul style="list-style-type: none"> Changes in groundwater levels due to minor increase in deep drainage under the irrigation area. Increase in salt transport and salinity levels. 	Negligible to low adverse
Surface water	<ul style="list-style-type: none"> Sedimentation of surface waters due to increased erosion and site sediment loss during both construction and operation. Contamination of surface waters in event of a leak or spill. Increase in runoff from irrigation area during operation. Changes in local surface water discharge volumes in event of flooding and inundation of the site. 	Negligible to low adverse
Air quality	<ul style="list-style-type: none"> Generation of exhaust emissions, dust and other particulates, particularly during construction. 	Negligible to low adverse
Greenhouse gases	<ul style="list-style-type: none"> Generation of GHG emissions. 	Negligible to low adverse
Noise	<ul style="list-style-type: none"> Generation of noise and vibration, particularly during construction. 	Low adverse
Waste	<ul style="list-style-type: none"> Generation and disposal of various wastes, including concentrated brine. Contamination of groundwater, soils or surface water from waste. Litter due to lack of suitable waste containment odours from improper storage or treatment of putrescible waste. 	Low adverse
Hazardous substance and chemical use	<ul style="list-style-type: none"> Land, water or air pollution, or fire, from improper use or storage of hazardous substances or chemicals. 	Negligible to low adverse
Flora and fauna	<ul style="list-style-type: none"> Disturbance of approximately 99.6 hectares of non-significant vegetation. Temporary disruption to sheltering and foraging behaviour of fauna species. Potential increase in presence of local weed and pasture species within the native vegetation communities as a result of increased soil moisture content. 	Low adverse
Public safety	<ul style="list-style-type: none"> Introduction of additional hazards, such as moving vehicles, plant and machinery, and chemicals, fuels and oils with potential safety implications. Bushfire risk. 	Low adverse
Traffic	<ul style="list-style-type: none"> Increase in traffic on Newell Highway and Old Mill Road. Tracking of sediment onto Newell Highway. 	Low adverse
Amenity	<ul style="list-style-type: none"> Visual impact of proposed activity from Newell Highway and surrounding properties. 	Low adverse

Aspect	Potential impacts	Potential impact category (with mitigation measures)
	<ul style="list-style-type: none"> Temporary reduced amenity for adjacent landowners from noise and dust. Increase in traffic on Newell Highway and Old Mill Road. 	
Community services, infrastructure and sites of importance	<ul style="list-style-type: none"> Pressure on temporary accommodation in Narrabri area. 	Low adverse
Economic issues	<ul style="list-style-type: none"> Economic benefits to Narrabri and broader area. 	Minor positive
Natural resources and land use impacts	<ul style="list-style-type: none"> Increase in net productivity of the area from the current low productivity pasture. Impacts on agricultural resources including soil, surface water and groundwater. Beneficial reuse of produced water and gas from coal seams. Spread of weeds or pathogens. 	Low adverse
Aboriginal cultural heritage	<ul style="list-style-type: none"> Disturbance of unknown Aboriginal objects. 	Negligible to low adverse
European cultural heritage impacts	<ul style="list-style-type: none"> Disturbance of unknown European heritage items. 	Negligible

7.1 Clause 228 Guidelines

Clause 228 of the *Environmental Planning and Assessment Regulation 2000* identifies factors that must be taken into consideration in assessing an activity under Part 5 of the EP&A Act. An assessment of the clause 228 factors is provided in Table 7-2.

Table 7-2 Clause 228 factors

Factor	Impact
Any environmental impact on a community	<p>Minor short-mid term.</p> <p>Potential impacts to the community during construction will be short term and localised. The nearest permanently occupied residential dwelling is located approximately 360 metres to the east of the site.</p> <p>The proposed activity will generate additional traffic (mainly during construction) but this will be unlikely to significantly impact the local road network. Impacts associated with the proposed activity will be virtually imperceptible to the wider community.</p>
Any transformation of a locality	<p>Negligible.</p> <p>The eastern side of the Leewood property is being transformed from sparsely vegetated grazing land to cropping, while the western side of the property was transformed during the construction of the approved water and brine storage ponds.</p>
Any environmental impact on the ecosystems of the locality.	<p>Negligible.</p> <p>The proposed activity will require the disturbance of up to approximately 99.6 hectares of non-significant vegetation (Derived Grassland) at Leewood.</p>
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality	<p>Minor short-mid term.</p> <p>Plant and equipment at the WBTP and associated infrastructure will be visible during construction and operation, but given its distance from the Newell Highway and neighbouring residences, will have a negligible impact on scenic amenity. In addition, the topography of the surrounding area is relatively flat which will reduce the visibility of the WBTP from surrounding areas.</p> <p>The proposed irrigation regime will increase the net productivity of the area from the current low productivity pasture, improving the productivity of the site.</p>
Any effect on a locality, place or building having	<p>Nil.</p> <p>With the implementation of the mitigation measures outlined in the Statement of</p>

Factor	Impact
aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations	Commitments (Table 9-1), no locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations will be impacted upon by the proposed activity.
Any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974)	Negligible. The site provides marginal foraging and nesting habitat for a range of protected fauna species within the meaning of the NPW Act. There are larger areas of more suitable habitat for threatened species nearby (Pilliga forest, approximately 160,000 hectares) and the proposed activity will affect a small area of sub-optimal habitat.
Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air	Nil. The proposed activity will not endanger any species of animal, plant or other form of life, whether living on land, in water or in the air.
Any long-term effects on the environment	Nil. The proposed activity will not have any long-term effects on the environment.
Any degradation of the quality of the environment	Minor short term. The application of the treated irrigation water and undertaking of land preparation activities, including soil amelioration, are likely to maintain or improve the soil quality and structure within the irrigation area on-site. The proposed activity may cause a minor short term increase in soil erosion and sediment loss, runoff and deep drainage, however these will be adequately addressed with mitigation, including erosion and sediment control, appropriate irrigation practices, and management of topsoil and chemicals. There is also a potential for minor short term environmental degradation as a result of air and noise emissions during the works.
Any risk to the safety of the environment	Minor long term. The proposed activity could also result in short term potential risks to the safety of the environment due to incidents and spills.
Any reduction in the range of beneficial uses of the environment	Nil. The proposed activity will not result in any reduction in the range of beneficial uses of the environment.
Any pollution of the environment	Minor short term. The proposed activity could also result in short term potential risk of pollution of the environment due to incidents and spills or as a result of air or noise emissions or salt discharge from the effluent irrigation scheme. These will be monitored and managed in accordance with the requirements of EPL 20350.
Any environmental problems associated with the disposal of waste	Nil. Wastes generated by the proposed activity will be collected, classified and removed from site for recycling, disposal or disposal at a licensed waste facility, as required.
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply	Minor short term. Resources required for the proposed activity are not in limited supply in the area.

8.0 CONCLUSION

Santos has a long term commitment to the development of new gas supplies to the growing NSW market. The proposed activity has been developed to assist with this objective, while taking into account environmental, economic and social considerations.

The proposed activity is permissible without consent and requires assessment and determination under Part 5 of the EP&A Act in accordance with the Mining SEPP.

The REF assesses the potential environmental impacts of the activity in accordance with the requirements of section 111 of the *Environmental Planning & Assessment Act 1979*, clause 228 of the *Environmental Planning and Assessment Regulation 2000*, and the ESG2 Guidelines. It has identified the potential impacts together with measures to mitigate those potential impacts.

The proposed activity is temporary and minor in scale. The site for the proposed activity has been selected to avoid significant environmental and heritage constraints, and reduce impacts to the surrounding community.

In considering the likely environmental significance of the impacts from the proposed activity it has been predicted that:

- potential impacts are considered to be localised and temporary in nature
- the proposed activity will improve soil structure and quality of the area under irrigation
- the proposed activity is unlikely to have a significant effect on surface water or groundwater resources
- the proposed activity is unlikely to have a significant effect on the environment or the community
- the proposed activity is unlikely to have a significant effect on threatened species, populations, ecological communities or their habitats
- the proposed activity is not on land that is, or part of, critical habitat.

Based on the assessments undertaken within the REF the impact of the activity will be negligible to low adverse provided that the mitigation measures identified in the REF are employed.

9.0 STATEMENT OF COMMITMENTS

Table 9-1 provides a statement of commitments for the proposed activity.

Table 9-1 Statement of Commitments

Item	Commitment
Activity type and location	<ul style="list-style-type: none"> ▪ The proposed activity will be carried out at Leewood, as described in Section 2.6 of the REF. It will include: <ul style="list-style-type: none"> – Construction and operation of: <ul style="list-style-type: none"> – a water treatment plant, including pre-treatment and reverse osmosis plant – a brine treatment plant – a brine distribution manifold and associated piping at Leewood, to allow water distribution into the water treatment plant and associated return flows to brine storage ponds – a treated water storage tank (five megalitre capacity) – a managed irrigation system including a centre pivot and sub-surface drip irrigation system – other associated infrastructure, including a gas pipeline to fuel the generators – a small potable water treatment system for water extracted from the licensed bore. ▪ The construction of (and the ability to operate) a treated water pipeline extending to the Leewood property boundary to transfer water to another location for irrigation by a third party (if required) ▪ Re-use of treated water for irrigation at the Leewood property and other uses both on and off site including dust suppression, drilling and construction and firefighting. Santos is investigating the option of providing treated water to third parties for agricultural irrigation, although this potential use of treated water does not form part of the proposed activity for the purposes of this REF and will be subject to separate assessment and approvals. ▪ Amelioration of soils within irrigation area by deep tillage, fertiliser, lime and gypsum in preparation for irrigation. ▪ Decommissioning and rehabilitation of the site, if the Narrabri Gas Project does not proceed. ▪ The operational process is expected to involve, but is not limited to: <ul style="list-style-type: none"> – pumping of produced water from the produced water pond to the water treatment plant – treatment of produced water within the water treatment plant, including removal of solids by filter (pre-treatment), reverse osmosis to separate the water and brine streams (treatment), and chemical and pH dosing (post-treatment) to make the treated water appropriate for irrigation – transfer of treated water to the treated water storage tank or directly to the on-site managed irrigation system for beneficial re-use – beneficial re-use of treated water for irrigation, or other uses both on and off-site such as dust suppression, drilling and construction and firefighting – transfer of brine to the brine treatment plant for concentration and further recovery of treated water – storage of brine in the existing Leewood ponds.
Hours of operation	<ul style="list-style-type: none"> ▪ Construction activities will usually be between 7am till 6pm, seven days a week and will comply with EPL 20350. ▪ The WBTP will operate up to 24 hours a day, seven days a week.
Activity duration	<ul style="list-style-type: none"> ▪ Construction will be approximately 50 weeks in duration. ▪ The proposed activity will operate for up to five years.
Proposed commencement date	<ul style="list-style-type: none"> ▪ Works will commence in the third quarter of 2015.
Maximum area of disturbance	<ul style="list-style-type: none"> ▪ Approximately 99.6 hectares.
Rehabilitation commitments and	<ul style="list-style-type: none"> ▪ Any operation beyond five years would be subject to further environmental assessment and approval. Should this not occur, the proposed activity would be decommissioned and the site

Item	Commitment
timeframes	<p>rehabilitated in accordance with the conditions of PAL 2.</p> <ul style="list-style-type: none"> The final landform of the site would depend on the requirements of any future user or proposed future use. The western side of the property would be converted back to grazing land. However, the irrigation area may be retained if requested by the future user. A detailed rehabilitation strategy for the site will be developed at the end of the life of the proposed activity.
Community consultation and complaint management	<ul style="list-style-type: none"> Community consultation and complaint management will be undertaken in accordance with Section 2.3 of the REF.
Soil quality and land stability	<ul style="list-style-type: none"> Erosion and sediment controls will be implemented where necessary, in accordance with the guidelines, principles and recommended minimum design standards contained in <i>Managing Urban Stormwater, Soils and Construction – Volume 1</i> (the Blue Book). These controls will be maintained until disturbed areas of the site are stabilised. A specific erosion and sediment control plan (ESCP) will be developed during detailed design and implemented for the proposed activity. Any spills or leaks will be contained and cleaned up immediately. Contaminated material (such as contaminated soil or absorbent materials) will be removed from the site for disposal at a licensed waste facility. Plant and equipment installed at the premises or used in connection with the licensed activity will be maintained and operated in accordance with condition O2.1 of EPL 20350. A soil sampling and monitoring program, inclusive of the irrigation area will be implemented, as outlined in Section 2.7.1.2. Soil amelioration, crop management and irrigation scheduling will occur generally as described in the concept irrigation design report (Appendix 3), to prepare and maintain the irrigation area throughout operation. The site will be rehabilitated in accordance with Section 2.6.4 of the REF.
Groundwater	<ul style="list-style-type: none"> Groundwater monitoring as per Section 2.7.1.5 will be implemented.
Surface water	<ul style="list-style-type: none"> Scheduling of irrigation activities will be managed generally in accordance with the concept irrigation design (Appendix 3), to minimise inundation and runoff. During construction in the event that prolonged, severe wet weather or flooding is predicted, appropriate measures will be put in place to mitigate impacts of the wet weather. The treated water storage tank will have high level alarms, or other appropriate controls, implemented to prevent overflows. A surface water monitoring program will be implemented, as outlined in Section 2.7.1.4. Management measures for dust suppression and in rehabilitation activities will be implemented, as outlined in Section 2.7.2. All above ground tanks containing material that is likely to cause environmental harm will be bunded or have an alternative spill containment system in place, in accordance with condition O5.3 of EPL 20350.
Air quality	<ul style="list-style-type: none"> Air emissions from construction-related activities will not exceed the air quality criteria at any occupied residence on privately owned land, as set out in the table in Section 6.1.4.4 of the REF (referenced from the <i>Development Consent for the Bibblewindi Gas Exploration Pilot Expansion</i>, dated July 2014). Air emissions from operations-related activities will not exceed the air quality criteria at any occupied residence on privately owned land, as outlined in Table 6-4 (referenced from the <i>Approved Methods for the Modelling and Assessment of Air Pollutants in NSW</i> (DEC, 2005)). The proposed activity will be carried out by such practicable means as to prevent or minimize the emission of dust. Plant and equipment will be operated and maintained in a proper and efficient condition. Generator selection and exhaust configuration will be designed to ensure emission rates comply with the <i>Protection of the Environment Operations (Clean Air) Regulation 2010</i> in-stack concentration limits. No offensive odours will be emitted from the proposed activity.

Item	Commitment
Greenhouse gases	<ul style="list-style-type: none"> Legislative reporting requirements for GHG emissions (such as to inform NGRS calculations) will be undertaken during both construction and operation. Natural gas fuel will be used in preference to diesel where practicable during operation. Plant and equipment will be operated and maintained in a proper and efficient condition.
Noise	<ul style="list-style-type: none"> Noise from the activity will meet the noise levels in the table provided in Section 6.1.6.3 of the REF at occupied residences unless a written agreement is in place with the landholder. Community notification will be undertaken prior to commencement of construction. Potentially impacted occupied residences will be informed of the nature of the works, duration of works and a method of contact to raise any complaints. In the event of a noise complaint, the effectiveness of noise mitigation measures will be assessed and additional feasible and reasonable measures implemented, where necessary. This may include noise monitoring.
Waste	<ul style="list-style-type: none"> Mitigation measures provided in the waste management strategy will be implemented, as outlined in Section 2.7.3. Management of waste, including its transport, will comply with the POEO Act and <i>Protection of the Environment Operations (Waste) Regulation 2005</i> (POEO (Waste) Regulation). Waste identified for recycling will be stored separately from other waste. Waste will be assessed and classified in accordance with the DECC Waste Classification Guidelines. All site personnel will be made aware of waste management procedures during the site induction and through toolbox talks.
Hazardous substance and chemical use	<ul style="list-style-type: none"> A spill kit will be available within the site during construction and personnel will be trained in its use. Chemicals and potentially hazardous substances will be used and stored according to regulatory requirements including the <i>Work Health and Safety Act 2011</i> and <i>Australian Standard 1940–2004; The Storage and Handling of Flammable and Combustible Liquids</i> or other relevant guidelines. Any dangerous goods will be transported according to regulatory requirements under the <i>Dangerous Goods (Road and Rail Transport) Act 2008</i>.
Biological impacts	<ul style="list-style-type: none"> The site boundary will be clearly marked in the field to ensure all clearing and construction activities occur within the approved footprint. Management measures will be implemented to minimise the potential for spray drift from the irrigation system to impact the stand of Brigalow on the northern boundary of the site will be minimised. Prior to earthworks, weeds listed as Noxious under the NSW <i>Noxious Weeds Act 1993</i> that are present on the site would be removed or treated with herbicide to prevent or reduce their spread. If any hollow-bearing trees are detected on-site and require removal, this will be undertaken with the supervision of an ecologist.
Public Safety	<ul style="list-style-type: none"> General site safety protocols, incident management and emergency procedures (including bushfire risk) will be implemented during the construction and operation works. Construction and operational sites will be fenced and locked after construction hours. The Bushfire Management Plan will be reviewed and updated as required to address the proposed activity. An induction for staff and contractors regarding the hazards and risks will be implemented.
Traffic	<ul style="list-style-type: none"> Access to and from adjacent properties will be maintained for the duration of construction. Parking for staff during construction and operation will be accommodated within the site. Construction traffic will not be permitted to queue or park on Old Mill Road, other State forest roads or the Newell Highway. All truck movements would be restricted to the direct route via the Newell Highway. Truck drivers will be advised of the designated truck routes to/ from the site. Oversized vehicles required for transporting earthmoving equipment will be undertaken in accordance with the relevant requirements of Roads and Maritime Services.

Item	Commitment
	<ul style="list-style-type: none"> The site access plan outlined in the transport assessment (Appendix 4) will be implemented during construction and traffic managed accordingly. Construction and operational traffic will only access Leewood via Old Mill Road.
Amenity	<ul style="list-style-type: none"> Where practicable, existing vegetation along the site boundary will be maintained to provide screening of the site. The site will be kept in a clean and tidy manner during site preparation, construction activities and operation.
Community services, infrastructure and sites of importance	<ul style="list-style-type: none"> The consultation activities outlined in Section 2.3 will be implemented.
Economic issues	<ul style="list-style-type: none"> A procurement and logistics policy would be implemented that gives preference to local businesses, suppliers and labour.
Natural resources	<ul style="list-style-type: none"> Works associated with the proposed activity will not impact on agricultural production at any adjacent properties.
Aboriginal cultural heritage	<ul style="list-style-type: none"> No works will be undertaken in the vegetated (Brigalow) area in the north-east corner of the site to avoid the scar trees (refer Figure 2-1). The isolated stone artefact (quartz) flakes will remain fenced off with a three metre buffer around each location. Project staff and contractors will be made aware of their statutory obligations for heritage under the NPW Act and the Heritage Act, as well as the location of the identified cultural objects through the site induction and toolbox talks. Monitoring will be undertaken immediately following earth-moving activities in the vicinity of the isolated quartz artefacts. This will consist of two persons jointly nominated by the Narrabri LALC and the Gomeroi native title claim group. If any previously unidentified Aboriginal site/s are identified during works, then works in the immediate area will cease, the area will be cordoned off and the OEH Enviroline 131 555 will be contacted. A suitably qualified archaeologist will be contacted so that the site can be assessed and managed. In the event that skeletal remains are uncovered, work must cease immediately in that area and the proponent, Santos must contact the NSW Police Coroner to determine if the material is of Aboriginal origin. If determined to be Aboriginal, the OEH Enviroline 131 555 and relevant Aboriginal stakeholders must be contacted to determine an action plan for the management of the skeletal remains prior to works re-commencing.
European cultural heritage	<ul style="list-style-type: none"> The temporary barriers erected around the SUGAR pits will remain in place until the completion of rehabilitation activities. No works will occur within these fenced areas. If any previously unidentified European cultural heritage material is identified during works, then works in the immediate area will cease, and advice sought from a suitably qualified archaeologist.
Cumulative	<ul style="list-style-type: none"> Santos will work with Narrabri Shire Council to ensure issues relating to increased pressure on labour resources, temporary and permanent accommodation, road infrastructure and telecommunications as a result of cumulative Santos activities are addressed appropriately.

Terms and abbreviations

Term/abbreviation	Meaning
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
AIS	Agricultural Impact Statement
ARI	Average Recurrence Interval
Blue Book	<i>Managing Urban Stormwater: Soils and Construction – Volume 1</i> (Landcom, 2004)
BoM	Bureau of Meteorology
BSAL	Biophysical Strategic Agricultural Land
CIC	Critical Industry Cluster
Consequence category	Category assigned to a dam according to the seriousness, and magnitude, of the adverse consequences affecting the community's interests, including environmental effects, which could be expected to result from that dam's failure. In assigning such consequence categories, no account is taken of the likelihood of dam failure.
CSG	Coal seam gas
dB(A)	A-weighted decibels. An expression of the relative loudness of sounds in air as perceived by the human ear.
DEC	Department of Environment and Conservation
DO	Dissolved oxygen
DoE	Department of Environment (Commonwealth)
DRE	Division of Resources and Energy (under DTIRIS)
DSC	Dam Safety Committee
DTIRIS	NSW Department of Trade, Investment, Regional Infrastructure and Services
EC	Electrical conductivity
EEC	Endangered ecological community
EFT	Equivalent full time
EHSMS	Environmental, Health and Safety Management System
EIS	Environmental Impact Statement
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPL	Environment Protection Licence
ESCP	Erosion and sediment control plan
ESG2 Guidelines	<i>ESG2: Environmental Impact Assessment Guidelines; For exploration, mining and petroleum production activities subject to Part 5 of the Environmental Planning and Assessment Act 1979</i> (DTIRIS, 2012)
EWP	Elevated work platform
FCNSW	Forestry Corporation of NSW
FGCS	Fuel gas conditioning skid. A machine that delivers clean and treated natural gas to gas turbines, gas engines, and other equipment which needs clean fuel.
Flowline	A pipeline which conveys fluid or gas from one location to another.

Term/abbreviation	Meaning
Gathering system	Large systems of pipelines that gather water and gas, typically associated with CSG projects.
GHG	Greenhouse gases
Heritage Act	<i>Heritage Act 1977</i>
ICNG	<i>Interim Construction Noise Guideline</i> (DECC, 2009)
IECA	International Erosion Control Association
INP	<i>NSW Industrial Noise Policy</i> (EPA, 2000)
LA ₉₀	Noise level which is exceeded for 90 per cent of the sample period.
LA _{eq}	Equivalent continuous sound level. The energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment.
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local government area
LoS	Level of Service
LSC	Land and Soil Capability
Mining SEPP	<i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007</i>
ML	Megalitres
MNES	Matter of National Environmental Significance
MOWL	Maximum Operating Water Level
Narrabri CCC	Narrabri Community Consultative Committee
NATA	National Association of Testing Authorities
NGER Act	<i>National Greenhouse and Energy Reporting Act 2007</i>
NGERS	National Greenhouse and Energy Reporting Scheme
NOW	NSW Office of Water
NPW Act	<i>National Parks and Wildlife Act 1994</i>
NNTT	National Native Title Tribunal
NSW	New South Wales
NV Act	<i>Native Vegetation Act 2003</i>
NW Act	<i>Noxious Weeds Act 1993</i>
OCSG	NSW Office of Coal Seam Gas
OEH	Office of Environment and Heritage
PAL	Petroleum Assessment Lease
PAWC	Plant available water capacity
PEL	Petroleum Exploration Licence
Petroleum Act	<i>Petroleum (Onshore) Act 1991</i>
PPL	Petroleum Production Lease
PM ₁₀	Particulate matter less than ten micrometres
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
POEO (Waste) Regulation	<i>Protection of the Environment Operations (Waste) Regulation 2005</i>

Term/abbreviation	Meaning
PPV	Peak particle velocity
Produced water	Also known as CSG water or wastewater, this is the water that is pumped out of coal seams in order to release CSG.
RBL	Rating background level
REF	Review of Environmental Factors
RFS	NSW Rural Fire Services
RNP	<i>NSW Road Noise Policy</i> (DECCW, 2011)
RO	Reverse osmosis
Roads and Maritime Services	NSW Roads and Maritime Services
RPS	RPS Australia East Pty Ltd
SAL	Strategic agricultural land
Santos	Santos NSW (Eastern) Pty Limited
SAR	Sodium adsorption ratio
SDS	Safety data sheet
SEPP 33	<i>State Environmental Planning (SEPP) No. 33 – Hazardous and Offensive Development Application Guidelines</i>
SIS	Species Impact Statement
SMS	Safety management system
SRD SEPP	<i>State Environmental Planning Policy (State and Regional Development) 2011</i>
SRLUP	<i>Strategic Regional Land Use Plan New England North West</i> (DP&I, 2012)
SUGAR	Sydney University Giant Air-shower Recorder
TDS	Total dissolved solids
TEC	Threatened ecological community
TSC Act	<i>Threatened Species Conservation Act 1995</i>
TSR	Travelling stock route
WBTP	Water and brine treatment plant
WMA	<i>Water Management Act 2000</i>
WPPS	Wilga Park Power Station

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Santos still hot on NSW coal seam gas project



James Baulderstone – regulatory delays have made it hard to market Santos's coal seam gas from Pilliga. **Photo: David Mariuz**



by **Angela Macdonald-Smith**

Santos has rejected suggestions that a huge contract signed by rival and potential customer Origin Energy to purchase gas from the Bass Strait has captured markets it is targeting for its delayed \$2 billion Pilliga coal seam gas project in central-west NSW.

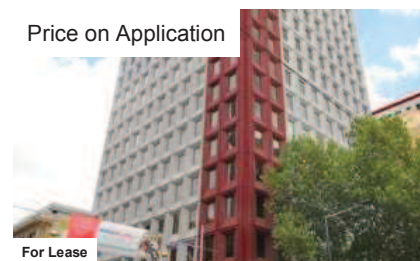
Vice-president eastern Australia James Baulderstone said Santos is “not at all worried about a lack of customers” for the Pilliga project, despite the large Origin contract. But he admitted that delays in moving ahead with the project, due to uncertain state regulatory conditions, had made it difficult to go out and market its gas, and find more partners. “It’s very hard; we can’t sell gas from these projects at the moment because our customers have no faith that this gas is going to hit the market when they need it,” Mr Baulderstone said in an interview in Adelaide.

Santos has spent more than \$1 billion on acquiring and developing its CSG position in NSW, built around its takeover of Eastern Star Gas in 2011. But its aim of starting production from the venture in 2015-16 has been foiled by changing state regulations on CSG.

Mr Baulderstone said the targeted start-up date had now slipped to 2017 and would slide again if the project didn’t start to move forward soon. He said uncertainty around the approvals process was also damaging Santos’s efforts to find customers that would co-invest in the Pilliga venture near Narrabri. “For them, it’s really a matter of when can the gas be brought on stream, and at the moment there is not enough confidence from a customer to know that so they then are forced to simply go out and buy a contract.”



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Santos is already partnered in its Pilliga project by EnergyAustralia, the former TRUenergy, which wants gas from the venture to supply its customer base in NSW. "To some degree we don't really rely at all on Origin for our customer base," Mr Baulderstone said. "We are very happy to supply the customers who need gas from 2015."

"Every molecule of gas we get out of Narrabri will be taken up by the NSW market, that and more," he said noting that gas demand in eastern Australia is set to triple by 2015 because of the new LNG export projects in Queensland.

Origin's deal to buy 432 petajoules of gas from the Esso/ BHP Billiton venture in the Bass Strait will increase NSW's reliance on Victoria for its gas. It already gets more than half its gas from Victoria, and about 40 per cent from South Australia and Queensland. Its own gas reserves meet only 5 per cent of its requirements.

Mr Baulderstone warned of the increasing reliance NSW is placing on gas from a single venture in the Bass Strait and said the answer lay in developing the state's own reserves.

He said the delay in the Pilliga project increased the risk of a large price shock in NSW for gas. While the price of gas would move up to the \$6 to \$9 range in any case, to cover increasing costs of extracting it, a spike beyond that risks destroying demand. "We didn't really expect to be delayed so significantly and that has created some tensions but as long as we move expeditiously now, I think we can very much avoid the worst positions of any price shock."

He said Santos wanted a "partnership" with government with the mutual aim of bringing Pilliga gas to the market. One of its biggest concerns is with the merit-appeal process for projects in NSW, which stalled Rio Tinto's Mount Thorley Warkworth coal project and others.

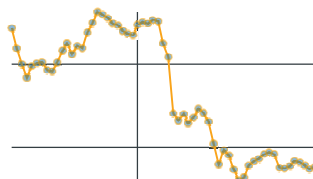
Mr Baulderstone said that process, which left the door open for "someone from left field" to challenge the whole approvals process once clearance had been granted, made investment almost impossible.

"You simply won't have investment in the energy space if the approvals process can take eight to 10 years – which is effectively what the merits appeals process allows to happen. You go through three or four years of regular approval then effectively you can be challenged and go back to square one. There simply won't be investment on that basis."

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24 February, 2014 1:56PM AEDT

Santos seals a gas deal with NSW Government

By **Kelly Fuller**

Santos and the NSW Government have signed a Memorandum of Understanding which will speed up the assessment of its Narrabri Coal Seam Gas Project

The NSW Government and Santos have cemented their relationship and support for a new coal seam gas project at Narrabri.

The company and government announced today they had signed a Memorandum of Understanding for the project expected to include up to 850 individual production wells.

The project (PEL 238) covers 98,000 hectares around the Pilliga and will include a yet unidentified pipeline.

The MoU includes an Assessment Process for Santos that moves from lodging the Environment Impact State in June 2014, then through 12 different NSW Government planning review processes to final Planning Assessment Commission Determination by the 23rd of January 2015.

The General Manager of Energy NSW for Santos, Peter Mitchely said the MoU gives certainty to the process rather than the outcome,

"...nothing in the process that is irregular ... All we are trying to do is agree with the government and government wants to agree with us that the project is important and we both need to understand how to move that process in a timely manner and that is driven by the need to get gas into the system."

"It doesn't guarantee anything actually, it very specifically says it is not legally binding, it's a Memorandum of Understanding of intent, and the intention is that it commits Santos to doing thorough and complete scientific work, putting in comprehensive assessment of the project and commits and it commits the government with intent to try and assess those submissions in a timely manner. It is very specific in the sense that it doesn't bind the government to anything, it doesn't bind the minister in making its decision, or Assessment Commission (PAC) to any outcome."

The MoU will see a co-ordinator appointed to oversee all of government responses to Santos.

The Deputy Premier Andrew Stoner wasn't available to talk to the Morning Show, but in a media statement said the deal was about energy affordability and supply,

"That is why the NSW Government has designated the Narrabri Gas Project as a Strategic Energy Project given its capacity to directly supply up to 25 to 50 percent of the State's natural gas needs."

But Mr Mitchley said there is no guarantee of supply,

"That would be wrong, we are in the process of appraising our project, we can only

know, once we have finished the appraisal work that we are currently doing, so what we are actually going to develop and the amount that our investor and board will approve, and more importantly what the state is going to approve for a development is unknown at this point in time."

As for concerns Santos would pipe the gas on to Queensland and use it for export, Mr Mitchley said the detail would be revealed in the EIS,

"We know that it is definitely running south, this is about getting gas into the NSW market and into the NSW system, there is no pipeline being contemplated that goes north, so many people are worried about the gas being exported, the molecules for this will for this physically will go south."

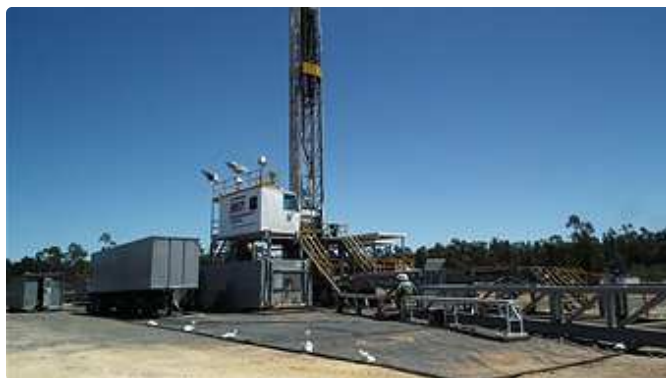
Mr Mitchley also said the deal would not give Santos a monopoly control of gas supply in NSW.

Greens MLC, Jeremy Buckingham said the Greens would refer the agreement to the Independent Commission Against Corruption for investigation.

Rosemary Nankerville from the Caroon Coal Action Group raised concerns about the timing of the announcement.

She said she is worried they are using the announcement to try and send a message to the stock exchange while they look for more investors.

"Financially it's a very strategic thing for them to do."



Santos and the NSW Government have signed an MoU over the Narrabri coal seam gas project (Lisa Herbert - ABC Rural)

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Appendix 3

Conceptual Irrigation Project Design (BeneTerra)

 <p>integrating land and water stewardship</p> <p>BeneTerra Pty Ltd PO Box 12580, George St. Post Brisbane, QLD 4003</p>		CLIENT																																							
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Executive Summary

The concept irrigation design presented herein for the Leewood project area was built upon a pre-feasibility study by BeneTerra in June 2013. In that exercise eighteen soil pits were analysed and ideas were presented as to how to design and manage irrigation at this site. Since then a comprehensive soil survey was performed using electromagnetic soil imaging to guide further soil core sampling. That information was combined with the earlier soil pit data to build a detailed soil map of the available project area. The soils were grouped into two irrigability classes – A and B.

The concept design utilises approximately all of the available land for irrigation. At peak production the Leewood water treatment plant will produce 365 ML/yr of high quality water that would be amended to lower SAR and raise EC. The soils across the site are primarily Sodosols having a low permeability layer 20 cm beneath the surface. These soils are both sodic and acidic but not saline. They are hard-setting and prone to compaction. As such they will require extensive amelioration by deep tillage, fertiliser, lime and gypsum to make them irrigable and productive. Thirty percent of the irrigable area, Class B soils lie within a drainage way that can be occasionally inundated. This area can be irrigated but will require specialised treatment.

The upland, Class A, soils would be managed differently than the wetter Class B soils of the drainage way. A sophisticated irrigation design that employs a variable rate centre-pivot and subsurface drip irrigation make it possible to irrigate this site. A perennial lucerne crop planted on the more elevated and drier Class A soils, would be harvested about five times annually. The B class soils occur on an ephemeral drainage depression that can be periodically inundated by overland flow. As this part of the landscape may become too wet to sustain a healthy lucerne stand, a blend of lucerne, white clover and fescue grass would be sown on the Class B soils. This mix would be more tolerant of occasional standing water.

Several irrigation scenarios were modelled using the HowLeaky water balance program. The modelling showed that if unlimited permeate supply was provided, the crop of lucerne would utilise 2.5 times (902 ML) the annual production at 1 MLD.

Irrigation scheduling should be supported with a variety of monitoring tools. Standard operating procedures should be developed for routine operations and maintenance procedures. Experts should be engaged for specific technical support to ensure that the mechanical and biological systems meet performance expectations. It is essential to maintain a healthy crop capable of optimal water use. Harvest operations should be conducted in a manner that minimises soil compaction.

Although this project presents little environmental risk, for quality assurance purposes we recommend a network of ten soil moisture monitoring sensors, and installation of two monitoring wells.

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LIST OF ABBREVIATIONS

AHD	Australian height datum
AIS	Agricultural Impact Statement
BOD ₅	biological oxygen demand (5 day test)
BOM	Australian Bureau of Meteorology
BT	BeneTerra
bgl	below ground level
CP	centre-pivot sprinkler system
CSG	coal seam gas
dS/m	deciSiemens per metre
EC	electrical conductivity
EC _e	electrical conductivity of a soil paste extract
EHS	environment health and safety
EM38	electro-magnetic induction device
ESP	exchangeable sodium percentage
h	hour
ha	hectare
IAR	instantaneous application rate
K	potassium
kg/ha	kilograms per hectare
LF	leaching fraction
LR	leaching requirement
m ³ /h	cubic metres per hour
mg/L	milligrams per litre
ML	megalitre
MLD	megalitres per day
ML/ha	megalitres per hectare
ML/ha-yr	megalitres per hectare per annum
mm	millimetre
mm/h	millimetres per hour
mS/cm	millisiemens per centimetre
N	nitrogen
NSW	New South Wales
ORP	oxidation reduction potential
P	phosphorus
PAWC	plant available water capacity
REF	Review of Environmental Factors
RO	reverse osmosis
S	sulphur
Santos ENSW	Santos Energy New South Wales
SAR	sodium adsorption ratio
SAR _e	sodium adsorption ratio of soil paste extract
SCADA	supervisory control and data acquisition
SDI	subsurface drip irrigation
SHC	saturated hydraulic conductivity

t	tonnes
t/ha	tonnes per hectare
t/ha-yr	tonnes per hectare per year
TOC	top of casing
$\mu\text{S}/\text{cm}$	microsiemens per centimetre
VFD	variable frequency drive
VRI	Variable Rate Irrigation system
yr	year

1 Introduction

This report is built upon an earlier pre-feasibility study performed by BeneTerra in 2013 wherein irrigation of the Leewood site was deemed to be feasible given adequate soil amelioration and a management strategy sensitive to soil classes.¹ The new information presented herein includes details from additional soil measurements, water balance modelling, concept irrigation design, and a description of operational activities.

2 Project activities

The following activities have been undertaken as part of the concept design:

- Desktop review of Phase 1– Review of Environmental Factors²
- Pre-feasibility study
- Interviews with key local people
- Soil sampling and EM38 mapping of soils
- Concept design of irrigation system
- Water balance modelling
- Interpretation and reporting

3 Assumptions

We have arrived at the following assumptions through review of the Phase 1 REF, discussions with Santos NSW staff and review of documents presented to BeneTerra. The base assumptions used for the design of this project were:

- Project design life will be four to five years
- Maximum irrigation water production will be 1 MLD, 365 ML/yr
- Treated (desalted) irrigation water will be derived from reverse osmosis treatment and will be of suitable irrigation quality with no toxic elements or excessive nutrients
- The relevant local historical climate data for modelling purposes was the period of January 1963 to April 2013
- The designated paddock for irrigation can be cleared of existing vegetation
- There are no identified legal, cultural heritage or ecological issues to prevent development and operations

¹ Bailey, G and J Zupancic. 2013-06-25. Irrigation feasibility at Leewood project site. For Santos NSW by BeneTerra.

² RPS. 2012. Leewood-Produced Water & Brine Management Ponds Review of Environmental Factors (Phase 1). For Santos.

4 Site description

4.1 Location

The prospective irrigation site is located on the eastern half of Santos ENSW's Leewood Block, approximately 24 km southwest of Narrabri on the Newell Highway. The property borders the Pilliga State Forest on the south and west boundaries. It is bounded on the southwest corner at MGA 55, 751072 E, 6622328 S and northeast corner at 55, 752849 E, 6623255 S. The property is accessible by the Newell Highway which runs along the eastern boundary and Dog Fence Road which runs westward along the southern boundary into the Pilliga State Forest.

4.2 Climate

Australian Bureau of Meteorology records from January 1963 to April 2013, Narrabri post office [station 053030] were utilised to develop the climate statistics and design basis for this project.³ The climatic regime is characterised by a slightly summer dominated rainfall pattern, with almost half the annual rainfall (46%) falling between November and February. Over the 50-year period mean annual rainfall at nearby Narrabri was 644 mm (Figure 1) whereas annual mean pan evaporation was 1,966 mm. Evaporation exceeded rainfall in all months (Figure 2).

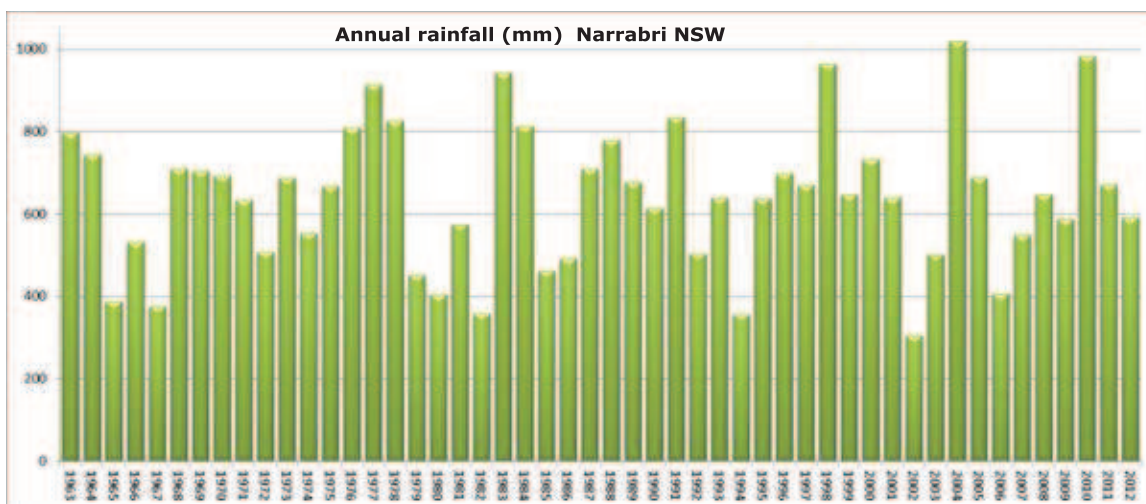


Figure 1 Annual rainfall at Narrabri NSW - 1963 – 2012

³ Bureau of Meteorology [internet]. 2014 [cited 2014-03-28]. Available from: <http://www.bom.gov.au/>

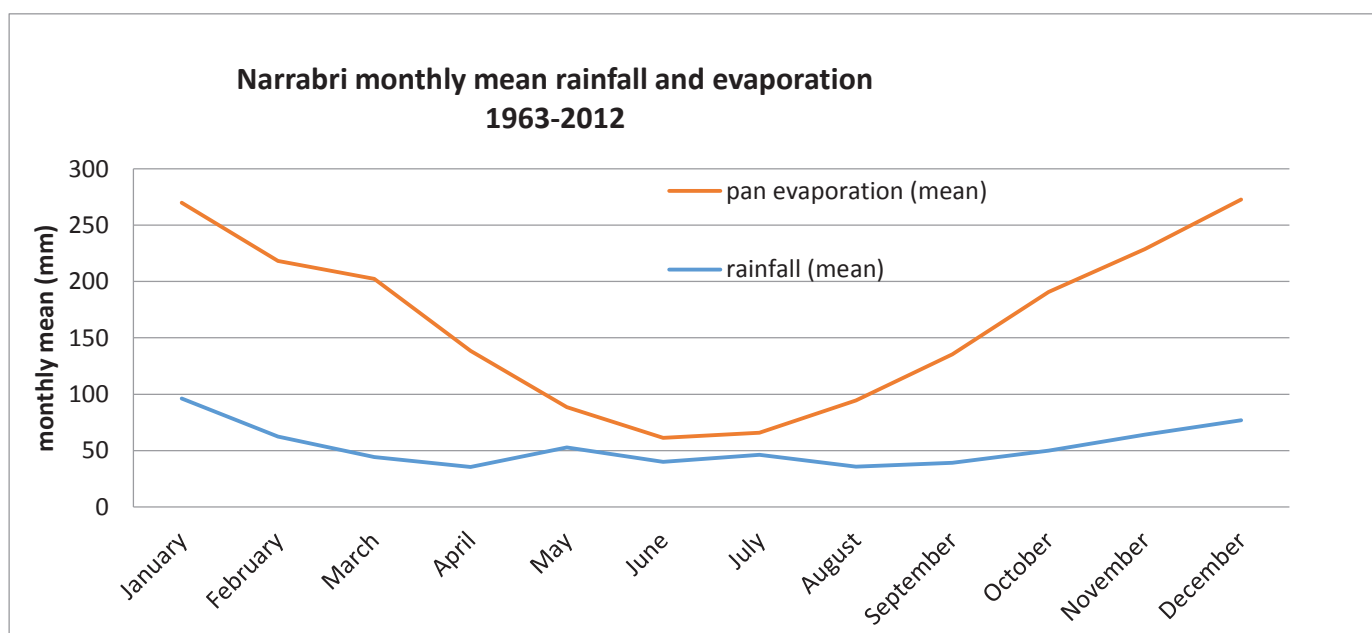


Figure 2 Mean rainfall and evaporation at Narrabri NSW (1963 - 2012)

Frosts can occur between May and October, and are common between June and August. Temperatures over 40°C have been recorded between October and March. The growing season for lucerne and pasture grasses is predominantly September to April, with growth during the winter months being approximately a third to a quarter of the summer growth rate.

4.3 Geologic setting

The surficial geological layer of the majority of the site is described as being Quaternary colluvium and/or residual deposits, and comprise talus, scree and sheet wash. These can take the form of boulder, gravel or sand, and may include minor alluvial or sand plain deposits. The southwest corner of the parcel is mapped as a Cainozoic sand plain, and may include some residual alluvium. It is sand dominant, also containing gravel and clay⁴. Further discussion of the geology of the site can be found in the Phase 1 REF (pp. 63).⁵ Siliceous sands are dominant components of the parent material forming the soils, and consequently all the soils described at the site presented coarse sand fragments that were easily distinguishable by feel in most horizons.

4.4 Topography

The site is relatively flat, with elevations ranging from 245 m to 249 m. The median slope for the irrigation area is 0.4%. The minimum slope for the area is 0.2% and maximum slope is 1.2%. The steepest slope drains a small catchment toward the northeast toward the Newell highway and the Bohena Creek. This corner also presents the best drained soils. The land rises away slightly from this corner towards the southwest, then slopes down toward a minor depression forming the drainage line that flows across the parcel from the southeast corner to the middle of the western boundary (Figure 3). Most of the property drains toward the northwest and overland flow enters from the southeast corner of the parcel.

⁴ Geological Survey of New South Wales, Statewide Geodatabase, 1:250,000 scale or better, 2005 updated data (unpublished). Geoscience Australia

⁵ RPS. 2012. Leewood-Produced Water & Brine Management Ponds Review of Environmental Factors (Phase 1). For Santos.

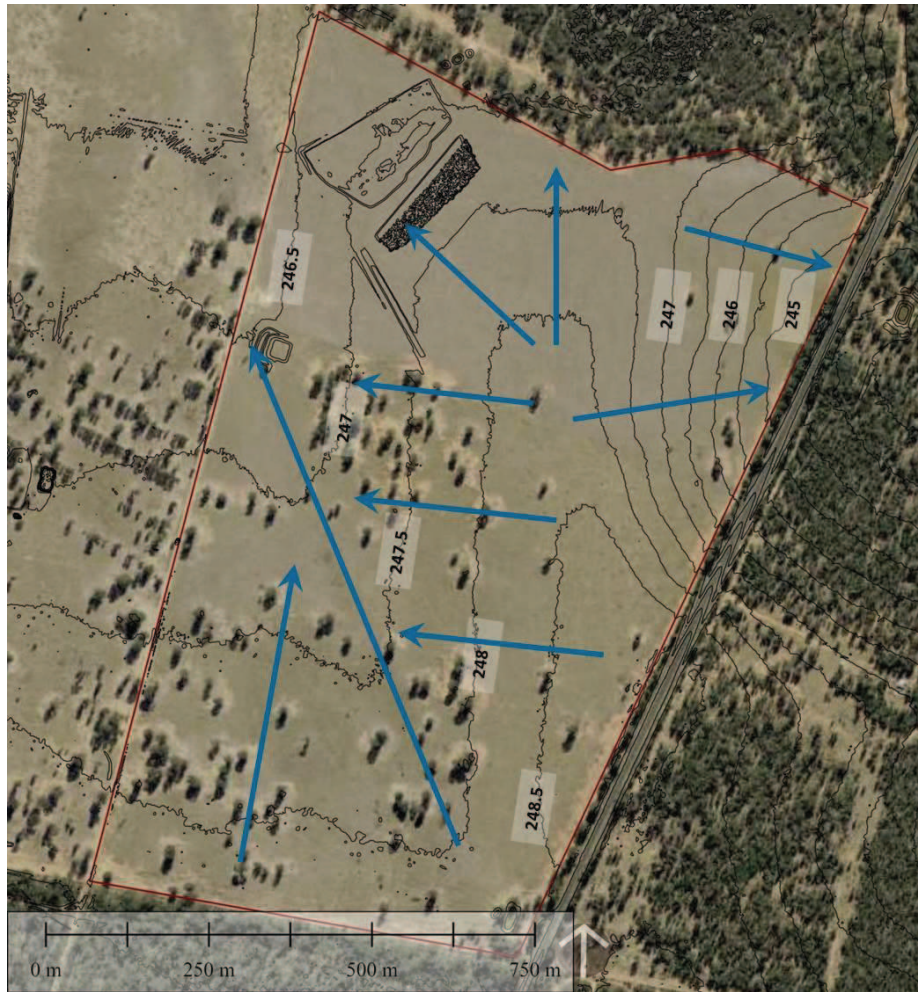


Figure 3 Topography and drainage patterns of prospective irrigated area

4.4.1 Limitations of landscape

The slopes on this site present no limitations for sprinkler or drip irrigation (Table 1). Occasional flooding or inundation of the lower elevations presents a “moderate” limitation. The drainage line is considered a “severe” landform limitation according to Table 1 because of potential erosion and waterlogging. A mitigation strategy is proposed for selectively irrigating this area. There are no surface outcrops of rock to interfere with irrigation of this property.

Table 1 Landscape slope limitations for irrigation technologies (after NSW effluent guidelines Table 2.1)⁶

Property 1	Limitation			Restrictive Feature
	Nil or Slight	Moderate	Severe ²	
Slope (%) (for following irrigation methods)				
– flood/surface/underground	< 1	1–3	> 3	excess runoff and erosion risk
– sprinkler	< 6	6–12 ³	> 12 ³	
– trickle/microspray	< 10	10–20 ³	> 20 ³	
Flooding	none or rare	Occasional	frequent	limited irrigation opportunities
Landform	crests, convex slopes and plains	concave slopes and foot-slopes	drainage lines and incised channels	erosion and seasonal water-logging risk
Surface rock outcrop (%)	Nil	0–5	> 5	interferes with irrigation and/or cultivation equipment; risk of runoff

Source: Based on Hardie and Hird (1998), NSW Agriculture, Organic Waste Recycling Unit

Notes: 1. Careful consideration should also be given to potential impacts on groundwater (see 2.6 Groundwater).

2. Sites with these properties are generally not suitable for irrigation.

3. Slopes over 12% may be acceptable provided runoff and erosion risks are identified in the site selection process.

4.5 Vegetative cover

The property is primarily covered with low quality pasture grasses and scattered remnant trees (**Figure 4**). The dominant tree species is *Eucalyptus pilligaensis* (Pilliga box), with occasional *E. crebra* (narrow leaved ironbark) also occurring. Approximately 150 medium to large woodland trees occur within the proposed irrigation area. Aside from these scattered remnant trees, there was no native vegetation cover aside from some native grasses that comprise part of the pasture mix.



Figure 4 View of landscape and vegetation of prospective irrigated area

⁶ Dept. Environment & Conservation (NSW).2004. Environmental Guidelines - Use of Effluent by Irrigation.

5 Water supply for irrigation

5.1 Water volume

Associated water from CSG wells will be collected in holding ponds at Leewood and treated by reverse osmosis (RO) technologies. At peak production it is expected that 1 MLD (365 ML/yr) desalted, RO permeate water will be available for irrigation.

5.2 Water quality

Expected permeate water quality data was provided by Santos ENSW for the Leewood project. The expected RO permeate water reflects amendment of that water for irrigation purposes such that it is optimal for soil /water interactions and longevity of the soil structure maintenance. Additional chemical treatments may be required for subsurface drip irrigation (SDI) to avoid potential blockage of emitters and maintain the structural integrity of the soil profile over the life of the project. BeneTerra has determined the expected water quality for irrigation purposes as shown in Table 2. Permeate water quality from the RO process was provided by Santos ENSW and BeneTerra determined the expected irrigation water quality for both these temperatures post amendment.

Table 2 Expected irrigation water quality

Parameter	Expected treated water ⁷
pH	6-8.5
TDS (mg/L)	<650
Salinity (mS/cm)	1.0
Turbidity (NTU)	<1
SAR	<5
Calcium (mg/L)	52
Magnesium (mg/L)	0.04
Sodium (mg/L)	131
Potassium (mg/L)	7
Ammonia-N (mg/L)	6
Boron (mg/L)	0.7
Alkalinity (mg/L CaCO ₃)	262
Chloride (mg/L)	120
Fluoride (mg/L)	0.3
Sulfate (mg/L)	0.0
Total N (mg/L)	Feed reduced by 50%
Total P (mg/L)	Feed reduced by 94%
Silica (mg/L SiO ₂)	0.9

5.3 Suitability for irrigation

The added calcium may reduce the need for future gypsum treatment of soils but care must be taken that calcium carbonate precipitation does not cause drip emitter plugging. Sulphuric acid amendment will

⁷ Treated water following chemical dosing, prior to entering the irrigation system.

remove bicarbonate to minimise the prospects of carbonate deposits in the SDI system and negative effects of bicarbonate on soils.

This water would be classified as “medium strength effluent” according to Table 3.1 of the NSW effluent guidelines only because it was ranked as medium in TDS concentration (600-1000 mg/L).⁸ It would be ranked as low in the other five categories listed. It will carry 6 mg/L of nitrogen as ammonium, and no metals or sources of nutrients or BOD₅. Fluoride concentration will be very low at 0.2 mg/L. Boron at 0.78 mg/L would be safe for the chosen forage crops according to the short-term trigger values (20 yr life cycle) of the ANZECC/ARMCANZ 2000 guidelines.⁹

The RO permeate should contain no heavy metals or organic compounds as these relatively coarse materials would be rejected by membranes in the treatment train.

5.4 Salinity and salt contribution to soils and vadose

The salinity of the amended water would be rated as “low” and suitable for moderately sensitive crops according to Table 3.4 of the NSW effluent guideline. Amendment of the water to EC of 1.0 mS/cm (Table 2) makes the water more suitable for the intended soils.

Most irrigation waters carry a salt load that presents a risk of accumulation in the rootzone particularly in arid regions or where high water table exists. Annual rainfall of 644 mm will offset some of the effects of salt deposition by irrigation water. Given average rainfall the weighted average EC of water applied to the crop would be 0.4 mS/cm. The average rootzone salinity, EC_e, of the Leewood soils is currently 1.5 mS/cm. Based upon BeneTerra’s experience growing lucerne with effluent a reasonable rootzone target EC_e of 4.0 mS/cm would be acceptable before yield declined excessively.

At an irrigation application rate of 372 mm or 3.7 ML/ha-yr (365 ML/ha applied evenly across 98 ha) the annual salt input from irrigation is shown in Table 3. The calcium sulphate salts will have a positive effect on soil quality so are not of concern. Annual salt inputs of sodium chloride from 644 mm rainfall are fairly small, estimated to be about 31 kg/ha.¹⁰ Whereas the permeate would add 490 kg/ha sodium and 440 kg/ha of chloride annually.

Table 3 Annual salt loading from 3.7 ML/ha of irrigation water

Salt added (kg/ha-yr)	Amended permeate
Sodium	490
Calcium	190
Chloride	440
Sulphate	0
Bicarbonate	1200
Total salts	2320

⁸ Dept. Environment & Conservation (NSW).2004. Environmental Guidelines - Use of Effluent by Irrigation. pp 19.

⁹ ANZECC and ARMCANZ 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.Natl Water Qual Mgmt Strategy. Aus & NZ Env & Conservation Council, Agric & Resource Mgmt Council of Aus & NZ.

¹⁰ Biggs, AJW.2004. Rainfall salt loads in southern Queensland, Australia, ISCO 13th International Soil Conservation Organisation Conference – Brisbane, July 2004 Conserving Soil and Water for Society: Sharing Solutions Paper No. 680

A yield of 15 tonnes of dry matter per year should be easily achievable at this site. Based on laboratory work previously performed by BeneTerra, on average lucerne will take up approximately 0.25% NaCl (2,500 ppm) in the dry matter. This equates to approximately 40 kg NaCl/ha-yr removed in the dry matter for the lucerne crop accounting for rainfall accessions plus a small amount of that from irrigation water. Thus it will be necessary to continually move a portion of the salts through and out of the rootzone via leaching – also referred to as deep drainage.

The leaching requirement can be estimated from the following equation:¹¹

$$LR = EC_w / ((5 * EC_e) - EC_w)$$

where:

LR = leaching requirement as a fraction of applied water and rainfall

EC_w = the electrical conductivity of irrigation water plus rainfall (weighted average)

For the water plus rainfall EC_w would be 0.4 mS/cm.

EC_e = paste extract electrical conductivity of rootzone threshold for yield suppression

A leaching requirement of 0.05 (50 mm) would be required to maintain the current rootzone EC_e and 0.02 (20 mm) would maintain a rootzone EC_e of 4.0 mS/cm. Salts leached beyond the rootzone would then accumulate in the vadose at a rate matching the additions from irrigation and rainwater. These salts would gradually leach down toward the watertable, with movement coinciding with flushing events when rainfall and irrigation exceed evapotranspiration and soil water storage capacity. The estimated distance of travel for the leachate from the bottom of the 1.5m root zone to the static water level at 20 m is 18.5 m.

At the estimated volume of leachate produced annually and assuming a vadose water holding capacity of 100 mm/m, and assuming uniform saturated hydraulic conductivity, it would take approximately 80 years for the deep drainage leachate to reach groundwater.

The modelling discussed in Section 9.1.7 predicts deep drainage of approximately 5 mm/yr. The shortfall in deep drainage can be overcome in the irrigation scheduling with good management and precision application irrigation systems (Variable Rate Irrigation VRI on the CPs and the sub-surface drip irrigation system). During periods of low ET an excess LF can be applied in order to achieve the theoretical LF requirement for the year. This can be achieved effectively by monitoring and applying the excess LF every few years as required. The soil will also encounter a large dilution of salinity due to heavy rainfall events. A large percentage of the soils at Leewood (30 ha of Class B) will be leached by occasional overland flow. Modelling indicates that overland flow events occur once or twice per year in most years.

¹¹ Ayers, RS and DW Westcott.1994.Water quality for agriculture. FAO Irrigation and Drainage Paper 29 rev 1.

6 Soil investigations

It is important to understand the soil qualities prior to designing an irrigation / cropping system. The soil serves as a medium for crop growth, a reservoir for water storage, a source of plant nutrients and a buffer to water and solute movement between the atmosphere and groundwater.

A total of 34 soil profiles were described and sampled by a Certified Professional Soil Scientist and a soil distribution map of the subject site was generated (**Figure 7**). Eighteen of these sites were soil pits dug to 140 cm with an excavator. These were located using topographic position, seasonal inundation maps from the Phase 1 REF¹² and gamma radiometric data as a part of the initial pre-feasibility study. The pits provided a superior means to observe the soil qualities visually (**Figure 5**). They were distributed across the property relatively evenly. The pits were sampled and described on 25 April 2013. Then on 11 February 2014, an electromagnetic induction (EM38) survey was carried out providing spatial data on the relative electrical conductivity of the soil (**Figure 6**). The map derived from the EM38 survey was used to assist with delineation of soil property boundaries and location of a further 16 soil investigation sites. On 13 February 2014 these were sampled to a depth of 150 cm using a hydraulic push tube corer.

Field inspection and subsequent characterisation of these soil profiles included:

- Identification and measurement of soil horizon depths
- Observation of soil structure (macropores, cracks, aggregates)
- Observation of plant rooting patterns
- Soil texture estimation (clay percentage)
- Colour determination
- Consistency observation
- Field pH and presence of carbonate

Selected samples from these sites were sent to laboratories for chemical analyses. The analyses included pH, elements of soil salinity, base saturation and fertility.

These assessments provided important insights into the soil qualities of the site, their spatial occurrence, and how these soils might be managed under various irrigation scenarios.

6.1 Soil descriptions

The soils were initially grouped into “soil units” based on similarities in morphology, chemistry and management requirements. Five soil units were defined for the Leewood property. The morphological differences between individual profiles within any given soil unit were very slight (Appendix A), with physical appearances of each unit being well represented by the images in **Figure 5**.

- Red Chromosol (1 ha)

¹² RPS. 2012. Leewood – Produced Water and Brine Management Ponds – Review of Environmental Factors. For Santos.

- Brown Chromosol (4 ha)
- Brown Sodosol-transitional (6 ha)
- Brown Sodosol (58 ha)
- Grey/Brown Sodosol (31 ha)

All five soil units shared the characteristics of being loamy and acidic in the surface grading to less acidic below the surface horizon with most becoming near neutral in the subsoil. Plant nutrients phosphorus, potassium and sulphur are marginal to deficient. Phosphorus buffering, estimated from soil type and surface texture, were moderate in the soil surface and high in the subsoil.

The two Chromosol units were only found in the northeast corner of the property and only comprise 5% of the available area. These are friable and moderately to well-drained and would be well suited for irrigation purposes.

The three Sodosol soil units are all very similar, and share the characteristics of being hardsetting in the surface, and having a very hard, coarse and physically constraining subsoil. The subsoil is capped by hard clay columns approximately 10 cm across and 40 cm long. These are characteristic of many sodic soils and create a physical barrier that reduces the options for water and root movement. Root and water movement are strongly preferential, and are concentrated on the edges of these clay structures. Roots generally extended to 140 cm in depth.

The subsoil becomes moderately saline below 50 cm depth; however, this feature will not be a constraint if suitable crop species are grown under irrigation.

Base cation measurements show that the soils are extremely deficient in calcium from the perspective of soil stability. The subsoils are highly magnesium dominated, and magnesium is less able to oppose the destabilising effects of sodium than is calcium. Exchangeable sodium is high, inducing a hardsetting surface, and is causing high dispersibility, hardness and low porosity in the first subsoil horizon of all the Sodosol soils.

Some of the soils also have dispersive properties in the lower subsoil. Exchangeable sodium increases with soil depth, becoming very high in the lower subsoil. However, the dispersion effect of the sodium is offset by the electrolyte effect of the increased salinity, resulting in the soil being more stable at this depth than in the surface layers.

Red Chromosol soil unit (2013 profile 2) - A friable brown loam over a friable red clay loam. Well drained, and chemically and physically amenable to root growth. Approximately 1 ha in area.

Brown Chromosol soil unit (2014 profile 11) - A friable brown loam over a hard brown clay. Moderately drained, and moderately chemically and physically amenable to root growth. Approximately 4 ha in area.

Transitional Brown Sodosol soil unit (2013 profiles 1, 3 and 2014 profile 16) - This unit is very similar to the Brown Sodosol unit for most of its properties (see description below). The soils of this unit were shallower

than the other Sodosol units, with a sandstone parent material encountered at around 120 cm. The soils of this unit also exhibited a very slightly brighter surface colour than the other Sodosol units. Additionally, boundaries derived from the EM38 scan and the surface topography appear to correlate with this unit. Approximately 6 ha in area.

Brown Sodosol soil unit (2013 profiles 4, 5, 7-11 and 2014 profiles 4, 6, 8, 9, 12, 18, 19) - A hardsetting brown sandy clay loam (or clay loam, sandy) over a very hard columnar brown clay. Well drained in the 15 cm or so of loam at the surface, changing sharply to much lower porosity clay upon which water perches for extended periods following heavy rainfall (remaining saturated for several days to a week). Root growth often extends to the full depth excavated, but is restricted by the coarse soil structure and moderate salinity of the subsoil, particularly below 1 m. Approximately 58 ha in area.

Grey/Brown Sodosol soil unit (2013 profiles 6, 12-14 and 2014 profiles 1-3, 5, 7, 10, 13) - Similar to Brown Sodosol unit, but with the following distinctions. Often a thicker surface soil, possibly built up from erosion off the up-slope soils, usually with a distinctly bleached subsurface horizon above the coarsely structured subsoil. The subsoil is grey or grey brown, indicating poorer drainage than the other soil units. However, it appears this is due just to landscape induced inundation i.e. due to drainage line flooding, rather than to lower internal permeability of the soil. Root development and clay structure are similar to the other Sodosols, indicating that the landscape effect is more important than differences in soil morphology. These cover approximately 31 ha in area.

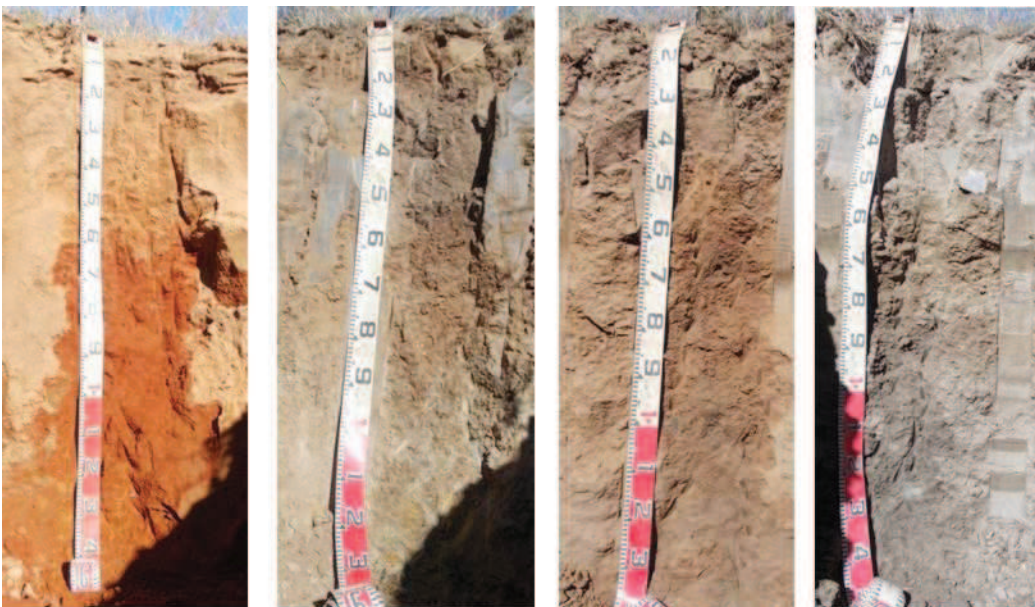


Figure 5 Soil pits with profile examples. L to R Red Chromosol, transitional Brown Sodosol, Brown Sodosol, Grey Sodosol

6.2 Soil classification

The soils of the site were relatively uniform, with the EM38 survey (**Figure 6**) and the new soil core sites confirming the soil distribution estimated from the original mapping process. The majority of the soils were

identified as “Magnesian Mesonatric Grey or Brown Sodosols; medium, non-gravelly, clay loamy/clayey, deep” according to the Australian Soil Classification¹³.

The soils in the northwest corner of the property tended to be shallower with most presenting a sandstone parent material within 1.2 m. Only about 11 ha consisted of these soils, with 6 ha of Brown Sodosols, and the remaining 5 ha being Red or Brown Chromosols- “Mottled, Mesotrophic Brown or Red Chromosol; medium or thick, non-gravelly, loamy/clay loamy, deep”.

For the purposes of this irrigation project design the soils on this site were further grouped into two irrigation management classes – A and B. These were differentiated primarily due to their landscape position and susceptibility to inundation.

- Class A soils: Chromosols and Brown Sodosols – more upland soils
- Class B soils: Grey/Brown Sodosols – lower lying soils

¹³ Isbell, Raymond. The Australian Soil Classification. CSIRO Pub. Rev. 2002.

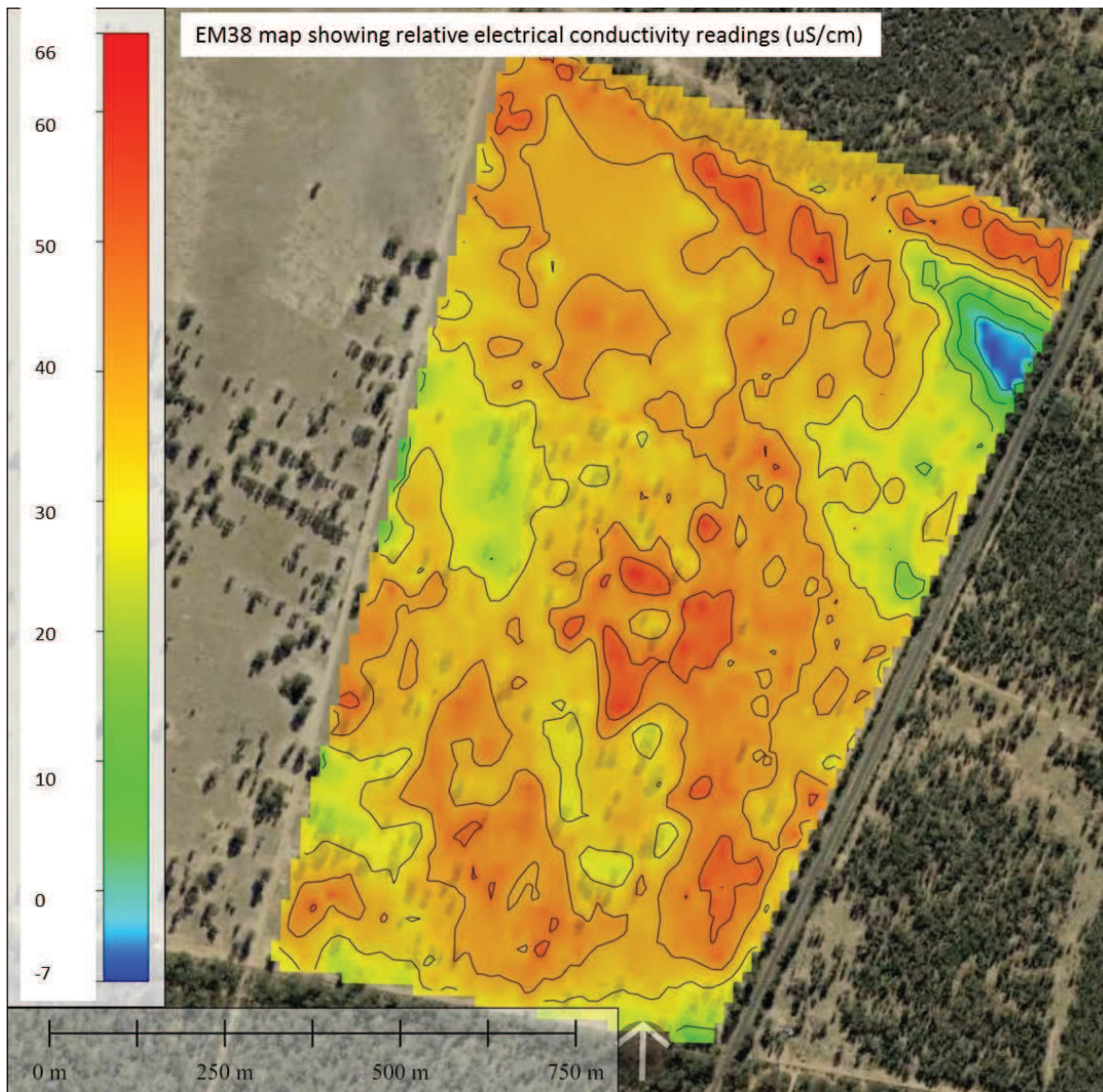


Figure 6 Results of EM38 survey illustrating varying soil conductivity across the project area

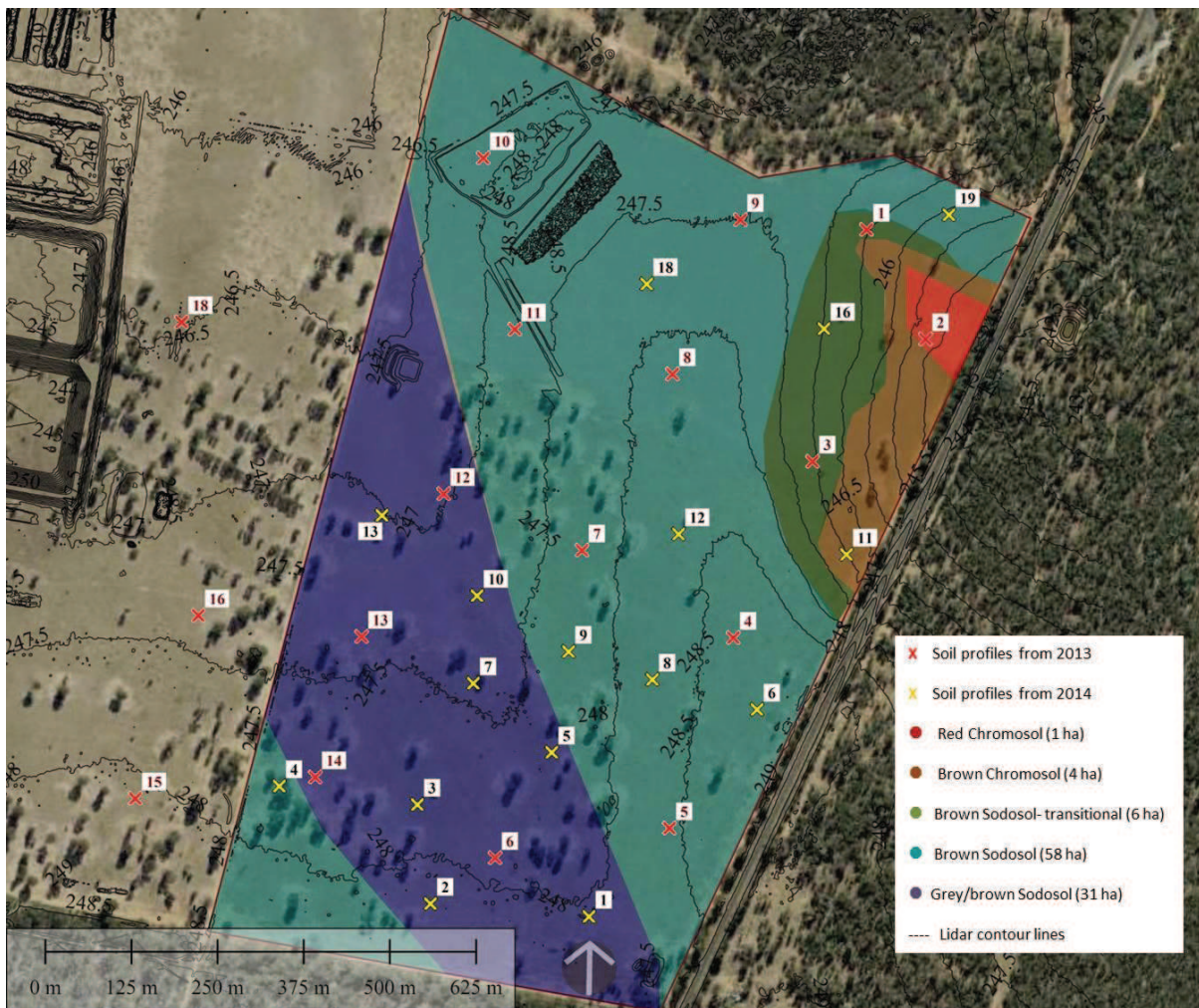


Figure 7 Soil sampling points and soil type distribution across irrigation area

The irrigation system design and operations would treat these as different management zones. Thus irrigation infrastructure, cropping and irrigation scheduling would vary according to the irrigation management class.

6.3 Soil metals

A subset of the soil cores from the 2014 soil survey of the site were analysed for heavy metals, including uranium and mercury. The results of these analyses are provided in Table 12 of Appendix A. The soil profiles selected were selected based on spatial distribution and their representativeness of the more prominent soil units described across the site. The range of depths sampled including from the ground surface to 150 cm below ground level. None of the metals were measured at levels above regulation thresholds.

6.4 Limitations

6.4.1 Soil chemistry

Note that details of soil chemistry for each sample tested can be found in Appendix A. All of the soil units exhibited exchangeable sodium percentages (ESP) greater than 10 in the surface 40 cm (**Figure 8**) which ranks as a “severe limitation” (Table 4). However surface application of gypsum can decrease this limitation to slight or moderate.

The ESP of the deeper soil, 40 to 100 cm, averaged 28% on the soils analysed but is not as critical a limitation as the surface ESP. This restriction can be mitigated through deep incorporation of gypsum into the soil.

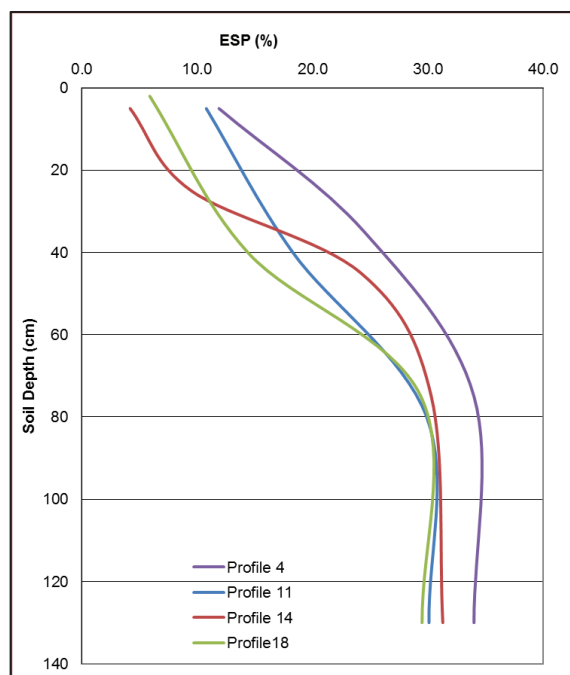


Figure 8 Exchangeable sodium percentage increases by depth until about 60 cm from four representative sampling locations.

Salinity posed a slight to moderate limitation for these soils in the 70 to 100 cm depth zone. However, some healthy roots were observed beyond 100 cm in many of the profiles. There were no indications that the water table or bedrock would be a limitation.

The saturated hydraulic conductivity (SHC) of the subsoil presents the most severe limitation as it would likely be in the range of 1 mm/hr. This contrasts sharply with approximately 20 mm/hr in the surface soil.¹⁴ This can be mitigated through careful irrigation scheduling that fills the surface horizon and allows enough time for that soil water to drain into the subsoil. Soil amelioration techniques such as ripping and injection of gypsum (and possibly organic matter) will improve SHC in the upper subsoil, possibly to as high as 6 mm/hr, reducing this limitation to a moderate level.

¹⁴ McDonald, R., Isbell, RF, Speight, JG, Walker, J and Hopkins, MS (1990). Australian Soil and Land Survey Field Handbook. Goanna Print. Canberra. Australia, pp. 150.

These soils have adequate water holding capacity. The surface pH is acidic (and commonly strongly acidic), but is easily amended with lime. The cation exchange capacity limitation is related to sandy soils and their ability to retain nutrients. This is irrelevant in this case because the soils have high clay content and, unlike most effluent waters, the irrigation source will not be nutrient rich. The site will require the addition of phosphorus (P), potassium (K) and sulphur (S) based fertilisers in order to optimise productivity of irrigated crops.

The second last limitation listed in (Table 4) relates to dispersibility, a result of sodicity, and is addressed above. These soils have dispersive qualities but amendment with lime and gypsum will mitigate that restriction.

6.4.2 Physical limitations

The key limitations of the site relate to the impeded drainage of the majority of the soils. All the Sodosol units (95% of the area) have coarsely structured, columnar subsoils which will perch water and drain slowly and preferentially (unevenly). The poor subsoil drainage is greatly exacerbated for the 31 ha of grey brown Sodosols that are subject to higher levels of overland flow associated with the drainage line.

The massive (structureless) clay loam and sandy clay loam surfaces of all the soils of the site have particle size distributions that make them highly susceptible to compaction when they are wet. Their lack of shrink/swell capacity also means they have little self-repair potential once compaction has occurred. As the subsoils will perch water, saturation of the surface soil following heavy rainfall is likely to extend for several days to a week after rain/overland flow stops. These drainage/waterlogging related issues will restrict water scheduling options, as well as the trafficability of the site.

6.5 Soil management

These soils are susceptible to compaction and runoff. It will require amelioration by deep ripping and application of gypsum to improve the permeability of these Sodosols. Ongoing calcium additions with irrigation water will assist this process. Traffic on the site needs to be restricted when soils are wet. It will be important to dry the soils out prior to harvest activities. A perennial lucerne crop will be recommended as it will reduce the need for ongoing soil disturbance. The crop will be harvested for hay or silage thus eliminating livestock traffic.

The upper horizons of these soils are acidic to the degree that crop growth would be inhibited. Application of 8 to 10 t/ha of lime will alleviate this problem. The extra calcium from the lime will ameliorate the effects of sodium as well.

Soil fertility will require ongoing monitoring to assess requirements. Initial fertiliser applications include P to address soil deficiencies. This will be followed by annual applications of P and K as necessary to maintain soil levels and replace removals from the crop. Trace elements will be monitored using plant symptoms and foliage analysis. Sulphur will be abundant due to the gypsum application.

Table 4 Range of soil qualities from all described units found at Leewood site and expected effect of amendment (shaded) in reference to Table 2.2 NSW effluent guide.¹⁵

Property	minimum	Maximum	mean	Limitation rating
ESP (0-40 cm)	10	25	18	severe
ESP (0-40 cm)- if amended	3	10	8	moderate
ESP (40-100 cm)	20	35	28	severe
ESP (40-100 cm)- if amended			na	na
ECe (0-70 cm) dS/m	0.5	1.0	0.8	nil
ECe (70-100 cm) dS/m	3.5	5.5	4.8	slight /moderate
Water table depth	>5 m		na	nil
Depth to C horizon	>1.5 m		na	nil
SHC top 1m (mm/hr)	1	20	na	severe
SHC top 1m (mm/hr)- amended	5	30	na	moderate
PAWC (mm/m)	110	110	110	nil
pH surface	5.2	5.9	5.5	moderate
pH surface- amended	7.0	7.0	7.0	nil
CEC (0-40 cm)	10	16	12	moderate
Dispersion	1	1	1	severe
Dispersion- amended	4	4	4	nil
P buffer	high	high	high	nil

6.6 Soil salinity

The baseline soil paste extracts (EC_e) showed salt content to be relatively low in the upper solum and subsoil. The amended irrigation water will contribute sodium and calcium salts in approximately equal quantities. This combination should ameliorate the effects of dispersion however the EC_e could rise to an inhibitory level if some leaching does not occur.

As mentioned in the NSW effluent guideline, “modelling the movement of salt through the soil is particularly difficult.” Salt accumulation is diminished by applying excess water beyond crop needs – known as a leaching fraction - to encourage downward movement of salts. This is best managed through annual soil sampling, EM38 scans and instrumental monitoring of salt accumulation in the rootzone and beneath (refer to Section 5.4).

The leaching fraction need not be considered just an exceedance of total annual consumption but can be seasonally targeted toward periods when ET is low. The proposed irrigation system would also provide the control sensitivity such that leaching can be targeted to specific areas in need of leaching. It is likely that

¹⁵ Dept. Environment & Conservation (NSW).2004. Environmental Guidelines - Use of Effluent by Irrigation.

leaching fractions need only be applied to Class A soils as occasional inundation of the Class B soils should serve that purpose.

7 Irrigation design

The concept irrigation design (Appendix B) combines two technologies enabling irrigation of 97.8 ha. It employs both a centre-pivot irrigator (CP) fitted with Variable Rate Irrigation (VRI) technology covering 49.5 ha and subsurface drip irrigation (SDI) covering 48.3 ha. This configuration was designed to accommodate the limited space available at the site, the soil intake limitations and the dissection of the Class A soils by the drainage line containing the Class B soils. The dual system will be capable of delivering peak water demand of 12 mm/day across the 97.8 ha. The maximum daily output would be 11.7 MLD. Both systems can be operated simultaneously. The whole system - pump station, irrigation infrastructure and soil moisture sensors would be monitored and capable of being controlled remotely via telemetry or internet connections.

The CP and the SDI systems will be supplied by separate mains and pumps (Appendix B). These need to be separated because of the extra requirements of the SDI system for filtration and disinfection.

7.1 Pump station requirements

It is envisioned that a redundant pump would serve each system (see process flow diagram in Appendix B). Each set of dual pumps would be controlled by a variable frequency drive (VFD) to accommodate the varying flow rates required for sensitive control of water application by management zone. Small jockey pumps would maintain pressure in the lines when the systems were not running to minimise the effects of water hammer on pipelines and protect irrigation infrastructure.

The water supplied to the SDI system should be filtered and disinfected, typically with hypochlorite, to prevent emitter plugging. The system should be capable of injection of sulphuric acid to prevent carbonate accumulation in the emitters.

Provisions should be made for safe storage of acid and chlorination products. Specialised injection pumps would also be employed along with a static in-line mixer. Chemicals would be injected prior to filtration.

The pumps supplying the CP system do not require the same level of variable flow control as the SDI system. Some level of filtration should be provided to prevent nozzle clogging but a coarser hydraulic screen-type filter can be utilised.

7.2 Centre-pivot features

The CP system (Table 5) will cover 49.5 ha - traversing 42.2 ha of Class A soils and 7.3 ha Class B soils. The design flow rate will be 248 m³/h with an instantaneous application rate of 50 mm/h under the outer span. The variable rate system can be programmed to modulate the application rate by pulsing flow to the nozzles via on-board solenoid valves. As the CP travels over Class B soils the selected nozzles can be programmed to deliver less water or none at all. This technology makes it possible to decrease the output in any area under the CP and will be especially useful in areas where runoff has the potential to occur.

Table 5 Centre-pivot features as per concept design (after WaterBiz)

Centre-pivot feature description	Specification
Radius (m)	397
Number of spans	8
Span lengths (m)	49.1
Span diameters (mm)	168/219
Overhang (m)	4.2
Area (ha)	49.5
Centre pressure (m)	30
Total dynamic head (m)	55
Nozzles	Rotators
Spreader bars	Yes
3-wheel base beams outer spans	Yes
Maximum IAR (mm/h)	50
Gross design capacity (mm/day)	12
Flow rate (m ³ /h)	248

7.3 Subsurface drip irrigation features

The SDI system (Table 6) will cover 48.3 ha in total – 25.7 ha of Class A and 22.6 ha of Class B soils. The SDI system makes it possible to irrigate corners and odd-shaped parcels. Small individualised management zones (blocks) will be assigned to Class A and B soils for fine control of water placement.

The design breaks the SDI system into 13 blocks with average cover of 3.7 ha. Seven of which irrigate Class A soils and six irrigate Class B soils. Each block will be controlled separately with electric/telemetry controlled, adjustable, pressure reducing valves. Maximum flow capacity of the SDI system will be 240 m³/h and would be capable of supplying 12 mm/day across the entire irrigated area.

The drip tubing laterals would be of medium wall thickness with pressure compensating emitters spaced at 50 cm. The laterals would be buried 30 cm deep and spaced 100 cm apart.

Table 6 Concept design of subsurface drip irrigation system (after WaterBiz).

Subsurface drip irrigation system feature	Specification
Lateral spacing (cm)	100
Emitter spacing (cm)	50
Emitter type	Pressure compensating, medium wall thickness
Number of blocks	13
Operating hours per day (h)	24
Shifts per day	4
Total area (ha)	48.3
Gross design capacity (mm/day)	12
Application rate (m ³ /h)	240
Flow per shift (m ³ /h)	240
Avg valve pressure (m)	12
Total dynamic head (m)	50

8 Land preparation

The proposed irrigation site on the Leewood property is prone to becoming waterlogged in the surface soil and untrafficable following extended rainfall periods, i.e. periods where continuous rainfall events exceed 50 mm. The land preparation operations will be restricted during these periods.

8.1 Land clearing

Approximately 150 scattered remnant woodland trees occur on the site. All of the trees will require removal where the irrigation systems are to be located. A tracked excavator will be used to push out the trees, grub out the roots, level the soil, and place the trees into piles or windrows. This process will involve the excavator travelling to each tree, pushing it out with the bucket/grapple attachment, and carrying the tree to a disposal pile. Limbs and branches will be cleaned up using a stick rake, and placed with the tree remains outside the irrigated areas and traffic ways. The stacks can be left in place or mulched.

8.2 Soil preparation

The majority of the soils of the property are sodic and dispersive, particularly in the subsoil. This has resulted in the formation of hard, capped, columnar structures at a depth of around 15 cm below the soil surface. If the site is to be irrigable, these poorly draining structures need to be broken down and stabilised. The stabilising of the soil requires a high application of gypsum to displace the sodium in the soil.

8.2.1 Gypsum and lime

In order to displace the majority of the sodium¹⁶ within the upper rootzone of the soil, we calculated¹⁷ that 20 tonnes of gypsum be applied per hectare. Gypsum is far more efficient in reducing sodicity and dispersion if it is worked into the affected parts of the soil. Initially 15 t/ha of the gypsum is to be spread across the site prior to any tillage operations. This will be achieved using a truck mounted agricultural lime/gypsum spreader. The subsequent cultivation will result in some of the gypsum being worked deeper into the soil profile. The remaining 5 t/ha of gypsum is to be spread following discing to ensure the surface soil is evenly covered and so less prone to surface crusting. Finally lime would be applied at a rate of 8 t/ha as the final surface dressing to neutralise the soil acidity. The additional calcium will also ameliorate sodium, and has been subtracted from the gypsum requirement. Lime is a sparingly soluble salt, and any that doesn't participate in soil reactions can be expected to be retained within the surface soil for the long term. Gypsum is more soluble than lime, but is also a slow moving salt through the soil profile and vadose. Some gypsum will be used in cation exchange reactions. Unreacted gypsum is likely to remain within the rootzone for many decades.

8.2.2 Deep ripping

Deep ripping using a large bulldozer or tractor capable of pulling a series of deep tynes will be undertaken in order to break up the hard, coarse subsoil. Ideally, this operation will take place when the soil is relatively dry so as to maximise the shattering effect of the tynes. The primary root zone of the soil extends to around 100 cm depth, and ripping to most of this depth will be advantageous. A minimum depth of 60 cm, and tyne spacing of less than 100 cm is recommended. If the initial ripping operation is either too

¹⁶ Sodium in the soil leads to clay dispersion and reduces a soil's porosity and capacity to drain freely

¹⁷ Based on inherent fertility of the soil, soil density, exchangeable sodium displacement, depth of treatment, gypsum quality

shallow or too widely spaced due to the hardness of the soil, it is recommended that cross ripping at a depth greater than 60 cm be undertaken.

8.2.3 Cultivation

Following the deep ripping, the soil will be left in a very rough state, with large clumps of soil and subsoil thrust up onto the surface. Offset discs will be run across the site in various directions as needed to level the soil and possibly harrowed to produce a tilth suitable for sowing. Once the site has been ripped and cultivated, irrigation infrastructure will need to be installed in quick succession so as to minimise the risk of interference from wet weather. The ripped soil will initially be prone to bogging once it is wetted.

8.3 Irrigation systems installation

8.3.1 Pump station and main lines

It is best to install the pump station and mainlines feeding the system prior to installation of the in-field irrigation infrastructure. This allows for testing of the system as it is built or shortly thereafter.

There will be two mains leading from the pump station because of the need to treat the water in the SDI system differently. These along with necessary wiring/telemetry should be laid and capped at the edge of the paddock until the CP and SDI are ready for connection.

8.3.2 Centre-pivot sprinkler system

The centre-pivot should be erected once the paddock has been disced. The various components would arrive on a B-double semi-truck and offloaded with a telehandler and then laid out across the paddock. The spans would be assembled and erected with the same telehandler supported by two utility vehicles carrying tools and personnel. Care should be taken when driving equipment on the soft ground.

Once erected and the wiring is completed, several dry runs of the circle should be completed to create tracks. Shallow trenches should then be cut in the tracks along those areas likely to be inundated and on slopes. A layer of rock should be laid in the tracks to aid in traction and prevent the machine from getting stuck.

8.3.3 Subsurface drip irrigation system

There are a number of mains and sub-mains associated with the SDI system. Some of the mains can be installed prior to laying the drip tubing laterals and some would be installed afterwards. All of the work would be done after the last discing. All of the materials would arrive on two semi-trucks – one carrying pipe and the other carrying drip tubing for laterals. Workers would utilise as many as two ATVs and three utility vehicles.

A tractor will install the SDI laterals at a depth of 30 cm and spaced 100 cm apart. Depending upon the equipment available as many as eight laterals can be installed in a single pass. Once the laterals are installed the trenches for the header and flush manifolds are cut through the tag ends of the laterals and connected. The complete installation should take 60 to 90 days.

After installation of the SDI system the paddock will likely require a light discing or harrowing to smooth the soil from the disruption created by installation. An SDI system has thousands of connections and some

failures are inevitable. The best time to locate these is while the land is bare so the system should be tested thoroughly as construction progresses if possible and definitely post construction prior to seeding.

8.4 Crop establishment

It is best to sow into a firm seedbed thus it may be helpful to pre-water the area under centre-pivot lightly. It may also be helpful to run a packing implement across the paddocks to firm the soil particularly where SDI was installed. The SDI system will require testing and this offers the opportunity to wet the upper rootzone and as close to the surface as possible.

Although the paddock has been in pasture for some period there still may be a case for application of a pre-emergent herbicide depending upon the time of year that sowing occurs. An agronomist should make that assessment prior to ripping and other cultivation.

8.4.1 Seed selection for upland Class A and lowland Class B soils

A lucerne variety suited to local conditions and heavy soils should be selected.

Some desirable qualities of the selected lucerne seed variety for Class A soils include:

- winter active to encourage year-round water consumption
- broad disease resistance
- inoculated with Rhizobium
- fungicide treated seed
- tolerant of sodic soils
- potentially high forage production and water use
- drought resistance

Other desirable qualities of varieties and species (lucerne and/or clover/grass mix) for Class B soils include:

- deep rooted
- tolerant of waterlogging
- compatible species in terms of competition and growth habit

8.4.2 Sowing

It is important to ensure firm seed to soil contact. A seeding drill outfitted with packing wheels serves this purpose best. When blending grasses with lucerne it is best to use a seeder with multiple seed boxes. BeneTerra has been successful planting mixed species in separate rows – often in pairs to minimise competition between the species.

The Class A soils are found on the more elevated parts of the landscape, and due to their favourable surface drainage they will be planted to lucerne only at a seeding rate of 15 kg/ha. The Class B soils are confined to a drainage depression that can be periodically inundated by overland flows. Consequently, they will be seeded to a blend of lucerne (10 kg/ha), white clover (2 kg/ha) and tall fescue (20 kg/ha). Seed will be coated with an insecticide and a fungicide to ensure viability. Where only lucerne is grown there may be an advantage to cross-seeding to maximize ground coverage. The seed should be placed only 10 to 15 mm deep.

Timing prior to rain is most critical for the drip irrigated areas. The soil can be wetted up with the SDI system but it requires rainfall to complete germination.

Crop under the centre-pivot can be pre-irrigated prior to sowing to wet the upper 30 cm. Then once the seed is sown it can be lightly irrigated to encourage germination. Surface crusting will inhibit seedling emergence so heavy irrigation must be avoided at that time.

The crop can be seeded in either autumn or spring. If planted in autumn it should be done early enough to allow seedlings time to mature adequately to withstand frost.

Once the crop is growing and in a tender state it should be checked frequently for insects and mites then treated if necessary. There also may be a need to apply a post-emergent herbicide as weeds will compete with the young seedlings.

9 Water balance modelling

9.1 Gross water balance estimate

The water treatment plant is expected to produce 1 MLD of high quality irrigation water at peak production, i.e. 365 ML/yr. Based upon the annual production of desalted irrigation water and the 98 ha land area under irrigation, the gross annual application rate would be 3.7 ML/ha. However in order to better predict the effects of irrigation of this site several management schemes were modelled for comparison to the current rain fed pasture setting.

In order to get a more detailed and time sensitive understanding of the water balance we employed the HowLeaky modelling program which integrates a variety of factors (Figure 9) such as historic climate data, rainfall, evaporation and evapotranspiration, irrigation, soil infiltration rates, plant available water capacity of soils and crop water consumption.¹⁸ This daily time step model incorporated a given set of criteria – climatic year or average, crop, soils, etc. and the output predicted:

- Crop water consumption
- Losses from the system
- Irrigation schedules

9.1.1 Climate data

The BOM climatic data set for the 50 years spanning January 1963-April 2013 from the Narrabri post office [station 053030] was used as the basis for rainfall and evapotranspiration (ET) input in the HowLeaky modelling simulations.

¹⁸ McClymont et al. 2011. HowLeaky v 5.47. Available from <http://www.howleaky.net/>

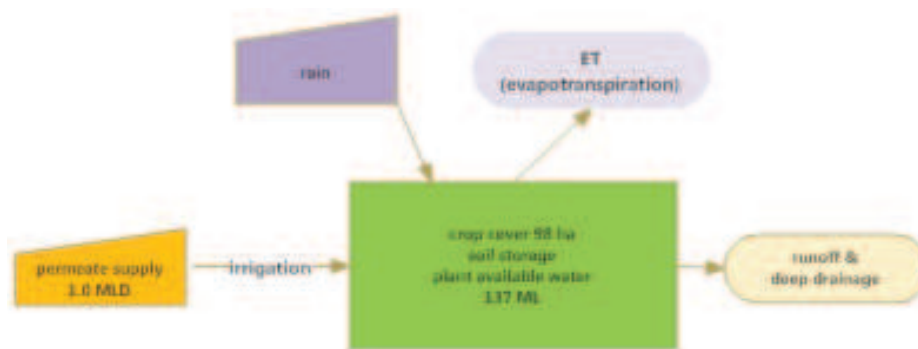


Figure 9 Simple flow diagram of water balance model

9.1.2 Soil considerations in the model

A Sodosol database was used to provide the soil data for the irrigation modelling. The key parameters used in the model were:

- 140 mm plant available water capacity (PAWC) of the soil profile
- 1.5-1.6 g/cm³ bulk density
- 0.5% slope
- 0.3 mm/day maximum drainage beyond the rootzone

9.1.3 Cropping: Two choices - uplands and drainage depression

Lucerne was the chosen crop for modelling purposes. It is well-suited because it is perennial in nature and does not require annual planting and soil preparation, nor is there a delay for root development in the early growing season. Thus it essentially has a longer growing season than most crops and while it can withstand periods of drought, it will consume large amounts of water if available. Lucerne is the preferred choice for the upland areas where inundation is not expected. For the periodically inundated drainage depression associated with the Class B soils, a blend of fescue, white clover and lucerne would be used. The fescue and clover will compensate for the lucerne should it underperform due to sustained wet conditions. This cropping scenario was not differentiated for modelling purposes because mixed lucerne/clover/grass crops have similar water use patterns.

9.1.4 Land area

For modelling purposes the irrigation system covered 98 ha. Centre-pivot or SDI were not differentiated and the system was capable of delivering 12 mm/day across the land base with an average application efficiency of 90%. There were:

- 68 ha Class A soils under irrigation
- 30 ha Class B soils under irrigation

9.1.5 Irrigation rate scenarios

Three irrigation scenarios were modelled using the HowLeaky model for the purposes of this report. Specifically these scenarios were chosen to estimate the effects of irrigation on runoff, erosion and deep drainage compared to the native setting. Actual management practices would take this into account and timing adjusted according to irrigation water requirement and soil water status.

- **Scenario 1** Current dryland pasture under natural rainfall. This was simulated to compare the natural erosion, deep drainage and runoff from the site
- **Scenario 2** Even irrigation of all 98 ha, simulation based on an average year with 1 MLD permeate supply
- **Scenario 3** Even irrigation of all 98 ha, simulation based on an average year with unlimited permeate supply
- **Scenario 4** Irrigation was split between the Class A (68 ha) and B soils (30 ha), with priority given to watering the Class B soils from October to May, and no irrigation of the Class B soils from June to September. 1 MLD permeate supply

Irrigation events were set at 12 mm per application. An irrigation event was triggered once the soil water deficit reached 50 mm or 36% of the 140 mm PAWC.

9.1.6 Model predictions – irrigation application rate

Scenario 1 was not relevant to application rate because it only represented the current rain fed pasture situation and no irrigation was imposed. The irrigation schedule in the model was set to a maximum of 12 mm per daily irrigation event, as per the irrigation system design.

Under conditions of Scenario 2 irrigation supply to the crop was limited due to available permeate supply being capped at 1 MLD, climate, crop water demand and soil moisture status. Based upon the input conditions the model predicted that a total of 234 mm (2.3 ML/ha-yr) or 225 ML (62% of supply @ 1 MLD permeate) could be applied and utilised by a lucerne crop across the 98 ha. Effectively, providing 1 ML/day permeate supply for irrigation results in approximately 131 days with no irrigation for this scenario due to a combination of crop irrigation demand outstripping permeate supply and due to wet periods of the year. Essentially, the Class A and B soils will hold similar amounts of water under the same climatic conditions and were treated the same for modelling purposes where the entire 98 ha were modelled.

Under conditions of Scenario 3 irrigation supply to the crop was unlimited, however, governed by climate, crop water demand and soil moisture status. Based upon the input conditions the model predicted that a total of 920 mm (9.2 ML/ha-yr) or 902 ML could be applied and utilised by a lucerne crop across the 98 ha. Scenario 3 shows the maximum irrigation rates that can theoretically be applied to the soils on site. It illustrates that the total annual permeate production can easily be utilised at this site through proper management.

Scenario 4 prioritises irrigation of the Class B soils (**Figure 10**) between the months of October and May while no irrigation occurs on those soils between June and September when evapotranspiration (ET) is low and the soils are most susceptible to overland flow from high rainfall. Conversely, the Class A soils are irrigated only if water availability is in excess of Class B requirements. Thus there is a sharp increase in irrigation in June as the Class B soils are not irrigated and the high Class A soil water deficit is finally quenched.

Under Scenario 4, the model predicted that splitting and prioritising the irrigation events resulted in 5.1 ML/ha-yr applied on the 30 ha of Class B soil and 2.4 ML/ha-yr on the 68 ha of Class A soil for a combined total of 316 ML/yr across the site– 87% of production. The weighted average water use was calculated as 3.2 ML/ha-yr for the full 98 ha crop. The reduced rate of 2.4 ML/ha-yr on Class A soils is a result of insufficient supply and wet periods resulting in reduced irrigation rates.

Although this appears to be a high application rate for the Class B land it illustrates that when the Class B soils received priority during the periods of the year with the highest ET, these soils can handle additional

irrigation in the profile. Furthermore there is ample capacity for the Class A soils to receive more irrigation than was provided in the model output.

Scenario 4 would be a potential management approach for this project, i.e. irrigate the Class B soils preferentially as they may not be available through parts of the year. This creates a larger deficit or potential reservoir to be filled in the Class A soils as illustrated by the spike in water usage when the Class B soils are not irrigated in winter.

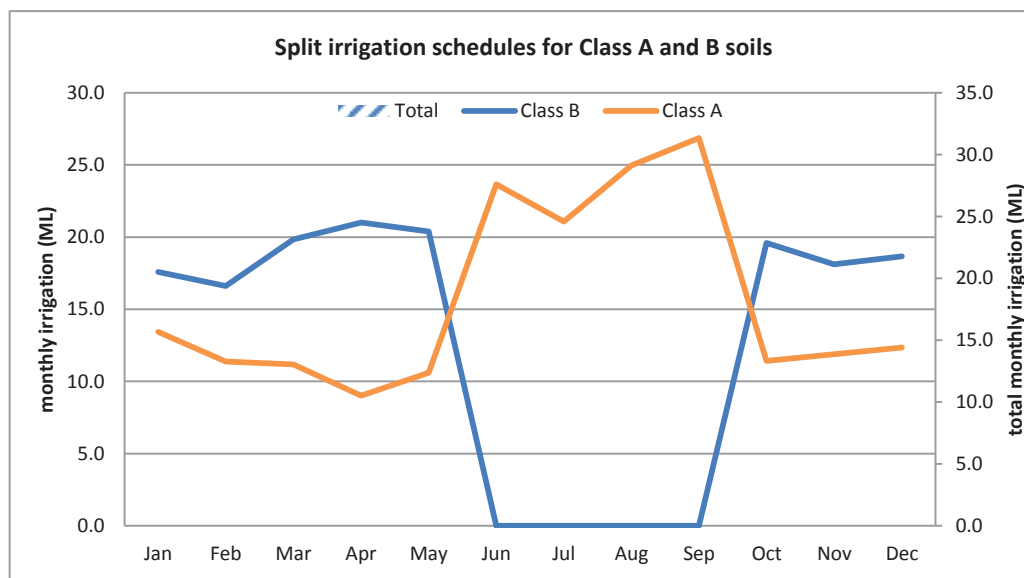


Figure 10 Effect of supply on average monthly irrigation – Scenario 4

At peak water use a lucerne crop can utilise as much as 9 mm/day, and without rainfall input one day's demand in summer could reach 8.8 MLD or 8.8 times the supply rate of 1 MLD. Consider that the plant available soil moisture storage capacity across the entire irrigated area is 137 ML (140 mm x 98 ha), and that in summer a full soil profile could be entirely depleted in 15.6 days. It would require 137 days permeate production to replenish that volume of soil water. In contrast, the winter crop demand can be less than 1 mm/day and permeate production would well exceed irrigation demand.

These modelled application rates reflect what may be possible under “average” climate and ideal crop production conditions. It should be noted that the results from the modelling vary considerably based on limited or unlimited permeate supply, climate, crop water demand and soil moisture conditions. There are many variables that contribute to the crop water use throughout a single season, including the management of the crop and irrigation.

It should be reiterated that the modelled scenarios are purely illustrative. Through a combination of management practises employed (crop management, irrigation scheduling, inter alia), the 98 ha of irrigation area is sufficient to deal with the suggested 1 MLD permeate supply. As shown in Scenario 3 above, the soil and crop will handle a much larger permeate production rate under the correct management and scheduling.

9.1.7 Water and soil losses to system

Three parameters having potential environmental impacts were modelled. These results (Table7) compare what may occur under current pasture conditions with natural rainfall against the three irrigation scenarios modelled.

Table7 Water losses from system with potential environmental impacts - HowLeaky model output

Water Loss Mechanism	Scenario 1 -pasture	Scenario 2 – limited 1MLD	Scenario 3 – unlimited	Scenario 4 Class A	Scenario 4 Class B
Rainfall (mm/yr)	644	644	644	644	644
Irrigation (mm/yr)		230	920	240	510
Runoff (mm/yr)	14.2	13.5	39.6	14.6	17.6.
Deep drainage (mm/yr)	4.0	3.9	16.9	4.3	5.7
Erosion-& site sediment loss (t/ha-yr)	0.22	0.22	0.70	0.24	0.30

Runoff modelled for Scenario 1 was 14.2 mm/yr. The greatest runoff was modelled under the split irrigation (Scenario 3) at 39.6 mm/yr, mainly because of the high irrigation volume applied. As rainfall occurs the soil becomes more prone to run off. Irrigation Scenario 2 lost 13.5 mm/yr to runoff. Scenario 4 showed 14.6 and 17.6 mm/yr of runoff for Class A and B soils respectively.

Deep drainage is primarily a concern where groundwater may be affected by irrigation activities. Deep drainage losses followed the same pattern as runoff with Scenario 3 at 16.9 mm/yr, Scenario 4 Class A soil at 4.3 mm/yr, Class B losing 5.7 mm/yr, Scenario 2 at 3.9 mm/yr and Scenario 1 at 4 mm/yr. Refer to Section 5.4 for a general discussion on deep drainage and leaching fraction.

Erosion and site sediment losses can affect surface waters carrying sediment and nutrients into rivers and streams. Under all four scenarios the paddocks were in permanent vegetative cover and the losses were predicted to be quite low at less than one tonne per hectare annually. The International Erosion Control Association best practices manual states that erosion losses less than one tonne per annum are a desirable target and should result in less than 50 mg/L suspended solids which is necessary for maintaining pristine rivers and streams.¹⁹

¹⁹ IECA Best practice erosion and sediment control manual Vol 1. pp 1.7

10 Operations and maintenance guidelines

It is important that the mechanical irrigation infrastructure is well maintained to ensure the viability of the water dispersal system. All of the equipment must be kept in proper working order.

It is perhaps more important that a healthy crop is ready and able to reliably utilise the available water. It is easier to repair mechanical problems in a timely fashion than to recover from a crop failure. Expert agronomic advice will help to ensure successful cropping.

Detailed standard operating procedures should be written or adapted to cover all aspects of operations and maintenance. Specific preventive maintenance programs for each bit of equipment should be developed or adapted. Operations personnel should be trained in the routine operations and maintenance of these systems and the appropriate experts should be utilised for other key aspects. Examples of outside experts would include electricians, agronomists, soil scientists, chemists and irrigation engineers.

10.1 Irrigation systems

The irrigation system infrastructure consists of pumps, filters, pipelines, valves, centre-pivot sprinkler and a subsurface drip distribution network. Some companies choose to manage the water amendment facility as part of the water treatment system separate from the irrigation system. BeneTerra typically manages the water amendment facility as an integrated part of the irrigation system. Either approach works but the former approach requires close communication with the irrigation managers for a successful outcome.

Most functions of the irrigation system can be monitored electronically through a variety of market-available SCADA systems. Remote control and data tracking options are recommended.

It is also important to create and maintain an accurate set of as-built drawings for the entire system. These are especially critical when problems occur so that isolation valves can be found or work-arounds can be created in order to continue operations while awaiting repairs to parts of the system.

10.1.1 Water amendment

The water amendment would be adequate to decrease SAR to between 4 and 5 and raise EC to approximately 1.0 mS/cm. The water can be amended by injecting the required chemicals directly into the lines feeding the irrigation system, but prior to any filtration. Some pH neutralisation with acid may be desirable depending upon the alkalinity of the permeate water. Chemical treatments required for subsurface drip irrigation (SDI) need to be considered at this stage to avoid potential blockage of emitters and maintain the structural integrity of the soil profile over the life of the project.

A disinfectant would be injected into the water entering the drip irrigation system to prevent biofouling and emitter plugging.

Water amendment facilities require diligent attention as there are potentially dangerous and corrosive materials involved. Another challenge relates to the limited solubility of some chemicals. If chemicals are not fully dissolved suspended particles may plug filters and drip emitters or collect in areas of slow water movement. The quality of the materials used must be checked regularly. Mixers, pumps, sensors and other related equipment must be maintained regularly.

10.1.2 Pump and filter station

Two sets of variable speed, centrifugal pumps (with built in redundancy) will supply separate mainlines for the CP and the SDI. The centrifugal pumps should be regularly inspected and maintained according to the manufacturer's recommendations. Tracking of amperage on each pump will provide a record of pump wear and indicate when replacement or repair may be needed.

Each centrifugal pump and jockey pump will have an associated Y-strainer filter on the intake side which must be periodically cleaned and maintained according to the amount of suspended solids in the incoming water.

The water going to the CP will pass through a rotating mechanical screen before going through the field main. While the water going to the SDI will require finer filtration (≈ 120 microns) and disinfection.

Filter banks require constant monitoring. Differential pressure will indicate the need for backwashing the filters and decreasing time between backwashes is an indicator of when the filters require cleaning.

The chemical injection system is typically monitored and controlled by EC, pH and sometimes ORP probes downstream of the injection point. These probes require regular calibration and cleaning and should be part of a regular maintenance program. The volume of injectate should be tracked and recorded along with influent water quality. Influent and amended water should be analysed on a regular schedule by both an in-house and outside laboratory.

10.1.3 Pipelines, valves and flow sensors

Each of the mains leaving the pump station would be outfitted with a flow meter that measures both flow rate and total volume. These sensors should be cleaned and maintained regularly. The frequency of maintenance will depend upon the nature of the incoming water and the meter design.

The flow meters on either main would be used in the pump station logic to ramp up line filling and detect leaks or line breaks. Excessive flows will trigger the pumps to shut down. Smaller increases in flow rate will indicate smaller, less obvious leakage. Constant flow monitoring of the SDI system will indicate emitter plugging and the need for system flushing or other remediation to maintain emitter flow.

Mains and sub-mains should be inspected regularly by the operators for leaks. These are most likely to occur at junctions and corners. The system will have a series of isolation valves that should be checked on a regular basis to assure that they function as intended. There will also be pressure reduction valves located throughout the system that require checking and calibration on a regular schedule.

It is also anticipated that electrical supply and control wires would follow the mains, unless a telemetry control unit is installed. This utility corridor should be inspected for burrowing animals or anything else that could intersect and damage these wires.

10.1.4 Centre-pivot system

Centre-pivots require regular inspection and maintenance. On a more frequent basis (daily or weekly) this would include, visual inspections of sprinkler nozzle plugging, track erosion or runoff. The variable rate solenoids controlling nozzle output will require regular testing as well. Gearboxes and wheel drive motors

will require at least annual maintenance. Cables should also be inspected for damage from wildlife. The steel structure should be inspected for corrosion at least annually.

The travel and output of the CP should be tracked remotely and daily inspections of its progress should be made. It will be important to ensure that the variable rate is applied properly to Class A and B soils. Catch can (rain gauge) tests should be performed to test the CP outlet under various settings of the VRI to ensure adequate control for sensitive areas.

10.1.5 Subsurface drip irrigation system

SDI systems are not visible from the surface so a combination of methods are used to inspect them. The first is daily review of electronic records for each block to ensure that the target volume was applied and at the correct nominal design rate. Initially each block should be run separately to ascertain the nominal flow rate and then tracked. These rates will decline over time and indicate the need for flushing. Increased flow indicates leaks in the system.

Regular field inspections should be done to check for leaks, evenness of irrigation (as evidenced by the crop health), burrowing animals, and access to isolation and block control valve operation. Tests for disinfectants should be carried out at the distal reaches to assure adequate disinfection throughout the system of pipes and laterals. A regular flushing schedule should be developed to remove sediment from the SDI lateral tubing. Initially this should be at least every 8 to 10 weeks but can be adjusted based upon experience.

10.1.6 Recordkeeping

It is important to keep certain records. These assist with environmental reporting, troubleshooting and hand-over between employees.

Records should be kept for:

- Water volume applied through each system
- Nominal flow rate by SDI block
- Amendments used and concentration as evidenced by sensors and field tests
- Filter backwash and cleaning intervals
- SDI flushing events
- Repairs to the system
- Weather
- Equipment maintenance records
- Changes in irrigation programs
- Water analyses

10.2 Crop Management

10.2.1 Early crop care for two land classes

It may be necessary to apply both pre and post-emergent herbicides if weed infestations are imminent. The young seedlings should be inspected frequently by a qualified agronomist for insect and mite predation. If this occurs the paddocks should be treated with an appropriate insecticide.

It is anticipated that the lucerne stand on the upland Class A soils will be viable for five to seven years before it needs to be rotated out of and back into lucerne. Typically there is one growing season between lucerne crops where another crop is grown. This timing will be dependent upon successful selection of varieties, soil preparation and how well the crop is managed in general. It is best to rotate and re-establish portions of the paddocks in phases to ensure there is always a crop to use the available water supply.

The blend of species on the lowland Class B soils will likely change due to ensuing weather and degrees of inundation. The white clover and tall fescue will be more likely to succeed if inundation is prolonged. Paddocks with this blend can stay in production for decades depending upon the degree of waterlogging or weed infestation. A wait and see approach should be used before planning rotations on the Class B soils.

10.2.2 Irrigation scheduling

The irrigation schedule will be driven by crop water demand and availability of permeate water. The HowLeaky model parameters were set so that irrigation would only occur once a 50 mm soil water deficit occurred and that only 12 mm would be applied in an irrigation event. A proposed scheduling strategy could be similar to that in Scenario 4 where the Class B soil deficit is replenished before Class A soils, or a combination of all four scenarios based on monitoring results. This makes room for the maximum irrigation inputs throughout the year.

In reality these parameters may represent average conditions for irrigation but other extenuating factors may override this. For example the modelled rate of permeate production was a peak target that may not be reached. In that case it may be necessary to give Class A soils priority to maintain them in a healthy condition. Crop management is another variable that will influence the irrigation scheduling.

An onsite weather station will record rainfall, temperature, solar radiation and wind speed. The collected data will calculate evapotranspiration (ET) in real time for that location.

Soil moisture monitoring devices should be placed one for every 10 ha and the data collected and reviewed weekly against the weather station data. The soil moisture data collection should be supplemented by spot checks with a hand auger. Then irrigation rates should be adjusted by soil and crop type as often as necessary to optimise crop health and water use.

Some of the soil moisture monitoring devices will also be placed at least 150 cm deep to estimate root uptake of deep moisture and deep drainage.

10.2.3 Agronomy

A healthy, actively growing crop is required to utilise the produced water. Crop failure puts the whole system in jeopardy. Therefore it is important to optimise the agronomic care and inputs necessary. Regular field inspections by a qualified agronomist will enhance the likelihood of success.

The crop should be inspected for weeds and insects at key intervals and appropriate treatments recommended. Irrigation distribution can be spot checked at the same time. Leaf and forage analyses should be performed occasionally to assess plant nutrition.

The agronomist should also make recommendations for harvest timing. This should optimise forage quality but more importantly minimise soil compaction and weed distribution. The agronomist would also make recommendations for the crop rotation sequences suitable to the goals of the project.

The surface 15 cm of topsoil should be sampled annually and the soil analysed for nutrients and salinity. This data will provide the basis for ongoing fertiliser and amendment applications. Subsequent deeper soil analysis to at least 100 cm should be done to assess the success of the soil amelioration program.

10.2.4 Harvest

It is anticipated that the forage crop would be harvested five times annually with adequate water available. Harvest operations should be done carefully to minimise soil compaction. Therefore the soils should be dried out prior to harvest operations. Then once the crop is swathed and baled, traffic patterns related to bale removal should minimise travel upon the irrigated areas of the paddock. Bales should be stored in a place that encourages careful traffic management.

10.2.5 Fertiliser

Soil tests have indicated that the limiting nutrients at the site are nitrogen (N) and phosphorus (P). Potassium (K) is marginal to adequate. Most of the N that the lucerne crop will require over time will come from the legume itself. P is rapidly immobilised in soil, and so surface applied P will be held in the surface soil. This can lead to availability restrictions when the surface soil is dry. The opportunity is available prior to crop establishment to work a number of year's supply of P into the profile during the process of ripping and cultivating. Consequently, 100 kg/ha P will be applied as monoammonium phosphate prior to ripping. However it will still be necessary to test the soil and leaf tissue to ensure adequate plant nutrition. It is common and expected to make annual applications of P and K fertiliser to lucerne crops as per crop removal calculations and soil test results.

11 Environmental monitoring

It is expected that given the high soil water deficit schedule being applied that runoff and deep drainage will be predominantly driven by rainfall, and will not be highly altered from conditions under a dryland pasture regime. The HowLeaky model suggests there will be small amounts of deep drainage beyond the root zone under irrigation as with the current pasture condition. Water and salts should be tracked as they pass through and beyond the root zone. Fluxes in groundwater static level and quality should also be tracked.

11.1 Groundwater monitoring

There are already three monitoring wells (piezometers) in place on the Leewood property (Figure 11) which provide baseline data regarding the vadose, static water levels and groundwater quality. The well LWD-3 is up-gradient of the irrigation system but in the area influenced by seasonal inundation. LWD-1, down-gradient from LWD-3, is and also likely to be influenced by seasonal inundation. We suspect that the drainage channel running across the property is the primary source of local groundwater recharge.

In order to assess the effects of the irrigation system upon groundwater we propose placement of monitoring well 4 near the edge of the centre-pivot (Figure 11) but out of the potentially inundated zone and down-gradient from LWD-3. Monitoring well 5 would be placed at the edge of the irrigated area in the northeast corner of the property where the soils are better drained. These two new wells would be screened in the first groundwater encountered.

Once the wells were drilled and allowed to settle they should be sampled for static water level and a thorough suite of chemical analyses. To track the effects of the irrigation system wells 3, 4 and 5 should be purged and sampled quarterly. The quarterly sampling should include static water level and TDS analysis. If significant changes in TDS are noted then a more thorough chemical analysis should be performed as a follow-up to the quarterly sampling. The full suite of analytes should be measured annually.

The installation of pressure transducers with data recording capabilities will assist in the detection of deep drainage from the irrigated area. These coordinated with soil moisture monitoring devices can be used to track the effects of rain and irrigation upon groundwater at the site.

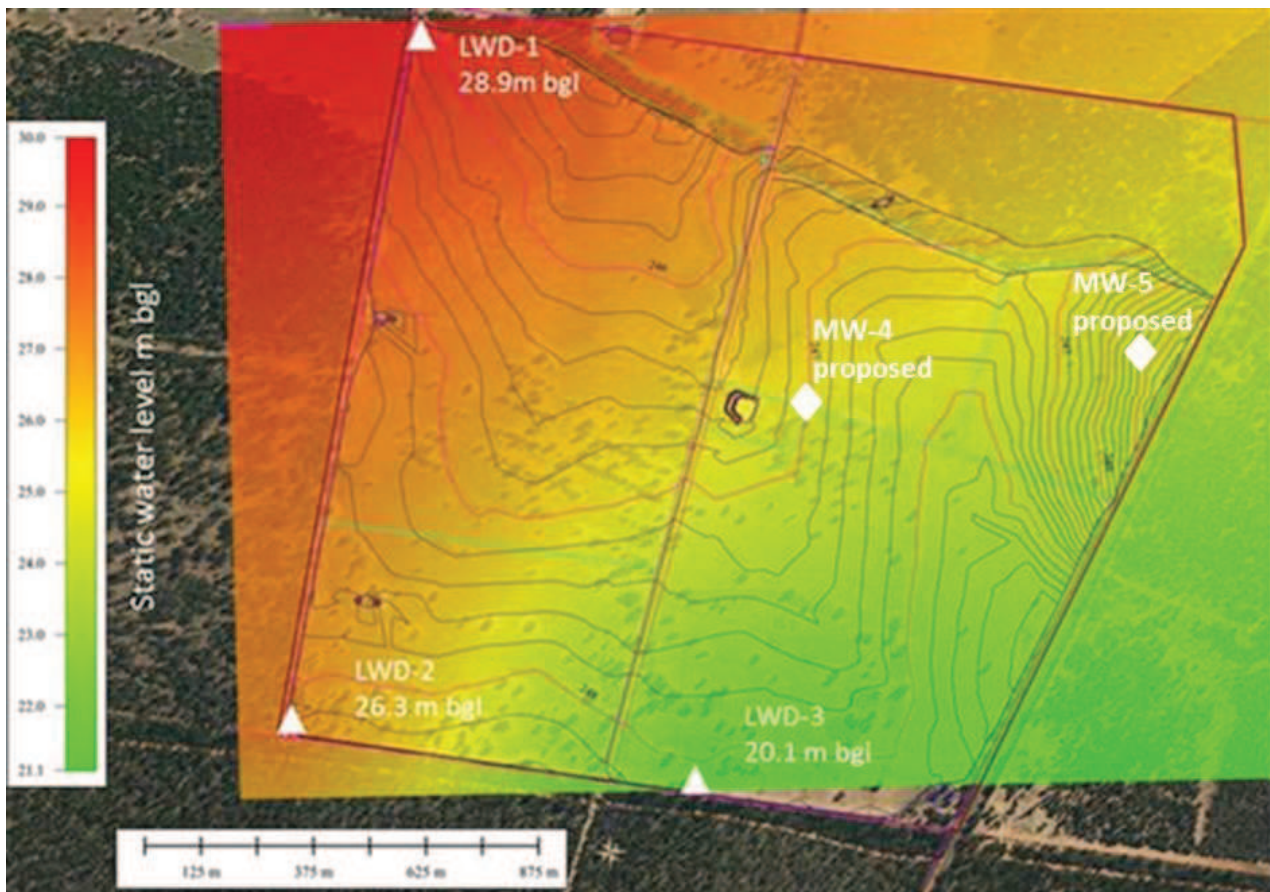


Figure 11 Proposed location of additional monitoring wells (diamonds)

11.2 Soil and vadose monitoring

Ten soil moisture monitoring stations would be scattered across the project area. Five would measure the most active rootzone in the top 100 cm and the other five would be equipped to measure soil moisture and salinity flux throughout and at the bottom of the rootzone. The derived data would be used to estimate the volume and rate of water moving through the vadose. Based upon monitoring bore log data describing the vadose beneath the rootzone, potential impacts to groundwater can be estimated by hydrogeologic modelling.

A soil sampling protocol should be established that utilises about 10 benchmark testing zones representing various soil types and positions on the landscape. The zones should be no more than 2,000 m² in size. These zones would then be sampled annually to a depth of 3 m. Three cores would be advanced per zone annually and composited by depth segments of approximately 1 m each except for the top 2 m which would be segmented in four parts. The core holes should be plugged with bentonite chips to prevent water from running into the holes and skewing future results. The composited samples would be analysed for pH, EC_e, SAR and any other constituents that may be of concern. The results of these can be presented graphically with concentrations on the X-axis and depth on the negative Y axis. The annual plotting of this data will indicate the flux in salt accumulation in these zones and provide important information to managers regarding salt management.

12 Conclusion

This concept design integrates both mechanical and biological systems for utilising the treated water at Leewood. A system for monitoring climate and environmental impacts was recommended as well. From this concept design a generalised construction, operations and maintenance plan were put forward and cost estimates derived.

Should Santos ENSW go forward with this project a detailed engineering design, construction and operations plan should be produced. The detailed engineering design would provide enough specific information to prepare bid packages.

The detailed construction and operations plan would include items such as:

- land clearance instructions
- traffic management
- EHS measures
- emergency response plans
- standard operating procedures
- system control logic
- specific crop varietal selection
- recordkeeping forms and registers
- monitoring schedules

The timing for land preparation, delivery of materials and construction of the irrigation systems should be done with consideration for the eventual planting of crops at critical windows in autumn or spring. It must also be recognised that there is a lag period to when the crops begin to utilise adequate amounts of water to keep up with production.

13 References

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14 Appendix A – Supplementary soil data



Table 8 Soil profile descriptions

Profile name	bag #	Santos label	Depth (cm)		Horizon	Munsell	Colour	Mottles	Texture	Est clay %	Structure	Moisture content	Strength	Roots	pH	Comments
			Top	Bot.		Colour					Type			Rank		
L2-01	1	7343_SOIL_0.1_1402131005	0	10	A1	10YR3/2	very dark grey brown	-	sandy clay loam	25%	massive	dry	hard	3	5.5	hard setting-pugged
	2	7343_SOIL_0.5_1402131005	10	50	B21	10YR3/3	dark brown	-	medium clay	45%	coarse	dry	very hard	2	5.5	
	3	7343_SOIL_1_1402131005	50	100	B22	10YR4/3	brown	-	medium clay	45%	coarse	dry	hard	2	6	
	4	7343_SOIL_1.5_1402131005	100	150	B23	10YR4/2	dark grey brown	-	light medium clay	40%	coarse	slightly moist	hard	1	7	
L2-02	1	7342_SOIL_0.15_1402130945	0	15	A1	10YR3/3	dark brown	-	light sandy clay loam	20%	massive	dry	firm	3	5.25	hard setting-pugged
	2	7342_SOIL_0.2_1402130945	15	20	A2e	10YR5/2	grey brown	-	light sandy clay loam	20%	massive	dry	-	2	-	
	3	7342_SOIL_0.5_1402130945	20	50	B21	10YR3/4	dark yellow brown	-	light medium clay	40%	coarse	dry	very hard	2	6	
	4	7342_SOIL_1_1402130945	50	100	B22	10YR4/3	brown	-	light clay	35%	coarse	dry	firm	1	6.5	
	5	7342_SOIL_1.5_1402130945	100	150	B23	10YR4/3	brown	-	light clay	35%	coarse	dry	firm	0	7	
L2-03	1	7341_SOIL_0.15_1402130920	0	15	A1	10YR3/3	dark brown	-	sandy clay loam	25%	massive	dry	hard	3	6	hard setting-pugged
	2	7341_SOIL_0.5_1402130920	15	50	B21	10YR4/3	brown	-	light medium clay	40%	coarse	dry	very hard	2	6	
	3	7341_SOIL_1_1402130920	50	100	B22	10YR3/3	dark brown	-	light medium clay	40%	coarse	slightly moist	hard	0	6.5	
	4	7341_SOIL_1.5_1402130920	100	150	B23	10YR3/3	dark brown	-	medium clay	45%	coarse	slightly moist	hard	0	6	
L2-04	1	7340_SOIL_0.15_1402130900	0	15	A1	10YR3/4	dark yellow brown	-	sandy clay loam	25%	massive	dry	-	3	5.5	hardsetting- level
	2	7340_SOIL_0.2_1402130900	15	20	A2e	10YR4/3	brown	-	sandy clay loam	25%	massive	dry	-	2	6	
	3	7340_SOIL_0.5_1402130900	20	50	B21	10YR4/3	brown	-	medium clay	45%	coarse	dry	very hard	2	6.75	
	4	7340_SOIL_1_1402130900	50	100	B22	10YR4/3	brown	-	light medium clay	40%	coarse	dry	hard	1	6	
	5	7340_SOIL_1.5_1402130900	100	150	B23	10YR4/3	brown	-	medium clay	45%	coarse	slightly moist	hard	0	6	
L2-05	1	7344_SOIL_0.1_1402131050	0	10	A1	10YR3/3	dark brown	-	light sandy clay loam	20%	massive	dry	-	3	6	hardsetting-pugged
	1A	7344_SOIL_0.15_1402131050	10	15	A2e	10YR5/2	grey brown	-	light sandy clay loam	20%	massive	dry	-	2	-	
	2	7344_SOIL_0.5_1402131050	15	50	B21	10YR4/3	brown	-	light medium clay	40%	coarse	dry	very hard	2	7.5	
	3	7344_SOIL_1_1402131050	50	100	B22	10YR4/2	dark grey brown	-	light medium clay	40%	coarse	slightly moist	hard	1	7.5	

Profile	bag #	Santos label	Depth (cm)		Horizon	Munsell	Colour	Mottles	Texture	Est	Structure	Moisture	Strength	Roots	pH	Comments
	4	7344_SOIL_1.5_1402131050	100	150	B23	10YR4/2	dark grey brown	orange & white	light medium clay	40%	coarse	slightly moist	hard	0	7	
L2-06	1	7348_SOIL_0.1_1402131320	0	10	A1	10YR3/4	dark yellow brown	-	sandy clay loam	25%	massive	dry	firm	3	5.5	hardsetting-pugged
	5	7348_SOIL_0.15_1402131320	10	15	A2e	10YR5/2	grey brown	-	sandy clay loam	25%	massive	dry	-	2	-	
	2	7348_SOIL_0.5_1402131320	15	50	B21	10YR3/4	dark yellow brown	-	medium clay	45%	coarse	dry	very hard	2	7.5	
	3	7348_SOIL_1_1402131320	50	100	B22	10YR3/3	dark brown	-	light medium clay	40%	coarse	dry	very hard	1	8	
	4	7348_SOIL_1.5_1402131320	100	150	B23	10YR3/2	very dark grey brown	-	medium clay	45%	coarse	slightly moist	hard	0	8	
L2-07	1	7345_SOIL_0.1_1402131140	0	10	A1	10YR3/4	dark yellow brown	-	sandy clay loam	25%	massive	dry	-	3	5.5	hardsetting-pugged
	1A	7345_SOIL_0.15_1402131140	10	15	A2e	10YR5/2	grey brown	-	sandy clay loam	25%	massive	dry	-	2	-	
	2	7345_SOIL_0.5_1402131140	15	50	B21	10YR4/2	dark grey brown	-	medium clay	45%	coarse	dry	very hard	2	6.25	
	3	7345_SOIL_1_1402131140	50	100	B22	10YR4/3	brown	-	light medium clay	40%	coarse	dry	hard	2	7	
	4	7345_SOIL_1.5_1402131140	100	150	B23	10YR4/3	brown	-	medium clay	45%	coarse	slightly moist	hard	1	6	
L2-08	1	7347_SOIL_0.1_1402131240	0	10	A1	10YR3/4	dark yellow brown	-	clay loam	30%	massive	dry	-	3	5.5	hardsetting-pugged
	2	7347_SOIL_0.5_1402131240	10	50	B21	7.5YR3/4	dark brown	-	medium clay	45%	coarse	dry	very hard	2	6	
	3	7347_SOIL_1_1402131240	50	100	B22	10YR4/3	brown	-	light clay	35%	coarse	dry	hard	1	7.5	
	4	7347_SOIL_1.5_1402131240	100	150	B23	10YR4/4	dark yellow brown	-	light clay	35%	coarse	moist	soft/firm	0	7.5	
L2-09	1	7346_SOIL_0.1_1402131210	0	10	A1	10YR3/4	dark yellow brown	-	clay loam	30%	massive	dry	hard	3	6	hardsetting-pugged
	2	7346_SOIL_0.5_1402131210	10	50	B21	7.5YR3/4	dark brown	-	medium clay	45%	coarse	dry	very hard	2	6.5	
	3	7346_SOIL_1_1402131210	50	100	B22	10YR3/3	dark brown	-	medium clay	45%	coarse	dry	very hard	2	7	
	4	7346_SOIL_1.5_1402131210	100	150	B23	10YR3/3	dark brown	-	light medium clay	40%	coarse	slightly moist	hard	0	7.5	
L2-10	1	7349_SOIL_0.1_1402131340	0	10	A1	10YR3/2	very dark grey brown	-	light sandy clay loam	20%	massive	dry	-	3	6.5	hardsetting-pugged
	2	7349_SOIL_0.5_1402131340	10	50	B21	10YR3/3	dark brown	-	medium clay	45%	coarse	dry	very hard	2	7.5	
	3	7349_SOIL_1_1402131340	50	100	B22	10YR4/2	dark grey brown	-	light medium clay	40%	coarse	slightly moist	hard	2	8	
	4	7349_SOIL_1.5_1402131340	100	150	B23	10YR3/2	very dark grey brown	-	light medium clay	40%	coarse	slightly moist	hard	0	7.5	
L2-11	1	7352_SOIL_0.1_1402131500	0	10	A1	7.5YR3/4	dark brown	-	light sandy clay loam	20%	massive	dry	soft	3	6	hardsetting- level. Refusal at 1m.

Profile	bag #	Santos label	Depth (cm)		Horizon	Munsell	Colour	Mottles	Texture	Est	Structure	Moisture	Strength	Roots	pH	Comments
	4	7352_SOIL_0.15_1402131500	10	15	A2e	7.5YR4/4	brown	-	light sandy clay loam	20%	massive	dry	-	2	7.5	
	2	7352_SOIL_0.6_1402131500	15	60	B21	7.5YR4/4	brown	-	medium clay	45%	coarse	dry	very hard	2	8	
	3	7352_SOIL_1_1402131500	60	100	C	7.5YR4/4	brown	grey and brown	weathered sandstone	-	massive	slightly moist	hard	0	-	
L2-12	1	7351_SOIL_0.15_1402131430	0	15	A1	10YR3/4	dark yellow brown	-	sandy clay loam	25%	massive	dry	-	3	5	hardsetting- level
	2	7351_SOIL_0.5_1402131430	15	50	B21	10YR3/4	dark yellow brown	-	medium clay	45%	coarse	dry	very hard	2	6.5	
	3	7351_SOIL_1_1402131430	50	100	B22	10YR3/3	dark brown	-	light medium clay	40%	coarse	dry	firm	1	7.5	
	4	7351_SOIL_1.5_1402131430	100	150	B23	10YR4/3	brown	-	light medium clay	40%	coarse	slightly moist	firm	0	7	
L2-13	1	7350_SOIL_0.2_1402131410	0	20	A1	10YR3/2	very dark grey brown	-	sandy clay loam	25%	massive	dry	-	3	4.5	hardsetting- level
	5	7350_SOIL_0.3_1402131410	20	30	A2e	10YR5/2	grey brown	-	sandy clay loam	25%	massive	dry	-	2	-	
	2	7350_SOIL_0.5_1402131410	30	50	B21	10YR3/3	dark brown	-	medium heavy clay	50%	coarse	dry	very hard	2	6	
	3	7350_SOIL_1_1402131410	50	100	B22	10YR3/3	dark brown	-	medium clay	45%	coarse	slightly moist	hard	2	6.5	
	4	7350_SOIL_1.5_1402131410	100	150	B23	10YR3/1	very dark grey	-	medium clay	45%	coarse	slightly moist	very hard	1	7.5	
L2-16	1	7354_SOIL_0.1_1402131600	0	10	A1	5YR3/3	dark red brown	-	sandy clay loam	25%	massive	dry	hard	3	5.5	hardsetting- level. Refusal at 1m.
	2	7354_SOIL_0.5_1402131600	10	50	B21	5YR4/4	dark red brown	-	medium clay	45%	coarse	slightly moist	hard	2	6.5	
	3	7354_SOIL_1_1402131600	50	100	B22	5YR3/3	dark red brown	-	medium clay	45%	coarse	slightly moist	hard	2	7	
L2-18	1	7355_SOIL_0.1_1402131640	0	10	A1	10YR3/4	dark yellow brown	-	sandy clay loam	25%	massive	dry	-	3	6	hardsetting- level
	5	7355_SOIL_0.2_1402131640	10	20	A2e	10YR5/2	grey brown	-	sandy clay loam	25%	massive	dry	-	2	-	
	2	7355_SOIL_0.5_1402131640	20	50	B21	10YR4/4	dark yellow brown	-	medium clay	45%	coarse	dry	very hard	2	6.5	
	3	7355_SOIL_1_1402131640	50	100	B22	10YR3/4	dark yellow brown	-	light medium clay	40%	coarse	dry	hard	1	7.5	
	4	7355_SOIL_1.5_1402131640	100	150	B23	10YR3/3	dark brown	-	light clay	35%	coarse	slightly moist	hard	0	7.5	
L2-19	1	7353_SOIL_0.1_1402131530	0	10	A1	10YR3/4	dark yellow brown	-	clay loam	30%	blocky	dry	hard	3	6	hardsetting with some cracks- level
	2	7353_SOIL_0.5_1402131530	10	50	B21	10YR3/4	dark yellow brown	-	medium heavy clay	50%	coarse	dry	very hard	2	7	
	3	7353_SOIL_1_1402131530	50	100	B22	7.5YR3/4	dark brown	-	medium clay	45%	coarse	dry	very hard	2	7	
	4	7353_SOIL_1.5_1402131530	100	150	B23	2.5Y4/2	dark grey brown	red & brown	medium clay	45%	coarse	moist	very hard	1	5.75	

Table 9 Soil chemistry values for selected soil cores.

Name	Code	N NH4+NO3	Phosphorus Colwell	Potassium Colwell	Sulphur	Organic Carbon	Conductivity	pH Level (CaCl2)	pH Level (H2O)	ECe	Saturation Paste exch. Ca	Saturation Paste exch. K	Saturation Paste exch. Mg	Saturation Paste exch. Na	Saturation Paste %	SAR	CROSS	Ca:Mg
			mg/Kg	mg/Kg	mg/Kg	%	dS/m	pH	pH	dS/m	meq/L	meq/L	meq/L	meq/L	%			
L4.1	7340_SOIL_0.15_1402130900	4	14	128	3	0.69	0.04	4.2	5.5	0.42	0.45	0.33	0.52	2.03	68.94			
L4.3	7340_SOIL_0.5_1402130900									2.24	1.69	1.44	11.12	19.43	49.46	2.91	3.59	0.865385
L4.4	7340_SOIL_1_1402130900						0.309	5.1	6	3.25	0.42	0.82	7.86	25.66	48.93	7.68	9.90	0.151978
L2.1	7342_SOIL_0.15_1402130945									0.43	0.35	0.26	0.63	2.54	40.88	12.61	16.30	0.053435
L2.3	7342_SOIL_0.5_1402130945									0.92	0.56	1.82	12.39	8.95	52.44	3.63	4.45	0.555556
L2.4	7342_SOIL_1_1402130945						0.107	5.8	6.6	1.31	0.42	0.7	4.4	10.5	44.7	3.52	4.99	0.045198
L5.1	7344_SOIL_0.1_1402131050	9	8	214	4.2	1.16	0.037	5	5.8	0.38	0.81	0.49	0.76	0.98	43.44	6.76	8.81	0.095455
L5.2	7344_SOIL_0.5_1402131050						0.184	6.2	7	1.59	0.47	0.7	6.82	11.86	50.91	1.11	1.58	1.065789
L5.3	7344_SOIL_1_1402131050									2.6	0.63	0.2	3.08	19.73	62.46	6.21	8.11	0.068915
L9.1	7346_SOIL_0.1_1402131210									0.56	0.5	0.22	0.87	2.87	48.1	14.49	17.83	0.204545
L9.2	7346_SOIL_0.5_1402131210						0.159	5.2	6.2	1.3	1.25	1.76	14.33	10.01	53.06	3.47	4.19	0.574713
L9.3	7346_SOIL_1_1402131210									3.36	0.82	0.19	6.69	24.15	54.58	3.59	4.96	0.08723
L6.1	7348_SOIL_0.1_1402131320									0.41	0.47	0.19	0.67	2.27	37.28	12.46	15.60	0.122571
L6.2	7348_SOIL_0.5_1402131320						0.283	5.9	6.9	2.6	0.59	0.55	5.49	20.67	49.88	3.01	3.60	0.701493
L6.3	7348_SOIL_1_1402131320									3.64	0.63	0.16	3.85	30.15	63.29	11.86	15.05	0.107468
L13.1	7350_SOIL_0.2_1402131410	7	10	87	2.8	1.95	0.031	4.1	4.7	0.4	0.95	0.28	0.94	1.4	48.35	20.14	24.94	0.163636
L13.2	7350_SOIL_0.5_1402131410						0.149	4.5	5.5	1.41	0.46	0.56	4.38	11.45	49.81	1.44	1.79	1.010638
L13.3	7350_SOIL_1_1402131410									3.07	0.99	1.59	15.17	26.74	56.8	7.36	9.47	0.105023
L12.1	7351_SOIL_0.15_1402131430	7	6	168	11.4	1.52	0.063	4.3	5	0.78	0.59	0.26	1.01	5.4	51.21	9.41	12.30	0.06526
L12.2	7351_SOIL_0.5_1402131430						0.203	5.2	6.2	1.55	0.64	0.57	4.55	12.26	54.28	6.04	7.17	0.584158
L12.3	7351_SOIL_1_1402131430									2.1	0.64	0.15	1.88	17.72	64.96	7.61	9.69	0.140659
L11.1	7352_SOIL_0.1_1402131500									0.53	0.46	0.16	0.73	2.7	36.21	15.79	18.94	0.340426
																3.50	4.16	0.630137

Name	Code	N NH4+NO3	Phosphorus Colwell	Potassium Colwell	Sulphur	Organic Carbon	Conductivity	pH Level (CaCl2)	pH Level (H2O)	ECe	Saturation Paste exch. Ca	Saturation Paste exch. K	Saturation Paste exch. Mg	Saturation Paste exch. Na	Saturation Paste %	SAR	CROSS	Ca:Mg
L11.2	7352_SOIL_0.6_1402131500						0.136	6.7	8.1	0.8	0.59	1.83	15.31	8.08	67.11			
L19.1	7353_SOIL_0.1_1402131530	7	18	151	3.8	1.19	0.032	4.6	5.6	0.26	0.26	0.19	0.63	1.44	51.5	2.87	4.12	0.038537
L19.2	7353_SOIL_0.5_1402131530						0.11	4.8	5.8	0.96	0.64	0.61	5.87	5.85	52.23	2.16	2.74	0.412698
L19.3	7353_SOIL_1_1402131530									3.24	0.85	0.15	7.9	21.87	64.41	3.24	4.29	0.109029
L16.1	7354_SOIL_0.1_1402131600	10	16	234	5.7	1.17	0.088	4.6	5.6	0.44	0.6	0.36	0.74	1.98	45.47	10.46	13.13	0.107595
L16.2	7354_SOIL_0.5_1402131600						0.172	4.9	5.9	1.39	1.03	2	15.25	11.79	51.48	2.42	3.02	0.810811
L16.3	7354_SOIL_1_1402131600									2.9	0.7	0.27	5.15	21.86	58.42	4.13	5.72	0.067541
																12.78	15.99	0.135922

Summary of key soil data

Measurements of soil cations, salinity and pH were made on samples from nine representative profiles from the 2014 survey. Soil solution cations were analysed from a saturated paste extract. Exchangeable cations were also analysed. The solution cations were used to calculate both SAR and CROSS²⁰, with the CROSS values deemed to be more appropriate for assessing dispersion potential due to the highly magnesian nature of the soil (Ca:Mg ratio is generally close to 0.1 in the subsoil). The ESP values were calculated from the sum of exchangeable cations, with the values likely to be elevated by the influence of pH dependant variable charge and unaccounted for exchangeable hydrogen.

Table 10 Average pH, salinity and sodicity of nine representative profiles

Depth	pH	ECe (mS/cm)	CROSS	SAR	ESP (%)
0-15 cm	4.47	0.45	3.57	2.91	-
15-50 cm	5.24	1.55	8.02	6.13	17.29
50-100 cm	5.45	2.83	15.98	12.77	23.92

Average surface nutrition from six points, with units being mg/kg. The values in the table relate to combined nitrate and ammonium nitrogen content, Colwell extractable P and K, and KCl-40 extractable sulphur.

Table 11 Average plant nutrient concentrations in surface soil (mg/kg).

N (NH ₄ +NO ₃)	P (Colwell)	K	S
7	12	163.	5

²⁰ ²⁰ Marchuk, A., Rengasamy, P. and McNeill, A. (2013) Influence of organic matter, clay mineralogy, and pH on the effects of CROSS on soil structure is related to the zeta potential of the dispersed clay. *Soil Research* 51(1) 34-40

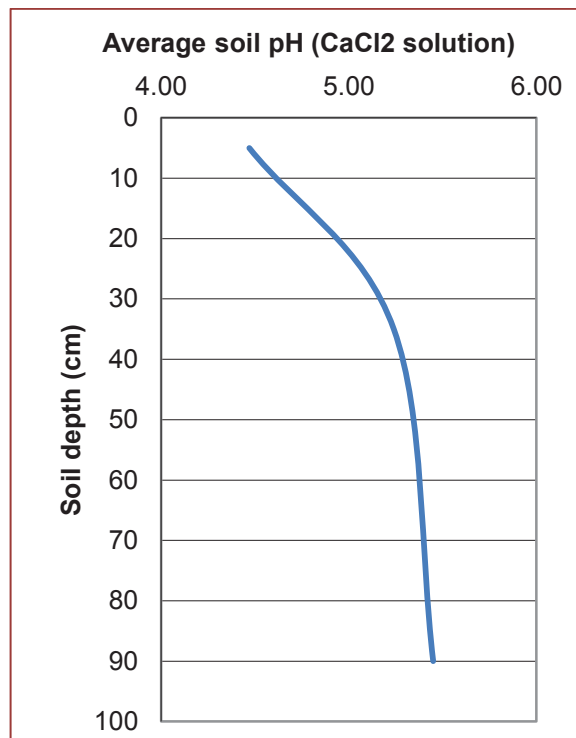


Figure 12 Average soil pH by depth

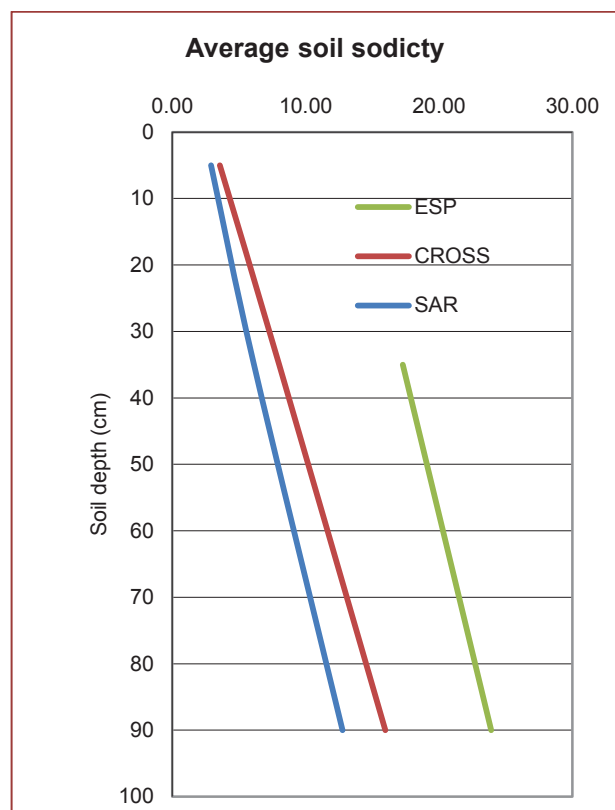


Figure 13 Average soil sodicity by depth

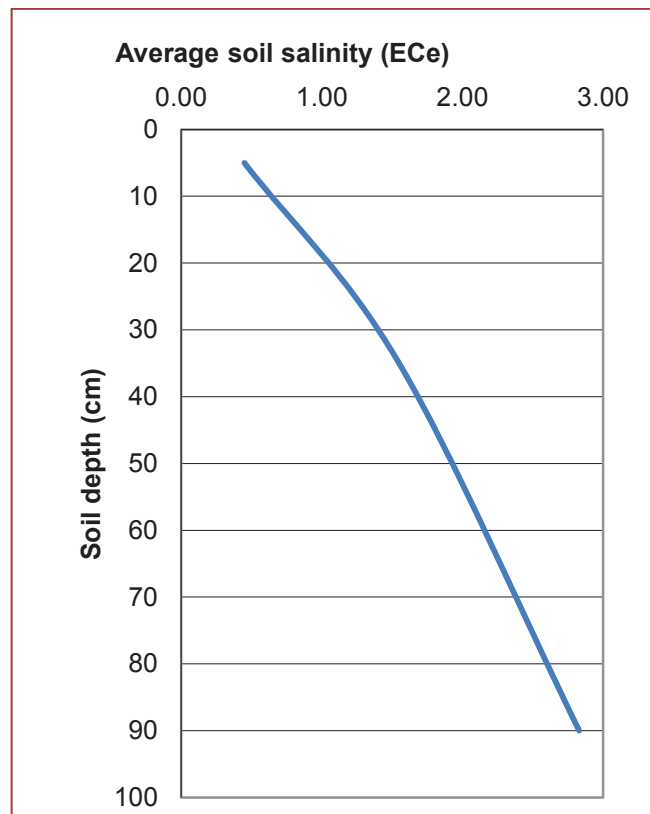


Figure 14 Average soil salinity by depth

Table 12 Total metals and total recoverable mercury

	As	Ba	Be	B	Cd	Cr	Co	Cu	Pb	Mn	Ni	Se	V	Zn	U	Hg
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID																
L201-1	<5	60	<1	<50	<1	8	2	<5	6	111	3	<5	22	<5	0.4	<0.1
L201-2	<5	40	<1	<50	<1	8	<2	<5	6	<5	<2	<5	23	<5	0.4	<0.1
L201-3	<5	270	<1	<50	<1	12	4	<5	8	<5	4	<5	28	<5	0.6	<0.1
L201-4	<5	270	2	<50	<1	14	44	6	11	118	11	<5	33	8	0.6	<0.1
L203-1	<5	110	<1	<50	<1	11	4	<5	8	62	4	<5	48	7	0.4	<0.1
L203-2	<5	230	1	<50	<1	13	8	<5	10	6	5	<5	36	<5	0.5	<0.1
L203-3	<5	110	2	<50	<1	14	14	<5	10	<5	8	<5	33	6	0.3	<0.1
L203-4	<5	50	<1	<50	<1	13	6	<5	9	5	3	<5	36	6	0.7	<0.1
L206-2	<5	590	1	<50	<1	14	5	<5	10	11	7	<5	36	<5	0.5	<0.1
L206-4	<5	150	1	<50	<1	13	41	7	13	140	7	<5	47	8	0.4	<0.1
L208-1	<5	50	<1	<50	<1	11	2	<5	8	98	5	<5	29	<5	0.4	<0.1
L208-2	<5	280	1	<50	<1	14	5	<5	10	<5	6	<5	36	<5	0.7	<0.1
L208-3	<5	220	2	<50	<1	15	22	8	10	22	13	<5	32	8	0.8	<0.1
L208-4	<5	250	2	<50	<1	15	26	9	10	10	15	<5	38	10	0.6	<0.1
L210-1	<5	50	<1	<50	<1	6	<2	<5	<5	109	3	<5	18	<5	0.2	<0.1
L210-2	<5	220	<1	<50	<1	9	3	<5	7	59	4	<5	23	<5	0.5	<0.1
L210-3	<5	160	<1	<50	<1	10	4	<5	8	88	7	<5	23	<5	0.3	<0.1
L210-4	<5	110	<1	<50	<1	12	9	5	7	43	7	<5	25	5	0.3	<0.1
L211-1	<5	40	<1	<50	<1	8	2	<5	5	94	3	<5	23	<5	0.2	<0.1
L211-3	<5	250	1	<50	<1	11	13	<5	6	41	7	<5	36	<5	0.4	<0.1
L216-2	<5	270	1	<50	<1	17	30	6	9	73	10	<5	38	6	0.5	<0.1
L218-1	<5	40	<1	<50	<1	9	<2	<5	5	84	2	<5	23	5	0.3	<0.1
L218-2	<5	60	<1	<50	<1	9	<2	<5	6	8	2	<5	26	<5	0.3	<0.1
L218-3	<5	50	<1	<50	<1	13	14	<5	7	59	5	<5	32	7	0.4	<0.1
L218-4	<5	50	<1	<50	<1	14	10	7	8	115	7	<5	32	8	0.4	<0.1
L219-1	<5	130	<1	<50	<1	13	7	<5	8	197	5	<5	35	7	0.6	<0.1
Minimum	0	40	1	0	0	6	2	5	5	5	2	0	18	5	0.2	0
Maximum	0	590	2	0	0	17	44	9	13	197	15	0	48	10	0.8	0
Average	0.00	158.08	1.40	0.00	0.00	11.77	12.50	6.86	8.20	70.59	6.12	0.00	31.19	7.00	0.45	0.00



Narrabri Gas Project

Bibblewindi Water Treatment Facility - Forest Health Assessment

Prepared for
Santos Limited

March 2012



DOCUMENT TRACKING

ITEM	DETAIL
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Prepared by	Martin Sullivan
Approved by	Mark Adams
Status	DRAFT
Version Number	1
Last saved on	23 March 2012
Cover photo	Top: visual vegetation stress; Middle: clear boundary between visual vegetation stress and adjoining vegetation; Bottom: Adjoining vegetation. Photos by MS.

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Abbreviations

ABBREVIATION	DESCRIPTION
BBAM	Biobanking Assessment Methodology
CSG	Coal Seam Gas
EIL	Ecological Investigation Level
ELA	Eco Logical Australia Pty Ltd
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
ESG	Eastern Star Gas (now Santos Limited)
LOR	Limit of Reporting
MNES	National Environmental Significance
NW Act	NSW <i>Noxious Weeds Act 1993</i>
ppm	Parts per million
SEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities (formerly the Department of Environment, Water, Heritage and the Arts)
SULE	Safe Use Life Expectancy
TDS	Total Dissolved Solids
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>
WTF	Water Treatment Facility

1 Introduction

Eco Logical Australia (ELA) was engaged by Santos Limited (Santos) to undertake an ecological health assessment of an approximately 1.5 ha area in the vicinity of the Bibblewindi Water Treatment Facility (WTF) in Bibblewindi State Forest following a number of incidents involving the escape of produced coal seam gas (CSG) water into the surrounding environment.

1.1 BACKGROUND

Santos acquired Eastern Star Gas (ESG) in November 2011. During a detailed review of ESG operations, Santos identified two incidents at the Bibblewindi WTF that resulted in the escape of produced CSG water into the surrounding environment (Santos 2012).

The first incident occurred sometime before May 2011 and resulted in a mixture of rain water and production CSG water escaping into the adjoining forest and ephemeral watercourse (Santos 2012). Significant rainfall occurred during the incident and the total quantum of water released and level of total dissolved solids (TDS) from the first incident is unknown (Santos 2012).

The second incident occurred on 25 June 2011. It is estimated that approximately 10,000 litres of produced CSG water containing elevated levels of salts with TDS measuring about 16,000 ppm escaped into the adjoining forest and ephemeral watercourse (Santos 2012). Following escape, the produced CSG water followed an overland flow-path in a south-westerly direction reaching approximately 420 m from the Bibblewindi WTF to Garlands Road (Santos 2012).

As part of the review of ESG operations, Santos engaged Golder Associates (Golder) to undertake a soil investigation of the area affected by these two incidents (Golder Associates 2012). Golder reported visual vegetation stress for the first 300 m south-west of the Bibblewindi WTF with a black residue visible on the ground surface diminishing with distance from the WTF (Golder Associates 2012). Golder mapped two areas in relation to these incidents: an area affected by visual vegetation stress and down gradient surface drainage pathway areas (the study area).

The soil investigation results were largely below the assessment criteria (as selected by Golder), or below the laboratory Limit of Reporting (LOR) with the exception of barium and vanadium which exceeded the Ecological Investigation Levels (EILs) at four locations (Golder Associates 2012). Tests of the black residue determined that the substance was most likely to be derived from natural organic material rather than a petroleum hydrocarbon source (Golder Associates 2012). Golder observed higher levels of heavy metals, TPH/TRH, nutrients, pH and particularly salts in the shallow soil profile samples compared with background levels. They concluded that a concentration of salts (particularly sodium) in the shallow soil profile is likely to have been the major contributing factor to the observed vegetation stress in the affected area (Golder Associates 2012). Further work including ecological advice and a supplementary soil sampling programme was recommended.

Santos has committed to fully remediate any detrimental impacts of ESG's former practices (Santos 2012). Rehabilitation planning for the Bibblewindi WTF has included assessment of potential impacts on Matters of National Environmental Significance (MNES) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act); a contaminated land assessment; and soil and water assessment (Santos 2012). The next phase of the remediation is the preparation and implementation of

a remediation strategy. This ecological health assessment will form part of the rehabilitation strategy.

1.2 SCOPE OF WORKS

The following is the scope of works for the ecological health assessment:

- Establishment of paired monitoring plots (impact and control sites)
- Collection of quantitative data in accordance with the Biobanking Assessment Methodology (BBAM)
- Assessment of tree health
- Collection of qualitative data on regeneration, reproductive potential, soil profile development and active erosion
- Analysis and comparison between impact and control sites
- Reporting and assessment of the impact of the release on threatened species, populations and ecological communities listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- Recommendations for rehabilitation

2 Methods

2.1 ECOLOGICAL HEALTH SURVEY

An ecological health survey was conducted by Martin Sullivan of ELA on 14 March 2012. The survey included the establishment of five ecological health monitoring plots (3 impact and 2 control). Ecological health monitoring plots were stratified across the study area with impact plots commencing at 0 m, 250 m and 460 m from the point source at the Bibblewindi WTF (Figure 2). Control plots were located in adjoining unaffected vegetation in the same vegetation type. Broad vegetation type mapping completed for the Narrabri Gas Project (ELA 2011a) was utilised and refined for this assessment.

Data collection for the project was undertaken in accordance with the Biobanking Assessment Methodology (BBAM) to ensure consistency with previous surveys (ELA 2011a). Quantitative data for native species richness (including cover-abundance); native versus exotic species cover; hollow bearing trees; over-storey regeneration; and length of fallen logs was recorded at each plot in accordance with the BBAM. Native canopy and mid-storey cover were visually estimated at 10 points along the 50 m line transect and divided by 10 to provide an estimated projected foliage cover for the plot. The projected foliage cover (%) of ground covers (native grasses, shrubs, other and exotic species), was calculated by recording their presence/absence at 50 points along the 50 m line transect and dividing the total number of hits by 50.

Health and condition of trees within plots was assessed visually from ground level based on the Visual Tree Assessment (VTA) technique (Mattheck and Breloer, 1994). Assessment of tree health and condition was based on visual inspection of tree crowns and estimation of tree heights using a Silva Clino Master.

Qualitative data was also collected for regeneration (seedlings, epicormic growth and lignotuberous growth), reproductive potential (buds, flowers and fruits), soil profile development (leaf litter cover, leaf litter depth and decomposition) and active erosion (rills, gullies, tunnels, surface crusting and overland flow paths). Survey data was recorded on field data sheets from a series of 20 x 20 m plots (0.04 ha) and 50 m line transects as shown in Figure 1. The geographic location of the plot was determined with a hand-held GPS unit at the start (labelled 'a') and end (labelled 'b') of each transect and recorded on the data sheet.

Prior to survey, existing geographic information system (GIS) data collected for the Narrabri Gas Project (aerial imagery, vegetation mapping, threatened species locations, drainage etc.) was loaded onto a field personal digital assistant (PDA) equipped with sensitive global positioning system (GPS) receivers and loaded with Arcpad 10 software to capture, edit, and displaying geographic information accurately in the field.

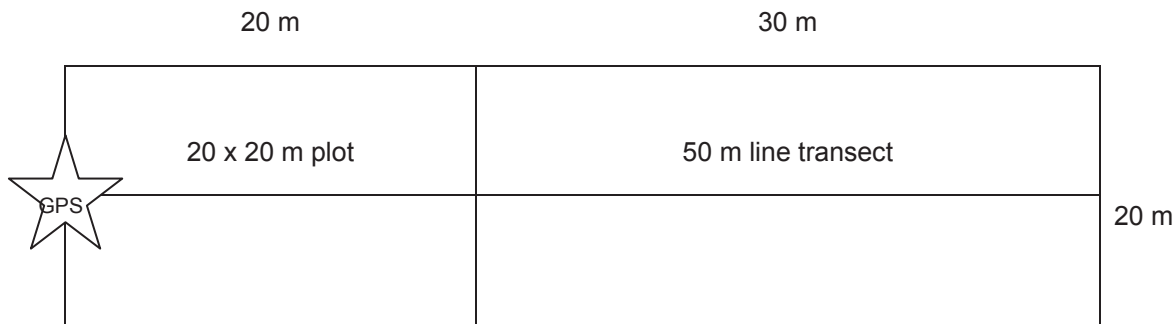


Figure 1: Biobanking plot layout

At each site, four photographs were taken at the 20 m mark along the transect facing each of the cardinal points (north, south, east and west) to illustrate the general condition of the site (Appendix A). These photos are useful for illustrating changes in tree, shrub and ground layers over time. A number of supplementary photos were taken of the canopy, ground disturbance and other site features.

Following completion of the ecological monitoring plots, field mapping of area affected by visual vegetation stress was undertaken utilising the field PDA (with GPS accuracy of approximately 3 m). This was undertaken by walking the entire boundary of the affected area (staying within the unaffected area and walking parallel to the affected area to ensure a conservative area was calculated) (Figure 2).

2.2 DATA ANALYSIS

Following completion of the ecological health survey, data collected at each impact site was analysed against the control sites (ELA 2011a).

Plot data was categorised into BioMetric vegetation types according to the Vegetation Types Database (OEH 2012) and then compared against the Vegetation Type Benchmarks (OEH 2012) to develop an accurate and repeatable condition score for each plot. The plot data for each site attribute was compared against the relevant benchmark for the vegetation type utilising the BioMetric tool (out of a maximum 100 points).

Paired sites (impact and control) in the same vegetation type were utilised for the assessment. The use of paired sites enables comparison with pre-disturbance vegetation rather than vegetation in 'benchmark' condition.

Analysis of tree health was undertaken by comparing the proportion of each tree health ranking (1 to 5) in each of the impact and control sites.

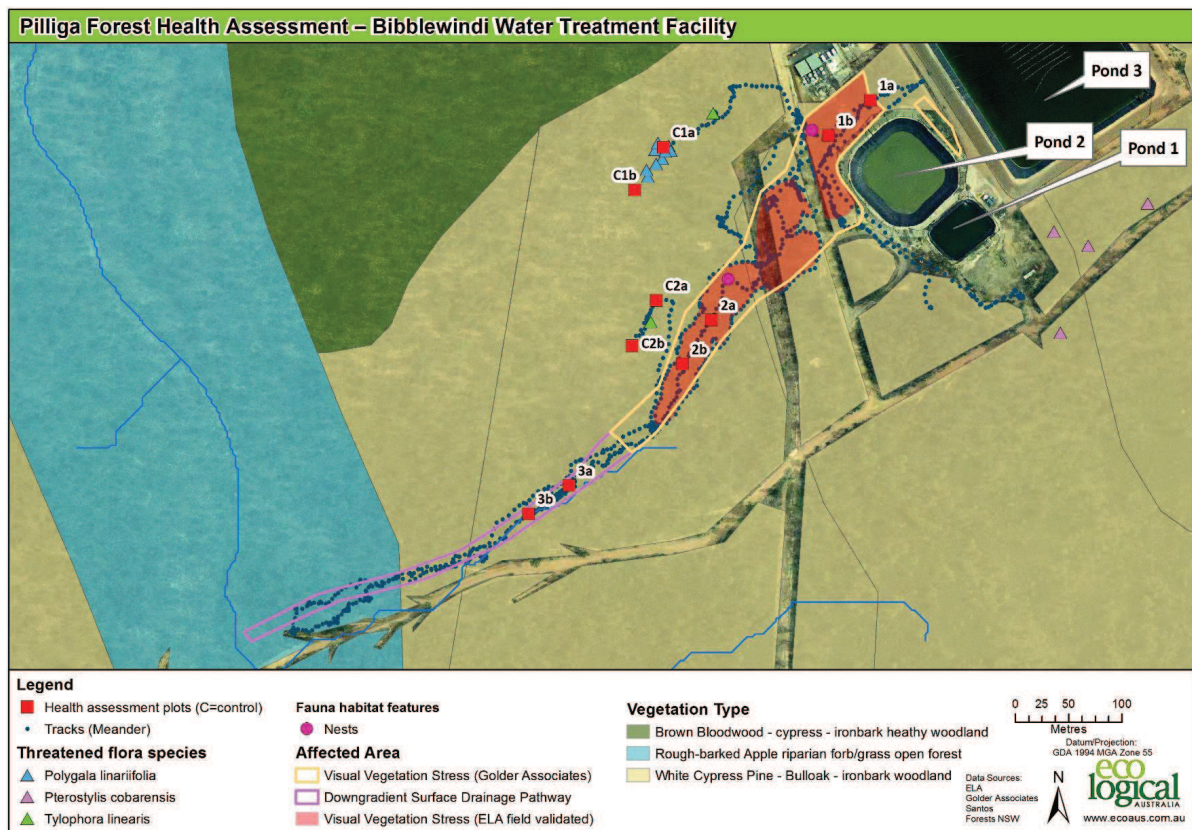


Figure 2: Ecological health survey locations and site features

3 Results

3.1 OBSERVATIONS

A visual inspection of the entire study area as defined by Golder (including the visual vegetation stress and down gradient surface drainage pathway areas) was undertaken (Figure 2). Two vegetation types were identified in the study area, namely White Cypress Pine - Bullock - Ironbark Woodland adjacent to the Bibblewindi WTF and Rough-barked Apple Riparian Forb/grass Open Forest along an ephemeral watercourse approximately 600 m to the south-west (Figure 2). Additional vegetation types occur in the vicinity of the Bibblewindi WTF (Figure 2), however they are not subject to this assessment.

Vegetation was observed to be visually affected from the point source at the Bibblewindi WTF (adjoining Pond 2, Figure 2) to a distance of approximately 370 m downstream to the south-west at which point there was a distinct boundary between the visually affected area and natural forest. Vegetation within the affected area had been significantly affected by the incidents with most large trees being dead (Plate 1). Canopy species affected included *Eucalyptus crebra* (Narrow-leaved Ironbark), *Eucalyptus conica* (Fuzzy Box), *Eucalyptus chloroclada* (Dirty Gum), *Callitris glaucophylla* (White Cypress Pine) and *Callitris endlicheri* (Black Cypress Pine). The area mapped as visually affected during this inspection was slightly different to that previously identified by Golder most likely due to the accuracy of the GPS and the previous mapping method used (Figure 2). Due to the improved accuracy obtained through field validation, it is recommended that the mapping undertaken as part of this assessment is utilised for future works.



Plate 1: Dead canopy species adjoining Pond 2

There was a clear and distinct boundary between areas which had been affected by the incidents, and

those areas which had not (Plate 2). The majority of all canopy, midstorey and ground cover species were dead (or dying) within the affected area.



Plate 2: Clear boundary between affected areas (right) and non-affected areas (left)

The visually affected area was characterised by largely barren, saturated soils with a black residue on the surface which was visibly crusting (Plate 3). A complex balance between chemical, physical (structural) and biological (including microbiological) components contribute to maintaining soil health (Nielsen & Winding 2002). Microorganisms (including those with visible fruiting bodies such as fungus) are excellent indicators of soil health as they rapidly respond to changes in the soil ecosystem (Nielsen & Winding 2002). As microorganisms perform complex soil processes (including decomposition and nutrient cycling), they provide a measure of soil and therefore ecosystem health. Through the observations of fungal fruiting bodies (e.g. mushrooms, bracket fungus, puffballs etc.), the health of the soil can be inferred.

No fungal fruiting bodies (sporocarps) were observed in the visually affected area, however fungus such as mushrooms and bracket fungus were common and widespread in the adjoining unaffected areas (Plate 4). This visual assessment suggests the functioning of soil and therefore ecosystem health in the visually affected area has been compromised.



Plate 3: Black residue crusting on soil surface



Plate 4: Fungal fruiting bodies in adjoining unaffected vegetation (mushrooms, bracket and gilled)

Regeneration through epicormic growth was observed to be occurring in a number of species including *E. crebra* (Plate 5) and *E. conica* (Plate 6); however the proportion of trees in this state is considered low overall (<5%). A number of trees were observed to have regenerated through epicormic growth following the incidents and have since died. No other form of recent regeneration of canopy species (e.g. lignotuberous regrowth or regrowth from seedlings) was observed. Older regrowth (i.e. greater than 12 months old) was present in some areas. Evidence of reproductive potential in the form of flowers and fruits was observed in ground cover species (particularly in grasses) in slightly elevated areas within the visually affected area and widespread outside the affected areas. Little to no seedlings of native ground covers were observed in the visually affected area despite the abundance of seed and good seasonal conditions.



Plate 5: Epicormic growth on *Eucalyptus crebra* following release of produced water



Plate 6: Epicormic growth on *Eucalyptus conica* following release of produced water

Where canopy, mid and groundlayer species were still alive within the affected area, these tended to be located on areas of higher ground which may not have been affected to the same level as surrounding areas (including areas of pre-incident canopy regeneration, Plate 7).



Plate 7: Older regeneration of *Eucalyptus crebra* surviving on localised areas of higher ground

Vegetation in the down gradient surface drainage pathway showed no obvious signs of impacts from the incidents. While the black residue was still visible on the soil surface in some areas, it had clearly dissipated and did not appear to be visually affecting the vegetation. Three small dead/dying *Allocasuarina luehmannii* (Bulloak) were located approximately 680 m from the Bibblewindi WTF along the edges of a drainage line which is likely to have received flow from the incidents. Due to their isolation from the point source and the condition of the vegetation in between, it is unclear whether these trees had died as a result of the incidents.

3.2 FLORA

A total of 115 species from 40 plant families were recorded from the five ecological health monitoring plots surveyed across the study area (Appendix B). Of the 115 species observed, 13 (11%) were exotic. The families which had the greatest representation include the Poaceae (26 species), Asteraceae (15 species), Fabaceae/Faboideae (8 species), Myrtaceae (6 species), and Cyperaceae (6 species).

There was no discernable difference between the total number of species recorded in the visually affected area and in the down gradient or adjoining bushland areas. As previously discussed this is considered most likely due to localised areas of higher ground within the visually affected area which may have not been affected to the same level as surrounding areas.

3.2.1 Threatened flora species

Two threatened flora species were observed during the current study, namely *Polygala linariifolia* (Native Milkwort) and *Tylophora linearis* (Plate 8 and Plate 9 respectively). *P. linariifolia* is listed as Endangered under the TSC Act and *T. linearis* is listed as Vulnerable under the TSC Act and Endangered under the EPBC Act. A total of 15 *P. linariifolia* and 3 *T. linearis* were observed during the current study outside of the visually affected area. Note that these individuals were located in the

vicinity of ecological health monitoring plots and do not constitute the entire local population. More detailed surveys would be required to determine the precise density and distribution of threatened flora species in the area.



Plate 8: *Tylophora linearis*



Plate 9: *Polygala linariifolia*

Two other threatened flora species are considered likely to occur within the area, namely *Pterostylis cobarensis* (Greenhood Orchid) and *Diuris tricolor* (Pine Donkey Orchid). Both *P. cobarensis* and *D. tricolor* have previously been recorded within 1 km of the Bibblewindi WTF (ELA 2011a). *P. cobarensis* is listed as Vulnerable under the TSC Act and EPBC Act and *D. tricolor* is listed as Vulnerable under the TSC Act. Both of these species are spring flowering and unable to be detected during the period of the current study. Habitat present in the study area has the potential to support both these species.

3.2.2 Noxious and environmental weeds

Of the 13 exotic species recorded in the current study, one is a declared noxious weed in the Narrabri Local Government Area, namely *Opuntia stricta* (Prickly Pear) (DPI 2012). The legal requirement under the NSW *Noxious Weeds Act 1993* (NW Act) for this species is to ensure:

“The growth of the plant [is to] be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction and the plant must not be sold propagated or knowingly distributed”

A number of invasive exotic species were also observed at Bibblewindi WTF which have the potential to invade adjoining bushland and pose a risk to rehabilitation including *Chloris virgata* (Feathertop Rhodes Grass), *Echinochloa* sp. (Barnyard Grass) and *Conyza bonariensis* (Flaxleaf fleabane).

3.3 FAUNA

The study area provides habitat to a range of native fauna species (including threatened species), with a suite of resources available including an ephemeral creek, an abundance of fallen logs, defoliating bark, winter flowering eucalypts and variable vegetation structure. Three abandoned moderate-large sized stick nests potentially belonging to *Pomatostomus temporalis* (Grey-crowned Babbler) were observed within the visually affected area. These nests were located in dead *C. glaucophylla* trees (Plate 10). As the trees had defoliated following the incidents, they are unlikely to be utilised by avifauna again due to a lack of foliage cover from predators.

Grey-crowned Babbler's were heard calling from adjoining vegetation during the ecological health survey. The Grey-crowned Babbler is listed as Vulnerable under the TSC Act. The vegetation within the vicinity of the Bibblewindi WTF is likely to provide habitat (foraging, roosting and breeding) for a wide range of threatened fauna species including birds, bats and mammals.

A number of other common native species were observed in the vicinity including *Dromaius novaehollandiae* (Emu), *Grallina cyanoleuca* (Magpie-lark), *Manorina melanocephala* (Noisy Miner), *Petroica goodenovii* (Red-capped Robin) and *Philemon corniculatus* (Noisy Friarbird).



Plate 10: Moderate-large stick nest in dead *C. glaucophylla*

3.4 BIOMETRIC DATA ANALYSIS

This section presents the results of an analysis of quantitative biometric data collected in the full floristic Biobanking plots. The series of graphs (Figures 3 to 11) show the values observed at impact sites and their paired control sites. The values utilised for the control at site 3 are an average of the values observed at the first two control sites as a paired control site for site 3 was not established. Figure 12 provides an overall summary of each of the impact and control sites compared with the biometric vegetation type benchmarks (OEH 2012).

Between 23 and 45 native species were recorded at the impact sites (Figure 3). These values are either less than or equal to those values observed at the reference (control) sites. The total number of number of native species recorded in the impact sites is high considering the visual affect the incidents have had on vegetation in this area. The majority of native species recorded at the first two impact sites were, however, observed to be growing on localised higher ground which may not have been affected to the same level as surrounding areas. The total number of native species recorded at each impact site is therefore not considered a useful measure for determining ecological health. A more effective measure is to compare species diversity (Figure 3) with native ground cover (Figures 6, 7 and 8).

No living native over-storey or mid-storey cover was observed along the transect at the first two impact sites with values being well below the measured values at the reference sites (Figure 4). Trees with overhanging branches which had recently died as a result of the incident (generally included in over-storey cover) were excluded from the analysis.

Over-storey cover within the broader plot area at site 1 was visually observed to be less than 5%. Approximately 5% cover of *Allocasuarina luehmannii* was observed at site 2. *A. luehmannii* is considered to be at least moderately salt tolerant (Marcar and Crawford 2004) which may explain its persistence in this area.

Native over-storey cover measured at site 3 was below the values measured at the reference site; however the canopy was not showing any signs of visual vegetation stress. Mid-storey cover measured at site 3 was well in excess of the values measured at the reference site due to a large number of regenerating *A. luehmannii* and *Eucalyptus crebra* (Figure 5). Due to their age, these species are likely to be regenerating following a significant wildfire event in 2006 and not as a result of the incidents. Differences in values between those observed at site 3 and the reference (control) site are therefore likely to be attributable to natural variation.

Native grass ground cover varied across the impacted sites with only site 3 approximating conditions in the reference sites (Figure 6). Native grass ground cover recorded at the impacted sites ranged from between 2% and 32% cover. Native grass ground cover has clearly been affected at the first two impact sites with less than 10% of the cover observed at reference sites. Native grass ground cover at site 3 was within 30% of the values measured at the reference sites. This data suggests that impacts of the incident are concentrated in the vicinity of the Bibblewindi WTF and do not appear to be having the same effect downstream.

Native shrub ground cover also varied considerably across the impacted and reference sites (Figure 7). The measured values at all three impacted sites was below those values measured at the reference sites. Native shrub cover at the first two impacted sites has been significantly reduced by the incidents with evidence of dead shrubs throughout these areas. Native shrub cover at site 3 is considered to be within the range of natural variability in this vegetation type.

Other native ground cover (forbs, sedges and rushes) also varied across the impacted sites with only site 3 approximating the values recorded in the reference sites (Figure 8). The majority of other native ground cover recorded in the first two impacted sites consisted of *Gahnia aspera* (Rough Saw-sedge) which appears to be salt tolerant to some degree. This data further confirms that the impacts of the incident are concentrated in the vicinity of the Bibblewindi WTF and do not appear to be having the same effect down gradient.

Exotic plant cover was practically absent at all impact and reference sites (i.e. below quantifiable values). Exotic species were recorded at each site (except for the site 1 control); however they occurred at a very low abundance. A number of invasive exotic species were observed at Bibblewindi WTF which have the potential to invade adjoining bushland and pose a risk to rehabilitation including *Chloris virgata* and *Echinochloa* sp.

Due to the relatively short time since the incidents (May/June 2011), the number of trees with hollows is unlikely to have been affected. The number of trees with hollows was lower than that observed at the reference sites at two of the impact sites (site 1 and site 3) and equal to the reference site at one site (site 2) (Figure 9). A large proportion of the forest was heavily burnt during a significant wildfire event in 2006, including the loss of large, hollow bearing trees (ELA 2011a). The absence of hollow bearing trees at the impact and reference sites is therefore attributable to past forestry activities and wildfire rather than the recent incidents.

The total length of fallen logs >10 cm in width (fauna habitat features) observed in the impacted sites is equal to or above the values observed in the adjoining reference sites (Figure 10). The majority of fallen logs within the impact sites are expected to have fallen prior to the incidents affecting the

vegetation in these areas.

Regeneration occurring in over-storey species at each of the impacted and reference sites (as a proportion) is shown in Figure 11. Note that this measure includes all canopy species with a trunk diameter of less than 50 mm and primarily includes regeneration which occurred prior to the area being affected by the incidents (i.e. regeneration > 1 year old). Regeneration of canopy species was observed in one of the three (33%) canopy species at site 1, in one of the two (50%) canopy species at site 2 and in all the canopy species at site 3. It is important to note that no regeneration of canopy species through seedling germination was observed at sites 1 or 2.

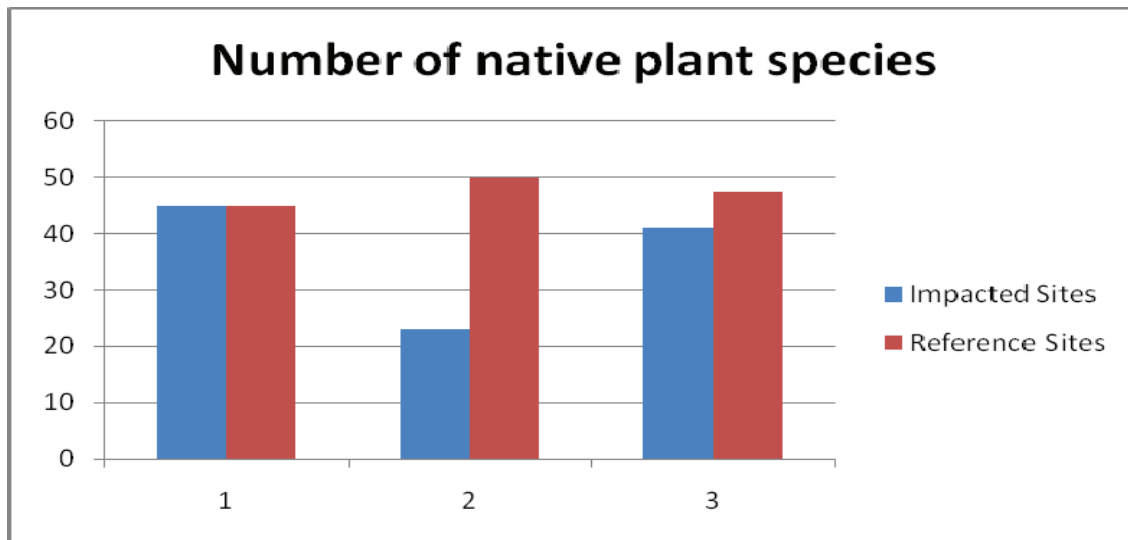


Figure 3: Number of native plant species

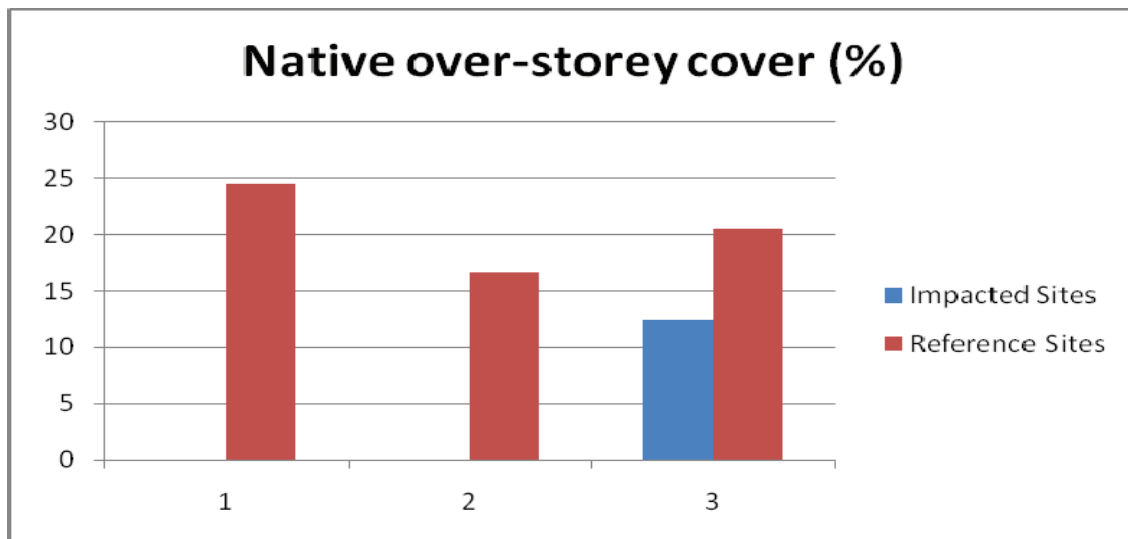


Figure 4: Native over-storey cover (%)

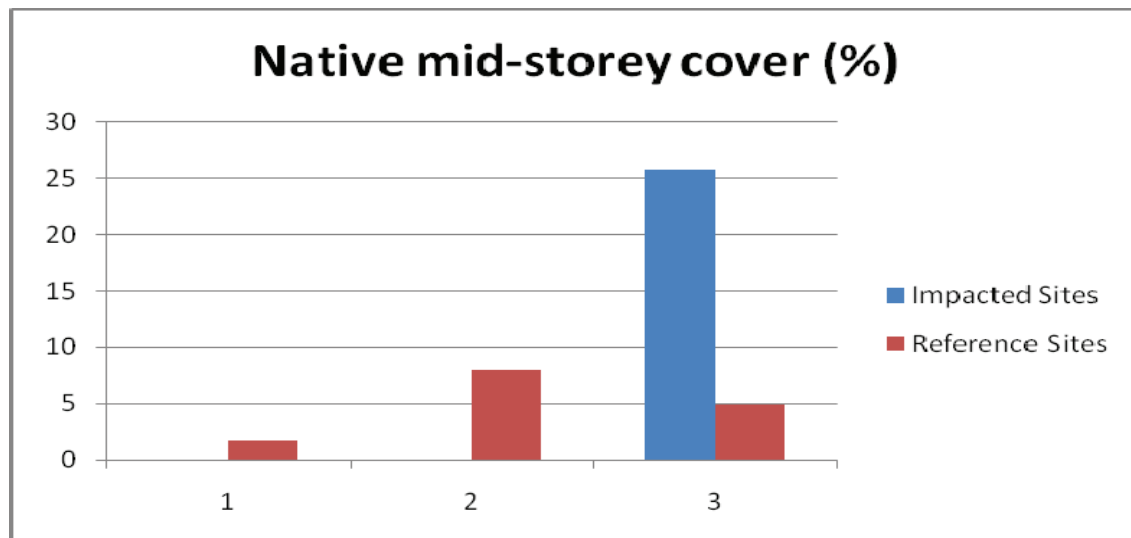


Figure 5: Native mid-storey cover (%)

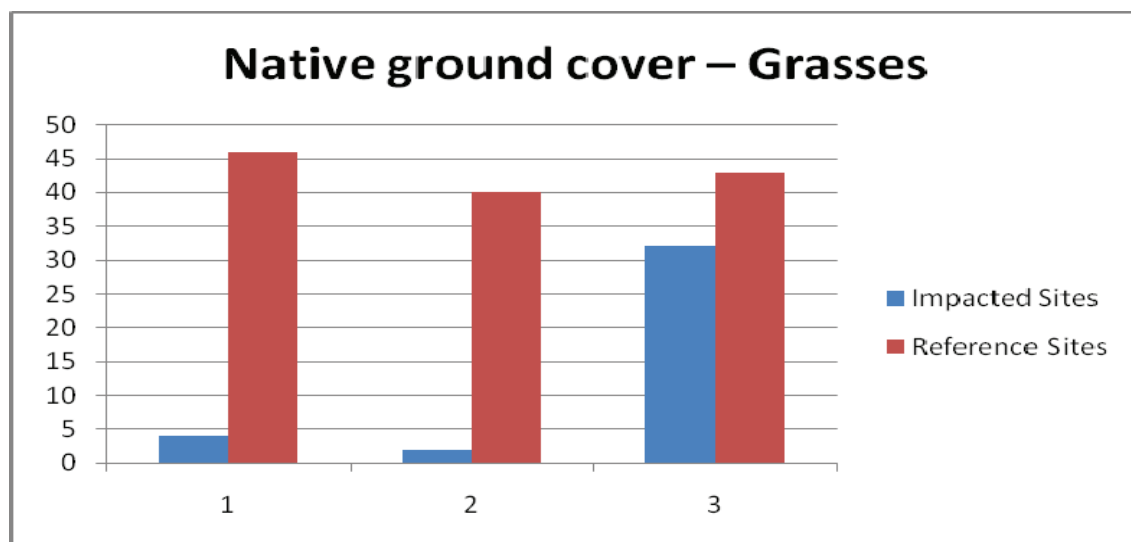


Figure 6: Native ground cover – Grasses

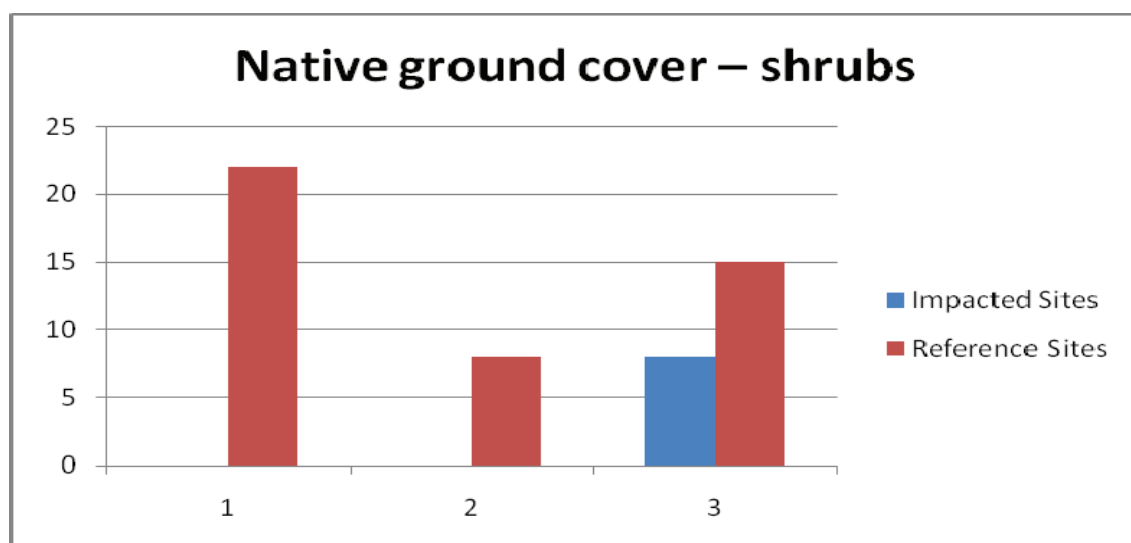


Figure 7: Native ground cover - shrubs

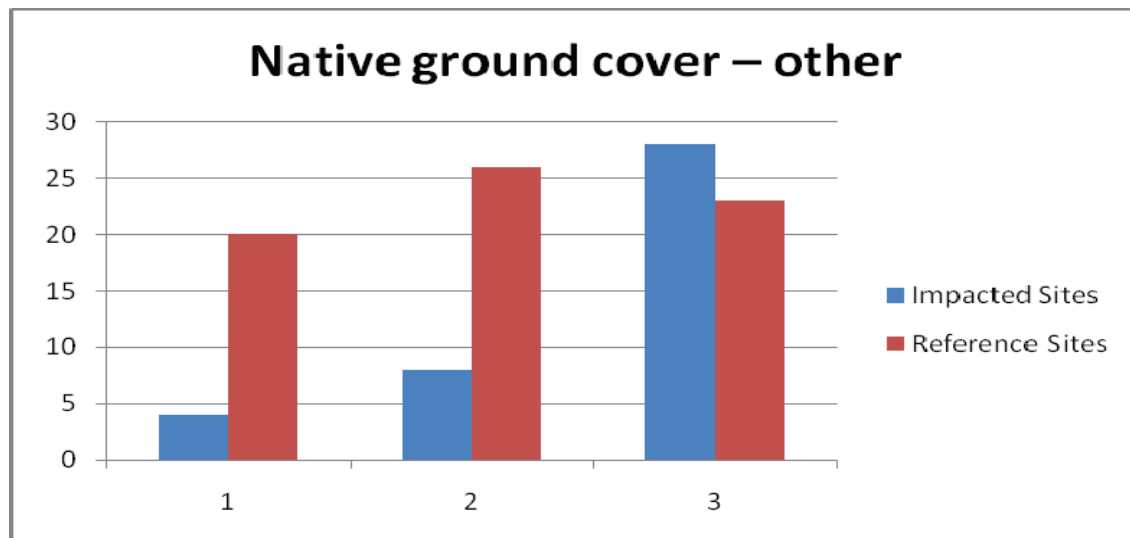


Figure 8: Native ground cover – other

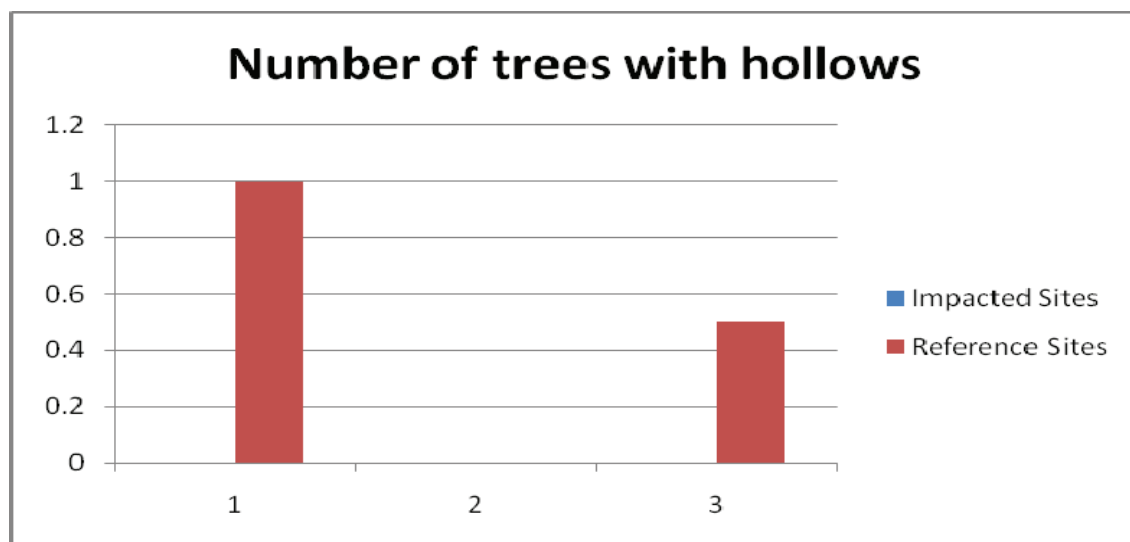


Figure 9: Number of trees with hollows

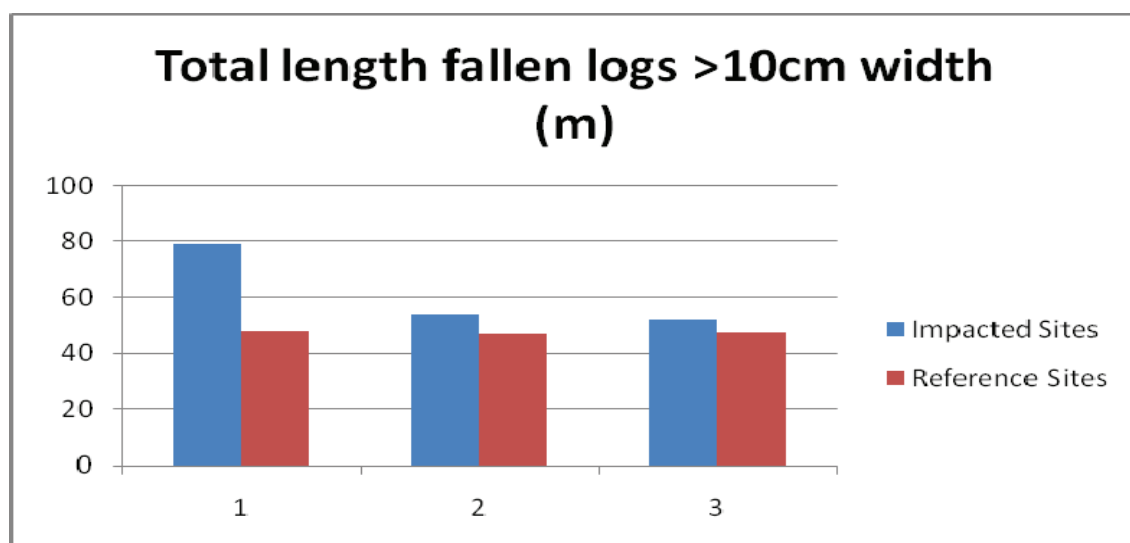


Figure 10: Total length fallen logs >10 cm width (m)

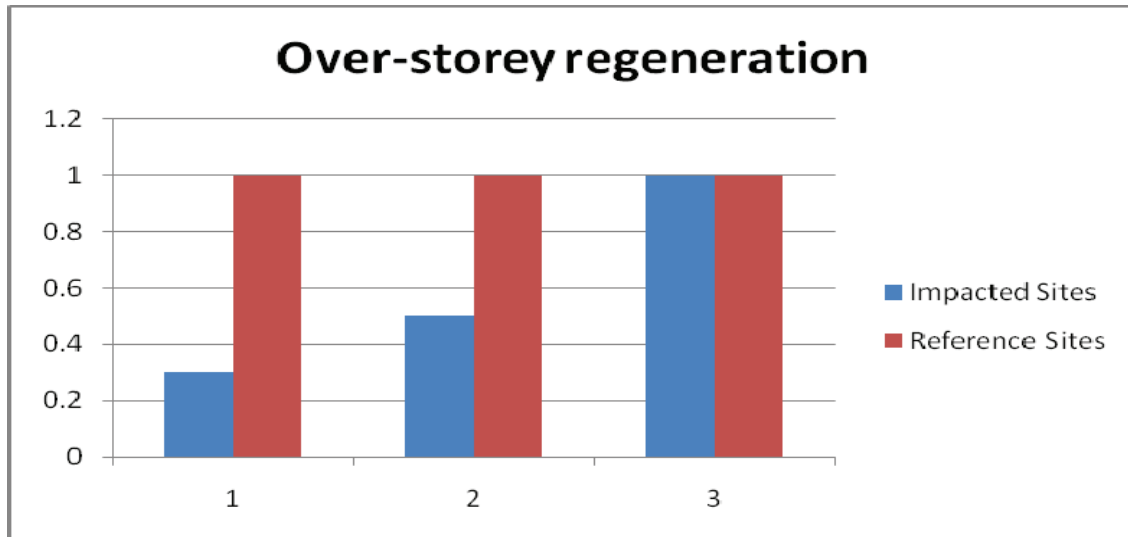


Figure 11: Over-storey regeneration

An overall summary of each of the impacted and reference sites compared with the vegetation type benchmarks (OEH 2012) are shown in Figure 12. It is important to note that the vegetation in Bibblewindi State Forest has been variously disturbed by a long history of forestry and recent wildfires (ELA 2011a). The reference sites exhibit values which approximate 70% of benchmark (or natural) condition largely due to these factors.

Site values for impacted sites are approximately 50% of the value of the corresponding reference site (site 1 and site 2). Site 3, which is located approximately 100 m downstream of areas affected by visual vegetation stress, has values approximately 85% of the corresponding reference site.

The low measured site value scores for site 1 and site 2 is attributable to a number of important factors including:

- Native over-storey cover (accounting for 10% of the total score)
- Native mid-storey cover (accounting for 10% of the total score)
- Native ground cover (accounting for 7.5% of the total score)
- Proportion of over-storey species occurring as regeneration (accounting for 12.5% of the total score)

Without intervention (for example re-instatement of canopy, mid and ground-cover species), the impacted sites are unlikely to approximate conditions in the reference sites. Considering the lack of regeneration occurring in affected areas (despite excellent seasonal conditions), these values are not expected to increase naturally over time.

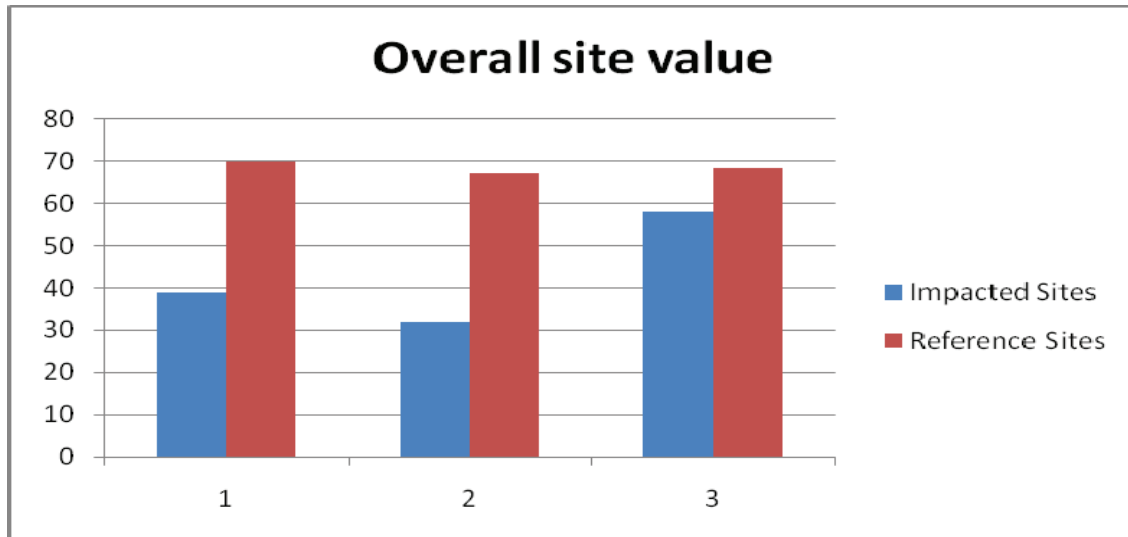


Figure 12: Overall site value scores

3.5 TREE HEALTH AND CONDITION ANALYSIS

The results of the tree health assessment undertaken in each of the 5 ecological health monitoring plots are shown in Figures 13 - 15. The values utilised for the control at site 3 (Figure 15) are an average of the values observed at the first two control sites as a paired control site for site 3 was not established. Note that trees which had clearly been killed by previous wildfire in 2006 (e.g. blackened trunks with no recent evidence of growth) were excluded from the assessment to minimise biased results.

As can be seen in Figure 13 and Figure 14, tree health is considered very poor at impacted sites 1 and 2 with greater than 85% of canopy trees being dead (stags) at these two locations. Where canopy trees were not entirely dead (site 1), the remaining canopy was in poor condition and fell into the lower categories (3 or 4). The few trees which were regenerating through epicormic growth scored poorly in the assessment due to the number of large, dead limbs.

Tree health and condition at impacted site 3 (located approximately 100 m downstream of the area affected by visual vegetation stress) is considered to be high with little to no evidence of health issues as a result of the incidents (Figure 15). Over 95% of the trees at site 3 had canopies which showed no evidence of stress while the remaining trees had a number of small dead branches which are considered insignificant to the long-term health of the trees.

Plate 11 and Plate 12 provide examples of extremes in canopy health between the visually affected area (site 1) and the corresponding reference site.

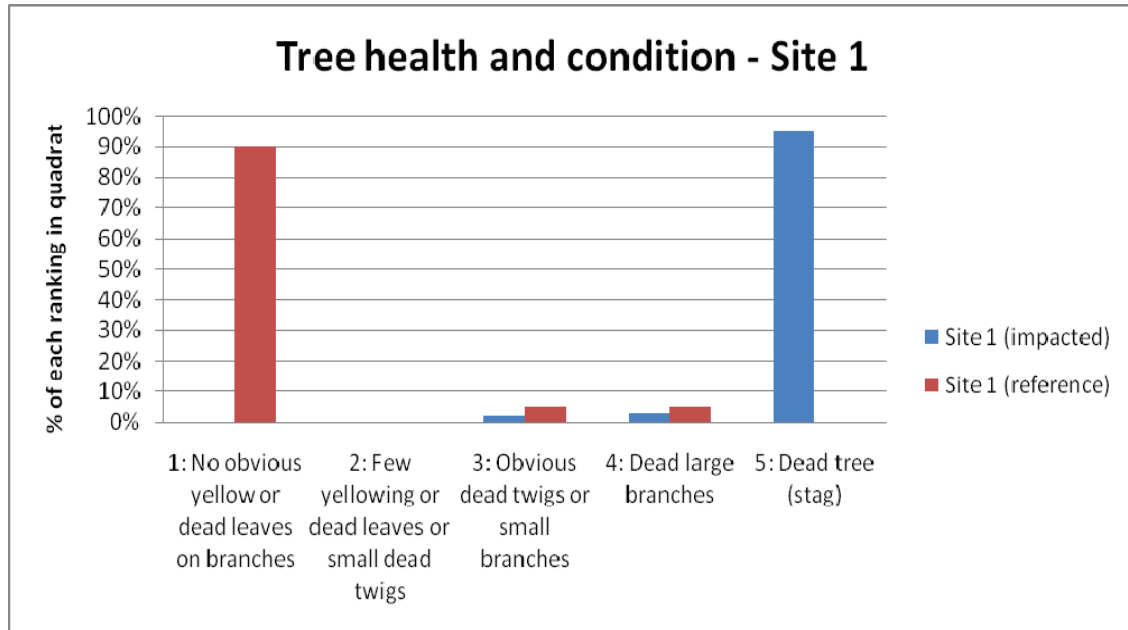


Figure 13: Tree health and condition – Site 1

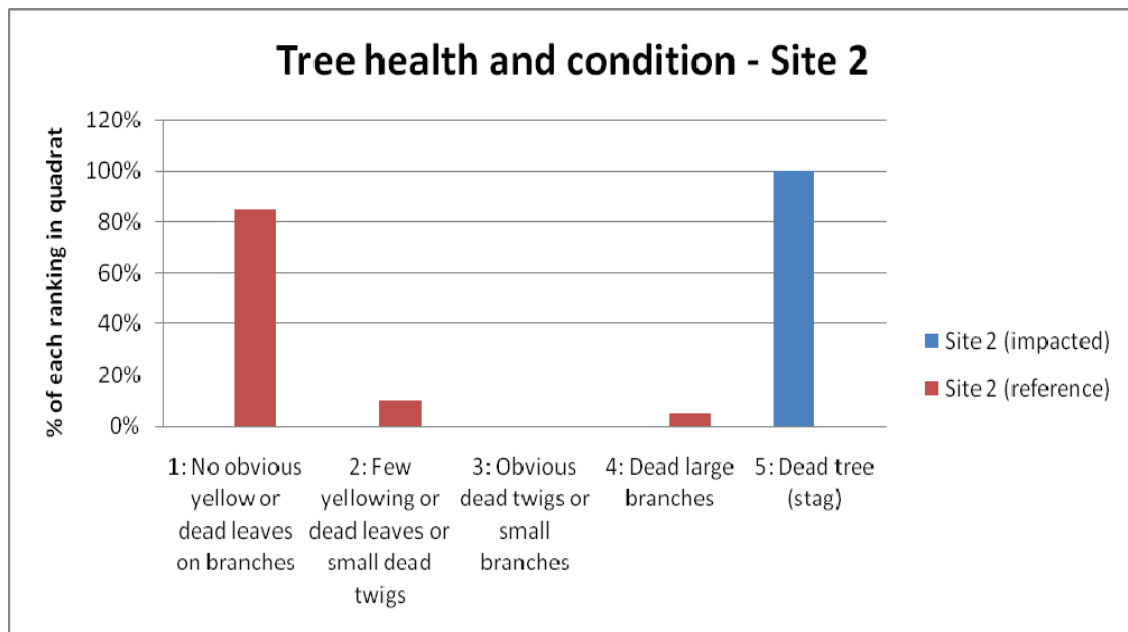


Figure 14: Tree health and condition – Site 2

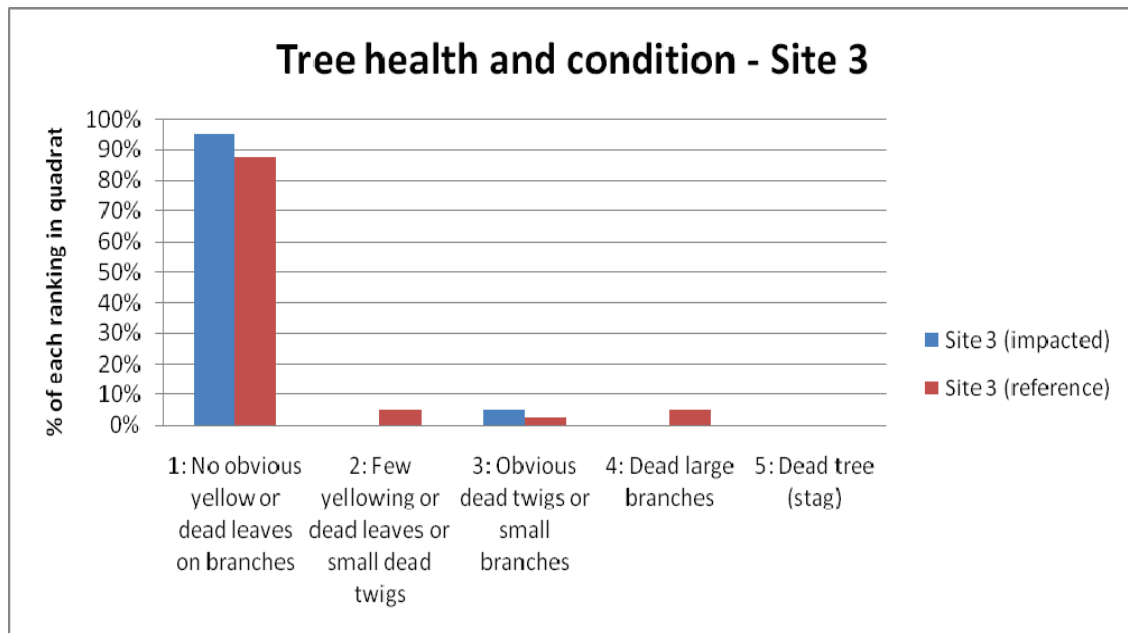


Figure 15: Tree health and condition – Site 3



Plate 11: Dead canopy of *Eucalyptus crebra* (Site 1)

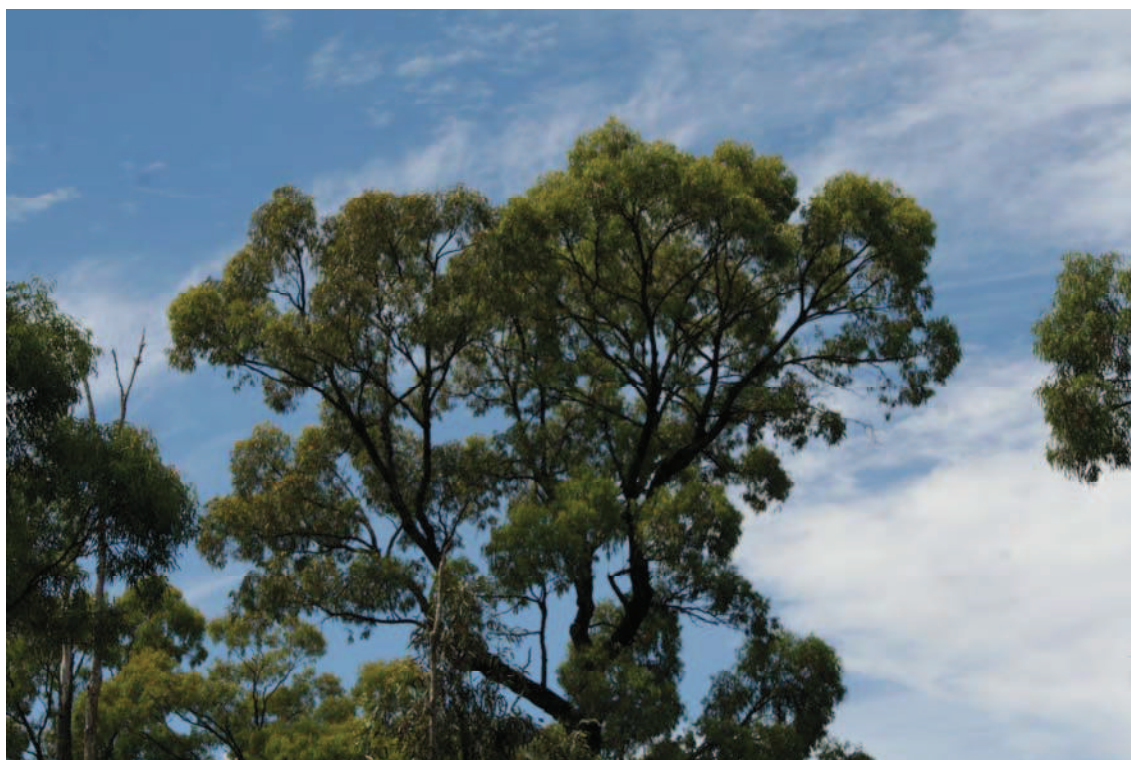


Plate 12: Healthy canopy of *Eucalyptus crebra* (reference site 1)

4 Rehabilitation recommendations

Santos has committed to the fully remediate any detrimental impacts of ESG's former practices (Santos 2012). Santos has identified the following preliminary approach to remediation which will be refined following the completion of detailed environmental investigations (Santos 2012):

1. The area between the water treatment plant and adjacent Pond 2 will be rehabilitated by:
 - a. Removal of soil to a licensed waste treatment facility
 - b. Replacement with appropriate material and/or sealing
 - c. Replanting of vegetation as appropriate
2. The area to the south of Pond 2 will be subject to in-situ remediation which will consist of:
 - a. Replanting of native species consistent with the surrounding vegetation
 - b. Providing support to regenerating vegetation – for example watering during low rainfall periods, regular inspections by qualified arborist/ecologist

Santos is also proposing a number of interim remedial actions including the installation of a cut-off trench (or bund) and drainage controls to eliminate or minimise surface water-run on (Santos 2012). These measures will help to contain future stormwater flow and minimise the risk of down gradient contamination.

The following rehabilitation recommendations have been prepared to assist Santos in the remediation of the affected areas at the Bibblewindi WTF. As the incidents have compromised the natural ability of the forest to regenerate in the visually affected area, intervention is required. Before any revegetation works can be undertaken, the affected soils require remediation to encourage plant growth. There are a range of options available to remediate the affected soils, including (in order of preference):

- Ameliorate the affected topsoil/subsoil in situ to remove containments (or to make them biochemically unavailable to plants)
- Remove the affected topsoil/subsoil and replace with topsoil from the same vegetation type from a nearby area which has been recently cleared (topsoil translocation)
- Remove the affected topsoil/subsoil and replace with imported clean soil of the same characteristics of the soil in the adjoining unaffected areas (least preferred option)

Areas of higher ground which appear to not have been affected to the same level as surrounding areas should be retained wherever possible to encourage natural regeneration.

Following remediation of the affected soils, there are a number of options for revegetation, including:

- Direct or hand seeding (utilising seed collected from the local area)
- Planting (using stock grown from seed collected from the local area)

- Natural regeneration (if topsoil translocation is undertaken)

Each of these approaches (direct seeding, planting and natural regeneration) have different associated costs and benefits. Direct seeding generally provides a more natural appearance, more diversely structured vegetation and provides healthier plants (through local adaptation), but takes longer to establish than planted vegetation. Planted vegetation often results in vegetation of an unnatural appearance but can be undertaken within a fast timeframe and produces reliable results. As such, it is recommended that Santos consider planting as the primary revegetation method supplemented with direct seeding of native understorey species. On-going monitoring and maintenance (particularly watering and weed control) will be required for planted areas.

Wherever possible, revegetation works (particularly seed collection, propagation and planting) should be undertaken during appropriate seasonal conditions. This will ensure the greatest chance for successful rehabilitation of the affected area.

Rehabilitation of the affected area is to follow best-practice management techniques and procedures to progressively restore ecological function. The most important aspects of rehabilitation are the management of topsoil, seed, weeds and fauna habitat resources (both in the short and longer term). Many of the principles, objectives and techniques required for the revegetation of the visually affected area are outlined in the *Narrabri Gas Project Rehabilitation Strategy* (ELA 2011b).

In order to successfully revegetate the affected area, it is recommended that a revegetation plan be prepared for the affected area in conjunction with the soil remediation plan. It is envisaged that the revegetation plan would include details on the revegetation methodology, topsoil, seed collection, direct seeding, planting, propagation, fauna habitat restoration, weed control, staging of works and monitoring.

Monitoring of the ecological health of the visually affected, downstream and adjoining areas should be undertaken over time. This is particularly important to determine the success of any rehabilitation works and to ensure downstream impacts of the incidents remain unchanged.

5 Conclusion

The analysis of vegetation visually affected by the incidents at Bibblewindi WTF quantifies impacts across a range of ecological health values. The approximately 1.5 ha area which directly adjoins Pond 2 (Figure 2) and extends approximately 360 m to the south-west has been significantly affected by the incidents to the extent that natural regeneration and re-establishment of pre-disturbance native vegetation is unlikely without intervention.

Key measures of ecological health including over-storey cover, mid-storey cover, ground cover and regeneration have been compromised in the visually affected area. Tree health is very poor with the majority of trees having died as a result of the incidents. While a small number of trees are regenerating through lignotuberous growth, these only account for a fraction of the number of trees present and will be unable to naturally replace the canopy in the area. Furthermore there was little to no evidence of active recruitment of mid or ground cover species in the visually affected area.

Conversely, vegetation downstream of the visually affected area appears to be in good ecological health with little to no discernable impacts to tree health, over-storey cover, mid-storey cover, ground cover or regeneration in this area.

With regard to potential impacts, the incidents are likely to have directly affected, or affected potential habitat for a range of threatened flora species including *Polygala linariifolia*, *Tylophora linearis*, *Pterostylis cobarensis* and *Diuris tricolor*. The release of produced CSG water is also likely to have affected potential habitat for a range of threatened fauna species including the Grey-crowned Babbler, *Nyctophilus timoriensis* (Greater Long-eared Bat) and *Pyrrholaemus sagittatus* (Speckled Warbler). While potential breeding and foraging habitat for *Pseudomys pilligaensis* (Pilliga Mouse) occurs in the vicinity, only dispersal habitat for this species is likely to have been affected by the release. The White Cypress Pine - Bullock - Ironbark Woodland vegetation type affected is the most widespread vegetation type within Bibblewindi State Forest.

Detailed assessments against the species impact criteria outlined in the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the EPBC Act have not been undertaken, however considering the extent of known threatened species populations as detailed in (ELA 2011a and 2011c), the magnitude of the impact (1.5 ha) and the high proportion of suitable habitat remaining in the adjoining areas, the incidents are not considered likely to have significantly affected any threatened species, populations or ecological communities.

Rehabilitation recommendations have been provided as part of this project (Section 4). The rehabilitation of the affected area could be successfully completed within an 18 month period (depending on the level of soil amelioration required) with vegetation expected to approximate pre-impact conditions within 20 years.

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Appendix A: Photographic record



Site 1 looking north



Site 2 Looking south



Site 1 looking east



Site 1 looking west



Site 2 looking north



Site 2 Looking south



Site 2 looking east



Site 2 looking west



Site 3 looking north



Site 3 Looking south



Site 3 looking east



Site 3 looking west



Site 4 looking north



Site 4 Looking south



Site 4 looking east



Site 4 looking west



Site 5 looking north



Site 5 Looking south



Site 5 looking east



Site 5 looking west

Appendix B: Flora species recorded

Note:

1. Families are group under the headings 1. Pteridophytes, 2. Gymnosperms, 3. Dicotyledons, 4. Monocotyledons.
2. An ^{***} before species indicates exotic species, # indicates non-local native, D indicates species present, but dead
3. A sample flora assemblage obtained from a short term survey, such as the present one, cannot be considered comprehensive, but rather indicative of the actual flora assemblage. It can take many years of flora surveys to record all of the plant species occurring within any area, especially species that are only apparent in some seasons.
4. Not all species can be accurately identified to species level due to absence of flowering or fruiting material.

FAMILY	SPECIES	COMMON NAME	Plot 1	Plot 2	Plot 3	Plot 1 Control	Plot 2 Control
1. Pteridophytes							
Sinopteridaceae	<i>Cheilanthes austrotenuifolia</i>	Rock Fern	X		X	X	X
	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	Rock Fern	X				
2. Gymnosperms							
Cupressaceae	<i>Callitris endlicheri</i>	Black Cypress Pine		D			
	<i>Callitris glaucophylla</i>	White Cypress Pine	X				X
3. Dicotyledons							
Acanthaceae	<i>Brunoniella australis</i>	Blue Trumpet, Blue Yam		X		X	
Amaranthaceae	<i>Alternanthera nana</i>	Hairy Joyweed	X	X	X		
Apocynaceae	<i>Alstonia constricta</i>	Bitter Bark, Quinine Tree			X		
Apocynaceae	<i>Tylophora linearis</i>					X	
Asteraceae	(Asteraceae genus unknown)		X	X			
	* <i>Bidens pilosa</i>	Farmer's Friend, Cobblers Pegs, Beggar's Ticks			X		
	* <i>Bidens subalternans</i>	Greater Beggar's Ticks				X	
	<i>Cassinia arcuata</i>	Sifton Bush, Chinese-shrub			X		X
	<i>Cassinia</i> sp.		D				
	<i>Chrysocephalum semipapposum</i>	Clustered Everlasting, Yellow Buttons	X				
	* <i>Conyza bonariensis</i>	Flaxleaf Fleabane	X	X		X	
	* <i>Conyza sumatrensis</i>	Tall Fleabane				X	
	<i>Epiltes australis</i>	Spreading Nut-heads		X	X		
	<i>Euchiton sphaericus</i>		X		X		
	<i>Glossogyne tannensis</i>	Cobbler's Tack	X			X	X

FAMILY		SPECIES	COMMON NAME	Plot 1	Plot 2	Plot 3	Plot 1 Control	Plot 2 Control
	*	<i>Sonchus oleraceus</i>	Common Sow-thistle, Milk-thistle	X	X	X	X	
		<i>Vernonia cinerea</i>		X	X	X	X	X
		<i>Vittadinia cuneata</i> var. <i>cuneata</i>	Fuzzweed				X	
		<i>Xerochrysum viscosum</i>	Common Everlasting, Golden Everlasting				X	
Cactaceae	*	<i>Opuntia stricta</i>	Prickly Pear, Common Pest Pear				X	
Campanulaceae		<i>Wahlenbergia</i> sp. (unidentified)	Australian Bluebell	X				
Caryophyllaceae		<i>Gypsophila australis</i>	Annual Chalkwort	X				
Casuarinaceae		<i>Allocasuarina diminuta</i> subsp. <i>diminuta</i>		D				
		<i>Allocasuarina luehmannii</i>	Bulloak		X	X	X	X
Chenopodiaceae		<i>Chenopodium</i> sp.				X		
		<i>Einadia trigonos</i>	Fishweed	X	X		X	
Clusiaceae		<i>Hypericum gramineum</i>	Small St Johns-wort			X	X	
Convolvulaceae		<i>Evolvulus alsinoides</i>		X	X	X	X	X
Ericaceae - Styphelioideae		<i>Brachyloma daphnoides</i>	Daphne Heath					X
		<i>Leucopogon muticus</i>	Blunt Beard-heath					X
		<i>Lissanthe strigosa</i>	Peach Heath	X		X	X	X
		<i>Melichrus urceolatus</i>	Urn Heath					X
Euphorbiaceae		<i>Chamaesyce drummondii</i>	Caustic Weed, Flat Spurge				X	X
		<i>Phyllanthus virgatus</i>		X	X		X	
		<i>Poranthera microphylla</i>	Small Poranthera					X
Fabaceae Faboideae		<i>Daviesia acicularis</i>	Sandplain Bitter-pea	X				
		<i>Daviesia ulicifolia</i>	Gorse Bitter-pea				X	
		<i>Desmodium varians</i>	Slender Tick-trefoil	X			X	X
		<i>Glycine clandestina</i>	Twining Glycine		X	X	X	X
		<i>Glycine</i> sp.		X		X		
		<i>Glycine tabacina</i>	Variable Glycine	X				
		<i>Pultenaea foliolosa</i>					X	X

FAMILY	SPECIES	COMMON NAME	Plot 1	Plot 2	Plot 3	Plot 1 Control	Plot 2 Control
	<i>Zornia dyctiocarpa</i>	Zornia			X		
Fabaceae Mimosoideae	<i>Acacia spectabilis</i>	Mudgee Wattle	X		X	X	X
Gentianaceae *	<i>Centaurium</i> sp.	Centaury		X	X		
Goodeniaceae	<i>Brunonia australis</i>	Blue Pincushion					X
	<i>Goodenia cycloptera</i>	Serrated Goodenia	X		X	X	X
	<i>Goodenia rotundifolia</i>		X			X	X
Haloragaceae	<i>Gonocarpus teucroides</i>	Raspwort					X
	<i>Haloragis heterophylla</i>	Raspwort			X		
Myrtaceae	<i>Calytrix tetragona</i>	Fringe-myrtle					X
	<i>Eucalyptus chloroclada</i>	Dirty Gum		D			
	<i>Eucalyptus conica</i>	Fuzzy Box	X				
	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	X	X	X	X	X
	<i>Melaleuca erubescens</i>					X	
	<i>Melaleuca uncinata</i>	Broom Honeymyrtle		X	X	X	
Oxalidaceae *	<i>Oxalis</i> sp.				X	X	X
Polygalaceae	<i>Polygala linariifolia</i>						X
Polygonaceae	<i>Rumex brownii</i>	Slender Dock		X			
Portulacaceae	<i>Calandrinia eremaea</i>	Small Purslane			X		
Primulaceae *	<i>Anagallis arvensis</i>	Pimpernel		X			
Rubiaceae	<i>Opercularia diphylla</i>	Stinkweed				X	
Santalaceae	<i>Exocarpos cupressiformis</i>	Cherry Ballart, Native Cherry					X
Sapindaceae	<i>Dodonaea peduncularis</i>	Stalked Hopbush				X	
Solanaceae	<i>Solanum cleistogamum</i>					X	
	* <i>Solanum nigrum</i>	Blackberry Nightshade	X				
	* <i>Solanum</i> sp.		X				X
Stylidiaceae	<i>Stylidium eglandulosum</i>	Trigger-plant					X
4. Monocotyledons							
Anthericaceae	<i>Laxmannia gracilis</i>	Slender Wire Lily				X	
Asphodelaceae	<i>Bulbine semibarbata</i>	Leek Lily	X	X			
Commelinaceae	<i>Commelina cyanea</i>	Blue Spiderwort	X	X			
	<i>Murdannia graminea</i>				X		
Cyperaceae	<i>Carex inversa</i>	Knob Sedge	X		X		
	<i>Cyperus fulvus</i>	Sticky Sedge		X		X	

FAMILY	SPECIES	COMMON NAME	Plot 1	Plot 2	Plot 3	Plot 1 Control	Plot 2 Control
	<i>Cyperus gracilis</i>	Slender Sedge	X	X	X	X	
	<i>Fimbristylis dichotoma</i>		X	X	X		X
	<i>Gahnia aspera</i>	Rough-leaved Saw-sedge	X	X		X	X
	<i>Schoenus</i> sp.						X
Juncaceae	<i>Juncus</i> sp.	Rush			X		
Lomandraceae	<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	Wattle Mat-rush				X	X
	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush, Honey Reed, Spike Mat-rush			X		
	<i>Lomandra multiflora</i>	Many-flowered Mat-rush			X	X	X
	<i>Lomandra multiflora</i> (terete form)	Many-flowered Mat-rush			X	X	
Phormiaceae	<i>Dianella revoluta</i>	Blue Flax-lily, Spreading Flax-lily	X		X	X	X
Poaceae	(Poaceae genus unknown)		X				
	<i>Aristida jerichoensis</i> var. <i>jerichoensis</i>	Jericho Wiregrass	X		X	X	X
	<i>Aristida</i> sp.	Wiregrass	X		X	X	
	<i>Austrodanthonia setacea</i>	Small-flowered Wallaby Grass	X				
	<i>Austrodanthonia</i> sp.	Wallaby Grass	X				X
	<i>Austrostipa setacea</i>	Corkscrew Grass				X	
	<i>Chloris truncata</i>	Windmill Grass	X	X			
	* <i>Cynodon dactylon</i>	Couch, Bermuda Grass	X				
	<i>Deyeuxia</i> sp.						X
	<i>Digitaria ammophila</i>	Silky Umbrella Grass				X	X
	<i>Digitaria breviglumis</i>		X		X	X	X
	<i>Digitaria brownii</i>	Cotton Panic Grass	X				
	<i>Digitaria diffusa</i>				X	X	X
	* <i>Echinochloa crus-galli</i>	Barnyard Grass	X	X			
	<i>Enteropogon acicularis</i>	Curly Windmill Grass		X			
	<i>Eragrostis brownii</i>	Brown's Lovegrass	X		X	X	X
	<i>Eragrostis lacunaria</i>	Purple Lovegrass	X		X		
	<i>Eragrostis leptostachya</i>	Paddock Lovegrass	X	X		X	

FAMILY	SPECIES	COMMON NAME	Plot 1	Plot 2	Plot 3	Plot 1 Control	Plot 2 Control
	<i>Eragrostis parviflora</i>	Weeping Lovegrass		X	X		
	<i>Eragrostis</i> sp.	Love Grass			X	X	X
	<i>Eriachne mucronata</i>	Mountain Wanderrie Grass				X	
	<i>Microlaena stipoides</i>	Meadow Rice-grass, Weeping Grass			X		
	<i>Panicum effusum</i>	Hairy Panic	X				
	<i>Panicum simile</i>	Two-colour Panic			X	X	X
	<i>Paspalidium gracile</i>	Slender Panic	X		X	X	
	<i>Sporobolus creber</i>	Slender Rat's-tail Grass	X	X			
Xanthorrhoeaceae	<i>Xanthorrhoea acaulis</i>						X

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Our Reference:

NAW:EL; P99/03+58-⁵⁹⁵⁵

Your Reference:

DA. 77/2008

Contact Name:

Mr Nick Wilton

Telephone:

(02) 6799 6855

Mr Tim Frew
Manager Engineering
Eastern Star Gas
PO Box 4526
SYDNEY NSW 2001

5 December 2007

Dear Sir

Re: Development Application No. 77/2008

HAVE YOU OBTAINED CONSTRUCTION CERTIFICATE APPROVAL?

Enclosed herewith is Council's notice to the applicant of determination of a development application pursuant to the *Environmental Planning and Assessment Act, 1979*.

YOU ARE ADVISED THAT THIS IS ONLY A DEVELOPMENT CONSENT AND DOES NOT CONSTITUTE A CONSENT FOR BUILDING WORK. FURTHER COUNCIL CONSENT IS REQUIRED PRIOR TO CONSTRUCTION ACTIVITIES COMMENCING.

Please read the determination notice carefully and observe/implement any conditions of consent as outlined in the notice.

Failure to comply with the determination notice will render you liable to legal proceedings under the *ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979*. The erection of a building without prior construction consent will render you liable to Council ordering the demolition of any building erected.


Yours sincerely

Mr Glen Warren
DIRECTOR CORPORATE SERVICES

5/12/07.

Summary of Comments on Development Consent - DA 77-2008 sn.pdf

Page: 1

 Number: 1 Author: Tony Subject: Sticky Note Date: 23/04/2017 12:28:42 PM
See clause 29 which means that anything within the Eastern Star Gas Application documentation cannot be altered unless Narrabri Council approves.
So that means the statement made in the Application about not manufacturing anything stands.



Prescribed Conditions of Development Consent:

~~1.~~

The proponent shall install a dust mitigative material such as blue metal, or sealing to ensure that dust is not generated onsite.

REASON: To ensure environmental compliance.

~~2.~~

2. The proponent shall establish a formal complaints register whereby any complaints are fielded and attended to upon a corporate level to the satisfaction of the objector. Any unresolved issues shall be forwarded to Council.

REASON: To ensure complaints are dealt with on a corporate level.

~~3.~~

3. All chemicals on site shall be appropriately banded and spill preventative measures will be required to Australian Standards, Ag-safe and Workcover requirements. If required, the proponent shall enter into a liquid trade waste agreement with Narrabri Shire Council.

REASON: To ensure Environmental compliance and OH&S requirements are adhered to.

~~4.~~

4. The proponent shall adhere to all EPA requirements with the handling and storage of chemicals onsite.

REASON: To ensure Environmental compliance.

~~5.~~

5. Traffic shall be restricted to thirty (30) vehicle movements per week as outlined in Statement of Environmental Effects.

REASON: Traffic Management.

~~6.~~

6. Noise levels shall be restricted to EPA noise generation guidelines for commercial development.

REASON: To ensure Environmental compliance.

~~7.~~

7. The proponent shall retain onsite a copy of all chemicals and quantities of all chemicals stored onsite.

REASON: Council Requirement.

~~8.~~

8. The proponent shall install a designated parking area for both staff and visitors which is to be sign posted.

REASON: Traffic Management.

9. ✓ The proponent shall provide a defined entry and egress for the site to Council's Design Specifications. Design plans for the entrance shall be submitted to Council for Engineering approval.

REASON: Traffic Management.

10. ✓ The proponent to direct all storm water from the structures to the table drain at the front of the allotment(s) Yarrie Lake Road or to the rear portion of the allotment for natural overland flows. Stormwater drainage shall not be directed toward neighbouring allotments or developments.

REASON: To ensure storm water management.

11. ✓ The proponent to install and maintain sedimentation barriers during construction / clearing of the said allotment in order to minimise soil erosion / sedimentation.

REASON: To ensure Environmental Compliance.

12. ✓ Any damage to local road infrastructure during construction Council shall be either financially compensated by the proponent or the proponent will be responsible to returning the road infrastructure to Council Engineering Standard requirements.

REASON: To ensure infrastructure is maintained to a standard.

13. ✓ The proponent shall install after application to Council and further approval a boundary point connection to town water infrastructure including the provision of a water meter.

REASON: Engineering Requirement.

14. ✓ The developer to submit to Council for assessment and determination, design plans of the access intersection from Yarrie Lake Road verge to the boundary of the allotment. These design plans shall comply with Council's Design Specifications Guide and shall be endorsed by a suitably qualified civil engineer. Please Note: Design Plans shall be submitted prior to commencement of works onsite.

REASON: To ensure adequate access to the allotment is maintained.

15. ✓ Prior to the commencement of the proposed facility, a formal application is to be made for a Construction Certificate (either by appointing Council as the principle certifying authority or a private certifier) by lodging with Council no less than 48 Hours prior to the commencement of the proposed activity.

REASON: To confirm that any proposed works complies with the relevant standards.

16. The developer shall notify Council not less than forty eight hours (two working days) prior to the commencement of the work(s) of;
- (i) Date of commencement of the work
 - (ii) Name of the principle certifying authority for the issue of compliance / occupational certificates.

REASON: Statutory Requirement.

17. Prior to the commencement of construction of the structure, the developer shall lodge with Council and receive approval for the following s68 of the Local Government Act Approval(s);
- (i) B1 - Carry out water supply work
 - (ii) B5 - Carry out stormwater drainage works
 - (iii) F10 - Operate an onsite sewerage waste management system.

REASON: Statutory Requirement

18. Prior to the occupation of the building / Structure, the developer shall apply for, using the prescribed form and payment of the prescribed fee a final occupational certificate.
- Note: If issued by a private certifier, the certificate must be lodged with Council 48 hours prior to the occupation of the building / Structure.

REASON: Statutory Requirement.

19. Suitable landscaping is to be implemented around the development or landscaping plans are to be submitted to and approved by Council, prior to the occupation / use of the development.

REASON: To reduce the visual impact of the development on the surrounding environment

20. Use of the building for habitable purposes is prohibited. Further Council consent is required for a change of use.

REASON: Statutory Requirement.

21. A fire Safety Certificate must be provided with respect to all fire safety measures installed within the building specified by the fire safety schedule. Such Certification must be provided prior to a final inspection or application for occupancy is considered.

REASON: Statutory Requirement.

22. The proposed land / structure to be connected to a 240 Volts AC mains electrical supply as per the regional electricity supplier's requirements.

REASON: Provision of essential utility services

23. The building is to comply with the requirements of the Commonwealth Disability Discrimination Act 1992 and the NSW Anti discrimination Act 1977;
- (i) The granting of this consent does not imply or confer compliance with requirements of the Disability Discrimination Act 1992, the Anti Discrimination Act 1977 and or the Building Code of Australia.
 - (ii) The Disability Discrimination Act 1992 and the Anti Discrimination Act 1977 provide that it is an offence to discriminate against a person in a number of different situations.
 - (iii) Compliance with part D3 of the Building Code of Australia - Access for people with disabilities, will be deemed to meet the requirements for the provisions of access for people with disabilities to Class 3, 5,6 ,7 and 9 buildings. The applicant should ensure that these matters are addressed in the plans and specifications submitted with the construction certificate.

REASON: Statutory Requirement.

24. The Proponent shall not operate business outside the hours of;
- 7am to 7pm Monday to Friday
 - 8am to 5pm Weekends and Holidays

REASON: Council Requirement

25. That the development, as identified in the application received by Council (DA), be carried out in accordance with this consent, except where amended by the conditions of consent;
- (i) Any alteration to the drawings and or documentation, as approved by Council, will require further development consent, as per section 96 of the Environmental Planning and Assessment Act 1979.
 - (ii) No other works, other than those approved by this consent notice shall be carried out without the prior development consent of Council.
 - (iii) Where there is an inconsistency between the documents lodged with this application and subsequent approval, and the following conditions, the conditions shall prevail to the extent of the inconsistency.




REASON: To confirm the application to which the consent relates.

26. Any use of the subject land shall not commence until the relevant conditions of consent have been met or unless satisfactory arrangements have been made in writing with Council.

REASON: To ensure compliance with the conditions of consent.

27. Any use of the building or structure shall not commence until the appropriate compliance certificate has been lodged with Council.

REASON: To ensure compliance with conditions of consent.

 Number: 1 Author: Tony Subject: Sticky Note Date: 23/04/2017 12:30:45 PM
Narrabri Shire Council clause inserted to ensure that only the matters stated within this Application are approved.
Any changes need to come back to NCS for approval.

28. ✓ The developer to provide onsite portable toilets during the construction phase of the proposal

REASON: Health Requirement.

29. ✓ A copy of this notice be kept on-site at all times. Further if the applicant is not the builder or occupier of the land to which the consent relates, a copy of the notice shall be provided to the said persons.

REASON: To ensure that all users / occupiers of the land are aware of the conditions of consent.

30. All work associated with the implementation / construction (not operation) of the approved development activity, involving the use of the electric or pneumatic tools, or other noisy operations, shall be restricted to the following hours of operation:

- ✓ (i) Monday to Saturday 7am to 8pm
(ii) Sunday 8am to 8pm
(iii) Public Holidays 8am to 8pm
(iv) Note: all noise generating activity is subject to the requirements of the Protection of the Environment Act 1977.
(v) This condition does not relieve the developer (or employees, contractors etc) from the requirements of the relevant Noise Control legislation.

REASON: Statutory Requirement

31. ✓ All Sanitary waste management devices are to be connected to a suitable and adequate water supply at all times.

REASON: Public Health Standards

32. ✓ The applicant / Land owner should note that there may be covenants in favour of other parties other than Council restricting what may be built or done upon the land. The applicant / Landowner is advised to check the position prior to the commencing work.

REASON: Section 88B of the Conveyance Act - restrictions of land use.

33. ✓ Change of building use - A building in respect of which there is a change of building use must comply with the category 1 fire safety provisions applicable to the proposed use. This clause does not apply to the extent to which an exemption is in force under Clause 80H or 80I, subject to the terms of any condition or requirement referred to in Clause 80H(6) or 80I(4). Within the clause Category 1 fire safety has the same meaning as it has in Part 7B.

REASON: Ensure that adequate fire safety measures are implemented.

34. ✓ Excavations and backfilling associated with the erection of a building must be executed safely and in accordance with appropriate professional standards. All

✓ excavations must be properly guarded to prevent them from being dangerous to life and property.

REASON: To ensure that safety measures are implemented on site to protect workers and the general public.

35. Protection of public places is required if the building works is likely to cause pedestrian or vehicular traffic in a public place to be obstructed or rendered inconvenient, or
✓ involve the enclosure of a public place. A fence must be erected between the worksite and a public place.
The worksite must be kept lit between the hours of sunset and sunrise if it is likely to be hazardous to persons in the public place. Any such fence is to be removed once the work has been completed.

REASON: To ensure measures have been taken to provide the protection of public places

36. Erection of Signage

1. For the purposes of section 80A (11) of the Act, the requirements of subclauses (2) and (3) are prescribed as conditions of a development consent for development that involves any building work, subdivision work or demolition work.

- ✓ 2. A sign must be erected in a prominent position on any site on which building work, subdivision work or demolition work is being carried out:
- a. showing the name, address and telephone number of the principal certifying authority for the work, and
 - b. showing the name of the principal contractor (if any) for any building work and a telephone number on which that person may be contacted outside working hours, and
 - c. stating that unauthorised entry to the work site is prohibited.

Any such sign is to be maintained while the building work, subdivision work or demolition work is being carried out, but must be removed when the work has been completed.

This clause does not apply in relation to building work, subdivision work or demolition work that is carried out inside an existing building that does not affect the external walls of the building.

This clause does not apply in relation to Crown building work that is certified, in accordance with section 116G of the Act, to comply with the technical provisions of the State's building laws.

This clause applies to a development consent granted before 1 July 2004 only if the building work, subdivision work or demolition work involved had not been commenced by that date.

Note. Principal certifying authorities and principal contractors must also ensure that signs required by this clause are erected and maintained (see clause 227A which currently imposes a maximum penalty of \$1,100).

38. Prior to the commencement of the proposed activity, a formal application for a construction certificate, together with the prescribed fee, plans and specifications be submitted to and approved by Council, or alternatively a privately certified Construction Certificate be lodged with Council no later than 48 hours prior to the commencement of the proposed activity.

REASON: To confirm that any proposed work(s) complies with the relevant standards.

39. The developer shall notify Council, not less than 48 Hours prior to the commencement of the proposed works of;
- i) Date of the commencement of the works.
 - ii) Name of the Principle Certifying Authority for the issue of Compliance / Occupational and or subdivision certificates.

REASON: Statutory Requirements

40. The proponent shall install a minimum 14 metre long, 375mm concrete piped culvert with suitable headwalls and guideposts at the proposed entrance and egress to Yarrie Lake Road, Narrabri. Please note the entrance is not to impede surface water flows (table drain flows).

REASON: Engineering Requirement.

- construction of a warehouse, storage building and ancillary office space
- construction of a hard stand pipe casing wash area, two other hard stand areas and associated drainage
- construction of external hardstand storage (laydown) area
- ancillary stormwater drainage, servicing and access works.

Since the lodgement of DA546-2013, the *Narrabri Local Environmental Plan 2012* (LEP 2012) was gazetted. LEP 2012, gazetted on 21 December 2012, identifies the site within the RU1 zone and the proposed development is therefore prohibited under LEP 2012. The current (and proposed) uses are non-conforming uses in the RU1 zone.

However, the current operation is considered an existing use.

Section 106 of the EP&A Act defines an existing use as:

- (a) *the use of a building, work or land for a lawful purpose immediately before the coming into force of an environmental planning instrument which would, but for Division 4 of this Part, have the effect of prohibiting that use, and*
- (b) *the use of a building, work or land:*
 - (i) *for which development consent was granted before the commencement of a provision of an environmental planning instrument having the effect of prohibiting the use, and*
 - (ii) *that has been carried out, within one year after the date on which that provision commenced, in accordance with the terms of the consent and to such an extent as to ensure (apart from that provision) that the development consent would not lapse.*

Despite the provisions of section 107(2) of the EP&A Act, section 108 provides that the regulations may make provisions for existing uses and in particular, for the enlargement or expansion or intensification of an existing use.

The *Environmental Planning and Assessment Regulation 2000* (the Regulations) contains provisions in relation to existing uses. Clause 41 of the Regulations provides that an existing use may be enlarged, expanded or intensified. Where an existing use is proposed to be enlarged, expanded or intensified, development consent is required (Clause 42 of the Regulations).

Clause 42(2) provides that:

“The enlargement, expansion or intensification:

- (a) *must be for the existing use and for no other use, and*
- (b) *must be carried out only on the land on which the existing use was carried out immediately before the relevant date.*

The existing, lawful use was approved under DA77/2008. The LEP 2012 was gazetted in December 2012. Since this time, the existing use has not ceased to operate and has continued as approved.

The proposed development seeks to expand and intensify the existing, lawful use, which (as described in the DA documentation for DA77/2008) includes works that would *facilitate ongoing management of Eastern Star's [now Santos] petroleum exploration and production assets in the Narrabri region*, and include the fabrication, maintenance and repair of specialised petroleum production equipment.

The addition of cement bulk storage and blending plant and FTF will provide additional facilities to support the management of Santos' assets in the Narrabri region, specifically the fabrication, maintenance and repair of drilling fluids and dry cement products to service exploration activities.

The additional uses will be provided on the land of the existing use. While DA77/2008 relates to Lot 24 DP



NARRABRI SHIRE COUNCIL

Environmental Services Division:

☎ 67996855

Fax 67996888

Email council@narrabri.nsw.gov.au



INTER APPR APPLI

(Section 78A, Environmental

Assessed Fee: Receipt N

REGO No: 107106729		
FILE No: P99/03158		
Rec'd: - 8 OCT 2007		
Dept: COR		
Comments: Approved		
Action Officer	A/N	Init
NAW	A	
Filed:		
NARRABRI SHIRE COUNCIL		

TYPE OF APPROVAL	(Office Use Only)	(Office Use Only)
<input checked="" type="checkbox"/> Development Approval	Application Stamp Here	Date Stamp Here
<input type="checkbox"/> Construction Certificate		
<input type="checkbox"/> Local Approval		
Note: More than one (1) box can be ticked		

Part 1

Site and Applicant Details

1. Applicant's Name

If you represent a company, apply in the company's name. State your position under 'Title - Other'.

Title Mr ☐ Mrs ☐ Miss ☐ Ms ☐ Other MANAGER ENGINEERING
Surname or company name EASTERN STAR GAS LIMITED
Given names
Name of contact person TIM FREW

2. Your Postal Address

GPO Box 4526
SYDNEY
NSW.
Post Code 2001

3. Your Phone or Fax Number

Phone BH(02) 92515599 Mobile 0411 151 285
Phone AH() Fax 02 9251 2299

4. Location of the Proposed Development

Unit No ☐ House No ☐ Village/ Locality 73 Dump Rd.
Street YARRIE LAKE RD
Property/Building Name

5. Land Title Description

We need this to correctly identify the land.

Lot(s) 241 24. Section
Deposited Plan(s) 1036154
Parish COOMA Strata Plan


P99/03158.

77/2008

A/N. 1358.59700.1

Summary of Comments on DA77-2008-SN.pdf

Page: 1

 Number: 1 Author: Tony Subject: Sticky Note Date: 13/05/2017 7:37:31 AM
See page 8 (pdf p18) for the stated and eventually approved use of the Narrabri Town Operations Centre

DEVELOPMENT APPLICATION
PLAN No.

77/2008

NARRABRI SHIRE COUNCIL

6. Owners Name

(if not the applicant)

If represented by a company, apply in the company's name. State position under 'Title - Other'.

Title Mr ☐ Mrs ☐ Miss ☐ Ms ☐ Other ☐

Surname or company name NARRABRI SHIRE COUNCIL

Given names

Name of contact person BILL BIRCH

7. Owner's Consent to Lodge this Application

The owner's authorisation to lodge this application must be obtained if you are not the owner. This is a mandatory requirement of the Act.

Note: If the land is owned by a company, a company seal must be provided with at least one executive signature.

As owner of the above property, I/we consent to this application, and grant permission for Council officers to enter upon such property in order to determine this application and undertake any associated inspections.

Owner's Name: (Print) Narrabri Shire Council

Postal Address: M J Kershaw

General Manager

Wednesday 5th December, 2007.

Date: / /

Owner's Signature: [Signature]

8. Applicant's Declaration

Before signing, make sure you have addressed and completed all applicable questions on this form.

I apply for approval to carry out the development described in this application. I also understand that:

- This application authorises Council officers to enter upon the subject land for the purpose of assessing and determining the application, and to perform associated and subsequent inspections.
- I am liable to pay for or rectify any damage caused to public roads, drains or footpaths arising from construction works associated with the development.

Date: 28/9/07

Applicants Signature: [Signature]

Part 2

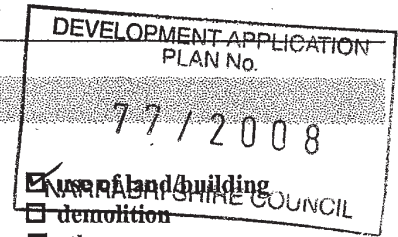
1. Development Proposal

Indicate the Type of development proposed.

Development Details

Tick the applicable box(s) below

- ☒ erection of a building
☐ subdivision
☐ carrying out of work



- ☒ use of land/building
☐ demolition
☐ other

2. Does the Development require a BASIX certificate?

- ☒ No ☐ Yes - (BASIX certificate to be submitted with development application)

"BASIX Certificate" The Building Sustainability Index (BASIX) is a web-based planning tool designed to assess the potential performance of residential buildings against a range of sustainability indices.

A BASIX Certificate identifies the sustainability features required to be incorporated in the building design. These features may include sustainable design elements such as recycled water, rainwater tanks, AAA-rated showerheads and taps, native landscaping, heat pump or solar water heaters, gas space heaters, roof eaves/awnings and wall/ceiling insulation.

You need a BASIX Certificate in the Narrabri Shire when BASIX applies to the type of development for which you require approval. Commencement dates and details of types of development are at www.basix.nsw.gov.au.

The applicant is required to submit the BASIX Certificate with the Development Application or Complying Development Certificate application. The plans and specifications must also identify the BASIX commitments which will be checked by a professional building certifier during construction. Where submitted plans or specifications are inconsistent with the relevant BASIX Certificate, Council will require applicants to submit consistent applications before progressing the assessment process, either by amending plans / specifications or by submitting a new BASIX Certificate with commitments that match the rest of the application.

Applicants can generate the BASIX Certificate only on the NSW Department of Infrastructure, Planning and Natural Resources' BASIX website: www.basix.nsw.gov.au. For more information, phone DIPNR's BASIX Help Line on 1300 650 908.

3. Development Description

(eg dwelling, residential flat building, warehouse, retail store etc)

DEVELOPMENT OF AN OPERATIONS CENTRE
INCLUDING OFFICES, WORKSHOP AND
EXTERNAL STORAGE AREAS

4. Proposed Use

State the intended use of the land /building (eg warehousing of white goods, motor vehicle repairs etc)

OPERATIONS CENTRE FOR GAS EXPLORATION
COMPANY INCLUDING:- OFFICE ACCOMMODATION,
WORKSHOP/WAREHOUSE, CHEMICAL STORAGE
EXTERNAL STORAGE, AND PARKING.

Refer plan in Statement of
Environmental Effects.

5. Is this application for Integrated Development?

Nominate the additional approvals to be obtained from the administering approval bodies.

NOTE: an application for Integrated Development must include:

- sufficient information to permit the approval body to assess the application;
- an additional fee of \$250 is applicable for each approval body - Council requires a separate cheque to be made out to these bodies;
- additional copies of plans as determined by Council.
- payment of minimum \$150.00 Advertising Fee

☒ No

☐ Yes - Tick the appropriate box(es) below

Fisheries Management Act 1994

☐ s144

☐ s 201

☐ s 205

Heritage Act 1977

☐ s 58

Mine Subsidence Compensation Act 1961

☐ s 15

National Parks and Wildlife Act 1974

☐ s 90

Pollution Control Act 1970

☐ s 17A

☐ s 17C

☐ s 17D

☐ 17I

Rivers and Foreshores Improvement Act 1948

☐ Part 3A

Roads Act 1993

☐ s 138

Waste Minimisation and Management Act 1995

☐ s 44

Water Act 1912

☐ s 10

☐ s 13A

☐ s 18F

☐ s 20B

☐ s 20CA

☐ s 20L

☐ s 116

☐ Part 8

6. Type Of Consent?
(If applicable)

N/A.

☐ Staged Development

☐ Deferred Development

7. Long Service Levy

(0.2% of estimated value > \$25,000)

☒ No

☐ Yes - (Long Service Levy Payment Form to be submitted with payment)

8. What is the Estimated Cost of Development?

Estimated Cost/Value:

\$ 700,000

9. Your Environmental Statement

Tick only one (1) of the boxes to indicate the environmental statement which is applicable to the proposed development.

- ☐ an Environmental Impact Statement (EIS) is attached (For Designated Development);
- ☒ a Statement on Environmental Effects (SEE) is attached (For other Development); or
- ☐ a Species Impact Statement (SIS) is attached (For threatened species, habitats, etc); or
- ☐ the proposed development is considered to have negligible effect.

DEVELOPMENT APPLICATION
PLAN No. 77/2008
NARRABRI SHIRE COUNCIL

	DEVELOPMENT APPLICATION PLAN No.
Part 3	Construction Details
	77 / 2008

1. Are you using a licensed builder?

To be completed only if the proposed building will be residential building work.

Yes ☐ Builder's Name

Address

Licence No. Phone (B)

Mobile Phone (H)

No ☐ If No, will the work be done as Owner-builder: Yes ☐ No ☐

Total Building Value:

\$

● Is a Builders Insurance Indemnity Certificate required?

An Insurance Indemnity Certificate must be obtained for any 'residential building work' performed by a licensed builder or contractor which exceeds a contract value of \$5,000.

Y

Yes

No

Certificate Number (if applicable):

2. What are the main materials to be used:

EXTERIOR WALLS

- | | | |
|--|---|---|
| <input type="checkbox"/> Single brick | <input type="checkbox"/> Brick veneer | <input type="checkbox"/> Full brick |
| <input type="checkbox"/> Weatherboard (timber) | <input type="checkbox"/> Concrete | <input type="checkbox"/> Curtain glass |
| <input type="checkbox"/> Weatherboard (cement fibre) | <input type="checkbox"/> Concrete block | |
| <input type="checkbox"/> Cement fibre sheeting | <input type="checkbox"/> AAC | <input type="checkbox"/> Steel |
| <input type="checkbox"/> Aluminium cladding | <input type="checkbox"/> Mud/adobe/pise | <input type="checkbox"/> Not Applicable |
| <input type="checkbox"/> Other: | | |

FLOOR

- | | | |
|--|---|--|
| <input type="checkbox"/> Timber | <input type="checkbox"/> Steel | <input type="checkbox"/> Concrete |
| <input type="checkbox"/> Timber subfloor | <input type="checkbox"/> Steel subfloor | <input type="checkbox"/> Natural earth |
| <input type="checkbox"/> Other: | | |

ROOF

- | | |
|---|---|
| <input type="checkbox"/> Precoloured metal sheeting | <input type="checkbox"/> Tile |
| <input type="checkbox"/> Zincalume/gal sheeting | <input type="checkbox"/> Slate |
| <input type="checkbox"/> Aluminium sheeting | <input type="checkbox"/> Cement fibre |
| <input type="checkbox"/> Fiberglass sheeting | <input type="checkbox"/> Plastic sheeting |
| <input type="checkbox"/> Concrete | <input type="checkbox"/> Shingles |
| <input type="checkbox"/> Other: | |

FRAME

- | | |
|--|----------------------------------|
| <input type="checkbox"/> Timber | <input type="checkbox"/> Steel |
| <input type="checkbox"/> Reinforced concrete | <input type="checkbox"/> Masonry |
| <input type="checkbox"/> Other: | |

3. Building Details

Gross Floor Area of existing building (m²): How many storeys will the building consist of?

Gross Floor Area of proposed addition/new building (m²): Does the site contain a dual occupancy?

Number of pre-existing dwellings: Number of dwellings to be demolished:

How many dwellings are proposed?

Indicate below the current and proposed uses of the building(s)/land

Part of Building/land	Existing Use	Proposed Use	BCA Class
.....			
.....			

Part 4

Local Approval Details

1. Are you also seeking an approval under the Local Government Act, 1993?

You can apply with this development application to seek an approval for any of the listed activities which require approval under Section 68 of the Local Government Act, 1993. Additional fees may be applicable.

NOTE: the plans, specifications & information required for Council to process and assess the relevant Activity (including that which is specified in the Regulations under the Local Government Act) must also be submitted with this application.

☐ No

☐ Yes - Tick the appropriate box(s) below ➤

(Part A – Building, Temporary Structures or Moveable Dwellings)

- ☐ Install a manufactured home, moveable dwelling or associated structure
- ☐ Install a temporary structure on land
- ☐ Use a building or temporary structure as a Place of Public Entertainment

(Part B – Water Supply, Sewerage & Stormwater Drainage Work)

- ☐ Carry out water plumbing work
- ☐ Draw water or sell water from a Council water supply standpipe
- ☐ Install, alter, disconnect or remove a meter connected to a service pipe
- ☐ Carry out sewerage work
- ☐ Carry out stormwater drainage work
- ☐ Connect a private drain or sewer with a public drain or sewer of Council

(Part C – Management of Waste)

- ☐ For fee or reward, transport waste over or under a public place
- ☐ Place waste in public place
- ☐ Place a waste storage container in a public place
- ☐ Dispose of waste into Council's sewer
- ☐ Install, construct or alter a waste treatment device

(Part D – Community Land)

- ☐ Engage in Trade or Business
- ☐ Direct or procure entertainment to the public
- ☐ Construct temporary enclosure for purpose of entertainment
- ☐ For fee reward, play a musical instrument or sing
- ☐ Set up, operate or use a loudspeaker or sound amplifying device
- ☐ Deliver a public address or hold a religious service or public meeting

(Part E – Public Roads)

- ☐ Swing/hoist goods over a public road by means of a lift, hoist or tackle
- ☐ Erect an advertising structure over a public road, or expose any article (whether for sale or otherwise) to overhang any part of the road or outside a shop window or doorway abutting the road, or hang an article beneath an awning over the road
- ☐ extend a balcony, awning, sunblind, canopy, or similar structure or an essential service pipe beyond a road alignment

(Part F – Other Activities)

- ☐ Operate a public car park
- ☐ Install a domestic oil or solid fuel heating device
- ☐ Operate a caravan park or camping ground
- ☐ Operate a manufactured home estate
- ☐ Install or operate amusement devices (*Construction Safety Act 1912*)
- ☐ Install or operate amusement devices in premises
- ☐ Approval to operate on-site sewerage waste management
- ☐ Operate an undertakers business
- ☐ Operate a mortuary
- ☐ Use a standing vehicle or any article for purpose of selling any article

Part 5**Checklist****● Have you provided:**

- 5 copies of the architectural/engineering plans (3 copies only for class 1 & 10)
 - 5 copies of the specifications (3 copies only for class 1 & 10)
- We cannot accept the application unless you provide the required number of copies.

Yes ☐

Office Use:

Plans: Specs: **● For Building works - Have you Attached:**

Yes

N/A

Office Use

- | | | | |
|---|--------------------------|--------------------------|--------------------------|
| • detailed architectural plans showing floor plans, elevations, site plan, sections, heights, levels | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • detailed specification describing the materials and manner of construction of the building | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • a basix certificate | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • geotechnical investigation/assessment report including site classification | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • engineering design drawings | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • details of the sewage management system if gravity sewer is not available | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • details of water supply and storage if Council's reticulated water supply is not available | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • stormwater drainage design details | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • soil and water management plan, including soil and erosion control works | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • plan of site levels/contours and proposed cut/fill | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • design details for wind bracing & uplift including design wind category | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • landscape design plan | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • design details for flood-resistant construction and floor levels | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • fire services design drawings and calculations | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • a list of existing & proposed <i>statutory fire safety measures</i> serving the building | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • a written Assessment of the need to fence the building site to prevent public access | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • interior design detail for food premises, hair/beauty salons | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • disabled toilet(s) design plan & elevations drawn to a scale of 1 in 20 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • evidence of any accredited component, process or design sought to be relied upon | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • where the application involves an Alternative Solution to meet a BCA performance requirement, is it accompanied by: | | | |
| - details of the performance requirements the Solution is intended to meet, and will affect | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| - details of the assessment and verification methods used to establish the Solution's compliance | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Notes For Completing Combined Application for Development Consent, Construction Certificate and Local Approvals.

Note 1 An application for local approvals under the Local Government Act 1993 must be accompanied by such matters as would be required under s81 of that Act, as well as the information and details prescribed under its Regulations (prescribed forms available at Council).

Note 2 An application for Integrated Development must include:

- a) sufficient information for the approval body to make an assessment of the application under their legislation;
- b) an additional fee (\$250) for each approval body - cheques must be made out in the name of that particular approval body, not in Council's name.
- c) additional copies of plans as determined by the consent authority.
- d) suitable mailing envelope and postage stamps.

Note 3 Plans or drawings describing the proposed development must indicate (where relevant):

- a) the location of proposed buildings or works (including extensions or additions to existing buildings or works) in relation to the land's boundaries and adjoining development;
- b) floor plans of proposed buildings showing layout, partitioning, room sizes and intended uses of each part of the building;
- c) elevations and sections showing proposed external finishes and heights;
- d) existing and proposed finished levels of the land in relation to buildings and roads;
- e) building perspectives, where necessary to illustrate the proposed building;
- f) proposed parking arrangements, entry and exit points for vehicles, and provision for movement of vehicles within the site (including dimensions where appropriate);
- g) proposed landscaping and treatment of the land (indicating the plant types and their height and maturity)
- h) proposed methods of draining the land;
- i) location of existing utility services and the extension/ provision of any new utility services necessary for the development;
- j) areas of environmentally sensitive land within and adjoining the proposed development;

Note 4 Where the development requires notification/advertising, an A4 plan of the building that indicates its height and external configuration, as erected, in relation to the site on which it is erected, is to be submitted.

Note 5 Other information must indicate (where relevant):

a) *in the case of shops, offices, commercial or industrial development:*

- details of hours and days of operation, including deliveries to the site
- plant and machinery to be installed
- type, size and quantity of goods to be made, stored or transported
- size, type and frequency of service and delivery vehicles intended to utilise the development
- loading and unloading facilities
- access for disabled persons
- types and quantities of waste to be generated by the development, and the manner of treatment, storage and disposal
- anticipated number of employees to be engaged, in both the short and long term

b) *in the case of a change of building use (except where the proposed change is to a class 1a or class 10 building) where no alterations or additions to the existing building are proposed:*

- a list of any fire safety measures in the building or on the land on which the building is situated in connection with the proposed change of building use, and
 - a separate list of such measures as are currently implemented in the building and on the land on which the building is situated.
- The list must describe the extent, capability and basis of design of each of the measures concerned.
- c) *in the case of development involving the erection of a building, work or demolition:*
- details of the methods securing the site during the course of construction

Note 6 Where a proposed development is not designated development, the application must be accompanied by a statement of environmental effects (SEE) unless the proposed development is considered to have a negligible effect (eg minor interior alterations) which must:

- demonstrate that the environmental impact of the development has been considered
- set out steps to be taken to protect the environment or to mitigate the harm.

Note 7 The Council may, within 21 days of receiving the development application, ask for additional information on the development if that information is necessary for the determination of the application or if that information is required by a concurrence authority.

The Council may, within 25 days after the lodgement of a development application for integrated development, ask for additional information concerning the development if the information is necessary for the determination of the application or if the information is required by an approving body.

Note 8 Under s80(10A) of the Environmental Planning and Assessment Act 1979 development consent cannot be granted until any long service levy payable under section 34 of the Building and Construction Industry Long Service Payments Act 1986 (or where such a levy is payable by instalments, the final instalment of the levy) has been paid.

Note 9 In the case of an application for a construction certificate for residential building work (within the meaning of the Home Building Act 1989) the following need to be supplied:

- in the case of work by a licensee under that Act:
 - the licensee's name and contractor licence number, and
 - documentary evidence that the licensee has complied with the applicable requirements of the Act - ie a certificate purporting to be issued by an approved insurer under Part 6 of the Home Building Act 1989 that the person is the holder of an insurance contract; or
- in the case of work done by any other person:
 - the person's name and owner-builder permit number, or
 - a declaration signed by the owner of the land, to the effect that the reasonable market cost of the labour and materials involved in the work is less than the amount prescribed for the purposes of that Act, currently being \$5,000.00 if work is to be carried out by a licensed builder, or \$3,000.00 if work is to be carried out by the owner.

Definition of Class 1 & 10 Buildings Under the BCA

Class	Definition
1a	A single dwelling being- (i) a detached house; or (ii) one of more attached dwellings, each being a building, separated by a fire-resisting wall, including a row house, terrace house, town house or villa unit, which is not located above or below another dwelling or another Class of building other than a private garage.
1b	A boarding house, guest house, hostel or the like with a total floor area not exceeding 300m ² and in which not more than 12 persons would ordinarily be resident.
10a	A non-habitable building being a private garage, carport, shed or the like.
10b	A non-habitable structure being a fence, mast, antenna, retaining or free-standing wall, swimming pool, or the like.

SIGNATURES AND SEALS ONLY.

Plan Drawing only to appear in this space

OFFICE USE ONLY

SURVEYORS	IPRACTICE	REGULATION 2001	CLAUSE 33
MARK	N.G.A. CO-ORDINATES	ZONE	CLASS
P.M.77620	763522.520	6644081.878	SS B
P.M.77621	763482.632	6644085.436	SS B
T.S.7155	765769.753	663953.801	SS 2A
SOURCE: SCMS SURVEY CONTROL SYDNEY DATE: 6-6-2003			
COMBINED SCALE FACTOR: 1.000423			

REFERENCE

A 254° 19'	1.03	G.I.PEPE FD
B 100° 33'	0.99	G.I.PEPE FD
C 20° 28'	0.8	G.I.PEPE FD
D 137° 05'	1.005	G.I.PEPE FD
E 144° 16'	0.64	G.I.PEPE FD
F 309° 33'	0.695	G.I.PEPE FD
G 26° 21'	0.63	G.I.PEPE FD
H 122° 37'	0.78	G.I.PEPE FD
I 89° 45'	1	G.I.PEPE FD
J 30° 48'	1.375	G.I.PEPE FD
K 308° 47'	1.2	G.I.PEPE

MARKS

D.P.1036154
BY HE
BY D.P.1036154
D.P.1036154
R21501-1603
BY HE
BY D.P.702892
D.P.1036154
BY HE
BY D.P.1036154
D.P.588798

DOCUMENT APPLICATION

Registered:
C.A. 77/2008

THE BATHURST COUNCIL

Purpose:

Ref. Map:

Last Plan:

PLAN OF SUBDIVISION OF
LOT 24 D.P.1036154.

Lengths are in metres. Reduction Ratio 1:5000

L.G.A.: NARRABRI SHIRE

Locality: NARRABRI WEST

Parish: COOMA

County: WHITE

This is sheet 1 of my plan in sheets
(Delete if inapplicable).

I, ROSS GLEESON,
of GLEESON SURVEYING, P.O. BOX 1, NARRABRI
a surveyor registered under the Surveyors Act 1920, certify that
the survey represented in this plan is accurate, has been made in
accordance with the Surveyors (Practical Regulations) 2001 and was
completed on 4-6-2007.

(Specify the land previously surveyed, or specify any land shown
the plan but is not the subject of the survey)

Signature: *[Signature]* Dated: 19/4/07
Surveyor registered under the Surveyors Act 1920

Return Line: X-Y
Type: Urban/Rural
of GLEESON SURVEYING, P.O. BOX 1, NARRABRI
R21501-1603 D.P.1036154
D.P.762892
586645
588798
832612
102825

Plans used in preparation of Survey/Completion
D.P.762892
586645
588798
832612
102825

PLAN FOR USE ONLY for statements of intention
to dedicate public roads, to create public reserves
drainage reserves, easements, restrictions on the
use of land or positive covenants.

Department of Land and Water Conservation Approval

I, *[Signature]*, in approving this plan certify
that all necessary approvals in regard to the execution of the land shown
herein have been given.

Signature: *[Signature]*
Date: *[Date]*
File Number: *[File Number]*
Office: *[Office]*

Council's Certificate

I certify that the provisions of s.108J of the Environmental Planning
and Assessment Act 1979 have been notified in relation to the
proposed

(Insert "subdivision" or "new road") set out herein

"Notified Person/General Manager/Controlled Officer"

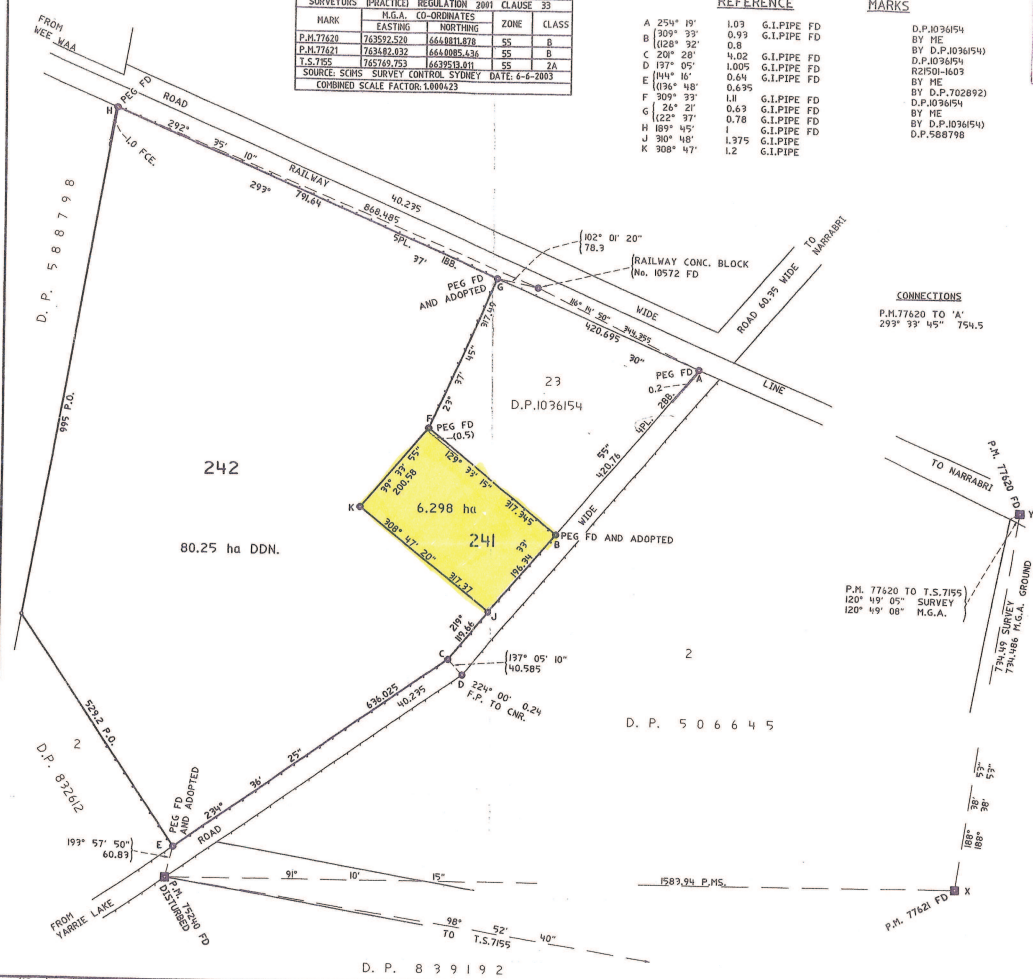
Consent Authority: *[Signature]*
Date of Endorsement: *[Date]*
Accreditation no.: *[Accreditation no.]*
Subdivision Certificate no.: *[Subdivision Certificate no.]*
File no.: *[File no.]*

Note:
When the plan is to be lodged electronically in the Land Titles
Office, it should include a signature in an electronic or digital format
approved by the Registrar-General.
This subdivision is inapplicable.

SURVEYOR'S REFERENCE: 7232

Fact. No. 1021 67923669

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION





Statement of Environmental Effects

To accompany the
Development Application
by Eastern Star Gas Limited
for
a new Operations Centre

Yarrie Lake Rd, West Narrabri



Proponent Contact Information and Declaration

Eastern Star Gas Ltd

Suite 1, Level 2

37 Pitt St

Sydney

NSW 2001

Location of lands referred to by SEE

This statement refers to the subdivision of Lot 24 DP 1036154 located on Yarrie Lake Road, West Narrabri adjacent to the Narrabri Tip Entrance. (See figures 1 & 2).

Declaration

Eastern Star Gas Ltd declares the information contained within this document an accurate representation of the proposed development activity, existing environment and the extent of impacts likely to occur. With the assistance of Government agencies and external contractors, Eastern Star has endeavoured to characterise the environment within which the project is located and, where possible, mitigate any potential environmental impacts and ongoing operational risks.

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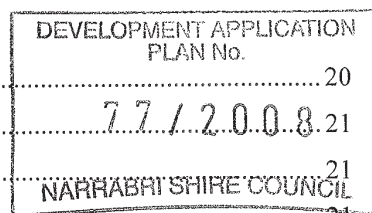
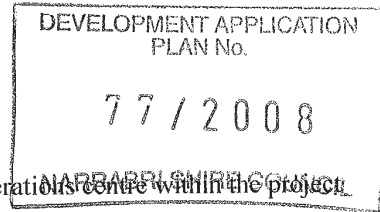


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1 INTRODUCTION

Eastern Star Gas Limited ("Eastern Star") proposes to develop a new operations centre within the project site. The centre will incorporate the following components:-

- An entrance/crossover from Yarrie Lake Rd into the site
- A workshop/ warehouse approximately 720 m2 in area (20m x 36m)
- Approximately 216 m2 of office accommodation attached to the workshop
- A sewage management facility (septic tank system)
- Parking
- Approximately 30,000 m2 external storage area
- Approximately 375 m2 chemical storage area – partly covered

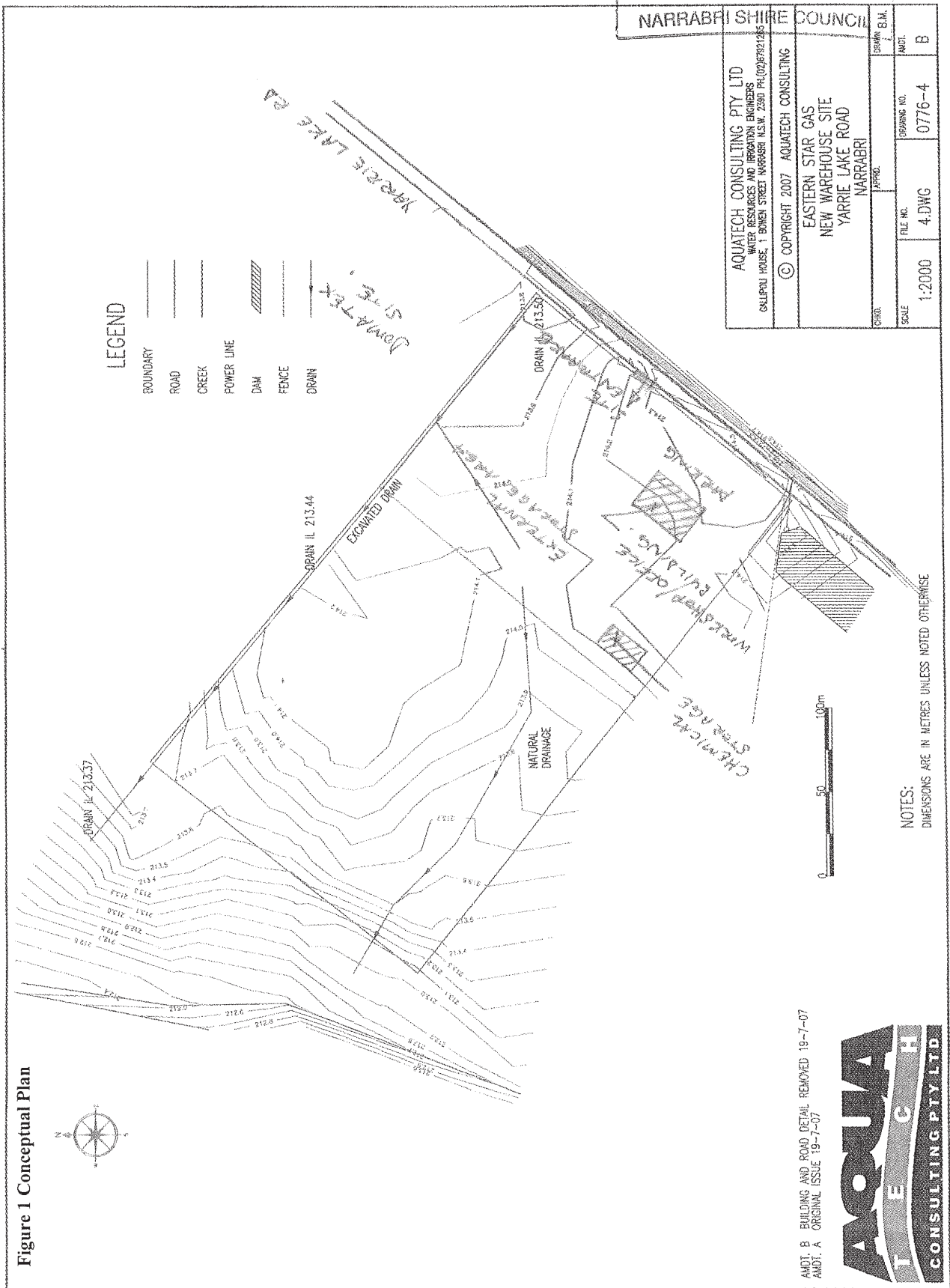
Eastern Star currently operates out of an operations centre on leased premises at 190 Culgoora Rd, The new development will assist in the expansion of Eastern Star's operations within the Narrabri Region. Upon completion of construction at the new site, the administrative, maintenance and storage operations at the current depot will be relocated to the new premises.

Figure 1 shows a conceptual plan of the development.

Development of the project would include:-

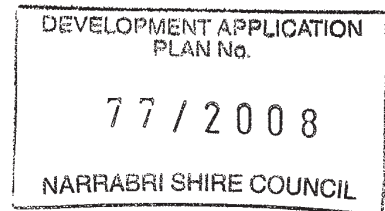
- Preparation of a levelled site with selective vegetation clearing and stripping of topsoils;
- Construction of a stable foundation pad upon which to base the development;
- Construction of reinforced concrete slabs for each of the workshop, the offices and the chemical storage facility; and
- Construction of the buildings and ancillary infrastructure as per submitted designs.

Figure 1 Conceptual Plan



AMDT. B BUILDING AND ROAD DETAIL REMOVED 19-7-07
AMDT. A ORIGINAL ISSUE 19-7-07





1.1 Project Site Location

The 6.298 hectare project site is located on Yarrie Lake Road, west Narrabri within an area zoned 1A (general rural) under the *Narrabri Local Environment Plan 1992*. The development is to occur within a subdivision of Lot 24/DP 1036154. The land is presently owned by the Narrabri Shire Council and is leased to Eastern Star. However, Eastern Star exercised its option to buy the site on 12 June 2007 and understands from the Council's lawyers, H.J. Palmer & Co, that the purchase will proceed as soon as the plan of subdivision is registered and Council provides a zoning certificate.

The surrounding area combines residential, rural and industrial sites on the fringes of the more densely inhabited areas of west Narrabri.

1.2 Previous and Current Land Use

The proposed development site is undeveloped and partially covered in vegetation.

ESG has no information that confirms any specific previous land use on this site. There is visible evidence of ongoing grazing by stock across the 6.298 ha subdivision and area up to the Narrabri Waste Depot. This would appear to constitute the current land use.

The development site is next to the Domatex cotton processing facility (not currently operating), the Narrabri Waste Depot and is in close proximity to the Corglen Grain Storage and Transport Depot. Other small holdings such as Bohena Olives are located nearby and larger scale cropping and grazing enterprises become more frequent to the west along Yarrie Lake Rd..

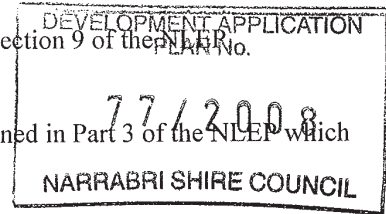
1.3 Development Standards

The proposed development of an operations centre at this location must comply with a range of local and State planning instruments.

1.3.1 Narrabri Local Environment Plan

The development site is located within the Narrabri Local Government Area and is therefore subject to the provisions of the Narrabri Local Environment Plan 1992 (NLEP). The site is located within an area designated Zone 1a (General Rural) in which development of this type is permitted with appropriate consent of the Narrabri Shire Council.

The proposed development is subject to the Objectives of Zone outlined in section 9 of the NLEP.



The proposed development is additionally subject to special provisions outlined in Part 3 of the NLEP which include (but are not limited to):

- Section 20 – Development along arterial roads
- Section 21 – Height of buildings
- Section 22 – Land subject to bushfire hazard
- Section 24 – Roads, drainage, recreation areas and parking
- Section 30 - Access
- Section 33 - Services

1.3.2 Narrabri Development Control Plans

The proposed development cannot be considered “exempt development” or “complying development” as defined by the Narrabri Development Control Plans.

1.3.3 NSW Environmental Planning and Assessment Act 1979

The proposed development will be subject to a development application and consent as defined in section 4 of the *Environmental Planning and Assessment Act 1979*. The Narrabri Shire Council is the consent authority.

2 PROPOSED ACTIVITIES

The proposed development will facilitate ongoing management of Eastern Star’s petroleum exploration and production assets in the Narrabri region. Modest quantities of materials required to conduct Eastern Star’s activities will be stored and maintained at the development.

Activities to be carried out on site include materials storage (externally and within the workshop/warehouse and the chemical storage area), fabrication, maintenance and repair of specialised petroleum production equipment (within the workshop/warehouse), and administration and management of the entire Eastern Star operation in the region (from the office accommodation).



2.1 Hours of Operation

The proposed development will be operational from Monday to Saturday and between the hours of 7:00am and 6pm. Incidental use of the depot outside of these times may occur during periods of particular activity such as drilling.



Number: 1

Author: Tony

Subject: Sticky Note

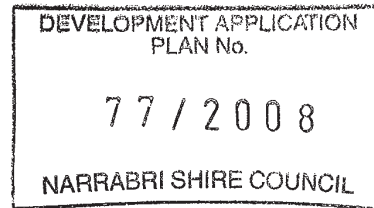
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This is the clause with the Eastern Star Application which lays out the Proposed Activities at the Narrabri town depot.

Fabrication is the closest the proposed activities comes to manufacturing but it does not quite make it. Also "fabricating" was to be done within the workshop/ware house not out in the open as the drill fluid filtration plants will be, along with any station to ADD chemical to manufacture a new drill fluid or treated existing drill fluid.

This condition carries over into DA769/2013. and that DA's approval.

As Santos is bound by DA 769/2013 and does not want to go back to Narrabri Shire Council to obtain approval for manufacturing, they are using the SEPP to do the job for them



2.2 Employment

Eastern Star currently employs a total of 24 people. 9 of these people who are residents of the Narrabri Shire and are employed in Narrabri, will work out of the new operations centre..

Expansion of Eastern Star operations within the region is likely to require the employment of further technical, field operations and administrative staff over the next 2 year period. It is anticipated the number of Eastern Star employees permanently based within the Narrabri Region will double within that period.

2.3 Equipment and Inventory

The operation of the development site in support Eastern Star's gas exploration, development and production activities in the Narrabri region requires a considerable inventory of equipment and materials to be held in storage. Stocks of steel drilling pipes, drilling mud additives and incidental hardware fittings and equipment currently held at the Culgoora Road yard will be sorted and transferred to the new operations centre upon its completion.

2.3.1 Chemical Storage

The following chemicals which are commonly used in Eastern Star's drilling operations and which are classified as hazardous goods will be stored within the chemical storage area at the new operations centre:-

- Aus Gel
- BC-140
- Cat-3 Activator
- Barytes
- Gum Guar
- Potassium Chloride
- GBW
- Penatrol
- Aqua Clear
- Barroid
- Hydrated Lime
- Soda Ash
- Super Foam
- AMC Biocide
- Wildcat
- AMC Defoamer

Caustic Soda (granulated)



In addition, the following liquids which are classified as dangerous substances will be stored:

Hydrochloric Acid

Caustic Soda

The chemical storage facility proposed for the new centre will be designed in accordance with appropriate NSW Occupational Health and Safety legislation and regulations and will be subject to approval by Council prior to construction.

2.4 Services and Amenities

The proposed development will have access to town water supply, three phase power supplied by Country Energy and Telstra communication services. Applications will be made for connection of these services in accordance with normal procedures.

Included in the proposed office accommodation area are offices, conference room, file storage space, a lunch room and ablutions facilities which will discharge to a septic system.

2.5 Transportation

Upon commencement of operations at the new centre, the work force will commute to and from the site via private and company vehicles.

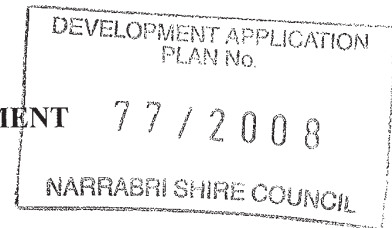
Total vehicular movements have been estimated at less than 30 per day during the most active periods during construction and fewer than 15 per day during the normal operations once the centre is complete. The majority of vehicular movements will occur between the hours of 8am-10am and 4pm and 6pm Monday to Friday.

2.6 Waste Management

Wastes generated during the construction phase will be collected and disposed of at the Narrabri waste depot adjacent to the site.

The small quantities of general wastes generated during day to day operations, including putrescible and recyclable wastes, will be collected and disposed of by a commercial waste removal contracting service.

3 THE EXISTING ENVIRONMENT AND IMPACT ASSESSMENT



3.1 Site Characteristics

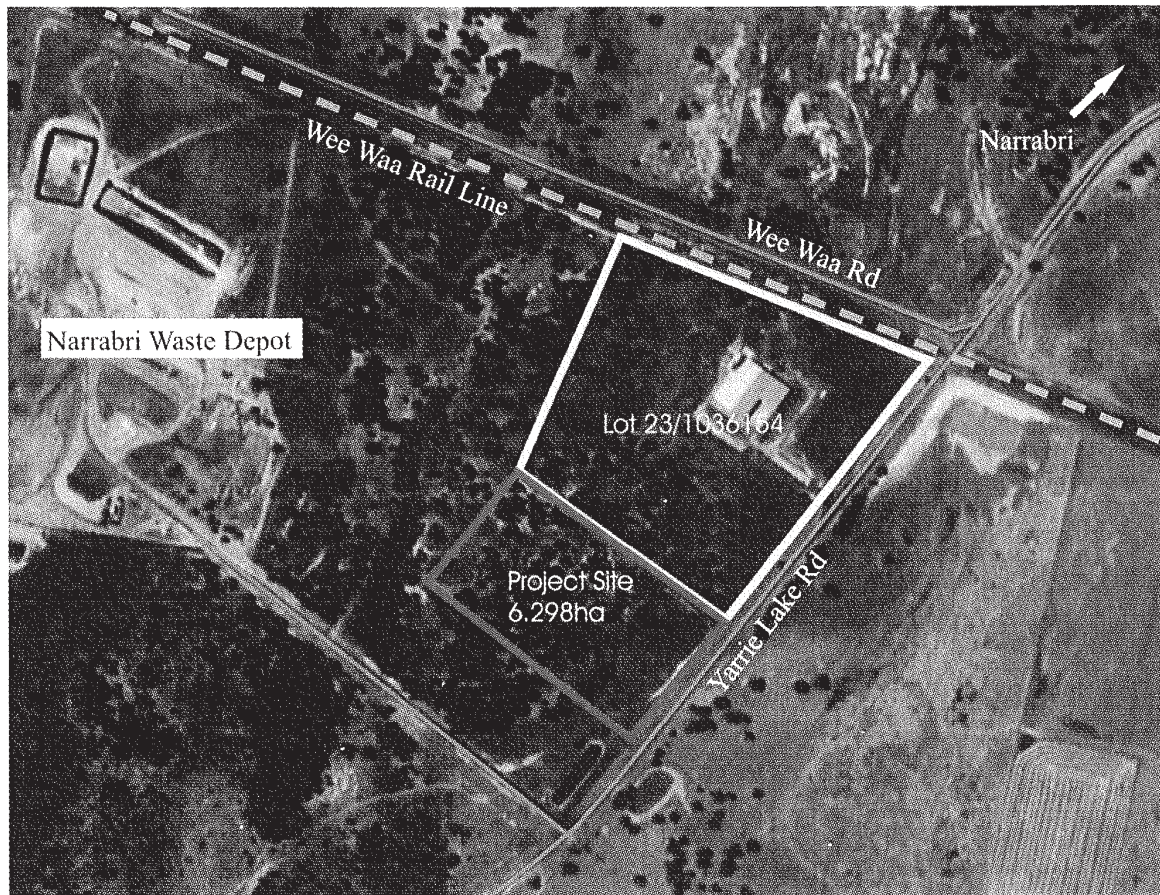


Figure 2 Aerial view of the project site and subdivision

3.2 Site Drainage and Hydrology

Eastern Star has commissioned Aquatech Consulting Pty Ltd to report on site drainage and hydrological characteristics that may impact on the proposed development. The initial survey is shown below at Figure 3. The survey shows that the proposed location of the development is generally on the highest ground level of the site with natural drainage available to the North West. The compacted development base will be raised slightly during construction which will facilitate drainage. It is also proposed to excavate a drain along the North Eastern boundary of the site which will discharge to the North Eastern corner of the site to allow drain water to naturally flow away to the North East beyond the site.

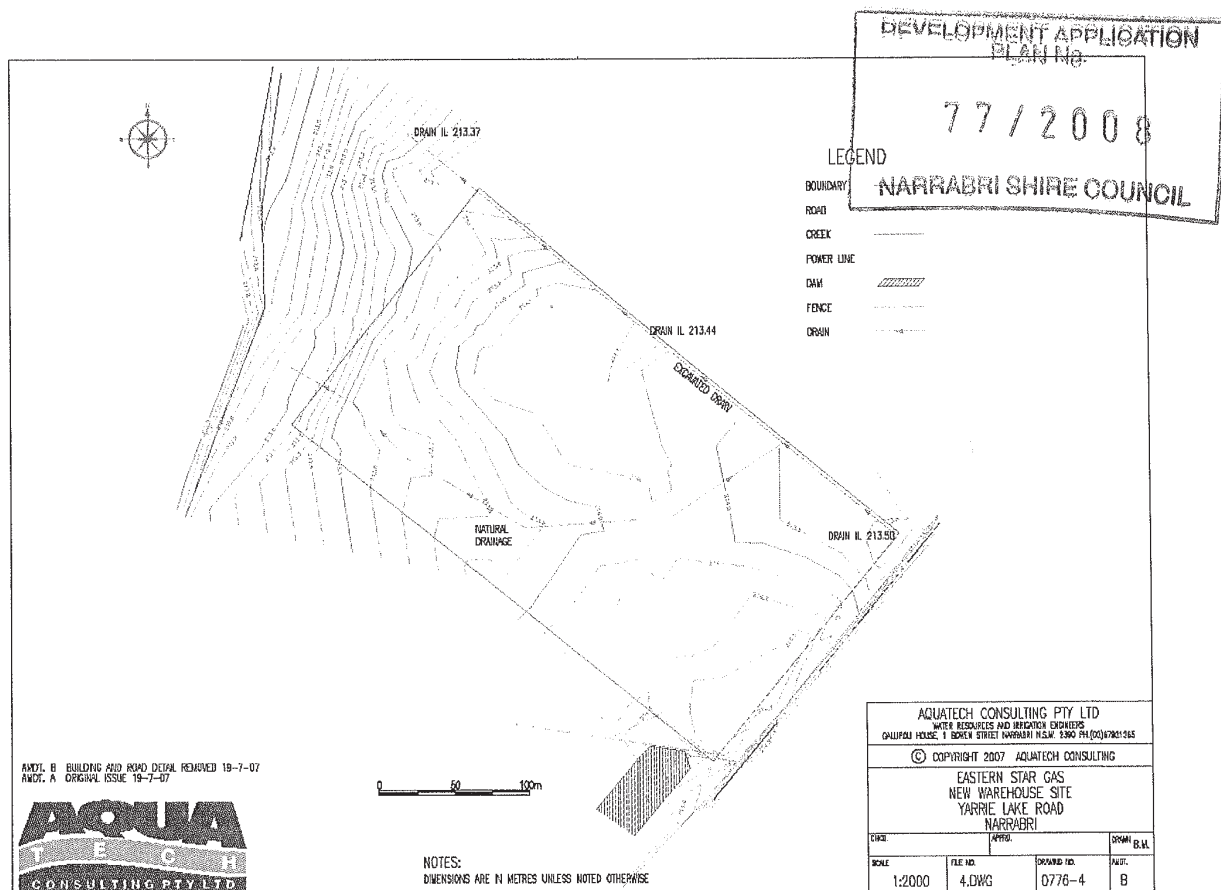
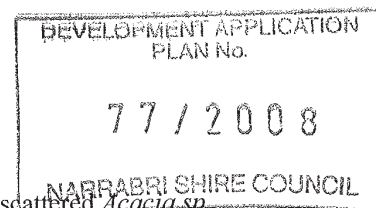


Figure 3 Site hydrology diagram indicating natural drainage

3.3 Flora

A preliminary site survey confirms the proposed development site is sparsely vegetated with grasses, shrubs and some larger trees. Photos 1 to 3 at Appendix A show the extent of the vegetative cover at various locations within the site and its quality in terms of diversity and percentage cover.

Recent rainfall in the Narrabri Region seems to have had little impact in terms of increasing the coverage of sub storey and groundcover vegetation although it is apparent that heavy grazing by stock on the site has impacted significantly on the density of grasses and forb regrowth to be expected after rainfall. The grazing regime is very likely to have also contributed to the lack of diversity observed with few species making up the majority of vegetation coverage.



3.3.1 Species Composition

The development site is dominated by White Cypress *Callitris glucophylla* with scattered *Acacia sp.* possibly Green Wattle *A. deanei*, Rough Barked Apple *Angophora floribunda* and various grass species that are generally unidentifiable due to constant grazing. A small incidental infestation of Spiny Burr *Cencherus sp.* is also apparent that has undergone physical and chemical eradication.

The distribution of these species across the site shows an apparent relationship to the variable soil types and drainage regime recorded during preliminary site inspections.

Stands of White Cypress dominate the sandier soils on the central high ground and northern edge. *Acacia sp.* dominates the more clay based soils in the central area and *Eucalyptus sp.* occurs more commonly towards the western edge on the margin of the drainage feature situated between the project site and the Narrabri Waste Depot (see Figure 3)

3.3.2 Threatened Species

Consultation with the NPWS Threatened Species database indicates 34 individual records of five threatened flora species across the Narrabri 1:50 000 topographic map sheet. The species recorded include:

- Spiny Peppercress *Lepidium aschersonii*
- Coolibah *Bertya sp. A Cobar-Coolabah*
- Ooline *Cadellia pentastylis*
- Slender Darling Pea *Swainsona murrayana*
- Bluegrass *Dichanthium setosum*

Flora surveying completed in 2001 for the Coonarah Gas Project (see Corkery, 2002) indicates that no threatened species were observed on the site.

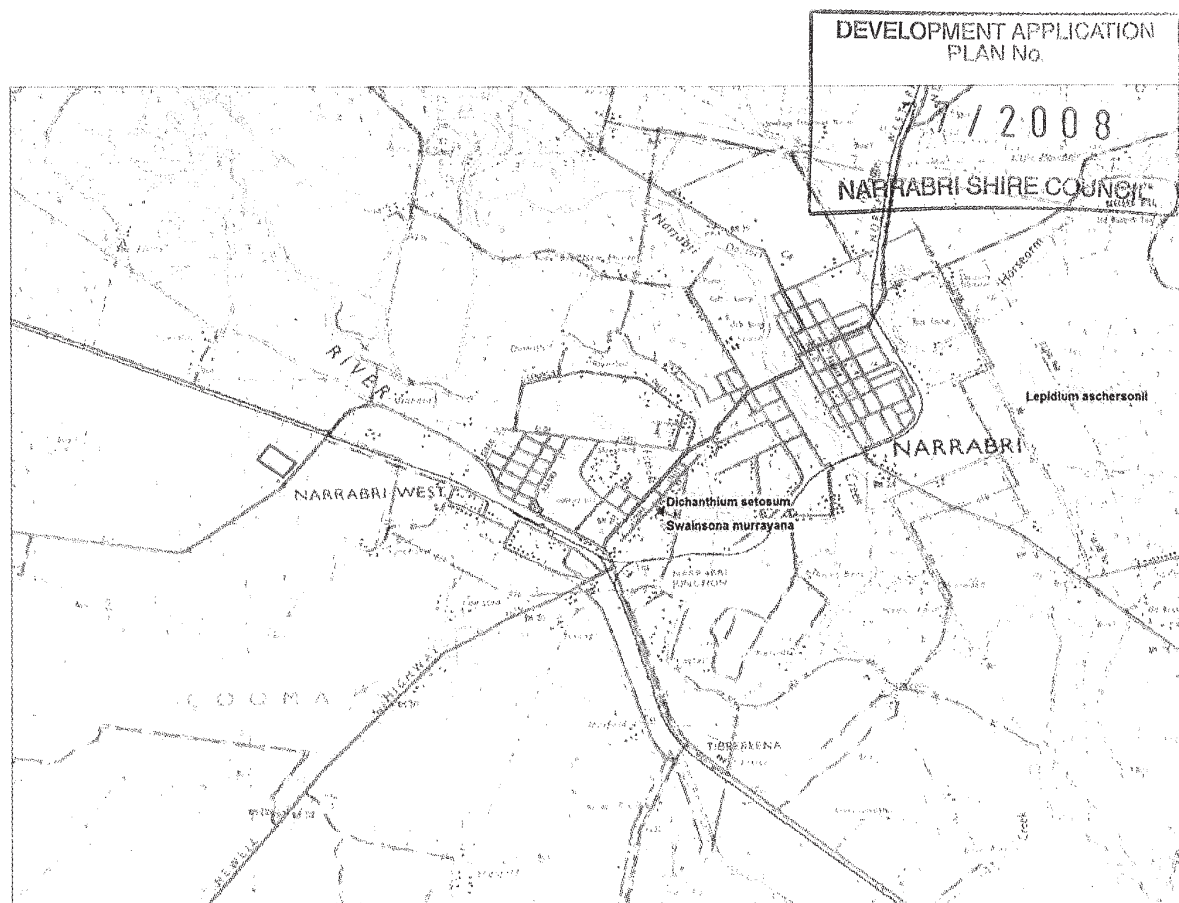


Figure 4 Threatened flora records in proximity to the development site

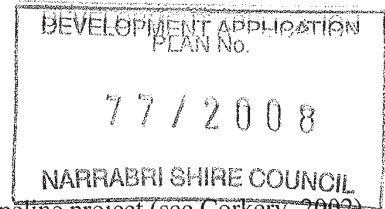
3.3.3 Impact Assessment

Removal and/or modification of approximately 3ha of vegetation will be required for the development of the site. The extent of impacts associated with the proposed development at this location has been reasonably characterised and suggests the likelihood that the proposed activity will have a significant impact on a threatened species is negligible.

Based upon the available data from NPWS databases, the likelihood that the proposed activity will impact on a species of significance is negligible. Generally speaking, the threatened species observed in the surrounding region are found in previously undisturbed and remnant pockets of native vegetation. The project site is considered moderately to highly disturbed in terms of its vegetation composition and density as a result of ongoing grazing of re-emergent understorey shrubs, grasses and forbs. This has effectively sterilised the regeneration potential of the vegetation and reduced the risk of impacting on an unidentified individual or community assemblage of threatened flora.

The clearance of vegetation for the proposed development is unlikely to pose any significant risk to any threatened species nor result in the further fragmentation of vegetation remnants such that the life cycle of a species is placed at further risk.

3.4 Fauna



The completion of fauna surveying in preparation for the Coonarah Gas Pipeline project (see Corkery, 2002) identified 42 species of bird, 12 species of mammals and one reptile species along the entire project site from the Coonarah Gas Field to the proposed development site.

During this survey, no specific observations of fauna species were made at the current development site although the report suggests that faunal community at this location is likely to consist of those species observed during the field survey.

3.4.1 Threatened Species

Consultation with the NPWS Threatened Species database indicates 254 individual records of 28 threatened fauna species across the Narrabri 1:50 000 topographic map sheet. The species recorded include:

- Five-clawed Worm-skink
- Pale-headed Snake
- Australian Brush-turkey
- Magpie Goose
- Freckled Duck
- Black-necked Stork
- Black-breasted Buzzard
- Brolga
- Red-tailed Black-Cockatoo
- Glossy Black-Cockatoo
- Turquoise Parrot
- Superb Parrot
- Barking Owl
- Grass Owl
- Masked Owl
- Brown Treecreeper
- Speckled Warbler
- Painted Honeyeater
- Hooded Robin
- Grey Crowned Babbler
- Koala
- Squirrel Glider
- Black-striped Wallaby
- Eastern Hare-Wallaby
- Yellow-bellied Sheath-tail-bat
- Large-eared Pied Bat
- Eastern Long-eared Bat

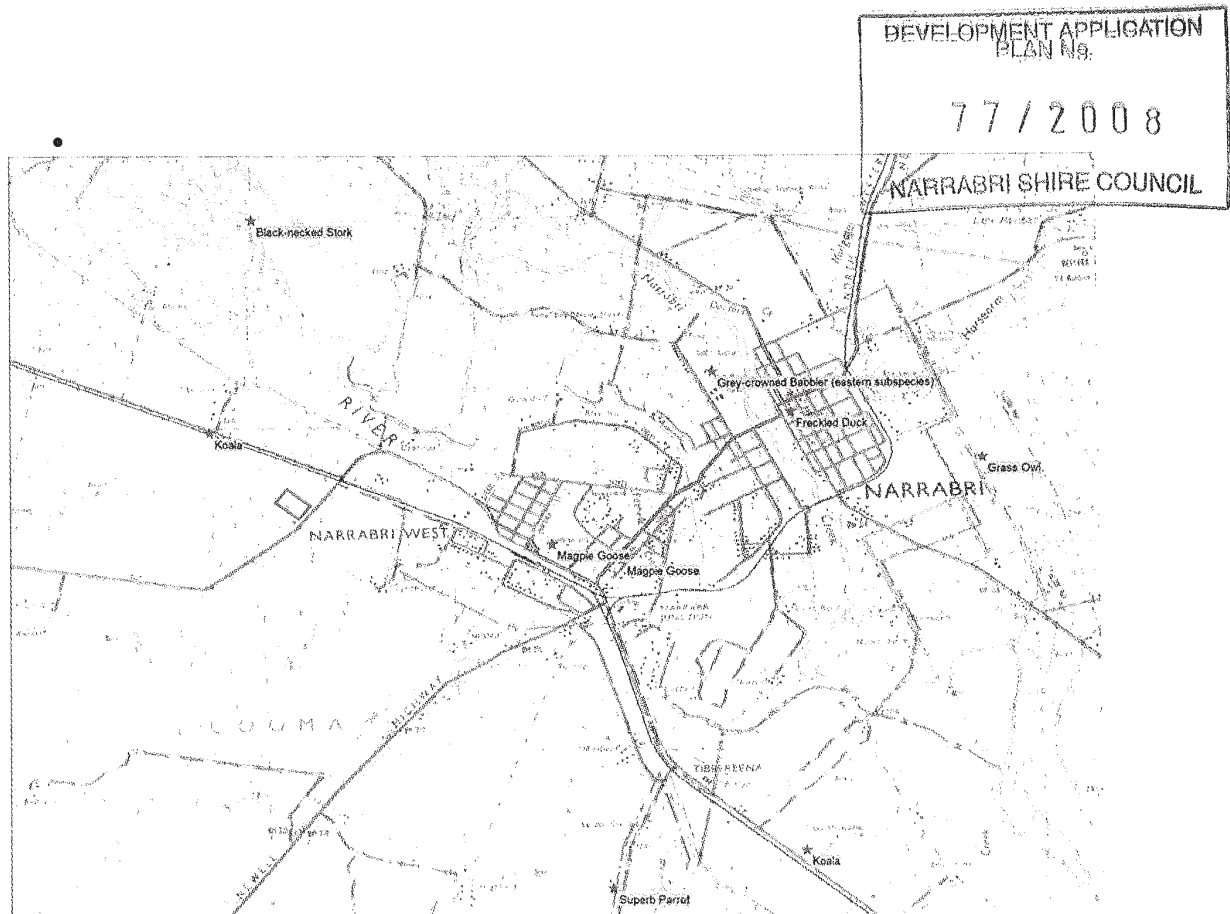


Figure 5 Threatened fauna records in proximity to the development site

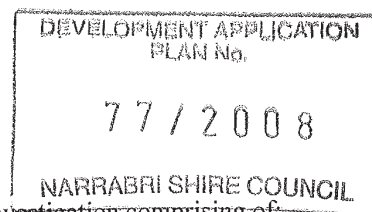
3.4.2 Impact Assessment

The quality of potential habitat within the development site plays a significant role in providing suitable nocturnal/diurnal refuge for fauna. As discussed in section 5.2, the site exhibits characteristics of a moderate to high disturbance regime with sparse to light stands of vegetation of limited diversity. The low diversity and poor quality of the habitat *in situ* and the surrounding land uses limits significantly the likelihood of ongoing inhabitation of this site by species of significance.

Removal and/or modification of approximately 3ha of vegetation will be required to for the development of the site. The extent of impacts associated with the proposed development at this location has been reasonably characterised and suggests the likelihood that the proposed activity will have a significant impact on a threatened species is negligible.

Based upon the available data from NPWS databases, the likelihood that the proposed activity will impact on a species of significance is very low due to their motility (i.e. avian and chiropteran species) and inhabitation of a sufficiently large home range. The clearance of the site for the proposed development is unlikely to pose any significant risk to the incidental inhabitation of the area by a threatened species nor result in the fragmentation of habitat such that a the life cycle of a species is placed at risk.

3.5 Aboriginal Heritage



The proposed development site has undergone an Aboriginal heritage investigation comprising of:

- An examination of the Aboriginal Heritage Information Management System (AHIMS) site register managed by NSW National Parks and Wildlife Services;
- Liaison and discussion of the proposal with representatives of the Narrabri Local Aboriginal Land Council (NLALC); and
- A cultural heritage survey completed with representatives of the NLALC.

3.5.1 AHIMS Database Search

Consultation with the NPWS AHIMS database indicates 15 sites of Aboriginal heritage significance have been recorded across the Narrabri 1:50 000 map sheet (see figure 5 below).

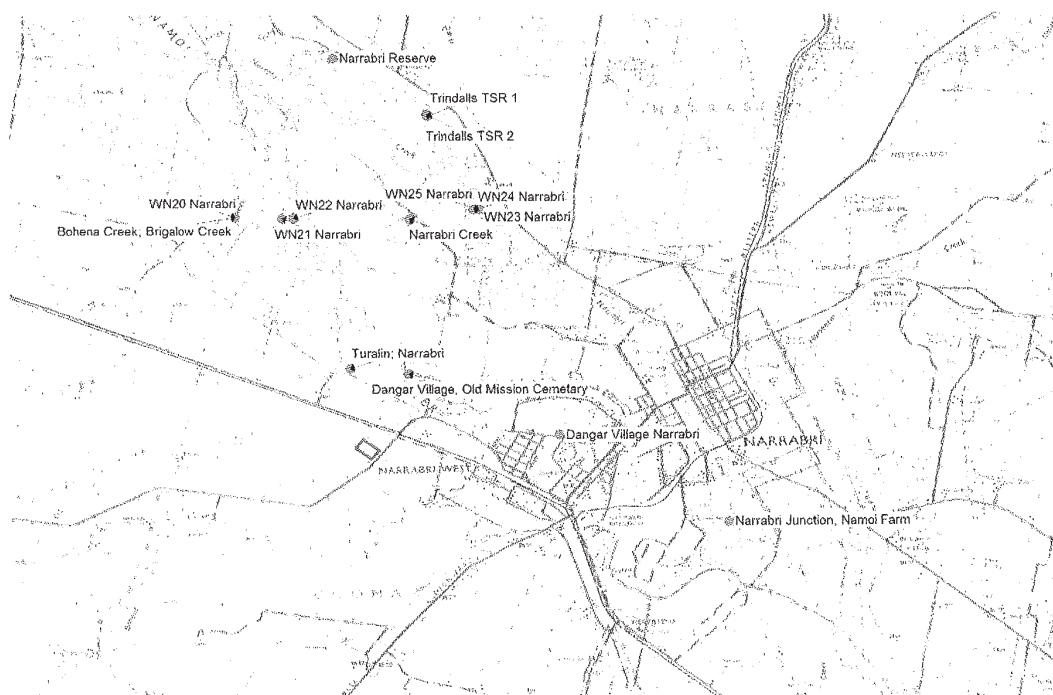
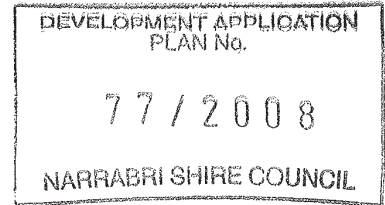


Figure 5 Sites of Aboriginal heritage significance in proximity to the development site

3.5.2 Cultural Heritage Survey

A survey of the development site has been previously completed by Mr Edward Trindall, cultural heritage advisor to the NLALC, in preparation for the Statement of environmental Effects submitted to Council for Eastern Star's Coonarah Gas Field Development (see Corkery, 2002).

No sites or items of Cultural Heritage Significance were located within the development site.



3.6 Noise

The ambient background noise in the vicinity of the development site is influenced by a range of rural and industrial activities including vehicular transport traffic, railway operations, farming activities and continuing operations at the Narrabri Waste Depot.

The nearest point receptor (residence) is located 850m to the north east of the development site.

The proposed development activity will result in a short term increase in noise during the construction period. During this period, the activities will be limited to the hours of 7am and 4pm Monday to Friday and 7am and 1pm Saturdays.

3.6.1 Development Noise Contributions

Increase in background noise levels in the area surrounding the development site would increase during the early phase of construction as earth moving machinery is employed to clear, level and compact the base for construction of the proposed operations centre.

During the operation of the centre, the principal noise sources would be vehicular transport entering and exiting the site and vehicles and equipment moving within the site itself. There are no other point sources of noise planned to operate from the site.

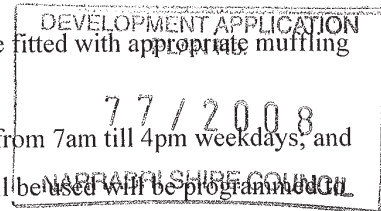
3.6.2 Impact Assessment

The criteria for assessing the impact of construction and operation of the proposed development is based upon NSW Industrial Noise Policy guidelines on intrusiveness where noise levels attributed to the development should not be greater than 5 dB(A) above the Rating Background Levels (RBL) for the surrounding environment. The RBL for the rural environment is 30 dB(A) at the nearest point receptor. However, this may be insufficient to account for the impacts attributable to industrial activities at the Waste Depot, vehicular traffic on Yarrie Lake Rd and the operation of the Walgett Branch Railway line some 400 m to the north of the site.

No specific noise monitoring program has been carried out due to the cumulative interference of other noise sources in the area.

As the nearest point receptor is approximately 850m north east of the site, the attenuation of construction related noise over that distance will be considerable. To mitigate increased noise which may be generated by the proposed development, the following noise minimisation strategies have been proposed:

- All machinery utilised in the construction phase of the project to be fitted with appropriate muffling apparatus;
- All construction activity to be limited to daylight hours, generally from 7am till 4pm weekdays, and
- The early construction phase in which earth moving machinery will be used will be programmed to be completed in the shortest possible time.



The increases in point source noise generation is unlikely to cause any significant noise related impacts on receptors surrounding the development site.

3.7 Air Quality

The air quality in the vicinity of the development site is typical of the rural/industrial environment and is influenced by a range of activities including:

- Light and heavy transport vehicle exhaust emissions;
- Dusts generated from vehicle movements on partially sealed roads; and
- Dusts and odours generated by operations at the Narrabri Waste Depot.

3.7.1 Development Activities and Potential Air Contaminants

The proposed development of the site is likely to increase the emissions of fugitive dusts and exhausts into the localised environment, principally from:-

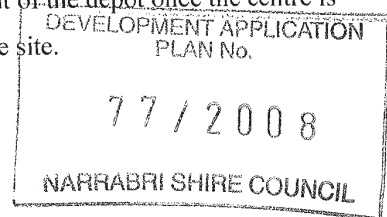
- The clearance and modification of vegetation;
- Stripping, stockpiling and removal of top soils; and
- Increased vehicular movements during the construction period.

Once the proposed development is operational, the extent of emissions would be limited to those generated by vehicles accessing the site during business hours.

3.7.2 Impact Assessment

The generation of particulate and gaseous emissions during the construction phases represents the largest single issue influencing air quality at the site. The increased levels of fugitive dusts during vegetation clearance and site preparation coupled with exhaust emissions from heavy machinery are short term in nature and have no long term implications for air quality in the localised area.

The small increases in vehicular traffic along Yarrie Lake Rd and into and out of the depot once the centre is operational is unlikely to significantly impact on the ambient air quality at the site.



3.8 Visual Amenity

As the proposed development is considered compatible with the surrounding land use, the completed operations centre would result in minimal visual intrusion on the surrounding area.

The proposed design of the workshop/warehouse is illustrated at Appendix B. The proposed construction materials are steel cladding over a steel frame. The overall height of the building will be 7.7m, which in terms of similar buildings such as the next door building at Domatex is reasonable and poses little risk of a negative visual impact on the area.

The plan for development also includes retention of existing vegetation across the site behind the actual footprint of the facility and a minimum 5m buffer surrounding all operational areas. This retained vegetation will serve to soften the visual impact of the proposal as well as providing a visual and acoustic buffer between the site and the Narrabri Waste Depot.

3.9 Fire Management

The proposed development will possess all requisite fire detection and suppression equipment for all types of fire sources contained within the site (chemical and electrical). The final installation will be in accordance with a report to be obtained from a recognised fire protection consultant. Details of the proposed installation will be submitted to Council for approval.

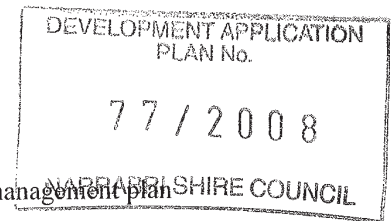
A minimum 5m vegetation free zone is to be included around the entire facility to mitigate the risk of bushfire.

3.10 Access and Traffic Management

The proposed development site fronts Yarrie Lake Rd which is approved for road train haulage. The 7m road at this point is sealed with grass and gravel shoulders and is in generally good condition with some deterioration of the sealed margins.

Sight distances at about the proposed access point is approximately 450m to the south west and in excess of 700m to the north east. The entrance to the Narrabri Waste Depot is approximately 200m south west of the proposed site entrance.

3.10.1 Proposed Management Safeguards



For the duration of the construction period, the site will be subject to a traffic management plan commensurate with the scale of the development and the expected traffic volumes. This would entail signage an appropriate distance from the entrance point and the employment of traffic controllers during the arrival and departure of oversized vehicles.

3.10.2 Impact Assessment

The implementation of the proposed traffic management plans and the relatively small increases in traffic during the construction phase is considered sufficient to mitigate any adverse impacts on the local road network and other road users.

4 CONCLUSIONS

The proposed project site is considered suitable for the development of the Eastern Star's new operations centre.

The land zoning and surrounding land use is compatible with the development of industrial operations and is adequately serviced by local infrastructure such that no major modifications or additions to local services will be required.

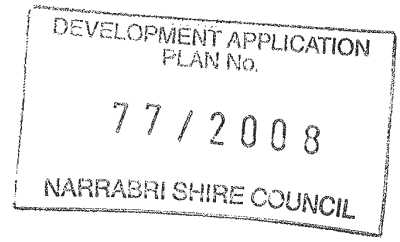
The site has been assessed and surveyed in terms of hydrology and geotechnical characteristics with no major impediments having been identified which might limit its suitability for the development and for ongoing operational activities.

The proposal will not impact on any threatened flora or fauna species nor any site or items of aboriginal heritage significance.

5 APPENDIX A – SITE PHOTOGRAPHS



Photo 1 The project site from Yarrie Lake Rd



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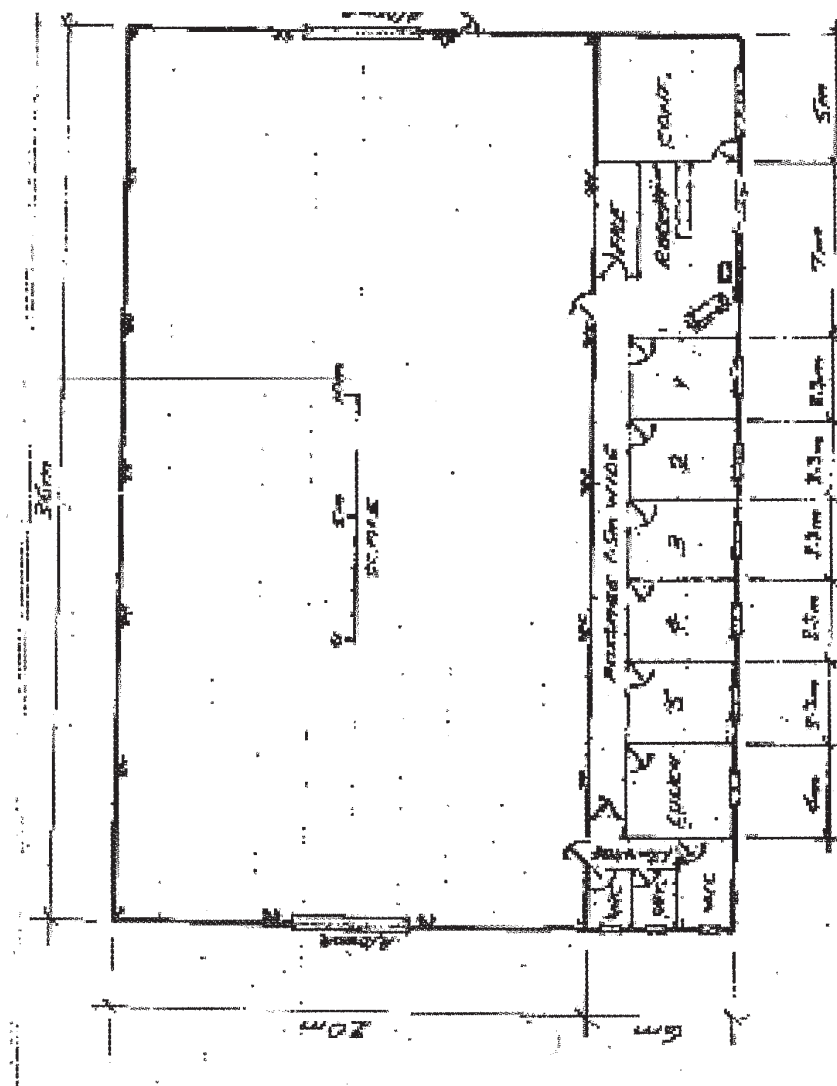
Photo 2 The sandy soils in the site are dominated by White Cypress with scattered *Acacia* sp.

DEVELOPMENT APPLICATION
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NARRABRI SHIRE COUNCIL



Photo 3 The margins of the main drainage feature are dominated by Rough barked Apple *Angophora floribunda*

6 APPENDIX B - BUILDING PLAN



DEVELOPMENT APPLICATION
PLAN No.
77/2008
NARRABRI SHIRE COUNCIL

PRELIMINARY LAYOUT PLAN FOR:
EASTERN STAR GLASS COMPANY



NARRABRI SHIRE COUNCIL

Environmental Services Division:
 ☎ 67996855
 Fax 67996888
 Email council@narrabri.nsw.gov.au

INTER APPR APPLI

(Section 78A, Environmental

Assessed Fee: Receipt N

REGO No: 107/06729		
FILE No: P99/03158		
Rec'd: - 8 OCT 2007		
Dept: COR		
Comments: Approved		
Action Officer	A/N	Init
NAW	A	[Signature]
Filed:		
NARRABRI SHIRE COUNCIL		

TYPE OF APPROVAL	(Office Use Only)	(Office Use Only)
<input checked="" type="checkbox"/> Development Approval	Application Stamp Here	Date Stamp Here
<input type="checkbox"/> Construction Certificate		
<input type="checkbox"/> Local Approval		
Note: More than one (1) box can be ticked		

Part 1

Site and Applicant Details

1. Applicant's Name

If you represent a company, apply in the company's name. State your position under 'Title - Other'.

Title Mr ☐ Mrs ☐ Miss ☐ Ms ☐ Other MANAGER ENGINEERING
 Surname or company name EASTERN STAR GAS LIMITED
 Given names
 Name of contact person TIM FREW

2. Your Postal Address

GPO Box 4526
SYDNEY
NSW.
 Post Code 2001

3. Your Phone or Fax Number

Phone BH(02) 92515599 Mobile 0411 151 285
 Phone AH() Fax 02 9251 2299

4. Location of the Proposed Development

Unit No ☐ House No ☐ Village/Locality YARRIE LAKE RD 73 Dump Rd.
 Street YARRIE LAKE RD 73 Dump Rd.
 Property/Building Name

5. Land Title Description

We need this to correctly identify the land.

Lot(s) 241 24. Section
 Deposited Plan(s) 1036154
 Parish COOMA Strata Plan

P99/03158.

77/2008

A/N. 1358.59700.1

77/2008

6. Owners Name

(if not the applicant)

If represented by a company, apply in the company's name. State position under 'Title - Other'.

Title Mr ☐ Mrs ☐ Miss ☐ Ms ☐ Other ☐ NARRABRI SHIRE COUNCIL

Surname or company name NARRABRI SHIRE COUNCIL

Given names

Name of contact person BILL BIRCH

7. Owner's Consent to Lodge this Application

The owner's authorisation to lodge this application must be obtained if you are not the owner. This is a mandatory requirement of the Act.

Note: If the land is owned by a company, a company seal must be provided with at least one executive signature.

As owner of the above property, I/we consent to this application, and grant permission for Council officers to enter upon such property in order to determine this application and undertake any associated inspections.

Owner's Name: (Print) NARRABRI SHIRE COUNCIL

Postal Address: M J Kershaw

General Manager

Wednesday 5th December, 2007.

Date:

/ /

Owner's Signature:

8. Applicant's Declaration

Before signing, make sure you have addressed and completed all applicable questions on this form.

I apply for approval to carry out the development described in this application. I also understand that:

- This application authorises Council officers to enter upon the subject land for the purpose of assessing and determining the application, and to perform associated and subsequent inspections.
- I am liable to pay for or rectify any damage caused to public roads, drains or footpaths arising from construction works associated with the development.

Date:

28/9/07

Applicants Signature:

Part 2

1. Development Proposal

Indicate the Type of development proposed.

Development Details

Tick the applicable box(s) below

- ☒ erection of a building
☐ subdivision
☐ carrying out of work

DEVELOPMENT APPLICATION
PLAN No.
77 / 2008
☒ use of land/building
☐ demolition
☐ other
NARRABRI SHIRE COUNCIL

2. Does the Development require a BASIX certificate?

- ☒ No ☐ Yes - (BASIX certificate to be submitted with development application)

"BASIX Certificate" The Building Sustainability Index (BASIX) is a web-based planning tool designed to assess the potential performance of residential buildings against a range of sustainability indices.

A BASIX Certificate identifies the sustainability features required to be incorporated in the building design. These features may include sustainable design elements such as recycled water, rainwater tanks, AAA-rated showerheads and taps, native landscaping, heat pump or solar water heaters, gas space heaters, roof eaves/awnings and wall/ceiling insulation.

You need a BASIX Certificate in the Narrabri Shire when BASIX applies to the type of development for which you require approval. Commencement dates and details of types of development are at www.basix.nsw.gov.au.

The applicant is required to submit the BASIX Certificate with the Development Application or Complying Development Certificate application. The plans and specifications must also identify the BASIX commitments which will be checked by a professional building certifier during construction. Where submitted plans or specifications are inconsistent with the relevant BASIX Certificate, Council will require applicants to submit consistent applications before progressing the assessment process, either by amending plans / specifications or by submitting a new BASIX Certificate with commitments that match the rest of the application.

Applicants can generate the BASIX Certificate only on the NSW Department of Infrastructure, Planning and Natural Resources' BASIX website: www.basix.nsw.gov.au. For more information, phone DIPNR's BASIX Help Line on 1300 650 908.

3. Development Description

(eg dwelling, residential flat building, warehouse, retail store etc)

DEVELOPMENT OF AN OPERATIONS CENTRE
INCLUDING OFFICES, WORKSHOP AND
EXTERNAL STORAGE AREAS

4. Proposed Use

State the intended use of the land /building (eg warehousing of white goods, motor vehicle repairs etc)

OPERATIONS CENTRE FOR GAS EXPLORATION
COMPANY INCLUDING :- OFFICE ACCOMMODATION
WORKSHOP/WAREHOUSE, CHEMICAL STORAGE
EXTERNAL STORAGE, AND PARKING.

Refer plan in Statement of
Environmental Effects.

5. Is this application for Integrated Development?

Nominate the additional approvals to be obtained from the administering approval bodies.

NOTE: an application for Integrated Development must include:

- a) sufficient information to permit the approval body to assess the application;
- b) an additional fee of \$250 is applicable for each approval body - Council requires a separate cheque to be made out to these bodies;
- c) additional copies of plans as determined by Council.
- d) payment of minimum \$150.00 Advertising Fee

☒ No

☐ Yes - Tick the appropriate box(s) below

Fisheries Management Act 1994

☐ s144 ☐ s 201 ☐ s 205

Heritage Act 1977

☐ s 58

Mine Subsidence Compensation Act 1961

☐ s 15

National Parks and Wildlife Act 1974

☐ s 90

Pollution Control Act 1970

☐ s 17A ☐ s 17C ☐ s 17D ☐ 17I

Rivers and Foreshores Improvement Act 1948

☐ Part 3A

Roads Act 1993

☐ s 138

Waste Minimisation and Management Act 1995

☐ s 44

Water Act 1912

☐ s 10 ☐ s 13A ☐ s 18F ☐ s 20B
☐ s 20CA ☐ s 20L ☐ s 116 ☐ Part 8

6. Type Of Consent?

(If applicable)

☐ Staged Development

☐ Deferred Development

7. Long Service Levy

(0.2% of estimated value > \$25,000)

☒ No

☐ Yes - (Long Service Levy Payment Form to be submitted with payment)

8. What is the Estimated Cost of Development?

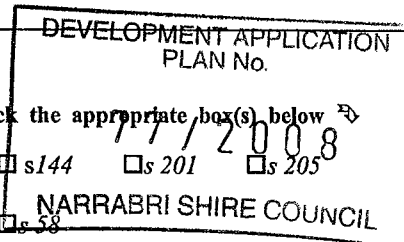
Estimated Cost/Value:

\$ 700,000

9. Your Environmental Statement

Tick only one (1) of the boxes to indicate the environmental statement which is applicable to the proposed development.

- ☐ an Environmental Impact Statement (EIS) is attached (For Designated Development);
- ☒ a Statement on Environmental Effects (SEE) is attached (For other Development); or
- ☐ a Species Impact Statement (SIS) is attached (For threatened species, habitats, etc); or
- ☐ the proposed development is considered to have negligible effect.



Part 3**Construction Details**

77/2008

1. Are you using a licensed builder?

To be completed only if the proposed building will be residential building work.

Yes ☐

Builder's Name

Address

NARRABRI SHIRE COUNCIL

Licence No.

Phone (B)

Mobile

Phone (H)

No ☐If No, will the work be done as Owner-builder: Yes ☐No ☐**Total Building Value:**

\$

Is a Builders Insurance Indemnity Certificate required?

Y

Yes

No

An Insurance Indemnity Certificate must be obtained for any 'residential building work' performed by a licensed builder or contractor which exceeds a contract value of \$5,000.

Certificate Number (if applicable):

2. What are the main materials to be used:**EXTERIOR WALLS**

- ☐ Single brick ☐ Brick veneer ☐ Full brick
☐ Weatherboard (timber) ☐ Concrete ☐ Curtain glass
☐ Weatherboard (cement fibre) ☐ Concrete block
☐ Cement fibre sheeting ☐ AAC ☐ Steel
☐ Aluminium cladding ☐ Mud/adobe/pise ☐ Not Applicable
☐ Other:

ROOF

- ☐ Precoloured metal sheeting ☐ Tile
☐ Zincalume/gal sheeting ☐ Slate
☐ Aluminium sheeting ☐ Cement fibre
☐ Fiberglass sheeting ☐ Plastic sheeting
☐ Concrete ☐ Shingles
☐ Other:

FLOOR

- ☐ Timber ☐ Steel ☐ Concrete
☐ Timber subfloor ☐ Steel subfloor ☐ Natural earth
☐ Other:

FRAME

- ☐ Timber ☐ Steel
☐ Reinforced concrete ☐ Masonry
☐ Other:

3. Building Details

Gross Floor Area of existing building (m²): How many storeys will the building consist of?
Gross Floor Area of proposed addition/new building (m²): Does the site contain a dual occupancy?
Number of pre-existing dwellings: Number of dwellings to be demolished:
How many dwellings are proposed?

Indicate below the current and proposed uses of the building(s)/land ↗

Part of Building/land	Existing Use	Proposed Use	BCA Class
.....			
.....			

Part 4

Local Approval Details

1. Are you also seeking an approval under the Local Government Act, 1993?

You can apply with this development application to seek an approval for any of the listed activities which require approval under Section 68 of the Local Government Act, 1993. Additional fees may be applicable.

NOTE: the plans, specifications & information required for Council to process and assess the relevant Activity (including that which is specified in the Regulations under the Local Government Act) must also be submitted with this application.

☐ No

☐ Yes - Tick the appropriate box(s) below ➤

(Part A – Building, Temporary Structures or Moveable Dwellings)

- ☐ Install a manufactured home, moveable dwelling or associated structure
- ☐ Install a temporary structure on land
- ☐ Use a building or temporary structure as a Place of Public Entertainment

(Part B – Water Supply, Sewerage & Stormwater Drainage Work)

- ☐ Carry out water plumbing work
- ☐ Draw water or sell water from a Council water supply standpipe
- ☐ Install, alter, disconnect or remove a meter connected to a service pipe
- ☐ Carry out sewerage work
- ☐ Carry out stormwater drainage work
- ☐ Connect a private drain or sewer with a public drain or sewer of Council

(Part C – Management of Waste)

- ☐ For fee or reward, transport waste over or under a public place
- ☐ Place waste in public place
- ☐ Place a waste storage container in a public place
- ☐ Dispose of waste into Council's sewer
- ☐ Install, construct or alter a waste treatment device

(Part D – Community Land)

- ☐ Engage in Trade or Business
- ☐ Direct or procure entertainment to the public
- ☐ Construct temporary enclosure for purpose of entertainment
- ☐ For fee reward, play a musical instrument or sing
- ☐ Set up, operate or use a loudspeaker or sound amplifying device
- ☐ Deliver a public address or hold a religious service or public meeting

(Part E – Public Roads)

- ☐ Swing/hoist goods over a public road by means of a lift, hoist or tackle
- ☐ Erect an advertising structure over a public road, or expose any article (whether for sale or otherwise) to overhang any part of the road or outside a shop window or doorway abutting the road, or hang an article beneath an awning over the road
- ☐ extend a balcony, awning, sunblind, canopy, or similar structure or an essential service pipe beyond a road alignment

(Part F – Other Activities)

- ☐ Operate a public car park
- ☐ Install a domestic oil or solid fuel heating device
- ☐ Operate a caravan park or camping ground
- ☐ Operate a manufactured home estate
- ☐ Install or operate amusement devices (*Construction Safety Act 1912*)
- ☐ Install or operate amusement devices in premises
- ☐ Approval to operate on-site sewerage waste management
- ☐ Operate an undertakers business
- ☐ Operate a mortuary
- ☐ Use a standing vehicle or any article for purpose of selling any article

Part 5**Checklist****● Have you provided:**

- 5 copies of the architectural/engineering plans (3 copies only for class 1 & 10)
- 5 copies of the specifications (3 copies only for class 1 & 10)

We cannot accept the application unless you provide the required number of copies.

Yes ☐

Office Use:

Plans:

Specs:

● For Building works - Have you Attached:

Yes

N/A

Office Use

- | | | | |
|---|--------------------------|--------------------------|--------------------------|
| • detailed architectural plans showing floor plans, elevations, site plan, sections, heights, levels | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • detailed specification describing the materials and manner of construction of the building | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • a basix certificate | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • geotechnical investigation/assessment report including site classification | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • engineering design drawings | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • details of the sewage management system if gravity sewer is not available | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • details of water supply and storage if Council's reticulated water supply is not available | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • stormwater drainage design details | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • soil and water management plan, including soil and erosion control works | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • plan of site levels/contours and proposed cut/fill | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • design details for wind bracing & uplift including design wind category | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • landscape design plan | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • design details for flood-resistant construction and floor levels | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • fire services design drawings and calculations | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • a list of existing & proposed <i>statutory fire safety measures</i> serving the building | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • a written Assessment of the need to fence the building site to prevent public access | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • interior design detail for food premises, hair/beauty salons | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • disabled toilet(s) design plan & elevations drawn to a scale of 1 in 20 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • evidence of any accredited component, process or design sought to be relied upon | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| • where the application involves an Alternative Solution to meet a BCA performance requirement, is it accompanied by: | | | |
| - details of the performance requirements the Solution is intended to meet, and will affect | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| - details of the assessment and verification methods used to establish the Solution's compliance | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Notes For Completing Combined Application for Development Consent, Construction Certificate and Local Approvals.

- Note 1** An application for local approvals under the Local Government Act 1993 must be accompanied by such matters as would be required under s81 of that Act, as well as the information and details prescribed under its Regulations (prescribed forms available at Council).
- Note 2** An application for Integrated Development must include:
- a) sufficient information for the approval body to make an assessment of the application under their legislation;
 - b) an additional fee (\$250) for each approval body - cheques must be made out in the name of that particular approval body, not in Council's name.
 - c) additional copies of plans as determined by the consent authority.
 - d) suitable mailing envelope and postage stamps.
- Note 3** Plans or drawings describing the proposed development must indicate (where relevant):
- a) the location of proposed buildings or works (including extensions or additions to existing buildings or works) in relation to the land's boundaries and adjoining development;
 - b) floor plans of proposed buildings showing layout, partitioning, room sizes and intended uses of each part of the building;
 - c) elevations and sections showing proposed external finishes and heights;
 - d) existing and proposed finished levels of the land in relation to buildings and roads;
 - e) building perspectives, where necessary to illustrate the proposed building;
 - f) proposed parking arrangements, entry and exit points for vehicles, and provision for movement of vehicles within the site (including dimensions where appropriate);
 - g) proposed landscaping and treatment of the land (indicating the plant types and their height and maturity)
 - h) proposed methods of draining the land;
 - i) location of existing utility services and the extension/ provision of any new utility services necessary for the development;
 - j) areas of environmentally sensitive land within and adjoining the proposed development;
- Note 4** Where the development requires notification/advertising, an A4 plan of the building that indicates its height and external configuration, as erected, in relation to the site on which it is erected, is to be submitted.
- Note 5** Other information must indicate (where relevant):
- a) *in the case of shops, offices, commercial or industrial development:*
 - details of hours and days of operation, including deliveries to the site
 - plant and machinery to be installed
 - type, size and quantity of goods to be made, stored or transported
 - size, type and frequency of service and delivery vehicles intended to utilise the development
 - loading and unloading facilities
 - access for disabled persons
 - types and quantities of waste to be generated by the development, and the manner of treatment, storage and disposal
 - anticipated number of employees to be engaged, in both the short and long term
 - b) *in the case of a change of building use (except where the proposed change is to a class 1a or class 10 building) where no alterations or additions to the existing building are proposed:*
-

- a list of any fire safety measures in the building or on the land on which the building is situated in connection with the proposed change of building use, and
 - a separate list of such measures as are currently implemented in the building and on the land on which the building is situated.
- The list must describe the extent, capability and basis of design of each of the measures concerned.
- c) *in the case of development involving the erection of a building, work or demolition:*
- details of the methods securing the site during the course of construction

Note 6 Where a proposed development is not designated development, the application must be accompanied by a statement of environmental effects (SEE) unless the proposed development is considered to have a negligible effect (eg minor interior alterations) which must:

- a) demonstrate that the environmental impact of the development has been considered
- b) set out steps to be taken to protect the environment or to mitigate the harm.

Note 7 The Council may, within 21 days of receiving the development application, ask for additional information on the development if that information is necessary for the determination of the application or if that information is required by a concurrence authority.

The Council may, within 25 days after the lodgement of a development application for integrated development, ask for additional information concerning the development if the information is necessary for the determination of the application or if the information is required by an approving body.

Note 8 Under s80(10A) of the Environmental Planning and Assessment Act 1979 development consent cannot be granted until any long service levy payable under section 34 of the Building and Construction Industry Long Service Payments Act 1986 (or where such a levy is payable by instalments, the final instalment of the levy) has been paid.

Note 9 In the case of an application for a construction certificate for residential building work (within the meaning of the Home Building Act 1989) the following need to be supplied:

- (a) in the case of work by a licensee under that Act:
 - (i) the licensee's name and contractor licence number, and
 - (ii) documentary evidence that the licensee has complied with the applicable requirements of the Act - ie a certificate purporting to be issued by an approved insurer under Part 6 of the Home Building Act 1989 that the person is the holder of an insurance contract; or
- (b) in the case of work done by any other person:
 - (i) the person's name and owner-builder permit number, or
 - (ii) a declaration signed by the owner of the land, to the effect that the reasonable market cost of the labour and materials involved in the work is less than the amount prescribed for the purposes of that Act, currently being \$5,000.00 if work is to be carried out by a licensed builder, or \$3,000.00 if work is to be carried out by the owner.

Definition of Class 1 & 10 Buildings Under the BCA

CLASS	DEFINITION
1a	A single dwelling being- (i) a detached house; or (ii) one of more attached dwellings, each being a building, separated by a fire-resisting wall, including a row house, terrace house, town house or villa unit; which is not located above or below another dwelling or another building.
1b	A boarding house, guest house, hostel or the like with a total floor area not exceeding 300m ² and in which not more than 12 persons would ordinarily be resident.
10a	A non-habitable building being a private garage, carport, shed or the like.
10b	A non-habitable structure being a fence, mast, antenna, retaining or free-standing wall, swimming pool, or the like.

SIGNATURES AND SEALS ONLY.

SURVEYORS (PRACTICE) REGULATION 2001 CLAUSE 33				
MARK	M.G.A. CO-ORDINATES		ZONE	CLASS
	EASTING	NORTHING		
P.M.77620	763592.520	6640811.878	55	B
P.M.77621	763482.032	6640085.436	55	B
T.S.7155	765769.753	6639513.011	55	2A
SOURCE: SCIMS SURVEY CONTROL SYDNEY DATE: 6-6-2003				
COMBINED SCALE FACTOR: 1.000423				

REFERENCE

A	254° 19'	1.03	G.I.PEPE	FD
B	309° 33'	0.93	G.I.PEPE	FD
	(128° 32')	0.8		
C	201° 28'	4.02	G.I.PEPE	FD
D	137° 05'	1.005	G.I.PEPE	FD
E	144° 16'	0.64	G.I.PEPE	FD
	(136° 48')	0.635		
F	309° 33'	1.11	G.I.PEPE	FD
G	26° 21'	0.63	G.I.PEPE	FD
	(22° 37')	0.78		
H	189° 45'	1	G.I.PEPE	FD
J	310° 48'	1.375	G.I.PEPE	FD
K	308° 47'	1.2	G.I.PEPE	

MARKS

D.P.1036154
BY ME
BY D.P.1036154
D.P.1036154
R21501-1603
BY ME
BY D.P.702892
D.P.1036154
BY ME
BY D.P.1036154
D.P.588798

DEVELOPMENT APPLICATION
PLAN NO.

Registered:

C.A. 77/2008

NARRABRI SHIRE COUNCIL

Purpose:

Ref. Map:

Last Plan:

PLAN OF SUBDIVISION OF
LOT 24 D.P.1036154.

Lengths are in metres. Reduction Ratio 1:5000

L.G.A.: NARRABRI SHIRE

Locality: NARRABRI WEST

Parish: COOMA

County: WHITE

This is sheet 1 of my plan in sheets
(Delete if inapplicable).I, ROSS GLEESON,
of GLEESON SURVEYING, P.O. BOX 1, NARRABRI

a surveyor registered under the Surveyors Act 1929, certify that the survey represented in this plan is accurate, has been made in accordance with the Surveyors (Practice) Regulation 2001 and was completed on 4-6-2003.

The survey relates to LOT 24 AND CONNECTIONS.

(Specify the land actually surveyed, or specify any land shown the plan that is not the subject of the survey)

Signature: *Ross Gleeson* Dated: 19/6/08
Surveyor registered under the Surveyors Act 1929

Datum Line: X-Y

Type: Urban/Rural

Plans used in preparation of Survey/Compilation
R21501-1603 D.P.1036154

D.P.702892

506645

588798

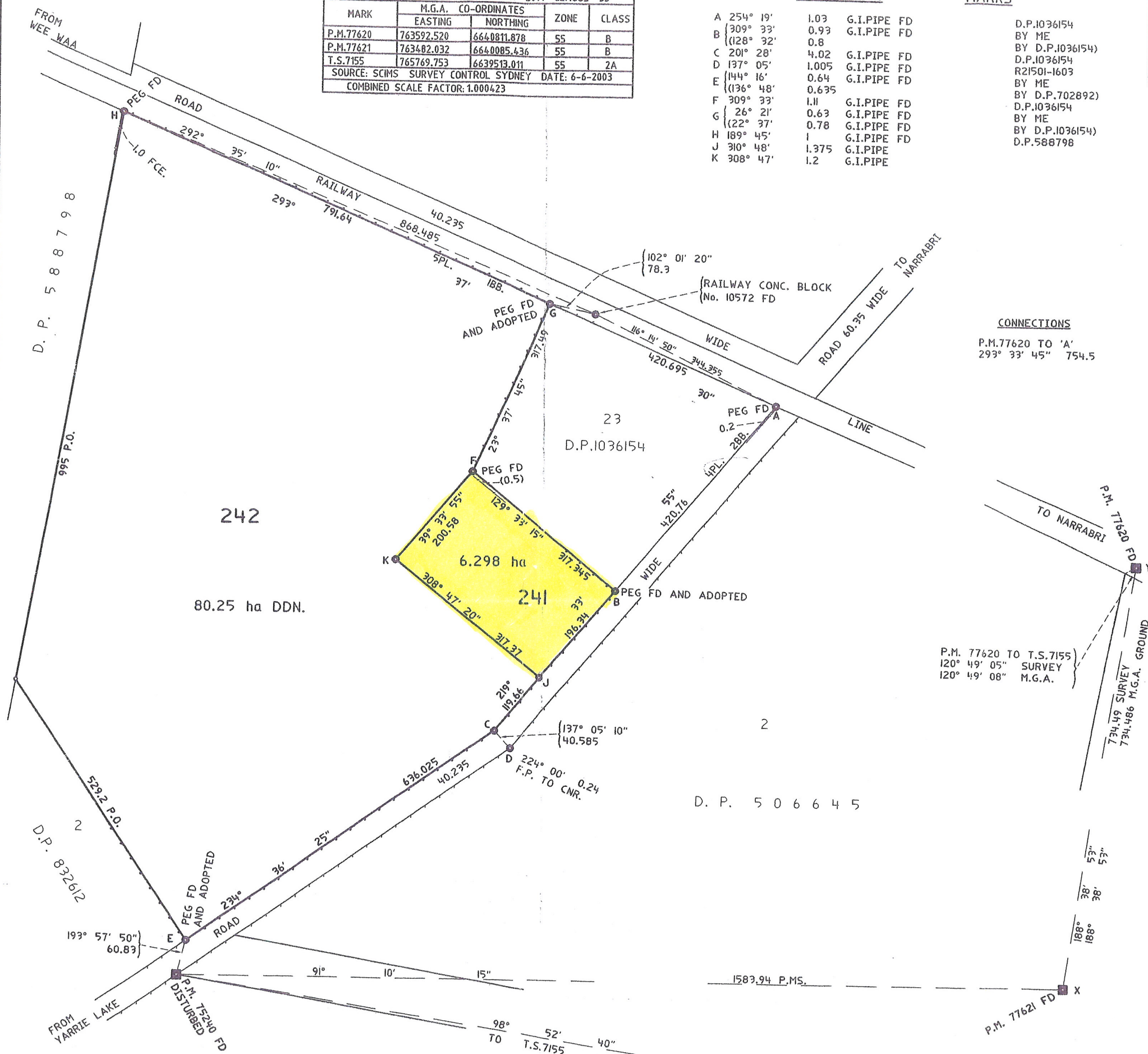
832612

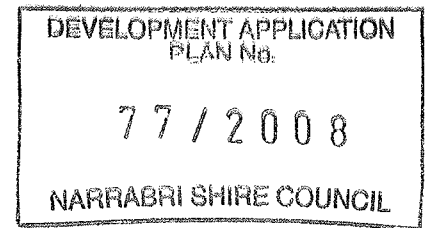
1029895

PANEL FOR USE ONLY for statements of intention to dedicate public roads, to create public reserves, drainage reserves, easements, restrictions on the use of land or positive covenants.

Department of Land and Water Conservation Approval
I, *Ross Gleeson*, in approving this plan certify that all necessary approvals in regard to the allocation of the land shown hereon have been given.
Signature: *Ross Gleeson*
Date: *19/6/08*
File Number: *77/2008*
Office: *Narrabri*

Council's Certificate
I certify that the provisions of s.109J of the Environmental Planning and Assessment Act 1979 have been satisfied in relation to the proposed *subdivision* set out herein.
(Insert 'subdivision' or 'new road')
*Authorized Person/General Manager/Accredited Certifier
Consent Authority: *Ross Gleeson*
Date of Endorsement: *19/6/08*
Accreditation no.: *506645*
Subdivision Certificate no.: *77/2008*
File no.: *77/2008*
Note:
When the plan is to be lodged electronically in the Land Titles Office, it should include a signature in an electronic or digital format approved by the Registrar-General.
*Delete whichever is inapplicable.

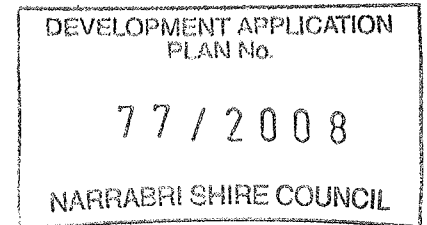




Statement of Environmental Effects

To accompany the
Development Application
by Eastern Star Gas Limited
for
a new Operations Centre

Yarrie Lake Rd, West Narrabri



Proponent Contact Information and Declaration

Eastern Star Gas Ltd

Suite 1, Level 2

37 Pitt St

Sydney

NSW 2001

Location of lands referred to by SEE

This statement refers to the subdivision of Lot 24 DP 1036154 located on Yarrie Lake Road, West Narrabri adjacent to the Narrabri Tip Entrance. (See figures 1 & 2).

Declaration

Eastern Star Gas Ltd declares the information contained within this document an accurate representation of the proposed development activity, existing environment and the extent of impacts likely to occur. With the assistance of Government agencies and external contractors, Eastern Star has endeavoured to characterise the environment within which the project is located and, where possible, mitigate any potential environmental impacts and ongoing operational risks.

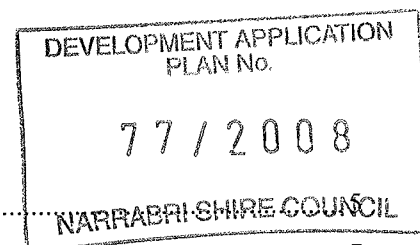


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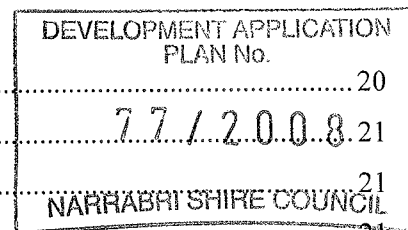
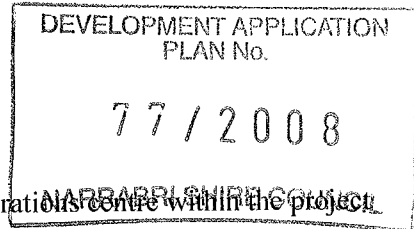


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1 INTRODUCTION

Eastern Star Gas Limited ("Eastern Star") proposes to develop a new operations centre within the project site. The centre will incorporate the following components:-

- An entrance/crossover from Yarrie Lake Rd into the site
- A workshop/ warehouse approximately 720 m² in area (20m x 36m)
- Approximately 216 m² of office accommodation attached to the workshop
- A sewage management facility (septic tank system)
- Parking
- Approximately 30,000 m² external storage area
- Approximately 375 m² chemical storage area – partly covered

Eastern Star currently operates out of an operations centre on leased premises at 190 Culgoora Rd, The new development will assist in the expansion of Eastern Star's operations within the Narrabri Region. Upon completion of construction at the new site, the administrative, maintenance and storage operations at the current depot will be relocated to the new premises.

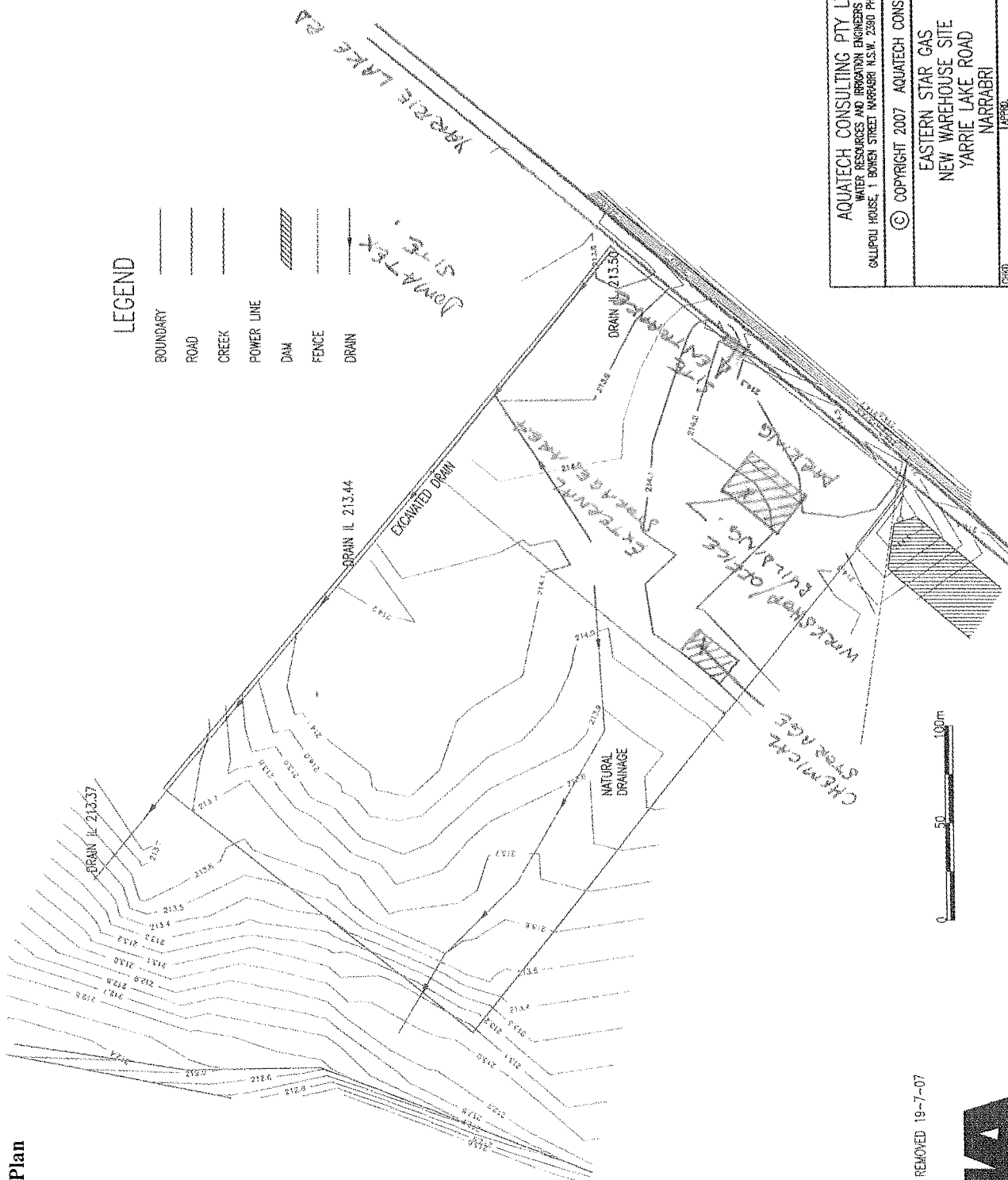
Figure 1 shows a conceptual plan of the development.

Development of the project would include:-

- Preparation of a levelled site with selective vegetation clearing and stripping of topsoils;
- Construction of a stable foundation pad upon which to base the development;
- Construction of reinforced concrete slabs for each of the workshop, the offices and the chemical storage facility; and
- Construction of the buildings and ancillary infrastructure as per submitted designs.

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**AQUA
TECH
CONSULTING PTY LTD**



LEGEND

BOUNDARY

ROAD

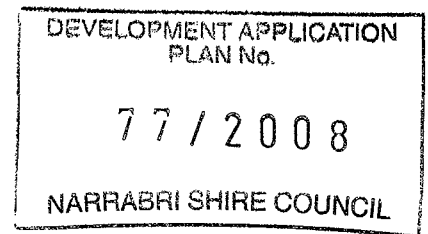
CREEK

POWER LINE

DAM

2.2.
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2000



1.1 Project Site Location

The 6.298 hectare project site is located on Yarrie Lake Road, west Narrabri within an area zoned 1A (general rural) under the *Narrabri Local Environment Plan 1992*. The development is to occur within a subdivision of Lot 24/DP 1036154. The land is presently owned by the Narrabri Shire Council and is leased to Eastern Star. However, Eastern Star exercised its option to buy the site on 12 June 2007 and understands from the Council's lawyers, H.J. Palmer & Co, that the purchase will proceed as soon as the plan of subdivision is registered and Council provides a zoning certificate.

The surrounding area combines residential, rural and industrial sites on the fringes of the more densely inhabited areas of west Narrabri.

1.2 Previous and Current Land Use

The proposed development site is undeveloped and partially covered in vegetation.

ESG has no information that confirms any specific previous land use on this site. There is visible evidence of ongoing grazing by stock across the 6.298 ha subdivision and area up to the Narrabri Waste Depot. This would appear to constitute the current land use.

The development site is next to the Domatex cotton processing facility (not currently operating), the Narrabri Waste Depot and is in close proximity to the Corglen Grain Storage and Transport Depot. Other small holdings such as Bohena Olives are located nearby and larger scale cropping and grazing enterprises become more frequent to the west along Yarrie Lake Rd..

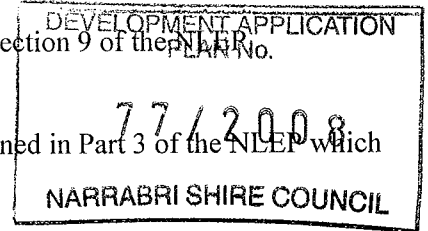
1.3 Development Standards

The proposed development of an operations centre at this location must comply with a range of local and State planning instruments.

1.3.1 Narrabri Local Environment Plan

The development site is located within the Narrabri Local Government Area and is therefore subject to the provisions of the Narrabri Local Environment Plan 1992 (NLEP). The site is located within an area designated Zone 1a (General Rural) in which development of this type is permitted with appropriate consent of the Narrabri Shire Council.

The proposed development is subject to the Objectives of Zone outlined in section 9 of the NLEP.



The proposed development is additionally subject to special provisions outlined in Part 3 of the NLEP which include (but are not limited to):

- Section 20 – Development along arterial roads
- Section 21 – Height of buildings
- Section 22 – Land subject to bushfire hazard
- Section 24 – Roads, drainage, recreation areas and parking
- Section 30 - Access
- Section 33 - Services

1.3.2 Narrabri Development Control Plans

The proposed development cannot be considered “exempt development” or “complying development” as defined by the Narrabri Development Control Plans.

1.3.3 NSW Environmental Planning and Assessment Act 1979

The proposed development will be subject to a development application and consent as defined in section 4 of the *Environmental Planning and Assessment Act 1979*. The Narrabri Shire Council is the consent authority.

2 PROPOSED ACTIVITIES

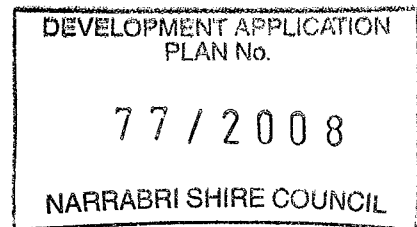
The proposed development will facilitate ongoing management of Eastern Star’s petroleum exploration and production assets in the Narrabri region. Modest quantities of materials required to conduct Eastern Star’s activities will be stored and maintained at the development.

Activities to be carried out on site include materials storage (externally and within the workshop/warehouse and the chemical storage area), fabrication, maintenance and repair of specialised petroleum production equipment (within the workshop/warehouse), and administration and management of the entire Eastern Star operation in the region (from the office accommodation).



2.1 Hours of Operation

The proposed development will be operational from Monday to Saturday and between the hours of 7:00am and 6pm. Incidental use of the depot outside of these times may occur during periods of particular activity such as drilling.



2.2 Employment

Eastern Star currently employs a total of 24 people. 9 of these people who are residents of the Narrabri Shire and are employed in Narrabri, will work out of the new operations centre..

Expansion of Eastern Star operations within the region is likely to require the employment of further technical, field operations and administrative staff over the next 2 year period. It is anticipated the number of Eastern Star employees permanently based within the Narrabri Region will double within that period.

2.3 Equipment and Inventory

The operation of the development site in support Eastern Star's gas exploration, development and production activities in the Narrabri region requires a considerable inventory of equipment and materials to be held in storage. Stocks of steel drilling pipes, drilling mud additives and incidental hardware fittings and equipment currently held at the Culgoora Road yard will be sorted and transferred to the new operations centre upon its completion.

2.3.1 Chemical Storage

The following chemicals which are commonly used in Eastern Star's drilling operations and which are classified as hazardous goods will be stored within the chemical storage area at the new operations centre:-

Aus Gel

BC-140

Cat-3 Activator

Barytes

Gum Guar

Potassium Chloride

GBW

Penatrol

Aqua Clear

Barroid

Hydrated Lime

Soda Ash

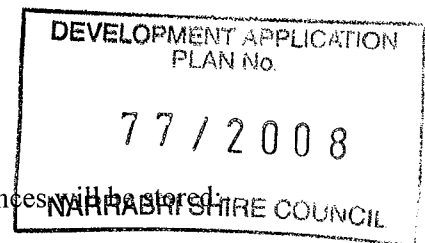
Super Foam

AMC Biocide

Wildcat

AMC Defoamer

Caustic Soda (granulated)



In addition, the following liquids which are classified as dangerous substances will be stored:

Hydrochloric Acid

Caustic Soda

The chemical storage facility proposed for the new centre will be designed in accordance with appropriate NSW Occupational Health and Safety legislation and regulations and will be subject to approval by Council prior to construction.

2.4 Services and Amenities

The proposed development will have access to town water supply, three phase power supplied by Country Energy and Telstra communication services. Applications will be made for connection of these services in accordance with normal procedures.

Included in the proposed office accommodation area are offices, conference room, file storage space, a lunch room and ablutions facilities which will discharge to a septic system.

2.5 Transportation

Upon commencement of operations at the new centre, the work force will commute to and from the site via private and company vehicles.

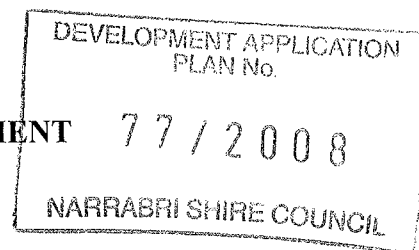
Total vehicular movements have been estimated at less than 30 per day during the most active periods during construction and fewer than 15 per day during the normal operations once the centre is complete. The majority of vehicular movements will occur between the hours of 8am-10am and 4pm and 6pm Monday to Friday.

2.6 Waste Management

Wastes generated during the construction phase will be collected and disposed of at the Narrabri waste depot adjacent to the site.

The small quantities of general wastes generated during day to day operations, including putrescible and recyclable wastes, will be collected and disposed of by a commercial waste removal contracting service.

3 THE EXISTING ENVIRONMENT AND IMPACT ASSESSMENT



3.1 Site Characteristics



Figure 2 Aerial view of the project site and subdivision

3.2 Site Drainage and Hydrology

Eastern Star has commissioned Aquatech Consulting Pty Ltd to report on site drainage and hydrological characteristics that may impact on the proposed development. The initial survey is shown below at Figure 3. The survey shows that the proposed location of the development is generally on the highest ground level of the site with natural drainage available to the North West. The compacted development base will be raised slightly during construction which will facilitate drainage. It is also proposed to excavate a drain along the North Eastern boundary of the site which will discharge to the North Eastern corner of the site to allow drain water to naturally flow away to the North East beyond the site.

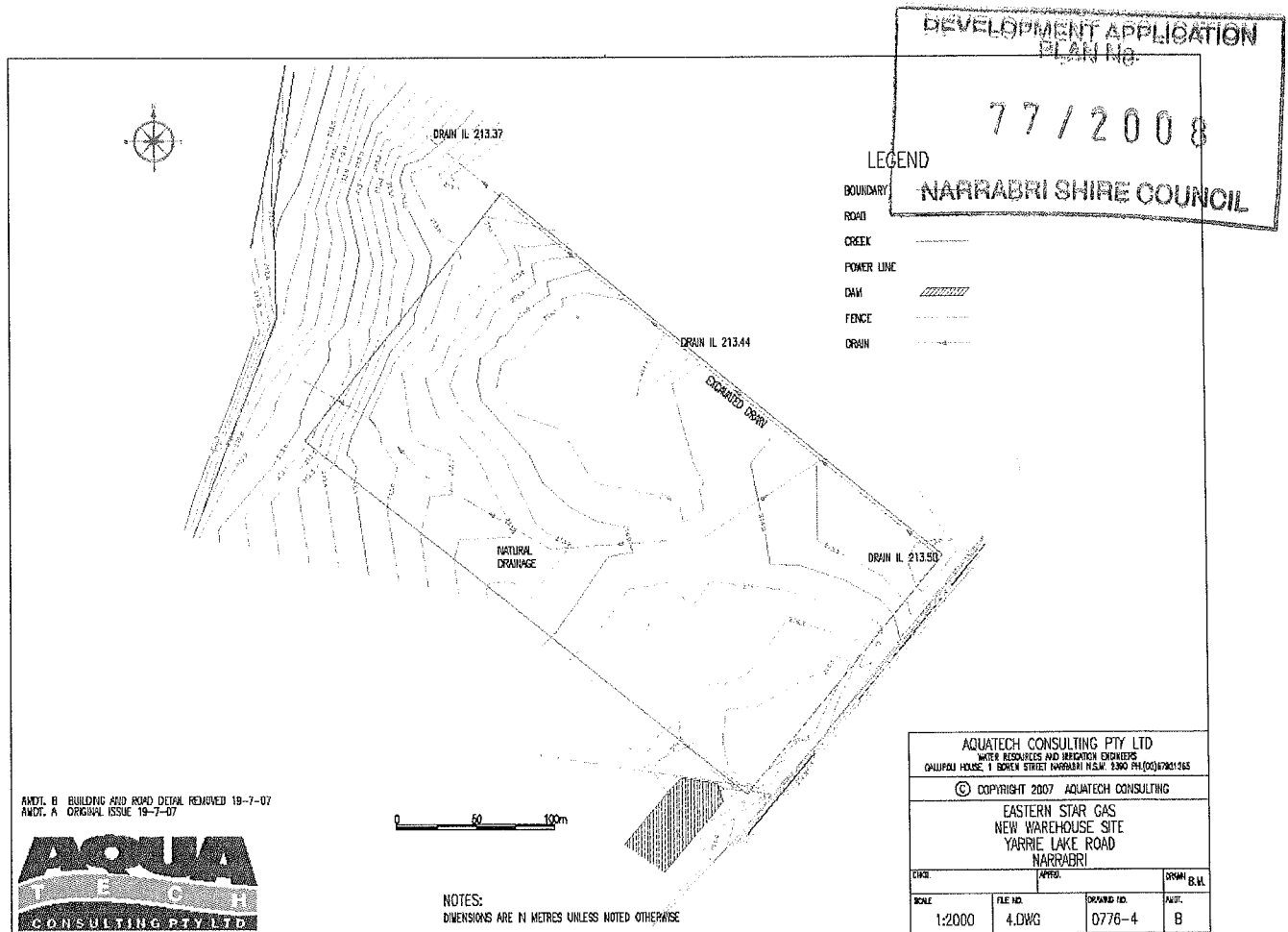
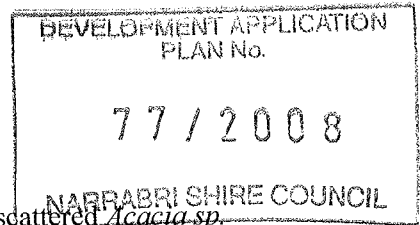


Figure 3 Site hydrology diagram indicating natural drainage

3.3 Flora

A preliminary site survey confirms the proposed development site is sparsely vegetated with grasses, shrubs and some larger trees. Photos 1 to 3 at Appendix A show the extent of the vegetative cover at various locations within the site and its quality in terms of diversity and percentage cover.

Recent rainfall in the Narrabri Region seems to have had little impact in terms of increasing the coverage of sub storey and groundcover vegetation although it is apparent that heavy grazing by stock on the site has impacted significantly on the density of grasses and forb regrowth to be expected after rainfall. The grazing regime is very likely to have also contributed to the lack of diversity observed with few species making up the majority of vegetation coverage.



3.3.1 Species Composition

The development site is dominated by White Cypress *Callitris glucophylla* with scattered *Acacia sp.* possibly Green Wattle *A. deanei*, Rough Barked Apple *Angophora floribunda* and various grass species that are generally unidentifiable due to constant grazing. A small incidental infestation of Spiny Burr *Cencherus sp.* is also apparent that has undergone physical and chemical eradication.

The distribution of these species across the site shows an apparent relationship to the variable soil types and drainage regime recorded during preliminary site inspections.

Stands of White Cypress dominate the sandier soils on the central high ground and northern edge. *Acacia sp.* dominates the more clay based soils in the central area and *Eucalyptus sp.* occurs more commonly towards the western edge on the margin of the drainage feature situated between the project site and the Narrabri Waste Depot (see Figure 3)

3.3.2 Threatened Species

Consultation with the NPWS Threatened Species database indicates 34 individual records of five threatened flora species across the Narrabri 1:50 000 topographic map sheet. The species recorded include:

- Spiny Peppercress *Lepidium aschersonii*
- Coolibah *Bertya sp.* *A. Cobar-Coolabah*
- Ooline *Cadellia pentastylis*
- Slender Darling Pea *Swainsona murrayana*
- Bluegrass *Dichanthium setosum*

Flora surveying completed in 2001 for the Coonarah Gas Project (see Corkery, 2002) indicates that no threatened species were observed on the site.

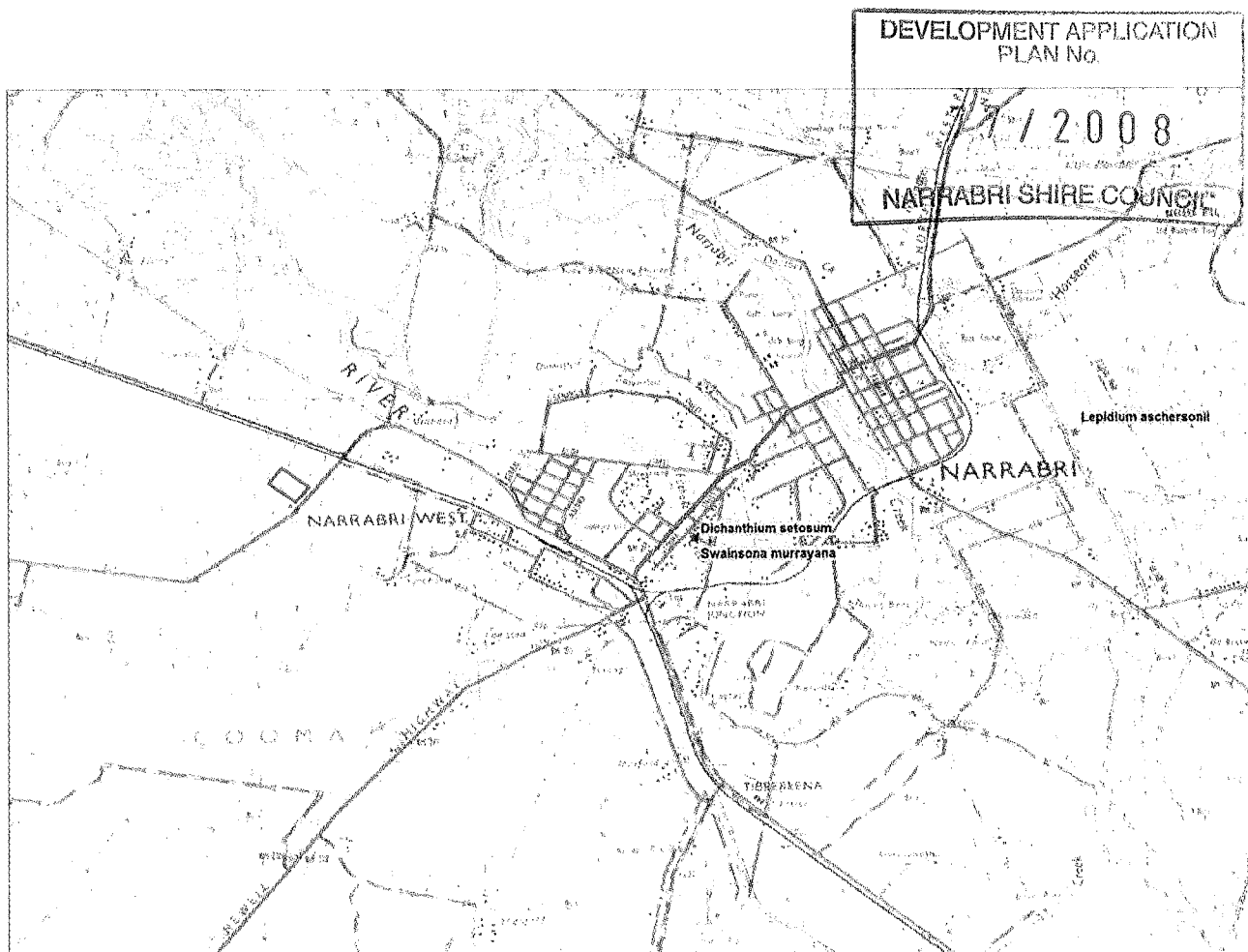


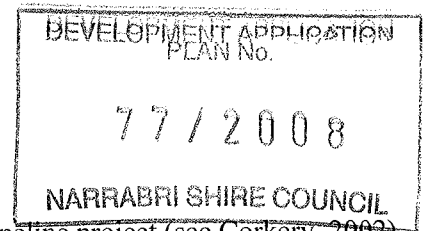
Figure 4 Threatened flora records in proximity to the development site

3.3.3 Impact Assessment

Removal and/or modification of approximately 3ha of vegetation will be required to for the development of the site. The extent of impacts associated with the proposed development at this location has been reasonably characterised and suggests the likelihood that the proposed activity will have a significant impact on a threatened species is negligible.

Based upon the available data from NPWS databases, the likelihood that the proposed activity will impact on a species of significance is negligible. Generally speaking, the threatened species observed in the surrounding region are found in previously undisturbed and remnant pockets of native vegetation. The project site is considered moderately to highly disturbed in terms of its vegetation composition and density as a result of ongoing grazing of re-emergent understorey shrubs, grasses and forbs. This has effectively sterilised the regeneration potential of the vegetation and reduced the risk of impacting on an unidentified individual or community assemblage of threatened flora.

The clearance of vegetation for the proposed development is unlikely to pose any significant risk to any threatened species nor result in the further fragmentation of vegetation remnants such that the life cycle of a species is placed at further risk.



3.4 Fauna

The completion of fauna surveying in preparation for the Coonarah Gas Pipeline project (see Corkery, 2002) identified 42 species of bird, 12 species of mammals and one reptile species along the entire project site from the Coonarah Gas Field to the proposed development site.

During this survey, no specific observations of fauna species were made at the current development site although the report suggests that faunal community at this location is likely to consist of those species observed during the field survey.

3.4.1 Threatened Species

Consultation with the NPWS Threatened Species database indicates 254 individual records of 28 threatened fauna species across the Narrabri 1:50 000 topographic map sheet. The species recorded include:

- Five-clawed Worm-skink
- Pale-headed Snake
- Australian Brush-turkey
- Magpie Goose
- Freckled Duck
- Black-necked Stork
- Black-breasted Buzzard
- Brolga
- Red-tailed Black-Cockatoo
- Glossy Black-Cockatoo
- Turquoise Parrot
- Superb Parrot
- Barking Owl
- Grass Owl
- Masked Owl
- Brown Tree creeper
- Speckled Warbler
- Painted Honeyeater
- Hooded Robin
- Grey Crowned Babbler
- Koala
- Squirrel Glider
- Black-striped Wallaby
- Eastern Hare-Wallaby
- Yellow-bellied Sheath-tail-bat
- Large-eared Pied Bat
- Eastern Long-eared Bat

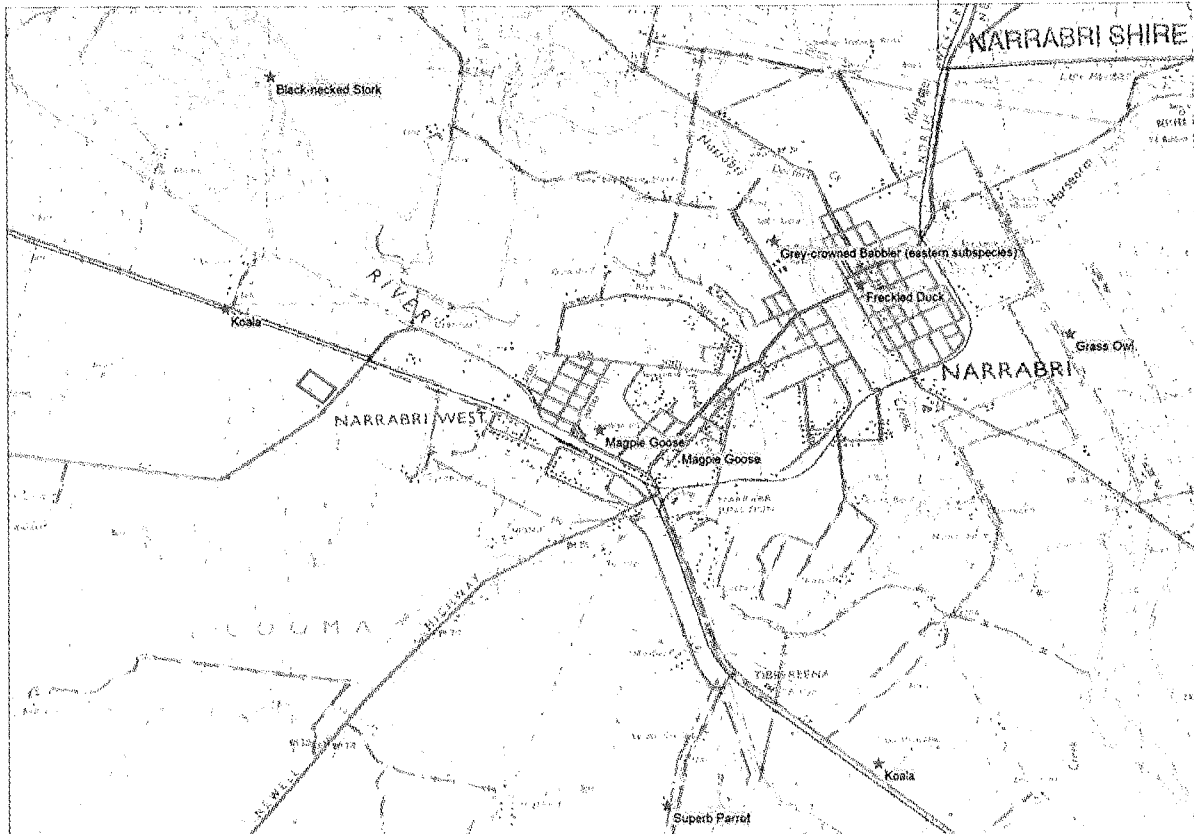


Figure 5 Threatened fauna records in proximity to the development site

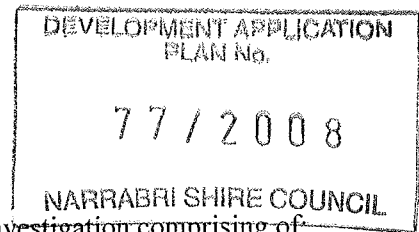
3.4.2 Impact Assessment

The quality of potential habitat within the development site plays a significant role in providing suitable nocturnal/diurnal refuge for fauna. As discussed in section 5.2, the site exhibits characteristics of a moderate to high disturbance regime with sparse to light stands of vegetation of limited diversity. The low diversity and poor quality of the habitat *in situ* and the surrounding land uses limits significantly the likelihood of ongoing inhabitation of this site by species of significance.

Removal and/or modification of approximately 3ha of vegetation will be required to for the development of the site. The extent of impacts associated with the proposed development at this location has been reasonably characterised and suggests the likelihood that the proposed activity will have a significant impact on a threatened species is negligible.

Based upon the available data from NPWS databases, the likelihood that the proposed activity will impact on a species of significance is very low due to their motility (i.e. avian and chiropteran species) and inhabitation of a sufficiently large home range. The clearance of the site for the proposed development is unlikely to pose any significant risk to the incidental inhabitation of the area by a threatened species nor result in the fragmentation of habitat such that a the life cycle of a species is placed at risk.

3.5 Aboriginal Heritage



The proposed development site has undergone an Aboriginal heritage investigation comprising of:

- An examination of the Aboriginal Heritage Information Management System (AHIMS) site register managed by NSW National Parks and Wildlife Services;
- Liaison and discussion of the proposal with representatives of the Narrabri Local Aboriginal Land Council (NLALC); and
- A cultural heritage survey completed with representatives of the NLALC.

3.5.1 AHIMS Database Search

Consultation with the NPWS AHIMS database indicates 15 sites of Aboriginal heritage significance have been recorded across the Narrabri 1:50 000 map sheet (see figure 5 below).

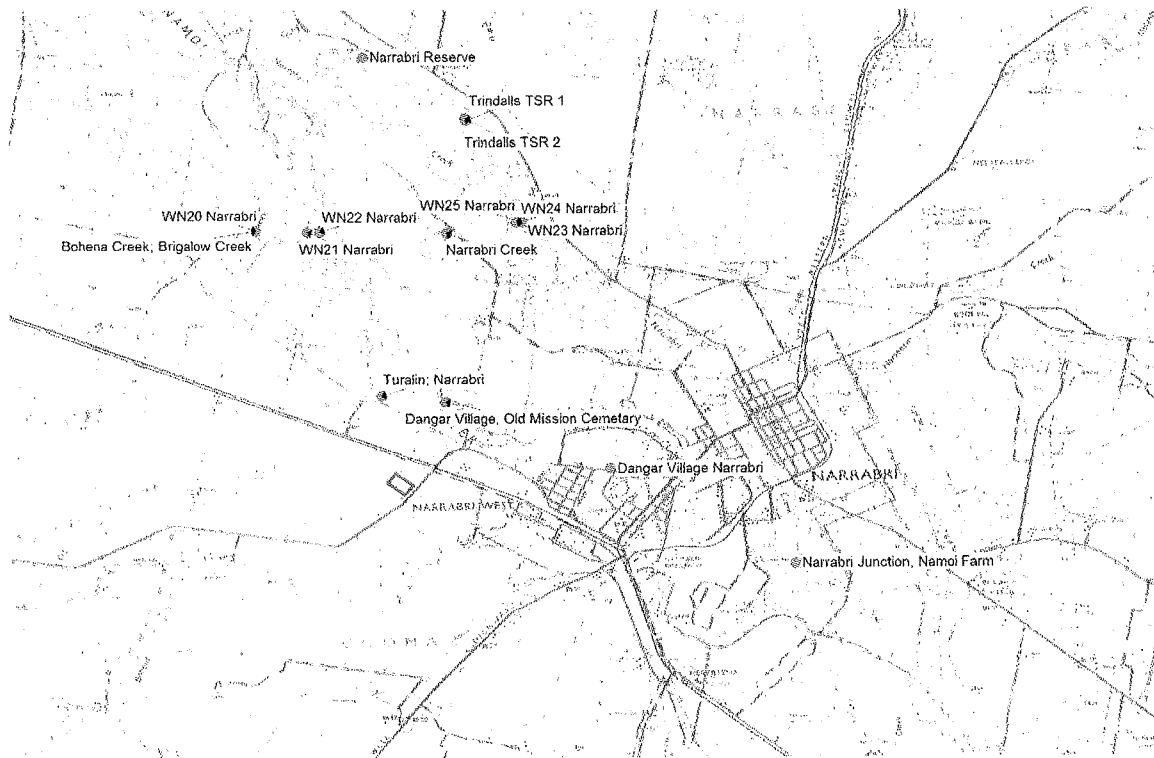


Figure 5 Sites of Aboriginal heritage significance in proximity to the development site

3.5.2 Cultural Heritage Survey

A survey of the development site has been previously completed by Mr Edward Trindall, cultural heritage advisor to the NLALC, in preparation for the Statement of environmental Effects submitted to Council for Eastern Star's Coonarah Gas Field Development (see Corkery, 2002).

No sites or items of Cultural Heritage Significance were located within the development site.

3.6 Noise

The ambient background noise in the vicinity of the development site is influenced by a range of rural and industrial activities including vehicular transport traffic, railway operations, farming activities and continuing operations at the Narrabri Waste Depot.

The nearest point receptor (residence) is located 850m to the north east of the development site.

The proposed development activity will result in a short term increase in noise during the construction period. During this period, the activities will be limited to the hours of 7am and 4pm Monday to Friday and 7am and 1pm Saturdays.

3.6.1 Development Noise Contributions

Increase in background noise levels in the area surrounding the development site would increase during the early phase of construction as earth moving machinery is employed to clear, level and compact the base for construction of the proposed operations centre.

During the operation of the centre, the principal noise sources would be vehicular transport entering and exiting the site and vehicles and equipment moving within the site itself. There are no other point sources of noise planned to operate from the site.

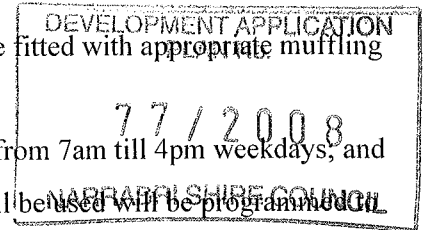
3.6.2 Impact Assessment

The criteria for assessing the impact of construction and operation of the proposed development is based upon NSW Industrial Noise Policy guidelines on intrusiveness where noise levels attributed to the development should not be greater than 5 dB(A) above the Rating Background Levels (RBL) for the surrounding environment. The RBL for the rural environment is 30 dB(A) at the nearest point receptor. However, this may be insufficient to account for the impacts attributable to industrial activities at the Waste Depot, vehicular traffic on Yarrie Lake Rd and the operation of the Walgett Branch Railway line some 400 m to the north of the site.

No specific noise monitoring program has been carried out due to the cumulative interference of other noise sources in the area.

As the nearest point receptor is approximately 850m north east of the site, the attenuation of construction related noise over that distance will be considerable. To mitigate increased noise which may be generated by the proposed development, the following noise minimisation strategies have been proposed:

- All machinery utilised in the construction phase of the project to be fitted with appropriate muffling apparatus;
- All construction activity to be limited to daylight hours, generally from 7am till 4pm weekdays; and
- The early construction phase in which earth moving machinery will be used will be programmed to be completed in the shortest possible time.



The increases in point source noise generation is unlikely to cause any significant noise related impacts on receptors surrounding the development site.

3.7 Air Quality

The air quality in the vicinity of the development site is typical of the rural/industrial environment and is influenced by a range of activities including:

- Light and heavy transport vehicle exhaust emissions;
- Dusts generated from vehicle movements on partially sealed roads; and
- Dusts and odours generated by operations at the Narrabri Waste Depot.

3.7.1 Development Activities and Potential Air Contaminants

The proposed development of the site is likely to increase the emissions of fugitive dusts and exhausts into the localised environment, principally from:-

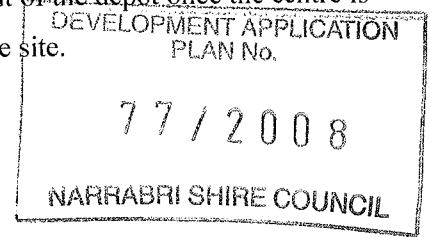
- The clearance and modification of vegetation;
- Stripping, stockpiling and removal of top soils; and
- Increased vehicular movements during the construction period.

Once the proposed development is operational, the extent of emissions would be limited to those generated by vehicles accessing the site during business hours.

3.7.2 Impact Assessment

The generation of particulate and gaseous emissions during the construction phases represents the largest single issue influencing air quality at the site. The increased levels of fugitive dusts during vegetation clearance and site preparation coupled with exhaust emissions from heavy machinery are short term in nature and have no long term implications for air quality in the localised area.

The small increases in vehicular traffic along Yarrie Lake Rd and into and out of the depot once the centre is operational is unlikely to significantly impact on the ambient air quality at the site.



3.8 Visual Amenity

As the proposed development is considered compatible with the surrounding land use, the completed operations centre would result in minimal visual intrusion on the surrounding area.

The proposed design of the workshop/warehouse is illustrated at Appendix B. The proposed construction materials are steel cladding over a steel frame. The overall height of the building will be 7.7m, which in terms of similar buildings such as the next door building at Domatex is reasonable and poses little risk of a negative visual impact on the area.

The plan for development also includes retention of existing vegetation across the site behind the actual footprint of the facility and a minimum 5m buffer surrounding all operational areas. This retained vegetation will serve to soften the visual impact of the proposal as well as providing a visual and acoustic buffer between the site and the Narrabri Waste Depot.

3.9 Fire Management

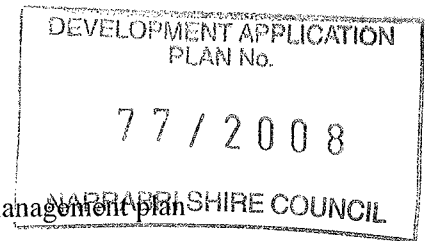
The proposed development will possess all requisite fire detection and suppression equipment for all types of fire sources contained within the site (chemical and electrical). The final installation will be in accordance with a report to be obtained from a recognised fire protection consultant. Details of the proposed installation will be submitted to Council for approval.

A minimum 5m vegetation free zone is to be included around the entire facility to mitigate the risk of bushfire.

3.10 Access and Traffic Management

The proposed development site fronts Yarrie Lake Rd which is approved for road train haulage. The 7m road at this point is sealed with grass and gravel shoulders and is in generally good condition with some deterioration of the sealed margins.

Sight distances at about the proposed access point is approximately 450m to the south west and in excess of 700m to the north east. The entrance to the Narrabri Waste Depot is approximately 200m south west of the proposed site entrance.



3.10.1 Proposed Management Safeguards

For the duration of the construction period, the site will be subject to a traffic management plan commensurate with the scale of the development and the expected traffic volumes. This would entail signage an appropriate distance from the entrance point and the employment of traffic controllers during the arrival and departure of oversized vehicles.

3.10.2 Impact Assessment

The implementation of the proposed traffic management plans and the relatively small increases in traffic during the construction phase is considered sufficient to mitigate any adverse impacts on the local road network and other road users.

4 CONCLUSIONS

The proposed project site is considered suitable for the development of the Eastern Star's new operations centre.

The land zoning and surrounding land use is compatible with the development of industrial operations and is adequately serviced by local infrastructure such that no major modifications or additions to local services will be required.

The site has been assessed and surveyed in terms of hydrology and geotechnical characteristics with no major impediments having been identified which might limit its suitability for the development and for ongoing operational activities.

The proposal will not impact on any threatened flora or fauna species nor any site or items of aboriginal heritage significance.

5 APPENDIX A – SITE PHOTOGRAPHS

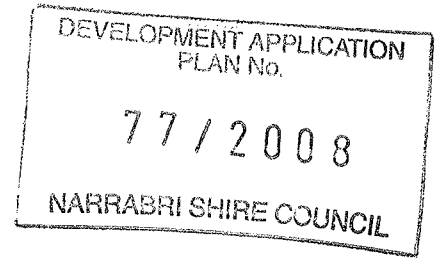


Photo 1 The project site from Yarrie Lake Rd



Photo 2 The sandy soils in the site are dominated by White Cypress with scattered *Acacia* sp.

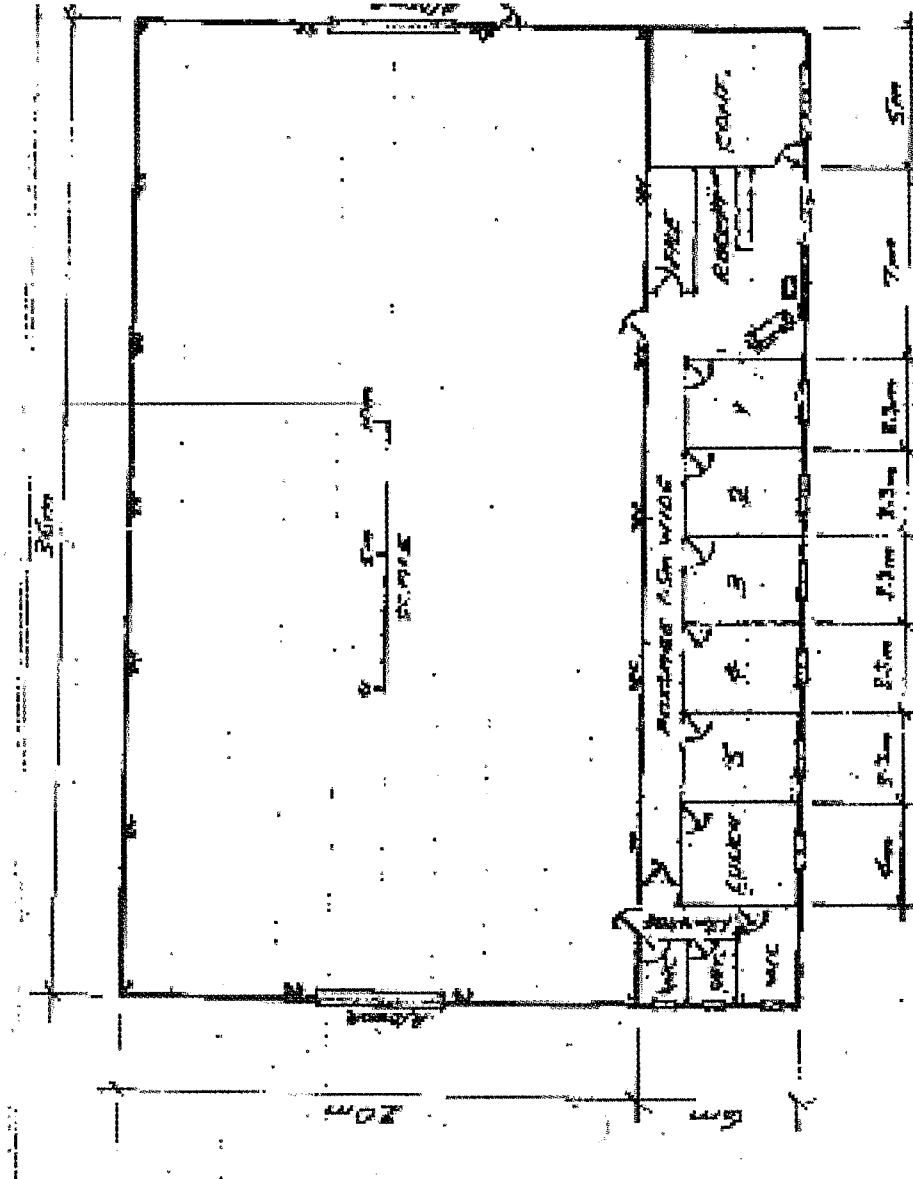
DEVELOPMENT APPLICATION
PLAN No.
77/2008
NARRABRI SHIRE COUNCIL



Photo 3 The margins of the main drainage feature are dominated by Rough barked Apple *Angophora floribunda*

6 APPENDIX B - BUILDING PLAN

DEVELOPMENT APPLICATION
PLAN No.
77/2008
NARRABRI SHIRE COUNCIL



PRELIMINARY LAYOUT ALONG AVE.
EASTERN STREET



NOTICE OF DETERMINATION OF A DEVELOPMENT APPLICATION

Environmental Planning and Assessment Act 1979

Development application: DA 546/2013

Applicant name: SANTOS Limited
Applicant address: GPO Box 4526
SYDNEY NSW 2001

Land to be developed: Lot 241 DP 1120041, 300 Yarrie Lake Road, Narrabri

Description of development: Expansion of Existing Logistics Centre

Owner/s: Eastern Energy Australia P/L, Hillgrove Energy P/L, Santos QNT P/L

Determination: Your development has been determined by the **granting of consent** subject to the conditions in the attached schedule.

Date of Determination: 2 April 2013
Date from which the Consent Operates: 2 April 2013
Date the Consent Lapses: 2 April 2018

Has a Public Inquiry been held into the application? No.

Right of Appeal: The applicant can appeal against the determination in the Land and Environment Court within 12 months of the date on which you received this notice. The applicant cannot appeal if a Commission of Inquiry was held and the development is Designated Development or State Significant Development.

Nick Wilton
**Manager Planning and Development Services
For General Manager**

8 April 2013

SCHEDULE OF DEVELOPMENT CONSENT CONDITIONS

1. The determination shall be regarded as being in accordance with the particulars and information set out and described in Development Application No. 546/2013 registered in Council's records as of 18 December 2012 except where varied by any or all of the following conditions. Any additional development not subject to this approval shall require the further consent of Council.

STATUTORY

2. Any demolition of the buildings / structures shall be in accordance with the requirements of *AS2601 The Demolition of Structures*.

REASON: To comply with statutory requirements.

3. Prior to the commencement of the proposed development, the applicant shall submit a formal application for a Construction Certificate, together with all prescribed fees, plans and specifications be submitted to and approved by Council, or alternatively a privately certified Construction Certificate be lodged with council no less than forty eight (48) hours prior to the commencement of the proposed development.

REASON: To comply with Council's statutory requirements.

4. The applicant shall notify Council, not less than forty eight (48) hours prior to the commencement of the work of:

- date of commencement of the work.
- name of the principle certifying authority for the issue of compliance, occupation and/or subdivision certificates.

REASON: To comply with Council's statutory requirements.

5. Where Council is not the Principal Certifying Authority (PCA), Council will require copies of the Occupation Certificate and all critical stage inspection reports.

REASON: To comply with Council's requirements.

6. Prior to the issue of a Construction Certificate, the applicant shall lodge with Council, and receive approval for the following Section 68 Approvals under the Local Government Act 1993:

B1 – Carry out water supply work

B5 – Carry out stormwater drainage work

C5 – Install, construct or alter a waste treatment device

C6 – Operate onsite sewerage waste management system

REASON: To comply with Council's statutory requirements.

7. Where Council is not the Principal Certifying Authority (PCA), the applicant or private certifier shall submit a Construction Certificate to Council prior to building works commencing on the subject allotment.

REASON: To comply with Council's statutory requirements.

8. Any use of the subject land not commence until all relevant conditions of consent have been met or unless other satisfactory arrangements have been made with Council.

REASON: To comply with Council's statutory requirements.

9. Where Council is not the Principal Certifying Authority an Occupation Certificate shall be submitted to Council when the building work has been completed and prior to the occupation of the building.

Advice:

- If the certificate is being issued by a private certifier, the certificate is to be lodged with Council not less than forty eight (48) hours to the occupation of the building/structure.

REASON: To comply with Council's statutory requirements.

10. Where Council is the Principal Certifying Authority, the applicant shall pay the prescribed fee to Council and satisfy all conditions of consent to obtain an Occupation Certificate prior to occupation of the building / structure.

REASON: To comply with Council's statutory requirements.

11. The building / structure shall be constructed in accordance with the requirements of the National Building Code 2012.

REASON: To comply with Council's statutory requirements.

12. The applicant shall erect signage in a prominent position on the site:

- (a) showing the name, address and telephone number of the principal certifying authority for the work, and
- (b) showing the name of the principal contractor (if any) for any building work and a telephone number on which that person may be contacted outside working hours, and
- (c) stating that unauthorised entry to the work site is prohibited.

REASON: To comply with Council's statutory requirements.

GENERAL

13. All works associated with the construction of the development (not operation of the proposal post Occupation Certificate), involving electric or pneumatic tools, or other noisy operations, shall be restricted to the following hours:

Monday to Friday	7am to 7pm
Saturday	8am to 6pm
Sunday/Public Holidays	Nil

Advice: All noise generating activities are subject to the requirements of the protection of the Environment Operations Act 1997. This condition of consent does not relieve the applicant including developers, contractors or their agents from the requirements under the relevant noise control legislation.

REASON: Statutory Requirement

14. Any damage caused to Council's infrastructure including but not limited to footpaths, roads, drainage, Kerb and Gutters, laybacks or other public land shall be restored in accordance with Council's Design Specifications at the full cost to the developer. Where a dispute arises over the person(s) responsible for the damage, Council shall reserve the right to carry out work to remedy such damage(s) at the applicants cost.

REASON: To comply with Council's requirements.

15. The applicant shall install suitable protection to ensure that damage to Council infrastructure does not occur during the construction phase of the development.

REASON: To comply with Council's requirements.

16. No materials or machinery to be used in the construction of the building shall be stored or stacked on Council's footpath, nature strip, public defined land or roadway.

REASON: To comply with Council's requirements.

17. During construction of the proposed building or structure no construction vehicles are to be parked on roads / rear lane ways as to restrict traffic flow and or access to allotments.

REASON: To comply with Council's requirements.

18. The applicant shall not burn waste material, felled trees or other material on the said land. All waste materials shall be directed to a Narrabri Local Government Area waste management or other approved facility.

REASON: To comply with Council's requirements.

19. The applicant shall provide at least forty-eight (48) hours notice be given to Council when any inspection is required.

REASON: To comply with Council's requirements.

ENGINEER'S DETAIL

20. That certification of the proposed work(s) be supplied by a qualified practising Structural or Civil Engineer at the completion of works, certifying that the work(s) have been carried out under their supervision and to their requirements.

REASON: To comply with Council's requirements.

21. The applicant shall provide engineers design details for the structure (slab/footings/steel frame) to Council by a suitably qualified and professional Engineer prior to the issue of a Construction Certificate.

REASON: To comply with Council's requirements.

DRAINAGE

22. The site shall be prepared so as to effectively divert surface water away from and around the building.

In this regard, Council may require permanent surface or subsoil drains or a combination of both, to all excavated areas and depressions and the invert of such drains shall be a minimum of 200mm below finished habitable floor level and shall have a minimum grade of 1:100 to the stormwater system or to a point satisfactory to Council's Officer.

REASON: To comply with Council's requirements to ensure the site/buildings are adequately protected from storm water.

CLASS 2/9 BUILDINGS

23. The applicant shall provide a Fire Safety Certificate to indicate compliance with the Fire Safety Schedule.

REASON: To comply with the Building Code of Australia.

24. That at least once in each period of twelve months after a certificate is required to have been submitted to Council pursuant to Section E of the Building Code of Australia. The owner of the building shall submit to Council a further certificate with respect to each fire safety measure installed in the building.

REASON: To comply with the Building Code of Australia.

25. The building shall be provided with access and facilities for disabled persons in accordance with Part D3 and Part F2.4 of the Building Code of Australia, Australian Standard AS1428.1 Part 1: General Requirements for Access Buildings.

REASON: To comply with the Building Code of Australia.

SECTION 94 CONTRIBUTIONS

26. Pursuant to Section 80(1) of the Environmental Planning and Assessment Act 1979 and the Narrabri Local Government Area Section 94A development contributions plan, a contribution of **\$28,800.00** shall be paid to Council prior to the issue of any interim or final occupation certificate for the development.

The amount to be paid is to be adjusted at the time of the actual payment, in accordance with the provisions of the Narrabri Local Government Area Section 94A plan. The contribution is to be paid prior to the issue of an occupation certificate. 55

REASON: To comply with Council requirements

LIABILITY

27. The applicant shall indemnify Council against any and all actions, suits and claims of whatsoever nature resulting in injury to person or persons or damage to property other than that owned by the applicant and providing a declaration to this effect to the satisfaction of Council and the applicant providing Council with proof of adequate public liability insurance coverage.

REASON: To comply with Council's requirement for insurance coverage against claims.

ENVIRONMENTAL

28. The applicant shall install, prior to the commencement of construction, adequate sediment and soil erosion controls in accordance with the requirements of the Department of Environment & Climate Change (DECC) requirements. All sediment is to be controlled onsite including the transport of sediment from vehicular tyres and machinery.

REASON: To comply with Council's statutory requirements.

CONSTRUCTION

GENERAL

29. At least forty-eight (48) hours notice be given to Council when any building inspection is required.

REASON: To comply with Council's requirements.



Operations Centre Expansion, 300 Yarrie Lake Road, Narrabri

Statement of Environmental Effects

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Version / Date: Rev 0/December 2012

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Document Status

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Approval for Issue

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Belinda Lewis		17/12/2012

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Appendix 2	Plans
Appendix 3	Traffic Impact Assessment
Appendix 4	Ecological Assessment
Appendix 5	Cultural Heritage Due Diligence Assessment
Appendix 6	Services Report
Appendix 7	Stormwater Quality Management Plan
Appendix 8	SEPP 33 Assessment

I.0 INTRODUCTION

This Statement of Environmental Effects (SEE) has been prepared by RPS Australia East Pty Ltd (RPS), on behalf of Santos to accompany a development application (DA) to Narrabri Shire Council for the expansion of their existing operations centre located at 300 Yarrie Lake Road, Narrabri (the proposal). The site is formally described as Lot 241 DP 1120041.

The proposed works will include:

- clearing and site preparation works
- construction of a warehouse, storage building and ancillary office space
- construction of a hard stand pipe casing wash area and associated drainage
- construction of external hardstand storage (laydown) area
- ancillary stormwater drainage, servicing and access works.

I.1 Applicant

The applicant for this DA is Santos.

I.2 Consent Authority

The proposal is located on land to which the *Narrabri Local Environmental Plan 1992* (NLEP) applies. Clause 7 of the NLEP provides that the Narrabri Shire Council is the consent authority for the purpose of the NLEP.

I.3 Structure of the Report

This SEE describes the proposal in detail, together with an assessment of potential impact as required under the EP&A Act. This report is divided into five subsequent sections.

- | | |
|-----------|--|
| Section 2 | describes the site, its location, ownership, existing conditions and key site issues |
| Section 3 | describes the proposal |
| Section 4 | assesses the planning context of the proposal by examining conformity with prevailing planning instruments |
| Section 5 | summarises the potential environmental effects of the proposal |
| Section 6 | concludes the statement of the environmental effects. |

2.0 SITE LOCATION AND DESCRIPTION

2.1 Site Description and Location

The site is located at 300 Yarrie Lake Road, Narrabri and is formally described as Lot 241 DP1120041. It is located approximately 5 kilometres west of the Narrabri town centre, within an area characterised by large allotments with occasional large sheds and buildings. The site is rectangular in shape, with a south east orientation and an area of 6.3 hectares (ha). Refer to the locality plan in Figure 2-1 and survey plan in Appendix 1.

The nearest residential area of Narrabri located approximately 1.5 kilometres east of the site.

The Narrabri Garbage Tip is located approximately 400m to the north west of the site. The Mungindi railway line is located approximately 440m to the north east of the site.

2.2 Existing Uses and Improvements

The existing operations centre was approved by Narrabri Shire Council on 5 December 2007 (DA77/2008). The existing operations include a workshop building with ancillary office and storage areas for pipe casings and other machinery and equipment. The southern half of the site is cleared land and the northern half of the site remains uncleared. An excavated drain spans the width of the site, setback 150m from the site frontage.

The photos below demonstrate the site conditions.



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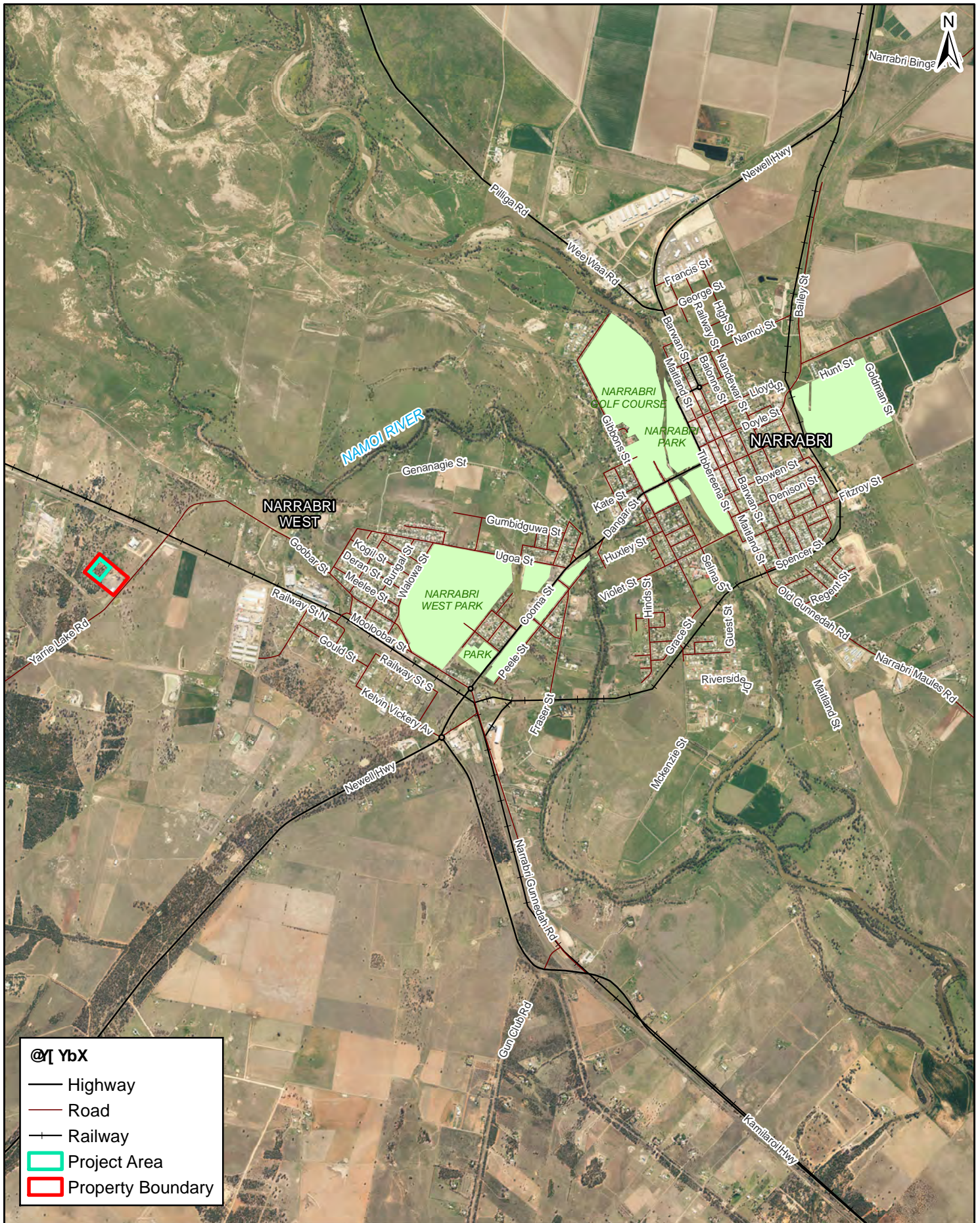


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2.3 Surrounding Traffic and Access

The site is currently accessed via one driveway from Yarrie Lake Road. Yarrie Lake Road is identified as a local road and is aligned in a northwest southwest direction at the site. It is a two-way road configured with a two-lane, six metre wide carriageway.

The nearest State controlled road is the Newell Highway, located approximately 2.6 kilometres to the south east of the site. The Transport Impact Assessment in Appendix 3 provides further detail in relation to the existing road network and traffic conditions.



Client: Santos		@WUJmD'Ub	
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Approved by: BL	Date: 13/12/2012		
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2.4 Site Conditions

Detailed site assessments have been undertaken by RPS ecologists and archaeologists. Assessments of the site conditions are discussed below.

2.4.1 Flora and Fauna

An Ecological Assessment was undertaken over the site by RPS (refer Appendix 4).

No regionally significant or threatened flora species or populations listed under the *Threatened Species Conservation Act 1995* (TSC Act) or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were detected within the study area during the survey period.

One vegetation community was observed within the site being Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodlands, Brigalow Belt South and Nandewar. This community is not commensurate with any threatened ecological community listed under the TSC Act and/or the EPBC Act.

The overall condition of this community was relatively poor throughout the site. This area of woodland exhibits a low floristic diversity this is as a result of a moderate level of disturbance from rural usage including grazing. A moderate level of weed infestation by African Boxthorn (*Lycium formosum*) and Prickly Pear (*Opuntia stricta*) was evident and the ground layer is largely a monoculture of only a few grass species further demonstrating a history of disturbance.

The vegetation offers little habitat in the form of mature canopy trees, hollows for nesting and dwelling, logs, rocks, understorey vegetation and vegetation diversity. There are no permanent water bodies present on site which could support native wildlife particularly amphibians.

The sparse vegetation on site and the garbage tip in close proximity to the site provide suitable foraging habitat for many common bird species throughout various times of day. The site has experienced some visible signs of clearing and grazing which has led to degradation of many ecological attributes. Horses appear to have access to the entirety of the site with their scats, tracks and grazing pressure being noted across the site. This has resulted in increasing the level of disturbance through soil compaction, vegetation degradation and soil nutrient disturbance from faecal matter.

No threatened fauna species listed under the TSC Act and no primary koala feed trees listed under Schedule 2 of the *State Environmental Planning Policy 44* (SEPP 44) were recorded during RPS (2012) surveys. The following fauna were recorded during the survey:

- a total of 22 bird species
- one common reptile species, the Garden Sun Skink (*Lampropholis delicata*.)
- three pest species, namely the Fox (*Vulpes vulpes*), Horse (*Equus ferus caballus*) and Rabbit (*Oryctolagus cuniculus*).

2.4.2 Cultural Heritage

An Aboriginal & European Cultural Heritage Due Diligence Assessment was undertaken over the site by RPS (refer to Appendix 5). The assessment was undertaken in accordance with the *Due Diligence Code of Practice of the Protection of Aboriginal Objects*.

The assessment has included the following investigations:

- Search of the Aboriginal Heritage Information Management System (AHIMS) database which identified

that there were no Aboriginal objects or Aboriginal places within one kilometre of the site.

- Consideration of specific sensitive landforms, including: within 200m of water; within dune systems; on ridge tops and headlands; and immediately above or below cliff faces and/or rockshelters/cave. These landforms were not identified on the site.
- Desktop assessment of previous archaeological and heritage studies in the vicinity of the site.
- A visual inspection of the site was undertaken and no Aboriginal objects were identified.

The assessment found that there are no Aboriginal objects or European (historic) heritage sites within the site.

3.0 PROPOSED DEVELOPMENT

3.1 Overview of the Proposal

The proposal involves the expansion of the existing operations centre at 300 Yarrie Lake Road, Narrabri to establish the Santos Logistics Centre.

The proposed expansion is to include the following:

- clearing and site preparation works
- construction of a warehouse, storage building and ancillary office space
- construction of a hard stand pipe casing wash area and associated drainage
- construction of external hardstand storage (laydown) area
- ancillary stormwater drainage, servicing and access works.

An internal access path and additional vehicular crossover at the south eastern corner of the site on Yarrie Lake Road is also proposed.

3.2 Staging

Construction of the proposal is to be staged as follows:

Stage 1:

- clearing of approximately 2.07 ha of vegetation;
- site preparation works, including levelling and filling with imported engineered material.

Stage 2 consists of:

- construction of the warehouse, storage building and office space
- construction and installation of the servicing and vehicular access.

3.3 Configuration and Built Form

Plans illustrating the proposal are contained in Appendix 2. The following table provides the key built form parameters of the proposal.

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Office	126 sqm
Warehouse	1195 sqm
Amenities	42 sqm
Storage building	602 sqm
HCH5 @	% *) `gea '
< YJ[\ h]b'GfcfYng'	1 storey
7 Uf'DUf_]b['	10 formal spaces, including 1 disabled space Significant areas of hardstand to cater for additional car parking

3.3.1 Site preparation and earthworks

The expansion will require clearing of approximately 2.07 hectares of land to the immediate north of the existing operations centre.

The site will require levelling, with bulk earthworks to be balanced cut and fill. The site will be finished with approximately 200 mm of engineered fill.

3.3.2 Access and Parking

GTA Consultants have conducted an assessment of the anticipated transport and access implications of the proposal (Appendix 3).

The current Santos Operations Centre has no formal line marked car parking spaces however site observations indicate that adequate space is available for parking within an area located between the main office building and Yarrie Lake Road. In addition, parking for company vehicles and equipment is also located along the boundaries of the site.

A spot count of the car park was undertaken by GTA Consultants at 3:00pm on 19 September 2012. It indicates an existing on-site car parking demand of up to 20 vehicles. It is also understood that peak parking demand during a busy period can see up to 40 vehicles parked on-site.

The proposal incorporates additional formal line marked on-site parking, including 10 spaces (including 1 disabled) at the front of the proposed office space. Additional hardstand area will also provide for informal parking, as required.

Access to the site is to be provided via Yarrie Lake Road. An additional 12m wide two-way vehicular crossover is proposed to provide an exit for the new internal site circulation road. A two-lane one-way 12m wide clockwise circulation road is proposed within the site to allow 25m B-double trucks to circulate within the site and exit the site in a forward direction.

Santos will seek approval under section 138 of the Roads Act 1993 for proposed works within Yarrie Lake Road. Preliminary details of these works are provided in Appendix 2.

3.3.3 Servicing & Stormwater Management

Details of servicing are outlined in the attached Servicing Report (Appendix 6). The site will be serviced by reticulated water, an on-site sewage treatment system, fibre optic cabling and electricity. Augmentation of existing services will be undertaken where necessary.

The proposal includes on-site stormwater management, which is discussed in Appendix 7. To improve the stormwater quality leaving the site, the proposal includes rainwater tanks and a sediment basin. The rainwater tanks will be located at the rear of the storage facility. The sediment basin is to be constructed at the northwest corner of the site.

Santos will seek approval under section 68 of the Local Government Act 1993 (NSW) to connect to council water supply and carry out sewerage and stormwater drainage works. Details for the works are addressed in the attached Services Report (Appendix 6).

3.3.4 Landscaping

There is existing juvenile landscaping along the frontage of the property, which when established will provide sufficient screening of the site from Yarrie Lake Road. No additional landscaping is considered necessary.

3.3.5 Staff and Hours of Operation

The proposal will not result in additional permanent staff at the site, however additional contract workers will access the site regularly throughout the day.

Access to the site will predominantly be between the hours of 6am and 6pm, however the site will be available to contractors 24 hours per day if required.

3.3.6 Materials and Finishes

The proposed building is a warehouse, office and storage shed separated in the middle of the building by a covered vehicular canopy. As illustrated in the plans in Appendix 2, the proposal employs monoclاد wall sheeting with a colorbond finish, monoclاد roof sheeting with a zincalume finish, steel angle screens and aluminium framed glazing.

3.3.7 Storage area

The proposal incorporates 602 sqm of storage area, which may be used to store dangerous goods. The facility is capable of holding 150 pallets of chemicals required for Santos' drilling activities. The design of the storage facility provides forklift access with two roller doors on the southeast corner of the building.

4.0 REGULATORY CONTEXT

4.1 Commonwealth Legislation

4.1.1 Environmental Protection and Biodiversity Conservation Act

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) provides for the protection of certain Matters of National Environmental Significance (MNES) listed under the Act, which include:

- World Heritage Areas
- National Heritage Places
- Ramsar wetlands of international importance
- Commonwealth listed threatened species and ecological communities
- listed migratory species
- Commonwealth marine areas
- Great Barrier Reef Marine Park
- nuclear actions.

Under the EPBC Act, a proposed action that is likely to be a 'controlled action' must be referred to the Minister for Sustainability, Environment, Water, Population and Communities (Commonwealth Minister) for a determination as to whether the proposed action is a 'controlled action'.

A "controlled action" is an action which is likely to have a significant impact on:

- a MNES; or
- Commonwealth land.

It also includes any action by the Commonwealth (or a Commonwealth agency) which is likely to have a significant impact on the environment.

If the Commonwealth Minister determines that an action is a 'controlled action' then the action may not be undertaken without prior approval from the Commonwealth Minister under the EPBC Act.

An EPBC Act Protected Matters Search Report was generated for a 10 kilometre radius surrounding the site to determine whether any MNES would likely be affected the proposal. Search results can be located in Appendix 4.

The proposal is considered unlikely to impact on any MNES, as detailed in Table 4-1, or the environment on Commonwealth land and is not proposed to be taken by a Commonwealth agency. Therefore, the proposal is unlikely to constitute a controlled action and Santos does not propose to lodge a referral to the Minister.

Table 4-1: Matters of National Environmental Significance (MNES) Search Results

AB9G	Cj Yfj JYk
World Heritage Properties	The proposal is not located in or within close proximity to a World Heritage area.
National Heritage Places	The proposal is not located in or within close proximity to a National Heritage Place.
Wetlands protected by international treaty (the RAMSAR convention)	The proposal is not located within a RAMSAR listed wetland area.

AB9G	Cj Yf jYk
Nationally listed threatened species and ecological communities:	<p>Twenty threatened species listed under the EPBC Act have been recorded within a 10 kilometre radius of the site.</p> <p>None of the species listed were recorded during the field surveys. The likelihood of occurrence and potential impact of the abovementioned species was assessed in the Ecological Assessment. It is considered unlikely that the proposal would have a significant impact on any of the species.</p> <p>No threatened Ecological Community listed under the EPBC Act was recorded on the site. These ecological communities were assessed in the Ecological Assessment. It is considered unlikely that the proposal would have a significant impact on any of the species.</p>
Migratory species	Ten migratory bird species listed under the EPBC Act were identified having the potential to occur on site. None of these species were identified during the field surveys. Impacts to these species are considered unlikely.
Commonwealth marine areas	The proposal would not impact any Commonwealth marine areas.
Great Barrier Reef Marine Park	The proposal would not impact the Great Barrier Reef Marine Park.
All nuclear actions	The proposal does not involve a nuclear activity.

4.2 NSW Legislation

The proposal requires formal assessment under the EP&A Act. As discussed in section 4.2.1.4 below, the proposal is permissible with development consent. An application for development consent under Part 4 of the EP&A Act must be made to the consent authority, which in this case is Narrabri Shire Council.

4.2.1 Environmental Planning and Assessment Act 1979

4.2.1.1 State Environmental Planning Policy No 33 – Hazardous and Offensive Development

This policy presents a systematic approach to planning and assessing proposals for potentially hazardous and offensive development for the purpose of industry or storage.

In order to assess if the proposal is considered a hazardous or offensive development, the proposal must undertake a screening method. The screening method assists consent authorities in determining whether a proposal is potentially hazardous and thus affected by SEPP 33.

JT Environmental Pty Ltd has conducted an assessment of the materials proposed to be stored on-site (Appendix 8). The report concludes the hazardous substances and dangerous goods to be used or stored within the site do not meet the stated volumetric thresholds calculated during the SEPP 33 screening process. The types of materials associated with the site are stored in appropriate packages for the materials. The site is significantly removed from any sensitive receptors. Therefore, the proposal is not considered hazardous or potentially hazardous development and a SEPP 33 application is considered unnecessary.

4.2.1.2 State Environmental Planning Policy No 44 – Koala Habitat Protection

The *State Environmental Planning Policy No 44 – Koala Habitat* (SEPP 44) applies to this proposal. Clause 5 of the SEPP Koala Habitat provides that the policy applies to the Narrabri LGA because it is listed in Schedule 1. Clause 6 of SEPP 44 provides that where development is proposed on land to which clause 5 applies, and the proposal is on land of more than one hectare, the SEPP 44 applies to the proposed development.

Before granting consent to carry out development on land to which the SEPP 44 applies, the Narrabri Shire Council must satisfy itself that the site is a koala habitat from information obtained by it, or from information provided by the proponent or from a person who is qualified and experienced in tree identification. If the council is satisfied that the land is a potential koala habitat, it must comply with clause 8 and determine whether the proposal will be carried out on core koala habitat. Council may only grant development consent on land which is found to be core koala habitat if it is satisfied that a plan of management is in place as provided by Part 3 of the SEPP 44.

No Koalas or traces of Koalas such as scats or scratches on tree trunks were observed within the site during the ecological field surveys (refer Appendix 4). As no Koalas, or signs of Koala occupation were observed on the site and it lacked primary feed tree species, it has been determined that the site does not provide 'Core' or 'Potential' Koala habitat according to SEPP 44. Therefore, a Koala plan of management is not required.

4.2.1.3 State Environmental Planning Policy No 55 – Remediation of Land

This policy introduces state-wide planning controls for the remediation of contaminated land. It states that land must not be developed if it is unsuitable for a proposed use because it is contaminated. If the land is unsuitable, remediation must take place before the land is developed. The policy makes remediation permissible across the State, defines when consent is required, requires all remediation to comply with standards, ensures land is investigated if contamination is suspected, and requires councils to be notified of all remediation proposals.

The site currently operates as an existing operations centre. The proposal is to expand this use. As such it is unlikely that there would be any contamination that would render the site unsuitable for the proposed use. Notwithstanding, a search of the Environment and Heritage List of NSW contaminated sites and the Contaminated Land: Record of Notices was carried out on 13 December 2012 with no records pertaining to the subject site or surrounding land.

4.2.1.4 Narrabri Local Environmental Plan 1992

The *Narrabri Local Environmental Plan 1992* (NLEP) is the principal environmental planning instrument applying to the proposal.

The relevant clauses in the NLEP are considered below.

Zoning and Permissibility

Under the NLEP the site is zoned Rural 1(a) Zone. The objective of the Rural 1(a) Zone is to promote the proper management and utilisation of resources.

Development that is allowed only with development consent is any development other than that which is prohibited or allowed without development consent. As the proposed use of an operations centre is not listed as a prohibited development, or a development that is allowed without development consent, the proposal is therefore permissible with development consent.

The objectives of this zone are detailed in Table 4-2.

HUV'Y (!&'FYgdcbgY'fc'fY'Yj UbhNcbY'CV'WVj Yg'

NcbY'CV'WVj Yg'	FYgdcbgY'
U'ldfchWVj b['ZYb\ UbVj b['UbX'W'bgYfj]b[.'	
(i) agricultural land in a manner which sustains its efficient and effective agricultural production potential,	<ul style="list-style-type: none"> The proposal seeks to expand the existing operations centre use on site. The site is not currently used for agricultural purposes and has no value as such.
(ii) soil stability by controlling and locating development in accordance with soil capability,	<ul style="list-style-type: none"> The proposal incorporates appropriate drainage and erosion and sediment control to ensure no impacts to soils.
(iii) forests of existing and potential commercial value for timber production,	<ul style="list-style-type: none"> The proposal would not impact on the forestry industry.
(iv) valuable deposits of minerals, coal, petroleum and extractive materials by controlling the location of development for other purposes in order to ensure the efficient extraction of those deposits,	<ul style="list-style-type: none"> The proposal is being established to facilitate the exploration of CSG resources in the region.
(v) trees and other vegetation in environmentally sensitive areas where the conservation of the vegetation is significant to scenic amenity or natural wildlife habitat or is likely to control land degradation,	<ul style="list-style-type: none"> The proposal will require removal of some non-significant vegetation. The site has been surveyed by an RPS ecologist and it has been concluded that the development will not impact any significant habitats, threatened species or ecological communities, nor would it involve the removal of any trees which are significant in terms of scenic amenity.
(vi) water resources for use in the public interest,	<ul style="list-style-type: none"> N/A
(vii) areas of significance for nature conservation, including areas with rare plants, wetlands and significant habitats, and	<ul style="list-style-type: none"> The site has been surveyed by an RPS ecologist and it has been concluded that the development will not impact any significant habitats, threatened species or ecological communities.
(viii) places and buildings of archaeological or heritage significance, including the protection of Aboriginal relics and places,	<ul style="list-style-type: none"> A cultural heritage survey has been carried out by an RPS heritage consultant and it has been concluded that the development will not impact on any items or sites of Aboriginal or non-Aboriginal significance.
fW'ldfYj Ybhj b['h Y' b' ghjYX'XYj Y'cda YbhcZ U' f]W' 'hi fU' UbX'Z'f' di fdcgYg'ch Yf' h Ub' U' f]W' 'hi fYz	<ul style="list-style-type: none"> The land has not been in agricultural production for a number of years and has no value as such. The site is currently being utilised as an operations centre. The proposal is to expand that use.
fW'ldfYj Ybhj b['fYg]XYbhjU'XYj Y'cda YbhcZdf]a Y'Wcd' UbX'dUgh fY' UbXZYI Wdhk \ YfY'h]g'UbWj' U'fmitc' U' f]W' 'hi fY'cf'Ubch Yf'i gY'dYfa]gg]VY'j b'h YncbYz	<ul style="list-style-type: none"> The site is not considered prime crop or pasture land.
fK'Z'WVj]HUj b['ZUfa 'UX' gla Ybfgz	<ul style="list-style-type: none"> N/A
fW'Z'Ybgi f]b['h U'UbmiU'cha YbhWYU'X'Z'f'Ub']bhYbg]j Y'U' f]W' 'hi fU' di fgi]h]g'dchYbhjU'miWUdU'Y'cZ gi ghj]b]b['U'fUb[Y'cZgi W' di fdcgYg'cf'ch Yf' U' f]W' 'hi fU' di fdcgYgZ	<ul style="list-style-type: none"> N/A
fZ'a]b]a]g]b['h Y'W'ghitc'h Y'W'ca a i b]micZ'	
(i) fragmented and isolated development of rural land, and	<ul style="list-style-type: none"> N/A
(ii) providing, extending and maintaining public amenities and services.	<ul style="list-style-type: none"> There will be no impact to public amenities or services.

General Considerations for Development within Rural Zones

Clause 10 of the NLEP details general considerations for development within rural zones. These considerations have been outlined and responded to in Table 4-3 below.

WU'Y('! 'FYgdcbgY'hc'; YbYfU'7 cbg]XYfU]cbg'Zf'8 Yj Y'cda Ybhk]h]b'Fi fU'NcbYg'

; YbYfU'7 cbg]XYfU]cbg'Zf'8 Yj Y'cda Ybhi	FYgdcbgY
f'k'k' Y7 ci bW'g\ U''bchV'bgYbhic' Ub'Udd']WU]cb'hc' WUffmici hXYj Y'cda Ybhicb' UbX'k]h]b'NcbY'bc' %fU'cf' %fU' i b'Ygg']h\ Ug' HU_ Yb']bhc' V'bg]XYfU]cbg'Zf'Y'Yj UbiZ'k Y'YZZWicZ'k Y'WUffm]b['ci h'icZ'k U'hXYj Y'cda Ybhicb.	
(a) the present use of the land, the potential use of the land for the purposes of agriculture and the potential of that land for sustained agricultural production,	<ul style="list-style-type: none"> ▪ The present use of the land is for an operations centre. The use of the land will continue.
(b) vegetation, timber production, land capability (including soil resources and soil stability) and water resources (including the quality and stability of water courses and ground water storage and riparian rights),	<ul style="list-style-type: none"> ▪ Refer to the Ecological Assessment at Appendix 4 which concludes that there would be no impacts on significant vegetation. ▪ The proposal will not impact on timber production or soil capability. ▪ The site is not located near a water course. ▪ The activity will not interfere with ground water. ▪ The proposal incorporates a sedimentation basin at the rear of the site to ensure the proposal will maintain or enhance environmental values of any affected receiving waters downstream of the development.
(c) the future recovery of know or prospective areas of valuable deposits of minerals, coal, petroleum, sand, gravel or other extractive materials,	<ul style="list-style-type: none"> ▪ While the site itself is not identified as containing valuable resource deposits, the existing operations centre provides support to the exploration of Coal Seam Gas (CSG) in the Narrabri local government area. The proposed expansion of the operations centre will assist in enhancing valuable resource deposits through further exploration of CSG.
(d) the protection of areas of significance for nature conservation or of high scenic or recreational value, and places and buildings of archaeological or heritage significance, including Aboriginal relics and places,	<ul style="list-style-type: none"> ▪ The land is highly disturbed and there are no areas of ecological, heritage or visual significance on the site.
(e) the cost of providing, extending and maintaining public amenities and services to the land, and	<ul style="list-style-type: none"> ▪ The site is currently serviced. Augmentation of existing services will be undertaken where required.
(f) future expansion of settlements in the locality.	<ul style="list-style-type: none"> ▪ N/A
f'k'5 g'k' Y''Ug'h Y'a UHYg'fYZfYX'hc']b' gi VWU gYf'f'k'k' Y7 ci bW'g\ U''HU_Y']bhc' V'bg]XYfU]cb' h Y'fYU]cbg\]d'cZ'k Y' XYj Y'cda Ybhic' XYj Y'cda Ybhicb' U'X'c']b[' UbX' UbX'cb'c'h Yf' UbX']b' h Y'cWU]mZ']bW' X]b[' h Y' YZZW'g'cZdchYb]U' UYf]U' gdfUhiXf]Zf'	<ul style="list-style-type: none"> ▪ The proposal is not in close proximity to any sensitive receivers. As such, the impacts on adjoining uses would be negligible or minor. ▪ There is potential that dust could drift from the site, affecting air quality in the short term, during construction. Appropriate construction management would minimise any impacts.

Development along Arterial Roads

The site fronts Yarrie Lake Road which is identified as a minor sealed road, therefore this section does not apply to the proposal.

Height of Buildings

The Narrabri LEP does not permit the development of a building containing more than 2 storeys above ground level.

The proposal is for a one storey building and does not exceed the height limit.

Development of Flood Liable Land

The site is not identified in the Section 149 certificate as being affected by flooding.

Land Subject to Bushfire Hazard

The site is not identified in the Section 149 certificate as being affected by bushfire.

4.2.1.5 Draft Narrabri Local Environmental Plan 2012

The *Draft Narrabri Local Environment Plan 2012* (DNLEP) was exhibited from 8 June 2012 till 13 July 2012. The exhibition material was not available to review on Council's website, however discussions with Council's planning staff have indicated that the site will be zoned RU1 Primary Production under the DNLEP.

The objectives of the RU1 zone (as exhibited in the DNLEP) are as follows:

- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- *To minimise the fragmentation and alienation of resource lands.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To allow for non-agricultural land uses that will not restrict the use of other land in the locality for agricultural purposes.*

The proposal is entirely consistent with the objectives of the zone. The site is currently occupied by a non-agricultural use and the proposal is an expansion of the existing lawful operations. It will not impact on the agricultural viability or productivity of the land, or any adjoining land, will not result in the fragmentation of resource lands or result in conflict with any adjoining zones. It is a non-agricultural use that will not restrict the use of other land in the locality for agricultural purposes.

4.2.2 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) sets the framework for the listing of threatened species, populations and ecological communities, and key threatening processes in NSW, and the preparation and implementation of recovery plans and threat abatement plans.

The TSC Act also provides the mechanism for applying for and obtaining licences to take actions, which could result in harm to a threatened species, population or ecological community, or their habitat, or damage to critical habitat.

The field investigations undertaken over the site did not identify any threatened species, communities or habitat as occurring on the site. The proposal is therefore unlikely to impact a threatened species, population or ecological community, or their habitat, or damage critical habitat.

4.2.3 National Parks and Wildlife Act 1974

4.2.3.1 Threatened species

Part 8A of the *National Parks and Wildlife Act 1974* (NPW Act) regulates the undertaking of activities, which may impact on threatened species, populations and ecological communities listed under the TSC Act and their habitats. The NPW Act provides that a person must not harm any animal that is a threatened species,

population or ecological community, pick any plant which is part of a threatened species, population or ecological community, damage any critical habitat or damage any habitat of a threatened species, population or ecological community without a licence being obtained under the NPW Act or TSC Act or unless another exception applies.

As stated above, there were no threatened species or communities identified on the site and the proposal will not result in harm to any threatened species, populations or ecological communities.

4.2.3.2 Aboriginal cultural heritage

The NPW Act conserves places, objects and features of significance to Aboriginal people.

It is an offence under the NPW Act to:

- harm or desecrate an object that the person knows is an Aboriginal object except in accordance with an Aboriginal heritage impact permit (AHIP)
- harm or desecrate Aboriginal objects and Aboriginal places except in accordance with an Aboriginal heritage impact permit or where the person can show they exercised due diligence to reasonably determine that no Aboriginal object will be harmed.

Aboriginal Heritage Information Management System (AHIMS) searches and a site inspection was undertaken for the site. No Aboriginal objects or places were identified on the site. Therefore, there is no identified risk of harm to Aboriginal objects and an Aboriginal Heritage Impact Permit (AHIP) is not required for the proposal.

4.2.4 **Heritage Act 1977**

The main objective of the *Heritage Act 1977* (Heritage Act) is to encourage the conservation of the heritage of NSW. The site is not listed on the State Heritage Register under the Heritage Act.

The Heritage Act also prevents impacts on 'relics', which are defined as:

any deposit, artefact, object or material evidence that:

(a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and

(b) is of State or local heritage significance.

Under the Heritage Act, it is an offence to disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an excavation permit.

No items of heritage significance listed under either the NLEP or on the NSW State Heritage Register occur on the site. A number of items of local and State heritage significance occur within the Narrabri LGA, however these are not located in close proximity to the site.

4.2.5 **Protection of the Environment Operations Act 1997**

The primary objective of the *Protection of the Environment Operations Act 1997* (NSW) (POEO Act) is to 'protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development'. The POEO Act requires environmental protection licences (EPLs) be obtained for the carrying out of 'scheduled activities' or pollution of waters.

The proposal does not involve a "scheduled activity" and it is not required to obtain an EPL.

4.2.6 Native Vegetation Act 2003

The *Native Vegetation Act 2003* (NV Act) seeks to encourage revegetation and rehabilitation of land with appropriate native vegetation, provide incentives to landholders to manage native vegetation on their properties and end broad scale clearing, unless it improves or maintains the environment.

The proposal will require the removal of a small area (approximately 2.07 ha) of poor quality vegetation, with a moderate level of weed infestation. This vegetation does not comprise a threatened ecological community and is not considered significant. The proposal is considered to be consistent with the aims of the NV Act.

4.3 Development Control Plans

The following Development Control Plans (DCPs) are relevant to the proposal.

Parking Code

The Parking Code DCP was adopted by Narrabri Shire Council on 19 January 1993 and came into effect on 26 January, 1993.

Annexure 1 of the DCP provides the minimum requirements for parking relating to a range of developments. The following parking rates apply to the site.

Table 4.3.1: Parking Rates

Development	Area (sqm)	Parking Requirement	Number of Spaces
Office	126sqm	1 space / 40sqm LFA	4 spaces
Warehouse	1,195sqm	1 space / 300sqm GFA	4 spaces
Storage	602sqm	1 space/300sqm GFA	2 spaces
Storage (external)	403sqm	1 space/600 sqm GFA*	1 space
.	.	Hatched	% of warehouse

*Due to the operational characteristics of the open storage, the parking rate has been assumed to be half of the warehouse DCP parking rate.

The proposal provides an additional 10 formal line marked parking spaces. Additional hardstand area will service any additional parking demand and the area is considered of appropriate size and layout to cater for the future demands of the site and therefore complies with the Narrabri Shire Council's car parking requirements.

Water Supply to Buildings

Proposed water supply is addressed in the attached Services Report (Appendix 6).

Drainage to Buildings

The Drainage to Buildings DCP ensures that there is adequate provision for the control and disposal of roof waters; to specify the method of disposal of wastes from sanitary fittings; to ensure that Trade Wastes are adequately treated and to specify the method of disposal.

Roof water drainage, sanitary drainage, effluent disposal and trade waste are addressed in the attached Services Report (Appendix 6).

Building Line

The objective of the building line DCP is to ensure the integrity of the streetscape through the provision of an appropriate building setback.

The DCP requires all buildings to be setback a minimum of 6m from the front boundary of an allotment. No works are proposed in front of the existing building on site, which complies with the control.

5.0 ENVIRONMENTAL EFFECTS

The following sections discuss the potential environmental effects of the proposal and the proposed measures to minimise any impacts.

5.1 Cultural Heritage

As previously discussed, field inspections and desktop assessments undertaken over the site did not identify the presence of any Aboriginal objects or places.

The RPS assessment and resultant description of the landscape conforms to the Office of Environment and Heritage (OEH) definition of "disturbed land" as outlined in *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW 2010*. It is reasonable to conclude, in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales 2010*, that there are no known Aboriginal objects or a low probability of objects occurring at the site, and thus unlikely that harm will occur to Aboriginal objects.

5.2 Flora and fauna

The proposal will require the removal of a small area of poor quality vegetation, which does not provide good quality habitat for fauna. As discussed in section 2.4.1, no regionally significant or threatened flora species or populations or threatened fauna listed under the TSC Act and/or the EPBC Act were detected on the site during the field investigations.

The proposal is unlikely to have a significant impact upon any threatened entities listed under the EPBC Act and/or the TSC Act.

5.3 Traffic and Parking Impacts

The proposal is expected to generate up to approximately 15 vehicle trips during peak hour. During peak site operations, it is anticipated that the proposal may generate up to 22 truck movements per day. Refer to Appendix 3 for further detail.

The existing traffic volumes passing the frontage of the site is approximately 60 vehicles in the AM peak hour and 75 in the PM peak hour. This includes traffic attending the existing Santos Operation Centre. Against existing traffic volumes, the additional traffic generated by the proposed development would increase the volume of traffic on Yarrie lake Road, however could not be expected to compromise the safety or function of the surrounding road network.

The intersection of Yarrie Lake Road and the site access is expected to operate with minimal delay and continue to operate at a level of service of A. Sight distances at the intersection are in excess of the requirements set out in Figure 3.3 in Australian Standard, Parking Facilities, Part 2: Off-Street Commercial Vehicle Facilities (AS 2890.2:2002).

5.4 Dust and Noise

The site is located a significant distance from the Narrabri urban area. The establishment and operation of the proposal is not expected to cause any amenity issues for neighbours in relation to noise. No formal noise impact assessment was considered necessary for the proposal given the nature of the proposed operation.

There will be short periods of noise during construction, however this will be a temporary disturbance and will be managed through appropriate construction hours of operation and practices. It is therefore considered unlikely that there will be any adverse impacts in relation to noise as a result of the proposal.

Where necessary, dust suppression will be adequately managed via the use of a water truck during clearing, site preparation and construction.

5.5 Fire

All the buildings will comply with BCA standards. All potential fuel sources and potentially flammable materials will be contained within approved storage areas and located so as not to contribute to fire risk nor impede fire fighting efforts.

Access for fire fighting operations should they be required is of good quality and no impediments to the efficient entry and exit of fire fighting vehicles and personnel are apparent.

5.6 Water Quality

Erosion and sediment control is addressed in the Stormwater Quality Management Plan, located in Appendix 7. To improve the stormwater quality leaving the site, the proposal includes rainwater tanks and a sediment basin. Therefore, it is considered there will be no adverse impacts in regard to water quality as a result of the proposal.

5.7 Soils

The site will require levelling, with bulk earthworks to be balanced cut and fill. The site will be finished with approximately 200 mm of engineered fill. The fill will be certified clean fill, sourced from an appropriately licensed facility.

There will be no adverse impacts to soils associated with the proposed subdivision. A Soil and Water Management Plan has been prepared as part of the Stormwater Management Plan which will be implemented during construction to ensure there are no adverse impacts as a result of the proposal.

5.8 Section 79C (1) – Matters for Consideration

Under the provisions of section 79C(1) of the EP&A Act, in determining a development application, a consent authority is to take into consideration the following matters as are of relevance to the development the subject of the development application.

(a) the provisions of:

- (i) any environmental planning instrument**
- (ii) any draft environmental planning instrument that is or had been placed on public exhibition and details of which have been notified to the consent authority, and**
- (iii) any development control plan**
- (iiia) any planning agreement that has been entered into under section 93F, or any draft planning agreement that a developer has offered to enter into under section 93F**
- (iv) any matters prescribed by the regulations that applied to the land to which the development relates**
- (v) any coastal zone management plan (within the meaning of the Coastal Protection Act 1979)**

The provisions of the relevant environmental planning instruments, draft environmental planning instruments and development control plans have been addressed in section 4. There are no planning

agreements or matters prescribed by the regulations that are relevant to the proposal. There is not a coastal zone management plan which applies to the site.

(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts on the locality:

The impacts of the development have been considered in section 4 and further addressed in this section. This report demonstrates that the development is suitable and acceptable on the site and within the locality.

(c) the suitability of the site for the development

The following attributes of the site make it suitable for the development:

- its existing use as an operations centre
 - its isolated location
 - it is not encumbered by any heritage or natural areas of significance.
-

(d) any submissions made in accordance with this Act or the regulations

There have been no submissions.

(e) the public interest

As this application has considered and complies with the legislation and policy which has been established by the government in consultation with the community and on behalf of the public, it is considered that positive assessment of this application is in the public interest.

6.0 Conclusion

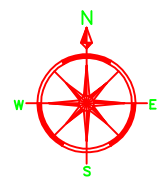
This report has provided an assessment of the proposed expansion of the existing Santos Operations Centre at 300 Yarrie Lake Road, Narrabri. The proposal is permissible with the consent of Council under the NLEP.

The site was found to be unconstrained in terms of heritage, ecology or adjoining uses and is considered to be highly suitable for the proposed purpose. The potential environmental effects of this development are considered negligible.

The proposal represents an efficient and orderly development of the land and is consistent with State and local planning instruments and local planning controls.

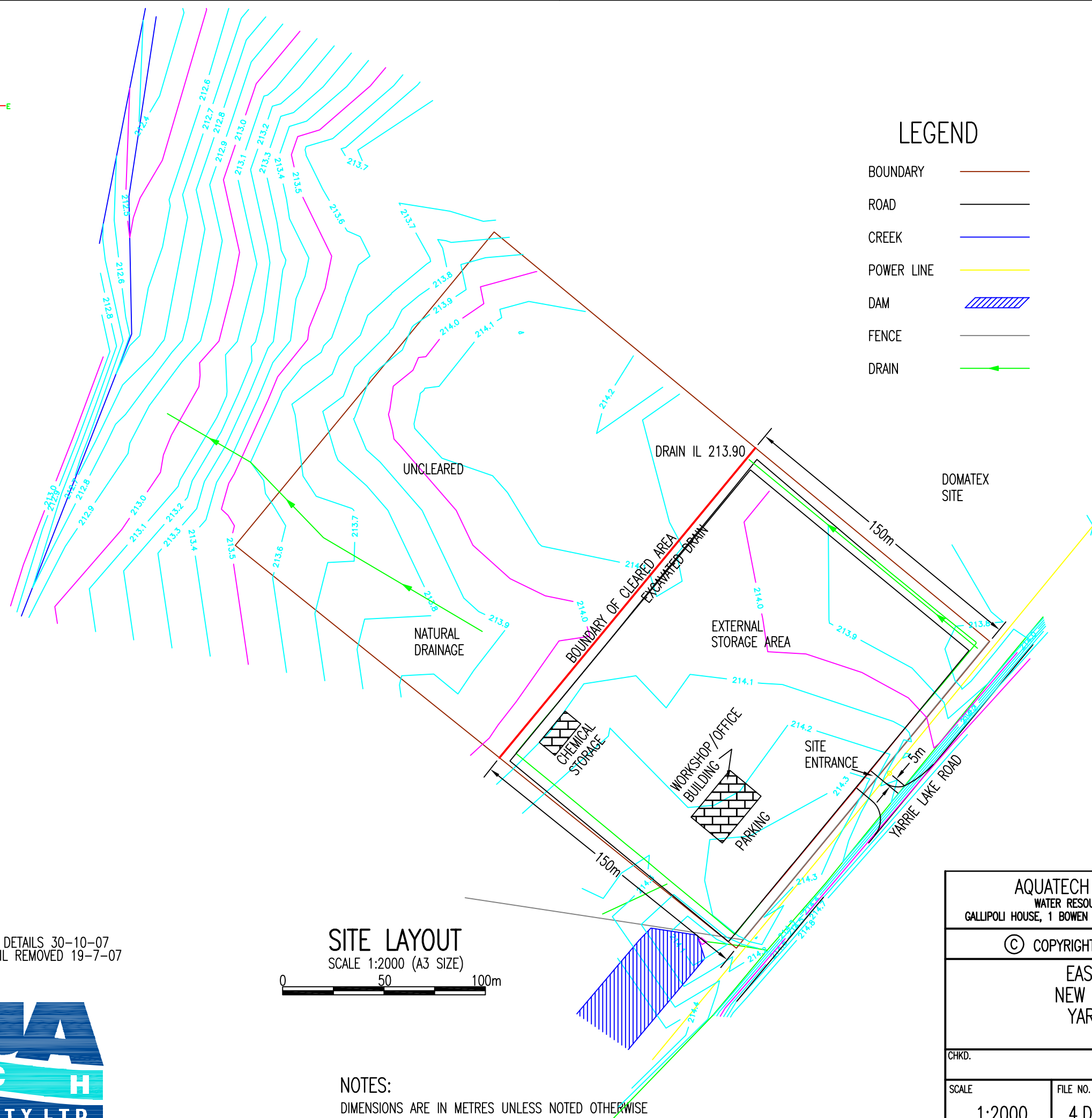
Appendix I

Survey



LEGEND

BOUNDARY	
ROAD	
CREEK	
POWER LINE	
DAM	
FENCE	
DRAIN	

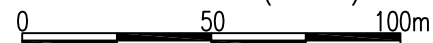


AMDT. C PLAN UPDATED WITH SITE DETAILS 30-10-07
AMDT. B BUILDING AND ROAD DETAIL REMOVED 19-7-07
AMDT. A ORIGINAL ISSUE 19-7-07



SITE LAYOUT

SCALE 1:2000 (A3 SIZE)



NOTES:

DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE

AQUATECH CONSULTING PTY LTD
WATER RESOURCES AND IRRIGATION ENGINEERS
GALLIPOLI HOUSE, 1 BOWEN STREET NARRABRI N.S.W. 2390 PH.(02)67921265

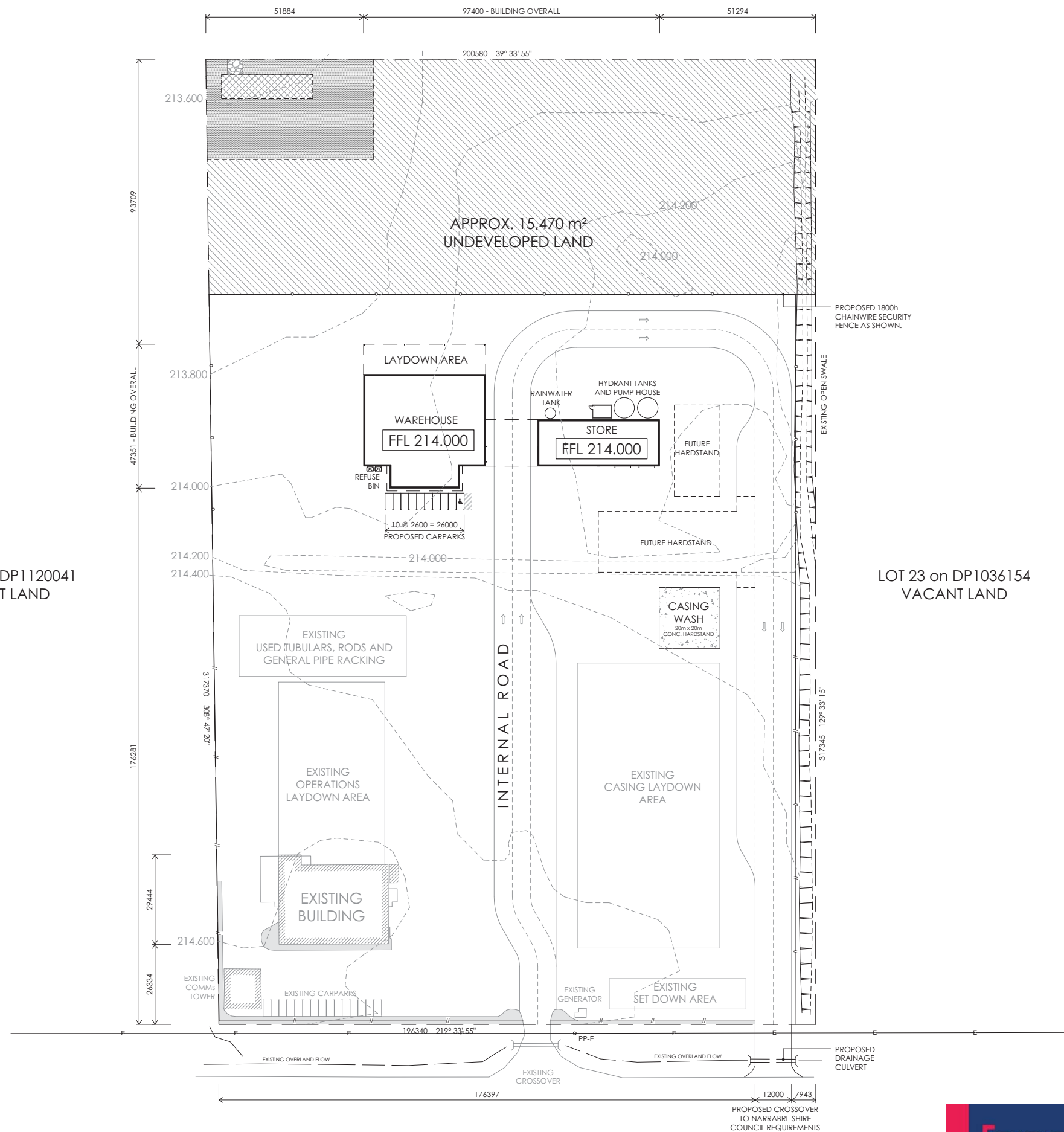
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EASTERN STAR GAS
NEW WAREHOUSE SITE
YARRIE LAKE ROAD
NARRABRI

CHKD.	APPRD.	DRAWN	B.M.
SCALE	FILE NO.	DRAWING NO.	AMDT.
1:2000	4.DWG	0776-4	C

Appendix 2

Plans



GENERAL NOTES

INDUSTRIAL CROSS OVERS TO BE CONSTRUCTED AS PER LOCAL AUTHORITY STANDARD DETAILS DRAWINGS.

150MM WIDE CONCRETE KERBING TO CAR PARK AND DRIVEWAY PERIMETER - WHERE SHOWN.

PROVIDE DISABLED ACCESS FROM CARPARK TO BUILDING RAMPS TO BE MAX. GRADES OF 1:20 ACROSS CAR TURNING AREA WITH MAX. 3MM STEP UP FROM RAMP TO FLOOR TO COMPLY WITH A.S. 1428. 1-2001.

ALL RAMPS FROM CARPARK TO TENANCY ENTRY DOORS TO BE 1:14 MAXIMUM GRADIENT.

LEGEND

- 27.000 EXISTING CONTOUR
- PP-E EXISTING LIGHT POLE
- DPH DUAL PILLAR HYDRANT
- EXISTING OVERLAND FLOW
- E-E EXISTING ELECTRICAL
- EXISTING FENCING
- PROPOSED FENCING
- EXISTING LANDSCAPING
- UNDEVELOPED LAND
- 20m WIDE GRASSED BUFFER
- SEDIMENTATION BASIN
- SCOUR PROTECTION

SITE INFORMATION

LOT 241 on DP1120041	62979 m ²
TOTAL FLOOR AREA	1964 m ²
GROUND FLOOR	
Amenities	42 m ²
Office	126 m ²
Store	602 m ²
Warehouse	1195 m ²
TOTAL CARPARKS	25

SITE PLAN

(A1) 1:750

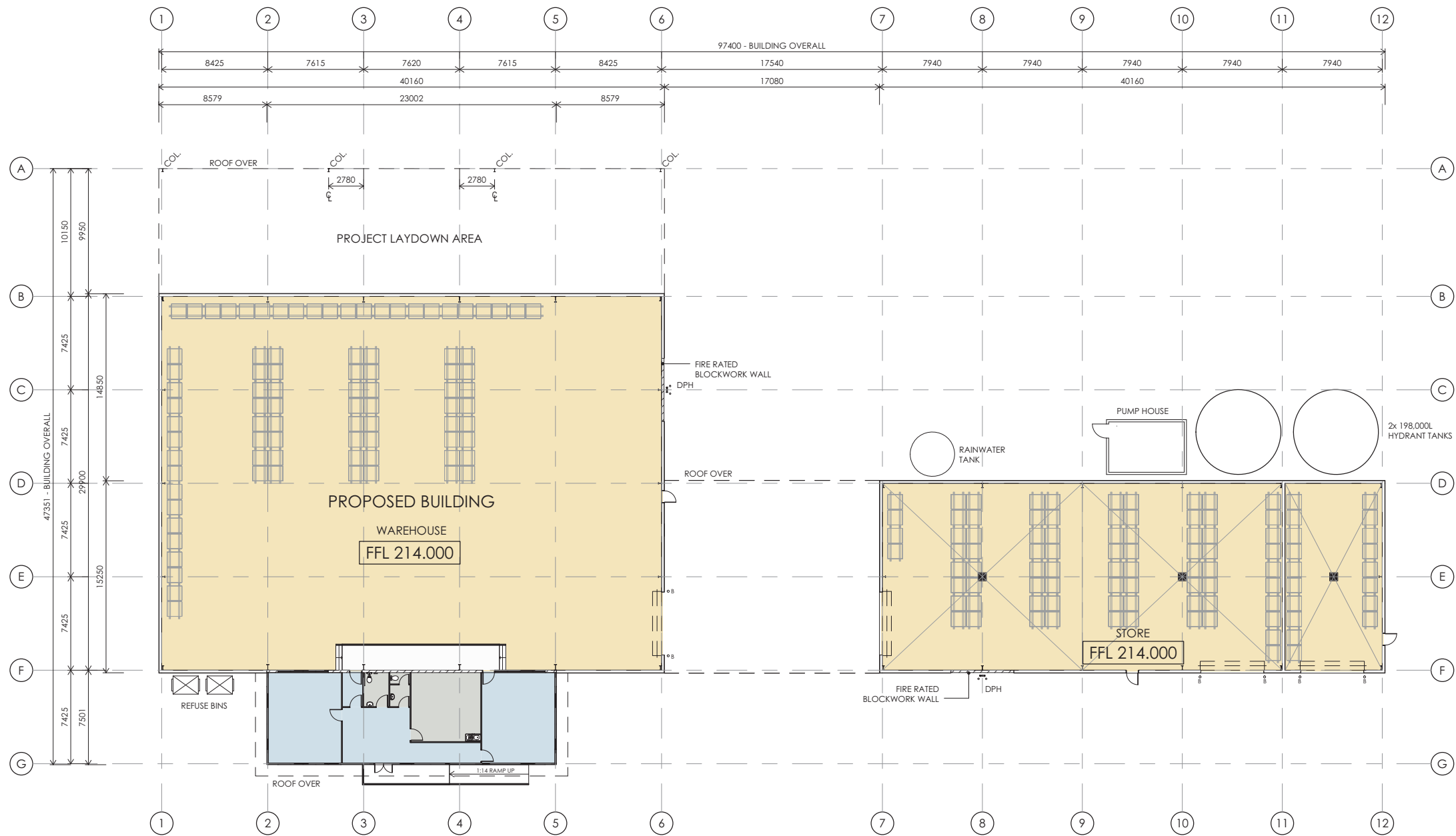
YARRIE LAKE ROAD

**space
frame**
DESIGN + CONSTRUCT SOLUTIONS

SITE PLAN SANTOS

NARRABRI LOGISTICS SUPPLY BASE
YARRIE LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 020 - 4
DATE 12.12.2012



GENERAL NOTES

- REINFORCED CONCRETE TILT UP PANELS TO COMPLY WITH 8.C.A. PART C 1.11
- IN ACCORDANCE WITH G 1.2 OF THE B.C.A. EXITS TO ALL FREEZER/COLDROOM AREAS WILL HAVE:
1. MANUALLY OPERATED TURN KEY BELLS.
 2. EMERGENCY RELEASE PIN WHICH ALLOWS DOORS TO BE OPENED FROM INSIDE.
- INTERNAL PARTITIONS TO BE 64mm RONDO STEEL STUD WITH PAINTED 10mm PLASTERBOARD LINING 10mm WATER RESISTANT PLASTERBOARD TO WET AREAS.
- ALL SANITARY COMPARTMENTS TO BE MECHANICALLY VENTILATED TO COMPLY TO BCA C1 F4.5(b) BY AIR-CONDITIONING CONTRACTOR.
- WALLS IN WET AREAS NEXT TO TILT PANEL WALLS TO BE ISOLATED OFF PANEL BY 10mm AND ALLOW FOR VERTICAL MOVEMENT.

LEGEND

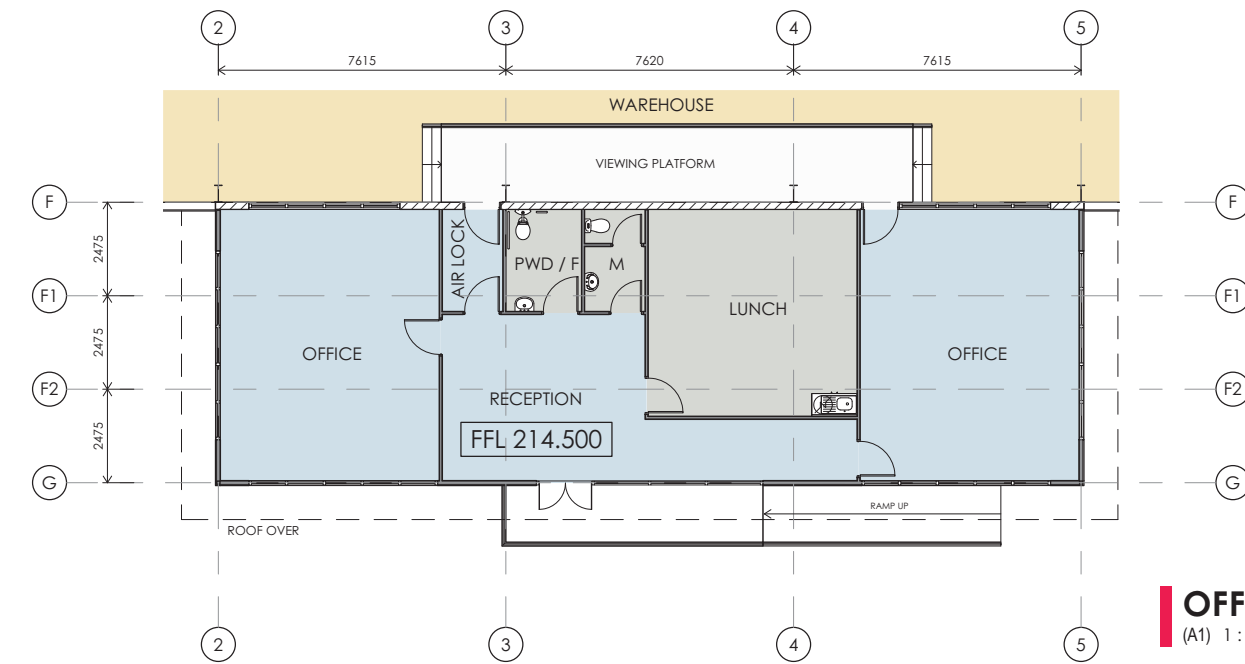
- UNDER BENCH WATER HEATER
- DPH DUAL PILLAR HYDRANT
- BLOCKWORK WALLS
- STEEL GIRT
- STUD WALL
- BOLLARD

BUILDING INFORMATION

TOTAL FLOOR AREA	1964 m ²
GROUND FLOOR	
Amenities	42 m ²
Office	126 m ²
Store	602 m ²
Warehouse	1195 m ²

GROUND FLOOR PLAN

(A1) 1 : 200



OFFICE FLOOR PLAN

(A1) 1 : 100



FLOOR PLAN SANTOS

NARRABRI LOGISTICS SUPPLY BASE
YARRI LAKE ROAD, NARRABRI NSW 2390
DWG N° 978 - 021 - 4
DATE 12.12.2012

BUILDING OVERALL
7345
EAVES (WAREHOUSE)
6500
EAVES (OFFICE)
4200
GROUND FLOOR (OFFICE)
500
GROUND FLOOR

STEEL ANGLE SCREEN
- HOT DIPPED GALVANISED
ALUMINIUM FRAMED GLAZING
- POWDERCOAT FINISH
MONOCLAD WALL SHEETING
- COLORBOND FINISH
SURFMIST
MONOCLAD ROOF SHEETING
- ZINCALUME FINISH

Santos

SOUTH EASTERN ELEVATION

(A1) 1 : 200

BUILDING OVERALL
7345
GROUND FLOOR

HYDRANT TANKS
PUMP HOUSE
RAINWATER TANK
STRUCTURAL STEEL
- PRIMED FINISH

NORTH WESTERN ELEVATION

(A1) 1 : 200

BUILDING OVERALL
7345
EAVES (OFFICE)
4200
GROUND FLOOR (OFFICE)
500
GROUND FLOOR

MONOCLAD WALL SHEETING
- COLORBOND FINISH
DEEP OCEAN

NORTH EASTERN ELEVATION

(A1) 1 : 200

BUILDING OVERALL
7345
GROUND FLOOR

SOUTH WESTERN ELEVATION

(A1) 1 : 200

space
frame
DESIGN + CONSTRUCT SOLUTIONS

ELEVATIONS SANTOS

NARRABRI LOGISTICS SUPPLY BASE
YARRI LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 022 - 4
DATE 12.12.2012

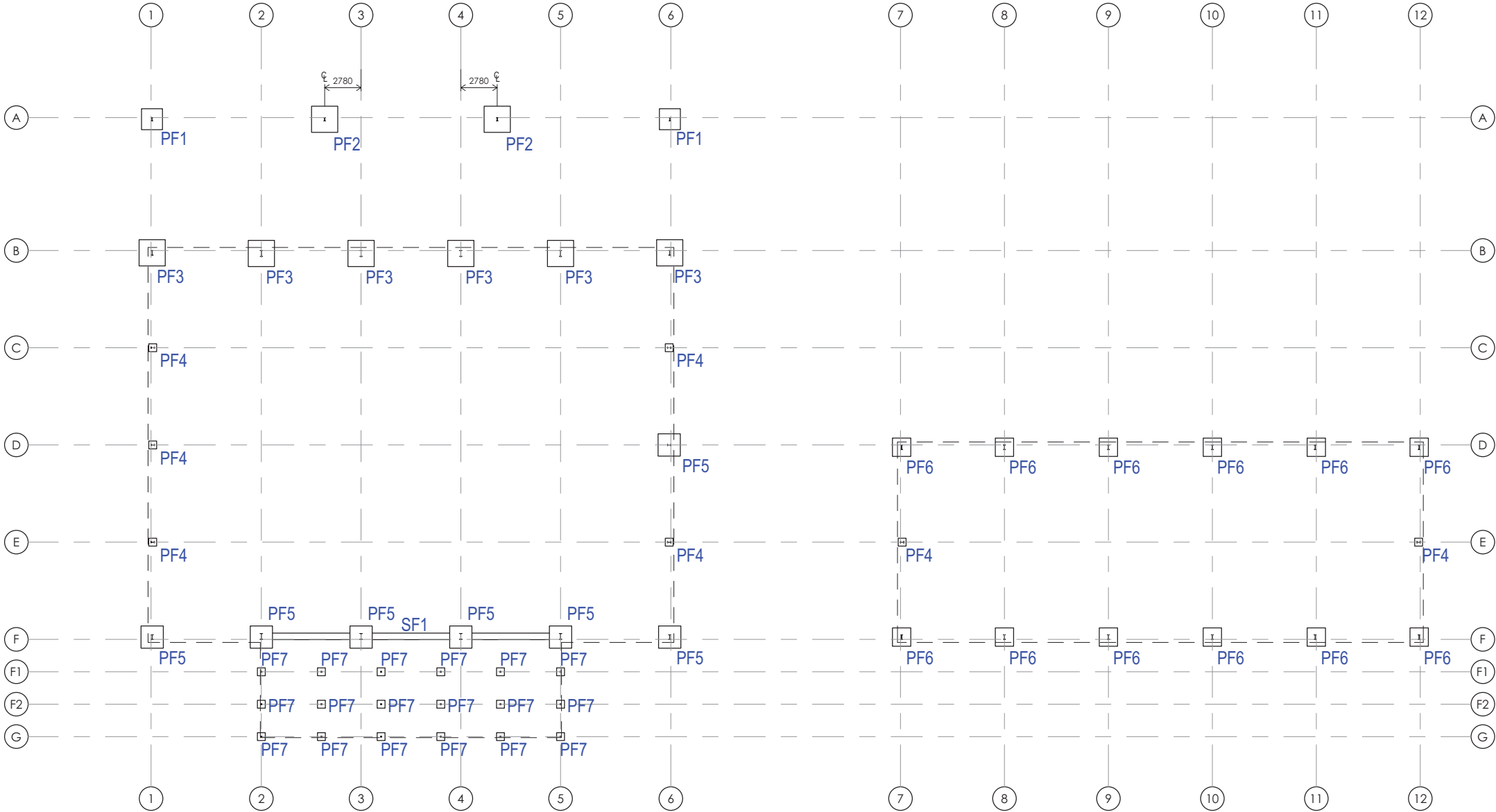


FOOTING NOTES

- UNLESS NOTED OTHERWISE:
1. DRAWING TO BE READ IN CONJUNCTION WITH DETAILS
 2. ALL BLOCKWORK TO BE 200 SERIES
 3. DIMENSIONS ARE TO CENTER OF FOOTING OR FACE OF BLOCKWORK WHERE APPLICABLE. IF NONE SHOWN REFER TO H.D. BOLT LAYOUT
 4. H.D. BOLTS TO SHOP DETAILER'S LAYOUT
 5. ALL FOOTINGS TO BE 300mm BELOW F.F.L. U.N.O. AND 100mm MIN. SAND BACKFILL OVER FOOTINGS.
 6. STRIP FOOTING REINFORCEMENT TO RUN THROUGH PIER FOOTING.

STRIP FOOTINGS SCHEDULE					
MARK	QTY	DIMENSIONS (mm)		REINFORCING	
		WIDTH	DEPTH		
SF1	1	500	600	3 N16 TOP & BOT: R10 LIGS @ 400	

PAD FOOTINGS SCHEDULE					
MARK	QTY	DIMENSIONS (mm)			REINFORCING
		LENGTH	WIDTH	DEPTH	
PF1	2	1600	1600	600	N16 TOP & BOTTOM
PF2	2	2000	2000	600	N16 TOP & BOTTOM
PF3	6	2000	2000	800	N16 TOP & BOTTOM
PF4	7	600	600	600	SL82 MESH, - BOTTOM COVER
PF5	7	1700	1700	800	N16 TOP & BOTTOM
PF6	12	1400	1400	800	N16 TOP & BOTTOM
PF7	18	600	600	750	N16 TOP & BOTTOM



FOOTINGS PLAN

(A1) 1 : 200

**space
frame**
DESIGN + CONSTRUCT SOLUTIONS

FOOTINGS PLAN SANTOS

NARRABRI LOGISTICS SUPPLY BASE
YARRI LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 030 - 2
DATE 12.12.2012



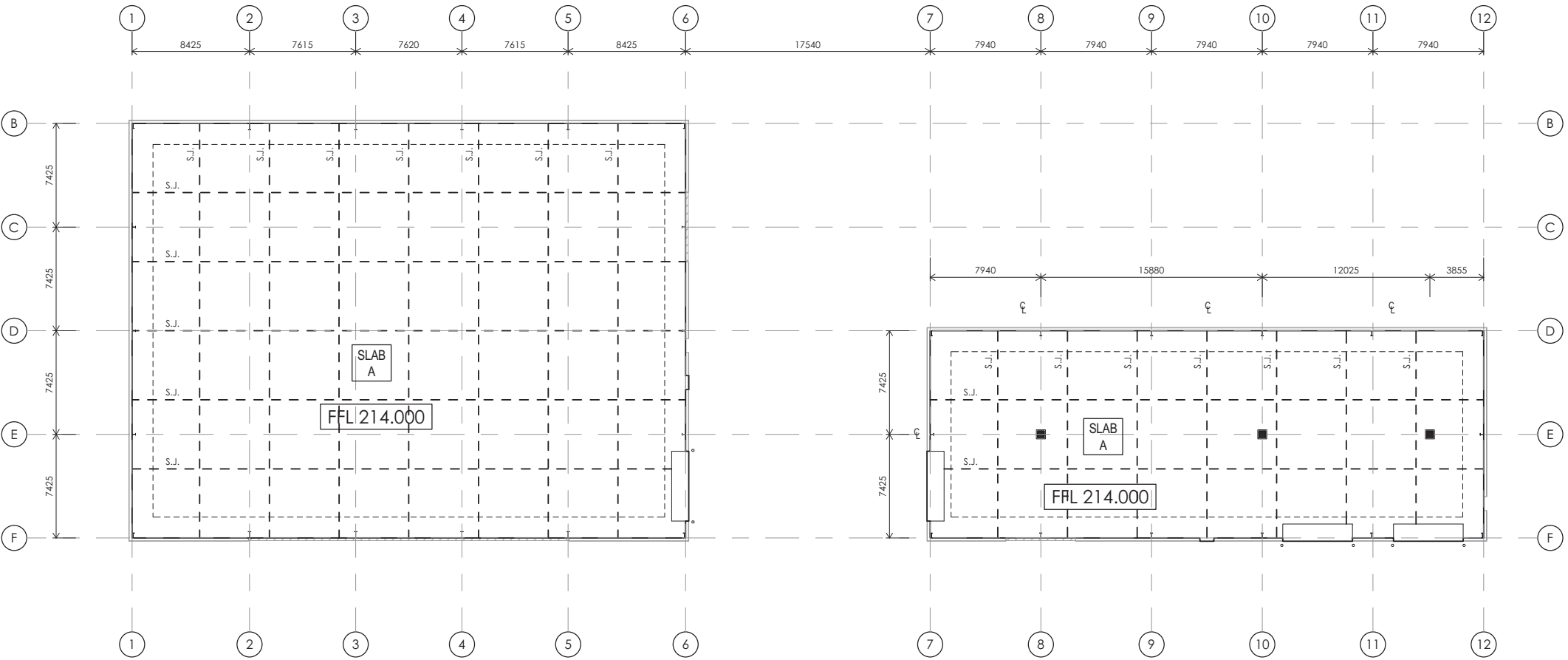
GENERAL NOTES

- UNLESS NOTED OTHERWISE:
1. PROVIDE 0.2mm VISQUEEN PLASTIC DAMP PROOFING MEMBRANE UNDER ALL INTERNAL BUILDING SLABS. ALL SHEET JOINTS TO BE LAPPED AND TAPED
 2. ALL CONVENTIONAL SLABS TO HAVE 50mm SAND BED. POST TENSION SLABS TO HAVE 25mm SAND BED
 3. FLOOR WASTES TO HAVE LOCAL 15mm FALL FOR 500mm RADIUS
 4. DISABLED TOILETS TO HAVE 30mm FALL TO SHOWER WASTE

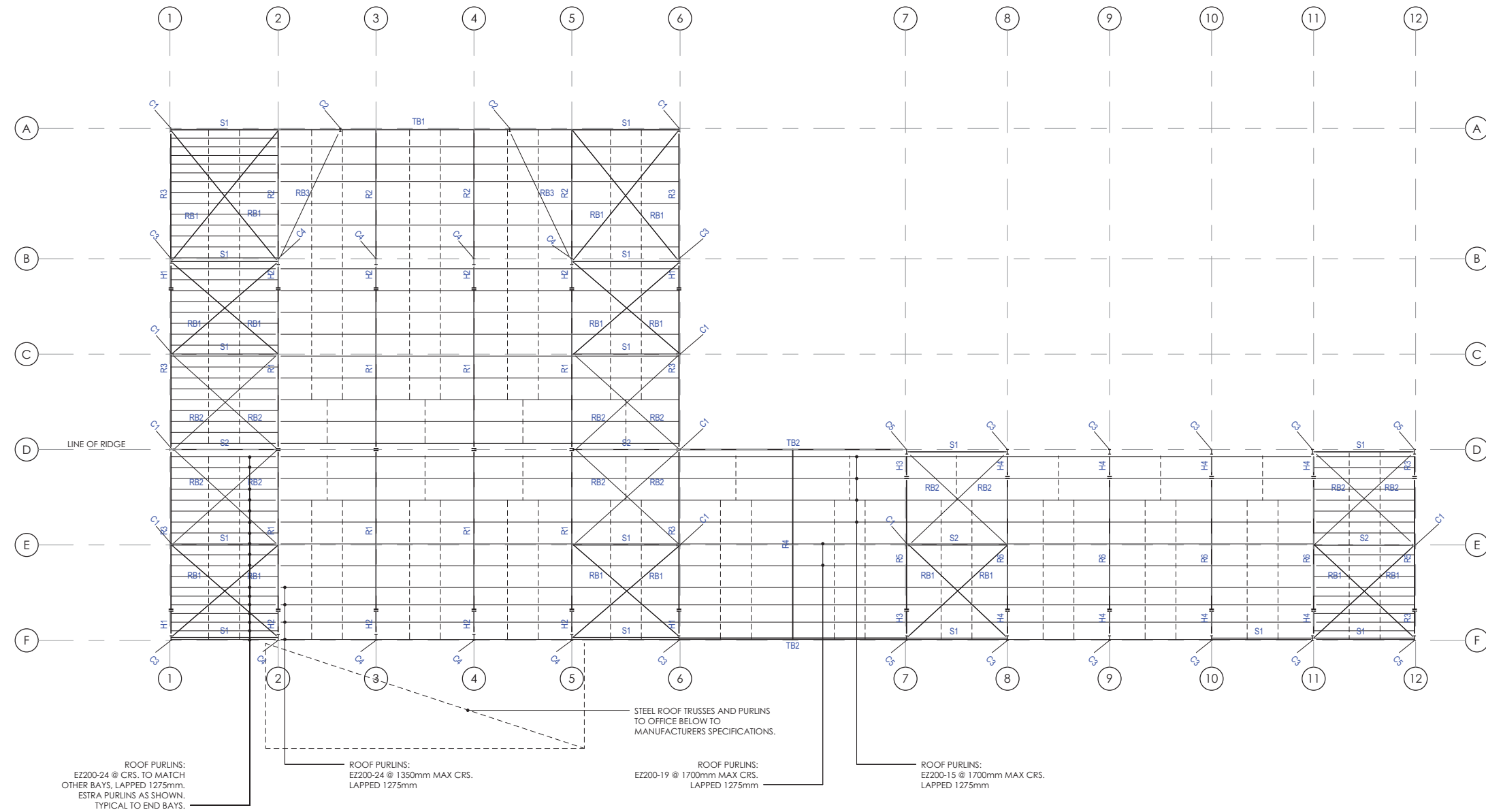
LEGEND

- DOWEL JOINT, REFER DETAILS
- - - SAWN JOINT, REFER DETAILS
- - - - - SLAB EDGE THICKENINGS, REFER DETAILS
- - - - - WALL UNDER
- - - - - SLAB FALL
- ← SLAB FALL DIRECTION
- SLAB A DENOTES SLAB TYPE, REFER SCHEDULE
- FLOOR WASTE DRAIN GRATE

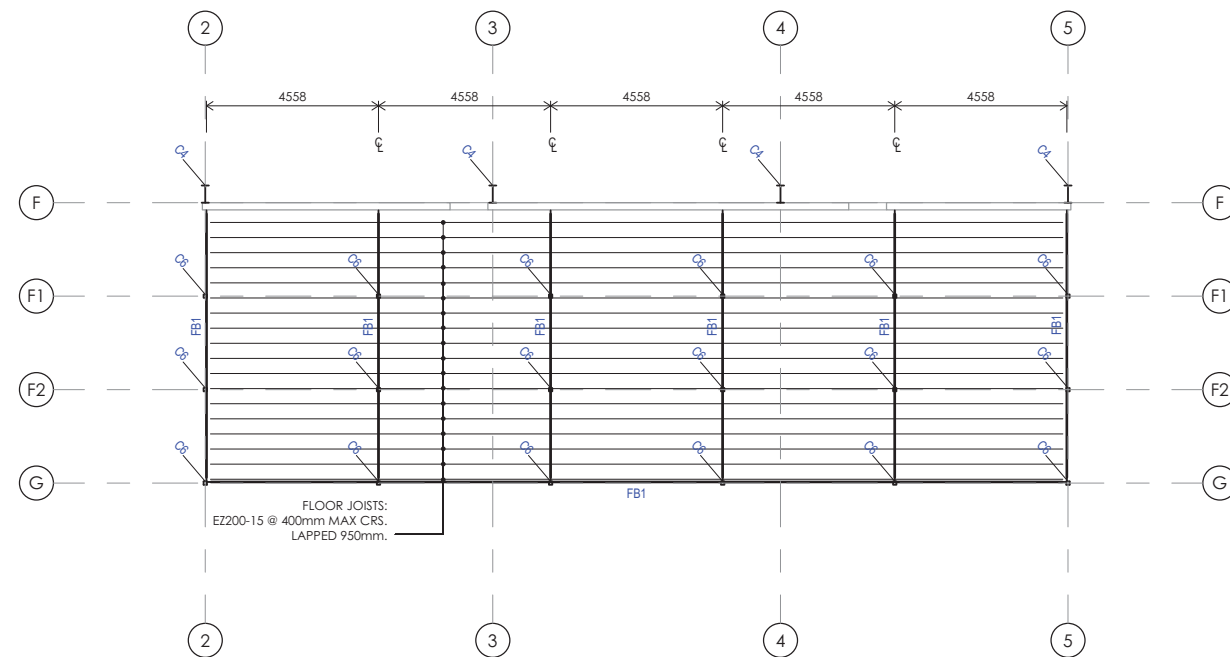
SLAB SCHEDULE	
SLAB	DESCRIPTION
A	170mm THICK CONCRETE SLAB WITH 1 LAYER SL92 MESH, 35mm TOP COVER, TO BE LAID ON 1 LAYER 0.2mm VISQUEEN DAMP PROOFING AND 50mm SAND. STEEL TROWEL FINISH.



CONCRETE PLAN
(A1) 1 : 200



ROOF STEEL PLAN
(A1) 1 : 200



FLOOR STEEL PLAN
(A1) 1 : 100



STRUCTURAL NOTES

REFER ALSO NOTES ON DWG 100

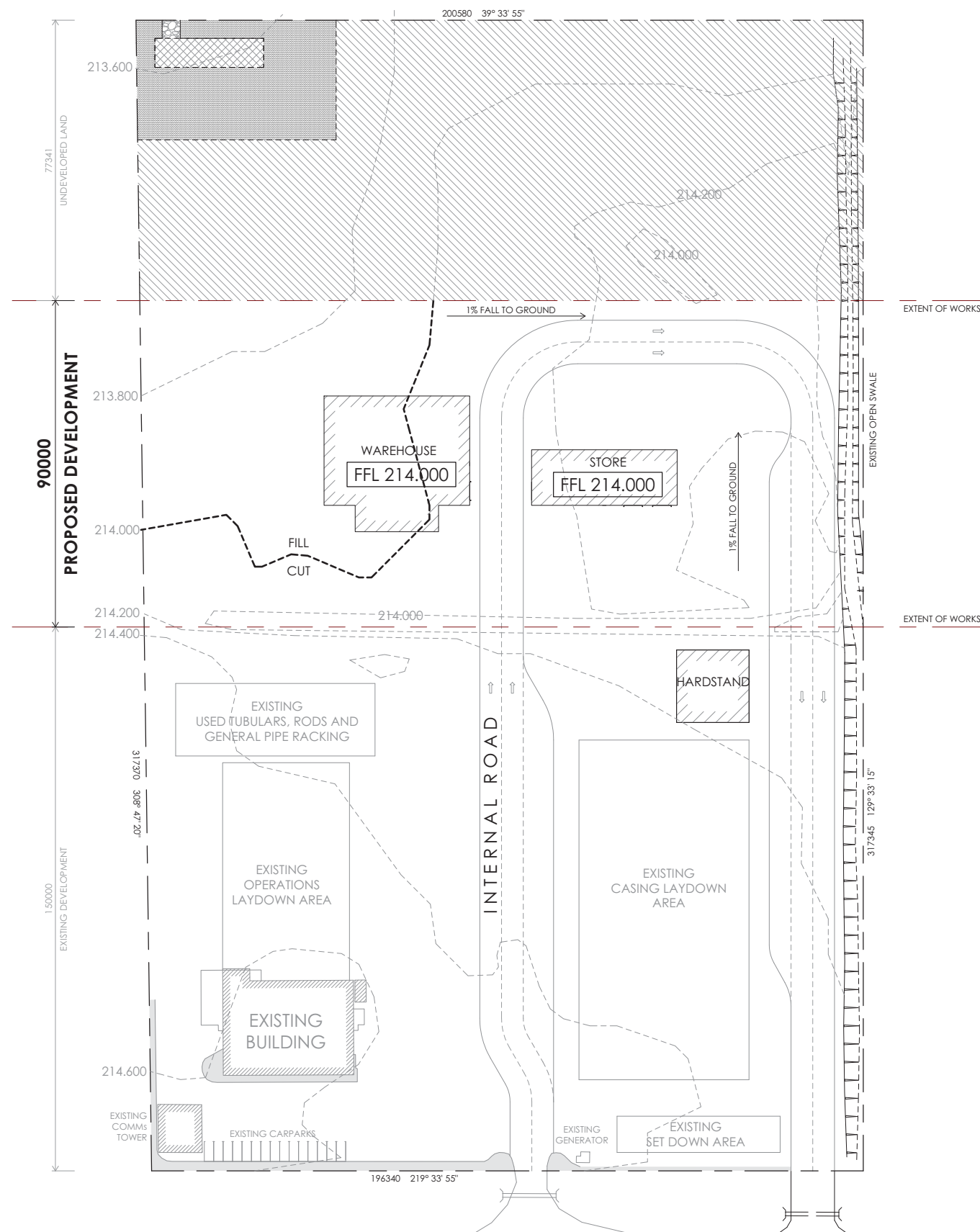
ALL 6mm PLATE WASHERS TO RAFTER END PLATE AND ANGLE CONNECTION SHALL BE WELDED AFTERWARDS WITH 4mm CFW. UNO

WASHERS IN THE FOLLOWING LOCATIONS SHOULD BE 75 x 6mm:
- TO RAKING ANGLES
- TO SHELF ANGLES UNDER FLOOR SLAB
- ON OVERSIZE HOLES

FINISHES:
INTERNAL PORTAL FRAMES - PRIMED
EXPOSED STRUCTURAL STEEL - H.D. GALV.
EXTERNAL AWNINGS - PRIMED

STRUCTURAL COLUMN SCHEDULE	
MARK	MEMBER
C1	250 UB 31
C2	250 UB 37
C3	360 UB 51
C4	460 UB 67
C5	360 UB 45
C6	Tubeline 89 x 89 x 5.0

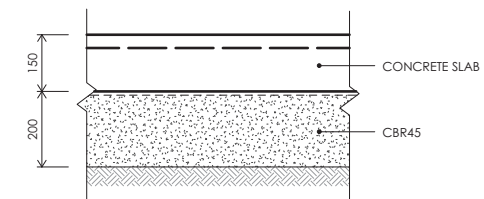
STRUCTURAL FRAMING SCHEDULE	
MARK	MEMBER
FB1	150 PFC
H1	360 UB 51
H2	460 UB 67 HAUNCH
H3	310 UB 33 HAUNCH
H4	310 UB 40 HAUNCH
R1	460 UB 67
R2	310 UB 40 RAFTER
R3	310 UB 32 RAFTER
R4	410 UB 54
R5	200 UB 25
R6	250 UB 31
RB1	EA 65 x 65 x 5.0
RB2	Bracelok 16mm
RB3	Tubeline 165.1 x 3.5
S1	Tubeline 139.7 x 3.0
S2	Tubeline 101.6 x 2.6
TB1	410 UB 54 TRANSFER BEAM
TB2	460 UB 67 TRANSFER BEAM



YARRIE LAKE ROAD

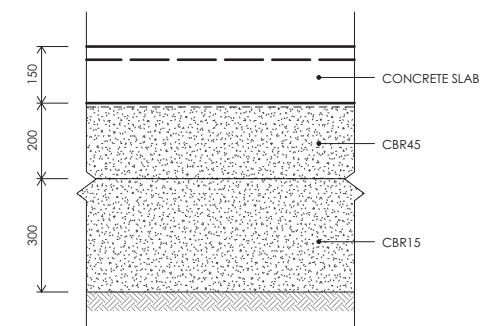
EARTHWORKS PLAN

(A1) 1 : 750



PAVEMENT DESIGN

(A1) 1 : 10



OPTIONAL PAVEMENT DESIGN

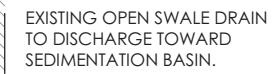
(A1) 1 : 10



EARTHWORKS PLAN SANTOS

NARRABRI LOGISTICS SUPPLY BASE
YARRI LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 060 - 1
DATE 12.12.2012



GENERAL NOTES

ALL BOX GUTTERS TO HAVE OVERFLOWS TO THE EXTERNAL OF THE BUILDING.

LEGEND

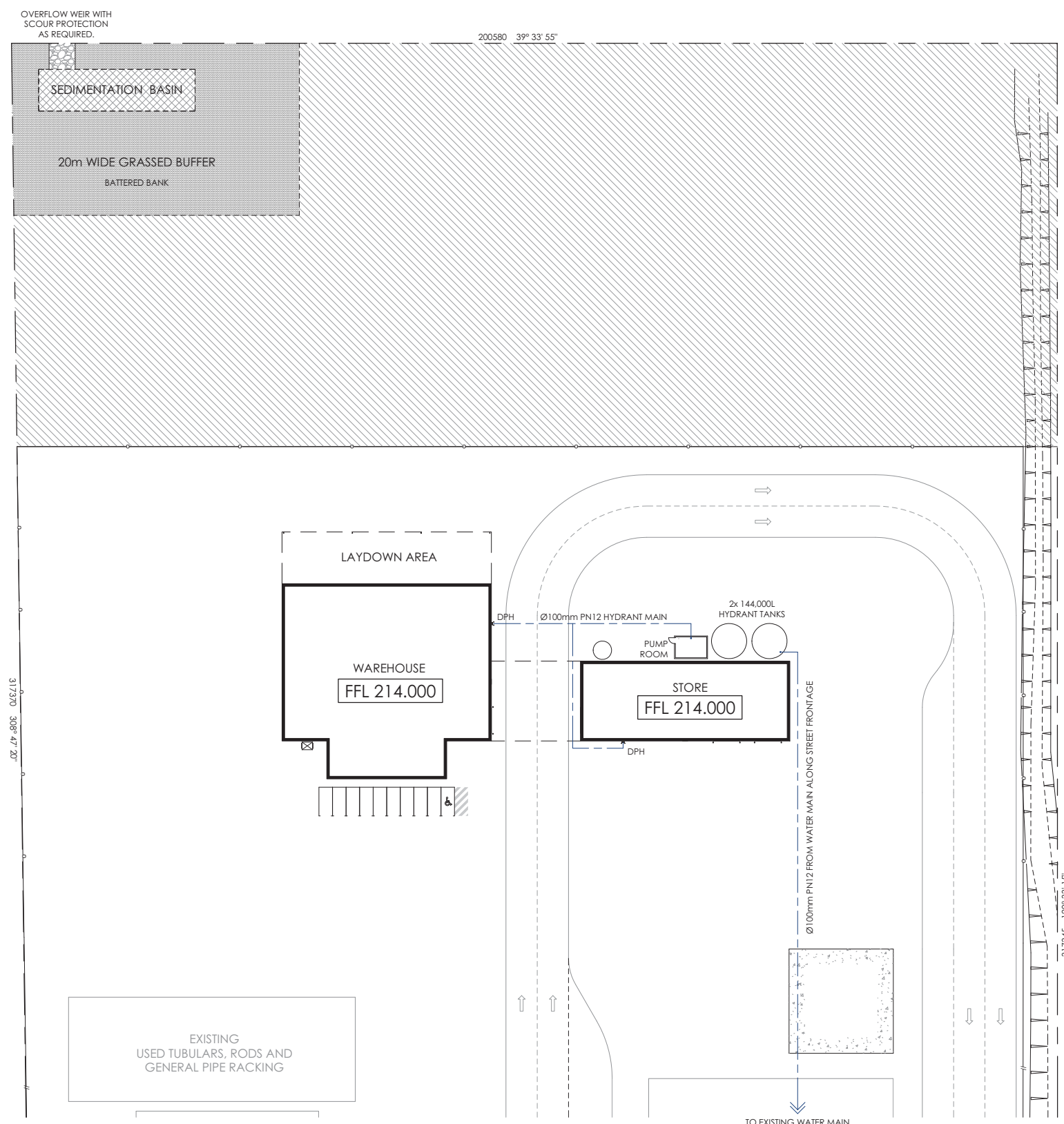
STORMWATER TREATMENT

SITE INFORMATION

LOT 241 on DP1120041	62979 m ²
TOTAL FLOOR AREA	1964 m ²

SITE PLAN

(A1) 1 : 500



HYDRANT PLAN
(A1) 1 : 500

GENERAL NOTES

ALL WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH AUSTRALIAN STANDARDS, LATEST VERSION OF STANDARD PLUMBING AND DRAINAGE REGULATIONS AND TO THE APPROVAL OF THE LOCAL AUTHORITY

WATER NOTES

SPACEFRAME WILL ARRANGE FOR WATER TO BE CONNECTED TO THE BOUNDARY

ALL WATER SUPPLY PIPES TO BE CONCEALED WHERE POSSIBLE. COLD WATER DROPPERS / RISERS TO BE PROVIDED AT PLUMBERS DISCRETION

HOT WATER UNIT OVERFLOW TO DISCHARGE EXTERNALLY U.N.O.

ALL HOT AND COLD WATER LINES TO BE INSTALLED IN ACCORDANCE WITH A.S. 3500.

ALL COLD WATER SERVICE PIPES TO AN INDIVIDUAL FIXTURE OUTLET SHALL BE 15mm DIA. PIPE FOR A MAXIMUM LENGTH OF 1.2m AND THEN ENLARGED TO 20mm DIA. FOR TWO OR MORE FIXTURES, THE PIPEWORK MUST BE 20MM DIA. OR LARGER OR AS NOTED ON DRAWINGS

ALL HOT WATER PIPES SHALL BE 20mm DIA. TO THE FIRST BRANCH AND 15mm DIA. THEREAFTER U.N.O. AND INSULATED WITH APPROVED SECTIONAL INSULATING MATERIAL

THE CONTRACTOR SHALL ALLOW TO PROVIDE AND INSTALL ALL BACK FLOW PREVENTION DEVICES, THERMOSTATIC MIXING VALVES AND TEMPERING VALVES AS REQUIRED BY THE AUTHORITIES

ANY EXPOSED PLUMBING PIPES IN AMENITIES TO BE CHROME PLATED COPPER

ALL PIPE DIA. ARE I.D.

25mm BALL VALVES FOR LANDSCAPE IRRIGATION IN PATH BOX

PROVIDE 25mm DOUBLE CHECK VALVES FOR DEDICATED LANDSCAPING IRRIGATION

HYDRAULIC LEGEND

DPH	DUAL PILLAR HYDRANT
---	NEW FIRE SERVICE
==	EXISTING FENCING
-o-o-	PROPOSED FENCING
[diagonal lines]	UNDEVELOPED LAND
[cross-hatch]	20m WIDE GRASSED BUFFER
[dotted]	SEDIMENTATION BASIN
[stippled]	SCOUR PROTECTION

SITE INFORMATION

LOT 241 on DP1120041	62979 m²
TOTAL FLOOR AREA	1964 m²

DESIGN + CONSTRUCT SOLUTIONS

HYDRANT SCHEMATIC PLAN

SANTOS

NARRABRI LOGISTICS SUPPLY BASE

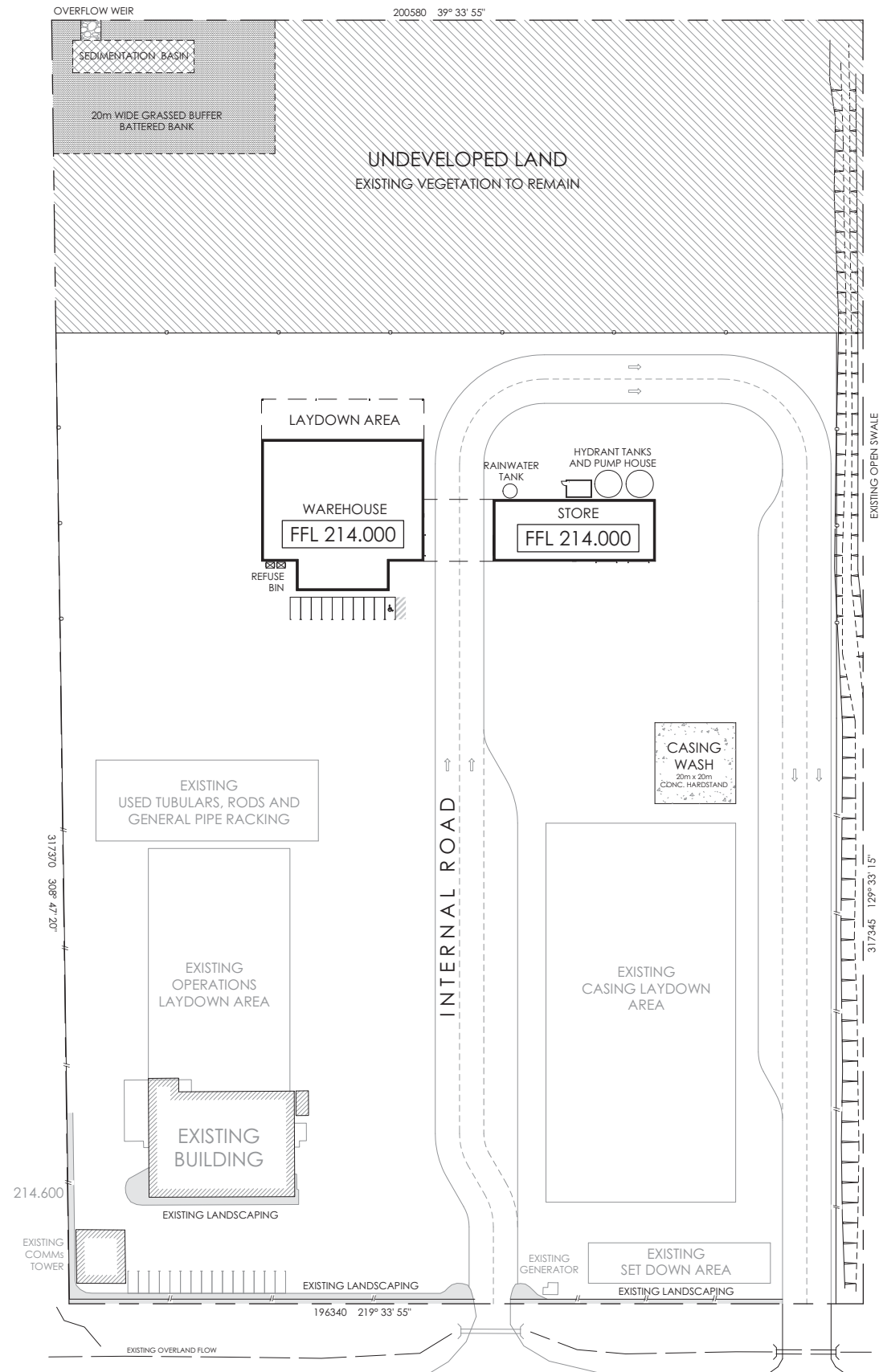
YARRI LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 062 - 2

DATE 12.12.2012

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12/12/2012 9:23:09 AM



GENERAL NOTES

- SHRUBS TO BE SUPPLIED FROM Ø200 POTS, TREES TO BE SUPPLIED FROM 25 LITRE POTS OR BAGS U.N.O.
- EXCAVATE PLANTING BEDS TO MINIMUM DEPTH OF 100MM.
- CULTIVATE EXISTING SUBGRADE TO 100MM BELOW NEW SOIL LEVEL.
- PLACE A MINIMUM OF 100MM SANDY LOAM TOP SOIL MIX WITH A PH LEVEL OF 6.5 - 7.0.
- GARDEN BED AREAS TO BE COVERED WITH MULCH TO A MINIMUM OF 75MM DEPTH. SURROUNDING PLANT STEMS TO BE 25MM.
- GARDEN EDGE - AT ANY GARDEN / GRASS INTERFACE 69X19 CCA PINE EDGING.
- LAWN TO BE 'B' GRADE BLUE COUCH PLACED ON A LAYER OF 25MM TOP SOIL (80% WEED FREE).
- SUPPLY AND INSTALL A MANUAL WATERING SYSTEM TO ALL GARDEN AREAS.
- STAKE & TIE TREES. WATER IN PLANTS THOROUGHLY. UPHOLD THE WORK AGAINST DEFECT AND PLANT FAILURE.
- PLUMBER TO PROVIDE 25mm BALL VALVE FOR LANDSCAPING IRRIGATION.

LEGEND

- EXISTING OVERLAND FLOW
- EXISTING FENCING
- PROPOSED FENCING
- EXISTING LANDSCAPING
- UNDEVELOPED LAND
- 20m WIDE GRASSED BUFFER
- SEDIMENTATION BASIN
- SCOUR PROTECTION

SITE INFORMATION

LOT 241 on DP1120041	62979 m ²
TOTAL FLOOR AREA	1964 m ²

YARRIE LAKE ROAD

SITE PLAN (A1) 1 : 750



LANDSCAPING SANTOS

NARRABRI LOGISTICS SUPPLY BASE
YARRI LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 070 - 1
DATE 12.12.2012

Appendix 3

Transport Assessment



Santos Logistics Centre
Yarrie Lake Road, Narrabri
Transport Impact Assessment

transportation planning, design and delivery

Santos Logistics Centre
Yarrie Lake Road, Narrabri
Transport Impact Assessment

Issue: A 13/12/12

Client: RPS Group

Reference: 13S1058000

GTA Consultants Office: NSW

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By
A	13/12/12	Final	Cameron Ward/ Rhys Hazell	Rhys Hazell	<i>B.T. Maynard</i>

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1. Introduction

1.1 Background

It is understood that a Development Application (DA) is to be lodged with Narrabri Shire Council for a proposed upgrade to the existing Santos operations centre. The operations centre is located on Yarrie Lake Road approximately 5km west of Narrabri Town Centre. The expansion is to accommodate a larger logistics centre; to be used primarily for the storage of machinery and equipment, including dangerous goods, and as a staging centre as part of the recent and future planned expansion of Santos facilities within the local and regional area.

The logistics centre is expected to service the needs of the surrounding Santos facilities and is intended to meet the needs of Santos in the foreseeable future.

GTA Consultants was commissioned by RPS Group in August 2012 to undertake a transport impact assessment for the proposed development.

1.2 Purpose of this Report

This report sets out an assessment of the anticipated transport implications of the proposed development, including consideration of the following:

- i existing traffic and parking conditions surrounding the site
- ii suitability of the proposed parking in terms of supply (quantum) and layout
- iii service vehicle requirements and site circulation
- iv the traffic generating characteristics of the proposed development
- v suitability of the proposed access arrangements for the site
- vi the traffic impact of the development proposal on the surrounding road network.

1.3 References

In preparing this report, reference has been made to the following:

- an inspection of the site and its surrounds undertaken on 19 September 2012
- Narrabri Shire Council Development Control Plan (DCP) Parking Code.
- traffic surveys undertaken by Narrabri Shire Council as referenced in the context of this report
- Australian Standard, Parking Facilities, Part 1: Off-Street Car Parking AS 2890.1:2004
- Australian Standard, Parking Facilities, Part 2: Off-Street Commercial Vehicle Facilities AS 2890.2:2002
- Australian Standard, Parking Facilities, Part 6: Off-Street Parking for People with Disabilities AS 2890.6:2009
- plans for the proposed development prepared by Space Frame, dated 12/12/2012
- other documents and data as referenced in this report.

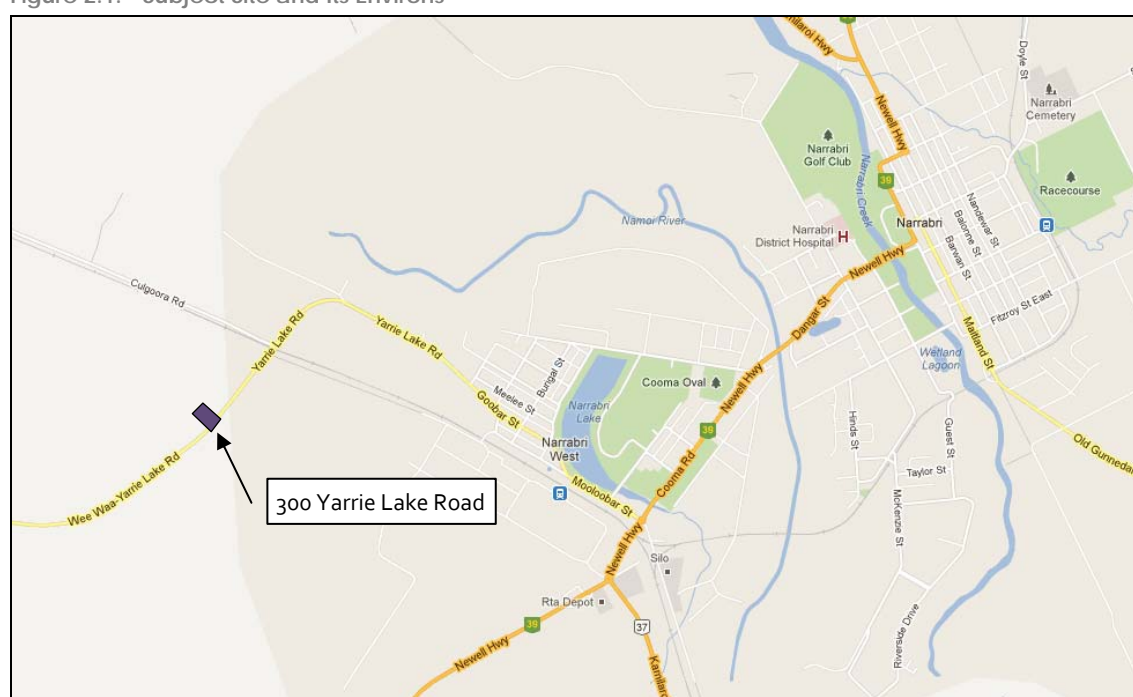
2. Existing Conditions

The subject site is located at 300 Yarrie Lake Road, Narrabri, approximately 550m south of Culgoora Road. The site, of approximately 62,979sq.m, has a frontage of 196m to Yarrie Lake Road and is currently occupied by Santos Narrabri Operations Centre, which includes offices, storage areas and a communications tower.

The surrounding area predominantly includes rural properties with Narrabri located approximately 2.2km to the east.

The location of the subject site and its surrounding environs is shown in Figure 2.1.

Figure 2.1: Subject Site and Its Environs



Source: Google Maps

2.1 Road Network

2.1.1 Adjoining Roads

Yarrie Lake Road

Yarrie Lake Road is local road and in the vicinity of the site is aligned in a northeast southwest direction. It is a two-way road configured with a 2-lane, 6 metre wide carriageway with an 18m setback to the site boundary. The posted speed limit is 100km/h; however site observations indicate vehicles travel slower than this speed given the road width, proximity to the Culgoora Road intersection and a causeway located further to the north.

Yarrie Lake Road is shown in Figure 2.2 and carries up to 900 vehicles per day¹.

¹ Based on the 24 hour traffic counts undertaken by Narrabri Shire Council in March 2012 to May 2012

Figure 2.2: Yarrie Lake Road (looking north from site access)



Figure 2.3: Yarrie Lake Road (looking south to site access)

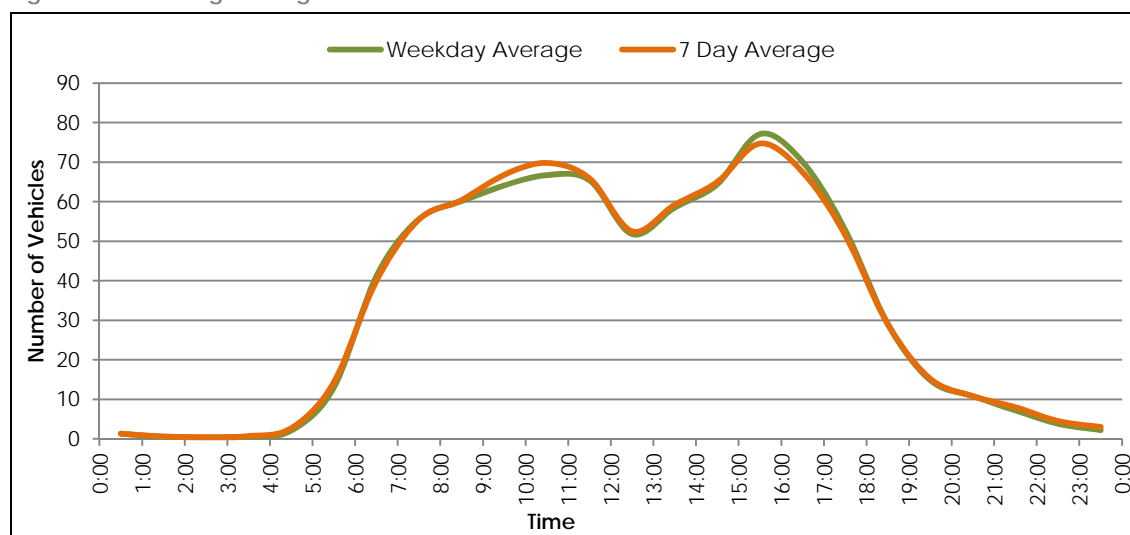


2.2 Traffic Volumes

Narrabri Shire Council has provided GTA Consultants with recent traffic volume data for Yarrie Lake Road, west of Narrabri. Council undertook 24 hour tube count data collection between 29 March 2012 and 11 May 2012, 50m east of Culgoora Road and approximately 600m north of the site. The results of the surveys are included in Appendix A and summarised in Figure 2.4 and Figure 2.5, with the following key data gathered.

- Average Daily Traffic: 820 vehicles
- proportion heavy vehicles: 28.8%
- 7 day average peak hour: 75
- highest average peak hour: 94

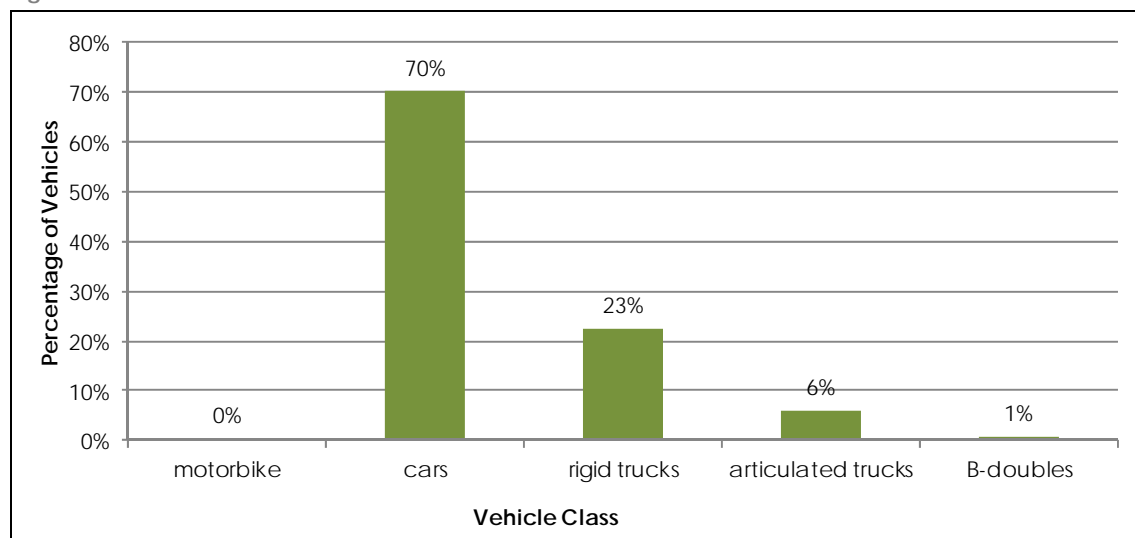
Figure 2.4: Existing Average Peak Hour Traffic Volumes



Source: Narrabri Shire Council

Figure 2.5 illustrates the majority of vehicles currently using Yarrie Lake Road are light vehicles (cars, utes, motorbikes) which account for approximately 70% of all vehicles.

Figure 2.5: Yarrie Lake Road Vehicle Classification



Source: Narrabri Shire Council

2.3 Car Parking

The current Santos Operations Centre has no formal line marked car parking spaces however site observations indicate that adequate space is available for parking within an area located between the main office building and Yarrie Lake Road. In addition, parking for company vehicles and equipment is also located along the boundaries of the site. Photos of these areas are provided in Figure 2.6 and Figure 2.7.

A spot count of the car park was undertaken at 3:00pm on Wednesday 19 September 2012 and indicates an existing on-site car parking demand of up to 20 vehicles. It is also understood that peak parking demand during a busy period can see up to 40 vehicles parked on-site.

Figure 2.6: Existing Parking Area



Figure 2.7: Existing Boundary Parking



2.4 Public Transport

No public transport facilities are located within a reasonable distance to the site. Narrabri Railway Station is located approximately 3.2km from the site with local buses operated by Narrabri Bus Services and operates from the station to various locations throughout Narrabri.

2.5 Existing Operations

The current Santos Operations Centre operates on a standard 7:00am to 4:00pm work day, however staff are generally on site between 6:00am and 6:00pm. The Operations Centre acts as a central hub for Santos activities/ facilities in the local and regional area, providing operational support and material, and equipment storage. As such the site operates to serve a variety of purposes, including the following:

- staff and Santos contractors attend the operations centre to collect works orders at the start of their shift before heading to other Santos sites
- the majority of staff return the centre at the end of their shift to 'clock-off'
- on-site storage areas are used to store equipment when not needed on other sites
- deliveries are generally by 19m articulated and 25m B-double trucks, with up to 5 deliveries per week during peak activities
- a limited number of Santos company vehicles are stored on-site over night, with the majority of vehicles taken home by staff.

Photos of the existing site are shown in Figure 2.8 and Figure 2.9.

Figure 2.8: Existing Site Operations (Open Storage)



Figure 2.9: Existing Site Operations (Open Storage and Parking)



3. Development Proposal

3.1 Land Uses

The proposal includes the expansion of the existing operations centre by 1.8ha to a total land area of 4.8ha; including the construction of a new warehouse and office facilities together with a dangerous goods/ chemical storage area together with a casing lay down area. This combines to a total additional area of 2,368m² with the remaining area to be used as hardstand area and for vehicle parking and manoeuvring. A plan of the proposed development is detailed in Table 3.1 and illustrated in Figure 3.1.

Table 3.1: Land Uses

Land Use	On-site facility	Area (GFA)
Office	Offices	126 m ²
	Amenities	42 m ²
Warehouse	Warehouse	1,195 m ²
Storage (internal)	Used Tubulars, Rods, General Pipe Racking, Dangerous Goods Storage	602 m ²
Sub-Total		1,965m²
Storage (external)	Casing Laydown Area, Operations Laydown Area, Used Tubulars, Rods, General Pipe Racking, Dangerous Goods Storage	403 m ²
Total		2,368 m²

GFA Source: Space Frame drawings dated 12 December 2012 (Note: Storage (External) GFA calculated from drawing dimensions of 10.15m x 39.70m)

3.2 Vehicle Access and Circulation

It is proposed to provide two site access driveways along Yarrie Lake Road. A 12m wide two-way vehicular crossover will provide access for both the staff/ visitor car park and the internal site circulation with an exit driveway proposed to allow service vehicles to exit the site.

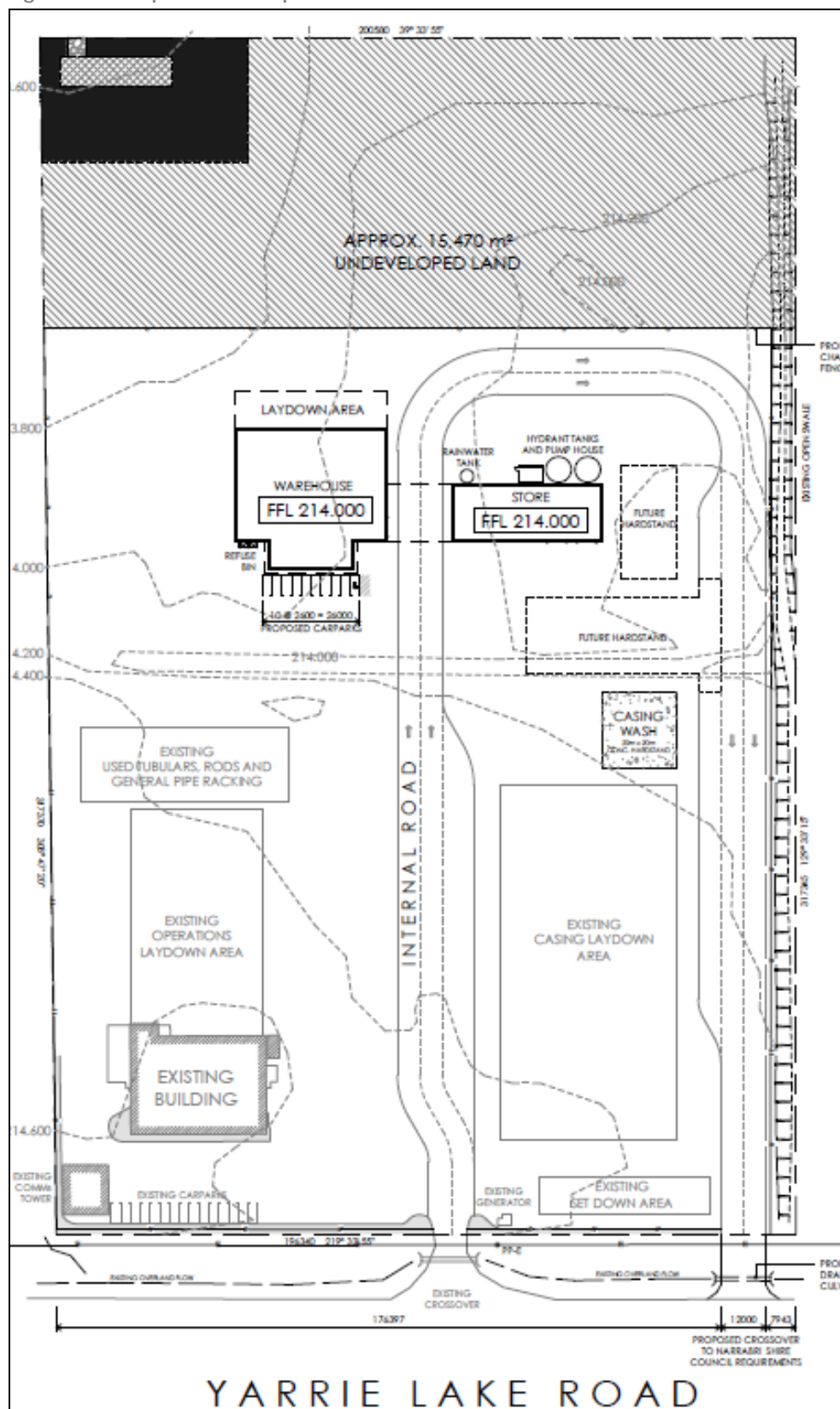
A two-lane one-way 12m wide clockwise circulation road has been proposed within the site. This circulation road is designed to allow 25m B-double trucks to circulate within the site and exit the site in a forward direction, or re-circulate if required. The circulation road provides access to various facilities within the site, including lay down areas, warehouse and storage area.

The site is generally expected to be serviced by medium to large rigid trucks (up to 12.5m in length) which will be used to supply and service other Santos facilities in the local and regional area. Access to the site by larger articulated vehicles, including 25m B-doubles will generally be for delivery or pick up of goods from interstate. The volumes of these vehicles will vary throughout the year and be dependent on the extent of expansion and activity associated with the local and regional Santos facilities.

Loading bays will generally be provided along the circulation road and specifically within an undercover area between the warehouse and storage facility to enable convenient access to stored goods. A long term truck parking area is also provided along the northern edge of the circulation road.

The proposed site layout and associated parking areas are expected to operate satisfactorily. Swept paths and compliance comments are included in this report as Appendix B.

Figure 3.1: Proposed Development



Source: Space Frame, dwg. no. 978-020-4, 12/12/2012

3.3 Car Parking

The proposed development will provide an additional 10 car parking spaces and provides adequate formal parking for staff and visitors alike. Plans of the proposed development indicate that these spaces will be located in a new formal car park adjacent to the proposed office/ warehouse building. Additional hardstand area will also provide for informal parking, as required.

The suitability of the car parking provision and layout is discussed in Section 4 of this report.

4. Car Parking

4.1 Car Parking Requirements

The car parking provision requirements for different development types are set out in Narrabri Shire Council's Development Control Plan – Parking Code. A review of the car parking requirement rates and the floor area schedule results in a DCP parking requirement for the proposed development as summarised in Table 4.1.

Table 4.1: DCP Car Parking Requirements

Use	Size	DCP Parking Rate	DCP Parking Requirement
Offices	126 m ²	1 space / 40m ² LFA	27 spaces
Warehouses	1,195 m ²	1 space / 300m ² GFA	4 spaces
Store (internal)	602 m ²	1 space / 300m ² GFA	2 spaces
Storage (external)	403 m ²	1 space / 600m ² GFA	1 spaces
Total			34 spaces

[1] LFA assumed to be 80% of GFA

[2] Due to the operational characteristics of the open storage, the parking rate has been assumed to be half of the warehouse DCP parking rate.

Based on the above, the proposed development is required to provide 34 car parking spaces.

4.2 Adequacy of Parking Supply

The expanded site will provide approximately 25 marked on-site car parking spaces for use by both staff (private and company vehicles) and visitors. Additional hardstand area will service any additional parking demand and the area is considered of appropriate size and layout to cater for the future demands of the site and therefore complies with the Narrabri Shire Council's car parking requirements.

5. Traffic Impact Assessment

5.1 Traffic Generation

5.1.1 Design Rates

Traffic generation estimates for the proposed additional site uses have been sourced from the RMS Guide to Traffic Generating Developments, 2002.

Estimates of peak hour and daily traffic volumes resulting from the proposal are set out in Table 5.1.

Table 5.1: Peak Hour Traffic Generation Estimates

Land Use	Area (GFA)	Traffic Generation Rate	Total Vehicle Trips
Offices	126 m ²	2.0 vehicle trips/100m ²	2
Warehouses	1,195 m ²	0.5 vehicle trips/100m ²	6
Store (internal)	602 m ²	1.0 vehicle trips/100m ²	6
Storage (external)	403 m ²	0.25 vehicle trips/100m ²	1
Total			15

[3] Due to the operational characteristics of the open storage, the traffic generation rate has been assumed to be half of the warehouse DCP parking rate.

Table 5.1 indicates that the additional site uses could potentially generate 15 vehicle movements in a peak hour.

5.1.2 Site Operation

As discussed in Section 3, it is understood that the site will operate as a logistics and supply base for Santos operations in the Narrabri region. Discussions and an on-site meeting with Santos representatives indicate that the intended use of the site is as follows:

- Santos staff contractors will access the logistic centre in the morning to obtain work orders and pick up material and equipment before travelling to other Santos facilities/ sites
- the typical site work day would be 7:00am to 4:00pm, however deliveries and access may be required 24 hours a day
- goods deliveries would occur regularly throughout a typical working day and not be concentrated during the respective peak periods.

The site is anticipated to increase operations throughout a period from late 2012, peaking during the second quarter of 2013. Santos has provided GTA Consultants with an estimated breakdown of truck volumes to and from the logistics centre based on anticipated number of wells and material volumes over the coming years. These truck movements are summarised in Table 5.2 and include movements associated with potential future works (not part of the proposed application) that have been included to provide an accurate assessment of future site operations where all proposed uses may be in operation.

Table 5.2: Estimated Trucks per Week

Time Period	Average Trips per Week ^[4]			
	Trucks into Narrabri Warehouse ^[5]	Trailers to Field (one-way)	Removal of Material from Narrabri Site	Total
4th Quarter 2012	3	9	1	13
1st Quarter 2013	1	31	1	33
2nd Quarter 2013	2	52	1	55

[4] Based on worst case scenario

[5] Referring to trucks from Brisbane, Roma, etc. not trucks returning from field

Table 5.2 indicates that the Narrabri Logistics Centre may generate up to 110 one-way truck movements per week, or 22 truck movements per day (assuming a 5-day working week), during peak site operations.

It is noted that the above assessment does not include movements associated with on-site administration staff, nor contractor movement to/ from the site to pick up work orders during the AM peak period. Contractor staff levels may vary considerably and as such it is hard to determine precise peak period activity.

Given the above, GTA Consultants recommends undertaking a conservative approach in estimating the potential traffic generation of the site. As such, the following assessment is based on a theoretical future maximum traffic generation for the site of 100 one-way vehicle movements during any weekday peak hour.

5.2 Distribution and Assignment

The directional distribution and assignment of traffic generated by the proposed development will be influenced by a number of factors including the:

- configuration of the arterial road network in the immediate vicinity of the site
- existing operation of intersections providing access between the local and arterial road network
- the proximity to, and location of Narrabri Town Centre
- location of Santos site in the surrounding local and regional areas
- likely distribution of staff residences in relation to the site.

Having consideration to the above, for the purposes of estimating vehicle movements, the following directional distributions have been assumed:

- Yarrie Lake Road (north) 90%
- Yarrie Lake Road (south) 10%.

In addition, the directional split of traffic (i.e. the ratio between the inbound and outbound traffic movements) has been assumed to be 70/30 as it is anticipated that staff will arrive to the site during the morning peak in their private vehicles and depart the site in Santos company vehicles to undertake work.

Based on the above, and assuming site generation of 100 vehicles within the peak hour, Figure 5.1 and Figure 5.2 have been prepared to show the estimated marginal increase in turning movements in the vicinity of the subject property following full site development.

Figure 5.1: AM Peak Hour Site Generation Traffic Volumes

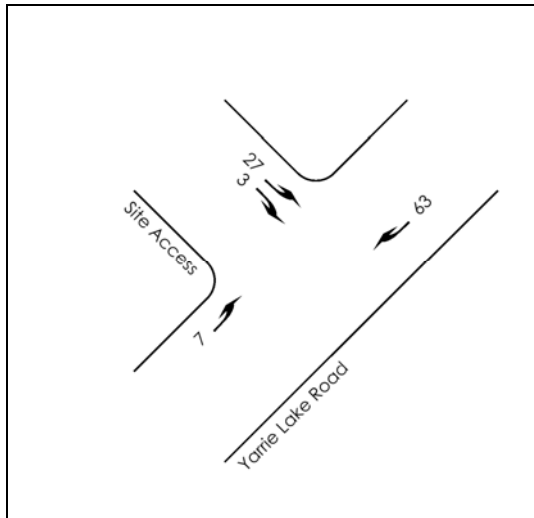
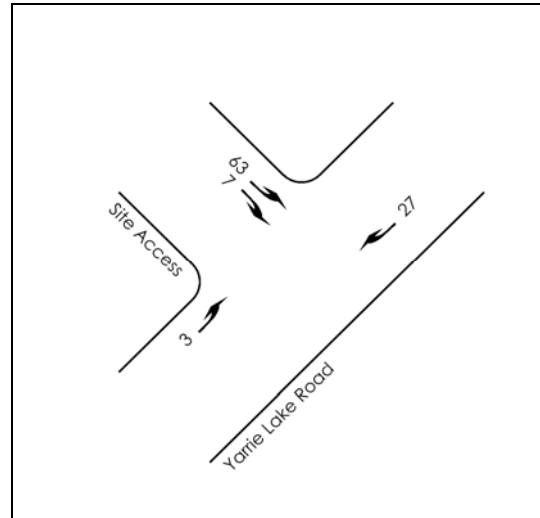


Figure 5.2: PM Peak Hour Site Generation Traffic Volumes



5.3 Traffic Impact

The existing traffic volumes passing the frontage of the site, as discussed in section 2, is approximately 60 vehicles in the AM peak hour and 75 in the PM peak hour. This includes traffic attending the current Santos Operation Centre. Against existing traffic volumes, the additional traffic generated by the proposed development would increase the volume of traffic on Yarrie lake Road, however could not be expected to compromise the safety or function of the surrounding road network.

The intersection of Yarrie Lake Road and the site access is expected to operate with minimal delay and continue to operate at a level of service of A. Sight distances at the intersection are in excess of the requirements set out in Figure 3.3 in Australian Standard, Parking Facilities, Part 2: Off-Street Commercial Vehicle Facilities (AS 2890.2:2002).

5.4 Mitigating Measures and Intersection Works

Provision will be made for the access driveways to Yarrie Lake Road to operate safely and efficiently into the future, with the following works proposed:

- upgrading of the driveways to cater for 25m B-double movements in/ out of the site
- linemarking of the access driveways to formalise Yarrie Lake Road movement priority
- installing 'Give-Way' signage for vehicles exiting the site to Yarrie Lake Road.

An overview compliance review with associated swept paths is included in Appendix C.

6. Construction Traffic Management

Construction Traffic Management considerations for the duration of the site establishment works have been developed on the basis of the following.

- overall principles of construction traffic management
- hours of operation
- construction traffic volumes
- truck routes.

6.1 Overall Principles of Construction Traffic Management

The overall principles of traffic management during construction activity include:

- ensure construction activities do not impede the existing operation of the site
- manage and control construction vehicle activity in the vicinity of the site
- construction activity to be carried out in accordance the approved hours of works as determined by Council.

6.2 Hours of Operation

The hours of construction work will be determined by the appointed construction contractor. It is anticipated that construction hours would be 7:00am to 6:00pm, Monday to Saturday.

Given the rural nature of the project site this is not expected to negatively impact the surrounding area. However, any associated heavy vehicle activity that passes through residential areas (including Narrabri Town Centre) should be confined to typical construction hours (7:00am-6:00pm, Monday to Friday, 8:00am-1:00pm Saturdays).

The contractor will be responsible for instructing and controlling all subcontractors with respect to the hours of work. Any work outside the approved construction hours would be subject to specific prior approval by Council.

6.3 Duration of Works

It is understood that the site establishment works will commence following any approvals and is estimated to take approximately six weeks to complete.

6.4 Construction Traffic Volumes

Construction traffic volumes associated with the site establishment works are detailed below with the key assumptions as follows:

- deliveries of construction materials and equipment would occur regularly throughout a typical working day for the duration of the works (assumed to be 10-11 hours)
- one vehicle would generate two vehicle movements (in and out).

The anticipated maximum vehicle size for the site establishment works are truck-and-dog vehicles (up to 17.5m long). There are two possible pavement options for the site, as summarised in Table 6.1 and based on an estimated truck-and-dog carrying capacity of 25m³ of material.

Table 6.1: Estimated Truck Movements

Pavement Design Option	Bulk Earthworks	Truck-and-dog trailer capacity	Total truck-and-dog trailer trips	Total truck-and-dog trailer movements (in and out)	Average truck-and-dog movements per day (in and out) [1]
1	4,700m ³	25m ³	188	376	10-11
2	11,400m ³		456	912	25-26

[1] Based on a 6 week construction period assuming a 6 day working week.

As shown in Table 6.1, pavement option 1 includes importing 4,700m³ of engineered quarry material to the site resulting in an estimated generation of 376 truck movements (in and out) for the duration of works. This equates to an average of 10-11 movements (in and out) per day.

Pavement option 2 includes a deeper base and equates to 11,400m³ of engineered quarry material brought to site. This is estimated to generate a total of 912 truck movements (in and out) for the duration of works with an average of 25-26 truck movements (in and out) per day.

6.5 Construction Traffic Routes

All construction traffic will access the site via the existing two-way access from Yarrie Lake Road. It is understood that the majority of construction vehicles (if not all) will access the site via Narrabri Town Centre.

6.6 Construction Staff Traffic and Parking

The number of staff required on-site will vary depending on the nature and works intensity. Construction staff parking for the site establishment works is expected to be provided within the existing on-site staff parking areas.

7. Conclusion

Based on the analysis and discussions presented within this report, the following conclusions are made:

- i It is proposed to expand the existing Operations Centre located along Yarrie lake Road, Narrabri into a larger Logistics Centre to serve the needs of Santos operations in the local and regional area.
- ii The proposed development will increase the size of the sites uses by 2,368m² and generates a DCP parking requirement of 34 spaces.
- iii The additional development is expected to generate up to 15 vehicle movements a typical week.
- iv The provision of the internal circulation road has been designed to accommodate 25m B-double trucks and is consistent with the requirements of AS2890.2:2002.
- v There is adequate capacity in the surrounding road network to cater for the traffic generated by the proposed development.
- vi There are two options for the bulk earthworks and includes the following:
 - pavement option 1 is expected to generate 376 truck movements (in and out) for the duration of the site establishment works, with an average of 10-11 movements (in and out) per day
 - pavement option 2 is expected to generate 912 truck movements (in and out) for the duration of the site establishment works with an average of 25-26 truck movements (in and out) per day.
- vii Mitigating measures include:
 - upgrading of the driveways to cater for 25m B-double movements in/ out of the site
 - linemarking of the access driveways to formalise Yarrie Lake Road movement priority
 - installing 'Give-Way' signage for vehicles exiting the site to Yarrie Lake Road.
- viii Provision is made for all access arrangements to operate safely and efficiently into the future.

Appendix A

Survey Data

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CG48BDKS MC56-L5 [MC55] (c)Microcom 19Oct04

Factory default (v3.21 - 15315)

Axle sensors - Paired (Class/Speed/Count)

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GW Ya Y.

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1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

10 - 160 km/h.

North, East, South, West (bound)

All - (Headway)

Default Profile

Vehicle classification (ARX)

Metric (meter, kilometer, m/s, km/h, kg, tonne)

Vehicles = 35682 / 35917 (99.35%)

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Vehicle classification (ARX)

Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages 1 - 5	1 - 7
Hour									
0000-0100	3.7	1.2	0.7	0.7	0.6	1.2	1.3	1.3	1.3
0100-0200	1.2	0.5	0.3	0.2	0.3	0.7	1.2	0.5	0.6
0200-0300	1.0	0.7	0.0	0.2	0.3	0.5	0.2	0.4	0.4
0300-0400	1.0	0.8	0.3	0.0	0.3	1.7	1.2	0.5	0.7
0400-0500	1.8	2.0	1.5	1.5	3.6	6.0	2.0	2.1	2.7
0500-0600	5.5	13.2	12.0	13.7	19.7	23.2	12.0	13.0	14.3
0600-0700	18.3	44.3	40.7	45.5	54.7	48.2	25.7	41.2	40.0
0700-0800	28.2	64.2	64.7<	54.0	65.3	63.5	47.2	55.6	55.5
0800-0900	40.8	62.7	54.2	67.9<	71.7<	66.5	55.8	60.1	60.4
0900-1000	65.2	71.5	60.2	58.7	65.4	68.0	79.8<	64.1	66.8
1000-1100	80.3	72.0	53.8	64.4	63.9	83.3<	73.0	66.7<	69.8<
1100-1200	81.8<	75.2<	57.5	57.0	58.3	65.3	68.8	65.4	65.9
1200-1300	58.7	55.5	42.3	52.3	50.1	54.2	55.2	51.8	52.5
1300-1400	63.7	50.2	46.3	63.3	66.7	58.7	63.7	58.5	59.2
1400-1500	70.3<	57.0	58.7	65.3	69.9	65.0	68.2<	64.4	65.0
1500-1600	68.3	60.8	75.8<	85.3<	93.8<	76.0<	61.3	77.1<	74.7<
1600-1700	55.3	65.0<	65.7	76.0	87.7	70.2	51.0	70.1	67.5
1700-1800	46.0	49.7	52.3	53.3	63.0	52.8	44.0	52.9	51.6
1800-1900	26.5	23.8	27.7	28.4	39.2	29.0	28.8	29.1	29.0
1900-2000	14.5	11.2	10.8	19.1	17.7	18.3	14.0	14.8	15.2
2000-2100	11.2	5.5	10.7	10.1	16.8	10.5	11.0	10.8	10.8
2100-2200	6.3	5.5	5.8	7.9	10.5	8.7	11.3	7.2	8.0
2200-2300	3.8	3.0	2.3	4.0	5.8	5.7	7.2	3.8	4.5
2300-2400	3.3	1.5	2.2	1.6	2.7	5.2	5.2	2.2	3.0
Totals									
0700-1900	685.2	707.5	659.2	725.9	795.0	752.5	696.8	715.7	718.0
0600-2200	735.5	774.0	727.2	808.5	894.7	838.2	758.8	789.8	792.0
0600-0000	742.7	778.5	731.7	814.1	903.2	849.0	771.2	795.8	799.6
0000-0000	756.8	796.8	746.5	830.2	927.9	882.2	789.0	813.7	819.6
AM Peak	1100	1100	0700	0800	0800	1000	0900		
	81.8	75.2	64.7	67.9	71.7	83.3	79.8		
PM Peak	1400	1600	1500	1500	1500	1500	1400		
	70.3	65.0	75.8	85.3	93.8	76.0	68.2		

* - No data.

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Factory default (v3.21 - 15315)

Axle sensors - Paired (Class/Speed/Count)

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1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

10 - 160 km/h.

North, East, South, West (bound)

All - (Headway)

Default Profile

Vehicle classification (ARX)

Metric (meter, kilometer, m/s, km/h, kg, tonne)

Vehicles = 35682 / 35917 (99.35%)

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Vehicle classification (ARX)

Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0)

Speed (km/h)Speed Totals

		Class													
		1	2	3	4	5	6	7	8	9	10	11	12		
10 - 20		13	24	1	12	6	5	.	.	1	1	.	.	63	0.2%
20 - 30		19	227	14	107	70	16	2	8	11	35	14	7	530	1.5%
30 - 40		17	1618	340	745	297	63	33	68	23	204	47	31	3486	9.8%
40 - 50		24	7732	999	2296	231	50	136	114	17	250	46	38	11933	33.4%
50 - 60		39	8179	509	2257	68	29	109	80	11	209	21	27	11538	32.3%
60 - 70		31	3221	186	1066	24	16	37	33	3	192	8	17	4834	13.5%
70 - 80		9	1171	72	433	4	4	16	14	1	127	7	12	1870	5.2%
80 - 90		8	565	15	180	.	.	2	3	.	59	.	2	834	2.3%
90 - 100		3	247	4	101	.	.	3	1	.	23	.	.	382	1.1%
100 - 110		2	105	3	34	.	.	2	.	.	2	.	.	148	0.4%
110 - 120		.	35	1	12	.	.	.	.	.	.	.	.	48	0.1%
120 - 130		1	7	.	6	.	.	.	.	.	.	.	.	14	0.0%
130 - 140		.	1	.	1	.	.	.	.	.	.	.	.	2	0.0%
140 - 150		.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
150 - 160		.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
		166	23132	2144	7250	700	183	340	321	67	1102	143	134	35682	
		0.5%	64.8%	6.0%	20.3%	2.0%	0.5%	1.0%	0.9%	0.2%	3.1%	0.4%	0.4%		
Class Totals															

Appendix B

Compliance Review and Swept Path Assessment

EXISTING
BUILDING

EXISTING CARPARKS

EXISTING
GENERATOR

EXISTING
SET DOWN AREA

196340 219° 33' 55"

PP-E

EXISTING OVERLAND FLOW

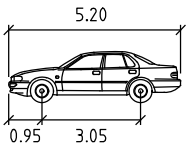
EXISTING OVERLAND FLOW

YARRIE LAKE ROAD

ASSUMED ROAD LOCATION
WITH 6.0m CARRIAGEWAY

PRELIMINARY PLAN

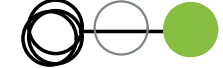
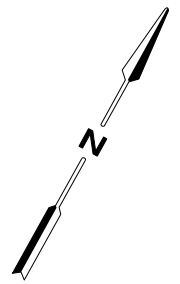
FOR DISCUSSION PURPOSES
ONLY SUBJECT TO CHANGE
WITHOUT NOTIFICATION



B99 6.3mR
Width : 1.94
Track : 1.77
Lock to Lock Time : 6.0
Steering Angle : 34.0

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 300mm CLEARANCE FROM VEHICLE BODY

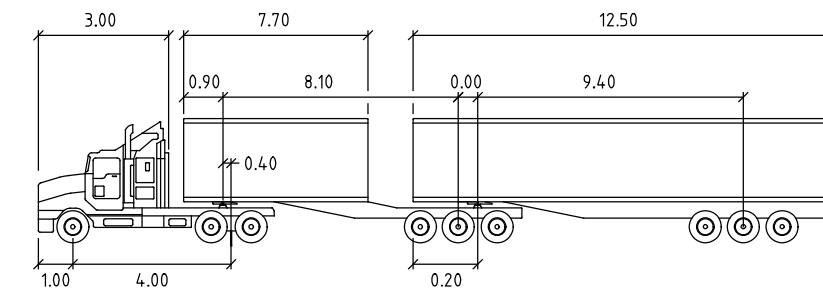
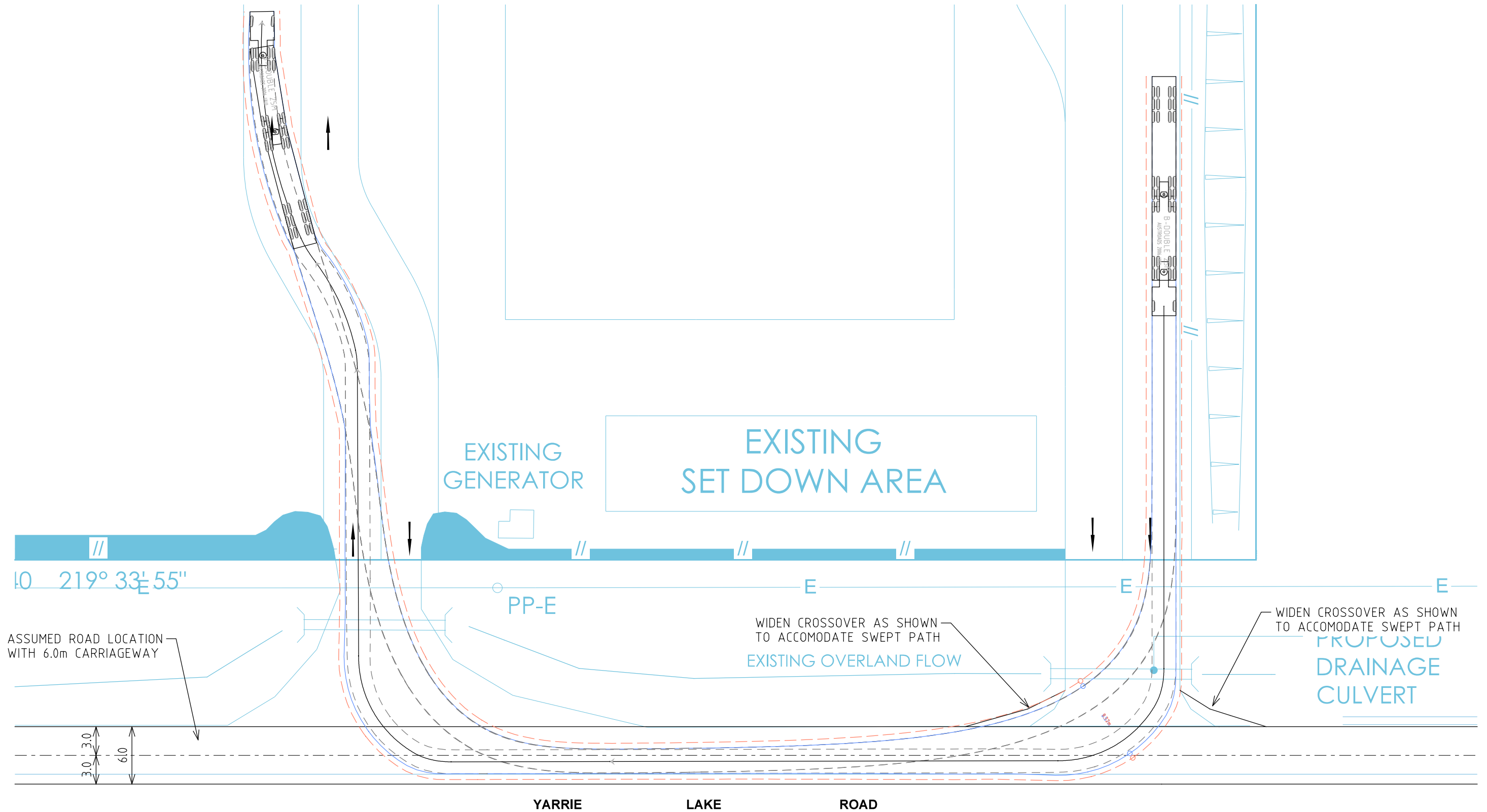


GTA consultants
www.gta.com.au

SWEPT PATH ASSESSMENTS
SANTOS LOGISTICS CENTRE
YARRIE LAKE ROAD, NARRABRI

13 DECEMBER '12
SCALE 1:400 @ A3
13S1058000-AT01-01-P2

PLOTTED BY : Andrew Yiannoudes ON 13/12/2012 AT 12:52:17 PM



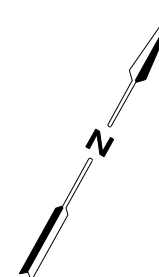
B-DOUBLE 25M

metres

Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 20.6
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 2.50		

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- - - VEHICLE TYRE PATH
- - - VEHICLE BODY PATH
- - - 600mm CLEARANCE FROM VEHICLE BODY



PRELIMINARY PLAN

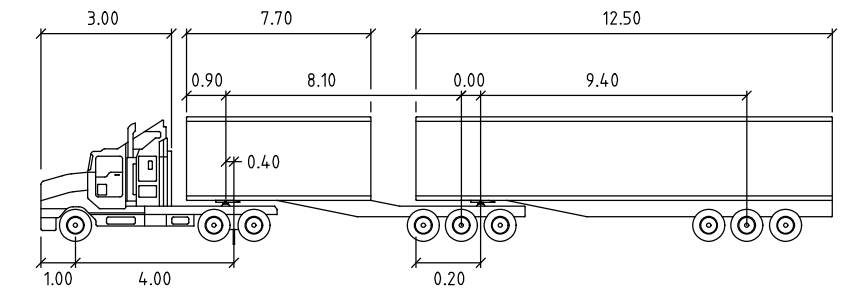
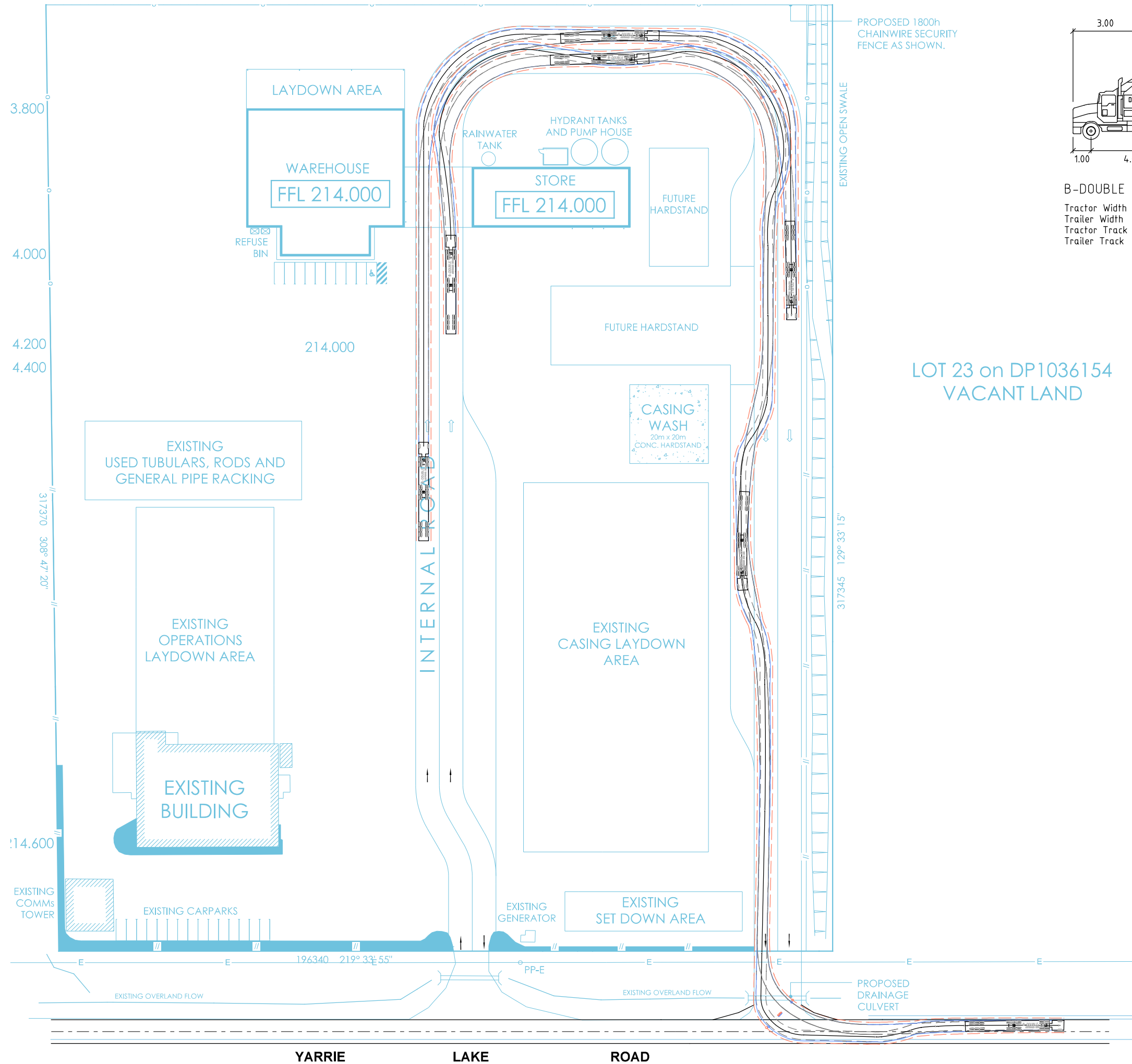
FOR DISCUSSION PURPOSES
ONLY SUBJECT TO CHANGE
WITHOUT NOTIFICATION



SWEPT PATH ASSESSMENTS
SANTOS LOGISTICS CENTRE
YARRIE LAKE ROAD, NARRABRI

13 DECEMBER '12
SCALE 1:400 @ A3
13S1058000-AT01-02-P2

PLOTTED BY : Andrew Yiannoudes ON 13/12/2012 AT 12:58:41 PM

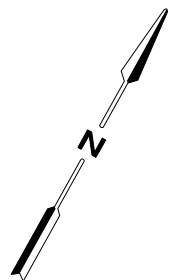


B-DOUBLE 25M

	metres		
Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 20.6
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 2.50		

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 600mm CLEARANCE FROM VEHICLE BODY



PRELIMINARY PLAN

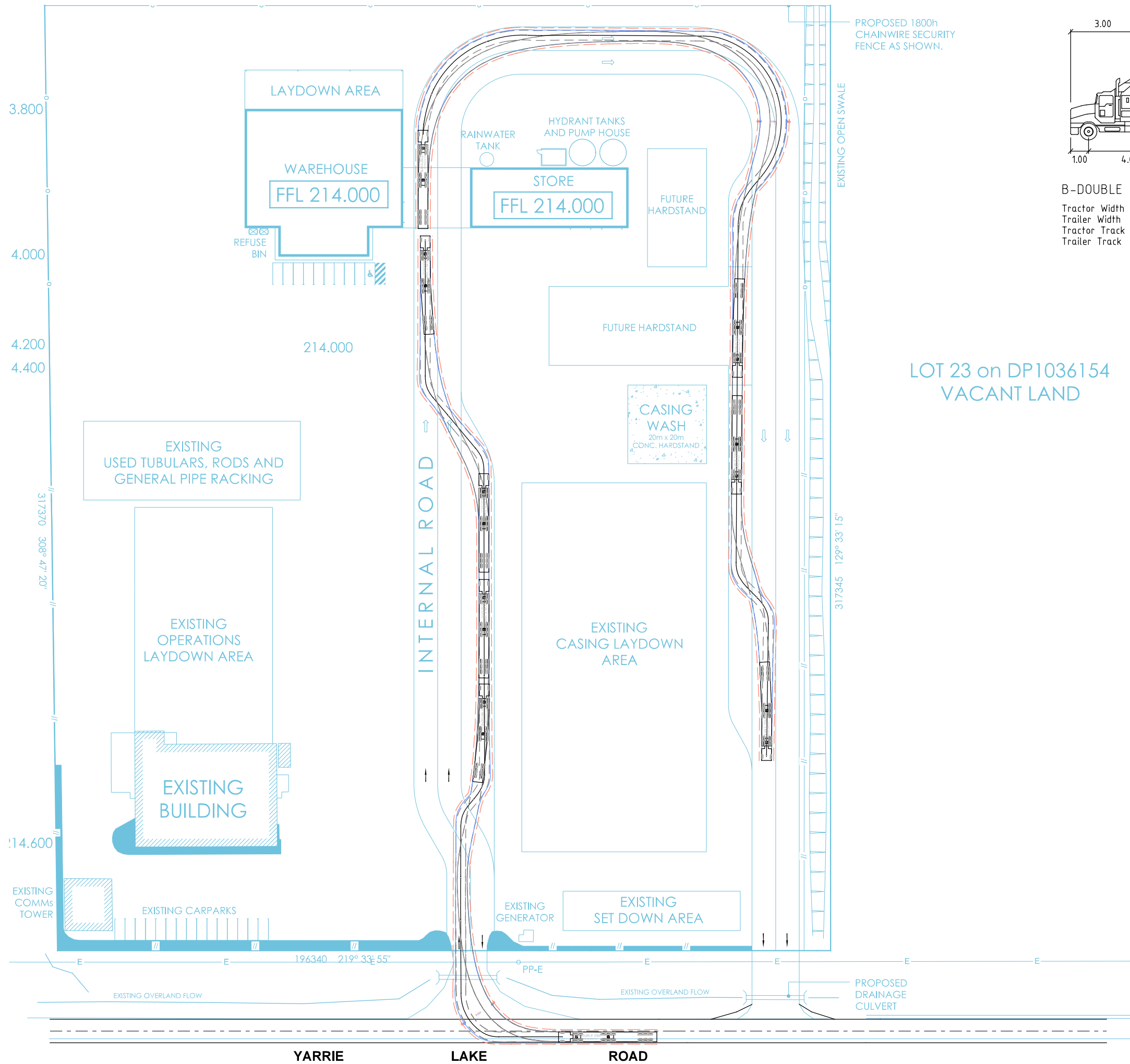
FOR DISCUSSION PURPOSES
ONLY SUBJECT TO CHANGE
WITHOUT NOTIFICATION



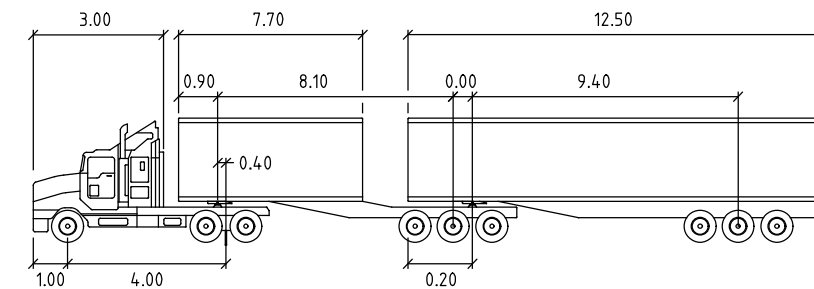
SWEPT PATH ASSESSMENTS
SANTOS LOGISTICS CENTRE
YARRIE LAKE ROAD, NARRABRI

13 DECEMBER '12
SCALE 1:1000 @ A3
13S1058000-AT01-03-P2

PLOTTED BY : Andrew Yiannoudes ON 13/12/2012 AT 10:46:01 PM



PROPOSED 1800h
CHAINWIRE SECURITY
FENCE AS SHOWN.



B-DOUBLE 25M

Tractor Width : 2.50
Trailer Width : 2.50
Tractor Track : 2.50
Trailer Track : 2.50

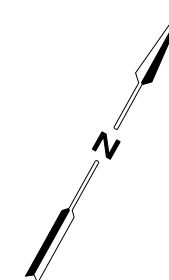
metres

Lock to Lock Time : 6.0
Steering Angle : 20.6
Articulating Angle : 70.0

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 600mm CLEARANCE FROM VEHICLE BODY

LOT 23 on DP1036154
VACANT LAND



PRELIMINARY PLAN

FOR DISCUSSION PURPOSES
ONLY SUBJECT TO CHANGE
WITHOUT NOTIFICATION



SWEPT PATH ASSESSMENTS
SANTOS LOGISTICS CENTRE
YARRIE LAKE ROAD, NARRABRI

13 DECEMBER '12
SCALE 1:1000 @ A3
13S1058000-AT01-04-P2

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Appendix 4

Ecological Assessment



Ecological Assessment

Narrabri Logistics Centre

Prepared by:

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Document Status

J Yfgjcb	Di fdcgYcZ8 cW a Ybhi	Cfj	F Yj JYk	F Yj JYk '8 UY
Draft	Draft for Review	AB	MD	17-10-2012
Final	Final for Issue	AB	MD	13-12-2012

Approval for Issue

BUa Y	Gj bUf fY	8 UY
Matt Doherty		13-12-2012

Summary

Introduction

Santos Limited (Santos), is investigating opportunities for expanding their existing operations centre at Narrabri to a larger logistics centre. RPS Australia East Pty Ltd (RPS) was engaged to undertake an ecological site inspection and produce reporting to inform a development application for assessment by Narrabri Council. The site inspection was carried out by an ecologist on the 3rd and 4th of September 2012, within Lot 241, DP 1120041, 300 Yarrie Lake Road, Narrabri, NSW. This location is hereafter referred to as the site and the proposed actions within the site are hereafter referred to as the proposal.

This assessment outlines the occurrence, or likely occurrence, of any threatened species, populations or ecological communities listed within the *Threatened Species Conservation Act 1995* (TSC Act 1995). The report recognises the relevant requirements of the EP&A Act 1979 as amended by the *Environmental Planning and Assessment Amendment Act 1997*. Reporting is also made with regard to those threatened entities listed federally under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999).

Vegetation

Ground truthing of the site confirmed previous mapping was inaccurate and delineated one native vegetation community identified as occurring within the site, which is not commensurate with TECs listed under EPBC Act 1979 and/or NSW TSC Act 1995 (refer to **5 ddYbXjl +**). The Vegetation community present on site was mapped in accordance with Namoi CMA Vegetation Mapping being Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodlands, Brigalow Belt South and Nandewar

No threatened flora species listed under the TSC Act 1995 or EPBC Act 1999 were recorded within the Site during RPS surveys.

Habitat

The Vegetation identified on site as 'Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodlands, Brigalow Belt South and Nandewar' was in relatively poor condition. The habitat offers little in the form of mature canopy trees, hollows for nesting and dwelling, logs, rocks, understorey vegetation and vegetation diversity.

Fauna

The vegetation on site and the garbage tip in close proximity to the site attracted some 22 different bird species throughout various times of day. Horses appear to have access to the entirety of the site with their scats, tracks and grazing pressure being noted across the site. Therefore, this has resulted in increasing the level of disturbance through soil compaction, vegetation degradation and soil nutrient disturbance from faecal matter. There are no permanent water bodies present on site which could support native wildlife particularly amphibians.

Conclusions

The proposal is will result in the clearing of approximately 2.07ha of disturbed and previously cleared woodland which provides potential sub-optimal habitat for a number of threatened species. Assessment under the TSC Act and EPBC Act determined the proposal is unlikely to have a significant impact on threatened species, populations or ecological communities.

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1.0 Introduction

Santos Limited (Santos), is investigating opportunities for expanding their existing operations centre at Narrabri to a larger logistics centre. RPS Australia East Pty Ltd (RPS) was engaged to undertake an ecological site inspection and produce reporting to inform a development application for assessment by Narrabri Council. The site inspection was carried out by an ecologist on the 3rd and 4th of September 2012, within Lot 241, DP 1120041, 300 Yarrie Lake Road, Narrabri, NSW. This location is hereafter referred to as the site and the proposed actions within the site are hereafter referred to as the proposal.

1.1 Site Particulars

1.1.1 Location

The site is located at 300 Yarrie Lakes Rd, approximately 2 kilometres north-west of the township of Narrabri, NSW. The site is within the Brigalow Belt South IBRA Bioregion, the Namoi Catchment Management Area (CMA) and Narrabri Local Government Area (LGA).

The Site is approximately 2.5 kilometres from Bohena Creek (to the west), which provides an ephemeral source of water. More permanent bodies of water nearby are Narrabri Lake, approximately 2.5 kilometres to the east and the Namoi River, which is approximately 2.5 kilometres to the north-east.

1.1.2 Site

The site is approximately 3.4ha in size (2.07ha of which is to be cleared as part of the proposal) and is currently unfenced and shows signs of rural uses including Horse grazing. The site is surrounded by vegetated land on the south-western, north-western and north-eastern boundaries owned by Council. The south-eastern boundary adjoins the existing Santos Narrabri Operations Centre.

1.1.3 Topography

The site is flat terrain on predominantly sandy and alluvial soils with moderate to low fertility.

1.2 Proposed Activity

Santos is proposing to expand its existing operations centre at 300 Yarrie Lake Road, Narrabri (the proposal). The proposal will include:

- Operations, fibreglass and casing laydown areas;
- A casing wash area;
- A drilling fluids treatment plant;
- Cement plant;
- Chemical and dangerous goods storage areas;
- Warehouse and office space;
- Other ancillary storage and parking areas; and a
- Sedimentation basin with an associated construction and maintenance access track.

The entire site is approximately 170m by 200m (~3.4ha). The proposal will require clearing of an area of approximately 90m by 200m (~1.84ha) immediately adjoining the of the existing Santos Narrabri Operations Centre. An additional area of approximately 0.23 ha will be cleared along the north-western side of the site to accommodate a sedimentation basin (0.19ha) and an associated construction and maintenance access track (.04ha). Therefore, the total area of clearing is approximately 2.07ha and approximately 1.36ha of native vegetation will be retained as part of the proposal (: ¶ i fY&).

1.3 Scope of the Study

The objective of this assessment was to undertake an ecological assessment of the proposed proposal in order to identify ecological constraints of the proposed activities, and where relevant recommendations to minimise any ecological impacts. The specific scope of the assessment was to:

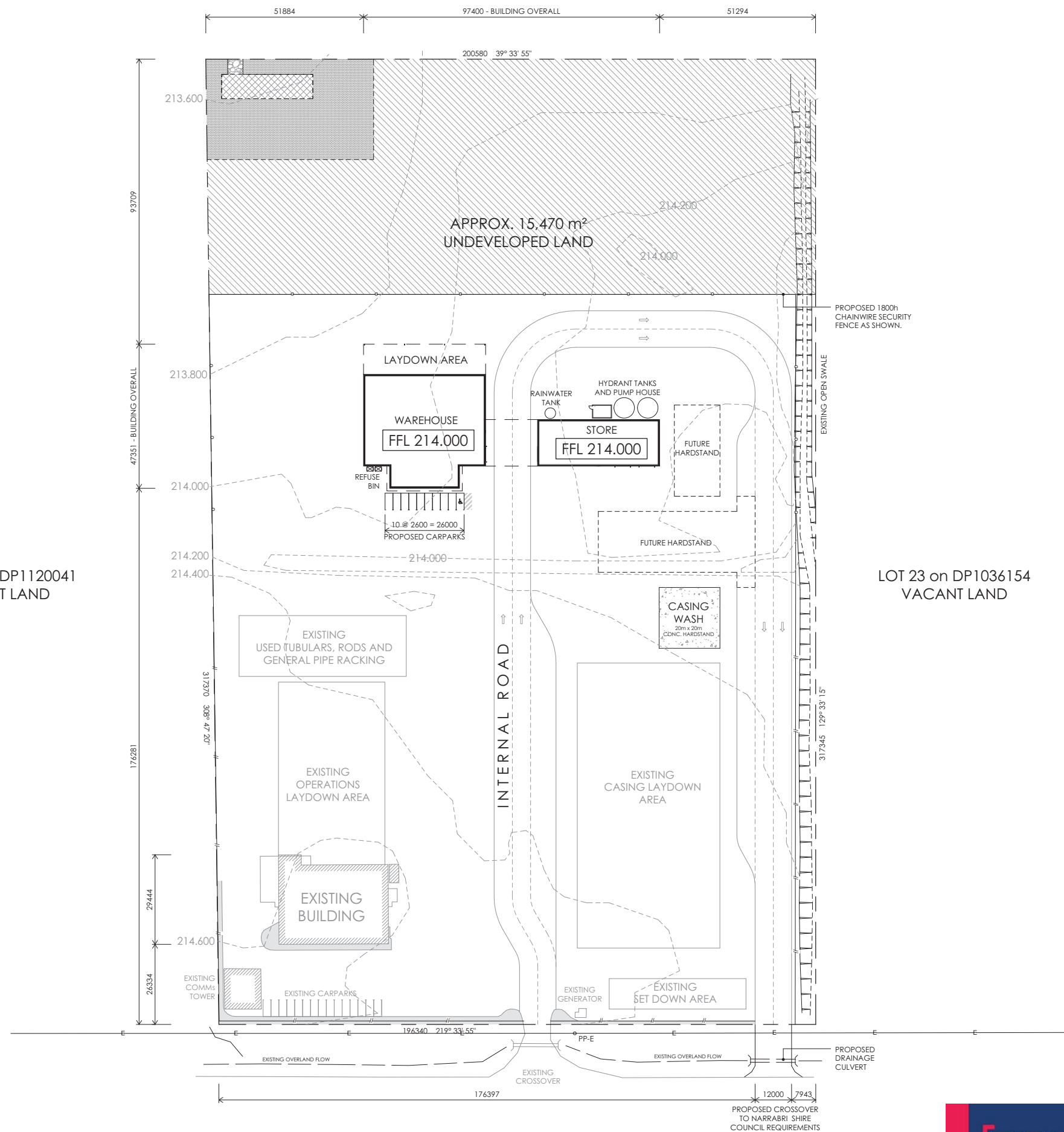
- Conduct a background review of relevant environmental databases, maps and policies;
- Verify the vegetation communities occurring on site;
- Identify habitat values of the site;
- Identify significant weed species;
- Identify constraints associated with the ecological features of the site in relation to threatened species, populations and ecological communities known from the locality (10km radius from the site) listed under the Threatened Species Conservation Act 1995 and Environment Protection Act 1999 along with other relevant NSW legislation and policy; and
- Recommendations to minimise potential ecological impacts.

1.4 Licensing and Certification

- NSW National Parks and Wildlife Service Scientific Investigation Licence S100536 (Valid 31 December 2012);
- Animal Research Authority (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2013);
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2013); and
- Certificate of Accreditation of a Corporation as an Animal Research Establishment (Trim File No: 01/1522 & Ref No: AW2001/014) issued by NSW Agriculture (Valid 22 May 2014).



Client: Santos		Locality Plan	
Compiled by: TW	Date: 13/12/2012	Figure 1	Project: O
Approved by: BL	Date: 13/12/2012		
<div><div><div>0</div><div>435</div><div>870</div><div>1,740</div></div><div>m</div><div>Datum: GDA94</div><div>RPS</div></div>		Source: Santos 2012 RPS 2012	



GENERAL NOTES

INDUSTRIAL CROSS OVERS TO BE CONSTRUCTED AS PER LOCAL AUTHORITY STANDARD DETAILS DRAWINGS.

150MM WIDE CONCRETE KERBING TO CAR PARK AND DRIVEWAY PERIMETER - WHERE SHOWN.

PROVIDE DISABLED ACCESS FROM CARPARK TO BUILDING RAMPS TO BE MAX. GRADES OF 1:20 ACROSS CAR TURNING AREA WITH MAX. 3MM STEP UP FROM RAMP TO FLOOR TO COMPLY WITH A.S. 1428. 1-2001.

ALL RAMPS FROM CARPARK TO TENANCY ENTRY DOORS TO BE 1:14 MAXIMUM GRADIENT.

LEGEND

- 27.000 EXISTING CONTOUR
- PP-E EXISTING LIGHT POLE
- DPH DUAL PILLAR HYDRANT
- EXISTING OVERLAND FLOW
- E-E EXISTING ELECTRICAL
- EXISTING FENCING
- PROPOSED FENCING
- EXISTING LANDSCAPING
- UNDEVELOPED LAND
- 20m WIDE GRASSED BUFFER
- SEDIMENTATION BASIN
- SCOUR PROTECTION

SITE INFORMATION

LOT 241 on DP1120041	62979 m ²
TOTAL FLOOR AREA	1964 m ²
GROUND FLOOR	
Amenities	42 m ²
Office	126 m ²
Store	602 m ²
Warehouse	1195 m ²
TOTAL CARPARKS	25

SITE PLAN

(A1) 1:750

YARRIE LAKE ROAD

**space
frame**
DESIGN + CONSTRUCT SOLUTIONS

SITE PLAN SANTOS

NARRABRI LOGISTICS SUPPLY BASE
YARRIE LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 020 - 4
DATE 12.12.2012

FIGURE 2

2.0 Legislative Context

2.1 Environmental Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) provides that a person proposing to take an action that the person thinks may be a "controlled action" must refer the proposal to the Minister for Sustainability, Environment, Water, Population and Communities (Minister). A "controlled action" is an action that:

- will have or is likely to have a significant impact on
 - » World heritage properties
 - » National heritage places
 - » Wetlands of international importance
 - » Great Barrier Reef Marine Parks
 - » Commonwealth marine areas
 - » Commonwealth listed threatened species
 - » Commonwealth listed threatened ecological communities
 - » Commonwealth listed migratory species
- Is undertaken by the Commonwealth and will have or is likely to have a significant impact on the environment;
- Is undertaken by any person on Commonwealth land and will have or is likely to have a significant impact on the environment; or
- Is a nuclear action.

These are referred to as "matters of national environmental significance" (MNES). The EPBC Act sets out the process for identifying and listing the MNES including listed threatened species and listed migratory species.

If the Minister decides that the proposed action is a controlled action via a referral under Part 7 of the EPBC Act, then the approval of the Minister is required under Part 9 of the EPBC Act.

2.2 NSW State Legislation

2.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) regulates development carried out in New South Wales. The carrying out of development is regulated under Part 4 of the EP&A Act.

Development is required to be assessed under Part 4 of the EP&A Act if the relevant environmental planning instruments provided that the development does not require consent or is not exempt development and the development is either carried out by a determining authority or requires the approval of a determining authority.

The objectives of the *Environmental Planning and Assessment Act 1979* include:

- (a) To encourage:
 - (i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,
 - (ii) the promotion and co-ordination of the orderly and economic use and development of land,
 - (iii) the protection, provision and co-ordination of communication and utility services,
 - (iv) the provision of land for public purposes,
 - (v) the provision and co-ordination of community services and facilities, and
 - (vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and
 - (vii) ecologically sustainable development, and
 - (viii) the provision and maintenance of affordable housing, and
- (b) To promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and
- (c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.

SEPP No. 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) aims "to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline".

Schedule 1 of SEPP 44, which lists the LGAs to which SEPP 44 applies, includes the Narrabri LGA. SEPP 44 applies to local councils determining development applications under Part 4 of the EP&A Act. Although SEPP 44 does not apply in relation to the assessment of development under Part 5 of the EP&A Act, it has been considered in the preparation of this ecological assessment.

SEPP 44 requires that before granting development consent under Part 4 of the EP&A Act for development on land over 1 hectare in area, a consent authority must form a view as to whether the land is "potential" and "core" koala habitat. Potential koala habitat is defined as:

- areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

Core koala habitat is defined as:

- an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.

Where core koala habitat is found to occur, SEPP 44 requires that a koala plan of management be prepared for the site.

2.2.2' Threatened Species Conservation Act 1995

The objectives the *Threatened Species Conservation Act 1995* (NSW) (TSC Act) include:

- To conserve biological diversity and promote ecologically sustainable development;
- Prevent the extinction and promote the recovery of threatened species, populations and ecological communities;
- To protect the critical habitat of those threatened species, populations and ecological communities that are endangered; and
- To ensure that the impact of any action prevents the extinction and promotes recovery of threatened species, populations and ecological communities.

The TSC Act provides the procedure for the listing of threatened species, populations and ecological communities and key threatening processes in New South Wales and the preparation and implementation of recovery plans and threat abatement plans.

The TSC Act also provides the mechanism for applying for and obtaining licences to take actions which will or are likely to result in harm to any animal that is a threatened species, population or ecological community, the picking of any plant which is part of a threatened species, population or ecological community, damage to critical habitat or damage to habitat of a threatened species, population or ecological community where such actions require a license to be obtained.

Key Threatening Processes

A key threatening process is defined under the TSC Act as 'a process that threatens, or that may threaten, the survival or evolutionary development of a species, population or ecological community. Threatening processes that adversely affect threatened species, populations or ecological communities, or possibly cause others that are not currently threatened; to become threatened may be eligible for listing as a key threatening process (KTP).

3.0 Methods

3.1 Desktop Assessment

Desktop assessments were undertaken to determine potential and previously recorded threatened species within a 10km radius the site. The Atlas of NSW Wildlife Database was utilised to assess species listed under the TSC Act 1995 and a Protected Matters Search was used to assess any species listed under the EPBC Act 1979. The following databases and maps were reviewed:

- EPBC Protected Matters Search Tool for an area extending 10km from the site (Department of Sustainability, Environment, Water, Population and Community (SEWPaC, 2012) (5 ddYbXjI '9%);
- Review of threatened fauna and flora records contained in the Bionet (OEH) database of threatened wildlife for an area extending 10km from the site;
- Review of the Namoi CMA Vegetation Geodatabase (Namoi CMA, 2010); and
- Aerial photography.

3.2 Field Assessment

Field survey was conducted over the site, under favourable weather conditions, on the 3 and 4 September 2012.

3.2.1 Flora Survey

Vegetation Mapping

Vegetation mapping carried out within the site using the following methods:

- Aerial Photograph Interpretation (API) to map the community(s) extent into definable map units;
- Confirmation of the community type(s) present (dominant species) via the undertaking of a flora survey and identification;
- Review of the Namoi CMA Vegetation Geodatabase (Namoi CMA, 2010) ;
- Map the type and general extent of the community(s) present into definable map units where appropriate; and
- Vegetation communities were delineated through flora random meander transect techniques.

Targeted Flora Survey

Flora surveys were carried out within the site using the following methods:

- Random meanders per Cropper (2003) across the site to record floristic diversity therein; and
- Targeted threatened flora species survey across the site based on known records (10km radius of the site) and habitat.

3.2.2 Habitat Assessment

Assessment of the relative value of the habitat present within the site were undertaken. This assessment also considered the potential value of the proximate areas for all major guilds of native flora and fauna.

The assessment was based on the specific habitat requirements of threatened fauna species known from the region (10km radius) in regards to home range, feeding, roosting, breeding, movement patterns and corridor

requirements. Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages.

3.2.3 Fauna Survey

The fauna survey methodology initially consisted of the production of an expected threatened fauna species (listed under the TSC Act 1995 and the EPBC Act 1999) lists based on the results of desktop searches. Confirmation of desktop results occurred during field survey by direct observation for species presence / absence, habitat value or secondary indications.

Avifauna

The presence of avifauna within the sites was assessed via opportunistic observations during all elements of fieldwork. Birds were identified by direct observation or by recognition of calls or distinctive features such as nests, feathers and owl regurgitation pellets etc.

Nocturnal surveys, during spotlighting, attempted to identify roosting diurnal birds in a similar fashion to methods employed during diurnal surveys. Spotlighting was undertaken on the site as described below where nocturnal avifauna species including forest owls were targeted.

Herpetofauna

Suitable habitat for herpetofauna (frogs and reptiles) was limited within the site, with no permanent water or rock assemblages being present on site. However, where potential habitat features such as logs and/or leaf litter were present herpetofauna searches were carried out.

Spotlighting

Spotlighting was undertaken within the site via the use of a 75-Watt hand-held spotlight and head torch whilst walking over the site. Nocturnal surveys undertaken during spotlighting, targeted arboreal and terrestrial mammals and roosting and nocturnal birds. A total of 2 person hours of spotlighting was conducted over 1 night (refer to : **II i fY'**).

Nocturnal Call Playback

Pre-recorded calls of Owl, Koala and Glider species with the potential to occur within the site were broadcast during the surveys in an effort to elicit vocal responses or to attract the species to the playback site. The calls were broadcast through an amplification system (loud hailer) designed to project the sound for at least 1km under still night conditions.

As described by Kavanagh and Peake (1993) and Debus (1995), the call of each species was broadcast for at least five minutes, followed by five minutes of listening, and stationary spotlighting. Following the final broadcast and listening, the area was spotlighted on foot. Species targeted included the Barking Owl (*N. connivens*), Powerful Owl (*Ninox strenua*), Masked Owl (*T. novaehollandiae*) and Koala (*Phascolarctus cinerius*). One night of call playback was undertaken within the site. The location of the call playback site is shown in : **II i fY'** .



Client: Santos		: U bUGi fj Ym9Zt:fh	
Compiled by: Glenn Jeffs	Date: 13/12/2012	: [i fY'	Project: Ecological Assessment
Approved by: Matt Doherty	Date: 13/12/2012		
<div><div><div>0</div><div>12.5</div><div>25</div><div>50</div></div><div>m</div><div>Datum: GDA94</div><div>RPS</div></div>		Source: Bing Maps 2011 Client provided 2012 RPS 2012	

Koala Assessments

The wooded areas within the entire site (3.4ha) were found to contain four individual Blakely's Red Gums (*Eucalyptus Blakelyi*) which are a secondary feed tree species as listed under SEPP 44. These trees were searched for signs of the species presence through means such as identification of scats, scratches, and individuals or their vocalisations (including eliciting response through call playback).

Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna were noted within the site. Such indicators included:

- Distinctive scats left by mammals. Any scats unable to be positively identified in the field were collected for further analysis, and scats of predator species containing fur / bones were sent for analysis if appropriate;
- Scratch marks made by various types of arboreal animals;
- Nests made by various guilds of birds;
- Scats and / or scratches consistent with Koalas;
- Tracks left by animals in sand;
- Carcasses and bones;
- Feeding scars on Eucalyptus trees made by Gliders; and
- Whitewash, regurgitation pellets and prey remains from Owls.

Any other incidental observations of fauna were recorded during all phases of fieldwork.

3.3 Survey Limitations

It should be noted that the detectability of flora and fauna and the ability to accurately identify plants to species level may vary greatly with the time of year, prevailing climatic conditions and the presence of reproductive material (e.g. flowers, fruit, and seed capsules). Consequently, the survey conducted for the site should not be regarded as conclusive evidence that certain protected species do not occur within the site; however, efforts have been made to detect these species in habitats that were considered suitable.

In response to the abovementioned limitations the precautionary approach has been adopted; as such 'assumed presence' of known and expected threatened species, populations and ecological communities has been made where relevant to ensure a holistic assessment.

4.0 Results

4.1 Flora Desktop Assessment

4.1.1 Threatened Ecological Communities

EPBC Act

Seven Threatened Ecological Communities listed under the EPBC Act were identified as potentially occurring within the locality of the site as part of the EPBC Protected Matters Search Tool, including:

- Brigalow (*Acacia harpophylla* dominant and co-dominant);
- Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions;
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia;
- Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland;
- Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions;
- Weeping Myall Woodlands; and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

TSC Act

No TECs listed within the TSC Act were identified as occurring within the site, based on known or predicted communities occurring in the Namoi Catchment Management Area Sub-region. However, of the above seven EPBC listed communities, all are commensurate with communities listed under the TSC Act and therefore, have the potential to occur. In addition to this a Wildlife Atlas Community Search provided two communities which are only listed under the TSC Act. These include:

- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions;
- Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions;
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions;
- Native Vegetation on Cracking Clay Soils of the Liverpool Plains;
- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South western Slopes bioregions;
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland;
- *Cadellia pentastylis* (Ooline) community in the Nandewar and Brigalow Belt South Bioregions;
- Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions; and
- Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions.

4.1.2 Threatened Flora

EPBC Act

An EPBC Protected Matters Report was generated on the 7 September 2012 via a search of the EPBC Protected Matters Search Tool. The EPBC Protected Matters Report identified 7 threatened flora species (HUVY%) with potential to occur within a 10 kilometre radius of the site.

HUVY%DchYbU`mcVV ff]b[`H fYUybYX`ZcfU`gdYVYg`fD67`5WV`

GWYbU`qWBUa Y`	7 ca a cb`BUa Y`	9D67`5WV`	HG7`5WV`
<i>Bertya opposens</i>	-	V	V
<i>Cadellia pentastylis</i>	Ooline	V	-
<i>Digitaria porrecta</i>	Finger Panic Grass	E	E
<i>Prasophyllum</i> sp. Wybong (C.Phelps ORG 5269)	A leek-orchid	CE	-
<i>Pterostylis cobarensis</i>	Cobar Greenhood Orchid	V	V
<i>Rulingia procumbens</i>	-	V	V
<i>Tylophora linearis</i>	-	E	V

GHU g..

CE = Critically Endangered

E = Endangered

V = Vulnerable

TSC Act

The Atlas of NSW Wildlife Database was accessed on the 10 August 2012 resulting in a total of 3 threatened species which have been recorded within 10km of the study site (HUVY%).

HUVY`&`H fYUybYX`:`cfU`GdYVYg`FVW`fXYX`k`JH`Jb`%`_a`cZH`Y`G`H`fHG7`5WV`

GWYbU`qWBUa Y`	7 ca a cb`BUa Y`	9D67`5WV`	HG7`5WV`
<i>Lepidium aschersonii</i>	Spiny Pepper-cress	V	V
<i>Swainsona murrayana</i>	Slender Darling Pea	V	V
<i>Dichanthium setosum</i>	Bluegrass	V	V

GHU g..

V = Vulnerable

4.2 Fauna Desktop Assessment

EPBC Act

An EPBC Protected Matters Report was generated on the 7 September 2012 via a search of the EPBC Protected Matters Search Tool. The EPBC Protected Matters Report identified 13 threatened fauna species (HUVY%) with potential to occur within a 10 kilometre radius of the site.

HUV'Y' "DchYbU`micVW ff]b['H fYUhbYX'Zi bUgdWYg'fD6 7 '5 WŁ"

GWYbUqWBLa Y'	7 ca a cb'BLa Y'	GHU g' 9D6 7 '5 WŁ
6 JfXg'		
<i>Anthochaera phrygia</i>	Regent Honeyeater	E
<i>Erythrotriorchis radiatus</i>	Red Goshawk	V
<i>Geophaps scripta scripta</i>	Squatter Pigeon	V
<i>Leipoa ocellata</i>	Malleefowl	V
<i>Polytelis swainsonii</i>	Superb Parrot	V
<i>Rostratula australis</i>	Australian Painted Snipe	V
AUa a Ug'		
<i>Phascolarctos cinereus</i>	Koala	V
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V
<i>Nyctophilus timoriensis</i> (South-eastern form)	Greater Long-eared Bat	V
<i>Petrogale penicillata</i>	Brush-tailed Rock Wallaby	V
<i>Pseudomys pilligaensis</i>	Pilliga Mouse	V
F Ydlj'Yg'		
<i>Anomalopus mackayi</i>	Five-clawed Worm-skink, Long-legged Wormskink	V
<i>Uvidicolus sphyrurus</i>	Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko	V

GHU g'fD6 7 '5 WŁ'

V = Vulnerable Species

E = Endangered Species

TSC Act

The Atlas of NSW Wildlife Database was accessed on the 10 August 2012 resulting in a total of 14 threatened fauna species having been recorded within a 10 kilometre radius of the site (HUV'Y').

HUV'Y' ('H fYUhbYX'Zi bUgdWYg'fYVcfYX'k JH Jb'%'?']ca YHfYg'fHG7 '5 WŁ"

GWYbUqWBLa Y'	7 ca a cb'BLa Y'	9D6 7 '5 WŁ	HG7 '5 WŁ
6 JfXg'			
<i>Polytelis swainsonii</i>	Superb Parrot	V	V
<i>Rostratula australis</i>	Australian Painted Snipe	V	E
<i>Anseranas semipalmata</i>	Magpie Goose	-	V
<i>Circus assimilis</i>	Spotted Harrier	-	V
<i>Tyto longimembris</i>	Eastern Grass Owl	-	V
<i>Stictonetta naevosa</i>	Freckled Duck	-	V
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	-	E
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	-	V
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler	-	V
<i>Chthonicola sagittata</i>	Speckled Warbler	-	V
<i>Glossopsitta pusilla</i>	Little Lorikeet	-	V
<i>Daphoenositta chrysoptera</i>	Varied Sittella	-	V

GWYbñjZWBÜa Y	7 ca a cb'BUa Y	9 D6 7 '5 Wñ	HG7 '5 Wñ
AÜa a Ug'			
<i>Phascolarctos cinereus</i>	Koala	V	V
F Ydhj'Yg'			
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	-	V

GHÜi g'fHG7 #D6 7 '5 Wñ:

V = Vulnerable Species

E = Endangered Species

4.2.2 Migratory Species

Ten species listed as migratory under the EPBC Act have the potential to occur on site. **HUV'Y)** lists all potentially occurring migratory species.

HUV'Y) 'DchYbñjU'ncWñ ff[b['a][fUrcfmgdYñYg'k jñ]b'\$_a 'fD6 7 '5 Wñ"

GWYbñjZWBÜa Y	7 ca a cb'BUa Y	9 D6 7 '5 Wñ	HG7 '5 Wñ
<i>Apus pacificus</i>	Fork-tailed Swift	M'	•
<i>Ardea alba</i>	Great Egret	M'	•
<i>Ardea ibis</i>	Cattle Egret	M'	•
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	M'	•
<i>Hirundapus caudacutus</i>	White-throated Needletail	M'	•
<i>Leipoa ocellata</i>	Malleefowl	V, M'	E'
<i>Merops ornatus</i>	Rainbow Bee-eater	M'	•
<i>Anthochaera phrygia</i>	Regent Honeyeater	E, M'	CE'
<i>Gallinago hardwickii</i>	Latham's Snipe	M'	•
<i>Rostratula australis</i>	Australian Painted Snipe	V, M'	E'

GHÜi g'fHG7 #D6 7 '5 Wñ:

V = Vulnerable Species

E = Endangered Species

CE = Critically Endangered Species

M = Migratory

4.3 Field Surveys

4.3.1 Vegetation Communities

One vegetation community was observed within the site being Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodlands, Brigalow Belt South and Nandewar.

A description of this community is provided below, while the location and extent is outlined in : **][i fY(** . A detailed flora species list for the site is included in **5 ddYbXj] ' &**

Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodlands

D`UHY`%Fci [\ !VUf_YX`5dd`Y!`6`U_Y`nfg`FYX`; i a `F]dUf]Ub`; fUggmiK ccX`UbXgž6 f]] Uck `6 Y`hGci h `UbX` BUbXYk Uf`

Description: The site was dominated by Rough-barked Apple (*Angophora floribunda*) and White Cypress Pine (*Callitris glaucophylla*) with four individual Blakely's Red Gums (*Eucalyptus Blakelyi*) occurring throughout the entire site (3.4ha). This community lacked diversity in the understorey. The shrub layer was comprised of Deane's Wattle (*Acacia deanei*), Appressed Bossiaea (*Bossiaea rhombifolia*) and African Boxthorn (*Lycium formosum*). The ground cover consisted mostly of native grasses including Cane Grass (*Eragrostis australasica*), Purple Wiregrass (*Aristida ramosa*) Hairy Panic (*Panicum effusum*) and Slender Bamboo (*Austrostipa verticillata*). Herbs and forbes in this community were scarce however, some Tufted Bluebell (*Wahlenbergia communis*), Common Everlasting (*Chrysocephalum apiculatum*) and *Glycine clandestina* were observed.

Condition: The overall condition of this community was relatively poor throughout the site. This area of woodland exhibits a low floristic diversity this is as a result of a moderate level of disturbance from rural usage including Horse grazing. A moderate level of weed infestation by African Boxthorn (*Lycium formosum*) and Prickly Pear (*Opuntia stricta**) was evident and the ground layer is largely a monoculture of only a few grass species further demonstrating a history of disturbance.

Classification: It was determined that this community is not commensurate with any TEC listed under the under the State (TSC Act 1995) and Commonwealth (EPBC Act 1999) legislative framework.(5 ddYbX]] +



@Y YbX

- Site Boundary
- Vegetation To Be Cleared
- Vegetation To Be Retained
- Construction and Maintenance Access (10m)
- Sedimentation Basin
- Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodlands, Brigalow Belt South and Nandewar

Client: Santos		JY[YHjcb'Wta a i b]m	
Compiled by: Glenn Jeffs	Date: 13/12/2012	: [i fY(	Project: Ecological Assessment
Approved by: Matt Doherty	Date: 13/12/2012		
<div><div><div>012.52550</div><div>m</div></div><div>Datum: GDA94</div><div>RPS</div></div>		Source: Bing Maps 2011 Client provided 2012 RPS 2011	

4.3.2 Targeted Flora Surveys

Targeted searches did not confirm the presence of any threatened flora species (listed under the TSC act or the EPBC Act) within the site. A full list of the flora species is compiled in **5 ddYbXJl ' &**. An assessment of likelihood of occurrence was completed for the threatened flora species listed in **HUV'Yg' %/ ' &** and is included in **5 ddYbXJl ' (**.

4.3.3 Weeds

Several exotic flora species were recorded on site and two of which are listed weed species. These two species, namely Prickly Pear (*Opuntia stricta*) and African Boxthorn (*Lycium formosum*), are considered to be a noxious weeds in NSW (DPI, 2012). Under the provisions of the *Noxious Weeds Act 1993*, Prickly Pears (except *Opuntia ficus-indica*) and African Boxthorn (*Lycium formosum**) are classified as Class 4 weeds. This means that the growth and spread of the plant must be controlled according to the measure specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed.

The remaining species are grasses or herbs that are not considered noxious in NSW. A complete flora list is compiled in **5 ddYbXJl ' &**.

4.4 Fauna

4.4.1 Habitat

The vegetation community within the site was identified as 'Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodlands, Brigalow Belt South and Nandewar'. This relatively small area of vegetation (3.4ha) offers little habitat in the form of mature canopy trees, hollows for nesting and dwelling, logs, rocks, understorey vegetation and vegetation diversity. There are no permanent water bodies present on site which could support native wildlife particularly amphibians.

The sparse vegetation on site and the garbage tip in close proximity to the site provide suitable foraging habitat for many common bird species throughout various times of day. The site has experienced some visible signs of clearing and grazing which has led to degradation of many ecological attributes. Horses appear to have access to the entirety of the site with their scats, tracks and grazing pressure being noted across the site. This has resulted in increasing the level of disturbance through soil compaction, vegetation degradation and soil nutrient disturbance from faecal matter.

4.4.2 Observed Fauna

Opportunistic searches and spotlight lighting/call playback methods during field surveys did not confirm the presence of any threatened fauna species (listed under the TSC act or the EPBC Act) within the site. A full list of the fauna species is compiled in **5 ddYbXJl ' "**. An assessment of likelihood of occurrence was completed for the threatened fauna species listed in **HUV'Yg' " / ' ("** and is included in **5 ddYbXJl ' (**.

4.4.3 Avifauna Survey

A total of 22 bird species were recorded within the site during the survey period. A full list of bird species observed within the site is provided in **5 ddYbXJl ' "**.

4.4.4 Reptile Survey

Opportunistic surveys were conducted across the site for reptiles, however, only one common reptile species was recorded within the site namely a Garden Sun Skink (*Lampropholis delicata*).

4.4.5 Frog Survey

Opportunistic surveys were conducted for amphibians within the site. However, no amphibian species were recorded within the site.

4.4.6 Koala Assessments

No Koalas (*Phascolarctos cinereus*), or signs of their presence, were recorded during the surveys. No primary koala feed trees listed under Schedule 2 of the SEPP 44 were recorded on site, only secondary Koala feed trees were present.

4.4.7 Spotlighting

A total of two person hours of spotlighting across the site as described in GYWjcb' "&" failed to locate and identify any faunal species within the site.

4.4.8 Nocturnal Call Playback

A nocturnal call playback within the site as described in GYWjcb' "&" failed to locate and identify any faunal species within the site.

4.4.9 Pests

Three pest species, namely the Fox (*Vulpes vulpes*), Horse (*Equus ferus caballus*) and Rabbit (*Oryctolagus cuniculus*) were all recorded on site via visual observations or signs of presence through scats, tracks or carcasses.

5.0 Ecological Impact Assessment

5.1 Potential Ecological Impacts

The proposal is likely to result in the clearing of approximately 2.07ha of disturbed woodland which provides potential sub-optimal habitat for a number of threatened entities. Based on the field survey and results an assessment of potential impacts on threatened species, populations and ecological communities from the locality (10km radius of the site) has been undertaken.

Blakely's Red Gums (*Eucalyptus Blakelyi*) were observed within the vegetation community on site, therefore, there is potential for White Box, Yellow Box, Blakely's Red Gum and Derived Grasslands TEC to occur. Further preliminary assessment has been undertaken, with reference to DEH (2006) and NPWS (2002) (see **5 ddYbXjl +**) to determine the likelihood of TEC presence based on site, situation and floristic structure. Specifically, the site contains a low abundance Blakely's Red Gum (*Eucalyptus Blakelyi*) and it is not considered a dominant or characteristic canopy species. Therefore, the assessment in **5 ddYbXjl +** concluded that the vegetation community within the site is not commensurate with the TEC determination under the State (TSC Act 1995) and Commonwealth (EPBC Act 1999) legislative framework.

Initially a consideration for likelihood of occurrence was carried out for both TSC Act and EPBC Act listed species in **5 ddYbXjl (**. Those threatened species, populations and ecological communities considered to have the potential to occur and/or impacted upon as result of the proposal were assessed further under a 7-Part Test for the threatened entities listed under the TSC Act (**5 ddYbXjl ***). Similarly, an Assessment of Significance (AoS) was conducted for the threatened entities and listed migratory species listed under the EPBC Act (**5 ddYbXjl)**.

5.2 Matters of National Environmental Significance

The EPBC Act focuses Commonwealth interests on matters of National Environmental Significance (NES) including integrated biodiversity conservation and the management of important protected areas. The matters of NES as identified in the Act which require assessment and approval to be addressed by the Commonwealth include:

- World Heritage Properties;
- National Heritage Places;
- Wetlands of International Importance;
- Great Barrier Reef Marine Parks;
- Commonwealth Marine areas;
- Nationally Threatened Species;
- Nationally Threatened Ecological Communities;
- Migratory Species;

The assessment and approval process applies to any action that has, will have or is likely to have a significant impact on a matter of NES. An 'action' is defined as a project, development, undertaking or an activity or series of activities.

The matter of NES and site-specific responses are as follows.

.

World Heritage Properties:

The Site is not World Heritage Property, and is not in close proximity to any such property.

Wetlands of International Importance (RAMSAR convention):

The Site is not part of any Wetland of International Importance, and is not in close proximity to any such area.

- Great Barrier Reef Marine Parks;
- The Site is not part of any Great Barrier Reef Marine Park, and is not in close proximity to any such park.
- Commonwealth Marine Areas

The proposal will not have a significantly adverse effect on any Commonwealth Marine area, as there are no such marine areas within the region.

Nationally Listed Threatened Species:

Threatened species listed under the EPBC Act, which occur, or have the potential to occur within the locality (10km radius) have been assessed for their potential to occur within the site (5 ddYbXJl ' (). Those threatened species that were considered to have potential to occur and subsequently may be impacted by the proposal is as follows:

Those EPBC listed threatened species considered to have potential to occur are:

- | | | |
|--------------------------|------------------------|---|
| ▪ Pterostylis cobarensis | Cobar Greenhood Orchid | V |
| ▪ Rulingia procumbens | | V |
| ▪ Tylophora linearis | | E |
| ▪ Phascolarctos cinereus | Koala | V |
| ▪ Leipoa ocellata | Malleefowl | V |
| ▪ Polytelis swainsonii | Superb Parrot | V |

The site and the proposed location of the development footprint exists, as a previously disturbed site (~3.4 ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). This site is within close proximity to superior areas of habitat (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) which would be suitable for supporting populations of the potentially occurring above listed threatened species. The small area to be impacted upon is unlikely to be essential to the survival of populations of these listed species.

Nationally Listed Threatened Ecological Communities:

No Threatened Ecological Community (TEC), nationally listed under the EPBC Act were recorded during field surveys. However, one TEC was considered for its likelihood to occur (5 ddYbXJl ' (). As no TEC's are considered likely to occur there is no potential for impacts upon any listed TEC's.

Nationally Listed Migratory Species:

Those EPBC listed Migratory species considered to have potential to occur are:

- | | |
|---------------------------|-------------------|
| ▪ <i>Circus assimilis</i> | Spotted Harrier |
| ▪ <i>Apus pacificus</i> | Fork-tailed Swift |

- *Leipoa ocellata* Malleefowl
- *Ardea ibis* Cattle Egret
- *Merops ornatus* Rainbow Bee-eater

The proposed location of the development footprint exists, as a previously disturbed site with a low diversity of habitat features. The site and the proposed location of the development footprint exists, as a previously disturbed site (~3.4 ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). This site is within close proximity to superior areas of habitat (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) which would be suitable for supporting populations of the potentially occurring above listed threatened species. The small area to be impacted upon is unlikely to be essential to the survival of populations of these listed species.

This site is surrounded by superior areas of habitat, which would be suitable for the above listed Migratory species. Due to the extensive tracts of vegetation within the Pilliga State Forest, supporting the populations of the potentially occurring above species, the small area to be impacted upon is unlikely to be essential to the survival of populations of these species.

5.3 NSW State Significance

5.3.1 TSC Act

Section 5A of the EP&A Act lists seven factors that must be taken into account in the determination of the significance of potential impacts proposed activities on 'threatened species, populations or ecological communities (or their habitats)' listed under the NSW TSC Act. The Assessment of Significance (7-part test) is used to determine whether activities are 'likely' to cause 'a significant impact' on threatened biota.

5 ddYbXjl * contains the assessment for the following species listed in HUVY*.

HUVY* *H fYUHybYX'GdYjYg'UggYggYX'i bXYf'+!DUfhHYghg'

: Uf bUGdYjYg'	: `cfUGdYjYg'
Spotted Harrier	<i>Dichanthium setosum</i>
Grey-crowned Babbler	<i>Digitaria porrecta</i>
Koala	<i>Rulingia procumbens</i>
Pale-headed Snake	<i>Pterostylis cobarensis</i>
Malleefowl	<i>Tylophora linearis</i>
Superb Parrot	
Speckled Warbler	
Little Lorikeet	
Varied Sittella	
Eastern Grass Owl	

The assessment determined that no significant impacts such that a local extinction would be likely to occur as a result of the proposal.

5.4 SEPP 44 (Koala Habitat Protection)

This policy aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline.

First Consideration – Is the Land ‘Potential Koala Habitat’?

Schedule 2 of State Environmental Planning Policy (SEPP) No. 44 – ‘Koala Habitat Protection’ lists 10 tree species that are considered indicators of ‘Potential Koala Habitat’. The presence of any of the species listed on a site proposed for development triggers the requirement for an assessment for ‘Potential Koala Habitat’. SEPP 44 defines potential Koala Habitat as:

“areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component”.

The wooded areas within the entire site (3.4ha) were found to contain four individual Blakely’s Red Gums (*Eucalyptus Blakelyi*) which are a secondary feed tree species. However, the site was dominated by Rough-barked Apple (*Angophora floribunda*) and White Cypress Pine (*Callitris glaucophylla*) which are neither primary nor secondary feed tree species. No primary feed trees listed under Schedule 2 of the SEPP 44 were detected within the site. No Koalas or traces of Koalas such as scats or scratches on tree trunks were observed within the site during the surveys. As no Koalas, or signs of Koala occupation were observed on the site and it lacked primary feed tree species, it has been determined that the site does not provide ‘Core’ or ‘Potential’ Koala habitat according to SEPP 44. Therefore, further assessment under SEPP 44 is not required.

6.0 Recommendations

The proposal has been assessed as being likely to have minimal ecological impacts, however to prevent and reduce potential for impact on ecological features within the site during the construction and operation phases of this project, the following management procedures are recommended.

- Vehicular traffic during the construction and operation phase are to avoid retained vegetation on site;
- Prevent the spread of exotic weed species through appropriate vehicle and personnel hygiene protocols during the construction phase.
- Vehicle speed should be minimised at all times on site to reduce dust levels and reduce the risk of fauna strike;
- Declared Noxious weeds (including Prickly Pear/ Tiger Pear) should be managed in accordance with local and state guidelines. In the absence of these reference shall be made to the Noxious Weeds Act; and
- Appropriate measures should be employed to ensure that construction and operations machinery are clean from materials potentially containing *Phytophthora cinnamomi*, as part of ongoing environmental stewardship.

7.0 Conclusion

RPS has been commissioned by Santos Pty Ltd to prepare an Ecological Assessment for the expansion of its existing Santos Narrabri Operations Centre at 300 Yarrie Lake Road, Narrabri (the proposal).

The proposal is will result in the clearing of approximately 2.07ha of disturbed woodland which provides potential sub-optimal habitat for a number of threatened entities. Based on the field survey and results an assessment of potential impacts on threatened species, populations and ecological communities from the locality (10km radius of the site) has been undertaken.

Assessment under the TSC Act found that the proposal is unlikely to have a signification impact on threatened species, populations or ecological communities known from the region.

Assessment under the EPBC Act found that the proposal was unlikely to have an impact on Matters of NES

No Koalas or traces of Koalas such as scats or scratches on tree trunks were observed within the site during the surveys. As no Koalas, or signs of Koala occupation were observed on the site and it lacked primary feed tree species, it has been determined that the site does not provide 'Core' or 'Potential' Koala habitat according to SEPP 44. Therefore, a Koala plan of management is not required.

The proposal has been assessed as being likely to have minimal ecological impacts, however to prevent and reduce potential for impact on ecological features within the site during the construction and operation phases of this project, the following management procedures are recommended.

- Vehicular traffic during the construction and operation phase are to avoid retained vegetation on site;
- Prevent the spread of exotic weed species through appropriate vehicle and personnel hygiene protocols during the construction phase.
- Vehicle speed should be minimised at all times on site to reduce dust levels and reduce the risk of fauna strike;
- Declared Noxious weeds (including Prickly Pear/ Tiger Pear) should be managed in accordance with local and state guidelines. In the absence of these reference shall be made to the Noxious Weeds Act; and
- Appropriate measures should be employed to ensure that construction and operations machinery are clean from materials potentially containing *Phytophthora cinnamomi*, as part of ongoing environmental stewardship.

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Appendix I

EPBC Protected Matters Report



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 07/09/12 10:46:32

[Summary](#)

[Details](#)

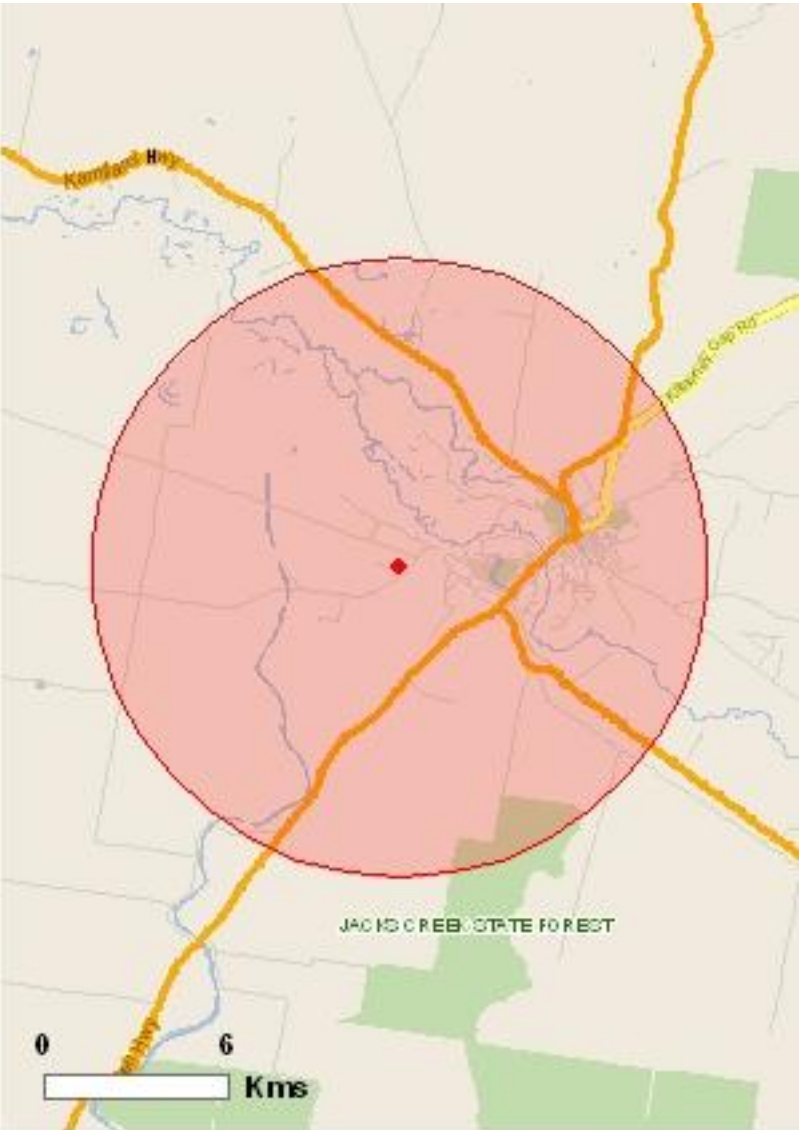
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



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[Coordinates](#)

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	6
Listed Threatened Species:	21
Listed Migratory Species:	12

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As [heritage values](#) of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	4
Commonwealth Heritage Places:	1
Listed Marine Species:	8
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	5
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	12
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [\[Resource Information \]](#)

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community likely to occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community may occur within area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species [\[Resource Information \]](#)

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Vulnerable	Species or species habitat likely to occur within area
Fish		
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Nyctophilus corbeni South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pseudomys pilligaensis Pilliga Mouse [99]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Bertya opposens [13792]	Vulnerable	Species or species habitat likely to occur within area
Cadellia pentastylis Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area
Digitaria porrecta Finger Panic Grass [12768]	Endangered	Species or species habitat likely to occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Pterostylis cobarensis Cobar Greenhood Orchid [12993]	Vulnerable	Species or species habitat likely to occur within area
Rulingia procumbens [12903]	Vulnerable	Species or species habitat likely to occur within area
Tylophora linearis [55231]	Endangered	Species or species habitat may occur within area
Reptiles		
Anomalopus mackayi Five-clawed Worm-skink, Long-legged Worm-skink [25934]	Vulnerable	Species or species habitat may occur within area
Uvidicolus sphyrurus Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko [84578]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species

[Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area

Migratory Terrestrial Species

Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Xanthomyza phrygia Regent Honeyeater [430]	Endangered*	Species or species habitat may occur within area

Migratory Wetlands Species

Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Vulnerable*	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land

[Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Scientific & Industrial Research Organisation
Commonwealth Land - Telstra Corporation Limited

Commonwealth Heritage Places

[Resource Information]

Name	State	Status
Historic		

Name	State	Status
Narrabri Post Office and former Telegraph Office	NSW	Listed place
Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Vulnerable*	Species or species habitat likely to occur within area

Extra Information

Places on the RNE		[Resource Information]
Note that not all Indigenous sites may be listed.		
Name	State	Status
Historic		
Collins Park Grandstand	NSW	Indicative Place
Narrabri Gaol (former)	NSW	Registered
Narrabri Post Office and former Telegraph Office	NSW	Registered
Narrabri Public School	NSW	Registered
Police Residence	NSW	Registered

Invasive Species		[Resource Information]
Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.		
Name	Status	Type of Presence
Frogs		

Name	Status	Type of Presence
Bufo marinus Cane Toad [1772]		Species or species habitat likely to occur within area
Mammals		
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat may occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Coordinates

-30.336 149.73

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Department of Environment, Climate Change and Water, New South Wales](#)
- [-Department of Sustainability and Environment, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment and Natural Resources, South Australia](#)
- [-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [-Environmental and Resource Management, Queensland](#)
- [-Department of Environment and Conservation, Western Australia](#)
- [-Department of the Environment, Climate Change, Energy and Water](#)
- [-Birds Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-SA Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-State Forests of NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

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Appendix 2

Flora Species List

Family Name	Scientific Name	Common Name
Fabaceae/faboideae/Mimosoideae	<i>Acacia deanei</i>	Green Wattle
Polygonaceae	<i>Acetosella vulgaris</i> *	Sheep Sorrel
Asteraceae	<i>Actinotus helianthi</i>	Flannel Flower
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple
Asteraceae	<i>Arctotheca calendula</i> *	Capeweed
Poaceae	<i>Aristida ramosa</i>	Purple Wiregrass
Poaceae	<i>Arundinella nepalensis</i>	Reed grass
Fabaceae/faboideae	<i>Bossiaea rhombifolia</i>	-
Asteraceae	<i>Brachyscome</i> sp.	-
Cupressaceae	<i>Callitris glaucophylla</i>	White Cypress Pine
Sinopteridaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	Poison Rock Fern
Asteraceae	<i>Conyza</i> sp.*	Fleabane
Poaceae	<i>Cynodon dactylon</i>	Common Couch
Fabaceae/faboideae	<i>Desmodium varians</i>	Slender Tick-trefoil
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed
Boraginaceae	<i>Echium plantagineum</i> *	Paterson's Curse
Poaceae	<i>Eragrostis</i> sp.	Bristly Love Grass
Myrtaceae	<i>Eucalyptus blakelyi</i>	Blakeley's Red Gum
Fabaceae/faboideae	<i>Glycine clandestina</i>	Twining Glycine
Lomandraceae	<i>Lomandra leucocephala</i>	-
Solanaceae	<i>Lycium ferocissimum</i> *	African Boxthorn
Cactaceae	<i>Opuntia stricta</i> *	Prickly Pear
Oxalidaceae	<i>Oxalis</i> sp.	-
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum
Poaceae	<i>Panicum</i> sp.	-
Fabaceae/faboideae	<i>Swainsona procumbens</i>	Broughton Pea, Swamp Pea
Asteraceae	<i>Taraxacum officinale</i> *	Dandelion
Campanulaceae	<i>Wahlenbergia</i> sp.	-

Appendix 3

Fauna Species List

Family Name	Scientific Name	Common Name
Avifauna		
Accipitridae	<i>Elanus scriptus</i>	Letter-winged Kite
Accipitridae	<i>Milvus migrans</i>	Black Kite
Cacatuidae	<i>Eolophus roseicapillus</i>	Galah
Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo
Halcyonidae	<i>Dacelo novaeguineae</i>	Laughing Kookaburra
Maluridae	<i>Malurus cyaneus</i>	Superb Fairy-wren
Acanthizidae	<i>Acanthiza reguloides</i>	Buff-rumped Thornbill
Pardalotidae	<i>Pardalotus punctatus</i>	Spotted Pardalote
Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote
Meliphagidae	<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater
Meliphagidae	<i>Philemon corniculatus</i>	Noisy Friarbird
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-thrush
Artamidae	<i>Cracticus tibicen</i>	Australian Magpie
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail
Corvidae	<i>Corvus coronoides</i>	Australian Raven
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark
Corcoracidae	<i>Corcorax melanorhamphos</i>	White-winged Chough
Megaluridae	<i>Cincloramphus mathewsi</i>	Rufous Songlark
Estrildidae	<i>Taeniopygia bichenovii</i>	Double-barred Finch
Mammals		
Equidae	<i>Equus ferus caballus</i> *	Horse
Canidae	<i>Vulpes vulpes</i> *	Fox
Leporidae	<i>Oryctolagus cuniculus</i> *	Rabbit
Reptile		
Scincidae	<i>Lampropholis delicata</i>	Garden Sun Skink

Appendix 4

Assessment of Likelihood of Occurrence, and Potential Level of Impact

Those threatened flora and fauna species (listed under the *TSC Act* and the *EPBC Act*) that have been gazetted / recorded from within the locality have been considered in the following tables. TEC's and Endangered Populations known from the broader area have also been addressed. Each species / community / population is considered for its potential to occur within the site and the likely level of impact as a result of the proposed activities. The following tables deal with each species / community / population separately and identifies the ecological parameters of significance associated with the proposed activities.

'Species' or 'TEC / Population' – Lists each threatened species / TEC / population known from the vicinity of the site. The status of each threatened species under the *TSC Act* and *EPBC Act* is also provided.

'Habitat' – Provides a brief account of the species / community / population and the preferred habitat attributes required for the existence / survival of each species / community / population.

'Likelihood of Occurrence' – Assesses the likelihood of each species / community / population to occur within the site in terms of the aforementioned habitat description and taking into account local habitat preferences, results of recent field investigations, data gained from various sources and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

'Potential for Impact' – Through consideration of the likely level / significance of impacts to each species / community / population that would result from the proposed activities, taking into account both short and long-term impacts, a decision has been made whether further assessment is required. This assessment is largely based on the chance of occurrence of each species / community with due recognition to other parameters such as home range, habitat use, connectivity etc. It also considers the scope of the proposed activities.

Ecological Community	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions (TSC). Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) (EPBC)	E	E	Dominated by <i>A. harpophylla</i> and associated with deep gilgaied clays, sedentary clays, alluvial clays and loamy red soils. Can occur with or without various Eucalypt species. Generally poses a dense low tree layer or tall shrub layer. The ground layer is typically sparse but dominated by native grasses.	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	E	E	Open eucalypt woodlands formerly occurred across a range of climatic regions of Australia, including semi-arid and humid subtropical zones. The position in the landscape of these woodlands can determine the vegetation structure of the woodlands such as if they occur on the floodplains or uplands and consequently, whether they have a more shrubby or more grassy understorey.	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (EPBC) Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (TSC)	E	E	Dominated by <i>E. microcarpa</i> and is found on relatively fertile soils of the western slopes and plains of NSW. Has a sparse shrub layer with a variable ground layer of grass and herbaceous species present almost always. This woodland is 15-25m tall but disturbed patches can experience thinning and clearing which alters the overall height.	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales (EPBC) and southern Queensland; Native Vegetation on Cracking Clay Soils of the Liverpool Plains (TSC)	E	CE	This community is generally grassland often dominated by grass species such as <i>Austrostipa aristiglumis</i> , <i>Dichanthium sericeum</i> or <i>Panicum queenslandicum</i> but can also include various shrubs and trees. This community occurs on cracking clay soils within the Liverpool Plains Catchment.	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.
Weeping Myall Woodlands (EPBC) Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South western Slopes bioregions (TSC)	E	E	This woodland is dominated by <i>Acacia pendula</i> (Weeping Myall). It is scattered through the eastern parts of alluvial plains of the Murray-Darling river system. It is generally found on red-brown earths and heavy textured grey brown alluvial soils. The canopy layer reaches 10m in height with an open understorey of chenopod shrubs and other woody plant species. The ground layer is an open to continuous groundcover of grasses and herbs.	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC) White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (TSC)	E	CE	This woodland is found on fertile soils on the tablelands and western slopes of NSW. The distribution of the community spreads between NSW North Coast, New England Tableland, Nandewar, Brigalow Belt, South, Sydney Basin, South Eastern Highlands and NSW South Western Slopes Bioregions. The characteristic species for this woodland are <i>Eucalyptus albens</i> , <i>Eucalyptus melliodora</i> or <i>Eucalyptus blakelyi</i> . Grass and herbaceous species generally characterise the ground layer. In some locations canopy species may be entirely absent due to clearing. Shrubs are generally sparse or absent.	This community was not identified on site during targeted surveys (refer to Appendix 7). Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.
<i>Cadellia pentastylis</i> (Ooline) community in the Nandewar and Brigalow Belt South Bioregions (TSC)	E	-	The Ooline community is an unusual and distinctive forest community with the canopy dominated by the tree Ooline (<i>Cadellia pentastylis</i>). Other canopy species include White Box (<i>Eucalyptus albens</i>), Ironbarks (<i>E. beyeriana</i> and <i>E. melanophloia</i>), Dirty Gum (<i>E. chloroclada</i>), Narrow-leaved Grey Box (<i>E. pilligaensis</i>), Green Mallee (<i>E. viridis</i>) and White Cypress Pine (<i>Callitris glaucophylla</i>). The understorey is made up of a range of shrubs such as Wattles and grasses. and ecology Usually occurs on undulating terrain on a variety of soil types, between 300-450 m altitude	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions (TSC)	E	-	Community occurs on brown loam or clay, alluvial or colluvial soils on prior streams and abandoned channels or slight depressions on undulating plains or flats of the western slopes. Community often occurs upslope from River Red Gum communities above frequently inundated areas of the floodplain. It also occurs on colluvium soils on lower slopes and valley flats. Less than 5% of the original extent is estimated to remain. Shrubs include Wilga, Deane's Wattle, Hop Bush, Cassia, Water Bush and Sifton Bush.	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.

Ecological Community	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions (TSC)	E	E	<p>The main canopy is dominated by rainforest species such as Red Olive Plum (<i>Cassine australis</i> var. <i>angustifolia</i>), Wilga (<i>Geijera parvifolia</i>) Native Olive (<i>Notelaea microcarpa</i> var. <i>microcarpa</i>) and Peach Bush (<i>Ehretia membranifolia</i>), with taller eucalypts and cypress pines from surrounding woodland vegetation emerging above the main canopy. Currant Bush (<i>Carissa ovata</i>) is often present and typical vines include Gargaloo (<i>Parsonsia eucalytophylla</i>) and Wonga Vine (<i>Pandorea pandorana</i>). and ecology</p> <p>This community often occurs on rocky hills, in deep, loam, high nutrient soils derived from basalt or other volcanic rocks, in areas which are sheltered from frequent fire.</p>	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.

Species	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
<i>Bertya opposens</i>		V	V	Grows on slightly elevated ridges with moderately coarse, sandy soil. The vegetation ranges from mallee shrubland to open woodland.	This species was not recorded on site and no records exist within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. This species preferred habitat specifically elevated ridges in association with mallee shrubland does not occur on site. Therefore, it is considered unlikely to occur on site.	This species is unlikely to occur on site due to the lack of suitable habitat. Therefore, it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Cadellia pentastylis</i>	Ooline	V	V	Ooline occurs on the western edge of the NSW north-west slopes. Ooline grows in dry rainforest, semi-evergreen vine thickets and sclerophyll ecological communities, often locally dominant or as an emergent. Prefers high fertile soils.	No records for this species exist within a 10km radius of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. This species was not detected during comprehensive field surveys to spite it being a distinctive looking small tree. Suitable habitat on site is also sub-optimal. Therefore, it is considered unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Dichanthium setosum</i>	Bluegrass	V	V	Bluegrass is associated with heavy basaltic black soils and stony red-brown hard setting loam with clay subsoil. It is found in moderately disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pasture.	Records for this species exist within 10km of the site (NSW Wildlife Atlas). The Protected Matters Search predicted that this species has potential to occur. Although, it was not recorded during field surveys. Although these soils do not exist on site, there are areas of disturbance where this species could inhabit. Therefore it is considered as having potential to occur.	Due to this species inhabiting disturbed areas, there is potential for it to be impacted upon as a result of the proposal if it does persist on site. <i>Therefore, this species has been assessed by a 7-Part Test below and in Appendix 5.</i>
<i>Digitaria porrecta</i>	Finger Panic Grass	E	E	<p>In NSW, the most frequently recorded associated tree species are <i>Eucalyptus albens</i> and <i>Acacia pendula</i>. Common associated grasses and forbs in NSW sites include <i>Austrostipa aristiglumis</i>, <i>Enteropogon acicularis</i>, <i>Cyperus bifax</i>, <i>Hibiscus trionum</i> and <i>Neptunia gracilis</i>. Flowering season is summer or late summer from mid-January to late February, with seeds maturing and falling from the plant soon after.</p> <p>Native grassland, woodlands or open forest with a grassy understorey, on richer soils. Often found along roadsides and travelling stock routes where there is light grazing and occasional fire.</p> <p><i>Digitaria porrecta</i> is a perennial tussock-forming grass that can vegetatively reproduce.</p>	Records for this species exist within 10km of the site (NSW Wildlife Atlas). The Protected Matters Search predicted that this species has potential to occur. Although, it was not recorded during field surveys. Although richer soils do not exist on site, there are areas of disturbed woodland with a grassy understorey where this species could inhabit. Therefore, it is considered as having potential to occur.	Due to this species inhabiting woodland with a grassy understorey, there is potential for it to be impacted upon as a result of the proposal if it does persist on site. <i>Therefore, this species has been assessed by a 7-Part Test below and in Appendix 5.</i>

Species	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
<i>Prasophyllum</i> sp. Wybong (C.Phelps ORG 5269)	A Leek-orchid		CE	A perennial orchid, appearing as a single leaf over winter and spring. Flowers in spring and dies back to a dormant tuber over summer and autumn. Known to occur in open eucalypt woodland and grassland.	This species was not recorded within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. The field surveys were conducted during the flowering season and it was not detected during field surveys. Eucalypt woodland in which this species can occur do exist within the site. Therefore, it is considered as having potential to occur.	This species is considered to have potential to occur on site. Therefore, it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed in Appendix 5.</i>
<i>Lepidium aschersonii</i>	Spiny Pepper-cress	V	V	Spiny Peppercress is endemic to mainland southern Australia, where it is widely but patchily distributed from north-eastern New South Wales to Western Australia. There are currently thought to be about 30 populations of Spiny Peppercress with only 14 population records existing within NSW. Occurs in periodically wet sites such as gilgai depressions and the margins of freshwater and saline marshes and shallow lakes, usually on heavy cracking clay soil.	This species has been recorded 18 times within 10km of the site (NSW Wildlife Atlas) and the Protected Matters Search predicted that this species has potential to occur. However, it was not detected during field surveys. No periodically wet habitat or heavy cracking clay soils exist on site. Therefore, it is considered as having unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Pterostylis cobarensis</i>	Cobar Greenhood Orchid	V	V	Cobar Greenhood Orchid is known chiefly from the Nyngan–Cobar–Bourke district in the far western plains of NSW. Grows among rocks on low hills and on slopes above streams. Inhabits eucalypt woodland, open mallee, or <i>Callitris</i> shrubland on low stony ridges and slopes with skeletal sandy-loam soils.	This species was not recorded within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Although it was not detected during field surveys. The surveys were not conducted within the flowering period for this cryptic species. Eucalypt woodland in which this species can occur and associated species including <i>Callitris glaucophylla</i> , do exist within the site. Therefore, it is considered as having potential to occur.	This species is considered to have potential to occur on site. Therefore, it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test(Appendix 6) and in Appendix 5.</i>
<i>Rulingia procumbens</i>		V	V	Endemic to NSW and is known from the Dubbo–Medooran–Gilgandra region, the Cobar region, and the upper Hunter Valley. Populations of this species have been recorded in Goonoo State Forest (SF), Mt Kaputar National Park, and Pilliga Nature Reserve. Occurs in sandy soils, often in disturbed habitats such as road verges, quarry boundaries, gravel stockpiles, and power line easements.	No records for this species exist within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Although it was not detected during field surveys. Sandy soils which this species prefers are present and the site is currently in a disturbed state. It is therefore, considered as having potential to occur.	The disturbed area in which this species could occur is being cleared and hence impacted upon. For this reason there is potential for the proposal to impact upon this species if it does occur on site. <i>Therefore, this species has been assessed by a 7-Part (Appendix 6) and in Appendix 5</i>
<i>Swainsona murrayana</i>	Slender Darling Pea	V	V	Found in grassland, herbland, and open Black-box woodland, often in depressions. This species grows in heavy grey or brown clay, loam, or red cracking clays. It is often associated with low chenopod shrubs (<i>Maireana</i> spp.), wallaby-grass (<i>Austrodanthonia</i> spp), and spear grass (<i>Austrostipa</i> spp.).	This species has been recorded within 10km of the site. (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. It was not detected during field surveys and suitable habitats with the appropriate soils do not occur on site. Therefore, it is considered unlikely to occur.	This species is unlikely to occur, therefore is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
<i>Tylophora linearis</i>		V	E	<i>Tylophora linearis</i> has rarely been collected and is known from eight localities in the Dubbo area and Mt Crow near Barraba in NSW. Grows in dry scrub, open forest and woodlands associated with <i>Melaleuca uncinata</i> , <i>Eucalyptus fibrosa</i> , <i>E. sideroxylon</i> , <i>E. albens</i> , <i>Callitris endlicheri</i> , <i>C. glaucophylla</i> , <i>Allocasuarina luehmannii</i> , <i>Acacia hakeoides</i> , <i>A. lineata</i> , <i>Myoporum</i> spp., and <i>Casuarina</i> spp.	This species has not been recorded within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Although, it was not detected during field surveys. However, some sub-optimal habitat does occur on site therefore, it is considered to have potential to occur on site.	This species is considered to have potential to occur on site. Therefore, it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6) and in Appendix 5.</i>

Species	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
<i>Circus assimilis</i>	Spotted Harrier	V	M	Occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges. Individuals disperse widely in NSW and comprise a single population. Grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe (e.g. chenopods). It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	This species could utilise the site to forage for prey such as small birds and mammals. Therefore, there is potential for it to occur on site.	This species is considered to have potential to occur on site. Therefore, it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6) and in Appendix 5.</i>
<i>Erythroriorchis radiatus</i>	Red Goshawk	E	V	Red Goshawks are found from across northern Australia, down the east coast of Qld and into the northern coast of NSW. In NSW records are rare. Listed as having occurred south to Port Stephens. Its habitat consists of wooded and forested areas. Prefers forest and woodland with a mosaic of vegetation types, large populations of birds for prey and permanent water. Riverine vegetation is highly utilised by this species. Its habits are not well known, but it is considered to be a solitary, sedentary bird. They nest in tree forks of <i>Eucalypt</i> sp. and <i>Melaleuca</i> sp. or those nests of other large birds such as Magpies or Crows. The nests are generally built of sticks, which are lined with soft twigs and leaves.	This species distribution in NSW is restricted to the north-eastern coast. Therefore, it is unlikely for this species to occur.	As this species is unlikely to occur, it is also unlikely to be impacted as a result of the proposal.
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler	V		Occupies open forests and woodlands, Acacia shrubland and adjoining farmland. Also Box-Gum Woodlands on the divide slopes and Box-Cypress Pine and open Box Woodlands on the plains. They feed on terrestrial invertebrates and insects on lower trunks and branches. Generally they prefer wooded areas with an intact ground cover, although in such areas as the Hunter Valley they occur in sparsely vegetated areas such as properties and golf courses. Appears unable to persist in cleared and highly fragmented habitats. Nest comprise of a dome shape stick nest which is often only a couple of metres from the ground in shrubs or Eucalypt saplings.	This species has been recorded within 10km of the site (NSW Wildlife Atlas). Although, it was not detected during field surveys, some habitat does occur on site. Therefore, it is considered to have potential to occur on site.	This species is considered to have potential to occur on site. Therefore, it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6).</i>
<i>Phascolarctos cinereus</i>	Koala	V	V	Koalas occur along the east coast of Australia and extend into Woodland, Mulga and River Red Gum forests west of the Great Dividing Range. The range of the Koala covers all such suitable areas of NSW. In drier forested areas, Koalas are generally observed as individuals in low densities. They are more abundant in coastal woodland and in open forest, where they have been found in densities as high as ten individuals per hectare. They are rare or absent in wet forests in the southern part of their range above 600 m which may be due more to distribution of Eucalypt species than climate, as the Koala is limited to areas where there are acceptable food trees. The diet is generally restricted to that of Eucalypt leaves. On occasion, non-Eucalypt foliage is eaten. The foliage of <i>Eucalyptus camaldulensis</i> (River Red Gum), <i>E. microcorys</i> (Tallowwood), <i>E. tereticornis</i> (Forest Red Gum), <i>E. punctata</i> (Grey Gum), <i>E. viminalis</i> (Ribbon Gum) and <i>E. robusta</i> (Swamp Mahogany) are some of the preferred Eucalypt species.	Various records for this species occur within 10km of the site (NSW Wildlife Atlas). Secondary feed trees used by this species do occur on site, although surveys did not locate this species or signs of this species on site. Nevertheless it is considered as having potential to occur.	Due the low number of non-preferred feed trees to be removed by the proposal, this species is unlikely to be impacted by the proposed action. <i>Nevertheless, as there is some degree of likelihood that this species occurs within the site, it has been assessed by a 7-Part Test (Appendix 6) and in Appendix 5.</i>
<i>Underwoodisaurus sphyrurus</i>	Border Thick-tailed Gecko	V	V	<i>U. sphyrurus</i> has a patchy distribution spread throughout the north-west slopes and northern tablelands of NSW. Habitat preferred by this species is dry sclerophyll open forest and woodland associated with outcrops of granite, basalt, sandstone and metamorphic rocks. Most known populations occur on sites with granite rocks. Sites favouring an easterly aspect have also been found to harbour more populations of this species. This species has been known to shelter under rocks, barks, logs and litter in rocky rubble.	This species was not recorded on or within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. No suitable habitat in the form of granite rocky outcrops occurs on site. Therefore it is considered unlikely to occur.	Due to lack of suitable habitat this species is unlikely to occur. Therefore, this species is considered unlikely to be impacted by the proposal and an AoS is not required
<i>Anomalopus mackayi</i>	Five-clawed Worm-skink	E	V	The species' known distribution in New South Wales is confined to the Namoi River and Gwydir River floodplains and the lower north-western slopes of the Great Dividing Range. The species ranges from the Wallangra-Masterman Range area in the east, south-west to the Narrabri-Wee Waa area, west along the northern edge of the Pilliga outwash demarcation to the south-west corner of the Namoi catchment south of Walgett. Known to occur in both remnant and non-remnant woodlands with low grass cover. Individuals also occur in open grassy paddocks with scattered eucalypts and moist black soil. It uses fallen logs and timber as sheltering sites and digs in loose soil to create permanent tunnel like burrows. In areas modified by agriculture and other human activities, the species has been found sheltering under artificial materials lying flat on the ground, such as discarded railway sleepers, sheet metal and hay bales.	This species was not recorded on site or within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. The soil on the site is not the preferred substance in which this species burrows in. Therefore it is considered unlikely to occur.	This species is unlikely to occur on site, therefore it is unlikely to be impacted upon as a result of the proposed actions and an AoS is not required for this species.

Species	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V		Found mainly in dry eucalypt forests and woodlands, cypress woodland and occasionally in rainforest or moist eucalypt forest. Favours streamside areas, particularly in drier habitats. Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. The main prey is tree frogs although lizards and small mammals are also taken.	This species has been recorded within 10km of the site (NSW Wildlife Atlas). Although, it was not detected during field surveys, some sub-optimal habitat does occur on site. Therefore, it is considered to have potential to occur on site.	This species is considered to have potential to occur on site. Therefore, it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6).</i>
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E, M	Nomadic Honeyeater that disperses to non-breeding areas, including the coast, in winter, where flowering trees are sought. Within the region, mostly recorded in Box-Ironbark Eucalypt associations along creek flats, river valleys and foothills. Coastal swamp forests in Lower Hunter are used when more western resources fail. The main feed tree for coastal areas is <i>Eucalyptus robusta</i> (Swamp Mahogany). Hunter records are more common in near coastal areas such as Cessnock LGA. Feed trees in this region are <i>Corymbia maculata</i> (Spotted Gum), <i>E. fibrosa</i> (Broad-leaved Ironbark), <i>E. crebra</i> (Narrow-leaved Ironbark) and various stringybark sp.. Nests mainly west of the divide, although local breeding attempts have occurred at Quorrobolong.	This species has not been recorded within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Although it was not recorded during field surveys. Flowering Eucalypt blossoms are scarce (4 individual trees) within the site in which this species could potentially forage. Therefore, due to the scarcity of habitat and the lack of records in the vicinity, it is considered unlikely to occur.	This species is unlikely to occur on site, therefore it is unlikely to be impacted upon as a result of the proposed actions and an AoS is not required for this species.
<i>Geophaps scripta scripta</i>	Squatter Pigeon	E	V	Occurs on the inland slopes of the Great Dividing Range with a distribution that extends from the Burdekin-Lynd divide in central Queensland, west to Charleville and Longreach, east to the coast from Prosperine to Port Curtis, and south to scattered sites in south-eastern Queensland. Inhabits grassy woodlands and open forests that are dominated by eucalypts. No confirmed records have been made since the 1970s.	No records exist within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Although, it was not detected during field surveys. No records have been made since the late 1970s, therefore, it is considered unlikely to occur.	This species was considered unlikely to occur. Therefore it is unlikely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Leipoa ocellata</i>	Malleefowl	E	V, M	Inhabits semi-arid regions of southern Australia. In New South Wales, it typically occurs west of the Great Dividing Range. Extends from Pilliga south-west to the districts of Griffith and Wentworth. The extent of occurrence is known to be decreasing. The distribution of the Malleefowl was formerly more extensive, extending over a large proportion of mainland southern Australia, including the south-western region of the Northern Territory. Occupies shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine <i>Callitris</i> woodlands, acacia shrublands, Broombush <i>Melaleuca uncinata</i> vegetation or coastal heathlands.	No records exist within 10km of the site for this species (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Callitris and Acacia woodlands do persist on site and they provide sub-optimal habitat. Therefore, it is considered to have potential to occur on site.	This species is considered to have potential to occur on site. Therefore it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6) and in Appendix 5.</i>
<i>Polytelis swainsonii</i>	Superb Parrot	V	V	The Superb Parrot occurs only in south-eastern Australia. The Superb Parrot is found in NSW and northern Victoria, where it occurs on the inland slopes of the Great Divide and on adjacent plains, especially along the major river-systems; vagrants have also been recorded in southern Queensland. Mainly inhabits forests and woodlands dominated by eucalypts, especially River Red Gums (<i>Eucalyptus camaldulensis</i>) and box eucalypts such as Yellow Box (<i>Eucalyptus melliodora</i>) or Grey Box (<i>E. microcarpa</i>). The species also seasonally occurs in box-pine (<i>Callitris</i>) and Boree (<i>Acacia pendula</i>) woodland.	This species has been recorded within 10km of the (NSW Wildlife Atlas) and the Protected Matters Search predicted that this species has potential to occur. Suitable eucalypt species (four individual trees) and <i>Callitris</i> (which provides seasonal habitat) do exist on site in which this species could forage. Therefore, it is considered as having potential to occur.	This species is unlikely to be impacted upon as a result of the proposed actions. <i>Nevertheless, as there is some degree of likelihood that this species occurs seasonally within the site, it has been assessed by a 7-Part Test (Appendix 6) and in Appendix 5.</i>
<i>Rostratula australis</i>	Australian Painted Snipe	E	V, M	A small freshwater and estuarine wader, which prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	No suitable habitat exists on site for this species. Therefore it is considered unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	This species forages in tall open forests and the edges of rainforest. It roosts in mine shafts and similar structures. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of <i>Hirundo ariel</i> (Fairy Martin), frequenting low to mid-elevation dry open forest and woodland close to these features.	No records for this species exist within 10km of the site (NSW Wildlife Atlas) and suitable habitat is not present. It is therefore, considered unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Nyctophilus timoriensis</i> (South-eastern form)	Greater Long-eared Bat	V	V	This species has not been recorded within 10km of the site. Its distribution is limited to the Murray-Darling Basin and records are scattered within this region. Occurs in a range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands. An insectivorous species that commonly feeds on moths, beetles and crickets.	This species has not been recorded within 10km of the site and records are rare. Sub-optimal habitat occurs on site for this species. It is considered unlikely to occur on site.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AOS is not required for this species.

Species	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
<i>Petrogale penicillata</i>	Brush-tailed Rock Wallaby	E	V	Occurs in forests and woodlands along the Great Divide and on the western slopes in escarpment country with rocky outcrops, steep rocky slopes, gorges, boulders and isolated rocky areas. The majority of populations favour north-facing aspects, but some southern aspects have been recorded. Apart from the critical rock structure <i>Petrogale penicillata</i> also requires adjacent vegetation types, associated types include, dense rainforest, wet sclerophyll, vine thicket, dry sclerophyll forest and open forest.	No records for this species exist within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. No suitable habitat in the form of rocky outcrops exists on site. Therefore, it is considered unlikely to occur on site.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Pseudomys pilligaensis</i>	Pilliga Mouse	V	V	This species is known only from the Pilliga region of NSW including the Pilliga state forest and Pilliga nature reserve. A defined habitat for this species is hard to characterise as the vegetation type in which this species has been found varies. Eucalypt, Callitris and Acacia woodlands are vegetation types in which this species has been found. It has been found mostly in gullies that have experienced recent fire events. Habitat features that appear to be preferential for this species include a moderate to high low-shrub cover; site moisture retention; and groundcover of plants, litter and fungi. Topography of sites where this species is found include rolling landscapes with low relief on sandy soil and sandstone ridges.	Records for this species do not exist within 10km of the site (NSW Wildlife Atlas) and the site is outside of this species' known range (the 'Pilliga' region). Therefore, it is considered unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Anseranas semipalmata</i>	Magpie Goose	V		Often seen in trios or flocks of 100 to 5,000, on shallow wetlands (especially those with a dense growth of rushes or sedges), drying ephemeral swamps, wet grasslands and floodplains, often roosting in fringing Paperbarks (<i>Melaleuca</i> spp.). The diet of this species is composed of grass seeds and sedge rhizomes.	Records for this species exist within 10km of the site (NSW Wildlife Atlas). Suitable habitat in the form of wetlands and swamps do not occur on site. Therefore, it is unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V		<i>Calyptorhynchus lathami</i> (Glossy Black-Cockatoo) is sparsely distributed along the east coast and immediate inland districts from western Victoria to Rockhampton in Queensland. In NSW, the species is found as far west as Cobar to Hillston and Griffith in isolated mountain range. The inland distribution of the species is restricted by the occurrence of the various <i>Casuarinaceae</i> spp. <i>C. lathami</i> characteristically inhabits forests on sites with low soil-nutrients status, reflecting the distribution of key <i>Allocasuarina</i> spp. The drier forest types with intact and less rugged landscapes are preferred by the species. It prefers highlands towards the north but may be found closer to the coast where conditions are suitable. In the south they are widespread in lowland coastal forests, dense mountain forests, semi-arid woodland and trees bordering water courses.	Records for this species exist within 10km of the site (NSW Wildlife Atlas). However, suitable habitat in the form of <i>Casuarinaceae</i> spp. do not occur on site. Therefore, it is unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Chthonicola sagittata</i>	Speckled Warbler	V		Speckled Warbler ranges in South-Eastern Australia, from South-West Victoria through eastern New South Wales to Central Queensland, mostly on the western slopes and tablelands of the Great Dividing Range, and in the drier areas of coast. They live in a wide range of Eucalypt dominated vegetation that has a grassy and shrubby understorey often on rocky ridges or gullies. It is a sedentary species with a home range that varies from 6-12 hectares. This species appears to be extinct from areas without vegetation fragments larger than 48.2ha. Prefers woodland areas where ground cover consists of shrubs, grass, fallen leaves and bark. This ground foraging bird feeds on insects, insect larvae and small seeds.	Records for this species exist within 10km of the site (NSW Wildlife Atlas), but it was not detected during field surveys. Suitable habitat in the form of open woodlands on site for this species. Therefore, it is considered as having potential to occur.	This species is considered to have potential to occur on site. Therefore, it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6).</i>
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		This species is more commonly encountered in near coastal habitats and on the divide. Habitat is mainly dry, open sclerophyll forests and woodlands, usually dominated by Eucalyptus, sometimes in plantations of <i>Eucalyptus cladocalyx</i> (Sugar Gum). They can be found in large flocks of hundreds of birds spread out across blossoming eucalypts. Movements of Little Lorikeets are largely unknown, but the belief is that they follow abundant blossom. Some areas they are sedentary and move within the local area in response to blossom. Nesting of <i>G. pusilla</i> consists of holes, including knotholes, in bend, top or side of limb, usually living or in main trunk of tree, occasionally over water, recorded in <i>Eucalyptus camaldulensis</i> (River Red Gum), <i>Eucalyptus grandis</i> (Flooded Gum) and <i>Casuarina cunninghamiana</i> (River Oak).	Records for this species exist within 10km of the site (NSW Wildlife Atlas). Suitable foraging habitat occurs on site Suitable eucalypt species (four individual trees) do exist on site in which this species could forage. Therefore it is considered as having potential to occur.	This species is considered to have potential to occur on site. Therefore it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6).</i>
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		The Varied Sittella can be reasonably common in some areas and also nomadic in others, where as they also can be sedentary. Habitat across the varying races is similar, although they can be found in a wide range of habitats. Open eucalypt forests and woodlands are the preferred habitat, but this species may also be found in mallee, coastal tea-tree scrubs, inland acacia communities, golf courses orchards and scrubby gardens. The nest of the Varied Sittella consists of deep cup of bark which is well camouflaged with spider's web and lichen. They favour the use of tree species for nesting such as Eucalypts, paperbarks, she-oaks and tea-trees.	Records for this species exist within 10km of the site (NSW Wildlife Atlas), but it was not detected on site during surveys. Suitable foraging habitat occurs on site Suitable eucalypt species (four individual trees) do exist on site in which this species could forage. Therefore it is considered as having potential to occur.	This species is considered to have potential to occur on site. Therefore it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6).</i>

Species	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
<i>Tyto longimembris</i>	Eastern Grass Owl	V		<p>Eastern Grass Owls are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. They rest by day in a 'form' - a trampled platform in a large tussock or other heavy vegetative growth.</p> <p>If disturbed they burst out of cover, flying low and slowly, before dropping straight down again into cover.</p> <p>Always breeds on the ground. Nests are found in trodden grass, and often accessed by tunnels through vegetation.</p> <p>Breeding season is highly variable and dependent on environmental conditions, but in NSW nesting most typically occurs in autumn or winter.</p>	<p>Records for this species exist within 10km of the site (NSW Wildlife Atlas) and suitable habitat in the form of areas of tall grass do occur on site. Therefore, it is considered to have potential to occur.</p>	<p>This species is considered to have potential to occur on site. Therefore it has potential to be impacted upon as a result of the proposed actions.</p> <p><i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6).</i></p>
<i>Stictonetta naevosa</i>	Freckled Duck	-	V	<p>Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.</p> <p>Generally rest in dense cover during the day, usually in deep water. Feed at dawn and dusk and at night on algae, seeds and vegetative parts of aquatic grasses and sedges and small invertebrates.</p> <p>Nesting usually occurs between October and December but can take place at other times when conditions are favourable.</p> <p>Nests are usually located in dense vegetation at or near water level.</p>	<p>Records for this species exist within 10km of the site (NSW Wildlife Atlas). However, suitable habitat of permanent or ephemeral freshwater water bodies do not occur on site. Therefore, it is unlikely to occur.</p>	<p>This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.</p>
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	-	E	<p>Black-necked Storks are mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation.</p> <p>They mainly forage in shallow, still water, preferring open wetlands, and taking a variety of prey, including eels and other fish, frogs, turtles, snakes, and small invertebrates, such as crabs and small insects. Vertebrates form the main mass of the diet, with medium-sized eels contributing the greatest biomass and were also the only food seen to be delivered to nestlings.</p> <p>In NSW, Black-necked Storks breed in late spring and summer.</p> <p>In NSW, Storks usually nest in a tall, live and isolated paddock tree, but also in other trees, including paperbarks, or even lower shrubs within wetlands. The nest is a large platform, 1-2 m in diameter, made in a live or dead tree, in or near a freshwater swamp.</p> <p>The clutch-size of nests in NSW is not properly known, but nests have been observed with from one to three young in the nest. Broods of four young have been recorded in northern Queensland.</p>	<p>Records for this species exist within 10km of the site (NSW Wildlife Atlas). However, suitable habitat of permanent or ephemeral water bodies do not occur on site. Therefore, it is unlikely to occur.</p>	<p>This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.</p>
<i>Apus pacificus</i>	Fork-tailed Swift		M	<p>This incredibly fast swift has a wide distribution covering most of the Australian continent. In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide, however, a few populations have been found west of the Great Divide. These are widespread but scattered further west of the line joining Bourke and Dareton. Sightings have been recorded at Milparinka, the Bulloo River and Thurloo Downs (Higgins 1999). The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. They mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh (Higgins 1999).</p>	<p>The Protected Matters Search predicted that this species has potential to occur. Although, it was not recorded during field surveys. Due to the wide variety of habitats in which this species occurs, it cannot be ruled out from occurring on site. Therefore, it is considered as having potential to occur on site.</p>	<p>This species is considered to have potential to occur on site. Therefore it has potential to be impacted upon as a result of the proposed actions.</p> <p><i>As there is potential for impact upon this species it is further assessed in Appendix 5</i></p>
<i>Ardea alba</i>	Great Egret		M	<p>This species is wide spread across Australia, occurring in wetland habitats such as estuaries, littoral habitats and moist grasslands (Marchant and Higgins 1990). They regularly use areas inundated with water such as freshwater meadows, flooded grasslands, ovals, pastoral lands and agricultural lands. Also regularly use saline habitats. They breed in wetlands fringed with trees or tall vegetation.</p>	<p>Records for this species exist within 10km of the site (NSW Wildlife Atlas). However, suitable habitat of permanent or ephemeral water bodies do not occur on site. Therefore, it is unlikely to occur.</p>	<p>This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.</p>

Species	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
<i>Ardea ibis</i>	Cattle Egret		M	<i>A. ibis</i> is distributed widely across Australia, occupying most of the continent with the exception of the arid western centre. The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. It has occasionally been seen in arid and semi-arid regions, however, this is extremely rare. High numbers have been observed in moist, low-lying poorly drained pastures with an abundance of high grass; it avoids low grass pastures. It has been recorded on earthen dam walls and ploughed fields. It is commonly associated with the habitats of farm animals, particularly cattle, but also pigs, sheep, horses and deer.	The Protected Matters Search predicted that this species has potential to occur. Although, it was not recorded during field surveys. Due to the wide variety of habitats in which this species occurs, it cannot be ruled out from occurring on site. Therefore, it is considered as having potential to occur on site.	This species is considered to have potential to occur on site. Therefore it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is further assessed in Appendix 5</i>
<i>Gallinago hardwickii</i>	Latham's Snipe		M	Latham's Snipe occurs across the eastern half of Australia in fresh water wetlands and saltmarshes. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies) however, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity. This species does not breed in Australia.	Records for this species exist within 10km of the site (NSW Wildlife Atlas). However, suitable habitat of permanent or ephemeral water bodies do not occur on site. Therefore, it is unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle		M	The White-bellied Sea-Eagle is distributed along the coastline (including offshore islands) of mainland Australia and Tasmania. It also extends inland along some of the larger waterways, especially in eastern Australia. The White-bellied Sea-Eagle is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, the sea).	The Protected Matters Search predicted that this species has potential to occur. This species may be observed flying over the site however suitable aquatic habitat for utilisation does not occur on site. Therefore it is considered unlikely to occur.	This species is unlikely to occur on site. Therefore, it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species
<i>Hirundapus caudacutus</i>	White-throated Needletail		M	The White-throated Needletail is widespread in eastern and south-eastern Australia (Simpson and Day 2010). In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland.	The Protected Matters Search predicted that this species has potential to occur. Although there is potential for this species to fly over the site, it is unlikely to be utilising the ecological attributes of the site. Therefore it is considered unlikely to occur.	This species is unlikely to occur on site. Therefore, it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species
<i>Merops ornatus</i>	Rainbow Bee-eater		M	This species covers the majority of the Australian mainland with the exception of the arid western centre. Inhabits a wide variety of open country generally near water, as well as habitat edges of parks, forests and gardens (Higgins 1999). Vegetation communities in which this species is known to occur include dry open sclerophyll forest, mallee, open woodland and shrubland, Spinifex tussock grassland with scattered trees and riverine or littoral assemblages (Higgins 1999). They nest in sandy banks or level ground, mostly in river banks and similar habitats.	This species was not recorded on or within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Due to the wide range of habitats in which this species can occur, and the site being located within its known distribution, it considered as having potential to occur on site.	This species is considered to have potential to occur on site. Therefore it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is further assessed in Appendix 5</i>

Appendix 5

Assessment of Significance - EPBC Act

The EPBC Act focuses Commonwealth interests on matters of National Environmental Significance (NES) including integrated biodiversity conservation and the management of important protected areas. The matters of NES as identified in the Act which require assessment and approval to be addressed by the Commonwealth include:

- World Heritage Properties;
- National Heritage Places;
- Wetlands of International Importance;
- Great Barrier Reef Marine Parks;
- Commonwealth Marine areas;
- Nationally Threatened Species;
- Nationally Threatened Ecological Communities;
- Migratory Species;

The assessment and approval process applies to any action that has, will have or is likely to have a significant impact on a matter of NES. An 'action' is defined as a project, development, undertaking or an activity or series of activities.

The matter of NES and site-specific responses are as follows.

World Heritage Properties:

The Site is not World Heritage Property, and is not in close proximity to any such property.

Wetlands of International Importance (RAMSAR convention):

The Site is not part of any Wetland of International Importance, and is not in close proximity to any such area.

- Great Barrier Reef Marine Parks;
- The Site is not part of any Great Barrier Reef Marine Park, and is not in close proximity to any such park.
- Commonwealth Marine Areas

The proposal will not have a significantly adverse effect on any Commonwealth Marine area, as there are no such marine areas within the region.

Nationally Listed Threatened Species:

Threatened species listed under the EPBC Act, which occur, or have the potential to occur within the locality (10km radius) have been assessed for their potential to occur within the site (**Appendix 4**). Those threatened species that were considered to have potential to occur and subsequently may be impacted by the proposal is as follows:

Those EPBC listed threatened species considered to have potential to occur are:

- | | | |
|---------------------------------|------------------------|---|
| ▪ <i>Pterostylis cobarensis</i> | Cobar Greenhood Orchid | V |
| ▪ <i>Rulingia procumbens</i> | | V |
| ▪ <i>Tylophora linearis</i> | | E |
| ▪ <i>Phascolarctos cinereus</i> | Koala | V |

▪ <i>Leipoa ocellata</i>	Malleefowl	V
▪ <i>Polytelis swainsonii</i>	Superb Parrot	V

These threatened species require assessment under the EPBC Act significant Impact Guidelines 1.1 with regards to the relevant significant impact criteria.

Critically endangered and endangered species - Significant Impact Criteria Assessment

Significant Impacts	<i>Tylophora linearis</i>
Lead to a long-term decrease in the size of a population	Unlikely. This species was not recorded on site and only suboptimal habitat of woodlands associated with <i>C. glaucophylla</i> occurs on site. Due to the large area of more suitable habitat within the wider area, <i>Tylophora linearis</i> will not be losing any significant habitat due to the proposed activities on site. Therefore no long-term decrease in population size will occur.
Reduce the area of occupancy of the species	Unlikely. This species was not recorded on site so it is unlikely that its area of occupancy on site will be reduced as a result of the proposed activities.
Fragment an existing population into two or more populations	No. No existing populations are known on site or within 10km of the site(Wildlife Atlas Search). Therefore, it is unlikely that any populations will be fragmented as a result of this project.
Adversely affect habitat critical to the survival of a species	No. No critical habitat for this species exists on site.
Disrupt the breeding cycle of a population	Unlikely. The area is potentially used for breeding (propagation). However, due to the large area of more suitable habitat in the form of 'woodlands associated with <i>C. glaucophylla</i> ', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)), the size of the potential breeding habitat on site (2.07ha) is not considered to be significant. The impacts of the proposed actions are therefore, not considered likely to disrupt the breeding cycle of this species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely. Although 2.07ha of potential albeit sub-optimal habitat would be reduced, given the large area of more suitable habitat in the form of 'woodlands associated with <i>C. glaucophylla</i> ', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)),it is considered unlikely that the impacts would cause this species to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely. It is unlikely that the impacted area will increase invasive species, such as exotic weed or pest species becoming established to any greater degree than what already exists.
Introduce disease that may cause the species to decline, or	Unlikely. There are no diseases which have been associated with the decline of this species. As a consequence the proposed activities are not expected to introduce any diseases that may cause this species to decline.
Interfere with the recovery of the species.	Unlikely. Due to the small area of impact and the large extent of more suitable habitat available for this species within the surrounding area, it is considered unlikely that the impacts of the proposal will substantially interfere with the recovery of the species.

Vulnerable species – Significant Impact Criteria Assessment

Significant Impacts	<i>Pterostylis cobarensis</i>	<i>Rulingia procumbens</i>	Superb Parrot	Malleefowl	Koala
Lead to a long-term decrease in the size of an important population of a species	Unlikely. This species was not recorded on site and The site does not contain preferred habitat of rocks, slopes or low hills. However, potential habitat for this species occurs within the disturbed Callitris woodlands on the site. Due to the large area of more suitable habitat within the wider area, <i>Pterostylis cobarensis</i> will not be losing any significant habitat due to the proposed activities on site. Therefore, no long-term decrease in population size will occur.	Unlikely. This species was not recorded on site and The site does contain the preferred habitat of sandy soils, often in disturbed habitats. Due to the large area of more suitable habitat within the wider area, <i>Rulingia procumbens</i> will not be losing any significant habitat due to the proposed activities on site. Therefore, no long-term decrease in population size will occur.	Potential habitat of Eucalypt woodlands and Callitris woodlands occur within the disturbed woodlands on the site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal. Unlikely. This species was not recorded on site and The site does contain suitable Eucalypt species (four individual trees) and Callitris (which provides seasonal habitat) in which this species could forage. Due to the large area of more suitable habitat within the wider area, Superb Parrot will not be losing any significant habitat due to the proposed activities on site. Therefore no long-term decrease in population size will occur.	Unlikely. This species was not recorded on site and The site does contain suitable Eucalypt woodlands and Callitris woodlands in which this species could forage. Due to the large area of more suitable habitat within the wider area, Malleefowl will not be losing any significant habitat due to the proposed activities on site. Therefore no long-term decrease in population size will occur.	Unlikely. This species was not recorded on site and only suboptimal foraging habitat is present (four individual secondary feed trees). Due to the large area of more suitable habitat within the wider area, the Koala will not be losing any significant habitat due to the proposed activities on site. Therefore no long-term decrease in population size will occur.
Reduce the area of occupancy of an important population	Unlikely. This species was not recorded on site so it is unlikely that its area of occupancy on site will be reduced as a result of the proposed activities.	Unlikely. This species was not recorded on site so it is unlikely that its area of occupancy on site will be reduced as a result of the proposed activities.	Unlikely. This species was not recorded on site so it is unlikely that its area of occupancy on site will be reduced as a result of the proposed activities.	Unlikely. This species was not recorded on site so it is unlikely that its area of occupancy on site will be reduced as a result of the proposed activities.	Unlikely. This species was not recorded on site so it is unlikely that its area of occupancy will be reduced as a result of the proposed activities.

Significant Impacts	<i>Pterostylis cobarensis</i>	<i>Rulingia procumbens</i>	Superb Parrot	Malleefowl	Koala
Fragment an existing important population into two or more populations	Unlikely. No existing populations are known on site. Therefore, it is unlikely that any populations will be fragmented as a result of this project.	Unlikely. No existing populations are known on site. Therefore, it is unlikely that any populations will be fragmented as a result of this project.	Unlikely. No existing populations are known on site. Therefore, it is unlikely that any populations will be fragmented as a result of this project.	Unlikely. No existing populations are known on site. Therefore, it is unlikely that any populations will be fragmented as a result of this project.	No. No existing populations are known on site so it is unlikely that any populations will be fragmented as a result of this project.
Adversely affect habitat critical to the survival of a species	No. No critical habitat for this species exists on site.	No. No critical habitat for this species exists on site.	No. No critical habitat for this species exists on site.	No. No critical habitat for this species exists on site.	No. No critical habitat for this species exists on site.
Disrupt the breeding cycle of an important population	Unlikely. The area is potentially used for breeding (propagation). However, due to the large area of more suitable habitat in the form of 'Callitris woodlands', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha))), the size of the potential breeding habitat on site (2.07ha) is not considered to be significant. The impacts of the proposed actions are therefore, not considered likely to disrupt the breeding cycle of this species.	Unlikely. The area is potentially used for breeding (propagation). However, due to the large area of more suitable habitat in the form of 'sandy soils, often in disturbed habitats', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha))), the size of the potential breeding habitat on site (2.07ha) is not considered to be significant. The impacts of the proposed actions are therefore, not considered likely to disrupt the breeding cycle of this species.	Unlikely. The area is potentially used for breeding. However, due to the large area of more suitable habitat in the form of 'Suitable Eucalypt species and Callitris (which provides seasonal habitat) in which this species could forage', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha))), the size of the potential breeding habitat on site (2.07ha) is not considered to be significant. The impacts of the proposed actions are therefore, not considered likely to disrupt the breeding cycle of this species.	Unlikely. The area is potentially used for breeding. However, due to the large area of more suitable habitat in the form of 'Eucalypt woodlands and Callitris woodlands in which this species could forage', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha))), the size of the potential breeding habitat on site (2.07ha) is not considered to be significant. The impacts of the proposed actions are therefore, not considered likely to disrupt the breeding cycle of this species.	Unlikely. The area is potentially used for breeding. However, due to the large area of more suitable habitat in the form of 'Eucalypt woodlands' in which this species could forage', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha))), the size of the potential breeding habitat on site (2.07ha) is not considered to be significant. The impacts of the proposed actions are therefore, not considered likely to disrupt the breeding cycle of this species.

Significant Impacts	<i>Pterostylis cobarensis</i>	<i>Rulingia procumbens</i>	Superb Parrot	Malleefowl	Koala
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely. Although 2.07ha of potential albeit sub-optimal habitat would be reduced, given the large area of more suitable habitat in the form of 'Callitris woodlands', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)), it is considered unlikely that the impacts would cause this species to decline.	Unlikely. Although 2.07ha of potential albeit sub-optimal habitat would be reduced, given the large area of more suitable habitat in the form of 'sandy soils, often in disturbed habitats', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)), it is considered unlikely that the impacts would cause this species to decline.	Unlikely. Although 2.07ha of potential albeit sub-optimal habitat would be reduced, given the large area of more suitable habitat in the form of 'Suitable Eucalypt species and Callitris (which provides seasonal habitat) in which this species could forage', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)), it is considered unlikely that the impacts would cause this species to decline.	Unlikely. Although 2.07ha of potential albeit sub-optimal habitat would be reduced, given the large area of more suitable habitat in the form of 'Eucalypt woodlands and Callitris woodlands' in which this species could forage, nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)), it is considered unlikely that the impacts would cause this species to decline.	Unlikely. Although 2.07ha of potential albeit sub-optimal habitat would be reduced, given the large area of more suitable habitat in the form of 'Eucalypt woodlands' in which this species could forage, nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)), it is considered unlikely that the impacts would cause this species to decline..
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely. It is unlikely that the impacted area will increase invasive species, such as exotic weed or pest species becoming established to any greater degree than what already exists.	Unlikely. It is unlikely that the impacted area will increase invasive species, such as exotic weed or pest species becoming established to any greater degree than what already exists.	Unlikely. It is unlikely that the impacted area will increase invasive species, such as exotic weed or pest species becoming established to any greater degree than what already exists.	Unlikely. It is unlikely that the impacted area will increase invasive species, such as exotic weed or pest species becoming established to any greater degree than what already exists.	Unlikely. It is unlikely that the impacted area will increase invasive species, such as foxes or cats becoming established to any greater degree than what already exists.

Significant Impacts	<i>Pterostylis cobarensis</i>	<i>Rulingia procumbens</i>	Superb Parrot	Malleefowl	Koala
Introduce disease that may cause the species to decline, or	Unlikely. There are no diseases which have been associated with the decline of this species. As a consequence the proposed activities are not expected to introduce any diseases that may cause this species to decline.	Unlikely. There are no diseases which have been associated with the decline of this species. As a consequence the proposed activities are not expected to introduce any diseases that may cause this species to decline.	Unlikely. There are no diseases which have been associated with the decline of this species. As a consequence the proposed activities are not expected to introduce any diseases that may cause this species to decline.	Unlikely. There are no diseases which have been associated with the decline of this species. As a consequence the proposed activities are not expected to introduce any diseases that may cause this species to decline.	Unlikely. Due to the small amount of clearing and lack of koala presence on site, it is unlikely that the proposal will contribute to the introduction of any related diseases. As a consequence the proposed activities are not expected to introduce any diseases that may cause this species to decline.
Interfere substantially with the recovery of the species	Unlikely. Due to the small area of impact and the large extent of more suitable habitat available for this species within the surrounding area, it is considered unlikely that the impacts of the proposal will substantially interfere with the recovery of the species.	Unlikely. Due to the small area of impact and the large extent of more suitable habitat available for this species within the surrounding area, it is considered unlikely that the impacts of the proposal will substantially interfere with the recovery of the species.	Unlikely. Due to the small area of impact and the large extent of more suitable habitat available for this species within the surrounding area, it is considered unlikely that the impacts of the proposal will substantially interfere with the recovery of the species.	Unlikely. Due to the small area of impact and the large extent of more suitable habitat available for this species within the surrounding area, it is considered unlikely that the impacts of the proposal will substantially interfere with the recovery of the species.	Unlikely. Due to the small area of impact and the large extent of more suitable habitat available for this species within the surrounding area, it is considered unlikely that the impacts of the proposal will substantially interfere with the recovery of the species.

The site and the proposed location of the development footprint exists, as a previously disturbed site (~3.4 ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). This site is within close proximity to superior areas of habitat (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) which would be suitable for supporting populations of the potentially occurring above listed threatened species. The small area to be impacted upon is unlikely to be essential to the survival of populations of these listed species.

Nationally Listed Threatened Ecological Communities:

No Threatened Ecological Community (TEC), nationally listed under the EPBC Act were recorded during field surveys. However, one TEC was considered for its likelihood to occur (**Appendix 4**). As no TEC's are considered likely to occur there is no potential for impacts upon any listed TEC's.

Nationally Listed Migratory Species:

Those EPBC listed Migratory species considered to have potential to occur are:

- | | |
|---------------------------|-------------------|
| ▪ <i>Circus assimilis</i> | Spotted Harrier |
| ▪ <i>Apus pacificus</i> | Fork-tailed Swift |
| ▪ <i>Leipoa ocellata</i> | Malleefowl |
| ▪ <i>Ardea ibis</i> | Cattle Egret |
| ▪ <i>Merops ornatus</i> | Rainbow Bee-eater |

The proposed location of the development footprint exists, as a previously disturbed site with a low diversity of habitat features. The site and the proposed location of the development footprint exists, as a previously disturbed site (~3.4 ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). This site is within close proximity to superior areas of habitat (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) which would be suitable for supporting populations of the potentially occurring above listed threatened species. The small area to be impacted upon is unlikely to be essential to the survival of populations of these listed species.

This site is surrounded by superior areas of habitat, which would be suitable for the above listed Migratory species. Due to the extensive tracts of vegetation within the surrounding area, supporting the populations of the potentially occurring above species, the small area to be impacted upon is unlikely to be essential to the survival of populations of these species.

Appendix 6

7-Part Test – TSC Act

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Flora

Dichanthium setosum

Dichanthium setosum occurs chiefly on the northern tablelands in the Saumarez area, west of Armidale, and 18-30 km east of Guyra. It is more rarely found on the north-western slopes, central western slopes and north-western plains of NSW, extending west to Narrabri. *D. setosum* is associated with heavy basaltic black soils and stony red-brown hard setting loam with clay subsoil and is found in moderately disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pasture. The extent to which this species tolerates disturbance is unknown. *D. setosum* occurs within the Border Rivers–Gwydir, Central West, Namoi, Northern Rivers (NSW), South East and Fitzroy (Queensland) Natural Resources Management Regions (OEH, 2012).

Records for this species exist within 10km of the site (NSW Wildlife Atlas) and the Protected Matters Search predicted that this species has potential to occur. Although, it was not recorded during field surveys and the preferred soil substrate (heavy basaltic black soils and stony red-brown hard setting loam with clay subsoil) does not exist on site, there are areas of disturbance where this species could potentially inhabit. In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Digitaria porrecta

Digitaria porrecta (Finger Panic Grass) occurs in NSW and Queensland. In NSW it is found on the North West Slopes and Plains, from near Moree south to Tambar Springs and from Tamworth to Coonabarabran. It largely occurs on private land. In NSW, the most frequently recorded associated tree species are *Eucalyptus albens* and *Acacia pendula*. Common associated grasses and forbs in NSW sites include *Austrostipa aristiglumis*, *Enteropogon acicularis*, *Cyperus bifax*, *Hibiscus trionum* and *Neptunia gracilis*. Flowering season is summer or late summer from mid-January to late February, with seeds maturing and falling from the plant soon after. Native grassland, woodlands or open forest with a grassy understorey, on richer soils. Often found along roadsides and travelling stock routes where there is light grazing and occasional fire. *Digitaria porrecta* is a perennial tussock-forming grass that can vegetatively reproduce (OEH, 2012).

Records for this species exist within 10km of the site (NSW Wildlife Atlas). The Protected Matters Search predicted that this species has potential to occur. Although, it was not recorded during field surveys and richer soils do not exist on site, there are areas of disturbed woodland with a grassy understorey where this species could potentially inhabit. In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Rulingia procumbens

Rulingia procumbens is endemic to NSW and is known from the Dubbo–Medooran–Gilgandra region, the Cobar region, and the upper Hunter Valley (Harden, 2000). Populations of this species have been recorded in Goonoo State Forest (SF), Mt Kaputar National Park, and Pilliga Nature Reserve and other populations occur on crown land, state forests, and on private land (DECC NSW, 2005a). *R. procumbens* occurs within the Border Rivers–Gwydir, Central West, Hunter–Central Rivers, Namoi, and Western (NSW) Natural Resource Management Regions. The species occurs in sandy soils, often in disturbed habitats such as road verges, quarry boundaries, gravel stockpiles, and power line easements. *R. procumbens* is often found in communities of *Eucalyptus dealbata*–*E. sideroxylon* woodland, *Melaleuca uncinata* shrubland, and mallee eucalypt with *Calytrix tetragona* understorey. Associated species include *Acacia triptera*, *Callitris endlicheri*, *Eucalyptus melliodora*, *Allocasuarina diminuta*, *Philotheca salsolifolia*, *Xanthorrhoea* spp., *Exocarpos cupressiformis*, *Leptospermum parvifolium*, and *Kunzea parvifolia* (OEH, 2012).

No records for this species exist within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Although, it was not detected during field surveys. Sandy soils which this species prefers are present and the site is currently in a disturbed state. It is therefore, considered as having potential to occur. In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Pterostylis cobarensis

Pterostylis cobarensis (Cobar Greenhood Orchid) also known as Cobar Greenhood Orchid, is a terrestrial orchid with 7–11 narrow-elliptic leaves which form a basal rosette, each 1.5–2.5 cm long and 5–8 mm wide. Three to eight flowers grow on stems up to 40 cm high, with 3–5 closely sheathing stem leaves. Flowers are transparent with brown and green markings, each flower about 1.2 cm long. Flowering occurs from September to November. Vegetative reproduction is not common in this group of Greenhoods, but some species may form more than one daughter tuber annually. Plants are deciduous and die back to the large, underground tubers after seed release. New rosettes are produced following soaking autumn and winter rains. *Pterostylis cobarensis* is pollinated by the males of small gnats which are attracted to the flower by some pseudosexual perfume (DECC, 2008a). Cobar Greenhood Orchid is known chiefly from the Nyngan–Cobar–Bourke district in the far western plains of NSW. Grows among rocks on low hills and on slopes above streams. Inhabits eucalypt woodland, open mallee, or *Callitris* shrubland on low stony ridges and slopes with skeletal sandy-loam soils. Flowering occurs from September to November (OEH, 2012).

The Protected Matters Search predicted that this species has potential to occur. Although, it was not detected during field surveys the surveys were not conducted within the flowering period for this cryptic species. Eucalypt woodland in which this species can occur and associated species including *Callitris glaucophylla*, do exist within the site. Therefore, it is considered as having potential to occur. However, this species was not recorded within 10km of the site (NSW Wildlife Atlas). In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Tylophora linearis

Tylophora linearis is a herbaceous climber with clear latex that grows to about 2 m long. The stems are cylindrical, up to 3 mm in diameter with internodes up to 100 mm long. Leaves are dark green, linear, up to 100 mm long and 4 mm wide, and extra-floral nectaries are absent from the base of the leaf. Flowers are clustered in radiating groups of 3–8. Flowers are 6–22 mm in diameter, with petals olive-green externally, dark purple internally and with short hairs internally concentrated towards the tip. Fruits form follicles 95–100 mm long and 5 mm wide (Forster, 1992; Forster et al., 2004). *Tylophora linearis* has rarely been collected and is known from eight localities in the Dubbo area and Mt Crow near Barraba in NSW. Grows in dry scrub, open forest and woodlands associated with *Melaleuca uncinata*, *Eucalyptus fibrosa*, *E. sideroxylon*, *E. albens*, *Callitris endlicheri*, *C. glaucophylla*, *Allocasuarina luehmannii*, *Acacia hakeoides*, *A. lineata*, *Myoporum* spp., and *Casuarina* spp (OEH, 2012).

The Protected Matters Search predicted that this species has potential to occur and some sub-optimal habitat of woodlands associated with *C. glaucophylla* does occur on site. Therefore, it is considered to have potential to occur on site. However, this species was not detected during field surveys and it has not been recorded within 10km of the site (NSW Wildlife Atlas). In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Fauna

Spotted Harrier

Spotted Harrier (*Circus assimilis*) is one of two resident Harriers in Australia. Spotted Harrier is a large raptor with a wingspan of 1.2m. Flies with upward swept wings and soars high when moving areas and flies low when searching for food. It is similar in appearance to *Circus approximans* (Swamp Harrier) in which the main distinguishing features of Spotted Harrier are the rump is mottled black.

Spotted Harrier ranges across all of Australia except for Tasmania. Most commonly found inland to near coastal eastern and south eastern Australia. During times of rodent and quail irruptions they will disperse to areas not commonly found. Found in open and wooded country in which it hunts over low vegetation or woodland where hunting at low levels is possible due to vegetation breaks (OEH, 2012).

Usually silent, breeding birds utter piercing squeaks and rapid chatter (Marchant and Higgins 1993). Nest in trees in open remnant woodland, in agricultural areas, often near ripening crop used for hunting (Marchant and Higgins 1993).

This species has been recorded within 10km of the site (NSW Wildlife Atlas) and could utilise the site to forage for prey such as small birds and mammals. Therefore, there is potential for it to occur on site on at least an intermittent basis. However, this is a highly mobile species and it was not recorded on site during targeted surveys. In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat, habitat retained on site (~1.36ha of disturbed woodland habitat) and this species' high level of mobility it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Grey Crowned Babbler

The eastern subspecies of Grey-crowned Babbler (*Pomatostomus temporalis temporalis*) ranges from Mt Lofty Range, SA to Cape York Peninsula, Qld, generally in areas receiving an average annual rainfall between 250 and 1000 mm. Grey-crowned Babblers inhabit open Eucalypt woodlands with a grassy groundcover and sparse, tall shrub layer. Grey-crowned Babblers may also be observed along streams in cleared areas and grassy road verges (Morcombe, 2000). Grey-crowned Babblers forage mainly on insects and spiders, spending the majority of their time searching through leaf litter and soil for food, but also venturing into vegetation. Grey-crowned Babblers live in extended families usually consisting of a breeding pair with offspring. Pairs mate for life and are usually the only breeding birds within the group. The other group members help them build the nest and feed the young (OEH, 2012).

Breeding occurs between July and February. Their large domed nests (up to 50cm wide) are constructed in trees at a height of about 4-7m. They tend to be built into an upward sloping or horizontal, multiple forked branches in a tree's upper outer foliage and have a side entrance tunnel (Morcombe, 2000). Nest-like structures are also used for overnight roosts. The group as a whole defends a territory (usually about 12 hectares) throughout the year (OEH, 2012).

This species has been recorded within 10km of the site (NSW Wildlife Atlas). Although, it was not detected during field surveys, some habitat does occur on site. Therefore, it is considered to have potential to occur on site. However, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat, habitat retained on site (~1.36ha of disturbed woodland habitat) and this species' high level of mobility it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Koala

The Koala (*Phascolarctos cinereus*) occurs along the east coast of Australia and extends into Woodland, Mulga and River Red Gum forests west of the Great Dividing Range. The range of the Koala covers all such suitable areas of NSW. In drier forested areas, Koalas are generally observed as individuals in low densities. They are more abundant in coastal woodland and in open forest, where they have been found in densities as high as ten individuals per hectare. They are rare or absent in wet forests in the southern part of their range above 600 m which may be due more to distribution of Eucalypt species than climate, as the Koala is limited to areas where there are acceptable food trees (OEH, 2012).

Koala's diet is generally restricted to that of Eucalypt leaves. On occasion, non-Eucalypt foliage is eaten. The foliage of *Eucalyptus camaldulensis* (River Red Gum), *E. microcorys* (Tallowwood), *E. tereticornis* (Forest Red Gum), *E. punctata* (Grey Gum), *E. viminalis* (Ribbon Gum) and *E. robusta* (Swamp Mahogany) are some of the preferred Eucalypt species. Koalas use a wide variety of tree sizes, and do not preferentially use large or tall trees in NSW forests, although this has been listed as a habitat preference in areas where trees are generally small, stunted or nutrient deprived. The breeding biology of this species is characterised by the occurrence of discrete core, sedentary breeding groups. A core group may comprise up to several dozen individuals that are usually well separated from other breeding groups. These core groups produce a continual supply of dispersing nomadic sub-adults. Individuals within core breeding groups occupy semi-exclusive territories. There is interaction with and marginal overlap of territories between adjacent individual animals. The territories of breeding males generally occur within a matrix of adjacent territories of breeding females. In the overlap zones of adjacent territories of breeding individuals, individual trees occur that are habitually used for interaction between the two animals concerned. These breeding core interaction trees (sometimes termed "home range trees") are readily identifiable by scratched "trails" up the bole and copious

dung deposits at the base of the tree. Breeding occurs in summer and young females produce one young (rarely twins) each year (OEH, 2012).

Various records for this species occur within 10km of the site. No primary koala feed trees listed under the SEPP 44 were recorded within the site, only four secondary Koala feed trees were present. Although, Koalas have potential to occur within the site no Koala's or secondary signs indicating their presence were recorded during the field work. In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Furthermore the proposal will not prohibit this species ability to disperse throughout the local landscape. Due to the available surrounding habitat and the habitat to be retained on site (~1.36ha of disturbed woodland habitat) it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Pale-headed Snake

Pale-headed Snake (*Hoplocephalus bitorquatus*) has a patchy distribution from north-east Queensland to north-east NSW. In NSW it occurs from the coast to the western side of the Great Divide as far south as Tuggerah. Pale-headed Snake is found mainly in dry eucalypt forests and woodlands, cypress woodland and occasionally in rainforest or moist eucalypt forest. It favours streamside areas, particularly in drier habitats. Pale-headed Snakes shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. The main prey is tree frogs although lizards and small mammals are also taken (OEH, 2012).

This species has been recorded within 10km of the site (NSW Wildlife Atlas). Although, it was not detected during field surveys, some sub-optimal habitat does occur on site. Therefore, it is considered to have potential to occur on site. However, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat and the habitat to be retained on site (~1.36ha of disturbed woodland habitat) it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Malleefowl

Malleefowl (*Leipoa ocellata*) inhabits semi-arid regions of southern Australia. In New South Wales, it typically occurs west of the Great Dividing Range. Extends from Pilliga south-west to the districts of Griffith and Wentworth. The extent of occurrence is known to be decreasing. The distribution of the Malleefowl was formerly more extensive, extending over a large proportion of mainland southern Australia, including the south-western region of the Northern Territory. Malleefowl's occupy shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine *Callitris* woodlands, acacia shrublands, Broombush *Melaleuca uncinata* vegetation or coastal heathlands (OEH, 2012).

The Protected Matters Search predicted that this species has potential to occur on site and *Callitris* and *Acacia* woodlands do persist on site which they provide sub-optimal habitat. Therefore, it is considered to have potential to occur on site. However, no records exist within 10km of the site for this species (NSW Wildlife Atlas) and they were not recorded on site during field surveys. In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of

sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat, the habitat to be retained on site (~1.36ha of disturbed woodland habitat) and the high mobility of this species it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Superb Parrot

Superb Parrots (*Polytelis swainsonii*) are ground feeders where they spend most of their time foraging for seeds and herbaceous plants. They have been known to eat pollen, nectar and fruits and leaf buds, and occasionally they visit farmlands to feed on wheat and oats. During winter Superb parrots will spend most of its time feeding on green weeds including, *Sonchus oleraceus* (Milk Thistle), *Sisymbrium spp.* (Wild Mustard) and *Urtica urens* (Stinging Nettle). During spring and summer, Superb Parrots are attracted to flowering eucalypts; particularly favoured are *Eucalyptus melliodora* (Yellow box), and *E. cladocalyx* (Sugar Gum) (Forshaw, 1991).

Superb Parrots are distributed within inland NSW and north most Victoria. The breeding range in southern NSW is centred on the Murrumbidgee River valley, between Hay in the west and Canberra in the east. Birds over-winter to the north. In the east, they are restricted to riparian habitats, being generally along the Namoi River, between Narrabri and Gunnedah, and along the Castlereagh River and its tributaries, between Coonamble and Gilgandra. Superb parrots breeds from September to December. Its nest is a hollow limb or hole in a tree, at great height. It lays four to six eggs, which are white and rounded. The young leave the nest about four weeks after hatching. They gradually acquire full adult plumage over the next 6-9 months (OEH, 2012).

This species has been recorded within 10km of the (NSW Wildlife Atlas) and the Protected Matters Search predicted that this species has potential to occur. Suitable eucalypt species (four individual trees) and Callitris (which provides seasonal habitat) do exist on site in which this species could forage. Therefore, there is some degree of likelihood that this species occurs seasonally within the site. However, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat and the habitat to be retained on site (~1.36ha of disturbed woodland habitat) it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Speckled Warbler

Speckled Warbler (*Chthonicola sagittata*) ranges in South-Eastern Australia, from South-West Victoria through eastern New South Wales to Central Queensland, mostly on the western slopes and tablelands of the Great Dividing Range, and in the drier areas of coast. Speckled Warblers live in a wide range of Eucalypt dominated vegetation that has a grassy and shrubby understorey often on rocky ridges or gullies (Garnett et al, 2000).

Speckled Warbler is a sedentary species with a home range that varies from 6-12 hectares (Readers Digest, 1982). This species appears to be extinct from areas without vegetation fragments larger than 100ha. *C. sagittata* appears to prefer woodland areas where ground cover consists of shrubs, grass, fallen leaves and bark. This ground foraging bird feeds on insects, insect larvae and small seeds (Readers Digest, 1982). A study from the Armidale area indicated that beetles were a major food source, ants were often eaten and larvae, flies and spiders were also taken (Ford, 1985). Speckled Warblers congregate in small family groups of two or three and breed from September to March. Dome shaped nests are constructed of dried grasses and bark strips and are camouflaged under a tuft of grass usually beneath fallen branches or at the base of a

small shrub (Hoskin, 1991; Readers Digest, 1982). *C. sagittata* is one of the most common hosts of *Chalcites osculans* (Black-eared Cuckoo) chicks (OEH, 2012).

Records for this species exist within 10km of the site (NSW Wildlife Atlas), but it was not detected during field surveys. Suitable habitat in the form of open woodlands occurs on site. Therefore, it is considered as having potential to occur. However, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat, habitat retained on site (~1.36ha of disturbed woodland habitat) and this species' high level of mobility it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Little Lorikeet

Little Lorikeet (*Glossopsitta pusilla*) is the smallest of the lorikeets in Australia. Their size ranges from about 15-16.5cm. The colouring is mostly all a lime green with bright red on the forehead and throat surrounding the bill and up to the eye. The rear of the neck is a yellow-brown colour. Little Lorikeet ranges from about Cooktown in Qld, coastally and to the west of the ranges down to Victoria and occasionally into South Australia. This species is more commonly encountered in near coastal habitats and on the divide (OEH, 2012).

Habitat is mainly dry, open sclerophyll forests and woodlands, usually dominated by Eucalyptus, sometimes in plantations of *Eucalyptus cladocalyx* (Sugar Gum) (Higgins 1999). *G. pusilla* can be found in large flocks of hundreds of birds spread out across blossoming eucalypts, such feeding congregations have been recorded within areas such as Werekata N.P. at Cessnock when *Corymbia maculata* (Spotted Gum) has abundant flowering periods (authors pers. obs.). Little Lorikeet can be found feeding with other lorikeet species such as *Trichoglossus haematodus* (Rainbow Lorikeet), *Glossopsitta porphyrocephala* (Purple-crowned Lorikeet) and *Glossopsitta concinna* (Musk Lorikeet). In the Hunter Valley they are often found with flocks of *G. concinna* (author's pers. obs.). Little Lorikeet prefers to feed in the upper canopy and rarely comes below the uppermost blossom. During feeding show great agility, hanging and crawling through foliage, can also be very inconspicuous whilst feeding. Generally though Little Lorikeet can often be heard by the mass of calls, which can be deafening when large flocks are feeding together. The call is a distinctive thin, high-pitched rolling metallic 'zit' or 'zit zit', repeated, also utter constant soft chatter while feeding (Higgins 1999). The call can be distinguished from most of the other lorikeet species due to the short length of the call.

Movements of Little Lorikeets are largely unknown, but the belief is that they follow abundant blossom. Some areas they are sedentary and move within the local area in response to blossom. Nesting of *G. pusilla* consists of holes, including knotholes, in bend, top or side of limb, usually living or in main trunk of tree, occasionally over water, recorded in *Eucalyptus camaldulensis* (River Red Gum), *Eucalyptus grandis* (Flooded Gum) and *Casuarina cunninghamiana* (River Oak) (Higgins 1999).

Records for this species exist within 10km of the site (NSW Wildlife Atlas). Suitable tree species do exist on site in which this species could forage. Therefore, it is considered as having potential to occur. However, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat, habitat retained on site (~1.36ha of disturbed woodland habitat) and this species' high level of mobility it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Varied Sittella

Varied Sittella (*Daphoenositta chrysoptera*) is a small 'treecreeper' like bird that covers the majority of Australia. There are 5 races of Varied Sittella of which 3 occur within NSW. The nominate race which occurs across the majority of NSW, sometimes referred to as the 'Orange-winged Sittella'. The second race is Race *leucocephala* which occurs within the far north eastern corner of NSW and is sometimes known as 'White-headed Sittella'. The third race is Race *pileata* which occurs within the far western areas of NSW and is commonly called 'Black-capped Sittella'. Varied Sittella can be reasonably common in some areas and also nomadic in others, where as they also can be sedentary (OEH, 2012).

Habitat across the varying races is similar, although they can be found in a wide range of habitats. Open eucalypt forests and woodlands are the preferred habitat, but this species may also be found in mallee, coastal tea-tree scrubs, inland acacia communities, golf courses orchards and scrubby gardens. In flight, wings seem too large for the bird: broad, pale orange wing band, white rump and white tail tips conspicuous (Pizzey 2007). Varied Sittella can be heard sometimes before it is seen, the call, a high pitched 'chip chip' can often be heard as groups of these birds move through the upper canopy. Groups forage together, flying into heads of trees, typically working down branches and trunk with constant rocking-horse motion, probing and levering bark flakes with longish, slightly upturned bills, maintaining contact with constant chitterings, before flying on to next tree (Pizzey 2007).

The nest of Varied Sittella consists of deep cup of bark which is well camouflaged with spiders web and lichen. They favour the use of tree species for nesting such as Eucalypts, paperbarks, she-oaks and tea-trees. When breeding, one female appears to lay, but all members of group feed the young (Pizzey 2007).

Records for this species exist within 10km of the site (NSW Wildlife Atlas), but it was not detected on site during surveys. Suitable Eucalypt species do exist on site in which this species could forage and nest in. Therefore, it is considered as having potential to occur. However, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat, habitat retained on site (~1.36ha of disturbed woodland habitat) and this species' high level of mobility it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern Grass Owl

Eastern Grass Owls (*Tyto longimembris*) are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. They rest by day in a 'form' - a trampled platform in a large tussock or other heavy vegetative growth. If disturbed they burst out of cover, flying low and slowly, before dropping straight down again into cover. Eastern Grass Owls always breeds on the ground. Nests are found in trodden grass, and often accessed by tunnels through vegetation. Breeding season is highly variable and dependent on environmental conditions, but in NSW nesting most typically occurs in autumn or winter.

Records for this species exist within 10km of the site (NSW Wildlife Atlas) and suitable habitat in the form of areas of tall grass occur on site. Therefore, it is considered to have potential to occur. However, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat, habitat retained on site (~1.36ha of disturbed woodland habitat) and this species' high level of mobility it is considered that the proposed development is not likely to have an adverse effect on the life

cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

No endangered populations were identified within or surrounding the site.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

No EECs were identified within the site. However, there were four individual Blakely's Red Gum (*Eucalyptus blakelyi*) trees present within the entire site (3.4ha). The presence of this particular tree species was further assessed (**Appendix 7**) for the potential occurrence of a CEEC namely *White Box, Yellow Box, Blakely's Red Gum Woodland and Derived Grasslands* (EPBC Act) which is commensurate with the EEC *White Box, Yellow Box, Blakely's Red Gum Woodland* (TSC Act). This Assessment in **Appendix 3** has resulted in the vegetation community on site not qualifying as being commensurate with either the TSC Act or EPBC Act listing of this community. Therefore, there will be no clearing of any EECs as a result of the proposal, hence not placing any EECs at a risk of extinction.

d) In relation to the habitat of a threatened species, population or ecological community:

Flora Species

- *Dichanthium setosum*
- *Digitaria porrecta*
- *Rulingia procumbens*
- *Pterostylis cobarensis*
- *Tylophora linearis*

Fauna Species

- Spotted Harrier
- Grey-crowned Babbler
- Koala
- Pale-headed Snake
- Malleefowl
- Superb Parrot
- Speckled Warbler

- Little Lorikeet
- Varied Sittella
- Eastern Grass Owl

(i) The extent to which habitat is likely to be removed or modified as a result of the action proposed, and

Flora

- *Dichanthium setosum*

The site does not contain preferred soil substrate (heavy basaltic black soils and stony red-brown hardsetting loam with clay subsoil). Nevertheless, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- *Digitaria porrecta*

The site does not contain preferred soil substrate (richer soils). Nevertheless, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- *Rulingia procumbens*

Potential habitat for this species occurs within the disturbed woodlands on site and the site does contain preferred habitat of sandy soils, often in disturbed habitats. Approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- *Pterostylis cobarensis*

The site does not contain preferred habitat of rocks, slopes or low hills. However, potential habitat for this species occurs within the disturbed Callitris woodlands on the site. Nevertheless, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- *Tylophora linearis*

Potential habitat for this species occurs within the disturbed woodlands on site. However, the site does contain preferred woodlands associated with *C. glaucophylla*. Nevertheless, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

Fauna

- Spotted Harrier

Potential habitat for this species occurs within the disturbed woodlands on site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species (primarily for foraging) and will be removed or modified as a result of the proposal.

- Swift Parrot

Potential habitat for this species occurs within the disturbed woodlands on the site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species (primarily for foraging) and will be removed or modified as a result of the proposal.

- Grey-crowned Babbler

Potential habitat for this species occurs within the disturbed woodlands on the site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species (primarily for foraging) and will be removed or modified as a result of the proposal.

- Koala

Suboptimal habitat (only four secondary Koala feed trees were present within the entire site [3.4ha] and of this only 2.07ha will be removed) for this species occurs within the disturbed woodlands on the site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- Pale-headed Snake

Potential habitat of dry eucalypt woodlands and cypress woodlands occur within the disturbed woodlands on the site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- Malleefowl

Potential habitat of Eucalypt woodlands and Callitris woodlands occur within the disturbed woodlands on the site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- Superb Parrot

Suitable Eucalypt species (four individual trees) and Callitris (which provides seasonal habitat) do exist on site in which this species could. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- Speckled Warbler

Suitable habitat in the form of open woodlands occurs on site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- Little Lorikeet

Suitable tree species do exist on site in which this species could forage and nest. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- Varied Sittella

Suitable eucalypt species do exist on site in which this species could forage and nest. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- Eastern Grass Owl

Suitable habitat in the form of areas of tall grass occur on site in which this species could forage and nest. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

(ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

No area of habitat is likely to become fragmented or isolated from other areas of habitat as part of this proposal.

(iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

A small area of sub-optimal habitat (2.07ha) is to be removed. The habitat removal is taking place in a pre-disturbed area. Due to the relatively small area vegetation to be cleared (2.07ha of the 3.4ha of similar vegetation within the site) and the pre-disturbed nature of the disturbance area it is considered that the proposal will not contribute to fragmentation and will not have an impact on the survival of the species, population or ecological community in the locality.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No areas of critical habitat occur within or adjacent to the site.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

The proposed action will not act against and will be consistent with the objectives or actions of the recovery or threat abatement plan that exist for the following species:

- Koala.

The remaining species, listed below, do not have an associated recovery or threat abatement plan.

Flora Species

- *Dichanthium setosum*
- *Digitaria porrecta*
- *Rulingia procumbens*
- *Pterostylis cobarensis*
- *Tylophora linearis*

Fauna Species

- Spotted Harrier
- Grey-crowned Babbler
- Pale-headed Snake
- Malleefowl
- Superb Parrot
- Speckled Warbler
- Little Lorikeet
- Varied Sittella
- Eastern Grass Owl

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The proposal will incrementally contribute to the following KTP's:

- "Clearing of native vegetation"

A small area of sub-optimal habitat (2.07ha) is to be removed. The habitat removal is taking place in a pre-disturbed area. Given that there is a relatively small area of vegetation to be cleared (2.07ha of the 3.4ha of similar vegetation within the site) and the pre-disturbed nature of the disturbance area it is considered that the proposal it is not expected to significantly increase the impact on native flora and fauna. Therefore, it is considered that this KTP will not have a significant impact to the overall extent of similar adjoining native vegetation within the locality.

- “Anthropogenic Caused Climate Change”

The proposal is likely to contribute to the Key Threatening Process “Anthropogenic Caused Climate Change” as a result of clearing a small amount of native vegetation. The extent to which the proposal could contribute to this process is considered unlikely to be significant. Apart from the direct impacts to vegetation, which are considered likely to result in a negligible increase to Climate Change impacts,

- “Infection of native plants by *Phytophthora cinnamomi*”

The proposed development has the potential to result in the importation of this fungus. Cleaning protocols for vehicles and machinery should be implemented for the low-level above-ground activities. It is considered that with the correct hygiene protocols in place, the project is unlikely to contribute to this process.

- “Invasion of native plant communities by exotic perennial grasses”

The proposed development is considered unlikely to significantly contribute to this process due to the comparatively low level of surface disturbance that is proposed.

- “Removal of dead wood and dead trees”

The proposed development will require the removal of ground debris in above-ground areas of disturbance. Reptiles, frogs and ground foraging birds may be affected by the removal of this Habitat. However, these form a minor component of the overall works and the vast majority of this habitat will be retained in-situ. It is not expected that the proposal will significantly contribute to this process.

- “Introduction and establishment of exotic rust fungus of the order Puccinales pathogenic on plants of the family Myrtaceae”

The proposed development has the potential to result in the importation of the Myrtle Rust fungus, an species recently discovered in Australia that can have lethal effects on plants from the family Myrtaceae. Cleaning protocols for vehicles and machinery should be implemented for the low-level above-ground activities. It is considered that with the correct hygiene protocols in place, the project is unlikely to contribute to this process.

Appendix 7

White Box, Yellow Box, Blakely's Red Gum and Derived Grasslands TEC considerations.

TSC Act 1995 Considerations

Under the TSC Act, White Box Yellow Box Blakely's Red Gum Woodland EEC can exist in a number of states. Intact stands that contain diverse upper and mid-storeys and ground layers are rare. Modified sites include the following:

- Areas where the main tree species are present ranging from an open woodland formation to a forest structure, and the ground layer is predominantly composed of exotic species; and
- Sites where the trees have been removed and only the grassy ground layer and some herbs remain.

Identification guidelines have been provided for this community (NPWS 2002). The area of vegetation, which the site is located within, has been assessed against these guidelines in the table below.

TSC Act Box Gum Woodland Listing Criteria

Box Gum Woodland	NPWS Comment	Answer
1. The site is in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands or NSW South Western Slopes Bioregions – proceed to 2.		1. The site is located within the Brigalow Belt South Bioregion.
1* The site is outside the above bioregions	Not Box Gum Woodland	
2. There are no native species in the understorey, and the site is unlikely to respond to assisted natural regeneration	Not Box Gum Woodland	
2* The site is otherwise – proceed to 3		Native species present in the understorey
3. The site has trees – proceed to 4.		Yes
3* The site is treeless, but is likely to have supported White Box, Yellow Box or Blakely's Red Gum prior to clearing – proceed to 5		
4. White Box, Yellow Box or Blakely's Red Gum, or a combination of these species, are or were characteristic tree species.		Blakely's Red Gums are present. However, there are only four individual trees within the entire site (3.4ha) and they are not considered to be characteristic of this community.
4* White Box, Yellow Box or Blakely's Red Gum have never been present	Not Box Gum Woodland	
5. The site is predominantly grassy	Is Box Gum Woodland	Yes
5* The understorey of the site is dominated by shrubs excluding pioneer species	Not Box Gum Woodland	No

In reference to the NSW NPWS Identification Guidelines for White Box Yellow Box Blakely's Red Gum Woodland EEC, the results of the field survey determined that the area of vegetation, does not fit the NSW Scientific Committee Final Determination of this EEC because the canopy is dominated by Rough-barked Apple (*Angophora floribunda*) and White Cypress Pine (*Callitris glaucophylla*) and the four Blakely's Red Gums (*Eucalyptus Blakelyi*) are not considered to be characteristic tree species.

EPBC Act 1999 Considerations

The criteria for an area to qualify as White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland and Derived Grassland) Critically Endangered Ecological Community (CEEC) under the EPBC Act are slightly different to the NSW determination. Under the EPBC Act, remnants can exist in one of three states:

- An overstorey of Eucalypt trees exists, but there is no substantial native understorey.
- A native understorey exists, but the trees have been cleared.
- Both a native understorey and an overstorey of Eucalypts exist in conjunction (DEH 2006).

The Threatened Species Scientific Committee considers that areas in which an overstorey exists without a substantially native understorey are degraded and are no longer a viable part of the ecological community. Although some native species may remain, in most of these areas the native understorey is effectively irretrievable. In order for an area to be included in the listed ecological community, a patch must have a predominantly native understorey (DEH 2006).

Vegetation communities with the potential to be the locally occurring White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland and Derived Grassland) EPBC Act listed Critically Endangered Ecological Community, were analysed in detail by using the criteria in the table below.

EPBC Act Box Gum Woodland Listing Criteria

Criteria	Description	Does the site meet the criteria?	Outcome
1	Is or was previously, at least one of the most common overstorey species White Box, Yellow Box or Blakely's Red Gum (or Western Grey Box or Coastal Grey Box in the Nandewar Bioregion)?	No	
2	Does the 'patch' have a predominately native understorey?	N/A	
3	Is the patch 0.1ha or greater in size?	N/A	
4a	Is there 12 or more native understorey species present (excluding grasses)?	N/A	
4b	Does the site contain at least one important species?	N/A	
5	Is shrub cover less than 30% across the entire remnant	N/A	
Outcome			No, the site is <u>not</u> the CEEC
6	Where sites do not meet the criteria 4a and 4b, is the patch 2ha or greater in size?	N/A	
7	Does the 2 ha patch have 40 or more trees with a DBH >40cm? (i.e. 20 per hectare)	N/A	
Outcome			NA
7b	In the 2ha area, are there mature trees and natural generation (>5cm DBH) of dominant overstorey Eucalypts (WB, YB, BRG)?	N/A	
Outcome			NA

In consideration of the above criteria, the Box Gum Woodland identified in the site does not fit the EPBC Act criteria for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. This is because the canopy is dominated by Rough-barked Apple (*Angophora floribunda*) and White Cypress Pine (*Callitris glaucophylla* (Criteria 1)).

Appendix 5

Cultural Heritage Due Diligence Assessment



Aboriginal & European Cultural Heritage Due Diligence Report

**Santos Logistics Centre
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Executive Summary

RPS has been engaged by Santos Limited to prepare an Aboriginal and European Cultural Heritage Due Diligence Assessment for the proposed expansion of the existing Narrabri Logistics Centre at 300 Yarrie Lake Road, Narrabri, New South Wales in the Narrabri Local Government Area (LGA).

This assessment has been undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects* (DECCW 2010) which requires reasonable and practicable steps be taken to: identify whether or not Aboriginal objects are, or are likely to be, present in an area; determine whether or not their activities are likely to harm Aboriginal objects (if present); and determine if an Aboriginal Heritage Impact Assessment is required (DECCW 2010:2).

Investigations under the code have included the following:

- a search of the Aboriginal Heritage Information Management System (AHIMS) database which identified that there were no Aboriginal objects or Aboriginal places in the Project Area;
- this report has considered specific sensitive landforms: within 200m of water; within dune systems; on ridge tops and headlands; and immediately above or below cliff faces and/or rockshelters/cave. These landforms were not identified in the Project Area;
- desktop assessment included a review of previous archaeological and heritage studies in the vicinity of the Project Area; and
- a visual inspection of the Project Area was undertaken and no Aboriginal objects were identified.

RECOMMENDATIONS

General mitigations have been provided for undertaking the proposed activity/works which set out contingency procedures should unexpected Aboriginal objects, skeletal remains or suspected additional European cultural heritage material be identified.

No Aboriginal objects or places have been identified within the Narrabri Logistics Centre Project Area. **As there are no identified Aboriginal objects in the Project Area, it is assessed that there is no identified risk of harm to Aboriginal objects and an AHIP is not required for the proposed activity.** The proposed works can proceed within the Project Area as planned.

No European (historic) heritage sites have been identified within Narrabri Logistics Centre Project Area. As such **there is no identified impact to European (historic) heritage and therefore a Statement of Heritage Impact is not required.**

Recommendation A

All relevant Santos Limited staff and contractors should be made aware of their statutory obligations for heritage under NSW *National Parks and Wildlife Act 1974* and the NSW *Heritage Act 1977*, which may be implemented as a heritage induction.

Recommendation B

This due diligence report must be kept by Santos Limited so that it can be presented, if needed, as a defence from prosecution.

Recommendation C

If Aboriginal object/s are identified in the Project Area during works, then all works in the immediate area must cease and the area cordoned off. The Office of Environment and Heritage must be notified by ringing the Enviroline 131 555 so that the site can be adequately assessed and managed.

Recommendation D

In the event that skeletal remains are uncovered, work must cease immediately in that area and the area cordoned off. Santos Limited must contact the NSW Police with no further action taken until written advice is provided by the Police. If the remains are determined to be of Aboriginal origin, the Office of Environment and Heritage must be notified by ringing the Enviroline 131 555 and a management plan prior to works recommencing must be developed in consultation with the relevant Aboriginal stakeholders.

Recommendation E

If, during the course of development works, suspected European cultural heritage material is uncovered, work should cease in that area immediately. The Heritage Branch, Office of Environment and Heritage (Enviroline 131 555) should be notified and works only recommence when an approved management strategy is developed.

1.0 Introduction

RPS has been engaged by Santos Limited (the proponent) to prepare an Aboriginal and European Cultural Heritage Due Diligence Report. The purpose of a due diligence report is to demonstrate that reasonable and practicable measures were taken to prevent harm to an Aboriginal object or place and has been undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (2010) ("Due Diligence Code").

The assessment contained in this report goes beyond the requirements of the Due Diligence Code to consider any potential impact on identified European (historic) heritage items within the Project Area.

This report has considered the relevant environmental and archaeological information, landforms, disturbances and the nature of the proposed activity in addition to formulating appropriate recommendations.

1.1 The Project Area

This due diligence report has been prepared for the area subject to the proposed activity, herein referred to as the "Project Area." The Project Area is located at 300 Yarrie Lake Road, Narrabri, in the Narrabri Local Government Area (LGA). The Project Area is approximately 2.5 kilometres from the town of Narrabri and approximately 6.298 hectares in size (Figure 1).

1.2 The Proposed Activity

The proposed activity is the upgrade of the existing Santos Operations Centre (Plate 1) at 300 Yarrie Lake Road to a larger logistics centre (the proposal). The proposal will include: warehouse and office space, a storage building, laydown areas, a casing wash area; and other ancillary works and parking areas.

Ground disturbance works will include the excavation of soil, the construction of buildings, plant and machinery and the potential impact of heavy machinery being used for excavation and construction purposes. A due diligence assessment is therefore required under S1 and S2a of the Due Diligence Code (DECCW 2010:11).

1.3 Authorship and Acknowledgements

This report was prepared by RPS Senior Archaeologist, Sarah Ward with contributions from RPS Senior Spatial Analyst, Thomas Wilson and RPS Planning Manager, Belinda Lewis. Assistance with report production was provided by Karyn Virgin, RPS Graduate Archaeologist and Audrey Churm, RPS Business Support Manager.

The report was reviewed by RPS Technical Director Cultural Heritage, Darrell Rigby.

Fieldwork was undertaken by RPS Senior Archaeologist, Sarah Ward in conjunction with RPS Ecologist, Arne Bishop.

2.0 Legislative Context

The following overview of the legal framework is provided solely for information purposes for the client, it should not be interpreted as legal advice. RPS will not be liable for any actions taken by any person, body or group as a result of this general overview, and recommend that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken as a result of the summary below.

Although there are a number Acts protecting and managing cultural heritage in New South Wales (see Appendix 1) the primary ones which apply to this report include:

- *National Parks & Wildlife Act 1974*
- *National Parks & Wildlife Regulation 2009*
- *Heritage Act 1977*

In brief, the *National Parks & Wildlife Act 1974* protects Aboriginal heritage (places and objects) within NSW; the *National Parks and Wildlife Regulation 2009* provides a framework for undertaking activities and exercising due diligence; whilst the *Heritage Act 1977* protects European (Historic) heritage.

2.1 *National Parks & Wildlife Act 1974*

The *National Parks & Wildlife Act 1974* (NPW Act) protects Aboriginal heritage within NSW. Protection of Aboriginal heritage is outlined in s86 of the Act, as follows:

- "A person must not harm or desecrate an object that the person knows is an Aboriginal object" s86(1);
- "A person must not harm an Aboriginal object" s86(2); and
- "A person must not harm or desecrate an Aboriginal place" s86(4).

Penalties apply for harming an Aboriginal object or place. The penalty for knowingly harming an Aboriginal object (s86[1]) and/or an Aboriginal place (s86[4]) is up to \$550,000 for an individual and/or imprisonment for 2 years; and in the case of a corporation the penalty is up to \$1.1 million. The penalty for a strict liability offence (s86[2]) is up to \$110,000 for an individual and \$200,000 for a corporation.

Harm

Under the NPW Act, harm is defined as any act that: destroys defaces or damages the object; moves the object from the land on which it has been situated; and/or causes or permits the object to be harmed. However, it is a defence from prosecution if the proponent can demonstrate: 1) that harm was authorised under an Aboriginal Heritage Impact Permit (AHIP) (and the permit was properly followed); or 2) that the proponent exercised due diligence in respect to Aboriginal heritage. The '**due diligence**' defence (s87(2)), states that if a person or company has exercised due diligence to ascertain that no Aboriginal object was likely to be harmed as a result of the activities proposed for the Project Area (subject area of the proposed activity); then liability from prosecution under the NPW Act will be removed or mitigated if it later transpires that an Aboriginal object was harmed.

Notification of Aboriginal Objects

Under section 89A of the NPW Act Aboriginal objects (and sites) must be reported to the Director-General (now Chief Executive) of OEH within a reasonable time (unless it has previously been recorded and submitted to AHIMS). Penalties of \$11,000 for an individual and \$22,000 for a corporation may apply for each object not reported.

2.2 National Parks and Wildlife Regulation 2009

The *National Parks and Wildlife Regulation 2009* ("NPW Regulation") provides a framework for undertaking activities and exercising due diligence in respect to Aboriginal heritage. The NPW Regulation 2009 outlines the recognised due diligence codes of practice which are relevant to this report, but it also outlines procedures for Aboriginal Heritage Impact Permit (AHIP) applications and Aboriginal Cultural Heritage Consultation Requirements (ACHCRs); amongst other regulatory processes.

2.3 Due Diligence and Codes of Practice

The **advantage of a Due Diligence** assessment is that:

- it assists in avoiding unintended harm to Aboriginal objects;
- provides certainty to land managers and developers about appropriate measures for them to take;
- encourages a precautionary approach;
- provides a defence against prosecution if the process is followed; and
- results in more effective conservation outcomes for Aboriginal cultural heritage.

One of the benefits of the due diligence provisions are that they provide a simplified process of investigating the Aboriginal archaeological context of an area to determine if an Aboriginal Heritage Impact Permit (AHIP) is required.

Under the s80A *National Parks & Wildlife Regulation 2009* ("NPW Regulation") the following due diligence codes recognised:

- (a) the Due Diligence Code published by the Department of Environment, Climate Change and Water and dated 13 September 2010;
- (b) the Plantations and Reafforestation Code (being the Appendix to the *Plantations & Reafforestation (Code) Regulation 2001*) as in force on 15 June 2010;
- (c) the *Private Native Forestry Code of Practice for Northern New South Wales* approved by the Minister for Climate Change, Environment and Water and published in the Gazette on 8 February 2008;
- (d) the *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects* published by NSW Minerals Council Ltd and dated 13 September 2010;
- (e) the *Aboriginal Objects Due Diligence Code for Plantation Officers Administering the Plantations and Reafforestation (Code) Regulation 2001* published by the Department of Industry and Investment and dated 13 September 2010; and
- (f) the *Operational Guidelines for Aboriginal Cultural Heritage Management* published by Forests NSW and dated 13 September 2010.

This report has been written to meet the Due Diligence Code (DECCW 2010).

2.3.1 Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010)

This publication sets out a minimum benchmark for acceptable due diligence investigations to be followed. The purpose of the code is set out reasonable and practical steps in order to:

- (1) identify whether or not Aboriginal objects (and places) are, or are likely to be, present in an area;
- (2) determine whether or not their activities are likely to harm Aboriginal objects (if present); and

(3) determine whether an AHIP application is required. (DECCW 2010:2).

Investigations under the code include the following:

- a search of the Aboriginal Heritage Information Management System (AHIMS) database to identify if there are previously recorded Aboriginal objects or places in the Project area;
- identification of landscape features including land within 200 metres of water, dune systems, ridge tops, headlands, land immediately above or below cliff faces and/or rockshelters/caves;
- desktop assessment including a review of previous archaeological and heritage studies and any other relevant material;
- visual inspection of the Project Area to identify if there are Aboriginal objects present; and
- assessment as to whether an AHIP is required.

This report has complied with the requirements of the code listed above. Other requirements under the code are outlined below.

Aboriginal consultation is not required for an investigation under the Due Diligence Code (DECCW 2010:3). However, if the due diligence investigation shows that the activities proposed for the area are likely to harm objects or likely objects within the landscape, then an Aboriginal Heritage Impact Permit will be required with full consultation.

A record of the due diligence procedure followed must be kept to ensure it can be used as a defence from prosecution (DECCW 2010:15).

Following a due diligence assessment (where an AHIP application was not required), such as this, an activity must proceed with caution. If any Aboriginal objects are identified during the activity, then works should cease in that area and OEHS notified (DECCW 2010:13). The due diligence defence does not authorise continuing harm.

2.3.2 *Aboriginal Community Consultation*

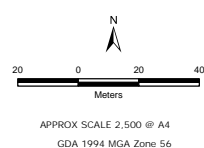
Aboriginal community consultation is not a formal requirement of the due diligence process (DECCW 2010:3); therefore the proponent is not obliged to undertake Aboriginal community consultation.

Aboriginal community consultation was not undertaken for this due diligence report.

2.4 *Heritage Act 1977*

This Act protects the natural and European cultural history of NSW with emphasis on non-Aboriginal 'historic' cultural heritage (such as place, building, works, relic, moveable object, precinct, historic shipwreck, or archaeological site) of State or local significance, through protection provisions and the establishment of a Heritage Council and a State Heritage Register. Additionally, Government agencies have special obligations under the *Heritage Act 1977* (NSW). Agencies are required to compile a register of heritage assets (known as a Section 170 Heritage and Conservation Register) and look after their assets on behalf of the community.

Although Aboriginal objects and places of significance are primarily protected by the NPW Act, if an Aboriginal site, object or place is of State or local significance, it may be protected by a heritage order issued by the Minister subject to advice by the Heritage Council. Penalties of up to \$1.1 million are in place for breaches of the Heritage Act and its Regulations.



Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

DATA SOURCES

Point features located in field by GPS.

LEGEND

- Project Area
- Property Boundary



FIGURE 1-1

Narribri Operations
Centre
Project Area

3.0 Environmental and Heritage Context

Aboriginal heritage due diligence requires that available knowledge and information is considered and forms part of the desktop assessment required under S4 of the Due Diligence Code (DECCW 2010:12-13). The purpose of reviewing the relevant environmental and heritage information is to assist in identifying whether Aboriginal objects or places are present within the Project Area.

3.1 Local Environment

An understanding of environmental context is important for the predictive modelling of Aboriginal sites and their interpretation. The local environment is understood to have provided natural resources for Aboriginal people, such as stone (for manufacturing stone tools), food and medicines, wood and bark (for implements such as shields, spears, canoes, bowls, shelters, amongst others), along with areas for camping and other activities. The nature of Aboriginal occupation and resource procurement is related to the local environment and it therefore needs to be considered as part of the cultural heritage assessment process. The Project Area is in the Pilliga sub-region of the Brigalow Belt South Bioregion (NSW National Parks and Wildlife Service 2003: 137).

3.1.1 Geology and Soils

The Project Area is predominantly located on the Jurassic Pilliga Sandstone landscape evidenced by horizontal Jurassic quartz sandstone, conglomerate and claystone with limited shale, tertiary basalt caps and the sediments derived from these rocks (Wallis 1971). The landscape is characterised by stepped sandstone ridges with low cliff faces with a high proportion of rock outcrop and long gentle outwash slopes intersected by sandy stream beds and prior stream channels, interspersed with patches of heavy clay.

The soils in the Project Area are typically shallow black earths and red loams on basalts. Extensive harsh-texture contrast duplex soils appear with cracking clay sub-soils. These soils are typical of those derived from the Pilliga Sandstone and are described as highly siliceous. They are characterised by the dense growth of trees and shrubs and high species diversity (Norris 1996).

The geology and soils of the Project Area demonstrate that the landscape prior to European contact was capable of supporting Aboriginal resources suitable for habitation.

3.1.2 Topography and Hydrology

The Project Area is located on relatively level (flat) land currently partly utilised for commercial purposes. At its closest, the Namoi River is approximately 1.5 kilometres to the north-east of the Project Area, Narrabri Lake is three (3) kilometres north/north-east of the Project Area, Bohena Creek is approximately 3.5 kilometres to the west and Narrabri Creek is approximately 4 kilometres north-east of the Project Area. All would have provided a permanent source of water, as would Yarrie Lake, approximately 20 kilometres to the south-west of the Project Area. The Project Area is on slightly elevated land of approximately 220 metres Australian Height Datum (AHD) (Geological Survey of NSW 2009: Online).

The topography and hydrology of the Project Area demonstrate that the surrounding landscape would have provided sufficient water resources and been fertile enough to sustain human habitation.

3.1.3 Climate

During the last glacial maximum (approximately 30,000-19,000 years ago), large ice sheets covered high latitude Europe and North America and the Antarctic ice sheet was more extensive than today. Sea levels

stood some 120-130 metres lower than today (Lambeck et al 2002:343) and the earth's climate was distinctly different from that of the present interglacial conditions. As the ice began to melt climatic conditions began to alter (Lambeck et al 2002:343). This affected the movement and behaviour of past populations within their environs. Sea levels started to rise, with a corresponding increase in rainfall and temperature. Short's (2000:19-21) research suggests the change in climatic conditions reached its peak about 6,000 years ago.

Up until 1,500 years ago, temperatures decreased slightly and then stabilised about 1,000 years ago producing similar temperatures to that currently experienced. Consequently, the climate of the Project Area for the past 1,000 years would probably have been much the same as present day, providing a year round habitable environment.

New South Wales is described as being in the temperate zone, although the climate undergoes large variations depending on proximity to the coast and mountains (OEH 2012a: Online; SEWPC 2011: 146). The Project Area is located within the eastern sub-humid region of Australia (NSW NPWS 2000b: 3).

Mean annual rainfall at Rosewood Farm, Narrabri, is 693 millimetres. Rainfall is highest in the summer months, with the highest mean rainfall in December (101.5 millimetres) (BOM 2012b: Online) and the lowest during the autumn months, with April recording the lowest mean of 25.5 millimetres (BOM 2012b: Online).

Temperatures are at their highest in January, with a monthly mean maximum temperature of 33.8 degrees Celsius. February records a monthly mean maximum temperature of 33.2 degrees Celsius. The coldest month is July, with a monthly mean maximum temperature of 18.0 degrees Celsius. This is closely followed by June with a monthly mean maximum temperature of 18.7 degrees Celsius (BOM 2012c: Online). An annual mean maximum of 26.5 degrees Celsius is recorded at the closest station, Narrabri West Post Office (BOM 2012c: Online).

3.1.4 Flora and Fauna

Keith (2006: 140-141) suggests that native vegetation in the vicinity of the Project Area is remnant Pilliga Outwash Dry Schlerophyl Forest dominated by box, red gum and iron bark eucalypts and interspersed with a prominent sub-canopy of smaller trees such as *Acacia*, *Casuarina* (Sheoak) and *Callitris glaucophyllia* (White Cyprus Pine). Vegetation within the Project Area, however, was observed (Plate 1) to be Pilliga Box – White Cypress Pine Grassy Open Woodland on Alluvial loams, with remnant Brigalow Woodland (Plate 2) in places. Blakeley's Red Gum and Ironbark Woodland (Plate 3; Plate 4) were also observed within the Project Area. Other than kangaroo and several unidentified species of birds, no fauna was observed by the archaeologist on site.

A full ecological assessment has been prepared by RPS Ecology (Bishop 2012) as a companion to this report.

3.1.5 Synthesis of Environmental Context

A review of environmental data indicates that, despite the landscape being highly disturbed by commercial and agricultural pursuits, prior to European occupation there would have been bountiful food, water and other resources available for exploitation by Aboriginal people and in sufficient quantities to sustain a local population.

This synthesis would suggest the presence of Aboriginal cultural heritage sites within the Narrabri Operations Centre Project Area; however this does not appear to be the case. The lack of Aboriginal sites and places in the vicinity of the Project Area recorded in AHIMS (Section 4.1.1) is understood to be a result of European occupation of the area, the high level of disturbance caused as a result of agricultural and commercial activities and the limited previous archaeological/cultural heritage work undertaken in the Project Area.

4.0 Heritage Context

Heritage consists of those objects, sites and places that will be inherited by future generations. Australia has many rich and varied historic places and landscapes, both urban and rural. Identifying and understanding their particular qualities, and what these add to our lives, is central to our engagement with our history and culture.

NSW's heritage is diverse and includes buildings, objects, monuments, Aboriginal places, gardens, bridges, landscapes, archaeological sites, shipwrecks, relics, bridges, streets, industrial structures and conservation precincts.

4.1 Aboriginal Cultural Heritage

Aboriginal and Torres Strait Islander heritage is an important part of Australian heritage. Evidence of the occupation of Australia by Aboriginal and Torres Strait Islander peoples dates to approximately 40,000 to 60,000 years ago (Dorey 2012: Online).

Aboriginal cultural heritage objects, sites and places provide valuable information about one of the world's oldest living cultures. It has continuing significance, creating and maintaining continuous links with the people and the land.

4.1.1 Aboriginal Heritage Information Management System (AHIMS)

A search was undertaken of the Aboriginal Heritage Information Management System (AHIMS) on 21 August 2012 in accordance with the Due Diligence Code (DECCW 2010:11). The searches were conducted over the parcels of land described as Lot 241, DP 1120041 with a 200 metre and a one (1) kilometre buffer (DECCW 2012a: Online; DECCW 2012b: Online).

The searches revealed that there are no previously recorded Aboriginal sites and no previously declared Aboriginal places in, or within, one (1) kilometre of the Project Area.

4.1.1 Archaeology and Cultural Heritage Literature Review

A review of previous archaeological and heritage reports is required as part of the desktop assessment and has been undertaken in accordance with the code (DECCW 2010:13). The most relevant publications are outlined below.

Appleton, J. (2009), Narrabri Longwall Stage 2 Project: Aboriginal Heritage Assessment. Whitehaven Coal: Sydney.

This investigation was conducted pursuant to an extension to the Narrabri Coal Mine by Whitehaven Coal, located approximately 28 kilometres south of Narrabri, adjacent to the Kamilaroi Highway. The investigation entailed a desktop assessment and a survey over four (4) main areas comprising the impact zones.

The survey identified a total of 121 sites across the four (4) survey areas. The majority of sites were identified in the longwall panels 8-26 (69), followed by the area comprising longwall 1-7. The longwall locations were on a variety of landscapes, but mostly on the eastern slopes of the Pilliga Forest. This area is fed by numerous ephemeral and permanent watercourses, including Pine Creek and Kurrajong Creek.

Overall, the sites comprised low density artefact scatters, with scatters of higher densities being associated with confluences of water courses. A scarred tree and a hearth were also identified in the longwall 1-7 area.

Trindall, E. (2007), *Narrabri Coal Seam Gas Utilisation Project: Aboriginal Heritage Assessment*, Santos Limited: Sydney.

This investigation was conducted ahead of the proposed construction of a gas gathering system, gas flow line and expansion of Wilga Park Power Station. The impact area of that project totalled approximately 36 hectares in the Pilliga East State Forest and open farmland in Narrabri Shire.

The investigation comprised a desktop assessment and a field survey to assess the impact of the proposed operations on the Aboriginal cultural heritage resource. Previous disturbances were variable, with the farmland being moderately disturbed, whilst the Pilliga Forest area had been subjected to varying levels of forestry, fires, grazing and mining exploration.

The survey identified one (1) site, a scarred tree located between Dog Fence Road and Pilliga Forest Way. The tree was a Pilliga Box, one (1) of less than 10 in the vicinity of the area surveyed. It was recommended that this tree be avoided by the proposed works.

Silcox, R. & Bowdler, S. (1982). *An Archaeological Survey of a Proposed 132 Kv Transmission Line Route from Walgett to Narrabri Part 1. A Report to the National Parks and Wildlife Service of N.S.W. on behalf of the Electricity Commission of N.S.W. unpublished.*

This investigation covered the physical examination (visual inspection) of a proposed 132 kilovolt (kv) transmission line route from Walgett to Narrabri. This report covers the first 87 kilometres of the 180 kilometre total route, which is proposed to contain an easement 45 metres wide. The second report, containing the Narrabri sector of the route was unable to be accessed.

Eight (8) sites and seven (7) isolated finds were identified during the course of the survey with visibility averaging 50%. The sites consisted of four scarred trees (two dead both ring barked (WN1 & WN2); two alive, standing, not ring barked (WN3 & WN4)), two surface campsites and two scatters of baked clay 'lumps' (WN7 & WN8). The authors initially suggested that these were from hearths, however conceded later in the report that they were likely the result of European clearing and burning of timber.

4.1.2 Synthesis of Aboriginal Heritage Context

A review of the AHIMS data and previous archaeological work in the vicinity of the Project Area suggests that the Project Area may have been utilised by past Aboriginal communities. This is in part due to the ready availability of food, water and other resources; the availability of water being a crucial factor in the frequency of occupation, as rivers and creeks are markers of community identity, traditional meeting places and the chosen location of settlements (NSW NPWS 2000s:36).

Trindall (2007: 5-11) observed the paucity of sites within the Pilliga Forest as being a direct consequence of the lack of reliable water, whilst sites outside the Pilliga, such as the proposed Narrabri Logistics Centre, which is closer to permanent water, contained a variety of site types. However, the potential for sites remaining must be tempered with the previous land disturbances noted above.

The literature review suggests that artefact sites, such as artefact scatters, isolated finds and non-specified artefact sites appear to be the most frequent site type encountered in the broader region. This is borne out by the Appleton survey, which found the majority of sites being artefact sites, although the AHIMS data has returned a nil result within one (1) kilometre of the Project Area. Appleton also observed the connection between site density/complexity and availability of reliable water which would suggest previous occupation within the Project Area; however, this cannot be confirmed.

4.2 European Heritage Context

European land settlement commenced in NSW in 1788 when Governor Phillip claimed possession of the land now known as Australia for a penal colony on behalf of the British Government. The region was first visited by John Oxley, the explorer and then Surveyor General of NSW in 1817, who noted the presence of Aboriginal people and the suitability of the land for agriculture (NSW NPWS 2000b: 133).

The heritage objects, sites and places associated with the European occupation of regional Australia point not only to the development of Australia as a modern nation, but to the places where people lived and worked the land.

European (historic) heritage is recorded in a number of ways/places including the Australian Heritage Database, which is an online database of items listed under the Commonwealth Heritage List, National Heritage List and the Register of the National Estate, along with a variety of State and local heritage registers.

4.2.1 World Heritage

The World Heritage List is a register of sites considered to have outstanding universal value. A search of the World Heritage List revealed there to be 23 World Heritage Sites in Australia, five (5) of which are in NSW (UNESCO 2012: Online). There are **no (0) World Heritage** sites in the Narrabri LGA, and therefore no items within the Project Area itself.

4.2.2 National Heritage

The National Heritage List is now the lead statutory document for the protection of heritage places considered to have national importance. This list comprises Aboriginal, natural and historic places that are of outstanding national heritage significance to Australia. Listed places are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A search of the Australian Heritage Database with reference to the National Heritage List (SEWPaC 2012a: Online) on 16 August 2012 indicates that there are no heritage items in the town of Narrabri or the Narrabri LGA, on the National Heritage List, and consequently **no National heritage items** within or near to the Project Area.

Previously the Register of the National Estate was the primary document. While the Register of the National Estate still exists in archival form, items can no longer be registered and since February 2012 no longer has statutory status. However, the Minister is still required to considering the Register when making some decisions under the EPBC Act. A search of the Australian Heritage Database with reference to the Register of the National Estate (SEWPaC 2012b: Online) on 16 August 2012 revealed six (6) heritage sites within the Narrabri LGA on the Register of the National Estate (the former Narrabri Gaol, Narrabri Public School, Police Residence, Mount Kaputar National Park, Collins Park Grandstand and the Narrabri Post Office and former Telegraph Office). The searches revealed that **no (0) heritage sites** on the Register of the National Estate are in, or near to, the Project Area.

4.2.3 Commonwealth Heritage

The Commonwealth Heritage List is a list of natural, Indigenous and historic heritage places owned or controlled by the Australian Government. These include places connected to defence, communications, customs and other government activities that also reflect Australia's development as a nation. A search of the Australian Heritage Database with reference to the Commonwealth Heritage List (SEWPaC 2012c: Online), on 16 August 2012 revealed that one (1) site in the town of Narrabri, the Narrabri Post Office and former Telegraph Office, is listed on the Commonwealth Heritage List. The Post Office and former Telegraph Office is located in Maitland Street, Narrabri, outside of the Project Area. As neither the Project Area nor

adjacent areas are owned by the Commonwealth, it is understood that there are **no Commonwealth heritage items** in the Project Area. The searches confirm this.

4.2.4 State Heritage

European heritage items in NSW may be registered as important at the State level and/or at the local level. The Heritage Council has developed a set of seven (7) criteria to help determine whether a heritage item is of State or local significance to the people of New South Wales. Items are assessed by the Heritage Council of NSW and if deemed eligible for listing, i.e. are of State significance, they are referred to the Minister for Heritage for a decision to list on the State Heritage Register, a statutory register of heritage items created by the NSW *Heritage Act 1977*.

The NSW Heritage Inventory database is maintained by the Heritage Branch, Office of Environment and Heritage and lists items that have been identified as of State and/or local heritage significance throughout NSW. A search of the State Heritage Register (OEH 2012c: Online) on 16 August 2012 revealed one (1) item of State Heritage Significance listed on the NSW State Heritage Register (Narrabri Gaol and Residence, Bowen Street, Narrabri) in the Narrabri LGA. The item is outside of the Project Area and therefore there are **no heritage items of State Significance** in, or near to the Project Area.

The searches also revealed **no heritage items** in the Narrabri LGA subject to an Interim, or Authorised Interim Heritage Order (OEH 2012d,e: Online); **no heritage items** subject to a s136 order (OEH 2012f: Online); and **no historic shipwrecks** in the Narrabri LGA (OEH 2012g: Online), and therefore no heritage items in, or near to the Project Area.

4.2.5 Local Heritage

Searches of the Heritage Branch, OEH State Heritage Inventory with reference to the Narrabri Local Environmental Plan No. 2 (current version for 20 April 2012 to date) were undertaken on 16 August 2012. The searches reveal nine (9) local heritage items listed on the LEP (Narrabri Shire Council 2012: Online). A search of the Heritage Branch, OEH State Heritage Inventory on the same day (OEH 2012h: Online) reveals twenty-three items of local significance in the Narrabri LGA, including the nine (9) LEP items. Of these twenty-three (23) local heritage items, **no heritage items** are in or near to the Project Area.

4.2.6 Synthesis of European Heritage Context

Although the Narrabri region has been settled for almost 200 years, the search results indicate that there are no known (i.e. reported, recorded or identified) European (Historic) heritage items within or near to the Project Area. It is therefore considered that there are **no European (Historic) heritage constraints** associated with the project.

5.0 Visual Inspection and Field Results

A visual inspection of the Project Area was undertaken to identify whether Aboriginal objects are present on the ground surface or are likely to be present below the ground surface. In accordance with S4 of the Due Diligence Code a qualified archaeologist undertook the visual inspection (DECCW 2010:12-13).

The visual inspection (pedestrian survey) of the Project Area (Figure 1) was undertaken on 4 September 2012 by Sarah Ward RPS Senior Archaeologist, in fine, sunny conditions.

An area of approximately 200 metres x 200 metres (4,000 square-metres or approximately 1.8 hectares) was surveyed to ensure adequate coverage for the purposes of due diligence.

At the commencement of the archaeological investigation, the corners of the Project Area (Table 1) were programmed into a Garmin Oregon 450 t GPS unit. After the perimeter of the Project Area was inspected, the survey continued by walking five (5) metre wide transects through it in a south/north direction, with particular attention paid to any ground surface exposures. Unfortunately, the extensive dense vegetation left no such exposures to inspect the natural ground surface, and visibility was assessed as poor, i.e. less than 5%. No Aboriginal objects were identified and the potential for unidentified Aboriginal objects was assessed to be low. No European (historic) heritage sites were identified within the Project Area.

Table 1 Narrabri Logistics Centre (NLC) Project Area Corner Locations (MGA55)

Corner	Eastings	Northings	Archaeological Sensitivity
NLC-A	762515	6640879	Low to nil sensitivity
NLC-B	762383	6640986	Low to nil sensitivity
NLC-C	762393	6640727	Low to nil sensitivity
NLC-D	762228	6640820	Low to nil sensitivity

Source: RPS 2012.

With regard to potential for Aboriginal objects to occur within the Project Area, as the land is not within 200 metres of a water course, it may not have been suitable for continuous habitation. Although continuous occupation is not dictated solely by distance to water (other factors are often at play), the Project Area may still have been used for transient or temporary purposes, though evidence of such use would not necessarily be left in the archaeological record. Further, past land uses such as grazing, land clearance, other agricultural and commercial pursuits may have damaged and/or destroyed what little evidence may have been left behind by such transient occupation.

6.0 Impact Assessment

There were no visible natural watercourses in the vicinity of the Project Area and the topography was of low relief. As aforementioned, the vegetation was observed to be a mix of native and non-native grasses, trees and shrubs with sections of woodland including Brigalow. RPS description of the landscape conforms with the Office of Environment and Heritage (OEH) definition of disturbed land (2010:18):

Land is disturbed land if it has been the subject of human activity that has changed the land's surface, being changes that remain clear and observable. Examples include ploughing, construction of rural infrastructure (such as dams and fences), construction of roads, trails and tracks (including fire trails and tracks and walking tracks), clearing vegetation, construction of buildings and the erection of other structures, construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure), substantial grazing involving the construction of rural infrastructure, and construction of earthworks associated with anything referred to above.

In keeping with the 2010 Due Diligence Code of Practice (2010:11-12) the landscape investigated by RPS did not possess sensitive landscape features which indicate the presence of Aboriginal objects. The Due Diligence Code provides examples of these higher sensitivity landscape features which occur: within 200 metres of waters; within a sand dune system; on a ridge top, ridge line or headland; within 200 metres below or above a cliff face; or within 20 metres of or in a cave, rock shelter or cave mouth; on land that is not disturbed. None of these landscape features were identified during the visual inspection. The RPS assessment confirms the land to be disturbed and the archaeological sensitivity and research potential to be low to nil.

No Aboriginal places, sites or objects were identified within the Project Area during the visual inspection. No culturally modified trees were observed in the Project Area. Whilst vegetation obscured much of the ground surface across the Project Area, past land uses and distance from permanent water sources tend to indicate that the potential for any Aboriginal cultural heritage material to be present within the Project Area is low to nil.

The results of the AHIMS and European (historic) heritage searches together with the visual inspection indicate that there are no identified Aboriginal objects or European (historic) heritage sites in the Project Area. **As there are no identified Aboriginal objects in the Project Area it is assessed that there is no identified risk of harm to Aboriginal objects and an AHIP is not required for the proposed activity.**

Similarly, as **no European (historic) heritage sites were identified within the Project Area, there is no identified risk of harm to European (historic) heritage and a Statement of Heritage Impact is not required.**

7.0 Recommendations

This report has considered the available environmental and archaeological information for the Project Area, the land condition, as well as, the nature of the proposed activities.

RECOMMENDATIONS

General mitigations have been provided for undertaking the proposed activity/works as they set out contingency procedures should unexpected Aboriginal objects, skeletal remains or suspected additional European cultural heritage material be identified during the proposed works.

Recommendation A

All relevant Santos Limited staff and contractors should be made aware of their statutory obligations for heritage under NSW *National Parks and Wildlife Act 1974* and the NSW *Heritage Act 1977*, which may be implemented as a heritage induction.

Recommendation B

This due diligence report must be kept by Santos Limited so that it can be presented, if needed, as a defence from prosecution.

Recommendation C

If Aboriginal object/s are identified in the Project Area during works, then all works in the immediate area must cease and the area cordoned off. The Office of Environment and Heritage must be notified by ringing the Enviroline 131 555 so that the site can be adequately assessed and managed.

Recommendation D

In the event that skeletal remains are uncovered, work must cease immediately in that area and the area cordoned off. Santos Limited must contact the NSW Police with no further action taken until written advice is provided by the Police. If the remains are determined to be of Aboriginal origin, the Office of Environment and Heritage must be notified by ringing the Enviroline 131 555 and a management plan prior to works re-commencing must developed in consultation with the relevant Aboriginal stakeholders.

Recommendation E

If, during the course of development works, suspected European cultural heritage material is uncovered, work should cease in that area immediately. The Heritage Branch, Office of Environment and Heritage (Enviroline 131 555) should be notified and works only recommence when an approved management strategy developed.

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9.0 Plates



Plate 1 Looking west across the Project Area from the north east corner of the existing Operations Centre compound.



Plate 2 Brigalow Woodland observed to the north of the Project Area.



Plate 3 Looking 301° North West across the Project Area from the existing Operations Centre.



Plate 4 Looking 186° south towards the existing Operations Centre from the north east corner of the Project Area.

10.0 Terms, Definitions, and Abbreviations

Abbreviation/ Term	Meaning
Aboriginal Object	“any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains” (DECCW 2010:18).
Aboriginal Place	“a place declared under s.84 of the NPW Act that, in the opinion of the Minister, is or was of special significance to Aboriginal culture” (DECCW 2010:18). Aboriginal places have been gazetted by the minister.
Aboriginal Culturally Modified Tree	“means a tree that, before or concurrent with (or both) the occupation of the area in which the tree is located by persons of non-Aboriginal extraction, has been scarred, carved or modified by an Aboriginal person by: (a) the deliberate removal, by traditional methods, of bark or wood from the tree; or (b) the deliberate modification, by traditional methods, of the wood of the tree” NPW Regulation 80B (3). Culturally Modified trees are sometimes referred to as scarred trees.
Activity	A project, development, or work (this term is used in its ordinary meaning and is not restricted to an activity as defined by Part 5 EP&A Act 1979).
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
cal. years BP	Calibrated years before present, indicates a radiocarbon date has been calibrated using the dendrochronology curves, making the date more accurate than an uncalibrated date.
DECCW	Department of Environment, Climate Change and Water (is now the Office of Environment and Heritage – OEH)
Disturbed Land	“Land is disturbed if it has been the subject of a human activity that has changed the land’s surface, being changes that remain clear and observable.” (DECCW 2010:18).
Due Diligence	“taking reasonable and practical steps to determine whether a person’s actions will harm an Aboriginal object and, if so, what measures can be taken to avoid that harm” (DECCW 2010:18)
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
GDA	Geodetic Datum Australia
GIS	Geographic Information System
Harm	“destroy, deface, damage an object, move an object from the land on which it is situated, cause or permit an object to be harmed.” (DECCW 2010:18)
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
NPWS	National Parks and Wildlife Service
NPW Act	<i>National Parks and Wildlife Act 1974 (NSW)</i>
NPW Regulation	<i>National Parks and Wildlife Regulation 2009 (NSW)</i>
OEH	Office of Environment and Heritage (formerly DECCW)
PAD	Potential Archaeological Deposit
Project Area	Project Area is the area subject to the proposed activity
REP	Regional Environment Plan
REF	Review of Environmental Factors

Appendix I

Legislative Requirements

Summary of Statutory Controls

The following overview of the legal framework is provided solely for information purposes for the client, it should not be interpreted as legal advice. RPS will not be liable for any actions taken by any person, body or group as a result of this general overview, and recommend that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken as a result of the summary below.

COMMONWEALTH

Aboriginal & Torres Strait Islander Heritage Protection Act 1984 (ATSIHIP Act)

The purpose of this Act is to preserve and protect all heritage places of particular significance to Aboriginal and Torres Strait Islander people. This Act applies to all sites and objects across Australia and in Australian waters (s4).

It would appear that the intention of this Act is to provide national baseline protection for Aboriginal places and objects where State legislation is absent. It is not to exclude or limit State laws (s7(1)). Should State legislation cover a matter already covered in the Commonwealth legislation, and a person contravenes that matter, that person may be prosecuted under either Act, but not both (s7(3)).

The Act provides for the preservation and protection of all Aboriginal objects and places from injury and/or desecration. A place is construed to be injured or desecrated if it is not treated consistently with the manner of Aboriginal tradition or is or likely to be adversely affected (s3).

Australian Heritage Commission Act 1975

The *Australian Heritage Commission Act (1975)* established the Australian Heritage Commission which assesses places to be included in the National Estate and maintains a register of those places. Places maintained in the register are those which are significant in terms of their association with particular community or social groups and they may be included for social, cultural or spiritual reasons. The Act does not include specific protective clauses.

The *Australian Heritage Council Act 2003*, together with the *Environment Protection & Biodiversity Conservation Act 1999*, includes a National Heritage List of places of National heritage significance, maintains a Commonwealth Heritage List of heritage places owned or managed by the Commonwealth and ongoing management of the Register of the National Estate.

STATE

It is incumbent on any land manager to adhere to state legislative requirements that protect Aboriginal Cultural heritage. The relevant legislation in NSW includes but is not limited to the summary below.

National Parks and Wildlife Act 1974 (NPW Act)

The NPW Act provides statutory protection for all Aboriginal heritage, places and objects (not being a handicraft made for sale), with penalties levied for breaches of the Act. This legislation is overseen by the Office of Environment and Heritage (OEH), and specifically the Chief Executive (formerly the Director-General) of OEH. Part 6 of this Act is the relevant part concerned with Aboriginal objects and places, with Section 86 and Section 90 being the most pertinent. In 2010, this Act was substantially amended, particularly with respect to Aboriginal cultural heritage requirements. Relevant sections include:

Section 86

This section now lists four major offences:

- (4) A person must not harm an object that the person knows is an Aboriginal object;
- (5) A person must not harm an Aboriginal object;
- (6) For the purposes of s86, “circumstances of aggravation” include:
 - (g) The offence being committed during the course of a commercial activity; or
 - (h) That the offence was the second or subsequent offence committed by the person; and
- (7) A person must not harm or desecrate an Aboriginal place.

Offences under s86 (2) and (4) are now strict liability offences, i.e. knowledge that the object or place harmed was an Aboriginal object or place needs to be proven. Penalties for all offences under Part 6 of this Act have also been substantially increased, depending on the nature and severity of the offence.

Section 87

This section now provides defences to the offences of s86. These offences chiefly consist of having an appropriate Aboriginal Heritage Impact Permit (AHIP), not contravening the conditions of the AHIP or demonstrating that due diligence was exercised prior to the alleged offence.

Section 87A & 87B

These sections provide exemptions from the operation of s86; Section 87A for authorities such as the Rural Fire Service, State Emergency Services and officers of the National Parks & Wildlife Service in the performance of their duties, and s87B for Aboriginal people performing traditional activities.

Section 89A

If a person knows of the location of an Aboriginal object or place that has not been previously registered and does not advise the Director-General (now Chief Executive) of that object or place within a reasonable period of time, then that person is guilty of an offence under this Section of the Act.

Section 90

This section authorises the Director-General (now Chief Executive) to issue an AHIP.

Section 90A-90R

These sections govern the requirements relating to applying for an AHIP. In addition to the amendments to the Act, OEHS have issued three new policy documents clarifying OEHS’s requirements with regards to Aboriginal archaeological investigations: *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* and *Code of Practice for Archaeological Investigations in NSW*. The Consultation Requirements formalise the consultation with Aboriginal community groups into four main stages, and includes details regarding the parties required to be consulted, advertisements inviting Aboriginal community groups to participate in the consultation process, requirements regarding the provision of methodologies, draft and final reports to the Aboriginal stakeholders and timetables for the four stages. The Due Diligence Code of Practice sets out the minimum requirements for investigation, with particular regard as to whether an AHIP is required. The Code of Practice for Archaeological Investigation sets out the minimum requirements for archaeological investigation of Aboriginal sites.

Aboriginal Heritage Impact Permits (AHIP)

OEH encourages consultation with relevant Aboriginal stakeholders for all Aboriginal Heritage Assessments. However, if an Aboriginal Heritage Impact Permit (AHIP) is required for an Aboriginal site, then specific OEH guidelines are triggered for Aboriginal consultation.

Aboriginal Cultural Heritage Consultation Requirements for Proponents

In 2010, the Aboriginal Cultural Heritage Consultation Requirements for Proponents (ACHCR's) were issued by OEH (12th April 2010). These consultation requirements replace the previously issued Interim Community Consultation Requirements (ICCR) for Applicants (Dec 2004). These guidelines apply to all AHIP applications prepared after 12th April 2010; for projects commenced prior to 12th April 2010, transitional arrangements have been stipulated in a supporting document, Questions and Answers 2: Transitional Arrangements.

The ACHCR's 2010 include a four stage Aboriginal consultation process and stipulate specific timeframes for each state. Stage 1 requires that Aboriginal people who hold cultural information are identified, notified and invited to register an expression of interest in the assessment. Stage 1 includes the identification of Aboriginal people who may have an interest in the Project Area and hold information relevant to determining the cultural significance of Aboriginal objects or places. This identification process should draw on reasonable sources of information including: the relevant OEH EPRG regional office, the relevant Local Aboriginal Land Council(s), the Registrar of Aboriginal Owners, Aboriginal Land Rights Act (1983), the Native Title Tribunal, Native Title Services Corporation Limited, the relevant local council(s), and the relevant catchment management authority. The identification process should also include an advertisement placed in a local newspaper circulating in the general location of the Project Area. Aboriginal organisations and/or individuals identified should be notified of the project and invited to register an expression of interest (Eoi) for Aboriginal consultation. Once a list of Aboriginal stakeholders has been compiled from the Eoi's, they need to be consulted in accordance with ACHCR's Stages 2, 3 and 4.

Environmental Planning & Assessment Act 1979 (EP&A Act)

This Act regulates a system of environmental planning and assessment for New South Wales. Land use planning requires that environmental impacts are considered, including the impact on cultural heritage and specifically Aboriginal heritage. Within the EP&A Act, Parts 3, 4 and 5 relate to Aboriginal heritage.

Part 3 regulates the preparation of planning policies and plans. Part 4 governs the manner in which consent authorities determine development applications and outlines those that require an environmental impact statement. Part 5 regulates government agencies that act as determining authorities for activities conducted by that agency or by authority from the agency. The National Parks & Wildlife Service is a Part 5 authority under the EP&A Act.

In brief, the NPW Act provides protection for Aboriginal objects or places, while the EP&A Act ensures that Aboriginal cultural heritage is properly assessed in land use planning and development.

Heritage Act 1977

This Act protects the natural and cultural history of NSW with emphasis on non-indigenous cultural heritage through protection provisions and the establishment of a Heritage Council. Although Aboriginal heritage sites and objects are primarily protected by the *National Parks & Wildlife Act 1974*, if an Aboriginal site, object or place is of great significance, it may be protected by a heritage order issued by the Minister subject to advice by the Heritage Council.

Other legislation of relevance to Aboriginal cultural heritage in NSW includes the *NSW Local Government Act 1993*. Local planning instruments also contain provisions relating to indigenous heritage and development conditions of consent.

Appendix 2

AHIMS Search Results

RPS Australia East Pty Ltd Sydney CBD
Level 12 92 Pitt Street
Sydney New South Wales 2000

Date: 21 August 2012

Attention: Sarah Ward

Email: sarah.ward@rpsgroup.com.au

Dear Sir or Madam:

**AHIMS Web Service search for the following area at Lot : 241, DP:DP1120041 with a Buffer of 200 meters.
conducted by Sarah Ward on 21 August 2012**

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette](http://www.nsw.gov.au/gazette) (<http://www.nsw.gov.au/gazette>) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

RPS Australia East Pty Ltd Sydney CBD
Level 12 92 Pitt Street
Sydney New South Wales 2000

Date: 21 August 2012

Attention: Sarah Ward

Email: sarah.ward@rpsgroup.com.au

Dear Sir or Madam:

**AHIMS Web Service search for the following area at Lot : 241, DP:DP1120041 with a Buffer of 1000 meters.
conducted by Sarah Ward on 21 August 2012**

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

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- This search can form part of your due diligence and remains valid for 12 months.

Appendix 6

Services Report



SANTOS, NARRABRI SERVICES REPORT

CONTENTS

- 1.0 SCOPE OF WORKS**
 - 1.1 Design Development**
 - 1.2 Building Services (General)**

- 2.0 ACTS, REGULATIONS AND STANDARDS**
 - 2.1 Acts and Regulations**
 - 2.2 Standards**

- 3.0 SERVICES**
 - 3.1 Hydraulic Design**
 - 3.1.1 Water
 - 3.1.2 Roof Drainage
 - 3.1.3 On Site Sewerage Treatment
 - 3.1.4 Sanitary Services
 - 3.2 Mechanical**
 - 3.2.1 General Requirements
 - 3.3 Communications**
 - 3.4 Electrical and Lighting**
 - 3.4.1 General Electrical Installation Requirements
 - 3.5 Fire Protection**

1.0 SCOPE OF WORK

The Narrabri Logistics Supply Base Project scope of work involves upgrading the existing Narrabri Operations Centre to achieve further future capacity for drilling operations.

1.1 Design Development

Santos Energy NSW requires a new warehouse and laydown area in Narrabri to support its current and future exploration and appraisal activities in the Gunnedah Basin.

This project will deliver a secure and purpose built facility that will enable all equipment and materials to be suitably stored to eliminate the equipment and material degradation. The Logistics Supply Base platform will be integrated with current Santos systems and standards and will improve the efficiency and productivity throughout the business unit.

1.2 Building Services Generally:

Required to be:

- Properly designed to achieve the environmental control requirements and operational control requirements of specific equipment, materials, processes, and functions.
- Designed and installed to the relevant Australian Standards and codes.
- Appropriately sized to allow for the full and proper functioning of all equipment, plant, and fittings.

2.0 ACTS, REGULATIONS AND STANDARDS

The provision of the Works shall comply in full with the acts, regulations and standards listed below. Unless noted otherwise the current revision of each Document shall apply.

2.1 Acts and Regulations

- *Work Health and Safety Act 2011* (NSW)
- *Work Health and Safety Regulation 2011* (NSW)
- *Environmental Planning and Assessment Act 1979* (NSW)
- *Environmental Planning and Assessment Regulation 2000* (NSW)

2.2 Standards

As referenced in this Specification and those below:

- AS 4801: Occupational Health and Safety Management Systems
- AS/NZS ISO 9000 series: Quality Systems
- AS/NZS ISO 14000 series: Environmental Management Systems

Note that all references to the word “should” in the standards shall be interpreted in this scope of Works to be synonymous with “shall”, unless noted otherwise.

3.0 SERVICES

3.1 Hydraulic Design

Dependant on building regulations a hydraulic design may be required to provide hydraulic services necessary for each area that fulfils designated function.

References:

- NSW Legislation
- AS/NZS 3500 National Plumbing and Drainage Code

3.1.1 Water

Hot and cold services will be provided to sinks and hand-basins by means of single mixer taps. Fixtures used for personal hygiene purposes will be fitted with a temperature control device to avoid scalding. A prescribed warning notice will be provided at tap outlets where the water supply temperature is greater than 50°C.

Cold water will be provided to all cisterns, mechanical plant and other equipment as required.

External cold water tap is required at four (4) places on the outside of the building and at the bunded areas.

Town water reticulation is low pressure and the hydraulic design will need to accommodate this in order to provide a fit for purpose design. Connection point will be on the western side of Yarree Lake Rd.

3.1.2 Roof Drainage

A suitable roofing drainage system is to be provided to control rainfall on the site. Consideration can be given to a syphonic roof drainage system.

The stormwater runoff from the proposed facilities must be designed to meet the requirements of an Environmental Management Plan to be developed and submitted to Santos for approval. This will include run-off to the adjacent land and / or roadways without affecting water quality:

- Control the quality of stormwater discharged from the facility by use of appropriate pollution control devices;
- Open channels to be generally unlined.

Runoff to rear of the property is preferred. Should runoff be proposed to Narrabri Council land to the east then a submission for approval is required.

3.1.3 On Site Sewage Treatment

Waste water will need to be treated in a suitable septic system on site which should be sized for less than 10 EP (equivalent persons) and designed such that the sewage treatment is not classified as an Environmentally Relevant Activity as defined in Schedule 2 of the Environmental Protection Regulation 2008.

3.1.4 Sanitary Services

Sanitary drainage and plumbing will be provided to all sanitary fixtures, and other equipment as required.

3.2 Mechanical

Mechanical services equipment will have a minimum design life of fifteen years. Offices are to be air-conditioned. Mechanical ventilation will be provided to toilets and ablutions.

3.2.1 General Requirements

HVAC installations shall comply with BCA and AS1668 and other applicable and relevant Australian standards, for the type of the installation or equipment to be used, irrespective of their status. Where Australian Standards are not available, recognised international or overseas national standards shall be used where they are relevant to the type of installation or equipment and to the installation conditions in Australia. The most cost effective design solution that will meet the requirements of this brief and those specific to the establishment or facility is preferred.

All materials and workmanship shall be of the best standard and shall comply with the relevant legislation and Australian Standards, or if such do not exist, with the relevant IEC or International (ISO) Standards.

3.3 Communications

The Contractor shall allow in its design for space for a communications rack. The Contractor shall provide one (1) communications rack. The Contractor will provide conduits for Fibre optic connection to the communications rack by Telstra. Copper network cabling is required throughout the facility.

Fibre optic cable currently runs to the existing Operations Centre so additional cabling will be required to run approximately 100m. The Contractor is to allow two 100mm PVC conduits into the facility.

The communications rack shall be in a dedicated lockable room. Internal copper cabling shall be Cat 6 category communications cable.

3.4 Electrical & Lighting

The design shall provide for a suitable power supply.

The site currently has a transformer at the site boundary. Further infrastructure will be installed onsite with advise provided by the Santos Electrical Engineer. It is not expected that this will be in place prior to construction commencing.

3.4.1 General Electrical Installation Requirements

All Australian Standards relevant to the scope of work are to be complied with. Of particular importance are:

References:

- AS/NZS 3000 - SAA Wiring Rules
- AS/NZS 3008 – Electrical Installations- Selection of Cables

Note that in addition to Australian Standards, there are particular Santos documents that are to be utilised in the design.

3.5 Fire Protection

The Contractor shall have a Fire Protection Engineering Consultant and a BCA Consultant to ensure that compliance with the requirements of this brief and the BCA is achieved. If there is not a legal requirement to install a fire sprinkler system then this decision will be made on a cost implication basis.

3.5.1 Fire protection

Contractor is to advise of minimum fire protection requirements for the facility to comply with BCA requirements. This is dependent on the floor area of the building and the category of risk the contents of the stores represent. Should fixed protection/detection be required, the provisions of AS 2118.1 and AS 1670.1 shall apply.

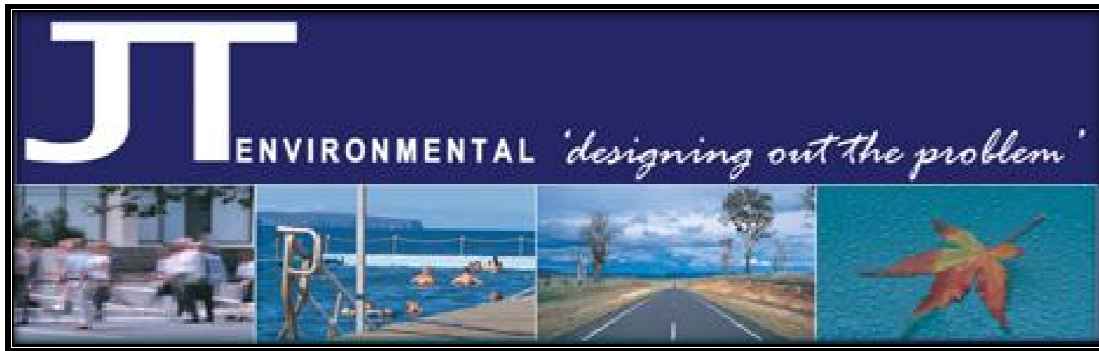
Additionally the following shall be considered:

- Automatic fire sprinkler systems if required shall be installed in stores buildings where the maximum floor area limitations are exceeded as detailed in the BCA.

- Fire hydrants if required shall be provided to meet the requirements of part E1.3 of the BCA and hydrant installations must comply with AS 2419.1—Fire Hydrant Installations—System Design, Installation and Commissioning.
- Hose reels if required shall be installed in buildings as listed in part E1.4 of the BCA and shall comply with AS 1221—Fire Hose Reels and AS 2441—Installation of Fire Hose Reel. Hose reels are to be located not more than 4 m from a required exit on each floor and adjacent to any hydrant required within the building.
- Fire points shall be established in positions readily accessible, but in locations where equipment will not be damaged by vehicular machinery movements. These points shall be established within 4 m of required exits. A fire point may comprise fire-extinguishers, fire hose reel and fire hydrants.

Appendix 7

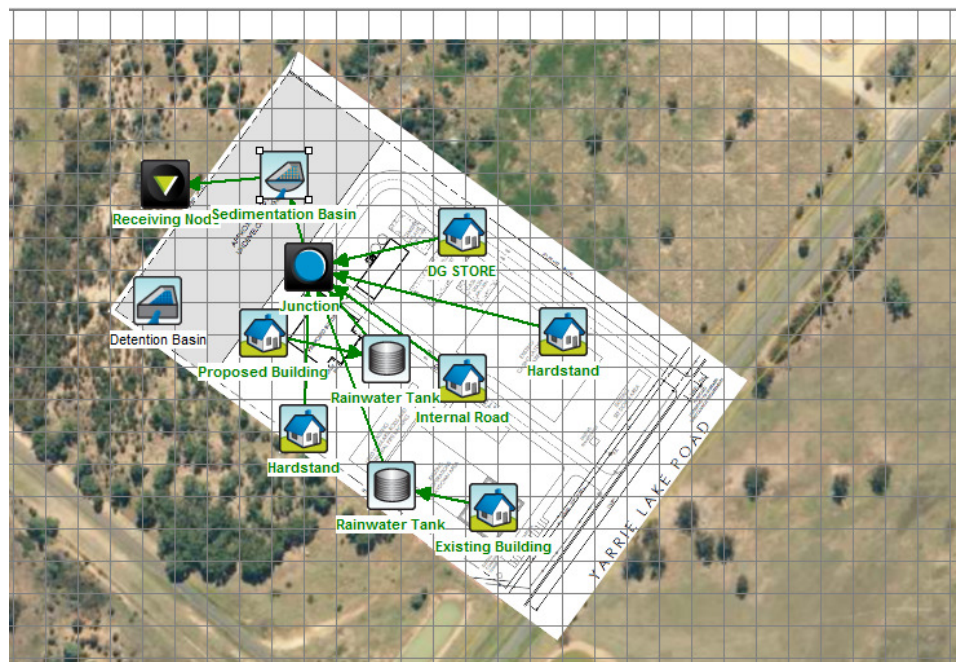
Stormwater Quality Management Plan



- Telephone 0417 727 981
- Facsimile 07 5530 7521 • ABN 68 467 757 073

Application Details

Application Type	Development Permit – Material Change of Use
Defined Use	Logistics Supply Base - Santos
Street Address	Yarri Lake Road, Narrabri, NSW
Property Description	Lot 241 on DP1120041
Client	Space Frame Buildings
Local Government Area	Narrabri Shire Council
Date	November 2012






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Limitations

This report was prepared for the sole use of Spaceframe Buildings Pty Ltd in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has not been prepared for use by parties other than the client, the owner and their respective consulting advisors. It may not contain sufficient information for the purposes of other parties or for other uses. It is recommended that any works planned by others and relating specifically to the content of this report be reviewed by JT Environmental to verify that the intent of our recommendations is properly reflected in the final design. To the best of our knowledge, information contained in this report is accurate at the date of issue.

Document Status					
Rev No.	Author	Reviewer	Approved for Issue		
			Name	Signature	Date
A	TCD	JLM	TCD		20.11.12

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1. EXECUTIVE SUMMARY

Report	Stormwater Quality Management Plan
Site address	Yarri Lake Road, Narrabri, NSW 2390
Area of Site	62,979m ²
Applicant's name	Spaceframe Buildings
Proposed use	Logistics Supply Base
Details of proposal	Material Change of Use (MCUs)
Total Floor Area	1,965m ²
Contact Details	Tyson Dodd – JT Environmental Pty Ltd - 0417 727 981 tyson@jtenvironmental.com.au



2. INTRODUCTION

2.1 APPLICATION INTENT

JT Environmental has been commissioned by Spaceframe Buildings Pty Ltd to prepare a Stormwater Quality Management Plan for an existing site located at Yarri Lake Road being described as proposed Lot 241 on DP1120041. A site plan is attached in Appendix A prepared by Spaceframe Buildings.

This report has been prepared to demonstrate that with the incorporation of an appropriated Stormwater treatment train on-site the proposed development will achieve the required removal efficiencies indicated by the Narrabri Shire Council.

The purpose of this document is to provide a Stormwater Quality Management Plan (SWQMP), to address Council's Stormwater Quality requirements.

It is important to note that the proposal as detailed in the attached site plan will result in the construction of a proposed warehouse to hold the Logistics Supply Base for Santos with associated buildings and offices. New proposed hardstand, car parking and maneuvering areas are detailed on the attached site plans.

The intent of this SWQMP is to ensure that the proposed development is designed and constructed in a manner that will maintain or enhance environmental values of any affected receiving waters downstream of this development. There is no existing site stormwater management for this proposed allotment and the incorporation of proposed treatment will serve to provide additional localised catchment benefits.

A successful SWQMP seeks to:

- Determine the Existing and future catchment and drainage characteristics;
- Opportunities and constraints regarding water quality management on site;
- Consideration of water quality management techniques consistence with Water Sensitive Urban Design principles where possible; and
- Opportunities for incorporating water quality management strategies and best practice techniques under the proposed development conditions.



2.2 LIMITATIONS OF THE SWQMP

It is stressed that this SWQMP does not negate the need for site Owner/s, Managers to continue to improve the environmental performance of the business. The recommendations provided are to be implemented into the operations during both construction and operational phases of the development.

Further, compliance with this SWQMP does not necessarily exempt the operators from prosecution or ensure compliance with legislation. It remains the responsibility of the operator, employee or manager undertaking these activities to satisfy their own “General Environmental duty”.

3. SITE ASSESSMENT

3.1 EXISTING LAND USE

West : Rural Land;
East : Yarri Lake Road;
South : Rural Land; and
North : Rural Land.

The site is currently partially utilised with existing lay down areas across the site and internal road access to the different operational areas of the site. However the site will be expanded to incorporate the additional storage requirements of the operator with a proposed building. The surrounding area consists of rural land with residential receptors at a distance where they will not be affected by any activity that occurs on this site.

3.2 PROPOSED DEVELOPMENT ENVIRONMENT

The proposed development will result in the construction of a new warehouse that will be occupied by Santos and used as their supply base and a small DG Store. Albeit that the operator will establish a DG Store, the proposed inventory does not trigger uses on-site for the storage of this DG material.



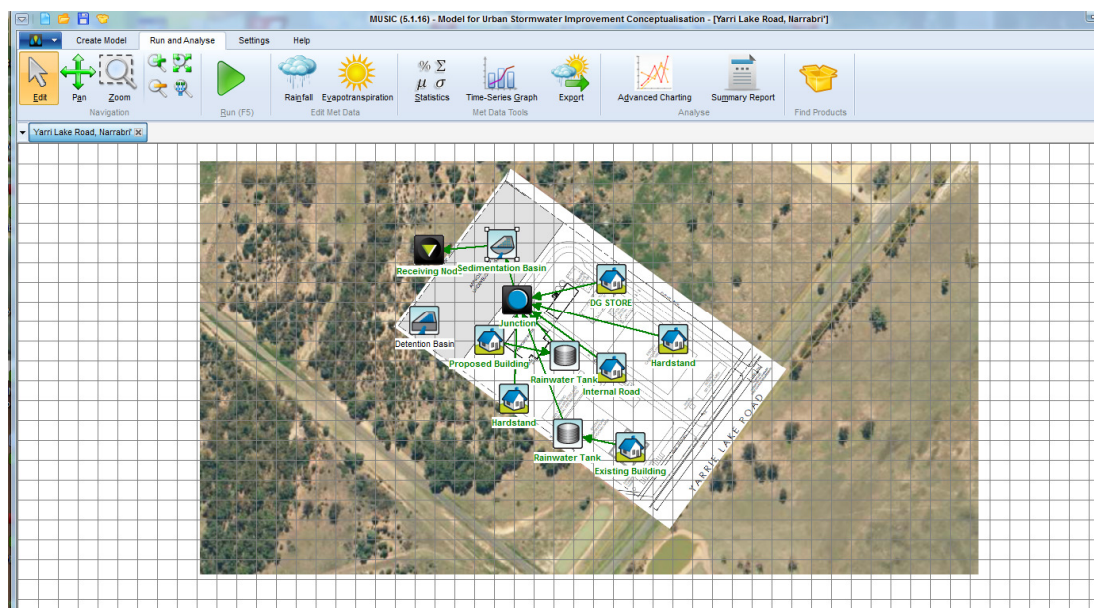
3.3 SITE LOCATION



Figure 1 – Site Map. Source: Near Map

The subject site is located at Yarri Lake Road, Narrabri, on a site that is already used for the proposed extension to the site.

Figure 2 – Site Map. Overlay and MUSIC model Source: Near Map





4. WATER QUALITY

4.1 EXISTING WATER QUALITY

The site is located in the Greenway and Purgatory Creek Catchment as defined by the Newcastle Stormwater Management Plan. The tributaries of this catchment run into Woodberry Swamp which is listed as a SEPP 14 wetland.

This document has identified which catchment the proposal site is located within and associated appropriate water quality objectives associated with the proposal.

5. ENVIRONMENTAL VALUES AND WATER QUALITY OBJECTIVES

5.1 NEWCASTLE CITY COUNCIL

The New South Wales Development Design Specification D7 Erosion Control and Stormwater Management make specific recommendations on the design techniques of application water quality devices. In this instance a sed basin has been modelled to appropriately assist in the control of stormwater quality from this site. The below Treatment Train efficiency criteria has been adopted for the site and the design of the Sed basin has been adjusted accordingly. The overall theme of the catchment values is ensuring habitats remain healthy and aquatic and natural ecosystems processes are maintained. Furthermore, given the size of the undeveloped area, the requirements for appropriate buffering of a minimum of 20m around the sed basin can be easily achieved. These reduction percentages are listed in the table below. Pollutants are not to exceed these percentages post-construction.

<i>Indicator</i>	<i>Water Quality Objectives – Newcastle City Council</i>
Total Phosphorus	60% reduction
Total Nitrogen	45% reduction
Suspended Solids	80% reduction
Gross Pollutants	90% reduction in the average annual load of Gross Pollutants (>5mm)

Table 2: Adopter Water Quality Objectives for Newcastle City Council

The reduction in loads is relative to the stormwater pollution loads expected from conventional urban development without stormwater treatment measures. Due to the size of the proposed development a more rigorous modeling assessment needs to be conducted to demonstrate that these targets are met.



As indicated this report will address the key pollutants and the use of the MUSIC model will be utilised to investigate the removal efficiency of the proposed devices on site. Parameters to be modelled will be **Total Nitrogen (TN)**, **Total Phosphorus (TP)**, **Total Suspended Solids (TSS)** and **Gross Pollutants (GP)**.

6 STORMWATER MANAGEMENT CONTROLS

6.1 CONSTRUCTION PHASE

The following measures will be implemented to ensure that discharges from the site during its construction phase will not affect the waterways:

- Where dewatering is required, devices such as settling ponds or filtration systems shall be used to reduce the total suspended solids ("TSS") concentration of the wastewater;
- Wastewater from dewatering processes shall only be released if the pH is between 6.5 and 9 and the TSS is less than 305mg/L or 100mg/L in wet weather periods;
- Waste from cement trucks shall be removed and taken back to base by the cement truck driver for disposal;
- Cement residue shall not be allowed to flow into stormwater drains or directly into the drainage;
- Cleaning of equipment and/or vehicle used during the construction shall not be undertaken in locations that permit flow of untreated water into stormwater drains;
- Stockpiles of potential water pollutants (ie oils, construction materials, rubbish, fuel and soil) shall be located in flat areas as far away as possible from the property boundary;
- Any erodible stockpiles (eg soil) should have upslope diversion measures in place and sediment fences installed around their downstream extent;
- All hard waste should be stored on site in a way that prevents material loss caused by wind or water. Smaller materials such as litter should be contained in covered bins or litter traps formed on three sides by geotextile wind breaks;
- All areas designated for the storage of fuels, oils, chemicals and other hazardous liquids shall have a compacted impervious base and be surrounded by bund to contain any spillage.
- Erosion and Sediment Control Drawings have been prepared for this site and controls be implemented as detailed in these plans.

6.2 OPERATIONAL PHASE

Opportunities and constraints have been considered with respect to potential stormwater quality management techniques that fall into the following categories:

- Primary control measures (removal of gross pollutants - education);
- Prevention of oil leaks from vehicles/plant and equipment; and



- Sedimentation basin with establishment of grassed buffer around a minimum of 20 m around the sed basin.

6.3 OPPORTUNITIES AND CONSTRAINTS

The extent of the proposal for the site has had to be significant re-designed to accommodate the required Stormwater Quality treatment train. As the proposal plans indicate, the site incorporates a significant amount of landscaping and pervious areas. This reduced the amount of impervious area on the ground hence promotes infiltration across the site, with all runoff to be directed to the sed-basin as detailed. The design has also, where possible, maximised the availability of the finished contours of the site. Therefore, given the nature of the development (warehousing not industrial), management strategies will be based on primary and secondary control for TSS, TP and solid Nutrients.

6.4 RECOMMENDED MANAGEMENT MEASURES AND TECHNIQUES

The water quality control devices and measures below will be incorporated into the drainage design of the proposed extensions on-site will also see the inclusion of rainwater tanks with the proposal to promote the availability of water for vehicle washing and irrigation as required. These management measures and techniques are based upon the nature of this development. These measures have been selected to provide a best management approach to Stormwater Quality while providing suitable treatment given the constraints of the site.

6.4.1 SOURCE CONTROLS

Source controls that can be implemented however are highly dependent on maintenance and employee education. The field inlets located within the hardstand area along the southern boundary will be trafficable grated inlets however the promotion of overland flow to the provided bio-infiltration systems will maximize stormwater treatment on-site.

6.4.2 SOURCE TREATMENT OPTIONS

Source controls that can be implemented however are highly dependent on maintenance. These controls will result in reductions in litter, sediments, and oxygen demanding substances, hydrocarbons, pathogens and heavy metals through use of impervious surfaces.



7 MUSIC MODELLING

7.1 INTRODUCTION

MUSIC (Ver 5.0, CRC for Catchment Hydrology), a pollutant export modelling program, has been used as an addition tool to model the effectiveness of treatment options selected for use on the proposed development site. The following guidelines were used to aid in MUSIC modelling:

- MUSIC User Guide Version 5;
- Australian Runoff Quality (ARQ) (Draft 2003) and,
- Australian Rainfall and Runoff (1987).

7.2 CATCHMENT PROPERTIES

A ten-year period of rainfall and evaporation data (1993-2003) in Tamworth was used to create a meteorological template for the MUSIC model of the site. A time step of 6 mins was adopted to ensure accurate results were obtained and a mean annual rainfall of 578mm was including in the meteorological file applied to the modelling.

The 1993-2003 period of rainfall was chosen because it:

- is a long enough duration to allow the rainfall-runoff model to reach equilibrium, in terms of soil stores, without a 'warm up period' having significant influence on the overall simulation results
- is sufficiently long enough duration to simulate a reasonable range of climatic conditions
- provides a balance between modeling accuracy and simulation time and output file size
- represents a 10 year duration with a mean annual rainfall closest to the median value of all the data.

The proposed extension to the development has been split into two additional source nodes. Due to the size of the site, several node incorporate the site and include a rainwater tanks capturing the runoff from both of these roofs. The site has been modelled incorporating the existing contours of the site which can promote runoff from the site and directing this to the proposed sed basin at the north-western corner of the site.

Additional grassed buffering in compliance with the NSW Development Design Specification D7 Erosion Control and Stormwater Management Plan.



As the site currently exists as a vacant lot, an unmitigated MUSIC model was created to determine the un-mitigated development pollutant generation and output concentrations to identify the treatment efficiencies.

The MUSIC Guidelines (2010) for pollutant generations were referred to and adopted where applicable given the extent of sample cases studied:

Table 3.8 Pollutant export parameters for split catchment land use (log¹⁰ values)

FLOW TYPE	SURFACE TYPE	TSS log ¹⁰ values		TP log ¹⁰ values		TN log ¹⁰ values	
		Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Urban residential							
Baseflow parameters	Roof	N/A	N/A	N/A	N/A	N/A	N/A
	Roads	1.00	0.34	-0.97	0.31	0.20	0.20
	Ground level	1.00	0.34	-0.97	0.31	0.20	0.20
Stormflow parameters	Roof	1.30	0.39	-0.89	0.31	0.26	0.23
	Roads	2.43	0.39	-0.30	0.31	0.26	0.23
	Ground level	2.18	0.39	-0.47	0.31	0.26	0.23
Industrial							
Baseflow parameters	Roof	N/A	N/A	N/A	N/A	N/A	N/A
	Roads	0.78	0.45	-1.11	0.48	0.14	0.20
	Ground level	0.78	0.45	-1.11	0.48	0.14	0.20
Stormflow parameters	Roof	1.30	0.44	-0.89	0.36	0.25	0.32
	Roads	2.43	0.44	-0.30	0.36	0.25	0.32
	Ground level	1.92	0.44	-0.59	0.36	0.25	0.32
Commercial							
Baseflow parameters	Roof	N/A	N/A	N/A	N/A	N/A	N/A
	Roads	0.78	0.39	-0.60	0.50	0.32	0.30
	Ground level	0.78	0.39	-0.60	0.50	0.32	0.30
Stormflow parameters	Roof	1.30	0.38	-0.89	0.34	0.37	0.34
	Roads	2.43	0.38	-0.30	0.34	0.37	0.34
	Ground level	2.16	0.38	-0.39	0.34	0.37	0.34

7.3 IDENTIFICATION OF TARGET POLLUTANTS

Potential pollutants expected to be generated from the proposed development site were identified as:

- Suspended solids;
- Total Phosphorus;
- Total Nitrogen; and
- Gross pollutants.



These pollutants are considered to be the target pollutants and given the activities to be ultimately associated with the proposed development.

7.4 TREATMENT DEVICES

To improve water quality leaving the site during the operation phase, the following treatment measures have been included using the MUSIC modelling package:

- Rainwater tanks (combined total of 20kL) collections from the extension roof area and overflow to the surface runoff and direction to the Sediment Basin.
- Sediment Basin

Properties of Sedimentation Basin

Location: Sedimentation Basin

Inlet Properties

Low Flow By-pass (cubic metres per sec)	0.000
High Flow By-pass (cubic metres per sec)	100.000

Storage Properties

Surface Area (square metres)	220.0
Extended Detention Depth (metres)	1.00
Permanent Pool Volume (cubic metres)	88.0
Exfiltration Rate (mm/hr)	36.00
Evaporative Loss as % of PET	75.00

Outlet Properties

Equivalent Pipe Diameter (mm)	150
Overflow Weir Width (metres)	5.0
Notional Detention Time (hrs)	1.17

☐ Use Custom Outflow and Storage Relationship

Define Custom Outflow and Storage Not Defined

Re-use... Fluxes... Notes... More

Cancel Back Finish

As hydrocarbons typically attach to fine sediment, it is well documented that significant hydrocarbon removal will be facilitated by the capture of fine sediment in any proposed treatment device.



7.5 MUSIC MODELLING RESULTS – DONE UP TO HERE

MUSIC modelling results for the catchment at the receiving node (discharge to the legal point of discharge existing stormwater infrastructure is detailed below in Table 4.

	Source	Residual Load	% Reduction	GCC Criteria
Flow (ML/yr)	14.8	8.47	42.6	
Total Suspended Solids (kg/yr)	5.83E3	1.21E3	79.3	85%
Total Phosphorus (kg/yr)	9.46	2.71	71.3	65%
Total Nitrogen (kg/yr)	34.1	18.3	46.3	45%
Gross Pollutants (kg/yr)	459	0.00	100.0	90%

Table 4: MUSIC Modelling Results (treatment train effectiveness)

	Source	ANZECC
Flow (ML/yr)	N/A	N/A
Total Suspended Solids (mg/L)	8.61	15
Total Phosphorus (mg/L)	0.0237	0.060
Total Nitrogen (mg/L)	0.0502	0.450
Gross Pollutants (mg/L)	0	0

Table 5: MUSIC Modelling Results (treatment train effectiveness)

Table 4 indicates that the removal efficiencies associated with the proposed treatment strategies. Table 5 illustrates that the proposed treatment train will be highly effective in reducing the key pollutants of concern from the proposal. Discharge levels as indicated in Table 5 indicate compliance with ANZECC and Adopted Criteria for freshwater receiving environment. Cumulative frequency graphs predicted by MUSIC simulations for the primary target pollutants of concern are displayed below and indicate that TN, TSS, GP, and TP achieve the cumulative frequency requirements and are capable of complying with the reduction criteria. Figure 3-6 provides the cumulative frequency graphs for the modelled (mitigated) scenario.

Figure 3: TSS at receiving node.

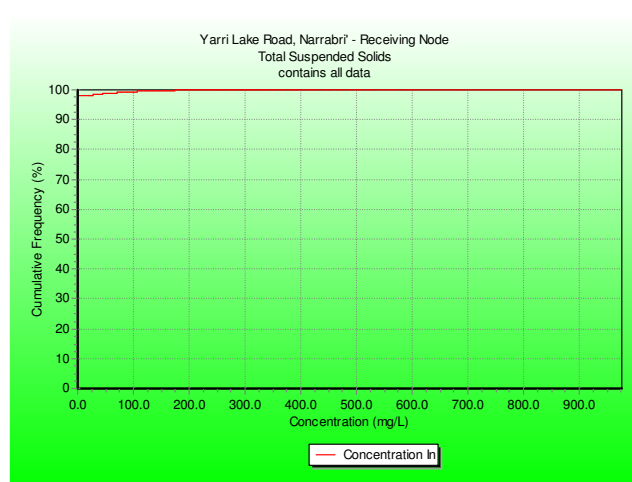




Figure 4: TP at receiving node.

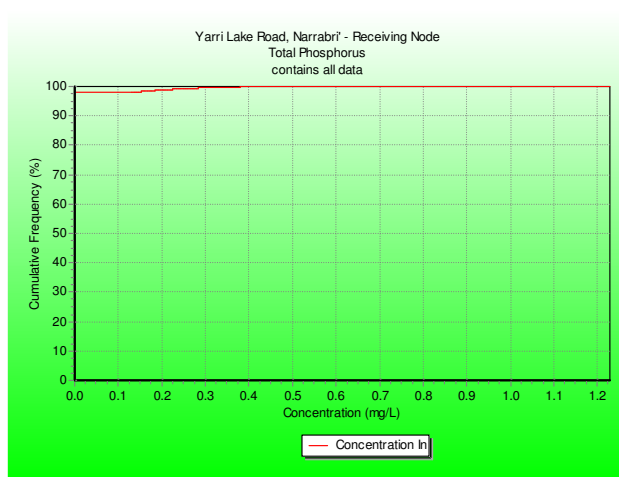


Figure 5: TN at receiving node.

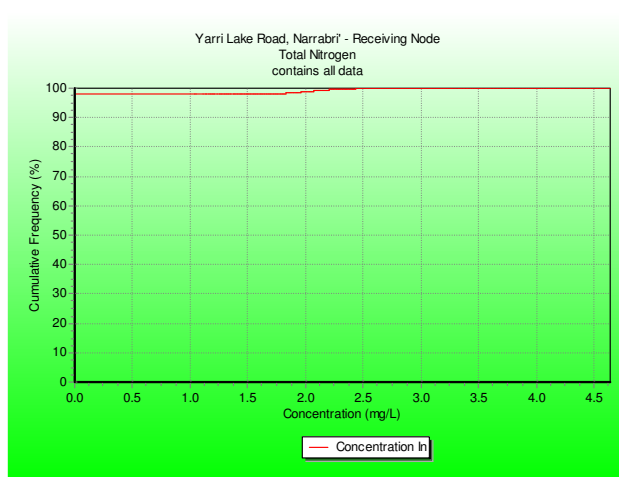
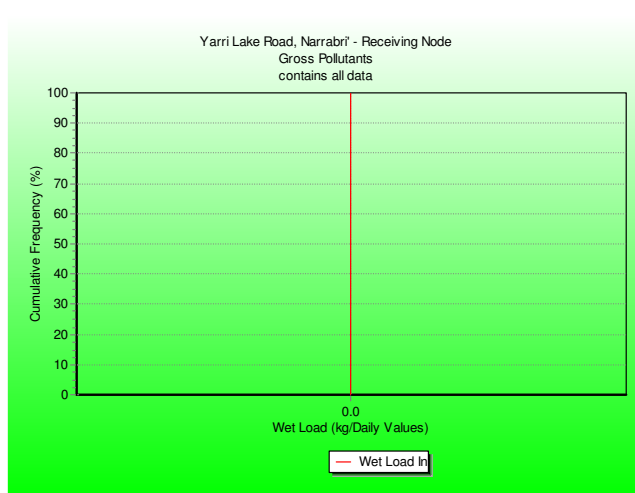


Figure 6: GP at receiving node.





8 CONCLUSION

This SWQMP was developed to determine the potential impacts the proposed development may have on stormwater quality leaving the site and finally entering the localised catchment.

Recommended measures to improve stormwater quality from this site include:

1. **Installation of a roof water tank of a total volume 20kL associated with the new proposed building extensions on-site as detailed on the attached Stormwater Plan prepared by Spaceframe Buildings (918-061-3).**
2. **Installation of a Sedimentation basin 240m² in size, a 0.3m deep permanent pool volume, 1-metre depth and a 5-metre overflow weir with scour protection as required.**

Properties of Sedimentation Basin	
Location	Sedimentation Basin
Inlet Properties	
Low Flow By-pass (cubic metres per sec)	0.000
High Flow By-pass (cubic metres per sec)	100.000
Storage Properties	
Surface Area (square metres)	240.0
Extended Detention Depth (metres)	1.00
Permanent Pool Volume (cubic metres)	72.0
Exfiltration Rate (mm/hr)	36.00
Evaporative Loss as % of PET	75.00
Outlet Properties	
Equivalent Pipe Diameter (mm)	100
Overflow Weir Width (metres)	5.0
Notional Detention Time (hrs)	2.86
<input type="checkbox"/> Use Custom Outflow and Storage Relationship <input checked="" type="checkbox"/> Define Custom Outflow and Storage Not Defined	
Re-use... Fluxes... Notes... More	
<input checked="" type="button"/> Cancel <input type="button"/> Back <input checked="" type="button"/> Finish	

3. **Incorporation of a minimum of 20-metre grassed buffer area around the perimeter of the Sedimentation basin as per the NSW Development Design Specification D7.**

This SWQMP has been completed to demonstrating that through the installation of appropriate stormwater management controls the Stormwater Quality produced from the proposed extensions on-site will not have a detrimental impact on the wider local catchment.

This Stormwater Quality Management Plan prepared by JT Environmental Pty Ltd indicates that the proposed development with the conditioning for the above recommendations will



have negligible effects on the post-development water quality of the local stormwater catchment. Incorporating the recommended measures into the proposed development has significantly reduced TSS, TP, TN and GP levels in discharge water.

The afore recommendation for the installation the proposed WSUD features is considered to be the best available solution for the proposal and will ensure that the site (regardless of tenant) will achieve the identified WQO's through treatment of Q3/first flush events.



9 REFERENCES

ANZECC (2000) *Australian Water Quality Guidelines for Fresh and Marine Waters*.

GCC (2007) *“Water Cycle Management Guidelines”*

NSW Development Design Specification D7, Erosion Control and Stormwater Management - Narrabri Shire Council (2000).

New South Wales Government (1997) *User’s Guide to Environmental Protection (Water) Policy 1997*.

Healthy Waterways (2006). *WSUD Technical Design Guidelines*.

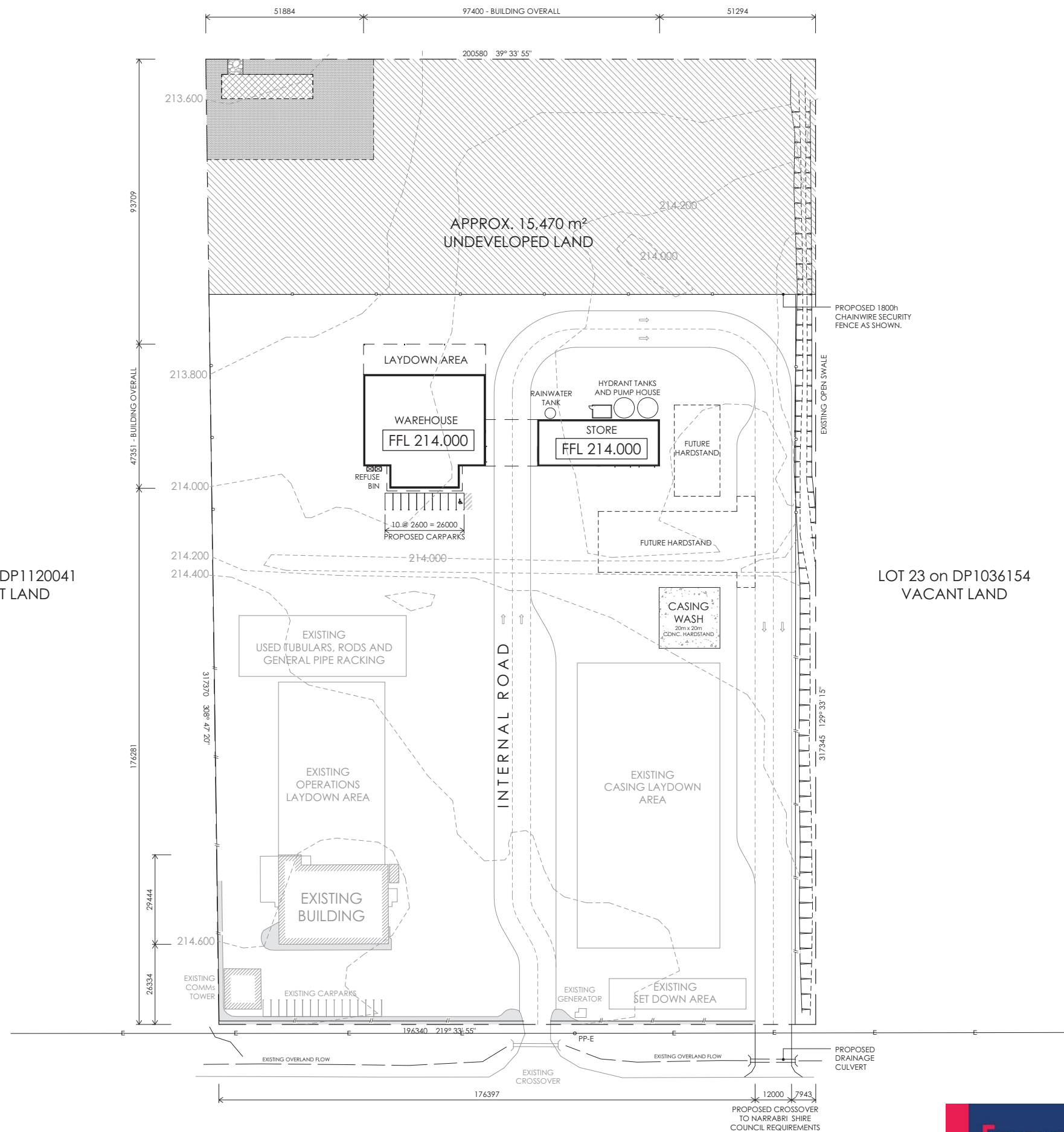


APPENDIX A – SITE AND ARCHITECTURAL PLANS

Table B1 Rainfall runoff parameter reporting table¹

Parameter	Source Node 1	Source Node 2	Source Node 3
Landuse	<u>Roof</u>	<u>Roof</u>	<u>Ground Level</u>
Rainfall threshold (mm)	1	1	1
Soil storage capacity (mm)	18	18	18
Initial storage (% capacity)	10	10	10
Field capacity (mm)	80	80	80
Infiltration capacity coefficient a	243	243	243
Infiltration capacity exponent b	0.6	0.6	0.6
Initial depth (mm)	50	50	50
Daily recharge rate (%)	0	0	0
Daily baseflow rate (%)	31	31	31
Daily deep seepage rate (%)	0	0	0

¹ This table only to be used where there have been any deviation from parameters recommended in these guidelines.



GENERAL NOTES

INDUSTRIAL CROSS OVERS TO BE CONSTRUCTED AS PER LOCAL AUTHORITY STANDARD DETAILS DRAWINGS.

150MM WIDE CONCRETE KERBING TO CAR PARK AND DRIVEWAY PERIMETER - WHERE SHOWN.

PROVIDE DISABLED ACCESS FROM CARPARK TO BUILDING RAMPS TO BE MAX. GRADES OF 1:20 ACROSS CAR TURNING AREA WITH MAX. 3MM STEP UP FROM RAMP TO FLOOR TO COMPLY WITH A.S. 1428. 1-2001.

ALL RAMPS FROM CARPARK TO TENANCY ENTRY DOORS TO BE 1:14 MAXIMUM GRADIENT.

LEGEND

- 27.000 EXISTING CONTOUR
- PP-E EXISTING LIGHT POLE
- DPH DUAL PILLAR HYDRANT
- EXISTING OVERLAND FLOW
- E-E EXISTING ELECTRICAL
- EXISTING FENCING
- PROPOSED FENCING
- EXISTING LANDSCAPING
- UNDEVELOPED LAND
- 20m WIDE GRASSED BUFFER
- SEDIMENTATION BASIN
- SCOUR PROTECTION

SITE INFORMATION

LOT 241 on DP1120041	62979 m ²
TOTAL FLOOR AREA	1964 m ²
GROUND FLOOR	
Amenities	42 m ²
Office	126 m ²
Store	602 m ²
Warehouse	1195 m ²
TOTAL CARPARKS	25

SITE PLAN

(A1) 1:750

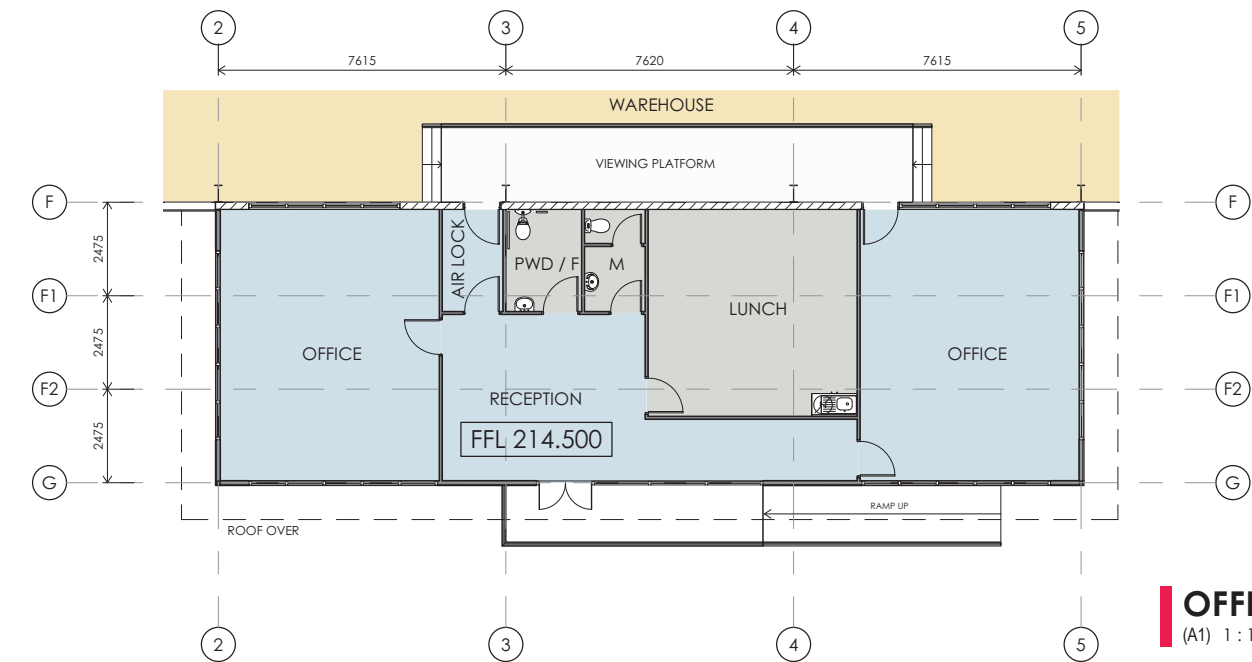
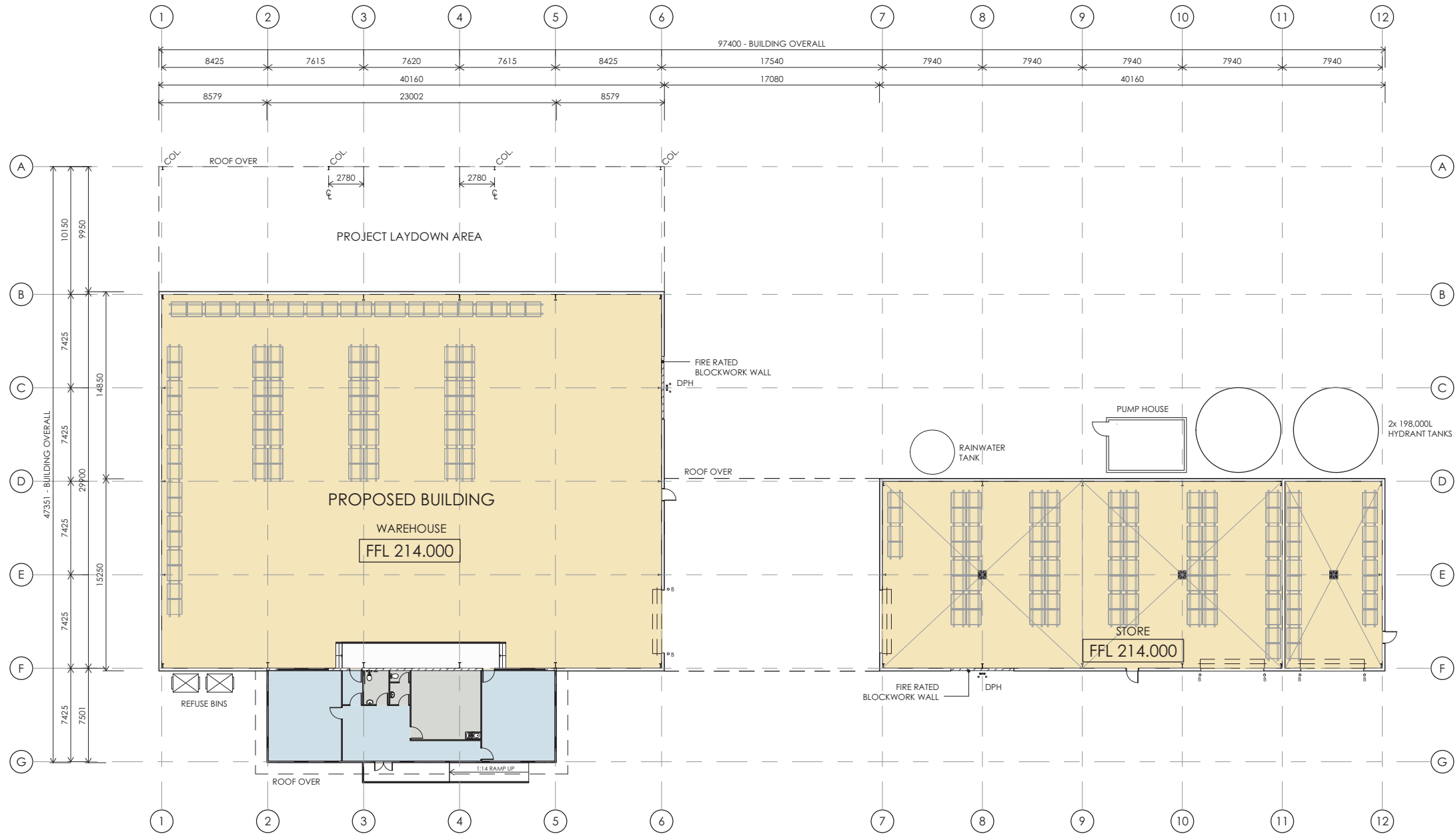
YARRIE LAKE ROAD



SITE PLAN SANTOS

NARRABRI LOGISTICS SUPPLY BASE
YARRI LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 020 - 4
DATE 12.12.2012



GENERAL NOTES

REINFORCED CONCRETE TILT UP PANELS TO COMPLY WITH 8.C.A. PART C 1.11

IN ACCORDANCE WITH G 1.2 OF THE B.C.A. EXITS TO ALL FREEZER/COLDROOM AREAS WILL HAVE:
1. MANUALLY OPERATED TURN KEY BELLS.
2. EMERGENCY RELEASE PIN WHICH ALLOWS DOORS TO BE OPENED FROM INSIDE.

INTERNAL PARTITIONS TO BE 64mm RONDO STEEL STUD WITH PAINTED 10mm PLASTERBOARD LINING 10mm WATER RESISTANT PLASTERBOARD TO WET AREAS.

ALL SANITARY COMPARTMENTS TO BE MECHANICALLY VENTILATED TO COMPLY TO BCA C1 F4.5(b) BY AIR-CONDITIONING CONTRACTOR.

WALLS IN WET AREAS NEXT TO TILT PANEL WALLS TO BE ISOLATED OFF PANEL BY 10mm AND ALLOW FOR VERTICAL MOVEMENT.

LEGEND

- UNDER BENCH WATER HEATER
- DPH DUAL PILLAR HYDRANT
- BLOCKWORK WALLS
- STEEL GIRT
- STUD WALL
- BOLLARD

BUILDING INFORMATION

TOTAL FLOOR AREA	1964 m ²
GROUND FLOOR	
Amenities	42 m ²
Office	126 m ²
Store	602 m ²
Warehouse	1195 m ²

space frame
DESIGN + CONSTRUCT SOLUTIONS

FLOOR PLAN SANTOS

NARRABRI LOGISTICS SUPPLY BASE
YARRI LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 021 - 4
DATE 12.12.2012

BUILDING OVERALL
7345
EAVES (WAREHOUSE)
6500
EAVES (OFFICE)
4200
GROUND FLOOR (OFFICE)
500
GROUND FLOOR

STEEL ANGLE SCREEN
- HOT DIPPED GALVANISED
ALUMINIUM FRAMED GLAZING
- POWDERCOAT FINISH
MONOCLAD WALL SHEETING
- COLORBOND FINISH
SURFMIST
MONOCLAD ROOF SHEETING
- ZINCALUME FINISH

Santos

SOUTH EASTERN ELEVATION

(A1) 1 : 200

BUILDING OVERALL
7345
GROUND FLOOR

HYDRANT TANKS
PUMP HOUSE
RAINWATER TANK
STRUCTURAL STEEL
- PRIMED FINISH

NORTH WESTERN ELEVATION

(A1) 1 : 200

BUILDING OVERALL
7345
EAVES (OFFICE)
4200
GROUND FLOOR (OFFICE)
500
GROUND FLOOR

MONOCLAD WALL SHEETING
- COLORBOND FINISH
DEEP OCEAN

NORTH EASTERN ELEVATION

(A1) 1 : 200

BUILDING OVERALL
7345
GROUND FLOOR

SOUTH WESTERN ELEVATION

(A1) 1 : 200

space
frame
DESIGN + CONSTRUCT SOLUTIONS

ELEVATIONS SANTOS

NARRABRI LOGISTICS SUPPLY BASE
YARRI LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 022 - 4
DATE 12.12.2012

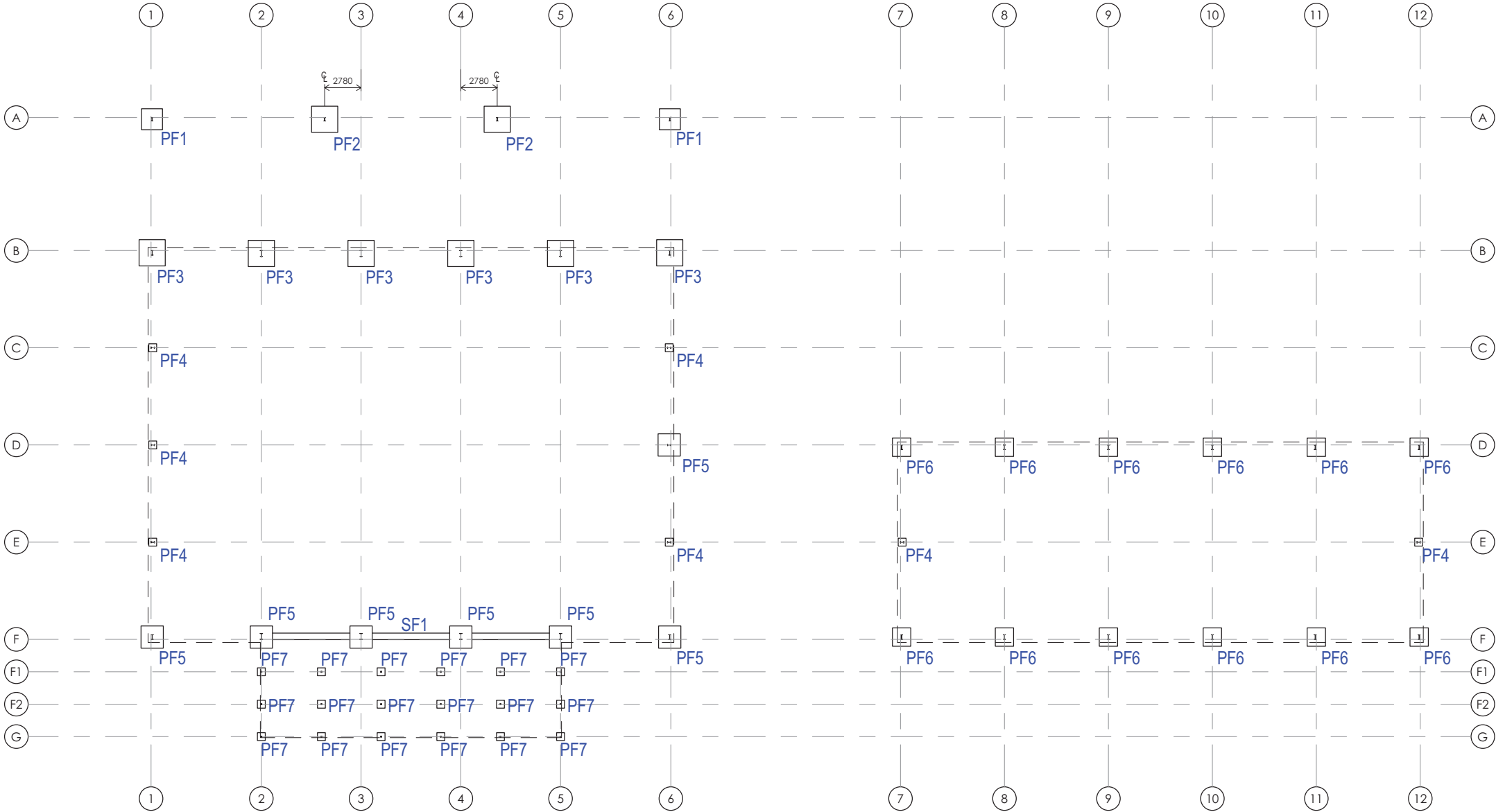


FOOTING NOTES

- UNLESS NOTED OTHERWISE:
1. DRAWING TO BE READ IN CONJUNCTION WITH DETAILS
 2. ALL BLOCKWORK TO BE 200 SERIES
 3. DIMENSIONS ARE TO CENTER OF FOOTING OR FACE OF BLOCKWORK WHERE APPLICABLE. IF NONE SHOWN REFER TO H.D. BOLT LAYOUT
 4. H.D. BOLTS TO SHOP DETAILER'S LAYOUT
 5. ALL FOOTINGS TO BE 300mm BELOW F.F.L. U.N.O. AND 100mm MIN. SAND BACKFILL OVER FOOTINGS.
 6. STRIP FOOTING REINFORCEMENT TO RUN THROUGH PIER FOOTING.

STRIP FOOTINGS SCHEDULE					
MARK	QTY	DIMENSIONS (mm)		REINFORCING	
		WIDTH	DEPTH		
SF1	1	500	600	3 N16 TOP & BOT: R10 LIGS @ 400	

PAD FOOTINGS SCHEDULE					
MARK	QTY	DIMENSIONS (mm)			REINFORCING
		LENGTH	WIDTH	DEPTH	
PF1	2	1600	1600	600	N16 TOP & BOTTOM
PF2	2	2000	2000	600	N16 TOP & BOTTOM
PF3	6	2000	2000	800	N16 TOP & BOTTOM
PF4	7	600	600	600	SL82 MESH, - BOTTOM COVER
PF5	7	1700	1700	800	N16 TOP & BOTTOM
PF6	12	1400	1400	800	N16 TOP & BOTTOM
PF7	18	600	600	750	N16 TOP & BOTTOM



FOOTINGS PLAN

(A1) 1 : 200

FOOTINGS PLAN SANTOS

NARRABRI LOGISTICS SUPPLY BASE
YARRI LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 030 - 2
DATE 12.12.2012



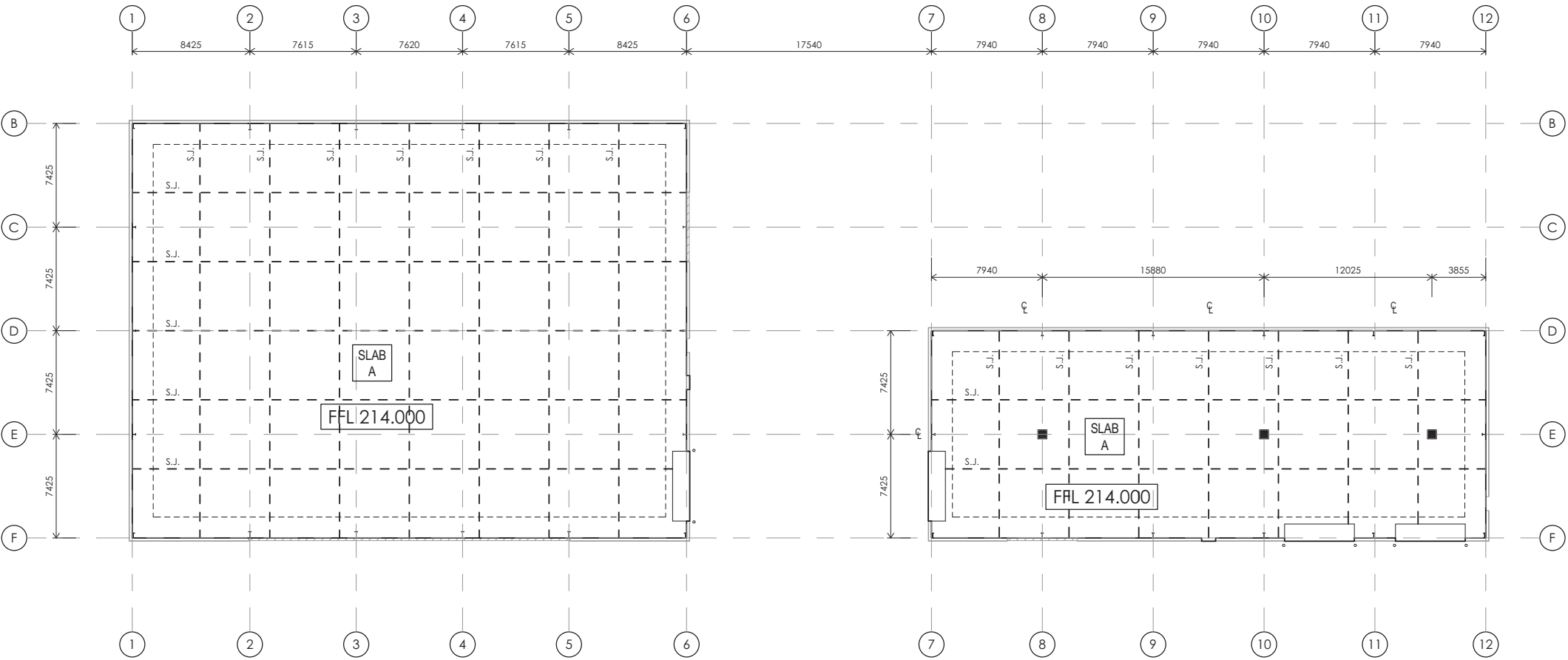
GENERAL NOTES

- UNLESS NOTED OTHERWISE:
1. PROVIDE 0.2mm VISQUEEN PLASTIC DAMP PROOFING MEMBRANE UNDER ALL INTERNAL BUILDING SLABS. ALL SHEET JOINTS TO BE LAPPED AND TAPED
 2. ALL CONVENTIONAL SLABS TO HAVE 50mm SAND BED. POST TENSION SLABS TO HAVE 25mm SAND BED
 3. FLOOR WASTES TO HAVE LOCAL 15mm FALL FOR 500mm RADIUS
 4. DISABLED TOILETS TO HAVE 30mm FALL TO SHOWER WASTE

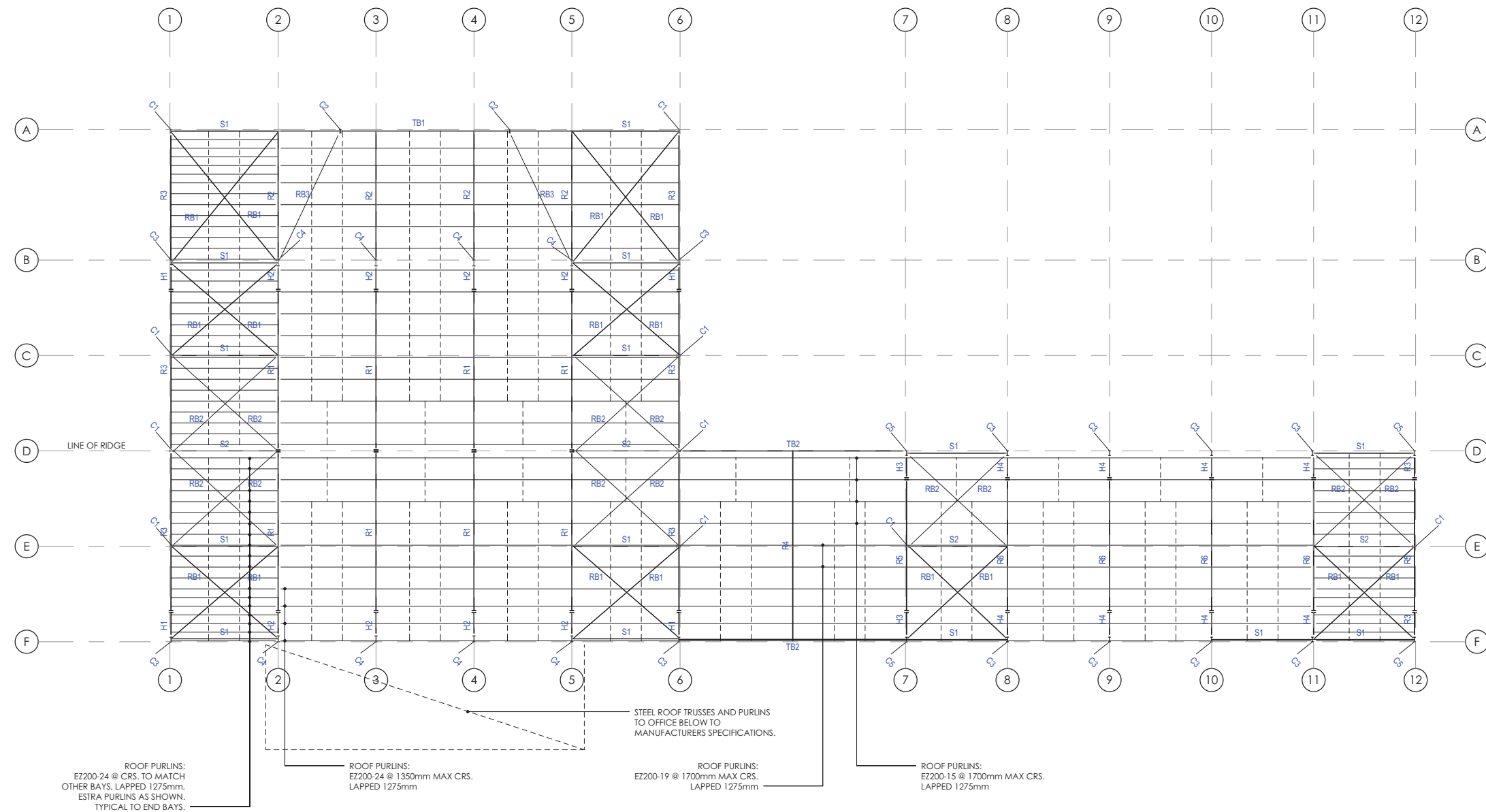
LEGEND

- DOWEL JOINT, REFER DETAILS
- SAWN JOINT, REFER DETAILS
- SLAB EDGE THICKENINGS, REFER DETAILS
- WALL UNDER
- - - SLAB FALL
- ← SLAB FALL DIRECTION
- SLAB A DENOTES SLAB TYPE, REFER SCHEDULE
- FLOOR WASTE DRAIN GRATE

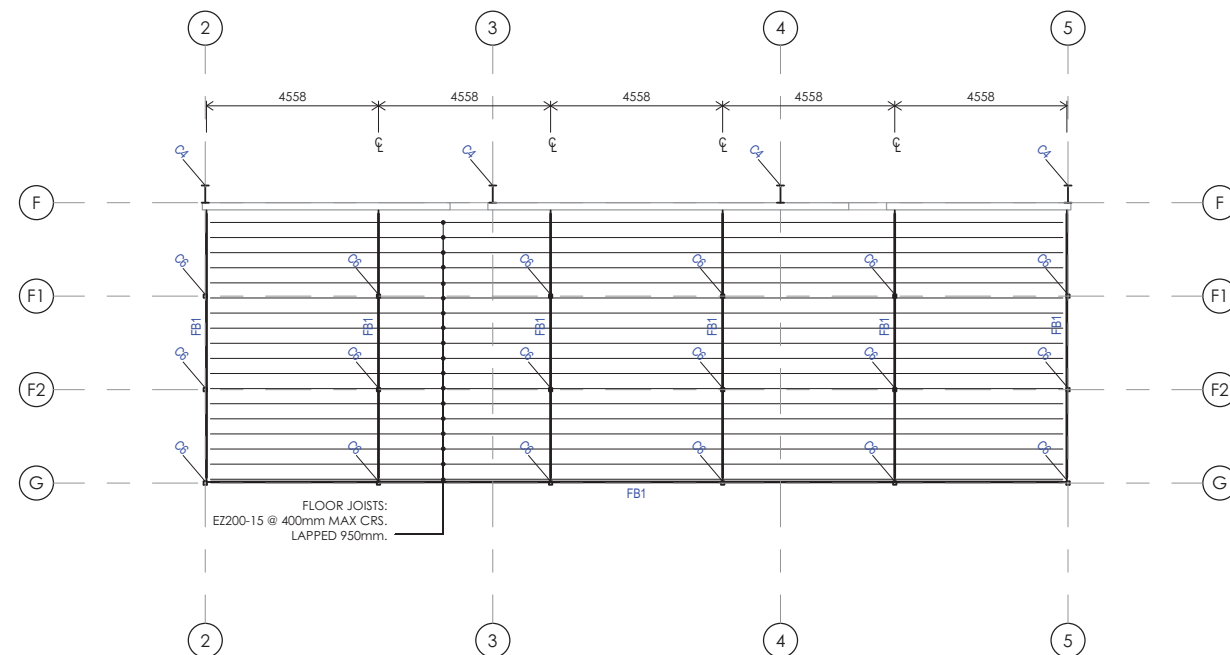
SLAB SCHEDULE	
SLAB	DESCRIPTION
A	170mm THICK CONCRETE SLAB WITH 1 LAYER SL92 MESH, 35mm TOP COVER, TO BE LAID ON 1 LAYER 0.2mm VISQUEEN DAMP PROOFING AND 50mm SAND. STEEL TROWEL FINISH.



CONCRETE PLAN
(A1) 1 : 200



ROOF STEEL PLAN
(A1) 1 : 200



FLOOR STEEL PLAN
(A1) 1 : 100



STRUCTURAL NOTES

REFER ALSO NOTES ON DWG 100

ALL 6mm PLATE WASHERS TO RAFTER END PLATE AND ANGLE CONNECTION SHALL BE WELDED AFTERWARDS WITH 4mm CFW. UNO

WASHERS IN THE FOLLOWING LOCATIONS SHOULD BE 75 x 6mm:
- TO RAKING ANGLES
- TO SHELF ANGLES UNDER FLOOR SLAB
- ON OVERSIZE HOLES

FINISHES:
INTERNAL PORTAL FRAMES - PRIMED
EXPOSED STRUCTURAL STEEL - H.D. GALV.
EXTERNAL AWNINGS - PRIMED

STRUCTURAL COLUMN SCHEDULE	
MARK	MEMBER
C1	250 UB 31
C2	250 UB 37
C3	360 UB 51
C4	460 UB 67
C5	360 UB 45
C6	Tubeline 89 x 89 x 5.0

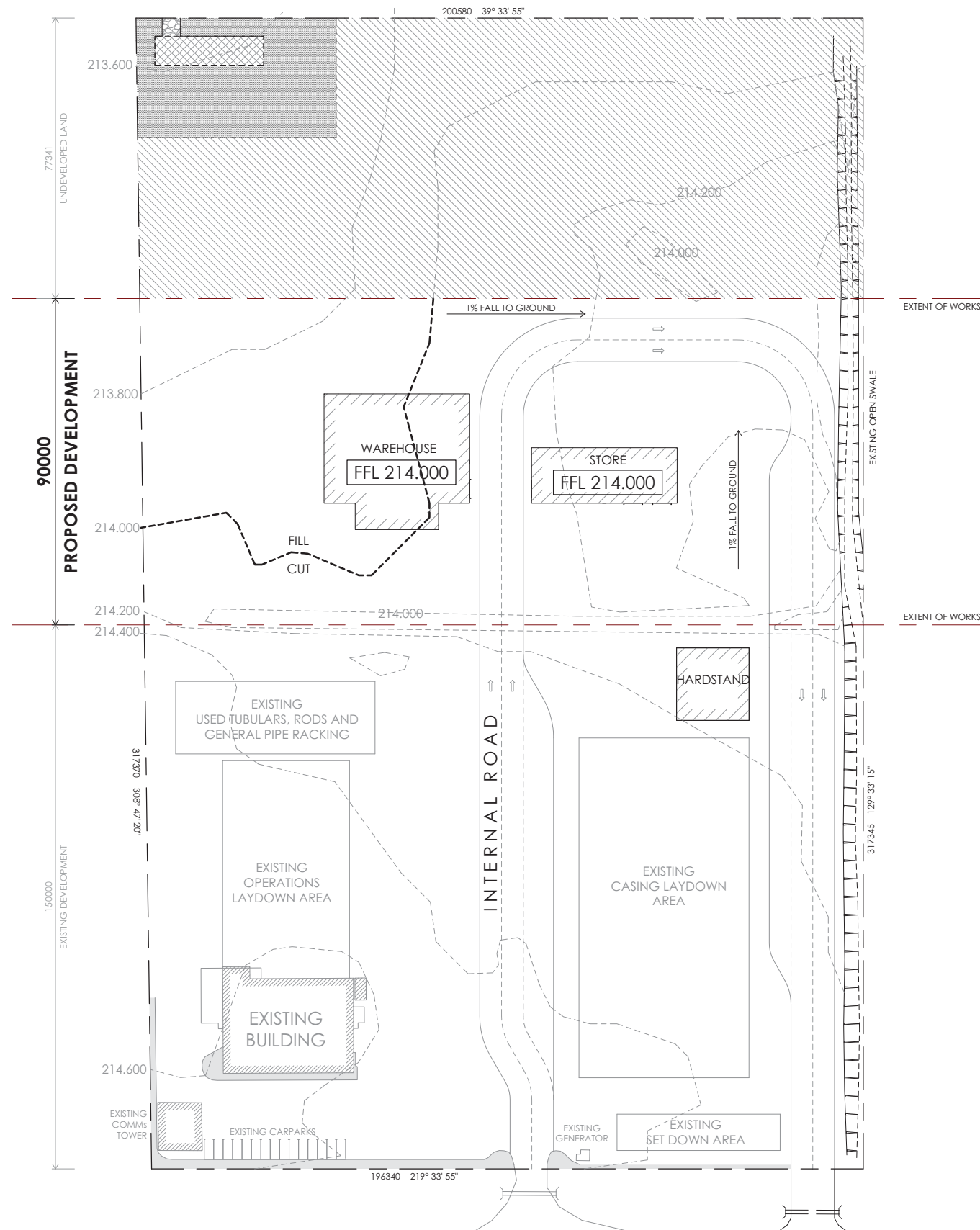
STRUCTURAL FRAMING SCHEDULE	
MARK	MEMBER
FB1	150 PFC
H1	360 UB 51
H2	460 UB 67 HAUNCH
H3	310 UB 33 HAUNCH
H4	310 UB 40 HAUNCH
R1	460 UB 67
R2	310 UB 40 RAFTER
R3	310 UB 32 RAFTER
R4	410 UB 54
R5	200 UB 25
R6	250 UB 31
RB1	EA 65 x 65 x 5.0
RB2	Bracelok 16mm
RB3	Tubeline 165.1 x 3.5
S1	Tubeline 139.7 x 3.0
S2	Tubeline 101.6 x 2.6
TB1	410 UB 54 TRANSFER BEAM
TB2	460 UB 67 TRANSFER BEAM



WAREHOUSE STEEL PLAN SANTOS

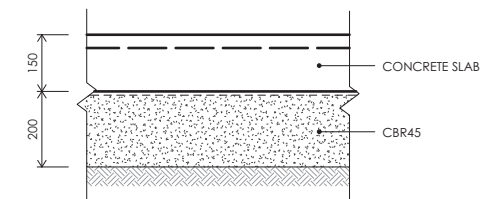
NARRABRI LOGISTICS SUPPLY BASE
YARRI LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 050 - 2
DATE 12.12.2012

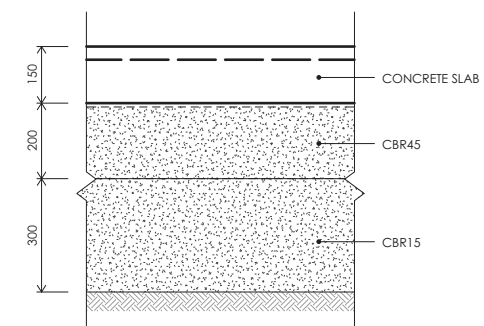


YARRIE LAKE ROAD

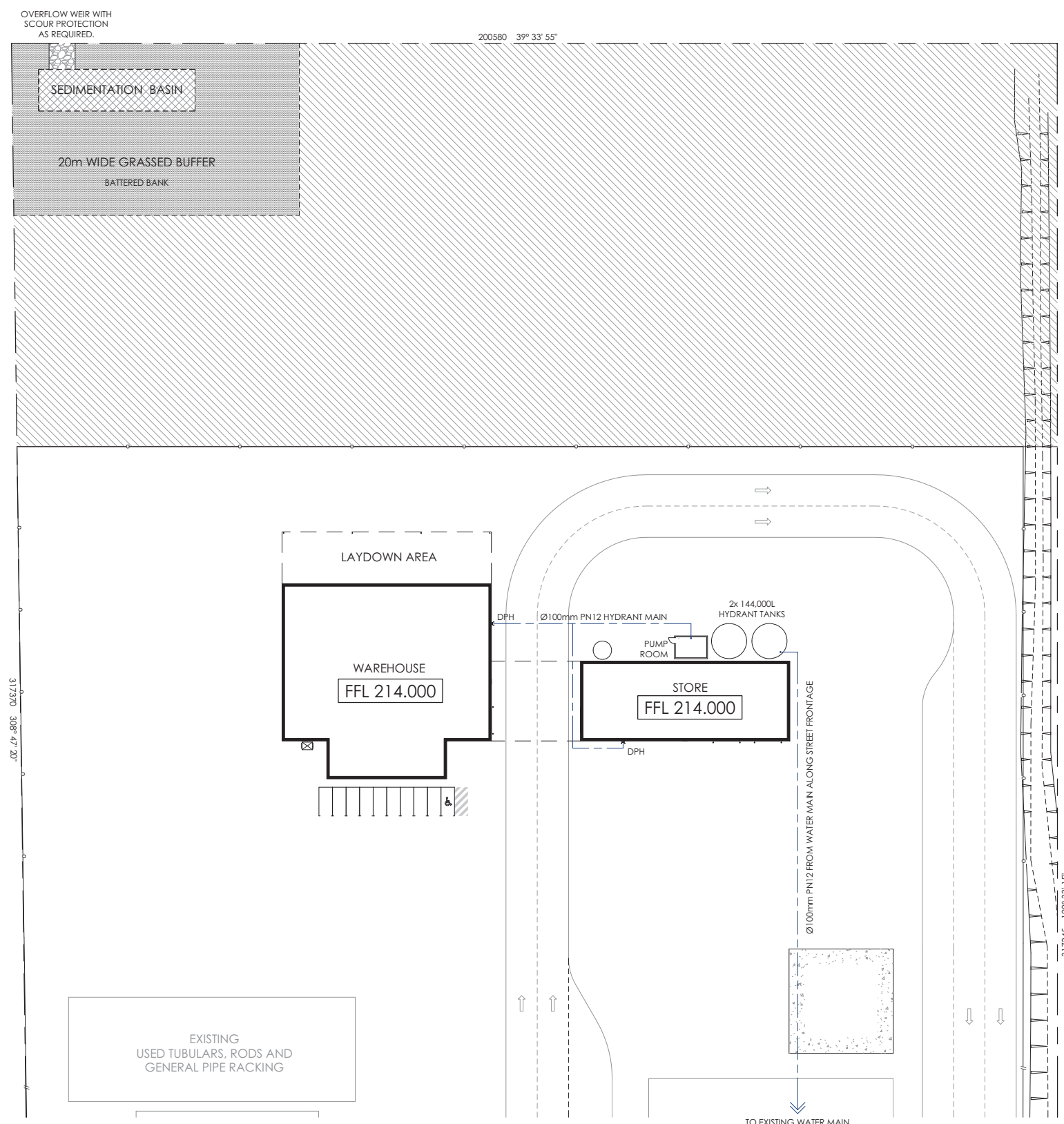
EARTHWORKS PLAN
(A1) 1 : 750



PAVEMENT DESIGN
(A1) 1 : 10



OPTIONAL PAVEMENT DESIGN
(A1) 1 : 10



HYDRANT PLAN
(A1) 1 : 500

GENERAL NOTES

ALL WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH AUSTRALIAN STANDARDS, LATEST VERSION OF STANDARD PLUMBING AND DRAINAGE REGULATIONS AND TO THE APPROVAL OF THE LOCAL AUTHORITY

WATER NOTES

SPACEFRAME WILL ARRANGE FOR WATER TO BE CONNECTED TO THE BOUNDARY

ALL WATER SUPPLY PIPES TO BE CONCEALED WHERE POSSIBLE. COLD WATER DROPPERS / RISERS TO BE PROVIDED AT PLUMBERS DISCRETION

HOT WATER UNIT OVERFLOW TO DISCHARGE EXTERNALLY U.N.O.

ALL HOT AND COLD WATER LINES TO BE INSTALLED IN ACCORDANCE WITH A.S. 3500.

ALL COLD WATER SERVICE PIPES TO AN INDIVIDUAL FIXTURE OUTLET SHALL BE 15mm DIA. PIPE FOR A MAXIMUM LENGTH OF 1.2m AND THEN ENLARGED TO 20mm DIA. FOR TWO OR MORE FIXTURES, THE PIPEWORK MUST BE 20MM DIA. OR LARGER OR AS NOTED ON DRAWINGS

ALL HOT WATER PIPES SHALL BE 20mm DIA. TO THE FIRST BRANCH AND 15mm DIA. THEREAFTER U.N.O. AND INSULATED WITH APPROVED SECTIONAL INSULATING MATERIAL

THE CONTRACTOR SHALL ALLOW TO PROVIDE AND INSTALL ALL BACK FLOW PREVENTION DEVICES, THERMOSTATIC MIXING VALVES AND TEMPERING VALVES AS REQUIRED BY THE AUTHORITIES

ANY EXPOSED PLUMBING PIPES IN AMENITIES TO BE CHROME PLATED COPPER

ALL PIPE DIA. ARE I.D.

25mm BALL VALVES FOR LANDSCAPE IRRIGATION IN PATH BOX

PROVIDE 25mm DOUBLE CHECK VALVES FOR DEDICATED LANDSCAPING IRRIGATION

HYDRAULIC LEGEND

DPH	DUAL PILLAR HYDRANT
NEW FIRE SERVICE	
EXISTING FENCING	
PROPOSED FENCING	
UNDEVELOPED LAND	
20m WIDE GRASSED BUFFER	
SEDIMENTATION BASIN	
SCOUR PROTECTION	

SITE INFORMATION

LOT 241 on DP1120041	62979 m²
TOTAL FLOOR AREA	1964 m²

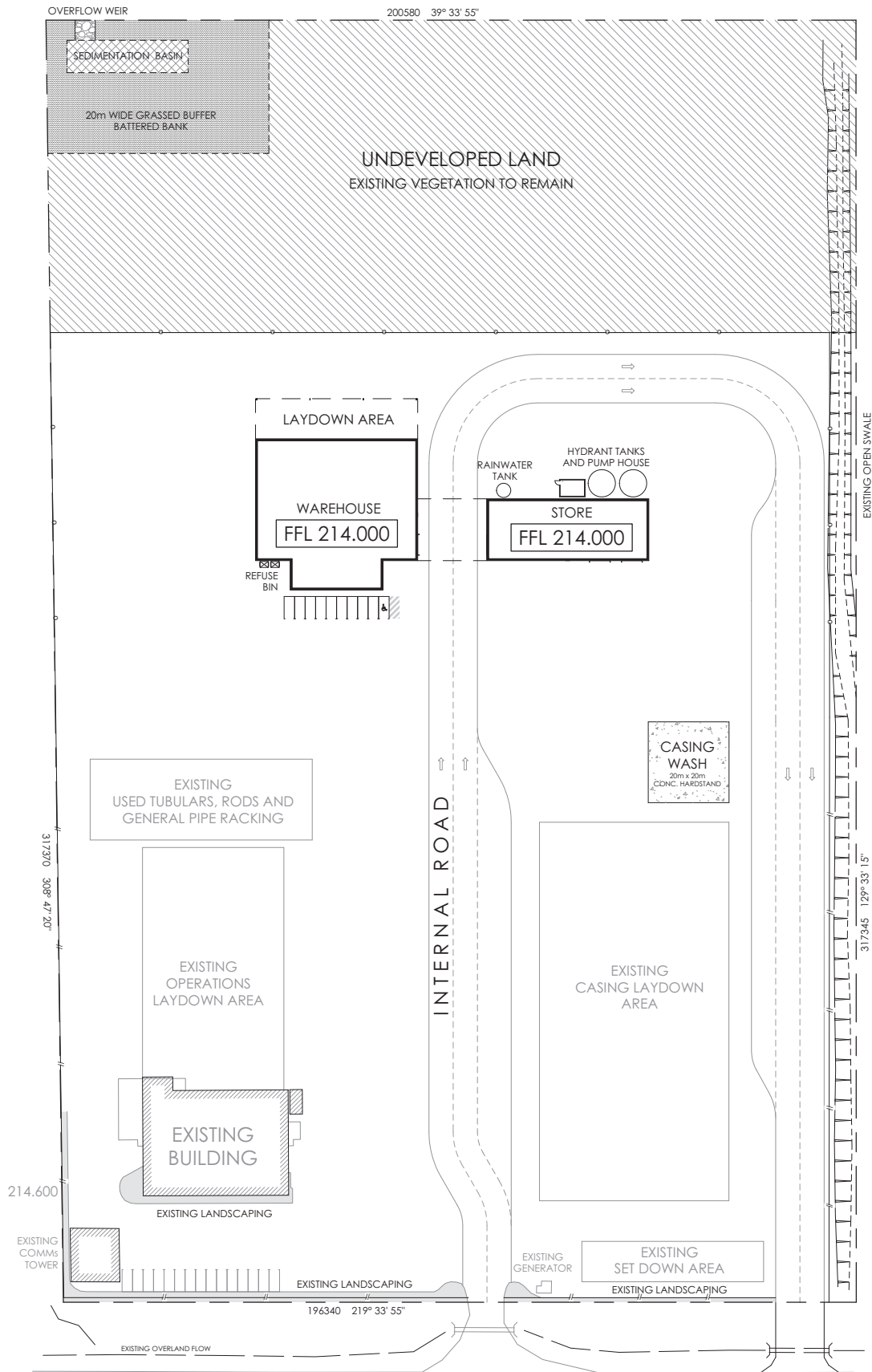


DESIGN + CONSTRUCT SOLUTIONS

HYDRANT SCHEMATIC PLAN
SANTOS
NARRABRI LOGISTICS SUPPLY BASE
YARRI LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 062 - 2
DATE 12.12.2012

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GENERAL NOTES

SHRUBS TO BE SUPPLIED FROM Ø200 POTS, TREES TO BE SUPPLIED FROM 25 LITRE POTS OR BAGS U.N.O.

EXCAVATE PLANTING BEDS TO MINIMUM DEPTH OF 100MM.

CULTIVATE EXISTING SUBGRADE TO 100MM BELOW NEW SOIL LEVEL.

PLACE A MINIMUM OF 100MM SANDY LOAM TOP SOIL MIX WITH A PH LEVEL OF 6.5 - 7.0.

GARDEN BED AREAS TO BE COVERED WITH MULCH TO A MINIMUM OF 75MM DEPTH. SURROUNDING PLANT STEMS TO BE 25MM.

GARDEN EDGE - AT ANY GARDEN / GRASS INTERFACE 69X19 CCA PINE EDGING.

LAWN TO BE 'B' GRADE BLUE COUCH PLACED ON A LAYER OF 25MM TOP SOIL (80% WEED FREE).

SUPPLY AND INSTALL A MANUAL WATERING SYSTEM TO ALL GARDEN AREAS.

STAKE & TIE TREES. WATER IN PLANTS THOROUGHLY. UPHOLD THE WORK AGAINST DEFECT AND PLANT FAILURE.

PLUMBER TO PROVIDE 25mm BALL VALVE FOR LANDSCAPING IRRIGATION.

LEGEND

- EXISTING OVERLAND FLOW
- EXISTING FENCING
- PROPOSED FENCING
- EXISTING LANDSCAPING
- UNDEVELOPED LAND
- 20m WIDE GRASSED BUFFER
- SEDIMENTATION BASIN
- SCOUR PROTECTION

SITE INFORMATION

LOT 241 on DP1120041	62979 m ²
TOTAL FLOOR AREA	1964 m ²

YARRIE LAKE ROAD

SITE PLAN

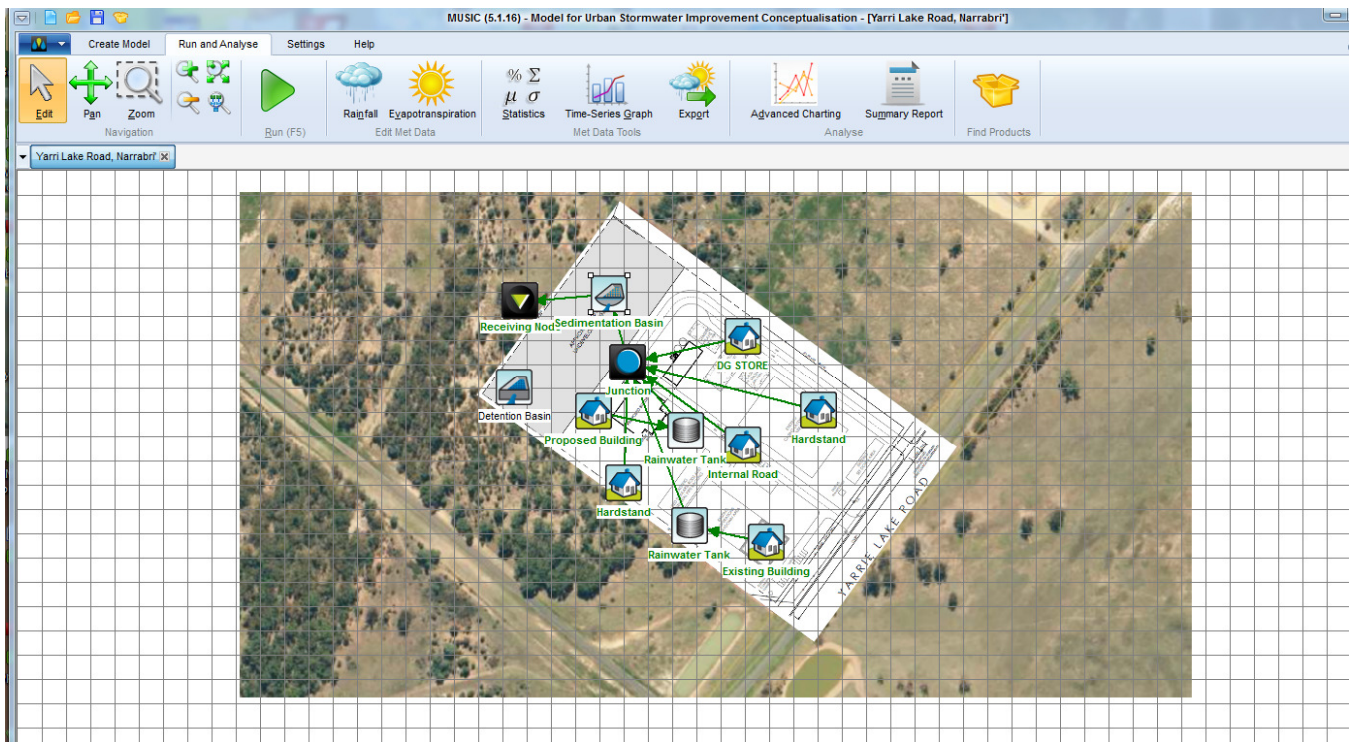
(A1) 1 : 750

**space
frame**
DESIGN + CONSTRUCT SOLUTIONS

LANDSCAPING SANTOS

NARRABRI LOGISTICS SUPPLY BASE
YARRI LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 070 - 1
DATE 12.12.2012

**APPENDIX B – MUSIC MODELLING LAYOUT**

Appendix 8

SEPP 33 Assessment



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November 29, 2012

PETER RASPOJNIK

DIRECTOR - OPERATIONS

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RE: SEPP33 Determination of a Hazardous Industry from the storage of Dangerous Goods On-site – Yarri Lake Road, Narrabri.

JT Environmental Pty Ltd has conducted an assessment of the materials currently and proposed to be stored on-site together with a comparison of the requirements of SEPP 33.

As detailed in the SEPP33 Document, there is essentially a 3 stage process of determining the risk associated with a site. As quoted this 3 stage process is:

Identify Hazardous Materials and the Type of Hazard

Determine the quantities of all classes of hazardous materials listed in the development application and, if the proposed development is part of an existing plant, any adjacent inventory. Ensure that both the main class and any subsidiary classes obtained from the Dangerous Goods Code or from information provided in the Material Safety Data Sheets are noted so that all relevant hazards are considered.

Group and Total by Class, Activity and Location

Where several hazardous materials of the same class are kept on site in the same general location, total the quantities by class and activity (that is, total all quantities of each class stored in bulk then separately total the quantities of each class stored in packages/containers).

Table 1 provides the basis for the grouping. Do not add underground and above ground storage together — these must always be treated separately. If the proposed development is an extension to an existing site, include those inventories on the existing site that are adjacent to the proposed development.

If dangerous goods of a given class but varying packing groups are stored in the same general area, assume the total of that class is present as the most hazardous packing group (for example, if 3PGI and 3PGII are present, add these together and assume the equivalent total is of 3PGI). Measure the distance of the material group to the nearest boundary. The distance is to be measured from those materials in the group located closest to the boundary.

Compare with Screening Threshold

Provided on the following page and in Appendix 4 is a series of tables and graphs which can be used to determine screening thresholds — quantities below which it can be assumed there is unlikely to be a significant off-site risk. Table 1 indicates the graph and/or table to be used. Hazardous materials with more than one possible classification should be considered under each classification.

(Source: SEPP33)

On this basis an entire assessment of all MSDS's associated with the site has been conducted by JT Environmental. All associated storage quantities have been collated and applicable volumes have been grouped designated by Class.

Class	Packaging Group	Total Quantity
8	II	6256 kg
8	III	907kg
8	Not Available	454kg
9	III	400kg

The applicable screening thresholds indicated by SEPP 33 for consideration of a hazardous industry is detailed in Appendix 4 of SEPP33.

Applying SEPP 33 (Consultation Draft) | July 2008

Table 3: General Screening Threshold Quantities

Class	Screening Threshold	Description
1.2	5 tonne	or are located within 100 m of a residential area
1.3	10 tonne	or are located within 100 m of a residential area
2.1	(LPG only — not including automotive retail outlets ¹)	
	10 tonne or 16 m ³	if stored above ground
	40 tonne or 64 m ³	if stored underground or mounded
2.3	5 tonne	anhydrous ammonia, kept in the same manner as for liquefied flammable gases and not kept for sale
	1 tonne	chlorine and sulfur dioxide stored as liquefied gas in containers <100 kg
	2.5 tonne	chlorine and sulphur dioxide stored as liquefied gas in containers >100 kg
	100 kg	liquefied gas kept in or on premises
	100 kg	other poisonous gases
4.1	5 tonne	
4.2	1 tonne	
4.3	1 tonne	
5.1	25 tonne	ammonium nitrate — high density fertiliser grade, kept on land zoned rural where rural industry is carried out, if the depot is at least 50 metres from the site boundary
	5 tonne	ammonium nitrate — elsewhere
	2.5 tonne	dry pool chlorine — if at a dedicated pool supply shop, in containers <30 kg
	1 tonne	dry pool chlorine — if at a dedicated pool supply shop, in containers >30 kg
	5 tonne	any other class 5.1
5.2	10 tonne	
6.1	0.5 tonne	packing group I
	2.5 tonne	packing groups II and III
6.2	0.5 tonne	includes clinical waste
7	all	should demonstrate compliance with Australian codes
8	5 tonne	packing group I
	25 tonne	packing group II
	50 tonne	packing group III

Note: The classes used are those referred to in the Australian Dangerous Goods Code and are explained in Appendix 7.

¹ These are covered by the department's Locational Guidelines No 1 – LPG Automotive Retail Outlets.

AS Detailed the subject site will not be storing volumes of materials that would see it trigger a Hazardous industry. The types of materials associated with the site as stored in appropriate packages for the materials. Furthermore, the current site that will undergo the extensions is significantly removed from any sensitive receptors.

On the basis of these materials being stored, the provisions of SEPP33 and the screening thresholds, JT Environmental P/L does not classify this site as a hazardous industry through the on-site storage of materials.

If there is any matters that you would like to discuss please do not hesitate to telephone me on 0417 727 981.

Regards,



Tyson Dodd
Environmental Engineer
JT Environmental PTY LTD

Drilling and Completions Hazardous Substance Register

The following hazardous substances exist at the workplace. A copy of the MSDS should be forwarded to the person responsible for First Aid and can be retained in the register to increase first aid response times.

Product Name	Product Description	Hazchem Code	Maximum Quantity held on Site	Maximum patts to be stored	MSDS Yes / No	Risk Class (1,2 or 3)	Control Measures
Barite	Barite, Barium Sulfate.	No	400 x 25kg sacks	10	Yes	3	Avoid Inhaling Dust. Store in well ventilated area.
Calcium Chloride 74-77%	Calcium Chloride	Yes	600 x 25kg sacks	15	Yes	1	Avoid Skin, Eyes and Lung Exposure.
CAUSTIC SODA (Drums)	Sodium Hydroxide	Yes	64 x 25kg Drums	2	Yes	1	Store away from Acids. Avoid contact Skin, Eyes and Lungs.
CITRIC ACID	-	Yes	80 x 25kg sacks	2	Yes	1	Avoid Skin, Eyes and Lung Exposure
DEFOAM - E	Polyoxyethylene polyoxypropylene copolymer	No	32 x 25kg drums	1	Yes	3	Liquid Product. Contain if spilled.
Fracseal - Fine	Micronised Cellulose fibre	No	105 x 11.3kg sacks	3	Yes	3	Avoid Inhaling Dust. Store in well ventilated area.
Guar Gum	Legume Seed based	No	80 x 25kg sacks	2	Yes	3	Avoid Inhalation
Idcide - 20	Tetrakis Hydroxymethyl Phosponium Sulfate	No	64 x 20kg drums	2	Yes	3	Liquid Product. Contain if spilled.
JK - 261	(Partially Hydrolised Poly Acrylamide)	No	72 x 25kg sacks	2	Yes	3	Avoid Inhalation
JK - 261	(Partially Hydrolised Poly Acrylamide)	No	72 x 25kg sacks	2	Yes	3	Avoid Inhalation
KCL - Fine	Potash / Potassium Chloride	No	480 x 25kg sacks	12	Yes	2	Avoid Inhaling Dust. Store in well ventilated area.
Kwikseal - Medium	Cellophane / Wood / Nutshells	No	75 x 18.1kg sacks	2	Yes	3	Avoid Inhaling Dust. Store in well ventilated area.
LIME	Calcium Hydroxide Ca(OH) ₂	Yes	54 x 18.1kg sacks	2	Yes	2	Avoid Inhalation of dust or powder.
Quickseal - Fine / Medium	Cellophane / Wood / Nutshells	No	200 x 18.1kg sacks	8	Yes	3	Avoid Inhaling Dust. Store in well ventilated area.
Rheoben NT	Water absorbent Clay.	No	200 x 25kg sacks	4	Yes	3	Avoid Inhalation
Rheolube	Vegetable Oil / Surfactants	No	32 x 25kg sacks	1	Yes	3	Liquid Product. Contain if spilled.
Rheopac - LV	Poly Anionic Cellulose	No	160 x 25kg sacks	4	Yes	3	Avoid Inhaling Dust. Store in well ventilated area.
Rheopac - RD	Poly Anionic Cellulose	No	160 x 25kg sacks	4	Yes	3	Avoid Inhalation
Salt	Sodium Chloride	No	720 x 25kg sacks	18	Yes	3	Avoid long exposure to dust.
Sandseal	Milled vegetable matter.	No	100 x 25kg sacks	2	Yes	3	Avoid Inhaling Dust. Store in well ventilated area.
SAPP	Sodium Acid Pyro Phosphate	No	80 x 25kg sacks	2	Yes	2	Avoid Inhaling Dust. Store in well ventilated area.
SODA ASH	Sodium Carbonate (Na ₂ CO ₃)	No	80 x 25kg sacks	2	Yes	2	Avoid Inhalation
Sodium Bicarbonate	Sodium Hydrogen Carbonate (NaHCO ₃)	No	80 x 25kg sacks	2	Yes	3	Avoid Inhalation
Sodium Sulphite	-	Yes	48 x 25kg sacks	1	Yes	3	Avoid Skin, Eyes and Lung Exposure
Potassium Sulphate	Fertilizer	No	1200 x 25 kg sacks	30	Yes	2	Avoid Inhaling Dust. Store in well ventilated area.
Starch B	Amylodextrin, Amylose, Amylopectin	No	80 x 25kg sacks	2	Yes	3	Avoid Inhaling Dust. Store in well ventilated area.
Xanthan Gum P	Corn Based biopolymer (polysaccharide)	No	80 x 25kg sacks	2	Yes	3	Avoid Skin, Eyes and Lung Exposure
Dewatering Floculant	Polyacralamide Polymer - Water Treatment	No	40 x 25kg sacks	1	Yes	2	Avoid Skin, Eyes and Lung Exposure
Dewatering Coagulent	Polyaluminium Chloride - Water Treatment	No	5 x 1m3 IBC	5	Yes	3	Non-Hazardous, Contain if Spilled

Drilling and Completions Hazardous Substance Register

The following hazardous substances exist at the workplace. A copy of the MSDS should be forwarded to the person responsible for First Aid and can be retained in the register to increase first aid response times.

Product Name	Product Description	Hazchem Code	Maximum Quantity held on Site	Maximum pallets to be stored	MSDS Yes / No	Risk Class (1,2 or 3)	Control Measures
Calcium Hypochlorite	Biocide - Water Treatment	No	20 x 20kg sacks	1	Yes	3	Non-Hazardous, Contain if Spilled
Sodium Formate	Weighting agent	No	1600 x 25 kg sacks		Yes	3	Non-Hazardous, Contain if Spilled
Xanthum Gum (TG)	Corn Based biopolymer (Transparent Grade)	No	160 x 25kg sacks	4	Yes	3	Non-Hazardous, Contain if Spilled
Sugar	Raw Sugar		40 x 25kg sacks	1	Yes	3	Non-Hazardous, Contain if Spilled

Total Pallets

Class 1: (High Risk) Does the substance and its associated hazards have the potential to kill, or cause permanent disability, eg Lung Disease?

Class 2: (Medium Risk) Does the substance and its associated hazards have the potential to cause a serious injury, or illness, which will temporarily disable, e.g. Dermatitis?

Class 3: (Low Risk) Does the substance have the potential to cause a minor injury, which would not disable, eg mild skin rash?

Narrabri Logistics Base



Halliburton Hazardous Substance Register

The following hazardous substances exist at the workplace. A copy of the MSDS should be forwarded to the person responsible for First Aid and can be retained in the register to increase first aid response times.

Product Name	Product Description	Hazchem Code	Maximum Quantity held on Site	Total Storage	MSDS Yes / No	Risk Class (1,2 or 3)	Control Measures
Standard Cement	Portland Cement	None	Bulk Quantities				Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Class G Cement	Portland Cement	None	Bulk Quantities				Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Standard 30% FAB	Portland Cement with 30% Fly Ash	None	Bulk Quantities	250 MT			This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Pozmix A	Pozzolanic cement additive.	None	Bulk Quantities				This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Silica Fume	Micro Silica	None	325kg Bulk Bag 20kg Sack				Avoid breathing dust. Suitable dust controls, including wearing a suitable respirator, should be utilised when handling bulk materials. Wash thoroughly after handling. If handling Silica Fume it is advisable to also use gloves and wash hands before eating, drinking or smoking to minimise inhalation or ingestion from hands.
SSA 1	Silica Flour	None	100lb Sack				This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Bentonite	Colloidal clay mineral	None	Bulk Quantities	25 MT			This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Cal Seal 60	Calcium Sulfate Hemihydrate	None	50lb Bag	8,000 lb			Avoid creating or inhaling dust.

Narrabri Logistics Base



Halliburton Hazardous Substance Register

The following hazardous substances exist at the workplace. A copy of the MSDS should be forwarded to the person responsible for First Aid and can be retained in the register to increase first aid response times.

Product Name	Product Description	Hazchem Code	Maximum Quantity held on Site	Total Storage	MSDS Yes / No	Risk Class (1,2 or 3)	Control Measures
Calcium Chloride	Calcium chloride	None	55lb Bag	8,000 lb			Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.
CFR-3	Sulfonic Acid Salt	None	50lb Bag	2,000 lb			Avoid creating or inhaling dust. Slippery when wet.
Econolite Powder	Sodium Metasilicate	None	50lb Bag	12,000 lb			Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Wash hands after use. Launder contaminated clothing before reuse.
EZ-FLO II	Flow Enhancer	2P	25lb Bag	1,000 lb			Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Avoid creating or inhaling dust. Wash hands after use. Launder contaminated clothing before reuse.
FE-2	Citric Acid	None	55lb Bag				Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.
Flocele	Cellophane Flakes	None	25lb Bag	1,000 lb			Avoid creating or inhaling dust.
Gas Stop	Modified Acrylamide Copolymer	None	50lb Bag				Avoid creating or inhaling dust.
Halad 322	Cellulose Derivative	None	50lb Bag	3,000 lb			Avoid creating or inhaling dust.
Halad 344	Modified Acrylamide Copolymer	None	50lb Bag	3,000 lb			Avoid creating or inhaling dust. Do not swallow. Avoid contact with eyes, skin, or clothing.
Halad 413	Acrylic Resin	None	50lb Bag	2,000 lb			Avoid creating or inhaling dust.
Halad 567	Fluid Loss Blend	None	50lb Bag				Avoid creating or inhaling dust.
HGS-4000	Hollow glass spheres (HGS)	None	100lb Box 700lb Bag				Do not eat, drink or smoke when using this product. Wash exposed areas thoroughly with soap and water. For industrial or professional use only. Use general dilution ventilation and/or local exhaust ventilation to control airborne exposures to below Occupational Exposure Limits. If ventilation is not adequate, use respiratory protection equipment. Avoid breathing of airborne material.
HR-5	Lignosulfonate Retarder	None	50lb Bag	2,000 lb			Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.
HR-7	Lignosulfonate Retarder	None	50lb Bag	2,000 lb			Avoid creating or inhaling dust.
LAP-1	Latex Additive	None	50lb Bag	2,000 lb			Avoid creating or inhaling dust.
Microbond	Calcium Sulfate Blend	None	50lb Bag				Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.
Microbond M	Magnesium Oxide	None	50lb Bag				This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
NaCl	Sodium chloride (NaCl)	None	55lb Bag	10,000 lb			Avoid creating or inhaling dust.
NF-6	Vegetable Oil	None	5gal Pail	160 gal			Avoid contact with eyes, skin, or clothing. Avoid breathing vapors.
Phenoseal	Reacted phenolic-melamine resin coated cellulose	None	40lb Bag	8,000 lb			Avoid creating or inhaling dust.
Pol-E-Flake	Cellophane Flakes	None	25lb Bag				Avoid creating or inhaling dust.
Spherelite	Fly Ash Spheres	None	1100lb Bag				This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Narrabri Logistics Base



Halliburton Hazardous Substance Register

The following hazardous substances exist at the workplace. A copy of the MSDS should be forwarded to the person responsible for First Aid and can be retained in the register to increase first aid response times.

Product Name	Product Description	Hazchem Code	Maximum Quantity held on Site	Total Storage	MSDS Yes / No	Risk Class (1,2 or 3)	Control Measures
Super CBL	Aluminium Powder	4Y	50lb Pail				Avoid creating or inhaling dust.
Tuf Additive No.2	Polypropylene	None	50lb Bag				Avoid creating or inhaling dust.
Versaset	Sodium Aluminate	2X	55lb Bag	2,000 lb			Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Wash hands after use. Launder contaminated clothing before reuse.
Econolite Liquid	Sodium Silicate	None	265gal Tote	2,650 gal			Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.
MF-1 / SAPP	Sodium Acid Pyrophosphate	None	50lb Bag	2,000 lb			Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.
Mud Flush III	Modified Lignosulfonate	None	40lb Bag	2,000 lb			Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.
Tuned Spacer III	Crystalline Silica Blend	None	40lb Bag				This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Acetic Acid 60%	Acetic Acid	2P	5gal Pail	110 gal			Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.
WG-11	Guar Gum Derivative	None	50lb Bag				Avoid creating or inhaling dust.
WG-17	Cellulose Derivative	None	55lb Bag				Avoid creating or inhaling dust.
WG-19	Guar Gum Derivative	None	50lb Bag	2,000 lb			Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.
K-35	Sodium Carbonate	None	55lb Bag				Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.
Fluorescein Powder Dye	Fluorescein Dye		55lb Bag				Keep exposure to this product to a minimum, and minimise the quantities kept in work areas. Check Section 8 (Exposure Controls/Personal Protection) of this MSDS for details of personal protective measures, and make sure that those measures are followed. The measures detailed below under 'Storage' should be followed during handling in order to minimise risks to persons using the product in the workplace. Also, avoid contact or contamination of product with strong oxidizing agents.

Total Pallets

Class 1: (High Risk) Does the substance and its associated hazards have the potential to kill, or cause permanent disability, eg Lung Disease?

Class 2: (Medium Risk) Does the substance and its associated hazards have the potential to cause a serious injury, or illness, which will temporarily disable, e.g. Dermatitis?

Class 3: (Low Risk) Does the substance have the potential to cause a minor injury, which would not disable, eg mild skin rash?



Expansion of Santos Operations Centre, 300 Yarrie Lake Road, Narrabri

Statement of Environmental Effects

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IMPORTANT NOTE

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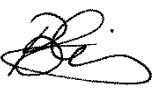
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Document Status

Version	Purpose of Document	Orig	Review	Review Date
1.0	Öðringur á samgöngu- og atvikaáhrifaáætlun	RVA	ÓSÁ	1.10.2020
1.1	Öðringur á samgöngu- og atvikaáhrifaáætlun	RVA	ÓSÁ	1.11.2020
1.2	Öðringur á samgöngu- og atvikaáhrifaáætlun	ÓSÁ	ÓSÁ	1.12.2020

Approval for Issue

Name	Signature	Date
Ólafur Þórðarson, RPS		1.12.2020

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I.0Á INTRODUCTION

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1.2 Consent Authority

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1.3 Background

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1.4 Structure of the Report

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2.4 Site Conditions

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■Ä Þ[Ä^*q} æ! Ää} äææ ö! Ä@æ^} ^äÄ[] !æÄ] ^&ä•Ä!Ä[] ~|æq}•ÄæcäÄ} ä!Ä@ÄThreatened Species
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ÇÜÖÖÄÇDÄ ^!^Ä^c^&cäÄ äÇ Äc ä^Äæ^ä~!ä*Ä@Ä~!ç^Ä!q äÄ

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Ü&@ä~|^ÄÄ Ä@ÄState Environmental Planning Policy 44ÄÇÜÖÜÄ! DÄ ^!^Ä&[] ä^äÄ~!ä*ÄÜÜÜÄÇFÇÄ
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3.2.2.4Á Process - ongoing

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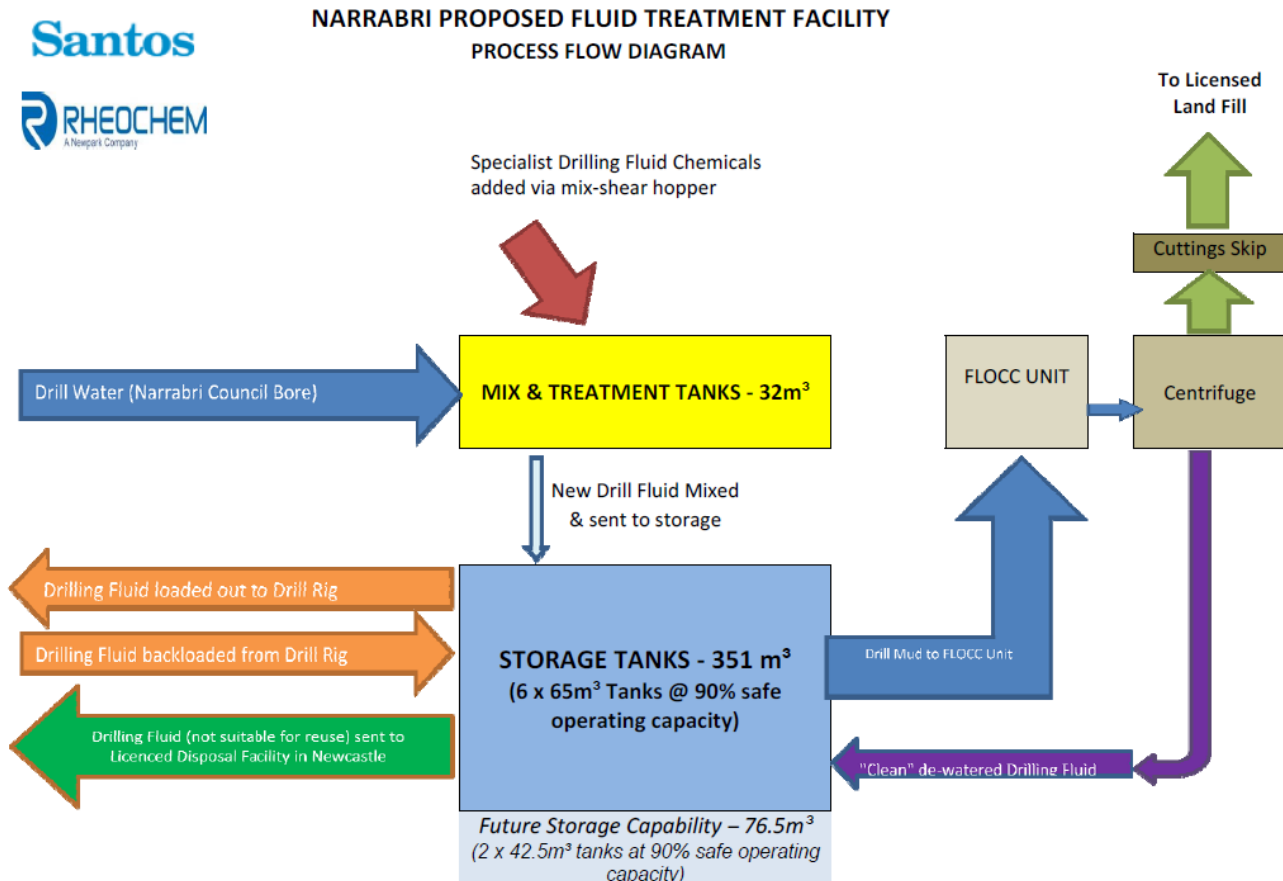


Figure 3-1 FTF Process

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3.2.2.5Á Drilling fluid composition & properties

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Table 3-1 Typical drilling fluid properties

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3.3 Access and Parking

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3.4 Servicing & Stormwater Management

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3.5 Pollution Control

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3.6 Staff and Hours of Operation

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3.7 Chemicals and Storage area

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3.8 Waste Management

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4.0Á REGULATORY CONTEXT

4.1 Commonwealth Legislation

4.1.1 Environmental Protection and Biodiversity Conservation Act

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Table 4-1 Matters of National Environmental Significance

MNES	Overview
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MNES	Overview
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4.2 NSW Legislation

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4.2.1 Environmental Planning and Assessment Act 1979

4.2.1.1 Existing Uses

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Úææ { } ò ÁÖ} çá { } { } çáÁÖ-ÁÖ Á á^áá æçç! Éçç Á•&æáÁç@Á!| [•ÁÁç áÁ, Á }| ç^áÁ
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The proposed development will facilitate ongoing management of Eastern Star's petroleum exploration and production assets in the Narrabri region. Modest quantities of materials required to conduct Eastern Star's activities will be stored and maintained at the development.

Activities to be carried out on site include materials storage (externally and within the workshop/warehouse and the chemical storage area), fabrication, maintenance and repair of specialised petroleum production equipment (within the workshop/warehouse), and administration and management of the entire Eastern Star operation in the region (from the office accommodation).

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- (a) *the use of a building, work or land for a lawful purpose immediately before the coming into force of an environmental planning instrument which would, but for Division 4 of this Part, have the effect of prohibiting that use, and*
- (b) *the use of a building, work or land:*
 - (i) *for which development consent was granted before the commencement of a provision of an environmental planning instrument having the effect of prohibiting the use, and*
 - (ii) *that has been carried out, within one year after the date on which that provision commenced, in accordance with the terms of the consent and to such an extent as to ensure (apart from that provision) that the development consent would not lapse.*

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"The enlargement, expansion or intensification:

- (a) *must be for the existing use and for no other use, and*
- (b) *must be carried out only on the land on which the existing use was carried out immediately before the relevant date.*

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4.2.1.2Á State Environmental Planning Policy No 33 – Hazardous and Offensive Development

V@ÁState Environmental Planning Policy No 33 – Hazardous and Offensive Development(ÀÒÓÚÁHÁ

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4.2.1.3Á State Environmental Planning Policy No 44 – Koala Habitat Protection

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4.2.1.4A State Environmental Planning Policy No 55 – Remediation of Land

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4.2.2 Threatened Species Conservation Act 1995

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4.2.3 National Parks and Wildlife Act 1974

4.2.3.1 Threatened species

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4.2.3.2Á Aboriginal cultural heritage

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[illegible]

4.2.4 Heritage Act 1977

[illegible]

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any deposit, artefact, object or material evidence that:

(a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and

*(b) is of State or local heritage significance.*Á

[illegible][illegible]

4.2.5 Protection of the Environment Operations Act 1997

[illegible]

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Table 4-2 Scheduled activities (POEO Act)

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4.3 Narrabri Local Environmental Plan 2012

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Table 4-3 Narrabri LEP 2012 Aims

[illegible]

Zoning and Permissibility

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- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*

- *Á To minimise the fragmentation and alienation of resource lands.*
- *Á To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *Á To allow for non-agricultural land uses that will not restrict the use of other land in the locality for agricultural purposes.*

[illegible]

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4.4 Development Control Plans

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Parking Code

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Table 4-4 Parking Rates

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		Total	13 spaces

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5.7 Section 79C (1) – Matters for Consideration

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(a) the provisions of: Á

- (i) any environmental planning instrument**
- (ii) any draft environmental planning instrument that is or has been placed on public exhibition and details of which have been notified to the consent authority;**
- (iii) any development control plan;**
- (iiia) any planning agreement that has been entered into under section 93F, or any draft planning agreement that a developer has offered to enter into under section 93F;**
- (iv) any matters prescribed by the regulations that apply to the land to which the development relates; and**
- (v) any coastal zone management plan (within the meaning of the Coastal Protection Act 1979)**

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(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts on the locality:Â

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6.0Á Conclusion

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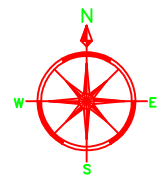
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Appendix I

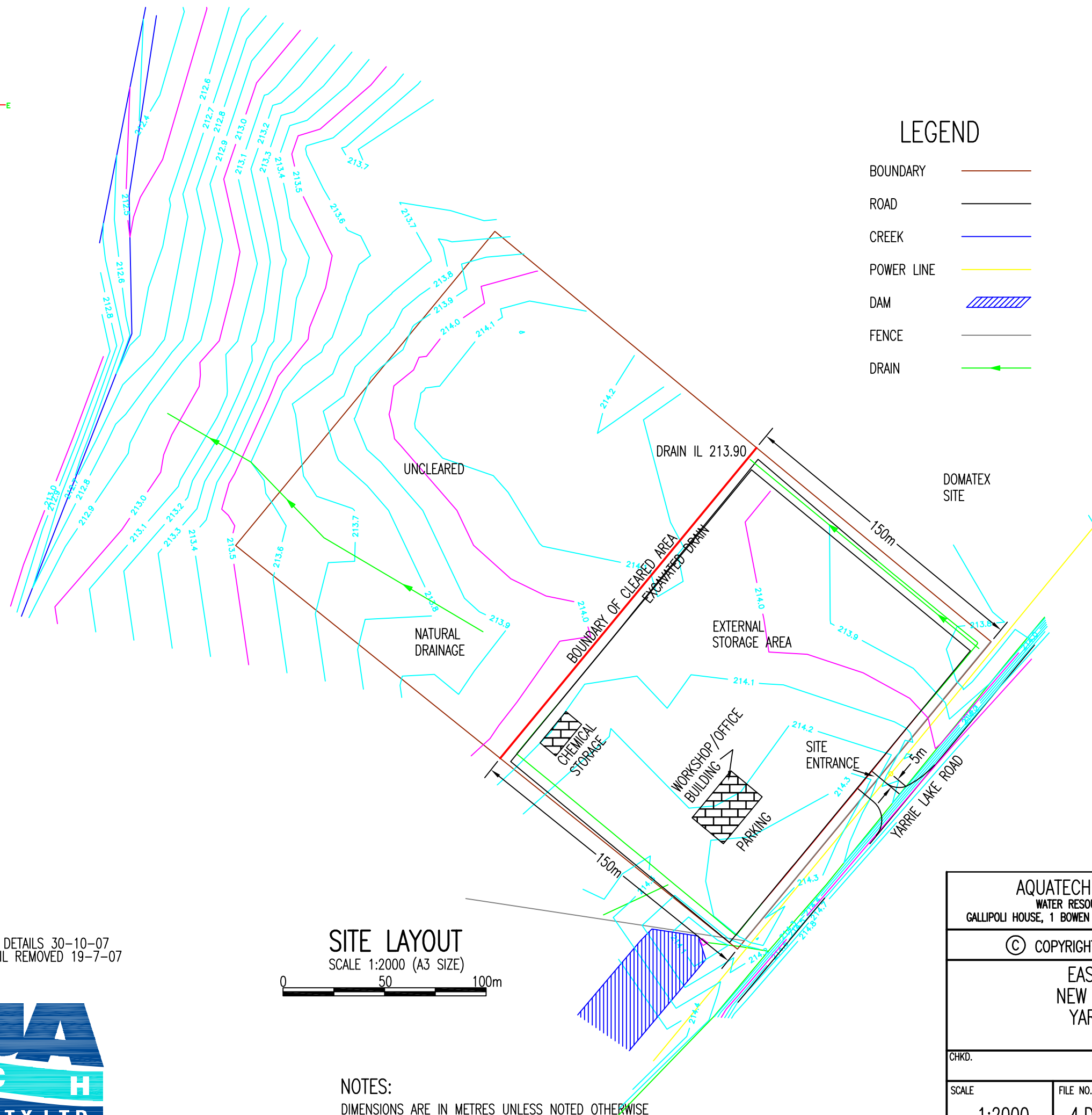
Survey

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LEGEND

BOUNDARY	
ROAD	
CREEK	
POWER LINE	
DAM	
FENCE	
DRAIN	

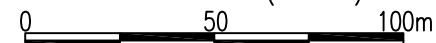


AMDT. C PLAN UPDATED WITH SITE DETAILS 30-10-07
AMDT. B BUILDING AND ROAD DETAIL REMOVED 19-7-07
AMDT. A ORIGINAL ISSUE 19-7-07



SITE LAYOUT

SCALE 1:2000 (A3 SIZE)



NOTES:

DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE

AQUATECH CONSULTING PTY LTD
WATER RESOURCES AND IRRIGATION ENGINEERS
GALLIPOLI HOUSE, 1 BOWEN STREET NARRABRI N.S.W. 2390 PH.(02)67921265

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EASTERN STAR GAS
NEW WAREHOUSE SITE
YARRIE LAKE ROAD
NARRABRI

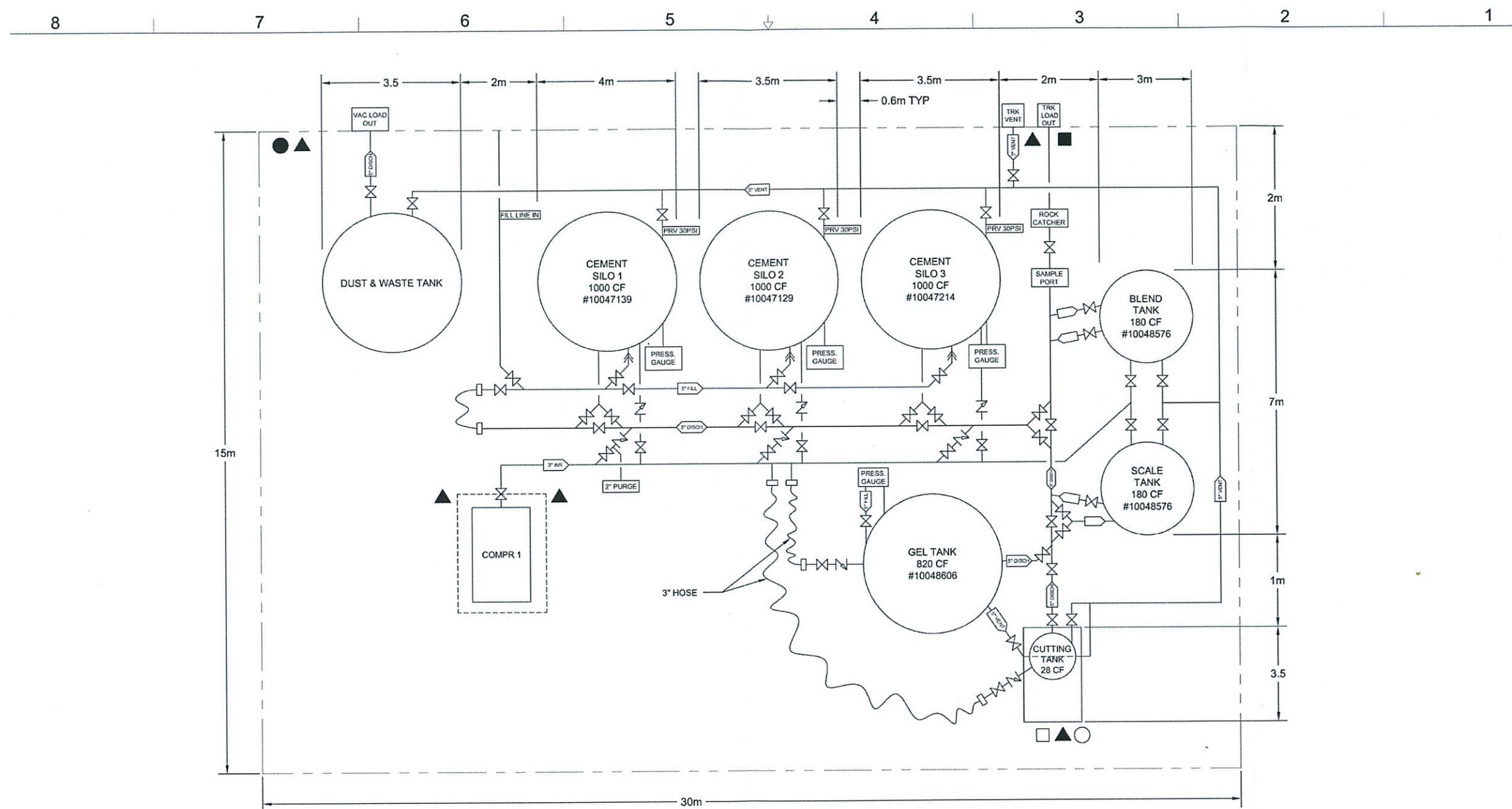
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Appendix 2

Plans

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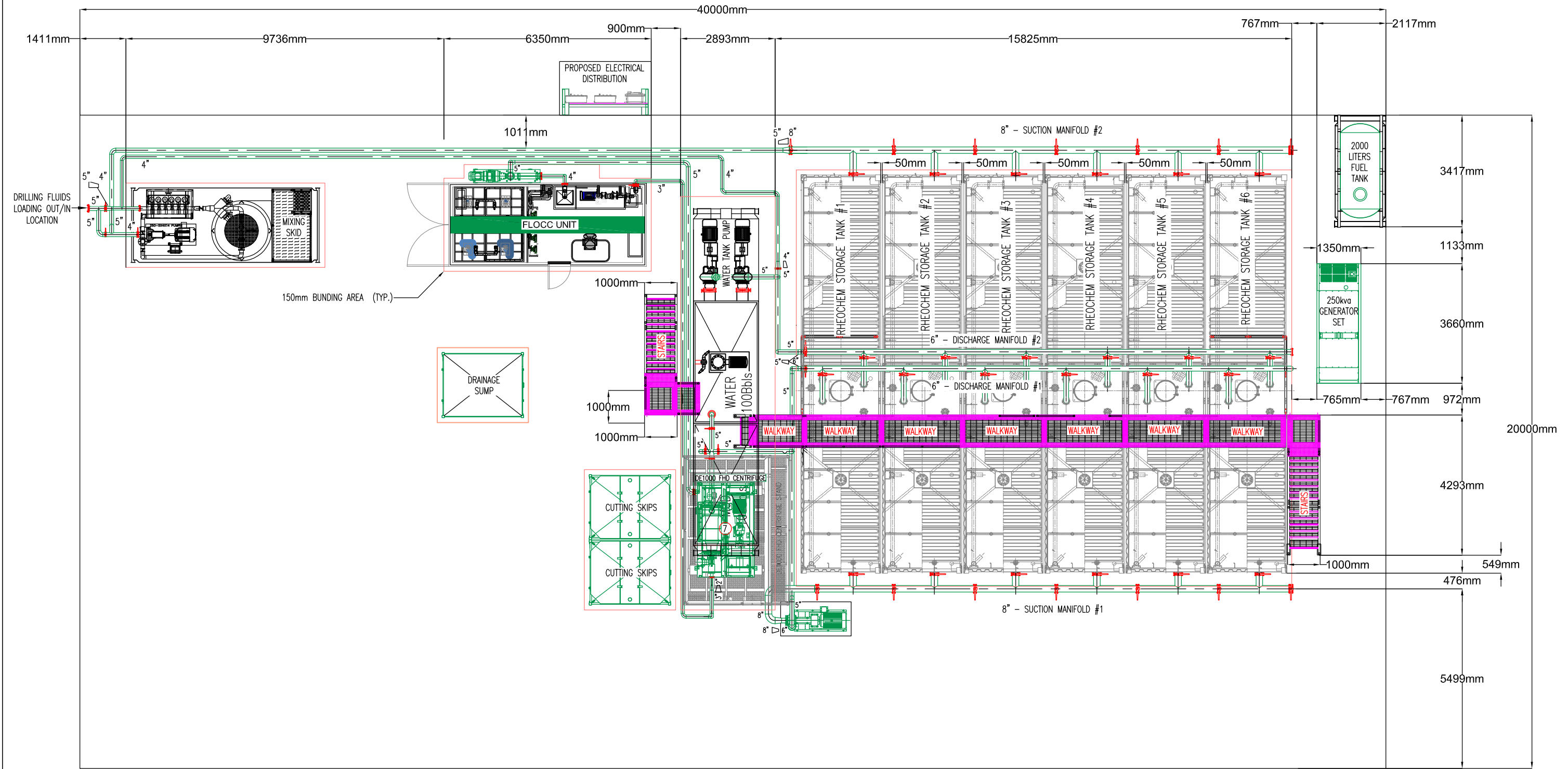
2.0 Narrabri Bulk Plant Diagram



- ▲ FIRE EXTINGUISHER
- PPE CUPBOARD
- MSDS
- EYE WASH STATION
- SAFETY SHOWER / EYE WASH
- ✕ BUTTERFLY VALVE
- ⌵ CHECK VALVE

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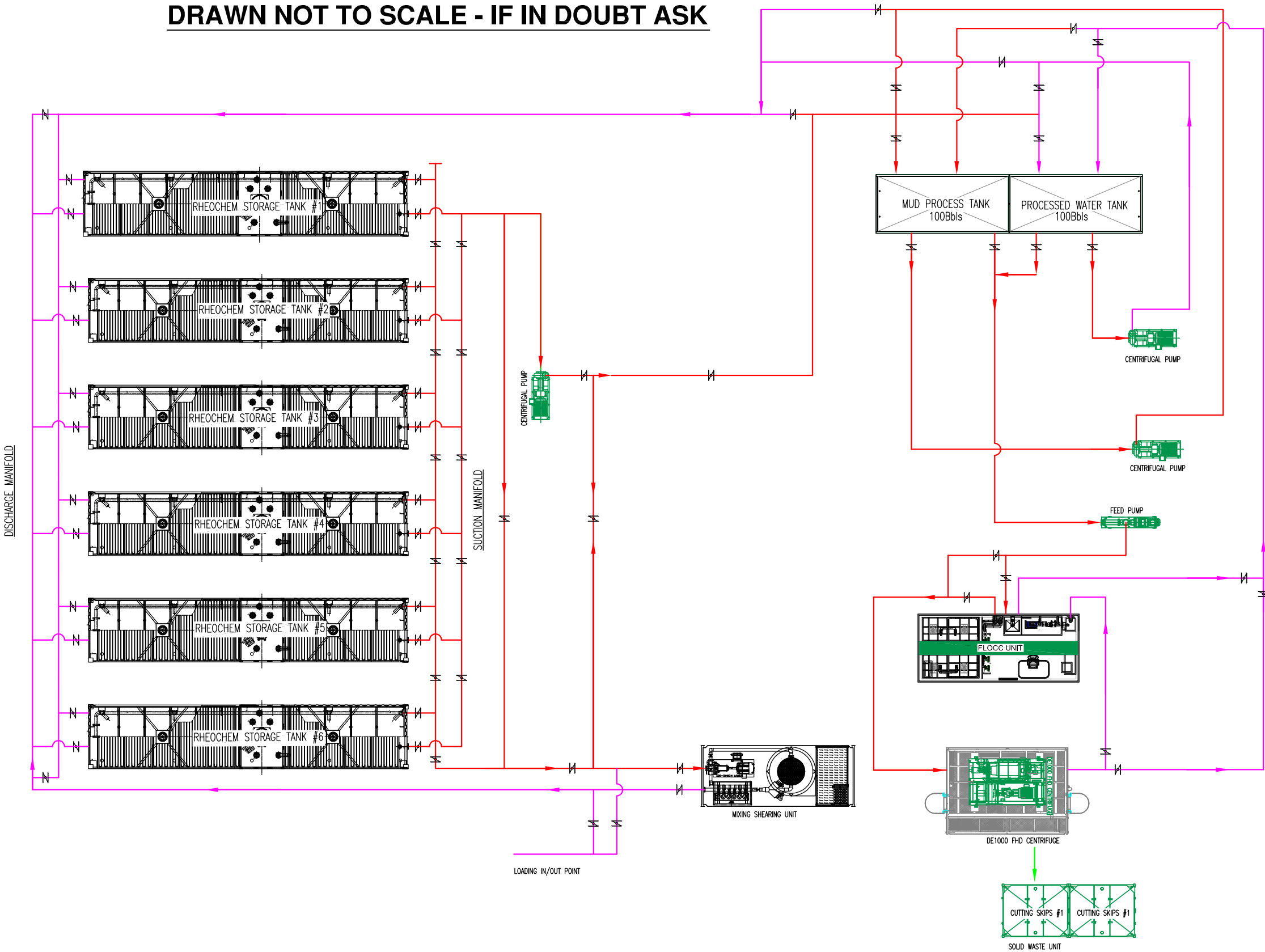


REVISIONS				
REV.	DATE	DESCRIPTION		BY
R2	01/03/13	ADDITIONAL GENERATOR AND FUEL TANK		JBMJR
R1	18/12/12	ISSUE FOR COMMENT		JBMJR
APPROVALS		DRAWN	CHECKED	APPROVED
BY		JBMJR	R.A.M	
DATE		17/10/2012	19/10/2012	

Issue:	JBMJR	Scale:	NTS	THIS IS A CAD PRODUCED DRAWING NO MANUAL MODIFICATIONS SHOULD BE MADE	
Drawing Title:					
SANTOS RHEOCHEM PROPOSED DEWATERING FACILITY LAYOUT OPT.#1					
Drawing No. SOPL-L-128-2012-001			Revision No. R2		Size A3

NOTE:
— DIRTY MUD PROCESS LINE
— CLEAN WATER DISCHARGE LINE
— SOLIDS WASTE DISCHARGE

DRAWN NOT TO SCALE - IF IN DOUBT ASK



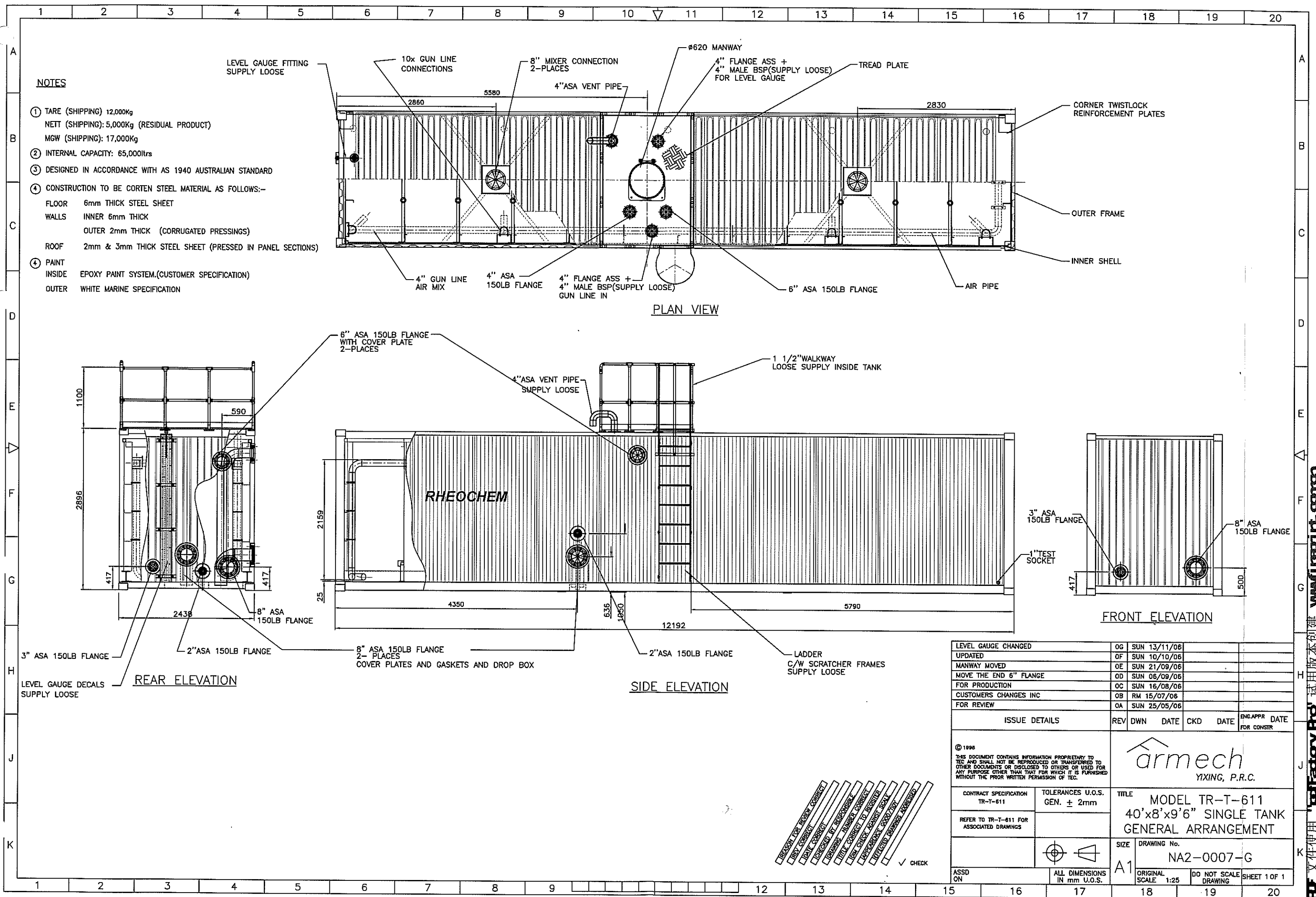
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P2	11/01/13	ISSUE FOR COMMENT		JBMJR
REV.	DATE	DESCRIPTION		BY
APPROVALS		DRAWN	CHECKED	APPROVED
BY		JBMJR	R.A.M	
DATE		11/01/2013	11/01/2013	

Issue: JBMJR	Scale: NTS	THIS IS A CAD PRODUCED DRAWING NO MANUAL MODIFICATIONS SHOULD BE MADE	
Drawing Title: SANTOS – RHEOCHEM PROPOSED MUD PROCESS FLOW DIAGRAM			
Drawing No. SOPL–F–128–2012–001		Revision No. P2	Size A3



Appendix 3

Ecological Assessment



Ecological Assessment

Narrabri Logistics Centre

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Report Number: PR114501-3
Version / Date: Final / December 2012

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Document Status

Version	Purpose of Document	Orig	Review	Review Date
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Final	Final for Issue	AB	MD	13-12-2012

Approval for Issue

Name	Signature	Date
Matt Doherty		13-12-2012

Summary

Introduction

Santos Limited (Santos), is investigating opportunities for expanding their existing operations centre at Narrabri to a larger logistics centre. RPS Australia East Pty Ltd (RPS) was engaged to undertake an ecological site inspection and produce reporting to inform a development application for assessment by Narrabri Council. The site inspection was carried out by an ecologist on the 3rd and 4th of September 2012, within Lot 241, DP 1120041, 300 Yarrie Lake Road, Narrabri, NSW. This location is hereafter referred to as the site and the proposed actions within the site are hereafter referred to as the proposal.

This assessment outlines the occurrence, or likely occurrence, of any threatened species, populations or ecological communities listed within the *Threatened Species Conservation Act 1995* (TSC Act 1995). The report recognises the relevant requirements of the EP&A Act 1979 as amended by the *Environmental Planning and Assessment Amendment Act 1997*. Reporting is also made with regard to those threatened entities listed federally under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999).

Vegetation

Ground truthing of the site confirmed previous mapping was inaccurate and delineated one native vegetation community identified as occurring within the site, which is not commensurate with TECs listed under EPBC Act 1979 and/or NSW TSC Act 1995 (refer to **Appendix 7**). The Vegetation community present on site was mapped in accordance with Namoi CMA Vegetation Mapping being Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodlands, Brigalow Belt South and Nandewar

No threatened flora species listed under the TSC Act 1995 or EPBC Act 1999 were recorded within the Site during RPS surveys.

Habitat

The Vegetation identified on site as 'Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodlands, Brigalow Belt South and Nandewar' was in relatively poor condition. The habitat offers little in the form of mature canopy trees, hollows for nesting and dwelling, logs, rocks, understorey vegetation and vegetation diversity.

Fauna

The vegetation on site and the garbage tip in close proximity to the site attracted some 22 different bird species throughout various times of day. Horses appear to have access to the entirety of the site with their scats, tracks and grazing pressure being noted across the site. Therefore, this has resulted in increasing the level of disturbance through soil compaction, vegetation degradation and soil nutrient disturbance from faecal matter. There are no permanent water bodies present on site which could support native wildlife particularly amphibians.

Conclusions

The proposal is will result in the clearing of approximately 2.07ha of disturbed and previously cleared woodland which provides potential sub-optimal habitat for a number of threatened species. Assessment under the TSC Act and EPBC Act determined the proposal is unlikely to have a significant impact on threatened species, populations or ecological communities.

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1.0 Introduction

Santos Limited (Santos), is investigating opportunities for expanding their existing operations centre at Narrabri to a larger logistics centre. RPS Australia East Pty Ltd (RPS) was engaged to undertake an ecological site inspection and produce reporting to inform a development application for assessment by Narrabri Council. The site inspection was carried out by an ecologist on the 3rd and 4th of September 2012, within Lot 241, DP 1120041, 300 Yarrie Lake Road, Narrabri, NSW. This location is hereafter referred to as the site and the proposed actions within the site are hereafter referred to as the proposal.

1.1 Site Particulars

1.1.1 Location

The site is located at 300 Yarrie Lakes Rd, approximately 2 kilometres north-west of the township of Narrabri, NSW (**Figure 1**). The site is within the Brigalow Belt South IBRA Bioregion, the Namoi Catchment Management Area (CMA) and Narrabri Local Government Area (LGA).

The Site is approximately 2.5 kilometres from Bohena Creek (to the west), which provides an ephemeral source of water. More permanent bodies of water nearby are Narrabri Lake, approximately 2.5 kilometres to the east and the Namoi River, which is approximately 2.5 kilometres to the north-east.

1.1.2 Site

The site is approximately 3.4ha in size (2.07ha of which is to be cleared as part of the proposal) and is currently unfenced and shows signs of rural uses including Horse grazing (**Figure 2**). The site is surrounded by vegetated land on the south-western, north-western and north-eastern boundaries owned by Council. The south-eastern boundary adjoins the existing Santos Narrabri Operations Centre.

1.1.3 Topography

The site is flat terrain on predominantly sandy and alluvial soils with moderate to low fertility.

1.2 Proposed Activity

Santos is proposing to expand its existing operations centre at 300 Yarrie Lake Road, Narrabri (the proposal). The proposal will include:

- Operations, fibreglass and casing laydown areas;
- A casing wash area;
- A drilling fluids treatment plant;
- Cement plant;
- Chemical and dangerous goods storage areas;
- Warehouse and office space;
- Other ancillary storage and parking areas; and a
- Sedimentation basin with an associated construction and maintenance access track.

The entire site is approximately 170m by 200m (~3.4ha). The proposal will require clearing of an area of approximately 90m by 200m (~1.84ha) immediately adjoining the of the existing Santos Narrabri Operations Centre. An additional area of approximately 0.23 ha will be cleared along the north-western side of the site to accommodate a sedimentation basin (0.19ha) and an associated construction and maintenance access track (.04ha). Therefore, the total area of clearing is approximately 2.07ha and approximately 1.36ha of native vegetation will be retained as part of the proposal (**Figure 2**).

1.3 Scope of the Study

The objective of this assessment was to undertake an ecological assessment of the proposed proposal in order to identify ecological constraints of the proposed activities, and where relevant recommendations to minimise any ecological impacts. The specific scope of the assessment was to:

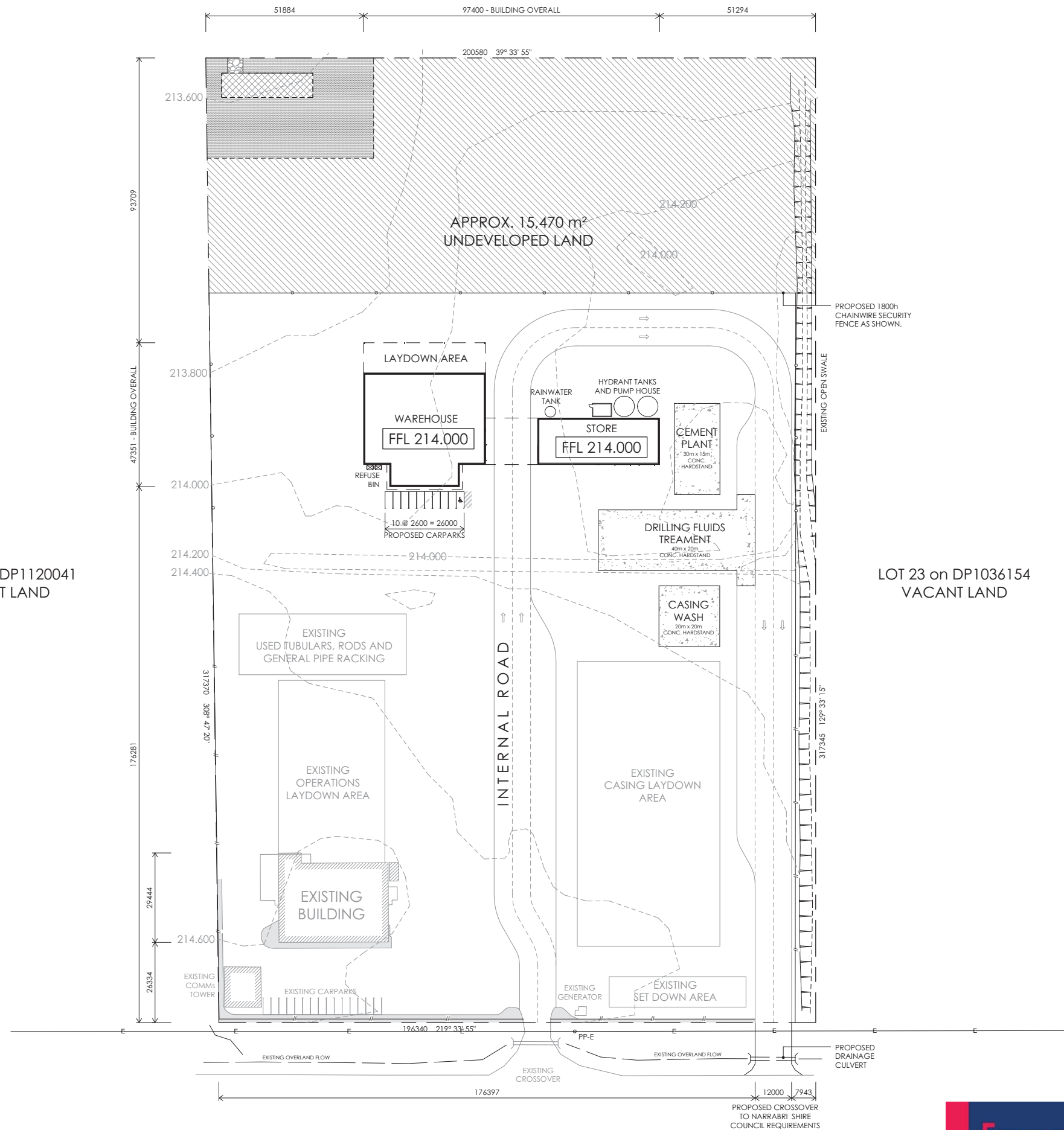
- Conduct a background review of relevant environmental databases, maps and policies;
- Verify the vegetation communities occurring on site;
- Identify habitat values of the site;
- Identify significant weed species;
- Identify constraints associated with the ecological features of the site in relation to threatened species, populations and ecological communities known from the locality (10km radius from the site) listed under the Threatened Species Conservation Act 1995 and Environment Protection Act 1999 along with other relevant NSW legislation and policy; and
- Recommendations to minimise potential ecological impacts.

1.4 Licensing and Certification

- NSW National Parks and Wildlife Service Scientific Investigation Licence S100536 (Valid 31 December 2012);
- Animal Research Authority (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2013);
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2013); and
- Certificate of Accreditation of a Corporation as an Animal Research Establishment (Trim File No: 01/1522 & Ref No: AW2001/014) issued by NSW Agriculture (Valid 22 May 2014).

LOT 242 on DP1120041
VACANT LAND

LOT 23 on DP1036154
VACANT LAND



GENERAL NOTES

INDUSTRIAL CROSS OVERS TO BE CONSTRUCTED AS PER LOCAL AUTHORITY STANDARD DETAILS DRAWINGS.

150MM WIDE CONCRETE KERBING TO CAR PARK AND DRIVEWAY PERIMETER - WHERE SHOWN.

PROVIDE DISABLED ACCESS FROM CARPARK TO BUILDING RAMPS TO BE MAX. GRADES OF 1:20 ACROSS CAR TURNING AREA WITH MAX. 3MM STEP UP FROM RAMP TO FLOOR TO COMPLY WITH A.S. 1428. 1-2001.

ALL RAMPS FROM CARPARK TO TENANCY ENTRY DOORS TO BE 1:14 MAXIMUM GRADIENT.

LEGEND

- 27.000 EXISTING CONTOUR
- PP-E EXISTING LIGHT POLE
- DPH DUAL PILLAR HYDRANT
- EXISTING OVERLAND FLOW
- E - E EXISTING ELECTRICAL
- // // EXISTING FENCING
- o - o PROPOSED FENCING
- EXISTING LANDSCAPING
- UNDEVELOPED LAND
- 20m WIDE GRASSED BUFFER
- SEDIMENTATION BASIN
- SCOUR PROTECTION

SITE INFORMATION

LOT 241 on DP1120041	62979 m ²
TOTAL FLOOR AREA	1964 m ²
GROUND FLOOR	
Amenities	42 m ²
Office	126 m ²
Store	602 m ²
Warehouse	1195 m ²
TOTAL CARPARKS	25

YARRIE LAKE ROAD

SITE PLAN
(A1) 1 : 750

**space
frame**
DESIGN + CONSTRUCT SOLUTIONS

**SITE PLAN
SANTOS**

NARRABRI LOGISTICS SUPPLY BASE
YARRI LAKE ROAD, NARRABRI NSW 2390

DWG N° 978 - 020 - 5
DATE 25.012013

FIGURE 2

2.0 Legislative Context

2.1 Environmental Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) provides that a person proposing to take an action that the person thinks may be a "controlled action" must refer the proposal to the Minister for Sustainability, Environment, Water, Population and Communities (Minister). A "controlled action" is an action that:

- will have or is likely to have a significant impact on
 - » World heritage properties
 - » National heritage places
 - » Wetlands of international importance
 - » Great Barrier Reef Marine Parks
 - » Commonwealth marine areas
 - » Commonwealth listed threatened species
 - » Commonwealth listed threatened ecological communities
 - » Commonwealth listed migratory species
- Is undertaken by the Commonwealth and will have or is likely to have a significant impact on the environment;
- Is undertaken by any person on Commonwealth land and will have or is likely to have a significant impact on the environment; or
- Is a nuclear action.

These are referred to as "matters of national environmental significance" (MNES). The EPBC Act sets out the process for identifying and listing the MNES including listed threatened species and listed migratory species.

If the Minister decides that the proposed action is a controlled action via a referral under Part 7 of the EPBC Act, then the approval of the Minister is required under Part 9 of the EPBC Act.

2.2 NSW State Legislation

2.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) regulates development carried out in New South Wales. The carrying out of development is regulated under Part 4 of the EP&A Act.

Development is required to be assessed under Part 4 of the EP&A Act if the relevant environmental planning instruments provided that the development does not require consent or is not exempt development and the development is either carried out by a determining authority or requires the approval of a determining authority.

The objectives of the *Environmental Planning and Assessment Act 1979* include:

- (a) To encourage:
 - (i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,
 - (ii) the promotion and co-ordination of the orderly and economic use and development of land,
 - (iii) the protection, provision and co-ordination of communication and utility services,
 - (iv) the provision of land for public purposes,
 - (v) the provision and co-ordination of community services and facilities, and
 - (vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and
 - (vii) ecologically sustainable development, and
 - (viii) the provision and maintenance of affordable housing, and
- (b) To promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and
- (c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.

SEPP No. 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) aims "to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline".

Schedule 1 of SEPP 44, which lists the LGAs to which SEPP 44 applies, includes the Narrabri LGA. SEPP 44 applies to local councils determining development applications under Part 4 of the EP&A Act. Although SEPP 44 does not apply in relation to the assessment of development under Part 5 of the EP&A Act, it has been considered in the preparation of this ecological assessment.

SEPP 44 requires that before granting development consent under Part 4 of the EP&A Act for development on land over 1 hectare in area, a consent authority must form a view as to whether the land is "potential" and "core" koala habitat. Potential koala habitat is defined as:

- areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

Core koala habitat is defined as:

- an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.

Where core koala habitat is found to occur, SEPP 44 requires that a koala plan of management be prepared for the site.

2.2.2 Threatened Species Conservation Act 1995

The objectives the *Threatened Species Conservation Act 1995* (NSW) (TSC Act) include:

- To conserve biological diversity and promote ecologically sustainable development;
- Prevent the extinction and promote the recovery of threatened species, populations and ecological communities;
- To protect the critical habitat of those threatened species, populations and ecological communities that are endangered; and
- To ensure that the impact of any action prevents the extinction and promotes recovery of threatened species, populations and ecological communities.

The TSC Act provides the procedure for the listing of threatened species, populations and ecological communities and key threatening processes in New South Wales and the preparation and implementation of recovery plans and threat abatement plans.

The TSC Act also provides the mechanism for applying for and obtaining licences to take actions which will or are likely to result in harm to any animal that is a threatened species, population or ecological community, the picking of any plant which is part of a threatened species, population or ecological community, damage to critical habitat or damage to habitat of a threatened species, population or ecological community where such actions require a license to be obtained.

Key Threatening Processes

A key threatening process is defined under the TSC Act as 'a process that threatens, or that may threaten, the survival or evolutionary development of a species, population or ecological community. Threatening processes that adversely affect threatened species, populations or ecological communities, or possibly cause others that are not currently threatened; to become threatened may be eligible for listing as a key threatening process (KTP).

3.0 Methods

3.1 Desktop Assessment

Desktop assessments were undertaken to determine potential and previously recorded threatened species within a 10km radius the site. The Atlas of NSW Wildlife Database was utilised to assess species listed under the TSC Act 1995 and a Protected Matters Search was used to assess any species listed under the EPBC Act 1979. The following databases and maps were reviewed:

- EPBC Protected Matters Search Tool for an area extending 10km from the site (Department of Sustainability, Environment, Water, Population and Community (SEWPaC, 2012) (**Appendix 1**);
- Review of threatened fauna and flora records contained in the Bionet (OEH) database of threatened wildlife for an area extending 10km from the site;
- Review of the Namoi CMA Vegetation Geodatabase (Namoi CMA, 2010); and
- Aerial photography.

3.2 Field Assessment

Field survey was conducted over the site, under favourable weather conditions, on the 3 and 4 September 2012.

3.2.1 Flora Survey

Vegetation Mapping

Vegetation mapping carried out within the site using the following methods:

- Aerial Photograph Interpretation (API) to map the community(s) extent into definable map units;
- Confirmation of the community type(s) present (dominant species) via the undertaking of a flora survey and identification;
- Review of the Namoi CMA Vegetation Geodatabase (Namoi CMA, 2010) ;
- Map the type and general extent of the community(s) present into definable map units where appropriate; and
- Vegetation communities were delineated through flora random meander transect techniques.

Targeted Flora Survey

Flora surveys were carried out within the site using the following methods:

- Random meanders per Cropper (2003) across the site to record floristic diversity therein; and
- Targeted threatened flora species survey across the site based on known records (10km radius of the site) and habitat.

3.2.2 Habitat Assessment

Assessment of the relative value of the habitat present within the site were undertaken. This assessment also considered the potential value of the proximate areas for all major guilds of native flora and fauna.

The assessment was based on the specific habitat requirements of threatened fauna species known from the region (10km radius) in regards to home range, feeding, roosting, breeding, movement patterns and corridor

requirements. Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages.

3.2.3 Fauna Survey

The fauna survey methodology initially consisted of the production of an expected threatened fauna species (listed under the TSC Act 1995 and the EPBC Act 1999) lists based on the results of desktop searches. Confirmation of desktop results occurred during field survey by direct observation for species presence / absence, habitat value or secondary indications.

Avifauna

The presence of avifauna within the sites was assessed via opportunistic observations during all elements of fieldwork. Birds were identified by direct observation or by recognition of calls or distinctive features such as nests, feathers and owl regurgitation pellets etc.

Nocturnal surveys, during spotlighting, attempted to identify roosting diurnal birds in a similar fashion to methods employed during diurnal surveys. Spotlighting was undertaken on the site as described below where nocturnal avifauna species including forest owls were targeted.

Herpetofauna

Suitable habitat for herpetofauna (frogs and reptiles) was limited within the site, with no permanent water or rock assemblages being present on site. However, where potential habitat features such as logs and/or leaf litter were present herpetofauna searches were carried out.

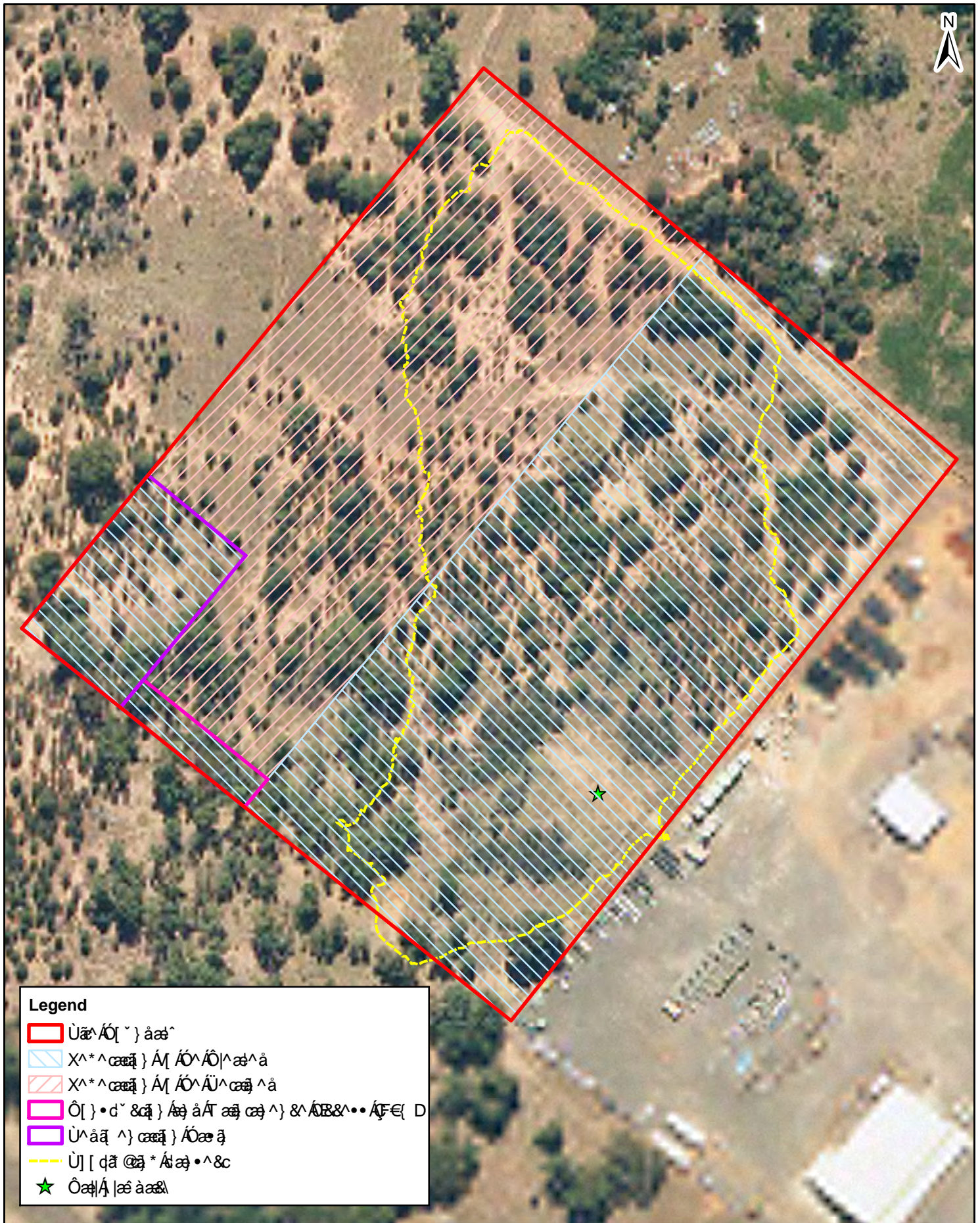
Spotlighting

Spotlighting was undertaken within the site via the use of a 75-Watt hand-held spotlight and head torch whilst walking over the site. Nocturnal surveys undertaken during spotlighting, targeted arboreal and terrestrial mammals and roosting and nocturnal birds. A total of 2 person hours of spotlighting was conducted over 1 night (refer to **Figure 3**).

Nocturnal Call Playback

Pre-recorded calls of Owl, Koala and Glider species with the potential to occur within the site were broadcast during the surveys in an effort to elicit vocal responses or to attract the species to the playback site. The calls were broadcast through an amplification system (loud hailer) designed to project the sound for at least 1km under still night conditions.

As described by Kavanagh and Peake (1993) and Debus (1995), the call of each species was broadcast for at least five minutes, followed by five minutes of listening, and stationary spotlighting. Following the final broadcast and listening, the area was spotlighted on foot. Species targeted included the Barking Owl (*N. connivens*), Powerful Owl (*Ninox strenua*), Masked Owl (*T. novaehollandiae*) and Koala (*Phascolarctus cinerius*). One night of call playback was undertaken within the site. The location of the call playback site is shown in **Figure 3**.



Úæ d •		Fauna Survey Effort	
Ô[] áæ áæ K	Ô[] áæ áæ K	Ôæ áæ F H F G B E F G	Ú[] áæ áæ K
Ô[] áæ áæ K	Ô[] áæ áæ K	Ôæ áæ F H F G B E F G	Ôæ [] áæ áæ K
 		Figure 3	Ôæ [] áæ áæ K
		Ú[] áæ áæ K Ôæ áæ áæ K Ôæ [] áæ áæ K ÚÚÚ áæ áæ K	

Koala Assessments

The wooded areas within the entire site (3.4ha) were found to contain four individual Blakely's Red Gums (*Eucalyptus Blakelyi*) which are a secondary feed tree species as listed under SEPP 44. These trees were searched for signs of the species presence through means such as identification of scats, scratches, and individuals or their vocalisations (including eliciting response through call playback).

Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna were noted within the site. Such indicators included:

- Distinctive scats left by mammals. Any scats unable to be positively identified in the field were collected for further analysis, and scats of predator species containing fur / bones were sent for analysis if appropriate;
- Scratch marks made by various types of arboreal animals;
- Nests made by various guilds of birds;
- Scats and / or scratches consistent with Koalas;
- Tracks left by animals in sand;
- Carcasses and bones;
- Feeding scars on Eucalyptus trees made by Gliders; and
- Whitewash, regurgitation pellets and prey remains from Owls.

Any other incidental observations of fauna were recorded during all phases of fieldwork.

3.3 Survey Limitations

It should be noted that the detectability of flora and fauna and the ability to accurately identify plants to species level may vary greatly with the time of year, prevailing climatic conditions and the presence of reproductive material (e.g. flowers, fruit, and seed capsules). Consequently, the survey conducted for the site should not be regarded as conclusive evidence that certain protected species do not occur within the site; however, efforts have been made to detect these species in habitats that were considered suitable.

In response to the abovementioned limitations the precautionary approach has been adopted; as such 'assumed presence' of known and expected threatened species, populations and ecological communities has been made where relevant to ensure a holistic assessment.

4.0 Results

4.1 Flora Desktop Assessment

4.1.1 Threatened Ecological Communities

EPBC Act

Seven Threatened Ecological Communities listed under the EPBC Act were identified as potentially occurring within the locality of the site as part of the EPBC Protected Matters Search Tool, including:

- Brigalow (*Acacia harpophylla* dominant and co-dominant);
- Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions;
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia;
- Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland;
- Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions;
- Weeping Myall Woodlands; and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

TSC Act

No TECs listed within the TSC Act were identified as occurring within the site, based on known or predicted communities occurring in the Namoi Catchment Management Area Sub-region. However, of the above seven EPBC listed communities, all are commensurate with communities listed under the TSC Act and therefore, have the potential to occur. In addition to this a Wildlife Atlas Community Search provided two communities which are only listed under the TSC Act. These include:

- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions;
- Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions;
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions;
- Native Vegetation on Cracking Clay Soils of the Liverpool Plains;
- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South western Slopes bioregions;
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland;
- *Cadellia pentastylis* (Ooline) community in the Nandewar and Brigalow Belt South Bioregions;
- Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions; and
- Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions.

4.1.2 Threatened Flora

EPBC Act

An EPBC Protected Matters Report was generated on the 7 September 2012 via a search of the EPBC Protected Matters Search Tool. The EPBC Protected Matters Report identified 7 threatened flora species (**Table 1**) with potential to occur within a 10 kilometre radius of the site.

Table 1 Potentially occurring threatened flora species (EPBC Act)

Scientific Name	Common Name	EPBC Act	TSC Act
<i>Bertya opposens</i>	-	V	V
<i>Cadellia pentastylis</i>	Ooline	V	-
<i>Digitaria porrecta</i>	Finger Panic Grass	E	E
<i>Prasophyllum</i> sp. Wybong (C.Phelps ORG 5269)	A leek-orchid	CE	-
<i>Pterostylis cobarensis</i>	Cobar Greenhood Orchid	V	V
<i>Rulingia procumbens</i>	-	V	V
<i>Tylophora linearis</i>	-	E	V

Status:

CE = Critically Endangered

E = Endangered

V = Vulnerable

TSC Act

The Atlas of NSW Wildlife Database was accessed on the 10 August 2012 resulting in a total of 3 threatened species which have been recorded within 10km of the study site (**Table 2**).

Table 2 Threatened Flora Species Recorded within 10km of the Site (TSC Act)

Scientific Name	Common Name	EPBC Act	TSC Act
<i>Lepidium aschersonii</i>	Spiny Pepper-cress	V	V
<i>Swainsona murrayana</i>	Slender Darling Pea	V	V
<i>Dichanthium setosum</i>	Bluegrass	V	V

Status:

V = Vulnerable

4.2 Fauna Desktop Assessment

EPBC Act

An EPBC Protected Matters Report was generated on the 7 September 2012 via a search of the EPBC Protected Matters Search Tool. The EPBC Protected Matters Report identified 13 threatened fauna species (**Table 3**) with potential to occur within a 10 kilometre radius of the site.

Table 3 Potentially occurring threatened fauna species (EPBC Act).

Scientific Name	Common Name	Status EPBC Act
Birds		
<i>Anthochaera phrygia</i>	Regent Honeyeater	E
<i>Erythrorhynchus radiatus</i>	Red Goshawk	V
<i>Geophaps scripta scripta</i>	Squatter Pigeon	V
<i>Leipoa ocellata</i>	Malleefowl	V
<i>Polytelis swainsonii</i>	Superb Parrot	V
<i>Rostratula australis</i>	Australian Painted Snipe	V
Mammals		
<i>Phascolarctos cinereus</i>	Koala	V
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V
<i>Nyctophilus timoriensis</i> (South-eastern form)	Greater Long-eared Bat	V
<i>Petrogale penicillata</i>	Brush-tailed Rock Wallaby	V
<i>Pseudomys pilligaensis</i>	Pilliga Mouse	V
Reptiles		
<i>Anomalopus mackayi</i>	Five-clawed Worm-skink, Long-legged Wormskink	V
<i>Uvidicolus sphyrurus</i>	Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko	V

Status (EPBC Act):

V = Vulnerable Species

E = Endangered Species

TSC Act

The Atlas of NSW Wildlife Database was accessed on the 10 August 2012 resulting in a total of 14 threatened fauna species having been recorded within a 10 kilometre radius of the site (**Table 4**).

Table 4 Threatened fauna species recorded within 10 Kilometres (TSC Act).

Scientific Name	Common Name	EPBC Act	TSC Act
Birds			
<i>Polytelis swainsonii</i>	Superb Parrot	V	V
<i>Rostratula australis</i>	Australian Painted Snipe	V	E
<i>Anseranas semipalmata</i>	Magpie Goose	-	V
<i>Circus assimilis</i>	Spotted Harrier	-	V
<i>Tyto longimembris</i>	Eastern Grass Owl	-	V
<i>Stictonetta naevosa</i>	Freckled Duck	-	V
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	-	E
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	-	V
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler	-	V
<i>Chthonicola sagittata</i>	Speckled Warbler	-	V
<i>Glossopsitta pusilla</i>	Little Lorikeet	-	V
<i>Daphoenositta chrysoptera</i>	Varied Sittella	-	V

Scientific Name	Common Name	EPBC Act	TSC Act
Mammals			
<i>Phascolarctos cinereus</i>	Koala	V	V
Reptiles			
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	-	V

Status (TSC/EPBC Act):

V = Vulnerable Species

E = Endangered Species

4.2.2 Migratory Species

Ten species listed as migratory under the EPBC Act have the potential to occur on site. **Table 5** lists all potentially occurring migratory species.

Table 5 Potentially occurring migratory species within 10km (EPBC Act).

Scientific Name	Common Name	EPBC Act	TSC Act
<i>Apus pacificus</i>	Fork-tailed Swift	M	
<i>Ardea alba</i>	Great Egret	M	
<i>Ardea ibis</i>	Cattle Egret	M	
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	M	
<i>Hirundapus caudacutus</i>	White-throated Needletail	M	
<i>Leipoa ocellata</i>	Malleefowl	V, M	E
<i>Merops ornatus</i>	Rainbow Bee-eater	M	
<i>Anthochaera phrygia</i>	Regent Honeyeater	E, M	CE
<i>Gallinago hardwickii</i>	Latham's Snipe	M	
<i>Rostratula australis</i>	Australian Painted Snipe	V, M	E

Status (TSC/EPBC Act):

V = Vulnerable Species

E = Endangered Species

CE = Critically Endangered Species

M = Migratory

4.3 Field Surveys

4.3.1 Vegetation Communities

One vegetation community was observed within the site being Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodlands, Brigalow Belt South and Nandewar.

A description of this community is provided below, while the location and extent is outlined in **Figure 4**. A detailed flora species list for the site is included in **Appendix 2**.

Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodlands



Plate 1 Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodlands, Brigalow Belt South and Nandewar

Description: The site was dominated by Rough-barked Apple (*Angophora floribunda*) and White Cypress Pine (*Callitris glaucophylla*) with four individual Blakely's Red Gums (*Eucalyptus Blakelyi*) occurring throughout the entire site (3.4ha). This community lacked diversity in the understorey. The shrub layer was comprised of Deane's Wattle (*Acacia deanei*), Appressed Bossiaea (*Bossiaea rhombifolia*) and African Boxthorn (*Lycium formosum*). The ground cover consisted mostly of native grasses including Cane Grass (*Eragrostis australasica*), Purple Wiregrass (*Aristida ramosa*) Hairy Panic (*Panicum effusum*) and Slender Bamboo (*Austrostipa verticillata*). Herbs and forbes in this community were scarce however, some Tufted Bluebell (*Wahlenbergia communis*), Common Everlasting (*Chrysocephalum apiculatum*) and *Glycine clandestina* were observed.

Condition: The overall condition of this community was relatively poor throughout the site. This area of woodland exhibits a low floristic diversity this is as a result of a moderate level of disturbance from rural usage including Horse grazing. A moderate level of weed infestation by African Boxthorn (*Lycium formosum*) and Prickly Pear (*Opuntia stricta**) was evident and the ground layer is largely a monoculture of only a few grass species further demonstrating a history of disturbance.

Classification: It was determined that this community is not commensurate with any TEC listed under the under the State (TSC Act 1995) and Commonwealth (EPBC Act 1999) legislative framework. (**Appendix 7**

4.3.2 Targeted Flora Surveys

Targeted searches did not confirm the presence of any threatened flora species (listed under the TSC act or the EPBC Act) within the site. A full list of the flora species is compiled in **Appendix 2**. An assessment of likelihood of occurrence was completed for the threatened flora species listed in **Tables 1 & 2** and is included in **Appendix 4**.

4.3.3 Weeds

Several exotic flora species were recorded on site and two of which are listed weed species. These two species, namely Prickly Pear (*Opuntia stricta*) and African Boxthorn (*Lycium formosum*), are considered to be a noxious weeds in NSW (DPI, 2012). Under the provisions of the *Noxious Weeds Act 1993*, Prickly Pears (except *Opuntia ficus-indica*) and African Boxthorn (*Lycium formosum**) are classified as Class 4 weeds. This means that the growth and spread of the plant must be controlled according to the measure specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed.

The remaining species are grasses or herbs that are not considered noxious in NSW. A complete flora list is compiled in **Appendix 2**.

4.4 Fauna

4.4.1 Habitat

The vegetation community within the site was identified as 'Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodlands, Brigalow Belt South and Nandewar'. This relatively small area of vegetation (3.4ha) offers little habitat in the form of mature canopy trees, hollows for nesting and dwelling, logs, rocks, understorey vegetation and vegetation diversity. There are no permanent water bodies present on site which could support native wildlife particularly amphibians.

The sparse vegetation on site and the garbage tip in close proximity to the site provide suitable foraging habitat for many common bird species throughout various times of day. The site has experienced some visible signs of clearing and grazing which has led to degradation of many ecological attributes. Horses appear to have access to the entirety of the site with their scats, tracks and grazing pressure being noted across the site. This has resulted in increasing the level of disturbance through soil compaction, vegetation degradation and soil nutrient disturbance from faecal matter.

4.4.2 Observed Fauna

Opportunistic searches and spotlight lighting/call playback methods during field surveys did not confirm the presence of any threatened fauna species (listed under the TSC act or the EPBC Act) within the site. A full list of the fauna species is compiled in **Appendix 3**. An assessment of likelihood of occurrence was completed for the threatened fauna species listed in **Tables 3 & 4** and is included in **Appendix 4**.

4.4.3 Avifauna Survey

A total of 22 bird species were recorded within the site during the survey period. A full list of bird species observed within the site is provided in **Appendix 3**.

4.4.4 Reptile Survey

Opportunistic surveys were conducted across the site for reptiles, however, only one common reptile species was recorded within the site namely a Garden Sun Skink (*Lampropholis delicata*).

4.4.5 Frog Survey

Opportunistic surveys were conducted for amphibians within the site. However, no amphibian species were recorded within the site.

4.4.6 Koala Assessments

No Koalas (*Phascolarctos cinereus*), or signs of their presence, were recorded during the surveys. No primary koala feed trees listed under Schedule 2 of the SEPP 44 were recorded on site, only secondary Koala feed trees were present.

4.4.7 Spotlighting

A total of two person hours of spotlighting across the site as described in **Section 3.2.3** failed to locate and identify any faunal species within the site.

4.4.8 Nocturnal Call Playback

A nocturnal call playback within the site as described in **Section 3.2.3** failed to locate and identify any faunal species within the site.

4.4.9 Pests

Three pest species, namely the Fox (*Vulpes vulpes*), Horse (*Equus ferus caballus*) and Rabbit (*Oryctolagus cuniculus*) were all recorded on site via visual observations or signs of presence through scats, tracks or carcasses.

5.0 Ecological Impact Assessment

5.1 Potential Ecological Impacts

The proposal is likely to result in the clearing of approximately 2.07ha of disturbed woodland which provides potential sub-optimal habitat for a number of threatened entities. Based on the field survey and results an assessment of potential impacts on threatened species, populations and ecological communities from the locality (10km radius of the site) has been undertaken.

Blakely's Red Gums (*Eucalyptus Blakelyi*) were observed within the vegetation community on site, therefore, there is potential for White Box, Yellow Box, Blakely's Red Gum and Derived Grasslands TEC to occur. Further preliminary assessment has been undertaken, with reference to DEH (2006) and NPWS (2002) (see **Appendix 7**) to determine the likelihood of TEC presence based on site, situation and floristic structure. Specifically, the site contains a low abundance Blakely's Red Gum (*Eucalyptus Blakelyi*) and it is not considered a dominant or characteristic canopy species. Therefore, the assessment in **Appendix 7** concluded that the vegetation community within the site is not commensurate with the TEC determination under the State (TSC Act 1995) and Commonwealth (EPBC Act 1999) legislative framework.

Initially a consideration for likelihood of occurrence was carried out for both TSC Act and EPBC Act listed species in **Appendix 4**. Those threatened species, populations and ecological communities considered to have the potential to occur and/or impacted upon as result of the proposal were assessed further under a 7-Part Test for the threatened entities listed under the TSC Act (**Appendix 6**). Similarly, an Assessment of Significance (AoS) was conducted for the threatened entities and listed migratory species listed under the EPBC Act (**Appendix 5**).

5.2 Matters of National Environmental Significance

The EPBC Act focuses Commonwealth interests on matters of National Environmental Significance (NES) including integrated biodiversity conservation and the management of important protected areas. The matters of NES as identified in the Act which require assessment and approval to be addressed by the Commonwealth include:

- World Heritage Properties;
- National Heritage Places;
- Wetlands of International Importance;
- Great Barrier Reef Marine Parks;
- Commonwealth Marine areas;
- Nationally Threatened Species;
- Nationally Threatened Ecological Communities;
- Migratory Species;

The assessment and approval process applies to any action that has, will have or is likely to have a significant impact on a matter of NES. An 'action' is defined as a project, development, undertaking or an activity or series of activities.

The matter of NES and site-specific responses are as follows.

World Heritage Properties:

The Site is not World Heritage Property, and is not in close proximity to any such property.

Wetlands of International Importance (RAMSAR convention):

The Site is not part of any Wetland of International Importance, and is not in close proximity to any such area.

- Great Barrier Reef Marine Parks;
- The Site is not part of any Great Barrier Reef Marine Park, and is not in close proximity to any such park.
- Commonwealth Marine Areas

The proposal will not have a significantly adverse effect on any Commonwealth Marine area, as there are no such marine areas within the region.

Nationally Listed Threatened Species:

Threatened species listed under the EPBC Act, which occur, or have the potential to occur within the locality (10km radius) have been assessed for their potential to occur within the site (**Appendix 4**). Those threatened species that were considered to have potential to occur and subsequently may be impacted by the proposal is as follows:

Those EPBC listed threatened species considered to have potential to occur are:

- | | | |
|---------------------------------|------------------------|---|
| ▪ <i>Pterostylis cobarensis</i> | Cobar Greenhood Orchid | V |
| ▪ <i>Rulingia procumbens</i> | | V |
| ▪ <i>Tylophora linearis</i> | | E |
| ▪ <i>Phascolarctos cinereus</i> | Koala | V |
| ▪ <i>Leipoa ocellata</i> | Malleefowl | V |
| ▪ <i>Polytelis swainsonii</i> | Superb Parrot | V |

The site and the proposed location of the development footprint exists, as a previously disturbed site (~3.4 ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). This site is within close proximity to superior areas of habitat (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) which would be suitable for supporting populations of the potentially occurring above listed threatened species. The small area to be impacted upon is unlikely to be essential to the survival of populations of these listed species.

Nationally Listed Threatened Ecological Communities:

No Threatened Ecological Community (TEC), nationally listed under the EPBC Act were recorded during field surveys. However, one TEC was considered for its likelihood to occur (**Appendix 4**). As no TEC's are considered likely to occur there is no potential for impacts upon any listed TEC's.

Nationally Listed Migratory Species:

Those EPBC listed Migratory species considered to have potential to occur are:

- | | |
|---------------------------|-------------------|
| ▪ <i>Circus assimilis</i> | Spotted Harrier |
| ▪ <i>Apus pacificus</i> | Fork-tailed Swift |

- *Leipoa ocellata* Malleefowl
- *Ardea ibis* Cattle Egret
- *Merops ornatus* Rainbow Bee-eater

The proposed location of the development footprint exists, as a previously disturbed site with a low diversity of habitat features. The site and the proposed location of the development footprint exists, as a previously disturbed site (~3.4 ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). This site is within close proximity to superior areas of habitat (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) which would be suitable for supporting populations of the potentially occurring above listed threatened species. The small area to be impacted upon is unlikely to be essential to the survival of populations of these listed species.

This site is surrounded by superior areas of habitat, which would be suitable for the above listed Migratory species. Due to the extensive tracts of vegetation within the Pilliga State Forest, supporting the populations of the potentially occurring above species, the small area to be impacted upon is unlikely to be essential to the survival of populations of these species.

5.3 NSW State Significance

5.3.1 TSC Act

Section 5A of the EP&A Act lists seven factors that must be taken into account in the determination of the significance of potential impacts proposed activities on 'threatened species, populations or ecological communities (or their habitats)' listed under the NSW TSC Act. The Assessment of Significance (7-part test) is used to determine whether activities are 'likely' to cause 'a significant impact' on threatened biota.

Appendix 6 contains the assessment for the following species listed in **Table 6**.

Table 6 Threatened Species assessed under 7-Part Tests

Fauna Species	Flora Species
Spotted Harrier	<i>Dichanthium setosum</i>
Grey-crowned Babbler	<i>Digitaria porrecta</i>
Koala	<i>Rulingia procumbens</i>
Pale-headed Snake	<i>Pterostylis cobarensis</i>
Malleefowl	<i>Tylophora linearis</i>
Superb Parrot	
Speckled Warbler	
Little Lorikeet	
Varied Sittella	
Eastern Grass Owl	

The assessment determined that no significant impacts such that a local extinction would be likely to occur as a result of the proposal.

5.4 SEPP 44 (Koala Habitat Protection)

This policy aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline.

First Consideration – Is the Land ‘Potential Koala Habitat’?

Schedule 2 of State Environmental Planning Policy (SEPP) No. 44 – ‘Koala Habitat Protection’ lists 10 tree species that are considered indicators of ‘Potential Koala Habitat’. The presence of any of the species listed on a site proposed for development triggers the requirement for an assessment for ‘Potential Koala Habitat’. SEPP 44 defines potential Koala Habitat as:

“areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component”.

The wooded areas within the entire site (3.4ha) were found to contain four individual Blakely’s Red Gums (*Eucalyptus Blakelyi*) which are a secondary feed tree species. However, the site was dominated by Rough-barked Apple (*Angophora floribunda*) and White Cypress Pine (*Callitris glaucophylla*) which are neither primary nor secondary feed tree species. No primary feed trees listed under Schedule 2 of the SEPP 44 were detected within the site. No Koalas or traces of Koalas such as scats or scratches on tree trunks were observed within the site during the surveys. As no Koalas, or signs of Koala occupation were observed on the site and it lacked primary feed tree species, it has been determined that the site does not provide ‘Core’ or ‘Potential’ Koala habitat according to SEPP 44. Therefore, further assessment under SEPP 44 is not required.

6.0 Recommendations

The proposal has been assessed as being likely to have minimal ecological impacts, however to prevent and reduce potential for impact on ecological features within the site during the construction and operation phases of this project, the following management procedures are recommended.

- Vehicular traffic during the construction and operation phase are to avoid retained vegetation on site;
- Prevent the spread of exotic weed species through appropriate vehicle and personnel hygiene protocols during the construction phase.
- Vehicle speed should be minimised at all times on site to reduce dust levels and reduce the risk of fauna strike;
- Declared Noxious weeds (including Prickly Pear/ Tiger Pear) should be managed in accordance with local and state guidelines. In the absence of these reference shall be made to the Noxious Weeds Act; and
- Appropriate measures should be employed to ensure that construction and operations machinery are clean from materials potentially containing *Phytophthora cinnamomi*, as part of ongoing environmental stewardship.

7.0 Conclusion

RPS has been commissioned by Santos Pty Ltd to prepare an Ecological Assessment for the expansion of its existing Santos Narrabri Operations Centre at 300 Yarrie Lake Road, Narrabri (the proposal).

The proposal is will result in the clearing of approximately 2.07ha of disturbed woodland which provides potential sub-optimal habitat for a number of threatened entities. Based on the field survey and results an assessment of potential impacts on threatened species, populations and ecological communities from the locality (10km radius of the site) has been undertaken.

Assessment under the TSC Act found that the proposal is unlikely to have a signification impact on threatened species, populations or ecological communities known from the region.

Assessment under the EPBC Act found that the proposal was unlikely to have an impact on Matters of NES

No Koalas or traces of Koalas such as scats or scratches on tree trunks were observed within the site during the surveys. As no Koalas, or signs of Koala occupation were observed on the site and it lacked primary feed tree species, it has been determined that the site does not provide 'Core' or 'Potential' Koala habitat according to SEPP 44. Therefore, a Koala plan of management is not required.

The proposal has been assessed as being likely to have minimal ecological impacts, however to prevent and reduce potential for impact on ecological features within the site during the construction and operation phases of this project, the following management procedures are recommended.

- Vehicular traffic during the construction and operation phase are to avoid retained vegetation on site;
- Prevent the spread of exotic weed species through appropriate vehicle and personnel hygiene protocols during the construction phase.
- Vehicle speed should be minimised at all times on site to reduce dust levels and reduce the risk of fauna strike;
- Declared Noxious weeds (including Prickly Pear/ Tiger Pear) should be managed in accordance with local and state guidelines. In the absence of these reference shall be made to the Noxious Weeds Act; and
- Appropriate measures should be employed to ensure that construction and operations machinery are clean from materials potentially containing *Phytophthora cinnamomi*, as part of ongoing environmental stewardship.

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Appendix I

EPBC Protected Matters Report



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 07/09/12 10:46:32

[Summary](#)

[Details](#)

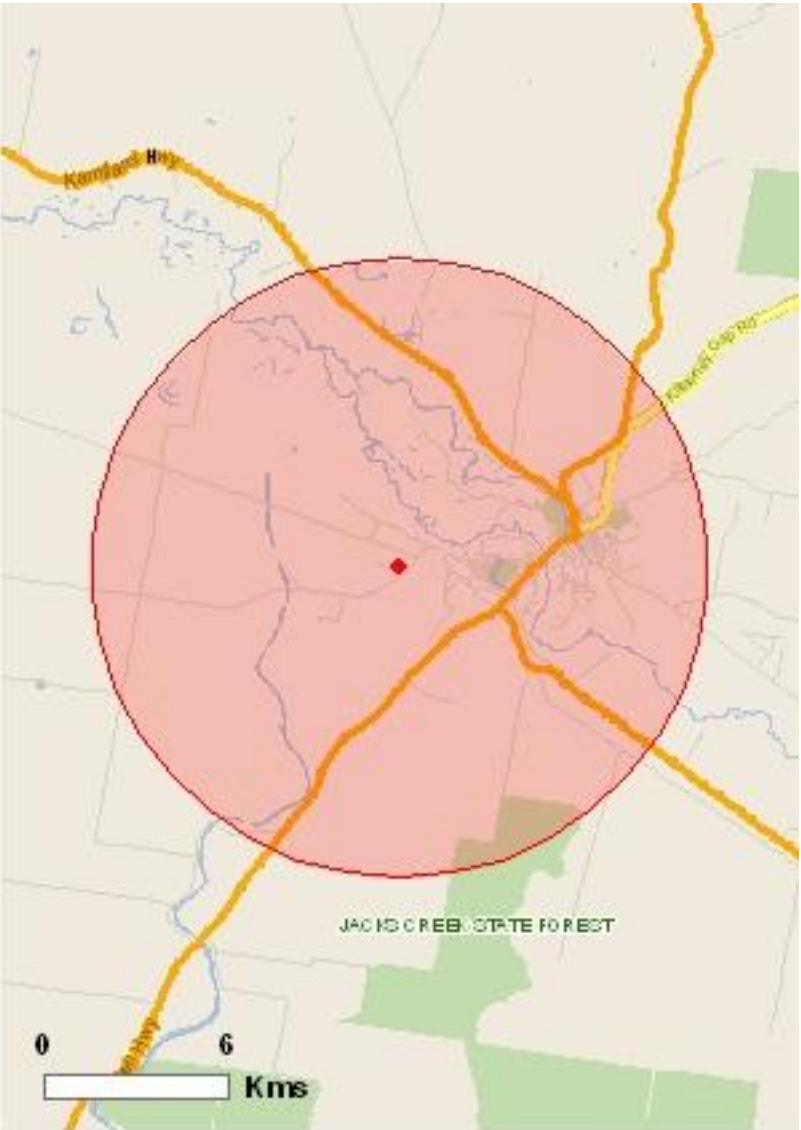
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	6
Listed Threatened Species:	21
Listed Migratory Species:	12

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As [heritage values](#) of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	4
Commonwealth Heritage Places:	1
Listed Marine Species:	8
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	5
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	12
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [\[Resource Information \]](#)

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community likely to occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community may occur within area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species [\[Resource Information \]](#)

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Vulnerable	Species or species habitat likely to occur within area
Fish		
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Nyctophilus corbeni South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pseudomys pilligaensis Pilliga Mouse [99]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Bertya opposens [13792]	Vulnerable	Species or species habitat likely to occur within area
Cadellia pentastylis Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area
Digitaria porrecta Finger Panic Grass [12768]	Endangered	Species or species habitat likely to occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Pterostylis cobarensis Cobar Greenhood Orchid [12993]	Vulnerable	Species or species habitat likely to occur within area
Rulingia procumbens [12903]	Vulnerable	Species or species habitat likely to occur within area
Tylophora linearis [55231]	Endangered	Species or species habitat may occur within area
Reptiles		
Anomalopus mackayi Five-clawed Worm-skink, Long-legged Worm-skink [25934]	Vulnerable	Species or species habitat may occur within area
Uvidicolus sphyrurus Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko [84578]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species

[Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area

Migratory Terrestrial Species

Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Xanthomyza phrygia Regent Honeyeater [430]	Endangered*	Species or species habitat may occur within area

Migratory Wetlands Species

Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Vulnerable*	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land

[Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Scientific & Industrial Research Organisation
Commonwealth Land - Telstra Corporation Limited

Commonwealth Heritage Places

[Resource Information]

Name	State	Status
Historic		

Name	State	Status
Narrabri Post Office and former Telegraph Office	NSW	Listed place
Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Vulnerable*	Species or species habitat likely to occur within area

Extra Information

Places on the RNE		[Resource Information]
Note that not all Indigenous sites may be listed.		
Name	State	Status
Historic		
Collins Park Grandstand	NSW	Indicative Place
Narrabri Gaol (former)	NSW	Registered
Narrabri Post Office and former Telegraph Office	NSW	Registered
Narrabri Public School	NSW	Registered
Police Residence	NSW	Registered

Invasive Species		[Resource Information]
Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.		
Name	Status	Type of Presence
Frogs		

Name	Status	Type of Presence
Bufo marinus Cane Toad [1772]		Species or species habitat likely to occur within area
Mammals		
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat may occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Coordinates

-30.336 149.73

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Department of Environment, Climate Change and Water, New South Wales](#)
- [-Department of Sustainability and Environment, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment and Natural Resources, South Australia](#)
- [-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [-Environmental and Resource Management, Queensland](#)
- [-Department of Environment and Conservation, Western Australia](#)
- [-Department of the Environment, Climate Change, Energy and Water](#)
- [-Birds Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-SA Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-State Forests of NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

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Appendix 2

Flora Species List

Family Name	Scientific Name	Common Name
Fabaceae/faboideae/Mimosoideae	<i>Acacia deanei</i>	Green Wattle
Polygonaceae	<i>Acetosella vulgaris</i> *	Sheep Sorrel
Asteraceae	<i>Actinotus helianthi</i>	Flannel Flower
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple
Asteraceae	<i>Arctotheca calendula</i> *	Capeweed
Poaceae	<i>Aristida ramosa</i>	Purple Wiregrass
Poaceae	<i>Arundinella nepalensis</i>	Reed grass
Fabaceae/faboideae	<i>Bossiaea rhombifolia</i>	-
Asteraceae	<i>Brachyscome</i> sp.	-
Cupressaceae	<i>Callitris glaucophylla</i>	White Cypress Pine
Sinopteridaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	Poison Rock Fern
Asteraceae	<i>Conyza</i> sp.*	Fleabane
Poaceae	<i>Cynodon dactylon</i>	Common Couch
Fabaceae/faboideae	<i>Desmodium varians</i>	Slender Tick-trefoil
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed
Boraginaceae	<i>Echium plantagineum</i> *	Paterson's Curse
Poaceae	<i>Eragrostis</i> sp.	Bristly Love Grass
Myrtaceae	<i>Eucalyptus blakelyi</i>	Blakeley's Red Gum
Fabaceae/faboideae	<i>Glycine clandestina</i>	Twining Glycine
Lomandraceae	<i>Lomandra leucocephala</i>	-
Solanaceae	<i>Lycium ferocissimum</i> *	African Boxthorn
Cactaceae	<i>Opuntia stricta</i> *	Prickly Pear
Oxalidaceae	<i>Oxalis</i> sp.	-
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum
Poaceae	<i>Panicum</i> sp.	-
Fabaceae/faboideae	<i>Swainsona procumbens</i>	Broughton Pea, Swamp Pea
Asteraceae	<i>Taraxacum officinale</i> *	Dandelion
Campanulaceae	<i>Wahlenbergia</i> sp.	-

Appendix 3

Fauna Species List

Family Name	Scientific Name	Common Name
Avifauna		
Accipitridae	<i>Elanus scriptus</i>	Letter-winged Kite
Accipitridae	<i>Milvus migrans</i>	Black Kite
Cacatuidae	<i>Eolophus roseicapillus</i>	Galah
Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo
Halcyonidae	<i>Dacelo novaeguineae</i>	Laughing Kookaburra
Maluridae	<i>Malurus cyaneus</i>	Superb Fairy-wren
Acanthizidae	<i>Acanthiza reguloides</i>	Buff-rumped Thornbill
Pardalotidae	<i>Pardalotus punctatus</i>	Spotted Pardalote
Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote
Meliphagidae	<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater
Meliphagidae	<i>Philemon corniculatus</i>	Noisy Friarbird
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-thrush
Artamidae	<i>Cracticus tibicen</i>	Australian Magpie
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail
Corvidae	<i>Corvus coronoides</i>	Australian Raven
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark
Corcoracidae	<i>Corcorax melanorhamphos</i>	White-winged Chough
Megaluridae	<i>Cincloramphus mathewsi</i>	Rufous Songlark
Estrildidae	<i>Taeniopygia bichenovii</i>	Double-barred Finch
Mammals		
Equidae	<i>Equus ferus caballus</i> *	Horse
Canidae	<i>Vulpes vulpes</i> *	Fox
Leporidae	<i>Oryctolagus cuniculus</i> *	Rabbit
Reptile		
Scincidae	<i>Lampropholis delicata</i>	Garden Sun Skink

Appendix 4

Assessment of Likelihood of Occurrence, and Potential Level of Impact

Those threatened flora and fauna species (listed under the *TSC Act* and the *EPBC Act*) that have been gazetted / recorded from within the locality have been considered in the following tables. TEC's and Endangered Populations known from the broader area have also been addressed. Each species / community / population is considered for its potential to occur within the site and the likely level of impact as a result of the proposed activities. The following tables deal with each species / community / population separately and identifies the ecological parameters of significance associated with the proposed activities.

'Species' or 'TEC / Population' – Lists each threatened species / TEC / population known from the vicinity of the site. The status of each threatened species under the *TSC Act* and *EPBC Act* is also provided.

'Habitat' – Provides a brief account of the species / community / population and the preferred habitat attributes required for the existence / survival of each species / community / population.

'Likelihood of Occurrence' – Assesses the likelihood of each species / community / population to occur within the site in terms of the aforementioned habitat description and taking into account local habitat preferences, results of recent field investigations, data gained from various sources and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

'Potential for Impact' – Through consideration of the likely level / significance of impacts to each species / community / population that would result from the proposed activities, taking into account both short and long-term impacts, a decision has been made whether further assessment is required. This assessment is largely based on the chance of occurrence of each species / community with due recognition to other parameters such as home range, habitat use, connectivity etc. It also considers the scope of the proposed activities.

Ecological Community	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions (TSC). Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant) (EPBC)	E	E	Dominated by <i>A. harpophylla</i> and associated with deep gilgaied clays, sedentary clays, alluvial clays and loamy red soils. Can occur with or without various Eucalypt species. Generally poses a dense low tree layer or tall shrub layer. The ground layer is typically sparse but dominated by native grasses.	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	E	E	Open eucalypt woodlands formerly occurred across a range of climatic regions of Australia, including semi-arid and humid subtropical zones. The position in the landscape of these woodlands can determine the vegetation structure of the woodlands such as if they occur on the floodplains or uplands and consequently, whether they have a more shrubby or more grassy understorey.	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (EPBC) Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (TSC)	E	E	Dominated by <i>E. microcarpa</i> and is found on relatively fertile soils of the western slopes and plains of NSW. Has a sparse shrub layer with a variable ground layer of grass and herbaceous species present almost always. This woodland is 15-25m tall but disturbed patches can experience thinning and clearing which alters the overall height.	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales (EPBC) and southern Queensland; Native Vegetation on Cracking Clay Soils of the Liverpool Plains (TSC)	E	CE	This community is generally grassland often dominated by grass species such as <i>Austrostipa aristiglumis</i> , <i>Dichanthium sericeum</i> or <i>Panicum queenslandicum</i> but can also include various shrubs and trees. This community occurs on cracking clay soils within the Liverpool Plains Catchment.	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.
Weeping Myall Woodlands (EPBC) Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South western Slopes bioregions (TSC)	E	E	This woodland is dominated by <i>Acacia pendula</i> (Weeping Myall). It is scattered through the eastern parts of alluvial plains of the Murray-Darling river system. It is generally found on red-brown earths and heavy textured grey brown alluvial soils. The canopy layer reaches 10m in height with an open understorey of chenopod shrubs and other woody plant species. The ground layer is an open to continuous groundcover of grasses and herbs.	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC) White Box-Yellow Box-Blakely's Red Gum Grassy Woodland (TSC)	E	CE	This woodland is found on fertile soils on the tablelands and western slopes of NSW. The distribution of the community spreads between NSW North Coast, New England Tableland, Nandewar, Brigalow Belt, South, Sydney Basin, South Eastern Highlands and NSW South Western Slopes Bioregions. The characteristic species for this woodland are <i>Eucalyptus albens</i> , <i>Eucalyptus melliodora</i> or <i>Eucalyptus blakelyi</i> . Grass and herbaceous species generally characterise the ground layer. In some locations canopy species may be entirely absent due to clearing. Shrubs are generally sparse or absent.	This community was not identified on site during targeted surveys (refer to Appendix 7). Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.
<i>Cadellia pentastylis</i> (Ooline) community in the Nandewar and Brigalow Belt South Bioregions (TSC)	E	-	The Ooline community is an unusual and distinctive forest community with the canopy dominated by the tree Ooline (<i>Cadellia pentastylis</i>). Other canopy species include White Box (<i>Eucalyptus albens</i>), Ironbarks (<i>E. beyeriana</i> and <i>E. melanophloia</i>), Dirty Gum (<i>E. chloroclada</i>), Narrow-leaved Grey Box (<i>E. pilligaensis</i>), Green Mallee (<i>E. viridis</i>) and White Cypress Pine (<i>Callitris glaucophylla</i>). The understorey is made up of a range of shrubs such as Wattles and grasses. and ecology Usually occurs on undulating terrain on a variety of soil types, between 300-450 m altitude	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions (TSC)	E	-	Community occurs on brown loam or clay, alluvial or colluvial soils on prior streams and abandoned channels or slight depressions on undulating plains or flats of the western slopes. Community often occurs upslope from River Red Gum communities above frequently inundated areas of the floodplain. It also occurs on colluvium soils on lower slopes and valley flats. Less than 5% of the original extent is estimated to remain. Shrubs include Wilga, Deane's Wattle, Hop Bush, Cassia, Water Bush and Sifton Bush.	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.

Ecological Community	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions (TSC)	E	E	<p>The main canopy is dominated by rainforest species such as Red Olive Plum (<i>Cassine australis</i> var. <i>angustifolia</i>), Wilga (<i>Geijera parvifolia</i>) Native Olive (<i>Notelaea microcarpa</i> var. <i>microcarpa</i>) and Peach Bush (<i>Ehretia membranifolia</i>), with taller eucalypts and cypress pines from surrounding woodland vegetation emerging above the main canopy. Currant Bush (<i>Carissa ovata</i>) is often present and typical vines include Gargaloo (<i>Parsonsia eucalytophylla</i>) and Wonga Vine (<i>Pandorea pandorana</i>). and ecology</p> <p>This community often occurs on rocky hills, in deep, loam, high nutrient soils derived from basalt or other volcanic rocks, in areas which are sheltered from frequent fire.</p>	This community was not identified on site during targeted surveys. Therefore, it is considered unlikely to occur.	As this community is unlikely to occur on site it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this community.

Species	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
<i>Bertya opposens</i>		V	V	Grows on slightly elevated ridges with moderately coarse, sandy soil. The vegetation ranges from mallee shrubland to open woodland.	This species was not recorded on site and no records exist within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. This species preferred habitat specifically elevated ridges in association with mallee shrubland does not occur on site. Therefore, it is considered unlikely to occur on site.	This species is unlikely to occur on site due to the lack of suitable habitat. Therefore, it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Cadellia pentastylis</i>	Ooline	V	V	Ooline occurs on the western edge of the NSW north-west slopes. Ooline grows in dry rainforest, semi-evergreen vine thickets and sclerophyll ecological communities, often locally dominant or as an emergent. Prefers high fertile soils.	No records for this species exist within a 10km radius of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. This species was not detected during comprehensive field surveys to spite it being a distinctive looking small tree. Suitable habitat on site is also sub-optimal. Therefore, it is considered unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Dichanthium setosum</i>	Bluegrass	V	V	Bluegrass is associated with heavy basaltic black soils and stony red-brown hard setting loam with clay subsoil. It is found in moderately disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pasture.	Records for this species exist within 10km of the site (NSW Wildlife Atlas). The Protected Matters Search predicted that this species has potential to occur. Although, it was not recorded during field surveys. Although these soils do not exist on site, there are areas of disturbance where this species could inhabit. Therefore it is considered as having potential to occur.	Due to this species inhabiting disturbed areas, there is potential for it to be impacted upon as a result of the proposal if it does persist on site. <i>Therefore, this species has been assessed by a 7-Part Test below and in Appendix 5.</i>
<i>Digitaria porrecta</i>	Finger Panic Grass	E	E	<p>In NSW, the most frequently recorded associated tree species are <i>Eucalyptus albens</i> and <i>Acacia pendula</i>. Common associated grasses and forbs in NSW sites include <i>Austrostipa aristiglumis</i>, <i>Enteropogon acicularis</i>, <i>Cyperus bifax</i>, <i>Hibiscus trionum</i> and <i>Neptunia gracilis</i>. Flowering season is summer or late summer from mid-January to late February, with seeds maturing and falling from the plant soon after.</p> <p>Native grassland, woodlands or open forest with a grassy understorey, on richer soils. Often found along roadsides and travelling stock routes where there is light grazing and occasional fire.</p> <p><i>Digitaria porrecta</i> is a perennial tussock-forming grass that can vegetatively reproduce.</p>	Records for this species exist within 10km of the site (NSW Wildlife Atlas). The Protected Matters Search predicted that this species has potential to occur. Although, it was not recorded during field surveys. Although richer soils do not exist on site, there are areas of disturbed woodland with a grassy understorey where this species could inhabit. Therefore, it is considered as having potential to occur.	Due to this species inhabiting woodland with a grassy understorey, there is potential for it to be impacted upon as a result of the proposal if it does persist on site. <i>Therefore, this species has been assessed by a 7-Part Test below and in Appendix 5.</i>

Species	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
<i>Prasophyllum</i> sp. Wybong (C.Phelps ORG 5269)	A Leek-orchid		CE	A perennial orchid, appearing as a single leaf over winter and spring. Flowers in spring and dies back to a dormant tuber over summer and autumn. Known to occur in open eucalypt woodland and grassland.	This species was not recorded within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. The field surveys were conducted during the flowering season and it was not detected during field surveys. Eucalypt woodland in which this species can occur do exist within the site. Therefore, it is considered as having potential to occur.	This species is considered to have potential to occur on site. Therefore, it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed in Appendix 5.</i>
<i>Lepidium aschersonii</i>	Spiny Pepper-cress	V	V	Spiny Peppercress is endemic to mainland southern Australia, where it is widely but patchily distributed from north-eastern New South Wales to Western Australia. There are currently thought to be about 30 populations of Spiny Peppercress with only 14 population records existing within NSW. Occurs in periodically wet sites such as gilgai depressions and the margins of freshwater and saline marshes and shallow lakes, usually on heavy cracking clay soil.	This species has been recorded 18 times within 10km of the site (NSW Wildlife Atlas) and the Protected Matters Search predicted that this species has potential to occur. However, it was not detected during field surveys. No periodically wet habitat or heavy cracking clay soils exist on site. Therefore, it is considered as having unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Pterostylis cobarensis</i>	Cobar Greenhood Orchid	V	V	Cobar Greenhood Orchid is known chiefly from the Nyngan–Cobar–Bourke district in the far western plains of NSW. Grows among rocks on low hills and on slopes above streams. Inhabits eucalypt woodland, open mallee, or <i>Callitris</i> shrubland on low stony ridges and slopes with skeletal sandy-loam soils.	This species was not recorded within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Although it was not detected during field surveys. The surveys were not conducted within the flowering period for this cryptic species. Eucalypt woodland in which this species can occur and associated species including <i>Callitris glaucophylla</i> , do exist within the site. Therefore, it is considered as having potential to occur.	This species is considered to have potential to occur on site. Therefore, it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test(Appendix 6) and in Appendix 5.</i>
<i>Rulingia procumbens</i>		V	V	Endemic to NSW and is known from the Dubbo–Medooran–Gilgandra region, the Cobar region, and the upper Hunter Valley. Populations of this species have been recorded in Goonoo State Forest (SF), Mt Kaputar National Park, and Pilliga Nature Reserve. Occurs in sandy soils, often in disturbed habitats such as road verges, quarry boundaries, gravel stockpiles, and power line easements.	No records for this species exist within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Although it was not detected during field surveys. Sandy soils which this species prefers are present and the site is currently in a disturbed state. It is therefore, considered as having potential to occur.	The disturbed area in which this species could occur is being cleared and hence impacted upon. For this reason there is potential for the proposal to impact upon this species if it does occur on site. <i>Therefore, this species has been assessed by a 7-Part (Appendix 6) and in Appendix 5</i>
<i>Swainsona murrayana</i>	Slender Darling Pea	V	V	Found in grassland, herbland, and open Black-box woodland, often in depressions. This species grows in heavy grey or brown clay, loam, or red cracking clays. It is often associated with low chenopod shrubs (<i>Maireana</i> spp.), wallaby-grass (<i>Austrodanthonia</i> spp), and spear grass (<i>Austrostipa</i> spp.).	This species has been recorded within 10km of the site. (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. It was not detected during field surveys and suitable habitats with the appropriate soils do not occur on site. Therefore, it is considered unlikely to occur.	This species is unlikely to occur, therefore is unlikely to be impacted upon as a result of the proposal. An AoS is not required for this species.
<i>Tylophora linearis</i>		V	E	<i>Tylophora linearis</i> has rarely been collected and is known from eight localities in the Dubbo area and Mt Crow near Barraba in NSW. Grows in dry scrub, open forest and woodlands associated with <i>Melaleuca uncinata</i> , <i>Eucalyptus fibrosa</i> , <i>E. sideroxylon</i> , <i>E. albens</i> , <i>Callitris endlicheri</i> , <i>C. glaucophylla</i> , <i>Allocasuarina luehmannii</i> , <i>Acacia hakeoides</i> , <i>A. lineata</i> , <i>Myoporum</i> spp., and <i>Casuarina</i> spp.	This species has not been recorded within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Although, it was not detected during field surveys. However, some sub-optimal habitat does occur on site therefore, it is considered to have potential to occur on site.	This species is considered to have potential to occur on site. Therefore, it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6) and in Appendix 5.</i>

Species	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
<i>Circus assimilis</i>	Spotted Harrier	V	M	Occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges. Individuals disperse widely in NSW and comprise a single population. Grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe (e.g. chenopods). It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	This species could utilise the site to forage for prey such as small birds and mammals. Therefore, there is potential for it to occur on site.	This species is considered to have potential to occur on site. Therefore, it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6) and in Appendix 5.</i>
<i>Erythroriorchis radiatus</i>	Red Goshawk	E	V	Red Goshawks are found from across northern Australia, down the east coast of Qld and into the northern coast of NSW. In NSW records are rare. Listed as having occurred south to Port Stephens. Its habitat consists of wooded and forested areas. Prefers forest and woodland with a mosaic of vegetation types, large populations of birds for prey and permanent water. Riverine vegetation is highly utilised by this species. Its habits are not well known, but it is considered to be a solitary, sedentary bird. They nest in tree forks of <i>Eucalypt</i> sp. and <i>Melaleuca</i> sp. or those nests of other large birds such as Magpies or Crows. The nests are generally built of sticks, which are lined with soft twigs and leaves.	This species distribution in NSW is restricted to the north-eastern coast. Therefore, it is unlikely for this species to occur.	As this species is unlikely to occur, it is also unlikely to be impacted as a result of the proposal.
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler	V		Occupies open forests and woodlands, Acacia shrubland and adjoining farmland. Also Box-Gum Woodlands on the divide slopes and Box-Cypress Pine and open Box Woodlands on the plains. They feed on terrestrial invertebrates and insects on lower trunks and branches. Generally they prefer wooded areas with an intact ground cover, although in such areas as the Hunter Valley they occur in sparsely vegetated areas such as properties and golf courses. Appears unable to persist in cleared and highly fragmented habitats. Nest comprise of a dome shape stick nest which is often only a couple of metres from the ground in shrubs or Eucalypt saplings.	This species has been recorded within 10km of the site (NSW Wildlife Atlas). Although, it was not detected during field surveys, some habitat does occur on site. Therefore, it is considered to have potential to occur on site.	This species is considered to have potential to occur on site. Therefore, it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6).</i>
<i>Phascolarctos cinereus</i>	Koala	V	V	Koalas occur along the east coast of Australia and extend into Woodland, Mulga and River Red Gum forests west of the Great Dividing Range. The range of the Koala covers all such suitable areas of NSW. In drier forested areas, Koalas are generally observed as individuals in low densities. They are more abundant in coastal woodland and in open forest, where they have been found in densities as high as ten individuals per hectare. They are rare or absent in wet forests in the southern part of their range above 600 m which may be due more to distribution of Eucalypt species than climate, as the Koala is limited to areas where there are acceptable food trees. The diet is generally restricted to that of Eucalypt leaves. On occasion, non-Eucalypt foliage is eaten. The foliage of <i>Eucalyptus camaldulensis</i> (River Red Gum), <i>E. microcorys</i> (Tallowwood), <i>E. tereticornis</i> (Forest Red Gum), <i>E. punctata</i> (Grey Gum), <i>E. viminalis</i> (Ribbon Gum) and <i>E. robusta</i> (Swamp Mahogany) are some of the preferred Eucalypt species.	Various records for this species occur within 10km of the site (NSW Wildlife Atlas). Secondary feed trees used by this species do occur on site, although surveys did not locate this species or signs of this species on site. Nevertheless it is considered as having potential to occur.	Due the low number of non-preferred feed trees to be removed by the proposal, this species is unlikely to be impacted by the proposed action. <i>Nevertheless, as there is some degree of likelihood that this species occurs within the site, it has been assessed by a 7-Part Test (Appendix 6) and in Appendix 5.</i>
<i>Underwoodisaurus sphyrurus</i>	Border Thick-tailed Gecko	V	V	<i>U. sphyrurus</i> has a patchy distribution spread throughout the north-west slopes and northern tablelands of NSW. Habitat preferred by this species is dry sclerophyll open forest and woodland associated with outcrops of granite, basalt, sandstone and metamorphic rocks. Most known populations occur on sites with granite rocks. Sites favouring an easterly aspect have also been found to harbour more populations of this species. This species has been known to shelter under rocks, barks, logs and litter in rocky rubble.	This species was not recorded on or within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. No suitable habitat in the form of granite rocky outcrops occurs on site. Therefore it is considered unlikely to occur.	Due to lack of suitable habitat this species is unlikely to occur. Therefore, this species is considered unlikely to be impacted by the proposal and an AoS is not required
<i>Anomalopus mackayi</i>	Five-clawed Worm-skink	E	V	The species' known distribution in New South Wales is confined to the Namoi River and Gwydir River floodplains and the lower north-western slopes of the Great Dividing Range. The species ranges from the Wallangra-Masterman Range area in the east, south-west to the Narrabri-Wee Waa area, west along the northern edge of the Pilliga outwash demarcation to the south-west corner of the Namoi catchment south of Walgett. Known to occur in both remnant and non-remnant woodlands with low grass cover. Individuals also occur in open grassy paddocks with scattered eucalypts and moist black soil. It uses fallen logs and timber as sheltering sites and digs in loose soil to create permanent tunnel like burrows. In areas modified by agriculture and other human activities, the species has been found sheltering under artificial materials lying flat on the ground, such as discarded railway sleepers, sheet metal and hay bales.	This species was not recorded on site or within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. The soil on the site is not the preferred substance in which this species burrows in. Therefore it is considered unlikely to occur.	This species is unlikely to occur on site, therefore it is unlikely to be impacted upon as a result of the proposed actions and an AoS is not required for this species.

Species	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V		Found mainly in dry eucalypt forests and woodlands, cypress woodland and occasionally in rainforest or moist eucalypt forest. Favours streamside areas, particularly in drier habitats. Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. The main prey is tree frogs although lizards and small mammals are also taken.	This species has been recorded within 10km of the site (NSW Wildlife Atlas). Although, it was not detected during field surveys, some sub-optimal habitat does occur on site. Therefore, it is considered to have potential to occur on site.	This species is considered to have potential to occur on site. Therefore, it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6).</i>
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E, M	Nomadic Honeyeater that disperses to non-breeding areas, including the coast, in winter, where flowering trees are sought. Within the region, mostly recorded in Box-Ironbark Eucalypt associations along creek flats, river valleys and foothills. Coastal swamp forests in Lower Hunter are used when more western resources fail. The main feed tree for coastal areas is <i>Eucalyptus robusta</i> (Swamp Mahogany). Hunter records are more common in near coastal areas such as Cessnock LGA. Feed trees in this region are <i>Corymbia maculata</i> (Spotted Gum), <i>E. fibrosa</i> (Broad-leaved Ironbark), <i>E. crebra</i> (Narrow-leaved Ironbark) and various stringybark sp.. Nests mainly west of the divide, although local breeding attempts have occurred at Quorrobolong.	This species has not been recorded within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Although it was not recorded during field surveys. Flowering Eucalypt blossoms are scarce (4 individual trees) within the site in which this species could potentially forage. Therefore, due to the scarcity of habitat and the lack of records in the vicinity, it is considered unlikely to occur.	This species is unlikely to occur on site, therefore it is unlikely to be impacted upon as a result of the proposed actions and an AoS is not required for this species.
<i>Geophaps scripta scripta</i>	Squatter Pigeon	E	V	Occurs on the inland slopes of the Great Dividing Range with a distribution that extends from the Burdekin-Lynd divide in central Queensland, west to Charleville and Longreach, east to the coast from Prosperine to Port Curtis, and south to scattered sites in south-eastern Queensland. Inhabits grassy woodlands and open forests that are dominated by eucalypts. No confirmed records have been made since the 1970s.	No records exist within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Although, it was not detected during field surveys. No records have been made since the late 1970s, therefore, it is considered unlikely to occur.	This species was considered unlikely to occur. Therefore it is unlikely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Leipoa ocellata</i>	Malleefowl	E	V, M	Inhabits semi-arid regions of southern Australia. In New South Wales, it typically occurs west of the Great Dividing Range. Extends from Pilliga south-west to the districts of Griffith and Wentworth. The extent of occurrence is known to be decreasing. The distribution of the Malleefowl was formerly more extensive, extending over a large proportion of mainland southern Australia, including the south-western region of the Northern Territory. Occupies shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine <i>Callitris</i> woodlands, acacia shrublands, Broombush <i>Melaleuca uncinata</i> vegetation or coastal heathlands.	No records exist within 10km of the site for this species (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Callitris and Acacia woodlands do persist on site and they provide sub-optimal habitat. Therefore, it is considered to have potential to occur on site.	This species is considered to have potential to occur on site. Therefore it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6) and in Appendix 5.</i>
<i>Polytelis swainsonii</i>	Superb Parrot	V	V	The Superb Parrot occurs only in south-eastern Australia. The Superb Parrot is found in NSW and northern Victoria, where it occurs on the inland slopes of the Great Divide and on adjacent plains, especially along the major river-systems; vagrants have also been recorded in southern Queensland. Mainly inhabits forests and woodlands dominated by eucalypts, especially River Red Gums (<i>Eucalyptus camaldulensis</i>) and box eucalypts such as Yellow Box (<i>Eucalyptus melliodora</i>) or Grey Box (<i>E. microcarpa</i>). The species also seasonally occurs in box-pine (<i>Callitris</i>) and Boree (<i>Acacia pendula</i>) woodland.	This species has been recorded within 10km of the (NSW Wildlife Atlas) and the Protected Matters Search predicted that this species has potential to occur. Suitable eucalypt species (four individual trees) and <i>Callitris</i> (which provides seasonal habitat) do exist on site in which this species could forage. Therefore, it is considered as having potential to occur.	This species is unlikely to be impacted upon as a result of the proposed actions. <i>Nevertheless, as there is some degree of likelihood that this species occurs seasonally within the site, it has been assessed by a 7-Part Test (Appendix 6) and in Appendix 5.</i>
<i>Rostratula australis</i>	Australian Painted Snipe	E	V, M	A small freshwater and estuarine wader, which prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	No suitable habitat exists on site for this species. Therefore it is considered unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	This species forages in tall open forests and the edges of rainforest. It roosts in mine shafts and similar structures. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of <i>Hirundo ariel</i> (Fairy Martin), frequenting low to mid-elevation dry open forest and woodland close to these features.	No records for this species exist within 10km of the site (NSW Wildlife Atlas) and suitable habitat is not present. It is therefore, considered unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Nyctophilus timoriensis</i> (South-eastern form)	Greater Long-eared Bat	V	V	This species has not been recorded within 10km of the site. Its distribution is limited to the Murray-Darling Basin and records are scattered within this region. Occurs in a range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands. An insectivorous species that commonly feeds on moths, beetles and crickets.	This species has not been recorded within 10km of the site and records are rare. Sub-optimal habitat occurs on site for this species. It is considered unlikely to occur on site.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AOS is not required for this species.

Species	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
<i>Petrogale penicillata</i>	Brush-tailed Rock Wallaby	E	V	Occurs in forests and woodlands along the Great Divide and on the western slopes in escarpment country with rocky outcrops, steep rocky slopes, gorges, boulders and isolated rocky areas. The majority of populations favour north-facing aspects, but some southern aspects have been recorded. Apart from the critical rock structure <i>Petrogale penicillata</i> also requires adjacent vegetation types, associated types include, dense rainforest, wet sclerophyll, vine thicket, dry sclerophyll forest and open forest.	No records for this species exist within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. No suitable habitat in the form of rocky outcrops exists on site. Therefore, it is considered unlikely to occur on site.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Pseudomys pilligaensis</i>	Pilliga Mouse	V	V	This species is known only from the Pilliga region of NSW including the Pilliga state forest and Pilliga nature reserve. A defined habitat for this species is hard to characterise as the vegetation type in which this species has been found varies. Eucalypt, Callitris and Acacia woodlands are vegetation types in which this species has been found. It has been found mostly in gullies that have experienced recent fire events. Habitat features that appear to be preferential for this species include a moderate to high low-shrub cover; site moisture retention; and groundcover of plants, litter and fungi. Topography of sites where this species is found include rolling landscapes with low relief on sandy soil and sandstone ridges.	Records for this species do not exist within 10km of the site (NSW Wildlife Atlas) and the site is outside of this species' known range (the 'Pilliga' region). Therefore, it is considered unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Anseranas semipalmata</i>	Magpie Goose	V		Often seen in trios or flocks of 100 to 5,000, on shallow wetlands (especially those with a dense growth of rushes or sedges), drying ephemeral swamps, wet grasslands and floodplains, often roosting in fringing Paperbarks (<i>Melaleuca</i> spp.). The diet of this species is composed of grass seeds and sedge rhizomes.	Records for this species exist within 10km of the site (NSW Wildlife Atlas). Suitable habitat in the form of wetlands and swamps do not occur on site. Therefore, it is unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V		<i>Calyptorhynchus lathami</i> (Glossy Black-Cockatoo) is sparsely distributed along the east coast and immediate inland districts from western Victoria to Rockhampton in Queensland. In NSW, the species is found as far west as Cobar to Hillston and Griffith in isolated mountain range. The inland distribution of the species is restricted by the occurrence of the various <i>Casuarinaceae</i> spp. <i>C. lathami</i> characteristically inhabits forests on sites with low soil-nutrients status, reflecting the distribution of key <i>Allocasuarina</i> spp. The drier forest types with intact and less rugged landscapes are preferred by the species. It prefers highlands towards the north but may be found closer to the coast where conditions are suitable. In the south they are widespread in lowland coastal forests, dense mountain forests, semi-arid woodland and trees bordering water courses.	Records for this species exist within 10km of the site (NSW Wildlife Atlas). However, suitable habitat in the form of <i>Casuarinaceae</i> spp. do not occur on site. Therefore, it is unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Chthonicola sagittata</i>	Speckled Warbler	V		Speckled Warbler ranges in South-Eastern Australia, from South-West Victoria through eastern New South Wales to Central Queensland, mostly on the western slopes and tablelands of the Great Dividing Range, and in the drier areas of coast. They live in a wide range of Eucalypt dominated vegetation that has a grassy and shrubby understorey often on rocky ridges or gullies. It is a sedentary species with a home range that varies from 6-12 hectares. This species appears to be extinct from areas without vegetation fragments larger than 48.2ha. Prefers woodland areas where ground cover consists of shrubs, grass, fallen leaves and bark. This ground foraging bird feeds on insects, insect larvae and small seeds.	Records for this species exist within 10km of the site (NSW Wildlife Atlas), but it was not detected during field surveys. Suitable habitat in the form of open woodlands on site for this species. Therefore, it is considered as having potential to occur.	This species is considered to have potential to occur on site. Therefore, it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6).</i>
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		This species is more commonly encountered in near coastal habitats and on the divide. Habitat is mainly dry, open sclerophyll forests and woodlands, usually dominated by Eucalyptus, sometimes in plantations of <i>Eucalyptus cladocalyx</i> (Sugar Gum). They can be found in large flocks of hundreds of birds spread out across blossoming eucalypts. Movements of Little Lorikeets are largely unknown, but the belief is that they follow abundant blossom. Some areas they are sedentary and move within the local area in response to blossom. Nesting of <i>G. pusilla</i> consists of holes, including knotholes, in bend, top or side of limb, usually living or in main trunk of tree, occasionally over water, recorded in <i>Eucalyptus camaldulensis</i> (River Red Gum), <i>Eucalyptus grandis</i> (Flooded Gum) and <i>Casuarina cunninghamiana</i> (River Oak).	Records for this species exist within 10km of the site (NSW Wildlife Atlas). Suitable foraging habitat occurs on site Suitable eucalypt species (four individual trees) do exist on site in which this species could forage. Therefore it is considered as having potential to occur.	This species is considered to have potential to occur on site. Therefore it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6).</i>
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		The Varied Sittella can be reasonably common in some areas and also nomadic in others, where as they also can be sedentary. Habitat across the varying races is similar, although they can be found in a wide range of habitats. Open eucalypt forests and woodlands are the preferred habitat, but this species may also be found in mallee, coastal tea-tree scrubs, inland acacia communities, golf courses orchards and scrubby gardens. The nest of the Varied Sittella consists of deep cup of bark which is well camouflaged with spider's web and lichen. They favour the use of tree species for nesting such as Eucalypts, paperbarks, she-oaks and tea-trees.	Records for this species exist within 10km of the site (NSW Wildlife Atlas), but it was not detected on site during surveys. Suitable foraging habitat occurs on site Suitable eucalypt species (four individual trees) do exist on site in which this species could forage. Therefore it is considered as having potential to occur.	This species is considered to have potential to occur on site. Therefore it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6).</i>

Species	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
<i>Tyto longimembris</i>	Eastern Grass Owl	V		<p>Eastern Grass Owls are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. They rest by day in a 'form' - a trampled platform in a large tussock or other heavy vegetative growth.</p> <p>If disturbed they burst out of cover, flying low and slowly, before dropping straight down again into cover.</p> <p>Always breeds on the ground. Nests are found in trodden grass, and often accessed by tunnels through vegetation.</p> <p>Breeding season is highly variable and dependent on environmental conditions, but in NSW nesting most typically occurs in autumn or winter.</p>	<p>Records for this species exist within 10km of the site (NSW Wildlife Atlas) and suitable habitat in the form of areas of tall grass do occur on site. Therefore, it is considered to have potential to occur.</p>	<p>This species is considered to have potential to occur on site. Therefore it has potential to be impacted upon as a result of the proposed actions.</p> <p><i>As there is potential for impact upon this species it is assessed by a 7-Part Test (Appendix 6).</i></p>
<i>Stictonetta naevosa</i>	Freckled Duck	-	V	<p>Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.</p> <p>Generally rest in dense cover during the day, usually in deep water. Feed at dawn and dusk and at night on algae, seeds and vegetative parts of aquatic grasses and sedges and small invertebrates.</p> <p>Nesting usually occurs between October and December but can take place at other times when conditions are favourable.</p> <p>Nests are usually located in dense vegetation at or near water level.</p>	<p>Records for this species exist within 10km of the site (NSW Wildlife Atlas). However, suitable habitat of permanent or ephemeral freshwater water bodies do not occur on site. Therefore, it is unlikely to occur.</p>	<p>This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.</p>
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	-	E	<p>Black-necked Storks are mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation.</p> <p>They mainly forage in shallow, still water, preferring open wetlands, and taking a variety of prey, including eels and other fish, frogs, turtles, snakes, and small invertebrates, such as crabs and small insects. Vertebrates form the main mass of the diet, with medium-sized eels contributing the greatest biomass and were also the only food seen to be delivered to nestlings.</p> <p>In NSW, Black-necked Storks breed in late spring and summer.</p> <p>In NSW, Storks usually nest in a tall, live and isolated paddock tree, but also in other trees, including paperbarks, or even lower shrubs within wetlands. The nest is a large platform, 1-2 m in diameter, made in a live or dead tree, in or near a freshwater swamp.</p> <p>The clutch-size of nests in NSW is not properly known, but nests have been observed with from one to three young in the nest. Broods of four young have been recorded in northern Queensland.</p>	<p>Records for this species exist within 10km of the site (NSW Wildlife Atlas). However, suitable habitat of permanent or ephemeral water bodies do not occur on site. Therefore, it is unlikely to occur.</p>	<p>This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.</p>
<i>Apus pacificus</i>	Fork-tailed Swift		M	<p>This incredibly fast swift has a wide distribution covering most of the Australian continent. In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide, however, a few populations have been found west of the Great Divide. These are widespread but scattered further west of the line joining Bourke and Dareton. Sightings have been recorded at Milparinka, the Bulloo River and Thurloo Downs (Higgins 1999). The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. They mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh (Higgins 1999).</p>	<p>The Protected Matters Search predicted that this species has potential to occur. Although, it was not recorded during field surveys. Due to the wide variety of habitats in which this species occurs, it cannot be ruled out from occurring on site. Therefore, it is considered as having potential to occur on site.</p>	<p>This species is considered to have potential to occur on site. Therefore it has potential to be impacted upon as a result of the proposed actions.</p> <p><i>As there is potential for impact upon this species it is further assessed in Appendix 5</i></p>
<i>Ardea alba</i>	Great Egret		M	<p>This species is wide spread across Australia, occurring in wetland habitats such as estuaries, littoral habitats and moist grasslands (Marchant and Higgins 1990). They regularly use areas inundated with water such as freshwater meadows, flooded grasslands, ovals, pastoral lands and agricultural lands. Also regularly use saline habitats. They breed in wetlands fringed with trees or tall vegetation.</p>	<p>Records for this species exist within 10km of the site (NSW Wildlife Atlas). However, suitable habitat of permanent or ephemeral water bodies do not occur on site. Therefore, it is unlikely to occur.</p>	<p>This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.</p>

Species	Common Name	TSC Act Status	EPBC Act Status	Habitat	Likelihood of Occurrence	Potential for Impact
<i>Ardea ibis</i>	Cattle Egret		M	<i>A. ibis</i> is distributed widely across Australia, occupying most of the continent with the exception of the arid western centre. The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. It has occasionally been seen in arid and semi-arid regions, however, this is extremely rare. High numbers have been observed in moist, low-lying poorly drained pastures with an abundance of high grass; it avoids low grass pastures. It has been recorded on earthen dam walls and ploughed fields. It is commonly associated with the habitats of farm animals, particularly cattle, but also pigs, sheep, horses and deer.	The Protected Matters Search predicted that this species has potential to occur. Although, it was not recorded during field surveys. Due to the wide variety of habitats in which this species occurs, it cannot be ruled out from occurring on site. Therefore, it is considered as having potential to occur on site.	This species is considered to have potential to occur on site. Therefore it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is further assessed in Appendix 5</i>
<i>Gallinago hardwickii</i>	Latham's Snipe		M	Latham's Snipe occurs across the eastern half of Australia in fresh water wetlands and saltmarshes. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies) however, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity. This species does not breed in Australia.	Records for this species exist within 10km of the site (NSW Wildlife Atlas). However, suitable habitat of permanent or ephemeral water bodies do not occur on site. Therefore, it is unlikely to occur.	This species is unlikely to occur on site. Therefore it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle		M	The White-bellied Sea-Eagle is distributed along the coastline (including offshore islands) of mainland Australia and Tasmania. It also extends inland along some of the larger waterways, especially in eastern Australia. The White-bellied Sea-Eagle is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, the sea).	The Protected Matters Search predicted that this species has potential to occur. This species may be observed flying over the site however suitable aquatic habitat for utilisation does not occur on site. Therefore it is considered unlikely to occur.	This species is unlikely to occur on site. Therefore, it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species
<i>Hirundapus caudacutus</i>	White-throated Needletail		M	The White-throated Needletail is widespread in eastern and south-eastern Australia (Simpson and Day 2010). In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland.	The Protected Matters Search predicted that this species has potential to occur. Although there is potential for this species to fly over the site, it is unlikely to be utilising the ecological attributes of the site. Therefore it is considered unlikely to occur.	This species is unlikely to occur on site. Therefore, it is not likely to be impacted upon as a result of the proposed actions. An AoS is not required for this species
<i>Merops ornatus</i>	Rainbow Bee-eater		M	This species covers the majority of the Australian mainland with the exception of the arid western centre. Inhabits a wide variety of open country generally near water, as well as habitat edges of parks, forests and gardens (Higgins 1999). Vegetation communities in which this species is known to occur include dry open sclerophyll forest, mallee, open woodland and shrubland, Spinifex tussock grassland with scattered trees and riverine or littoral assemblages (Higgins 1999). They nest in sandy banks or level ground, mostly in river banks and similar habitats.	This species was not recorded on or within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Due to the wide range of habitats in which this species can occur, and the site being located within its known distribution, it considered as having potential to occur on site.	This species is considered to have potential to occur on site. Therefore it has potential to be impacted upon as a result of the proposed actions. <i>As there is potential for impact upon this species it is further assessed in Appendix 5</i>

Appendix 5

Assessment of Significance - EPBC Act

The EPBC Act focuses Commonwealth interests on matters of National Environmental Significance (NES) including integrated biodiversity conservation and the management of important protected areas. The matters of NES as identified in the Act which require assessment and approval to be addressed by the Commonwealth include:

- World Heritage Properties;
- National Heritage Places;
- Wetlands of International Importance;
- Great Barrier Reef Marine Parks;
- Commonwealth Marine areas;
- Nationally Threatened Species;
- Nationally Threatened Ecological Communities;
- Migratory Species;

The assessment and approval process applies to any action that has, will have or is likely to have a significant impact on a matter of NES. An 'action' is defined as a project, development, undertaking or an activity or series of activities.

The matter of NES and site-specific responses are as follows.

World Heritage Properties:

The Site is not World Heritage Property, and is not in close proximity to any such property.

Wetlands of International Importance (RAMSAR convention):

The Site is not part of any Wetland of International Importance, and is not in close proximity to any such area.

- Great Barrier Reef Marine Parks;
- The Site is not part of any Great Barrier Reef Marine Park, and is not in close proximity to any such park.
- Commonwealth Marine Areas

The proposal will not have a significantly adverse effect on any Commonwealth Marine area, as there are no such marine areas within the region.

Nationally Listed Threatened Species:

Threatened species listed under the EPBC Act, which occur, or have the potential to occur within the locality (10km radius) have been assessed for their potential to occur within the site (**Appendix 4**). Those threatened species that were considered to have potential to occur and subsequently may be impacted by the proposal is as follows:

Those EPBC listed threatened species considered to have potential to occur are:

- | | | |
|---------------------------------|------------------------|---|
| ▪ <i>Pterostylis cobarensis</i> | Cobar Greenhood Orchid | V |
| ▪ <i>Rulingia procumbens</i> | | V |
| ▪ <i>Tylophora linearis</i> | | E |
| ▪ <i>Phascolarctos cinereus</i> | Koala | V |

▪ <i>Leipoa ocellata</i>	Malleefowl	V
▪ <i>Polytelis swainsonii</i>	Superb Parrot	V

These threatened species require assessment under the EPBC Act significant Impact Guidelines 1.1 with regards to the relevant significant impact criteria.

Critically endangered and endangered species - Significant Impact Criteria Assessment

Significant Impacts	<i>Tylophora linearis</i>
Lead to a long-term decrease in the size of a population	Unlikely. This species was not recorded on site and only suboptimal habitat of woodlands associated with <i>C. glaucophylla</i> occurs on site. Due to the large area of more suitable habitat within the wider area, <i>Tylophora linearis</i> will not be losing any significant habitat due to the proposed activities on site. Therefore no long-term decrease in population size will occur.
Reduce the area of occupancy of the species	Unlikely. This species was not recorded on site so it is unlikely that its area of occupancy on site will be reduced as a result of the proposed activities.
Fragment an existing population into two or more populations	No. No existing populations are known on site or within 10km of the site(Wildlife Atlas Search). Therefore, it is unlikely that any populations will be fragmented as a result of this project.
Adversely affect habitat critical to the survival of a species	No. No critical habitat for this species exists on site.
Disrupt the breeding cycle of a population	Unlikely. The area is potentially used for breeding (propagation). However, due to the large area of more suitable habitat in the form of 'woodlands associated with <i>C. glaucophylla</i> ', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)), the size of the potential breeding habitat on site (2.07ha) is not considered to be significant. The impacts of the proposed actions are therefore, not considered likely to disrupt the breeding cycle of this species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely. Although 2.07ha of potential albeit sub-optimal habitat would be reduced, given the large area of more suitable habitat in the form of 'woodlands associated with <i>C. glaucophylla</i> ', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)),it is considered unlikely that the impacts would cause this species to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely. It is unlikely that the impacted area will increase invasive species, such as exotic weed or pest species becoming established to any greater degree than what already exists.
Introduce disease that may cause the species to decline, or	Unlikely. There are no diseases which have been associated with the decline of this species. As a consequence the proposed activities are not expected to introduce any diseases that may cause this species to decline.
Interfere with the recovery of the species.	Unlikely. Due to the small area of impact and the large extent of more suitable habitat available for this species within the surrounding area, it is considered unlikely that the impacts of the proposal will substantially interfere with the recovery of the species.

Vulnerable species – Significant Impact Criteria Assessment

Significant Impacts	<i>Pterostylis cobarensis</i>	<i>Rulingia procumbens</i>	Superb Parrot	Malleefowl	Koala
Lead to a long-term decrease in the size of an important population of a species	Unlikely. This species was not recorded on site and The site does not contain preferred habitat of rocks, slopes or low hills. However, potential habitat for this species occurs within the disturbed Callitris woodlands on the site. Due to the large area of more suitable habitat within the wider area, <i>Pterostylis cobarensis</i> will not be losing any significant habitat due to the proposed activities on site. Therefore, no long-term decrease in population size will occur.	Unlikely. This species was not recorded on site and The site does contain the preferred habitat of sandy soils, often in disturbed habitats. Due to the large area of more suitable habitat within the wider area, <i>Rulingia procumbens</i> will not be losing any significant habitat due to the proposed activities on site. Therefore, no long-term decrease in population size will occur.	Potential habitat of Eucalypt woodlands and Callitris woodlands occur within the disturbed woodlands on the site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal. Unlikely. This species was not recorded on site and The site does contain suitable Eucalypt species (four individual trees) and Callitris (which provides seasonal habitat) in which this species could forage. Due to the large area of more suitable habitat within the wider area, Superb Parrot will not be losing any significant habitat due to the proposed activities on site. Therefore no long-term decrease in population size will occur.	Unlikely. This species was not recorded on site and The site does contain suitable Eucalypt woodlands and Callitris woodlands in which this species could forage. Due to the large area of more suitable habitat within the wider area, Malleefowl will not be losing any significant habitat due to the proposed activities on site. Therefore no long-term decrease in population size will occur.	Unlikely. This species was not recorded on site and only suboptimal foraging habitat is present (four individual secondary feed trees). Due to the large area of more suitable habitat within the wider area, the Koala will not be losing any significant habitat due to the proposed activities on site. Therefore no long-term decrease in population size will occur.
Reduce the area of occupancy of an important population	Unlikely. This species was not recorded on site so it is unlikely that its area of occupancy on site will be reduced as a result of the proposed activities.	Unlikely. This species was not recorded on site so it is unlikely that its area of occupancy on site will be reduced as a result of the proposed activities.	Unlikely. This species was not recorded on site so it is unlikely that its area of occupancy on site will be reduced as a result of the proposed activities.	Unlikely. This species was not recorded on site so it is unlikely that its area of occupancy on site will be reduced as a result of the proposed activities.	Unlikely. This species was not recorded on site so it is unlikely that its area of occupancy will be reduced as a result of the proposed activities.

Significant Impacts	<i>Pterostylis cobarensis</i>	<i>Rulingia procumbens</i>	Superb Parrot	Malleefowl	Koala
Fragment an existing important population into two or more populations	Unlikely. No existing populations are known on site. Therefore, it is unlikely that any populations will be fragmented as a result of this project.	Unlikely. No existing populations are known on site. Therefore, it is unlikely that any populations will be fragmented as a result of this project.	Unlikely. No existing populations are known on site. Therefore, it is unlikely that any populations will be fragmented as a result of this project.	Unlikely. No existing populations are known on site. Therefore, it is unlikely that any populations will be fragmented as a result of this project.	No. No existing populations are known on site so it is unlikely that any populations will be fragmented as a result of this project.
Adversely affect habitat critical to the survival of a species	No. No critical habitat for this species exists on site.	No. No critical habitat for this species exists on site.	No. No critical habitat for this species exists on site.	No. No critical habitat for this species exists on site.	No. No critical habitat for this species exists on site.
Disrupt the breeding cycle of an important population	Unlikely. The area is potentially used for breeding (propagation). However, due to the large area of more suitable habitat in the form of 'Callitris woodlands', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha))), the size of the potential breeding habitat on site (2.07ha) is not considered to be significant. The impacts of the proposed actions are therefore, not considered likely to disrupt the breeding cycle of this species.	Unlikely. The area is potentially used for breeding (propagation). However, due to the large area of more suitable habitat in the form of 'sandy soils, often in disturbed habitats', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha))), the size of the potential breeding habitat on site (2.07ha) is not considered to be significant. The impacts of the proposed actions are therefore, not considered likely to disrupt the breeding cycle of this species.	Unlikely. The area is potentially used for breeding. However, due to the large area of more suitable habitat in the form of 'Suitable Eucalypt species and Callitris (which provides seasonal habitat) in which this species could forage', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha))), the size of the potential breeding habitat on site (2.07ha) is not considered to be significant. The impacts of the proposed actions are therefore, not considered likely to disrupt the breeding cycle of this species.	Unlikely. The area is potentially used for breeding. However, due to the large area of more suitable habitat in the form of 'Eucalypt woodlands and Callitris woodlands in which this species could forage', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha))), the size of the potential breeding habitat on site (2.07ha) is not considered to be significant. The impacts of the proposed actions are therefore, not considered likely to disrupt the breeding cycle of this species.	Unlikely. The area is potentially used for breeding. However, due to the large area of more suitable habitat in the form of 'Eucalypt woodlands' in which this species could forage', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha))), the size of the potential breeding habitat on site (2.07ha) is not considered to be significant. The impacts of the proposed actions are therefore, not considered likely to disrupt the breeding cycle of this species.

Significant Impacts	<i>Pterostylis cobarensis</i>	<i>Rulingia procumbens</i>	Superb Parrot	Malleefowl	Koala
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely. Although 2.07ha of potential albeit sub-optimal habitat would be reduced, given the large area of more suitable habitat in the form of 'Callitris woodlands', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)), it is considered unlikely that the impacts would cause this species to decline.	Unlikely. Although 2.07ha of potential albeit sub-optimal habitat would be reduced, given the large area of more suitable habitat in the form of 'sandy soils, often in disturbed habitats', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)), it is considered unlikely that the impacts would cause this species to decline.	Unlikely. Although 2.07ha of potential albeit sub-optimal habitat would be reduced, given the large area of more suitable habitat in the form of 'Suitable Eucalypt species and Callitris (which provides seasonal habitat) in which this species could forage', nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)), it is considered unlikely that the impacts would cause this species to decline.	Unlikely. Although 2.07ha of potential albeit sub-optimal habitat would be reduced, given the large area of more suitable habitat in the form of 'Eucalypt woodlands and Callitris woodlands' in which this species could forage, nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)), it is considered unlikely that the impacts would cause this species to decline.	Unlikely. Although 2.07ha of potential albeit sub-optimal habitat would be reduced, given the large area of more suitable habitat in the form of 'Eucalypt woodlands' in which this species could forage, nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)), it is considered unlikely that the impacts would cause this species to decline..
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely. It is unlikely that the impacted area will increase invasive species, such as exotic weed or pest species becoming established to any greater degree than what already exists.	Unlikely. It is unlikely that the impacted area will increase invasive species, such as exotic weed or pest species becoming established to any greater degree than what already exists.	Unlikely. It is unlikely that the impacted area will increase invasive species, such as exotic weed or pest species becoming established to any greater degree than what already exists.	Unlikely. It is unlikely that the impacted area will increase invasive species, such as exotic weed or pest species becoming established to any greater degree than what already exists.	Unlikely. It is unlikely that the impacted area will increase invasive species, such as foxes or cats becoming established to any greater degree than what already exists.

Significant Impacts	<i>Pterostylis cobarensis</i>	<i>Rulingia procumbens</i>	Superb Parrot	Malleefowl	Koala
Introduce disease that may cause the species to decline, or	Unlikely. There are no diseases which have been associated with the decline of this species. As a consequence the proposed activities are not expected to introduce any diseases that may cause this species to decline.	Unlikely. There are no diseases which have been associated with the decline of this species. As a consequence the proposed activities are not expected to introduce any diseases that may cause this species to decline.	Unlikely. There are no diseases which have been associated with the decline of this species. As a consequence the proposed activities are not expected to introduce any diseases that may cause this species to decline.	Unlikely. There are no diseases which have been associated with the decline of this species. As a consequence the proposed activities are not expected to introduce any diseases that may cause this species to decline.	Unlikely. Due to the small amount of clearing and lack of koala presence on site, it is unlikely that the proposal will contribute to the introduction of any related diseases. As a consequence the proposed activities are not expected to introduce any diseases that may cause this species to decline.
Interfere substantially with the recovery of the species	Unlikely. Due to the small area of impact and the large extent of more suitable habitat available for this species within the surrounding area, it is considered unlikely that the impacts of the proposal will substantially interfere with the recovery of the species.	Unlikely. Due to the small area of impact and the large extent of more suitable habitat available for this species within the surrounding area, it is considered unlikely that the impacts of the proposal will substantially interfere with the recovery of the species.	Unlikely. Due to the small area of impact and the large extent of more suitable habitat available for this species within the surrounding area, it is considered unlikely that the impacts of the proposal will substantially interfere with the recovery of the species.	Unlikely. Due to the small area of impact and the large extent of more suitable habitat available for this species within the surrounding area, it is considered unlikely that the impacts of the proposal will substantially interfere with the recovery of the species.	Unlikely. Due to the small area of impact and the large extent of more suitable habitat available for this species within the surrounding area, it is considered unlikely that the impacts of the proposal will substantially interfere with the recovery of the species.

The site and the proposed location of the development footprint exists, as a previously disturbed site (~3.4 ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). This site is within close proximity to superior areas of habitat (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) which would be suitable for supporting populations of the potentially occurring above listed threatened species. The small area to be impacted upon is unlikely to be essential to the survival of populations of these listed species.

Nationally Listed Threatened Ecological Communities:

No Threatened Ecological Community (TEC), nationally listed under the EPBC Act were recorded during field surveys. However, one TEC was considered for its likelihood to occur (**Appendix 4**). As no TEC's are considered likely to occur there is no potential for impacts upon any listed TEC's.

Nationally Listed Migratory Species:

Those EPBC listed Migratory species considered to have potential to occur are:

- | | |
|---------------------------|-------------------|
| ▪ <i>Circus assimilis</i> | Spotted Harrier |
| ▪ <i>Apus pacificus</i> | Fork-tailed Swift |
| ▪ <i>Leipoa ocellata</i> | Malleefowl |
| ▪ <i>Ardea ibis</i> | Cattle Egret |
| ▪ <i>Merops ornatus</i> | Rainbow Bee-eater |

The proposed location of the development footprint exists, as a previously disturbed site with a low diversity of habitat features. The site and the proposed location of the development footprint exists, as a previously disturbed site (~3.4 ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). This site is within close proximity to superior areas of habitat (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) which would be suitable for supporting populations of the potentially occurring above listed threatened species. The small area to be impacted upon is unlikely to be essential to the survival of populations of these listed species.

This site is surrounded by superior areas of habitat, which would be suitable for the above listed Migratory species. Due to the extensive tracts of vegetation within the surrounding area, supporting the populations of the potentially occurring above species, the small area to be impacted upon is unlikely to be essential to the survival of populations of these species.

Appendix 6

7-Part Test – TSC Act

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Flora

Dichanthium setosum

Dichanthium setosum occurs chiefly on the northern tablelands in the Saumarez area, west of Armidale, and 18-30 km east of Guyra. It is more rarely found on the north-western slopes, central western slopes and north-western plains of NSW, extending west to Narrabri. *D. setosum* is associated with heavy basaltic black soils and stony red-brown hard setting loam with clay subsoil and is found in moderately disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pasture. The extent to which this species tolerates disturbance is unknown. *D. setosum* occurs within the Border Rivers–Gwydir, Central West, Namoi, Northern Rivers (NSW), South East and Fitzroy (Queensland) Natural Resources Management Regions (OEH, 2012).

Records for this species exist within 10km of the site (NSW Wildlife Atlas) and the Protected Matters Search predicted that this species has potential to occur. Although, it was not recorded during field surveys and the preferred soil substrate (heavy basaltic black soils and stony red-brown hard setting loam with clay subsoil) does not exist on site, there are areas of disturbance where this species could potentially inhabit. In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Digitaria porrecta

Digitaria porrecta (Finger Panic Grass) occurs in NSW and Queensland. In NSW it is found on the North West Slopes and Plains, from near Moree south to Tambar Springs and from Tamworth to Coonabarabran. It largely occurs on private land. In NSW, the most frequently recorded associated tree species are *Eucalyptus albens* and *Acacia pendula*. Common associated grasses and forbs in NSW sites include *Austrostipa aristiglumis*, *Enteropogon acicularis*, *Cyperus bifax*, *Hibiscus trionum* and *Neptunia gracilis*. Flowering season is summer or late summer from mid-January to late February, with seeds maturing and falling from the plant soon after. Native grassland, woodlands or open forest with a grassy understorey, on richer soils. Often found along roadsides and travelling stock routes where there is light grazing and occasional fire. *Digitaria porrecta* is a perennial tussock-forming grass that can vegetatively reproduce (OEH, 2012).

Records for this species exist within 10km of the site (NSW Wildlife Atlas). The Protected Matters Search predicted that this species has potential to occur. Although, it was not recorded during field surveys and richer soils do not exist on site, there are areas of disturbed woodland with a grassy understorey where this species could potentially inhabit. In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Rulingia procumbens

Rulingia procumbens is endemic to NSW and is known from the Dubbo–Medooran–Gilgandra region, the Cobar region, and the upper Hunter Valley (Harden, 2000). Populations of this species have been recorded in Goonoo State Forest (SF), Mt Kaputar National Park, and Pilliga Nature Reserve and other populations occur on crown land, state forests, and on private land (DECC NSW, 2005a). *R. procumbens* occurs within the Border Rivers–Gwydir, Central West, Hunter–Central Rivers, Namoi, and Western (NSW) Natural Resource Management Regions. The species occurs in sandy soils, often in disturbed habitats such as road verges, quarry boundaries, gravel stockpiles, and power line easements. *R. procumbens* is often found in communities of *Eucalyptus dealbata*–*E. sideroxylon* woodland, *Melaleuca uncinata* shrubland, and mallee eucalypt with *Calytrix tetragona* understorey. Associated species include *Acacia triptera*, *Callitris endlicheri*, *Eucalyptus melliodora*, *Allocasuarina diminuta*, *Philotheca salsolifolia*, *Xanthorrhoea* spp., *Exocarpos cupressiformis*, *Leptospermum parvifolium*, and *Kunzea parvifolia* (OEH, 2012).

No records for this species exist within 10km of the site (NSW Wildlife Atlas). However, the Protected Matters Search predicted that this species has potential to occur. Although, it was not detected during field surveys. Sandy soils which this species prefers are present and the site is currently in a disturbed state. It is therefore, considered as having potential to occur. In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Pterostylis cobarensis

Pterostylis cobarensis (Cobar Greenhood Orchid) also known as Cobar Greenhood Orchid, is a terrestrial orchid with 7–11 narrow-elliptic leaves which form a basal rosette, each 1.5–2.5 cm long and 5–8 mm wide. Three to eight flowers grow on stems up to 40 cm high, with 3–5 closely sheathing stem leaves. Flowers are transparent with brown and green markings, each flower about 1.2 cm long. Flowering occurs from September to November. Vegetative reproduction is not common in this group of Greenhoods, but some species may form more than one daughter tuber annually. Plants are deciduous and die back to the large, underground tubers after seed release. New rosettes are produced following soaking autumn and winter rains. *Pterostylis cobarensis* is pollinated by the males of small gnats which are attracted to the flower by some pseudosexual perfume (DECC, 2008a). Cobar Greenhood Orchid is known chiefly from the Nyngan–Cobar–Bourke district in the far western plains of NSW. Grows among rocks on low hills and on slopes above streams. Inhabits eucalypt woodland, open mallee, or *Callitris* shrubland on low stony ridges and slopes with skeletal sandy-loam soils. Flowering occurs from September to November (OEH, 2012).

The Protected Matters Search predicted that this species has potential to occur. Although, it was not detected during field surveys the surveys were not conducted within the flowering period for this cryptic species. Eucalypt woodland in which this species can occur and associated species including *Callitris glaucophylla*, do exist within the site. Therefore, it is considered as having potential to occur. However, this species was not recorded within 10km of the site (NSW Wildlife Atlas). In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Tylophora linearis

Tylophora linearis is a herbaceous climber with clear latex that grows to about 2 m long. The stems are cylindrical, up to 3 mm in diameter with internodes up to 100 mm long. Leaves are dark green, linear, up to 100 mm long and 4 mm wide, and extra-floral nectaries are absent from the base of the leaf. Flowers are clustered in radiating groups of 3–8. Flowers are 6–22 mm in diameter, with petals olive-green externally, dark purple internally and with short hairs internally concentrated towards the tip. Fruits form follicles 95–100 mm long and 5 mm wide (Forster, 1992; Forster et al., 2004). *Tylophora linearis* has rarely been collected and is known from eight localities in the Dubbo area and Mt Crow near Barraba in NSW. Grows in dry scrub, open forest and woodlands associated with *Melaleuca uncinata*, *Eucalyptus fibrosa*, *E. sideroxylon*, *E. albens*, *Callitris endlicheri*, *C. glaucophylla*, *Allocasuarina luehmannii*, *Acacia hakeoides*, *A. lineata*, *Myoporum* spp., and *Casuarina* spp (OEH, 2012).

The Protected Matters Search predicted that this species has potential to occur and some sub-optimal habitat of woodlands associated with *C. glaucophylla* does occur on site. Therefore, it is considered to have potential to occur on site. However, this species was not detected during field surveys and it has not been recorded within 10km of the site (NSW Wildlife Atlas). In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Fauna

Spotted Harrier

Spotted Harrier (*Circus assimilis*) is one of two resident Harriers in Australia. Spotted Harrier is a large raptor with a wingspan of 1.2m. Flies with upward swept wings and soars high when moving areas and flies low when searching for food. It is similar in appearance to *Circus approximans* (Swamp Harrier) in which the main distinguishing features of Spotted Harrier are the rump is mottled black.

Spotted Harrier ranges across all of Australia except for Tasmania. Most commonly found inland to near coastal eastern and south eastern Australia. During times of rodent and quail irruptions they will disperse to areas not commonly found. Found in open and wooded country in which it hunts over low vegetation or woodland where hunting at low levels is possible due to vegetation breaks (OEH, 2012).

Usually silent, breeding birds utter piercing squeaks and rapid chatter (Marchant and Higgins 1993). Nest in trees in open remnant woodland, in agricultural areas, often near ripening crop used for hunting (Marchant and Higgins 1993).

This species has been recorded within 10km of the site (NSW Wildlife Atlas) and could utilise the site to forage for prey such as small birds and mammals. Therefore, there is potential for it to occur on site on at least an intermittent basis. However, this is a highly mobile species and it was not recorded on site during targeted surveys. In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha)) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat, habitat retained on site (~1.36ha of disturbed woodland habitat) and this species' high level of mobility it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Grey Crowned Babbler

The eastern subspecies of Grey-crowned Babbler (*Pomatostomus temporalis temporalis*) ranges from Mt Lofty Range, SA to Cape York Peninsula, Qld, generally in areas receiving an average annual rainfall between 250 and 1000 mm. Grey-crowned Babblers inhabit open Eucalypt woodlands with a grassy groundcover and sparse, tall shrub layer. Grey-crowned Babblers may also be observed along streams in cleared areas and grassy road verges (Morcombe, 2000). Grey-crowned Babblers forage mainly on insects and spiders, spending the majority of their time searching through leaf litter and soil for food, but also venturing into vegetation. Grey-crowned Babblers live in extended families usually consisting of a breeding pair with offspring. Pairs mate for life and are usually the only breeding birds within the group. The other group members help them build the nest and feed the young (OEH, 2012).

Breeding occurs between July and February. Their large domed nests (up to 50cm wide) are constructed in trees at a height of about 4-7m. They tend to be built into an upward sloping or horizontal, multiple forked branches in a tree's upper outer foliage and have a side entrance tunnel (Morcombe, 2000). Nest-like structures are also used for overnight roosts. The group as a whole defends a territory (usually about 12 hectares) throughout the year (OEH, 2012).

This species has been recorded within 10km of the site (NSW Wildlife Atlas). Although, it was not detected during field surveys, some habitat does occur on site. Therefore, it is considered to have potential to occur on site. However, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat, habitat retained on site (~1.36ha of disturbed woodland habitat) and this species' high level of mobility it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Koala

The Koala (*Phascolarctos cinereus*) occurs along the east coast of Australia and extends into Woodland, Mulga and River Red Gum forests west of the Great Dividing Range. The range of the Koala covers all such suitable areas of NSW. In drier forested areas, Koalas are generally observed as individuals in low densities. They are more abundant in coastal woodland and in open forest, where they have been found in densities as high as ten individuals per hectare. They are rare or absent in wet forests in the southern part of their range above 600 m which may be due more to distribution of Eucalypt species than climate, as the Koala is limited to areas where there are acceptable food trees (OEH, 2012).

Koala's diet is generally restricted to that of Eucalypt leaves. On occasion, non-Eucalypt foliage is eaten. The foliage of *Eucalyptus camaldulensis* (River Red Gum), *E. microcorys* (Tallowwood), *E. tereticornis* (Forest Red Gum), *E. punctata* (Grey Gum), *E. viminalis* (Ribbon Gum) and *E. robusta* (Swamp Mahogany) are some of the preferred Eucalypt species. Koalas use a wide variety of tree sizes, and do not preferentially use large or tall trees in NSW forests, although this has been listed as a habitat preference in areas where trees are generally small, stunted or nutrient deprived. The breeding biology of this species is characterised by the occurrence of discrete core, sedentary breeding groups. A core group may comprise up to several dozen individuals that are usually well separated from other breeding groups. These core groups produce a continual supply of dispersing nomadic sub-adults. Individuals within core breeding groups occupy semi-exclusive territories. There is interaction with and marginal overlap of territories between adjacent individual animals. The territories of breeding males generally occur within a matrix of adjacent territories of breeding females. In the overlap zones of adjacent territories of breeding individuals, individual trees occur that are habitually used for interaction between the two animals concerned. These breeding core interaction trees (sometimes termed "home range trees") are readily identifiable by scratched "trails" up the bole and copious

dung deposits at the base of the tree. Breeding occurs in summer and young females produce one young (rarely twins) each year (OEH, 2012).

Various records for this species occur within 10km of the site. No primary koala feed trees listed under the SEPP 44 were recorded within the site, only four secondary Koala feed trees were present. Although, Koalas have potential to occur within the site no Koala's or secondary signs indicating their presence were recorded during the field work. In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Furthermore the proposal will not prohibit this species ability to disperse throughout the local landscape. Due to the available surrounding habitat and the habitat to be retained on site (~1.36ha of disturbed woodland habitat) it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Pale-headed Snake

Pale-headed Snake (*Hoplocephalus bitorquatus*) has a patchy distribution from north-east Queensland to north-east NSW. In NSW it occurs from the coast to the western side of the Great Divide as far south as Tuggerah. Pale-headed Snake is found mainly in dry eucalypt forests and woodlands, cypress woodland and occasionally in rainforest or moist eucalypt forest. It favours streamside areas, particularly in drier habitats. Pale-headed Snakes shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. The main prey is tree frogs although lizards and small mammals are also taken (OEH, 2012).

This species has been recorded within 10km of the site (NSW Wildlife Atlas). Although, it was not detected during field surveys, some sub-optimal habitat does occur on site. Therefore, it is considered to have potential to occur on site. However, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat and the habitat to be retained on site (~1.36ha of disturbed woodland habitat) it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Malleefowl

Malleefowl (*Leipoa ocellata*) inhabits semi-arid regions of southern Australia. In New South Wales, it typically occurs west of the Great Dividing Range. Extends from Pilliga south-west to the districts of Griffith and Wentworth. The extent of occurrence is known to be decreasing. The distribution of the Malleefowl was formerly more extensive, extending over a large proportion of mainland southern Australia, including the south-western region of the Northern Territory. Malleefowl's occupy shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine *Callitris* woodlands, acacia shrublands, Broombush *Melaleuca uncinata* vegetation or coastal heathlands (OEH, 2012).

The Protected Matters Search predicted that this species has potential to occur on site and *Callitris* and *Acacia* woodlands do persist on site which they provide sub-optimal habitat. Therefore, it is considered to have potential to occur on site. However, no records exist within 10km of the site for this species (NSW Wildlife Atlas) and they were not recorded on site during field surveys. In addition, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of

sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat, the habitat to be retained on site (~1.36ha of disturbed woodland habitat) and the high mobility of this species it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Superb Parrot

Superb Parrots (*Polytelis swainsonii*) are ground feeders where they spend most of their time foraging for seeds and herbaceous plants. They have been known to eat pollen, nectar and fruits and leaf buds, and occasionally they visit farmlands to feed on wheat and oats. During winter Superb parrots will spend most of its time feeding on green weeds including, *Sonchus oleraceus* (Milk Thistle), *Sisymbrium spp.* (Wild Mustard) and *Urtica urens* (Stinging Nettle). During spring and summer, Superb Parrots are attracted to flowering eucalypts; particularly favoured are *Eucalyptus melliodora* (Yellow box), and *E. cladocalyx* (Sugar Gum) (Forshaw, 1991).

Superb Parrots are distributed within inland NSW and north most Victoria. The breeding range in southern NSW is centred on the Murrumbidgee River valley, between Hay in the west and Canberra in the east. Birds over-winter to the north. In the east, they are restricted to riparian habitats, being generally along the Namoi River, between Narrabri and Gunnedah, and along the Castlereagh River and its tributaries, between Coonamble and Gilgandra. Superb parrots breeds from September to December. Its nest is a hollow limb or hole in a tree, at great height. It lays four to six eggs, which are white and rounded. The young leave the nest about four weeks after hatching. They gradually acquire full adult plumage over the next 6-9 months (OEH, 2012).

This species has been recorded within 10km of the (NSW Wildlife Atlas) and the Protected Matters Search predicted that this species has potential to occur. Suitable eucalypt species (four individual trees) and Callitris (which provides seasonal habitat) do exist on site in which this species could forage. Therefore, there is some degree of likelihood that this species occurs seasonally within the site. However, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat and the habitat to be retained on site (~1.36ha of disturbed woodland habitat) it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Speckled Warbler

Speckled Warbler (*Chthonicola sagittata*) ranges in South-Eastern Australia, from South-West Victoria through eastern New South Wales to Central Queensland, mostly on the western slopes and tablelands of the Great Dividing Range, and in the drier areas of coast. Speckled Warblers live in a wide range of Eucalypt dominated vegetation that has a grassy and shrubby understorey often on rocky ridges or gullies (Garnett et al, 2000).

Speckled Warbler is a sedentary species with a home range that varies from 6-12 hectares (Readers Digest, 1982). This species appears to be extinct from areas without vegetation fragments larger than 100ha. *C. sagittata* appears to prefer woodland areas where ground cover consists of shrubs, grass, fallen leaves and bark. This ground foraging bird feeds on insects, insect larvae and small seeds (Readers Digest, 1982). A study from the Armidale area indicated that beetles were a major food source, ants were often eaten and larvae, flies and spiders were also taken (Ford, 1985). Speckled Warblers congregate in small family groups of two or three and breed from September to March. Dome shaped nests are constructed of dried grasses and bark strips and are camouflaged under a tuft of grass usually beneath fallen branches or at the base of a

small shrub (Hoskin, 1991; Readers Digest, 1982). *C. sagittata* is one of the most common hosts of *Chalcites osculans* (Black-eared Cuckoo) chicks (OEH, 2012).

Records for this species exist within 10km of the site (NSW Wildlife Atlas), but it was not detected during field surveys. Suitable habitat in the form of open woodlands occurs on site. Therefore, it is considered as having potential to occur. However, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat, habitat retained on site (~1.36ha of disturbed woodland habitat) and this species' high level of mobility it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Little Lorikeet

Little Lorikeet (*Glossopsitta pusilla*) is the smallest of the lorikeets in Australia. Their size ranges from about 15-16.5cm. The colouring is mostly all a lime green with bright red on the forehead and throat surrounding the bill and up to the eye. The rear of the neck is a yellow-brown colour. Little Lorikeet ranges from about Cooktown in Qld, coastally and to the west of the ranges down to Victoria and occasionally into South Australia. This species is more commonly encountered in near coastal habitats and on the divide (OEH, 2012).

Habitat is mainly dry, open sclerophyll forests and woodlands, usually dominated by Eucalyptus, sometimes in plantations of *Eucalyptus cladocalyx* (Sugar Gum) (Higgins 1999). *G. pusilla* can be found in large flocks of hundreds of birds spread out across blossoming eucalypts, such feeding congregations have been recorded within areas such as Werekata N.P. at Cessnock when *Corymbia maculata* (Spotted Gum) has abundant flowering periods (authors pers. obs.). Little Lorikeet can be found feeding with other lorikeet species such as *Trichoglossus haematodus* (Rainbow Lorikeet), *Glossopsitta porphyrocephala* (Purple-crowned Lorikeet) and *Glossopsitta concinna* (Musk Lorikeet). In the Hunter Valley they are often found with flocks of *G. concinna* (author's pers. obs.). Little Lorikeet prefers to feed in the upper canopy and rarely comes below the uppermost blossom. During feeding show great agility, hanging and crawling through foliage, can also be very inconspicuous whilst feeding. Generally though Little Lorikeet can often be heard by the mass of calls, which can be deafening when large flocks are feeding together. The call is a distinctive thin, high-pitched rolling metallic 'zit' or 'zit zit', repeated, also utter constant soft chatter while feeding (Higgins 1999). The call can be distinguished from most of the other lorikeet species due to the short length of the call.

Movements of Little Lorikeets are largely unknown, but the belief is that they follow abundant blossom. Some areas they are sedentary and move within the local area in response to blossom. Nesting of *G. pusilla* consists of holes, including knotholes, in bend, top or side of limb, usually living or in main trunk of tree, occasionally over water, recorded in *Eucalyptus camaldulensis* (River Red Gum), *Eucalyptus grandis* (Flooded Gum) and *Casuarina cunninghamiana* (River Oak) (Higgins 1999).

Records for this species exist within 10km of the site (NSW Wildlife Atlas). Suitable tree species do exist on site in which this species could forage. Therefore, it is considered as having potential to occur. However, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat, habitat retained on site (~1.36ha of disturbed woodland habitat) and this species' high level of mobility it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Varied Sittella

Varied Sittella (*Daphoenositta chrysoptera*) is a small 'treecreeper' like bird that covers the majority of Australia. There are 5 races of Varied Sittella of which 3 occur within NSW. The nominate race which occurs across the majority of NSW, sometimes referred to as the 'Orange-winged Sittella'. The second race is Race *leucocephala* which occurs within the far north eastern corner of NSW and is sometimes known as 'White-headed Sittella'. The third race is Race *pileata* which occurs within the far western areas of NSW and is commonly called 'Black-capped Sittella'. Varied Sittella can be reasonably common in some areas and also nomadic in others, where as they also can be sedentary (OEH, 2012).

Habitat across the varying races is similar, although they can be found in a wide range of habitats. Open eucalypt forests and woodlands are the preferred habitat, but this species may also be found in mallee, coastal tea-tree scrubs, inland acacia communities, golf courses orchards and scrubby gardens. In flight, wings seem too large for the bird: broad, pale orange wing band, white rump and white tail tips conspicuous (Pizzey 2007). Varied Sittella can be heard sometimes before it is seen, the call, a high pitched 'chip chip' can often be heard as groups of these birds move through the upper canopy. Groups forage together, flying into heads of trees, typically working down branches and trunk with constant rocking-horse motion, probing and levering bark flakes with longish, slightly upturned bills, maintaining contact with constant chitterings, before flying on to next tree (Pizzey 2007).

The nest of Varied Sittella consists of deep cup of bark which is well camouflaged with spiders web and lichen. They favour the use of tree species for nesting such as Eucalypts, paperbarks, she-oaks and tea-trees. When breeding, one female appears to lay, but all members of group feed the young (Pizzey 2007).

Records for this species exist within 10km of the site (NSW Wildlife Atlas), but it was not detected on site during surveys. Suitable Eucalypt species do exist on site in which this species could forage and nest in. Therefore, it is considered as having potential to occur. However, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat, habitat retained on site (~1.36ha of disturbed woodland habitat) and this species' high level of mobility it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern Grass Owl

Eastern Grass Owls (*Tyto longimembris*) are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. They rest by day in a 'form' - a trampled platform in a large tussock or other heavy vegetative growth. If disturbed they burst out of cover, flying low and slowly, before dropping straight down again into cover. Eastern Grass Owls always breeds on the ground. Nests are found in trodden grass, and often accessed by tunnels through vegetation. Breeding season is highly variable and dependent on environmental conditions, but in NSW nesting most typically occurs in autumn or winter.

Records for this species exist within 10km of the site (NSW Wildlife Atlas) and suitable habitat in the form of areas of tall grass occur on site. Therefore, it is considered to have potential to occur. However, there are larger areas of more suitable habitat nearby (Jacks Creek State Forest ~ 7.7km to the South (2,195ha) and Killarney State Conservation Area ~13.5km to the North-east (~1,850ha) and the proposal will impact upon a small area of sub-optimal habitat (~ 2.07ha of disturbed woodland habitat). Due to the available surrounding habitat, habitat retained on site (~1.36ha of disturbed woodland habitat) and this species' high level of mobility it is considered that the proposed development is not likely to have an adverse effect on the life

cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

No endangered populations were identified within or surrounding the site.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

No EECs were identified within the site. However, there were four individual Blakely's Red Gum (*Eucalyptus blakelyi*) trees present within the entire site (3.4ha). The presence of this particular tree species was further assessed (**Appendix 7**) for the potential occurrence of a CEEC namely *White Box, Yellow Box, Blakely's Red Gum Woodland and Derived Grasslands* (EPBC Act) which is commensurate with the EEC *White Box, Yellow Box, Blakely's Red Gum Woodland* (TSC Act). This Assessment in **Appendix 3** has resulted in the vegetation community on site not qualifying as being commensurate with either the TSC Act or EPBC Act listing of this community. Therefore, there will be no clearing of any EECs as a result of the proposal, hence not placing any EECs at a risk of extinction.

d) In relation to the habitat of a threatened species, population or ecological community:

Flora Species

- *Dichanthium setosum*
- *Digitaria porrecta*
- *Rulingia procumbens*
- *Pterostylis cobarensis*
- *Tylophora linearis*

Fauna Species

- Spotted Harrier
- Grey-crowned Babbler
- Koala
- Pale-headed Snake
- Malleefowl
- Superb Parrot
- Speckled Warbler

- Little Lorikeet
- Varied Sittella
- Eastern Grass Owl

(i) The extent to which habitat is likely to be removed or modified as a result of the action proposed, and

Flora

- *Dichanthium setosum*

The site does not contain preferred soil substrate (heavy basaltic black soils and stony red-brown hardsetting loam with clay subsoil). Nevertheless, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- *Digitaria porrecta*

The site does not contain preferred soil substrate (richer soils). Nevertheless, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- *Rulingia procumbens*

Potential habitat for this species occurs within the disturbed woodlands on site and the site does contain preferred habitat of sandy soils, often in disturbed habitats. Approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- *Pterostylis cobarensis*

The site does not contain preferred habitat of rocks, slopes or low hills. However, potential habitat for this species occurs within the disturbed Callitris woodlands on the site. Nevertheless, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- *Tylophora linearis*

Potential habitat for this species occurs within the disturbed woodlands on site. However, the site does contain preferred woodlands associated with *C. glaucophylla*. Nevertheless, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

Fauna

- Spotted Harrier

Potential habitat for this species occurs within the disturbed woodlands on site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species (primarily for foraging) and will be removed or modified as a result of the proposal.

- Swift Parrot

Potential habitat for this species occurs within the disturbed woodlands on the site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species (primarily for foraging) and will be removed or modified as a result of the proposal.

- Grey-crowned Babbler

Potential habitat for this species occurs within the disturbed woodlands on the site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species (primarily for foraging) and will be removed or modified as a result of the proposal.

- Koala

Suboptimal habitat (only four secondary Koala feed trees were present within the entire site [3.4ha] and of this only 2.07ha will be removed) for this species occurs within the disturbed woodlands on the site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- Pale-headed Snake

Potential habitat of dry eucalypt woodlands and cypress woodlands occur within the disturbed woodlands on the site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- Malleefowl

Potential habitat of Eucalypt woodlands and Callitris woodlands occur within the disturbed woodlands on the site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- Superb Parrot

Suitable Eucalypt species (four individual trees) and Callitris (which provides seasonal habitat) do exist on site in which this species could. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- Speckled Warbler

Suitable habitat in the form of open woodlands occurs on site. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- Little Lorikeet

Suitable tree species do exist on site in which this species could forage and nest. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- Varied Sittella

Suitable eucalypt species do exist on site in which this species could forage and nest. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

- Eastern Grass Owl

Suitable habitat in the form of areas of tall grass occur on site in which this species could forage and nest. Therefore, approximately 2.07ha of disturbed woodland vegetation is potentially utilised by this species and will be removed or modified as a result of the proposal.

(ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

No area of habitat is likely to become fragmented or isolated from other areas of habitat as part of this proposal.

(iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

A small area of sub-optimal habitat (2.07ha) is to be removed. The habitat removal is taking place in a pre-disturbed area. Due to the relatively small area vegetation to be cleared (2.07ha of the 3.4ha of similar vegetation within the site) and the pre-disturbed nature of the disturbance area it is considered that the proposal will not contribute to fragmentation and will not have an impact on the survival of the species, population or ecological community in the locality.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No areas of critical habitat occur within or adjacent to the site.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

The proposed action will not act against and will be consistent with the objectives or actions of the recovery or threat abatement plan that exist for the following species:

- Koala.

The remaining species, listed below, do not have an associated recovery or threat abatement plan.

Flora Species

- *Dichanthium setosum*
- *Digitaria porrecta*
- *Rulingia procumbens*
- *Pterostylis cobarensis*
- *Tylophora linearis*

Fauna Species

- Spotted Harrier
- Grey-crowned Babbler
- Pale-headed Snake
- Malleefowl
- Superb Parrot
- Speckled Warbler
- Little Lorikeet
- Varied Sittella
- Eastern Grass Owl

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The proposal will incrementally contribute to the following KTP's:

- "Clearing of native vegetation"

A small area of sub-optimal habitat (2.07ha) is to be removed. The habitat removal is taking place in a pre-disturbed area. Given that there is a relatively small area of vegetation to be cleared (2.07ha of the 3.4ha of similar vegetation within the site) and the pre-disturbed nature of the disturbance area it is considered that the proposal it is not expected to significantly increase the impact on native flora and fauna. Therefore, it is considered that this KTP will not have a significant impact to the overall extent of similar adjoining native vegetation within the locality.

- “Anthropogenic Caused Climate Change”

The proposal is likely to contribute to the Key Threatening Process “Anthropogenic Caused Climate Change” as a result of clearing a small amount of native vegetation. The extent to which the proposal could contribute to this process is considered unlikely to be significant. Apart from the direct impacts to vegetation, which are considered likely to result in a negligible increase to Climate Change impacts,

- “Infection of native plants by *Phytophthora cinnamomi*”

The proposed development has the potential to result in the importation of this fungus. Cleaning protocols for vehicles and machinery should be implemented for the low-level above-ground activities. It is considered that with the correct hygiene protocols in place, the project is unlikely to contribute to this process.

- “Invasion of native plant communities by exotic perennial grasses”

The proposed development is considered unlikely to significantly contribute to this process due to the comparatively low level of surface disturbance that is proposed.

- “Removal of dead wood and dead trees”

The proposed development will require the removal of ground debris in above-ground areas of disturbance. Reptiles, frogs and ground foraging birds may be affected by the removal of this Habitat. However, these form a minor component of the overall works and the vast majority of this habitat will be retained in-situ. It is not expected that the proposal will significantly contribute to this process.

- “Introduction and establishment of exotic rust fungus of the order Puccinales pathogenic on plants of the family Myrtaceae”

The proposed development has the potential to result in the importation of the Myrtle Rust fungus, an species recently discovered in Australia that can have lethal effects on plants from the family Myrtaceae. Cleaning protocols for vehicles and machinery should be implemented for the low-level above-ground activities. It is considered that with the correct hygiene protocols in place, the project is unlikely to contribute to this process.

Appendix 7

White Box, Yellow Box, Blakely's Red Gum and Derived Grasslands TEC considerations.

TSC Act 1995 Considerations

Under the TSC Act, White Box Yellow Box Blakely's Red Gum Woodland EEC can exist in a number of states. Intact stands that contain diverse upper and mid-storeys and ground layers are rare. Modified sites include the following:

- Areas where the main tree species are present ranging from an open woodland formation to a forest structure, and the ground layer is predominantly composed of exotic species; and
- Sites where the trees have been removed and only the grassy ground layer and some herbs remain.

Identification guidelines have been provided for this community (NPWS 2002). The area of vegetation, which the site is located within, has been assessed against these guidelines in the table below.

TSC Act Box Gum Woodland Listing Criteria

Box Gum Woodland	NPWS Comment	Answer
1. The site is in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands or NSW South Western Slopes Bioregions – proceed to 2.		1. The site is located within the Brigalow Belt South Bioregion.
1* The site is outside the above bioregions	Not Box Gum Woodland	
2. There are no native species in the understorey, and the site is unlikely to respond to assisted natural regeneration	Not Box Gum Woodland	
2* The site is otherwise – proceed to 3		Native species present in the understorey
3. The site has trees – proceed to 4.		Yes
3* The site is treeless, but is likely to have supported White Box, Yellow Box or Blakely's Red Gum prior to clearing – proceed to 5		
4. White Box, Yellow Box or Blakely's Red Gum, or a combination of these species, are or were characteristic tree species.		Blakely's Red Gums are present. However, there are only four individual trees within the entire site (3.4ha) and they are not considered to be characteristic of this community.
4* White Box, Yellow Box or Blakely's Red Gum have never been present	Not Box Gum Woodland	
5. The site is predominantly grassy	Is Box Gum Woodland	Yes
5* The understorey of the site is dominated by shrubs excluding pioneer species	Not Box Gum Woodland	No

In reference to the NSW NPWS Identification Guidelines for White Box Yellow Box Blakely's Red Gum Woodland EEC, the results of the field survey determined that the area of vegetation, does not fit the NSW Scientific Committee Final Determination of this EEC because the canopy is dominated by Rough-barked Apple (*Angophora floribunda*) and White Cypress Pine (*Callitris glaucophylla*) and the four Blakely's Red Gums (*Eucalyptus Blakelyi*) are not considered to be characteristic tree species.

EPBC Act 1999 Considerations

The criteria for an area to qualify as White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland and Derived Grassland) Critically Endangered Ecological Community (CEEC) under the EPBC Act are slightly different to the NSW determination. Under the EPBC Act, remnants can exist in one of three states:

- An overstorey of Eucalypt trees exists, but there is no substantial native understorey.
- A native understorey exists, but the trees have been cleared.
- Both a native understorey and an overstorey of Eucalypts exist in conjunction (DEH 2006).

The Threatened Species Scientific Committee considers that areas in which an overstorey exists without a substantially native understorey are degraded and are no longer a viable part of the ecological community. Although some native species may remain, in most of these areas the native understorey is effectively irretrievable. In order for an area to be included in the listed ecological community, a patch must have a predominantly native understorey (DEH 2006).

Vegetation communities with the potential to be the locally occurring White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland and Derived Grassland) EPBC Act listed Critically Endangered Ecological Community, were analysed in detail by using the criteria in the table below.

EPBC Act Box Gum Woodland Listing Criteria

Criteria	Description	Does the site meet the criteria?	Outcome
1	Is or was previously, at least one of the most common overstorey species White Box, Yellow Box or Blakely's Red Gum (or Western Grey Box or Coastal Grey Box in the Nandewar Bioregion)?	No	
2	Does the 'patch' have a predominately native understorey?	N/A	
3	Is the patch 0.1ha or greater in size?	N/A	
4a	Is there 12 or more native understorey species present (excluding grasses)?	N/A	
4b	Does the site contain at least one important species?	N/A	
5	Is shrub cover less than 30% across the entire remnant	N/A	
Outcome			No, the site is <u>not</u> the CEEC
6	Where sites do not meet the criteria 4a and 4b, is the patch 2ha or greater in size?	N/A	
7	Does the 2 ha patch have 40 or more trees with a DBH >40cm? (i.e. 20 per hectare)	N/A	
Outcome			NA
7b	In the 2ha area, are there mature trees and natural generation (>5cm DBH) of dominant overstorey Eucalypts (WB, YB, BRG)?	N/A	
Outcome			NA

In consideration of the above criteria, the Box Gum Woodland identified in the site does not fit the EPBC Act criteria for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. This is because the canopy is dominated by Rough-barked Apple (*Angophora floribunda*) and White Cypress Pine (*Callitris glaucophylla* (Criteria 1)).

Appendix 4

Cultural Heritage Due Diligence Assessment



Aboriginal & European Cultural Heritage Due Diligence Report

**Santos Logistics Centre
Yarrie Lake Road, Narrabri NSW**

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REVISION / CHECKING HISTORY

Revision No.	Author	Reviewer
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2.		

APPROVAL FOR ISSUE

Name	Signature	Date
Sarah Ward		15/10/2012

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In preparing this report we have made certain assumptions. We have assumed that all information and documents provided to us by the Client or as a result of a specific request or enquiry were complete, accurate and up-to-date. Where we have obtained information from a government register or database, we have assumed that the information is accurate. Where an assumption has been made, we have not made any independent investigations with respect to the matters the subject of that assumption. We are not aware of any reason why any of the assumptions are incorrect.

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Appendix 1 Legislative Requirements

Appendix 2 AHIMS Search Results

Executive Summary

RPS has been engaged by Santos Limited to prepare an Aboriginal and European Cultural Heritage Due Diligence Assessment for the proposed expansion of the existing Narrabri Logistics Centre at 300 Yarrie Lake Road, Narrabri, New South Wales in the Narrabri Local Government Area (LGA).

This assessment has been undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects* (DECCW 2010) which requires reasonable and practicable steps be taken to: identify whether or not Aboriginal objects are, or are likely to be, present in an area; determine whether or not their activities are likely to harm Aboriginal objects (if present); and determine if an Aboriginal Heritage Impact Assessment is required (DECCW 2010:2).

Investigations under the code have included the following:

- a search of the Aboriginal Heritage Information Management System (AHIMS) database which identified that there were no Aboriginal objects or Aboriginal places in the Project Area;
- this report has considered specific sensitive landforms: within 200m of water; within dune systems; on ridge tops and headlands; and immediately above or below cliff faces and/or rockshelters/cave. These landforms were not identified in the Project Area;
- desktop assessment included a review of previous archaeological and heritage studies in the vicinity of the Project Area; and
- a visual inspection of the Project Area was undertaken and no Aboriginal objects were identified.

RECOMMENDATIONS

General mitigations have been provided for undertaking the proposed activity/works which set out contingency procedures should unexpected Aboriginal objects, skeletal remains or suspected additional European cultural heritage material be identified.

No Aboriginal objects or places have been identified within the Narrabri Logistics Centre Project Area. **As there are no identified Aboriginal objects in the Project Area, it is assessed that there is no identified risk of harm to Aboriginal objects and an AHIP is not required for the proposed activity.** The proposed works can proceed within the Project Area as planned.

No European (historic) heritage sites have been identified within Narrabri Logistics Centre Project Area. As such **there is no identified impact to European (historic) heritage and therefore a Statement of Heritage Impact is not required.**

Recommendation A

All relevant Santos Limited staff and contractors should be made aware of their statutory obligations for heritage under NSW *National Parks and Wildlife Act 1974* and the NSW *Heritage Act 1977*, which may be implemented as a heritage induction.

Recommendation B

This due diligence report must be kept by Santos Limited so that it can be presented, if needed, as a defence from prosecution.

Recommendation C

If Aboriginal object/s are identified in the Project Area during works, then all works in the immediate area must cease and the area cordoned off. The Office of Environment and Heritage must be notified by ringing the Enviroline 131 555 so that the site can be adequately assessed and managed.

Recommendation D

In the event that skeletal remains are uncovered, work must cease immediately in that area and the area cordoned off. Santos Limited must contact the NSW Police with no further action taken until written advice is provided by the Police. If the remains are determined to be of Aboriginal origin, the Office of Environment and Heritage must be notified by ringing the Enviroline 131 555 and a management plan prior to works recommencing must be developed in consultation with the relevant Aboriginal stakeholders.

Recommendation E

If, during the course of development works, suspected European cultural heritage material is uncovered, work should cease in that area immediately. The Heritage Branch, Office of Environment and Heritage (Enviroline 131 555) should be notified and works only recommence when an approved management strategy is developed.

1.0 Introduction

RPS has been engaged by Santos Limited (the proponent) to prepare an Aboriginal and European Cultural Heritage Due Diligence Report. The purpose of a due diligence report is to demonstrate that reasonable and practicable measures were taken to prevent harm to an Aboriginal object or place and has been undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (2010) ("Due Diligence Code").

The assessment contained in this report goes beyond the requirements of the Due Diligence Code to consider any potential impact on identified European (historic) heritage items within the Project Area.

This report has considered the relevant environmental and archaeological information, landforms, disturbances and the nature of the proposed activity in addition to formulating appropriate recommendations.

1.1 The Project Area

This due diligence report has been prepared for the area subject to the proposed activity, herein referred to as the "Project Area." The Project Area is located at 300 Yarrie Lake Road, Narrabri, in the Narrabri Local Government Area (LGA). The Project Area is approximately 2.5 kilometres from the town of Narrabri and approximately 6.298 hectares in size (Figure 1).

1.2 The Proposed Activity

The proposed activity is the upgrade of the existing Santos Operations Centre (Plate 1) at 300 Yarrie Lake Road to a larger logistics centre (the proposal). The proposal will include: warehouse and office space, a storage building, laydown areas, a casing wash area; and other ancillary works and parking areas.

Ground disturbance works will include the excavation of soil, the construction of buildings, plant and machinery and the potential impact of heavy machinery being used for excavation and construction purposes. A due diligence assessment is therefore required under S1 and S2a of the Due Diligence Code (DECCW 2010:11).

1.3 Authorship and Acknowledgements

This report was prepared by RPS Senior Archaeologist, Sarah Ward with contributions from RPS Senior Spatial Analyst, Thomas Wilson and RPS Planning Manager, Belinda Lewis. Assistance with report production was provided by Karyn Virgin, RPS Graduate Archaeologist and Audrey Churm, RPS Business Support Manager.

The report was reviewed by RPS Technical Director Cultural Heritage, Darrell Rigby.

Fieldwork was undertaken by RPS Senior Archaeologist, Sarah Ward in conjunction with RPS Ecologist, Arne Bishop.

2.0 Legislative Context

The following overview of the legal framework is provided solely for information purposes for the client, it should not be interpreted as legal advice. RPS will not be liable for any actions taken by any person, body or group as a result of this general overview, and recommend that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken as a result of the summary below.

Although there are a number Acts protecting and managing cultural heritage in New South Wales (see Appendix 1) the primary ones which apply to this report include:

- *National Parks & Wildlife Act 1974*
- *National Parks & Wildlife Regulation 2009*
- *Heritage Act 1977*

In brief, the *National Parks & Wildlife Act 1974* protects Aboriginal heritage (places and objects) within NSW; the *National Parks and Wildlife Regulation 2009* provides a framework for undertaking activities and exercising due diligence; whilst the *Heritage Act 1977* protects European (Historic) heritage.

2.1 *National Parks & Wildlife Act 1974*

The *National Parks & Wildlife Act 1974* (NPW Act) protects Aboriginal heritage within NSW. Protection of Aboriginal heritage is outlined in s86 of the Act, as follows:

- "A person must not harm or desecrate an object that the person knows is an Aboriginal object" s86(1);
- "A person must not harm an Aboriginal object" s86(2); and
- "A person must not harm or desecrate an Aboriginal place" s86(4).

Penalties apply for harming an Aboriginal object or place. The penalty for knowingly harming an Aboriginal object (s86[1]) and/or an Aboriginal place (s86[4]) is up to \$550,000 for an individual and/or imprisonment for 2 years; and in the case of a corporation the penalty is up to \$1.1 million. The penalty for a strict liability offence (s86[2]) is up to \$110,000 for an individual and \$200,000 for a corporation.

Harm

Under the NPW Act, harm is defined as any act that: destroys defaces or damages the object; moves the object from the land on which it has been situated; and/or causes or permits the object to be harmed. However, it is a defence from prosecution if the proponent can demonstrate: 1) that harm was authorised under an Aboriginal Heritage Impact Permit (AHIP) (and the permit was properly followed); or 2) that the proponent exercised due diligence in respect to Aboriginal heritage. The '**due diligence**' defence (s87(2)), states that if a person or company has exercised due diligence to ascertain that no Aboriginal object was likely to be harmed as a result of the activities proposed for the Project Area (subject area of the proposed activity); then liability from prosecution under the NPW Act will be removed or mitigated if it later transpires that an Aboriginal object was harmed.

Notification of Aboriginal Objects

Under section 89A of the NPW Act Aboriginal objects (and sites) must be reported to the Director-General (now Chief Executive) of OEH within a reasonable time (unless it has previously been recorded and submitted to AHIMS). Penalties of \$11,000 for an individual and \$22,000 for a corporation may apply for each object not reported.

2.2 National Parks and Wildlife Regulation 2009

The *National Parks and Wildlife Regulation 2009* ("NPW Regulation") provides a framework for undertaking activities and exercising due diligence in respect to Aboriginal heritage. The NPW Regulation 2009 outlines the recognised due diligence codes of practice which are relevant to this report, but it also outlines procedures for Aboriginal Heritage Impact Permit (AHIP) applications and Aboriginal Cultural Heritage Consultation Requirements (ACHCRs); amongst other regulatory processes.

2.3 Due Diligence and Codes of Practice

The **advantage of a Due Diligence** assessment is that:

- it assists in avoiding unintended harm to Aboriginal objects;
- provides certainty to land managers and developers about appropriate measures for them to take;
- encourages a precautionary approach;
- provides a defence against prosecution if the process is followed; and
- results in more effective conservation outcomes for Aboriginal cultural heritage.

One of the benefits of the due diligence provisions are that they provide a simplified process of investigating the Aboriginal archaeological context of an area to determine if an Aboriginal Heritage Impact Permit (AHIP) is required.

Under the s80A *National Parks & Wildlife Regulation 2009* ("NPW Regulation") the following due diligence codes recognised:

- (a) the Due Diligence Code published by the Department of Environment, Climate Change and Water and dated 13 September 2010;
- (b) the Plantations and Reafforestation Code (being the Appendix to the *Plantations & Reafforestation (Code) Regulation 2001*) as in force on 15 June 2010;
- (c) the *Private Native Forestry Code of Practice for Northern New South Wales* approved by the Minister for Climate Change, Environment and Water and published in the Gazette on 8 February 2008;
- (d) the *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects* published by NSW Minerals Council Ltd and dated 13 September 2010;
- (e) the *Aboriginal Objects Due Diligence Code for Plantation Officers Administering the Plantations and Reafforestation (Code) Regulation 2001* published by the Department of Industry and Investment and dated 13 September 2010; and
- (f) the *Operational Guidelines for Aboriginal Cultural Heritage Management* published by Forests NSW and dated 13 September 2010.

This report has been written to meet the Due Diligence Code (DECCW 2010).

2.3.1 Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010)

This publication sets out a minimum benchmark for acceptable due diligence investigations to be followed. The purpose of the code is set out reasonable and practical steps in order to:

- (1) identify whether or not Aboriginal objects (and places) are, or are likely to be, present in an area;
- (2) determine whether or not their activities are likely to harm Aboriginal objects (if present); and

(3) determine whether an AHIP application is required. (DECCW 2010:2).

Investigations under the code include the following:

- a search of the Aboriginal Heritage Information Management System (AHIMS) database to identify if there are previously recorded Aboriginal objects or places in the Project area;
- identification of landscape features including land within 200 metres of water, dune systems, ridge tops, headlands, land immediately above or below cliff faces and/or rockshelters/caves;
- desktop assessment including a review of previous archaeological and heritage studies and any other relevant material;
- visual inspection of the Project Area to identify if there are Aboriginal objects present; and
- assessment as to whether an AHIP is required.

This report has complied with the requirements of the code listed above. Other requirements under the code are outlined below.

Aboriginal consultation is not required for an investigation under the Due Diligence Code (DECCW 2010:3). However, if the due diligence investigation shows that the activities proposed for the area are likely to harm objects or likely objects within the landscape, then an Aboriginal Heritage Impact Permit will be required with full consultation.

A record of the due diligence procedure followed must be kept to ensure it can be used as a defence from prosecution (DECCW 2010:15).

Following a due diligence assessment (where an AHIP application was not required), such as this, an activity must proceed with caution. If any Aboriginal objects are identified during the activity, then works should cease in that area and OEHS notified (DECCW 2010:13). The due diligence defence does not authorise continuing harm.

2.3.2 *Aboriginal Community Consultation*

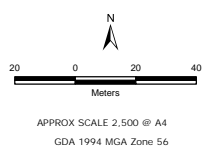
Aboriginal community consultation is not a formal requirement of the due diligence process (DECCW 2010:3); therefore the proponent is not obliged to undertake Aboriginal community consultation.

Aboriginal community consultation was not undertaken for this due diligence report.

2.4 *Heritage Act 1977*

This Act protects the natural and European cultural history of NSW with emphasis on non-Aboriginal 'historic' cultural heritage (such as place, building, works, relic, moveable object, precinct, historic shipwreck, or archaeological site) of State or local significance, through protection provisions and the establishment of a Heritage Council and a State Heritage Register. Additionally, Government agencies have special obligations under the *Heritage Act 1977* (NSW). Agencies are required to compile a register of heritage assets (known as a Section 170 Heritage and Conservation Register) and look after their assets on behalf of the community.

Although Aboriginal objects and places of significance are primarily protected by the NPW Act, if an Aboriginal site, object or place is of State or local significance, it may be protected by a heritage order issued by the Minister subject to advice by the Heritage Council. Penalties of up to \$1.1 million are in place for breaches of the Heritage Act and its Regulations.



Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

DATA SOURCES

Point features located in field by GPS.

LEGEND

- ▬ Project Area
- ▬ Property Boundary



FIGURE 1-1

Narribri Operations
Centre
Project Area

3.0 Environmental and Heritage Context

Aboriginal heritage due diligence requires that available knowledge and information is considered and forms part of the desktop assessment required under S4 of the Due Diligence Code (DECCW 2010:12-13). The purpose of reviewing the relevant environmental and heritage information is to assist in identifying whether Aboriginal objects or places are present within the Project Area.

3.1 Local Environment

An understanding of environmental context is important for the predictive modelling of Aboriginal sites and their interpretation. The local environment is understood to have provided natural resources for Aboriginal people, such as stone (for manufacturing stone tools), food and medicines, wood and bark (for implements such as shields, spears, canoes, bowls, shelters, amongst others), along with areas for camping and other activities. The nature of Aboriginal occupation and resource procurement is related to the local environment and it therefore needs to be considered as part of the cultural heritage assessment process. The Project Area is in the Pilliga sub-region of the Brigalow Belt South Bioregion (NSW National Parks and Wildlife Service 2003: 137).

3.1.1 Geology and Soils

The Project Area is predominantly located on the Jurassic Pilliga Sandstone landscape evidenced by horizontal Jurassic quartz sandstone, conglomerate and claystone with limited shale, tertiary basalt caps and the sediments derived from these rocks (Wallis 1971). The landscape is characterised by stepped sandstone ridges with low cliff faces with a high proportion of rock outcrop and long gentle outwash slopes intersected by sandy stream beds and prior stream channels, interspersed with patches of heavy clay.

The soils in the Project Area are typically shallow black earths and red loams on basalts. Extensive harsh-texture contrast duplex soils appear with cracking clay sub-soils. These soils are typical of those derived from the Pilliga Sandstone and are described as highly siliceous. They are characterised by the dense growth of trees and shrubs and high species diversity (Norris 1996).

The geology and soils of the Project Area demonstrate that the landscape prior to European contact was capable of supporting Aboriginal resources suitable for habitation.

3.1.2 Topography and Hydrology

The Project Area is located on relatively level (flat) land currently partly utilised for commercial purposes. At its closest, the Namoi River is approximately 1.5 kilometres to the north-east of the Project Area, Narrabri Lake is three (3) kilometres north/north-east of the Project Area, Bohena Creek is approximately 3.5 kilometres to the west and Narrabri Creek is approximately 4 kilometres north-east of the Project Area. All would have provided a permanent source of water, as would Yarrie Lake, approximately 20 kilometres to the south-west of the Project Area. The Project Area is on slightly elevated land of approximately 220 metres Australian Height Datum (AHD) (Geological Survey of NSW 2009: Online).

The topography and hydrology of the Project Area demonstrate that the surrounding landscape would have provided sufficient water resources and been fertile enough to sustain human habitation.

3.1.3 Climate

During the last glacial maximum (approximately 30,000-19,000 years ago), large ice sheets covered high latitude Europe and North America and the Antarctic ice sheet was more extensive than today. Sea levels

stood some 120-130 metres lower than today (Lambeck et al 2002:343) and the earth's climate was distinctly different from that of the present interglacial conditions. As the ice began to melt climatic conditions began to alter (Lambeck et al 2002:343). This affected the movement and behaviour of past populations within their environs. Sea levels started to rise, with a corresponding increase in rainfall and temperature. Short's (2000:19-21) research suggests the change in climatic conditions reached its peak about 6,000 years ago.

Up until 1,500 years ago, temperatures decreased slightly and then stabilised about 1,000 years ago producing similar temperatures to that currently experienced. Consequently, the climate of the Project Area for the past 1,000 years would probably have been much the same as present day, providing a year round habitable environment.

New South Wales is described as being in the temperate zone, although the climate undergoes large variations depending on proximity to the coast and mountains (OEH 2012a: Online; SEWPC 2011: 146). The Project Area is located within the eastern sub-humid region of Australia (NSW NPWS 2000b: 3).

Mean annual rainfall at Rosewood Farm, Narrabri, is 693 millimetres. Rainfall is highest in the summer months, with the highest mean rainfall in December (101.5 millimetres) (BOM 2012b: Online) and the lowest during the autumn months, with April recording the lowest mean of 25.5 millimetres (BOM 2012b: Online).

Temperatures are at their highest in January, with a monthly mean maximum temperature of 33.8 degrees Celsius. February records a monthly mean maximum temperature of 33.2 degrees Celsius. The coldest month is July, with a monthly mean maximum temperature of 18.0 degrees Celsius. This is closely followed by June with a monthly mean maximum temperature of 18.7 degrees Celsius (BOM 2012c: Online). An annual mean maximum of 26.5 degrees Celsius is recorded at the closest station, Narrabri West Post Office (BOM 2012c: Online).

3.1.4 Flora and Fauna

Keith (2006: 140-141) suggests that native vegetation in the vicinity of the Project Area is remnant Pilliga Outwash Dry Schlerophyl Forest dominated by box, red gum and iron bark eucalypts and interspersed with a prominent sub-canopy of smaller trees such as *Acacia*, *Casuarina* (Sheoak) and *Callitris glaucophyllia* (White Cyprus Pine). Vegetation within the Project Area, however, was observed (Plate 1) to be Pilliga Box – White Cypress Pine Grassy Open Woodland on Alluvial loams, with remnant Brigalow Woodland (Plate 2) in places. Blakeley's Red Gum and Ironbark Woodland (Plate 3; Plate 4) were also observed within the Project Area. Other than kangaroo and several unidentified species of birds, no fauna was observed by the archaeologist on site.

A full ecological assessment has been prepared by RPS Ecology (Bishop 2012) as a companion to this report.

3.1.5 Synthesis of Environmental Context

A review of environmental data indicates that, despite the landscape being highly disturbed by commercial and agricultural pursuits, prior to European occupation there would have been bountiful food, water and other resources available for exploitation by Aboriginal people and in sufficient quantities to sustain a local population.

This synthesis would suggest the presence of Aboriginal cultural heritage sites within the Narrabri Operations Centre Project Area; however this does not appear to be the case. The lack of Aboriginal sites and places in the vicinity of the Project Area recorded in AHIMS (Section 4.1.1) is understood to be a result of European occupation of the area, the high level of disturbance caused as a result of agricultural and commercial activities and the limited previous archaeological/cultural heritage work undertaken in the Project Area.

4.0 Heritage Context

Heritage consists of those objects, sites and places that will be inherited by future generations. Australia has many rich and varied historic places and landscapes, both urban and rural. Identifying and understanding their particular qualities, and what these add to our lives, is central to our engagement with our history and culture.

NSW's heritage is diverse and includes buildings, objects, monuments, Aboriginal places, gardens, bridges, landscapes, archaeological sites, shipwrecks, relics, bridges, streets, industrial structures and conservation precincts.

4.1 Aboriginal Cultural Heritage

Aboriginal and Torres Strait Islander heritage is an important part of Australian heritage. Evidence of the occupation of Australia by Aboriginal and Torres Strait Islander peoples dates to approximately 40,000 to 60,000 years ago (Dorey 2012: Online).

Aboriginal cultural heritage objects, sites and places provide valuable information about one of the world's oldest living cultures. It has continuing significance, creating and maintaining continuous links with the people and the land.

4.1.1 Aboriginal Heritage Information Management System (AHIMS)

A search was undertaken of the Aboriginal Heritage Information Management System (AHIMS) on 21 August 2012 in accordance with the Due Diligence Code (DECCW 2010:11). The searches were conducted over the parcels of land described as Lot 241, DP 1120041 with a 200 metre and a one (1) kilometre buffer (DECCW 2012a: Online; DECCW 2012b: Online).

The searches revealed that there are no previously recorded Aboriginal sites and no previously declared Aboriginal places in, or within, one (1) kilometre of the Project Area.

4.1.1 Archaeology and Cultural Heritage Literature Review

A review of previous archaeological and heritage reports is required as part of the desktop assessment and has been undertaken in accordance with the code (DECCW 2010:13). The most relevant publications are outlined below.

Appleton, J. (2009), Narrabri Longwall Stage 2 Project: Aboriginal Heritage Assessment. Whitehaven Coal: Sydney.

This investigation was conducted pursuant to an extension to the Narrabri Coal Mine by Whitehaven Coal, located approximately 28 kilometres south of Narrabri, adjacent to the Kamilaroi Highway. The investigation entailed a desktop assessment and a survey over four (4) main areas comprising the impact zones.

The survey identified a total of 121 sites across the four (4) survey areas. The majority of sites were identified in the longwall panels 8-26 (69), followed by the area comprising longwall 1-7. The longwall locations were on a variety of landscapes, but mostly on the eastern slopes of the Pilliga Forest. This area is fed by numerous ephemeral and permanent watercourses, including Pine Creek and Kurrajong Creek.

Overall, the sites comprised low density artefact scatters, with scatters of higher densities being associated with confluences of water courses. A scarred tree and a hearth were also identified in the longwall 1-7 area.

Trindall, E. (2007), *Narrabri Coal Seam Gas Utilisation Project: Aboriginal Heritage Assessment*, Santos Limited: Sydney.

This investigation was conducted ahead of the proposed construction of a gas gathering system, gas flow line and expansion of Wilga Park Power Station. The impact area of that project totalled approximately 36 hectares in the Pilliga East State Forest and open farmland in Narrabri Shire.

The investigation comprised a desktop assessment and a field survey to assess the impact of the proposed operations on the Aboriginal cultural heritage resource. Previous disturbances were variable, with the farmland being moderately disturbed, whilst the Pilliga Forest area had been subjected to varying levels of forestry, fires, grazing and mining exploration.

The survey identified one (1) site, a scarred tree located between Dog Fence Road and Pilliga Forest Way. The tree was a Pilliga Box, one (1) of less than 10 in the vicinity of the area surveyed. It was recommended that this tree be avoided by the proposed works.

Silcox, R. & Bowdler, S. (1982). *An Archaeological Survey of a Proposed 132 Kv Transmission Line Route from Walgett to Narrabri Part 1. A Report to the National Parks and Wildlife Service of N.S.W. on behalf of the Electricity Commission of N.S.W. unpublished.*

This investigation covered the physical examination (visual inspection) of a proposed 132 kilovolt (kv) transmission line route from Walgett to Narrabri. This report covers the first 87 kilometres of the 180 kilometre total route, which is proposed to contain an easement 45 metres wide. The second report, containing the Narrabri sector of the route was unable to be accessed.

Eight (8) sites and seven (7) isolated finds were identified during the course of the survey with visibility averaging 50%. The sites consisted of four scarred trees (two dead both ring barked (WN1 & WN2); two alive, standing, not ring barked (WN3 & WN4)), two surface campsites and two scatters of baked clay 'lumps' (WN7 & WN8). The authors initially suggested that these were from hearths, however conceded later in the report that they were likely the result of European clearing and burning of timber.

4.1.2 Synthesis of Aboriginal Heritage Context

A review of the AHIMS data and previous archaeological work in the vicinity of the Project Area suggests that the Project Area may have been utilised by past Aboriginal communities. This is in part due to the ready availability of food, water and other resources; the availability of water being a crucial factor in the frequency of occupation, as rivers and creeks are markers of community identity, traditional meeting places and the chosen location of settlements (NSW NPWS 2000s:36).

Trindall (2007: 5-11) observed the paucity of sites within the Pilliga Forest as being a direct consequence of the lack of reliable water, whilst sites outside the Pilliga, such as the proposed Narrabri Logistics Centre, which is closer to permanent water, contained a variety of site types. However, the potential for sites remaining must be tempered with the previous land disturbances noted above.

The literature review suggests that artefact sites, such as artefact scatters, isolated finds and non-specified artefact sites appear to be the most frequent site type encountered in the broader region. This is borne out by the Appleton survey, which found the majority of sites being artefact sites, although the AHIMS data has returned a nil result within one (1) kilometre of the Project Area. Appleton also observed the connection between site density/complexity and availability of reliable water which would suggest previous occupation within the Project Area; however, this cannot be confirmed.

4.2 European Heritage Context

European land settlement commenced in NSW in 1788 when Governor Phillip claimed possession of the land now known as Australia for a penal colony on behalf of the British Government. The region was first visited by John Oxley, the explorer and then Surveyor General of NSW in 1817, who noted the presence of Aboriginal people and the suitability of the land for agriculture (NSW NPWS 2000b: 133).

The heritage objects, sites and places associated with the European occupation of regional Australia point not only to the development of Australia as a modern nation, but to the places where people lived and worked the land.

European (historic) heritage is recorded in a number of ways/places including the Australian Heritage Database, which is an online database of items listed under the Commonwealth Heritage List, National Heritage List and the Register of the National Estate, along with a variety of State and local heritage registers.

4.2.1 World Heritage

The World Heritage List is a register of sites considered to have outstanding universal value. A search of the World Heritage List revealed there to be 23 World Heritage Sites in Australia, five (5) of which are in NSW (UNESCO 2012: Online). There are **no (0) World Heritage** sites in the Narrabri LGA, and therefore no items within the Project Area itself.

4.2.2 National Heritage

The National Heritage List is now the lead statutory document for the protection of heritage places considered to have national importance. This list comprises Aboriginal, natural and historic places that are of outstanding national heritage significance to Australia. Listed places are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A search of the Australian Heritage Database with reference to the National Heritage List (SEWPaC 2012a: Online) on 16 August 2012 indicates that there are no heritage items in the town of Narrabri or the Narrabri LGA, on the National Heritage List, and consequently **no National heritage items** within or near to the Project Area.

Previously the Register of the National Estate was the primary document. While the Register of the National Estate still exists in archival form, items can no longer be registered and since February 2012 no longer has statutory status. However, the Minister is still required to considering the Register when making some decisions under the EPBC Act. A search of the Australian Heritage Database with reference to the Register of the National Estate (SEWPaC 2012b: Online) on 16 August 2012 revealed six (6) heritage sites within the Narrabri LGA on the Register of the National Estate (the former Narrabri Gaol, Narrabri Public School, Police Residence, Mount Kaputar National Park, Collins Park Grandstand and the Narrabri Post Office and former Telegraph Office). The searches revealed that **no (0) heritage sites** on the Register of the National Estate are in, or near to, the Project Area.

4.2.3 Commonwealth Heritage

The Commonwealth Heritage List is a list of natural, Indigenous and historic heritage places owned or controlled by the Australian Government. These include places connected to defence, communications, customs and other government activities that also reflect Australia's development as a nation. A search of the Australian Heritage Database with reference to the Commonwealth Heritage List (SEWPaC 2012c: Online), on 16 August 2012 revealed that one (1) site in the town of Narrabri, the Narrabri Post Office and former Telegraph Office, is listed on the Commonwealth Heritage List. The Post Office and former Telegraph Office is located in Maitland Street, Narrabri, outside of the Project Area. As neither the Project Area nor

adjacent areas are owned by the Commonwealth, it is understood that there are **no Commonwealth heritage items** in the Project Area. The searches confirm this.

4.2.4 State Heritage

European heritage items in NSW may be registered as important at the State level and/or at the local level. The Heritage Council has developed a set of seven (7) criteria to help determine whether a heritage item is of State or local significance to the people of New South Wales. Items are assessed by the Heritage Council of NSW and if deemed eligible for listing, i.e. are of State significance, they are referred to the Minister for Heritage for a decision to list on the State Heritage Register, a statutory register of heritage items created by the NSW *Heritage Act 1977*.

The NSW Heritage Inventory database is maintained by the Heritage Branch, Office of Environment and Heritage and lists items that have been identified as of State and/or local heritage significance throughout NSW. A search of the State Heritage Register (OEH 2012c: Online) on 16 August 2012 revealed one (1) item of State Heritage Significance listed on the NSW State Heritage Register (Narrabri Gaol and Residence, Bowen Street, Narrabri) in the Narrabri LGA. The item is outside of the Project Area and therefore there are **no heritage items of State Significance** in, or near to the Project Area.

The searches also revealed **no heritage items** in the Narrabri LGA subject to an Interim, or Authorised Interim Heritage Order (OEH 2012d,e: Online); **no heritage items** subject to a s136 order (OEH 2012f: Online); and **no historic shipwrecks** in the Narrabri LGA (OEH 2012g: Online), and therefore no heritage items in, or near to the Project Area.

4.2.5 Local Heritage

Searches of the Heritage Branch, OEH State Heritage Inventory with reference to the Narrabri Local Environmental Plan No. 2 (current version for 20 April 2012 to date) were undertaken on 16 August 2012. The searches reveal nine (9) local heritage items listed on the LEP (Narrabri Shire Council 2012: Online). A search of the Heritage Branch, OEH State Heritage Inventory on the same day (OEH 2012h: Online) reveals twenty-three items of local significance in the Narrabri LGA, including the nine (9) LEP items. Of these twenty-three (23) local heritage items, **no heritage items** are in or near to the Project Area.

4.2.6 Synthesis of European Heritage Context

Although the Narrabri region has been settled for almost 200 years, the search results indicate that there are no known (i.e. reported, recorded or identified) European (Historic) heritage items within or near to the Project Area. It is therefore considered that there are **no European (Historic) heritage constraints** associated with the project.

5.0 Visual Inspection and Field Results

A visual inspection of the Project Area was undertaken to identify whether Aboriginal objects are present on the ground surface or are likely to be present below the ground surface. In accordance with S4 of the Due Diligence Code a qualified archaeologist undertook the visual inspection (DECCW 2010:12-13).

The visual inspection (pedestrian survey) of the Project Area (Figure 1) was undertaken on 4 September 2012 by Sarah Ward RPS Senior Archaeologist, in fine, sunny conditions.

An area of approximately 200 metres x 200 metres (4,000 square-metres or approximately 1.8 hectares) was surveyed to ensure adequate coverage for the purposes of due diligence.

At the commencement of the archaeological investigation, the corners of the Project Area (Table 1) were programmed into a Garmin Oregon 450 t GPS unit. After the perimeter of the Project Area was inspected, the survey continued by walking five (5) metre wide transects through it in a south/north direction, with particular attention paid to any ground surface exposures. Unfortunately, the extensive dense vegetation left no such exposures to inspect the natural ground surface, and visibility was assessed as poor, i.e. less than 5%. No Aboriginal objects were identified and the potential for unidentified Aboriginal objects was assessed to be low. No European (historic) heritage sites were identified within the Project Area.

Table 1 Narrabri Logistics Centre (NLC) Project Area Corner Locations (MGA55)

Corner	Eastings	Northings	Archaeological Sensitivity
NLC-A	762515	6640879	Low to nil sensitivity
NLC-B	762383	6640986	Low to nil sensitivity
NLC-C	762393	6640727	Low to nil sensitivity
NLC-D	762228	6640820	Low to nil sensitivity

Source: RPS 2012.

With regard to potential for Aboriginal objects to occur within the Project Area, as the land is not within 200 metres of a water course, it may not have been suitable for continuous habitation. Although continuous occupation is not dictated solely by distance to water (other factors are often at play), the Project Area may still have been used for transient or temporary purposes, though evidence of such use would not necessarily be left in the archaeological record. Further, past land uses such as grazing, land clearance, other agricultural and commercial pursuits may have damaged and/or destroyed what little evidence may have been left behind by such transient occupation.

6.0 Impact Assessment

There were no visible natural watercourses in the vicinity of the Project Area and the topography was of low relief. As aforementioned, the vegetation was observed to be a mix of native and non-native grasses, trees and shrubs with sections of woodland including Brigalow. RPS description of the landscape conforms with the Office of Environment and Heritage (OEH) definition of disturbed land (2010:18):

Land is disturbed land if it has been the subject of human activity that has changed the land's surface, being changes that remain clear and observable. Examples include ploughing, construction of rural infrastructure (such as dams and fences), construction of roads, trails and tracks (including fire trails and tracks and walking tracks), clearing vegetation, construction of buildings and the erection of other structures, construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure), substantial grazing involving the construction of rural infrastructure, and construction of earthworks associated with anything referred to above.

In keeping with the 2010 Due Diligence Code of Practice (2010:11-12) the landscape investigated by RPS did not possess sensitive landscape features which indicate the presence of Aboriginal objects. The Due Diligence Code provides examples of these higher sensitivity landscape features which occur: within 200 metres of waters; within a sand dune system; on a ridge top, ridge line or headland; within 200 metres below or above a cliff face; or within 20 metres of or in a cave, rock shelter or cave mouth; on land that is not disturbed. None of these landscape features were identified during the visual inspection. The RPS assessment confirms the land to be disturbed and the archaeological sensitivity and research potential to be low to nil.

No Aboriginal places, sites or objects were identified within the Project Area during the visual inspection. No culturally modified trees were observed in the Project Area. Whilst vegetation obscured much of the ground surface across the Project Area, past land uses and distance from permanent water sources tend to indicate that the potential for any Aboriginal cultural heritage material to be present within the Project Area is low to nil.

The results of the AHIMS and European (historic) heritage searches together with the visual inspection indicate that there are no identified Aboriginal objects or European (historic) heritage sites in the Project Area. **As there are no identified Aboriginal objects in the Project Area it is assessed that there is no identified risk of harm to Aboriginal objects and an AHIP is not required for the proposed activity.**

Similarly, as **no European (historic) heritage sites were identified within the Project Area, there is no identified risk of harm to European (historic) heritage and a Statement of Heritage Impact is not required.**

7.0 Recommendations

This report has considered the available environmental and archaeological information for the Project Area, the land condition, as well as, the nature of the proposed activities.

RECOMMENDATIONS

General mitigations have been provided for undertaking the proposed activity/works as they set out contingency procedures should unexpected Aboriginal objects, skeletal remains or suspected additional European cultural heritage material be identified during the proposed works.

Recommendation A

All relevant Santos Limited staff and contractors should be made aware of their statutory obligations for heritage under NSW *National Parks and Wildlife Act 1974* and the NSW *Heritage Act 1977*, which may be implemented as a heritage induction.

Recommendation B

This due diligence report must be kept by Santos Limited so that it can be presented, if needed, as a defence from prosecution.

Recommendation C

If Aboriginal object/s are identified in the Project Area during works, then all works in the immediate area must cease and the area cordoned off. The Office of Environment and Heritage must be notified by ringing the Enviroline 131 555 so that the site can be adequately assessed and managed.

Recommendation D

In the event that skeletal remains are uncovered, work must cease immediately in that area and the area cordoned off. Santos Limited must contact the NSW Police with no further action taken until written advice is provided by the Police. If the remains are determined to be of Aboriginal origin, the Office of Environment and Heritage must be notified by ringing the Enviroline 131 555 and a management plan prior to works re-commencing must developed in consultation with the relevant Aboriginal stakeholders.

Recommendation E

If, during the course of development works, suspected European cultural heritage material is uncovered, work should cease in that area immediately. The Heritage Branch, Office of Environment and Heritage (Enviroline 131 555) should be notified and works only recommence when an approved management strategy developed.

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9.0 Plates



Plate 1 Looking west across the Project Area from the north east corner of the existing Operations Centre compound.



Plate 2 Brigalow Woodland observed to the north of the Project Area.



Plate 3 Looking 301° North West across the Project Area from the existing Operations Centre.



Plate 4 Looking 186° south towards the existing Operations Centre from the north east corner of the Project Area.

10.0 Terms, Definitions, and Abbreviations

Abbreviation/ Term	Meaning
Aboriginal Object	“any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains” (DECCW 2010:18).
Aboriginal Place	“a place declared under s.84 of the NPW Act that, in the opinion of the Minister, is or was of special significance to Aboriginal culture” (DECCW 2010:18). Aboriginal places have been gazetted by the minister.
Aboriginal Culturally Modified Tree	“means a tree that, before or concurrent with (or both) the occupation of the area in which the tree is located by persons of non-Aboriginal extraction, has been scarred, carved or modified by an Aboriginal person by: (a) the deliberate removal, by traditional methods, of bark or wood from the tree; or (b) the deliberate modification, by traditional methods, of the wood of the tree” NPW Regulation 80B (3). Culturally Modified trees are sometimes referred to as scarred trees.
Activity	A project, development, or work (this term is used in its ordinary meaning and is not restricted to an activity as defined by Part 5 EP&A Act 1979).
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
cal. years BP	Calibrated years before present, indicates a radiocarbon date has been calibrated using the dendrochronology curves, making the date more accurate than an uncalibrated date.
DECCW	Department of Environment, Climate Change and Water (is now the Office of Environment and Heritage – OEH)
Disturbed Land	“Land is disturbed if it has been the subject of a human activity that has changed the land’s surface, being changes that remain clear and observable.” (DECCW 2010:18).
Due Diligence	“taking reasonable and practical steps to determine whether a person’s actions will harm an Aboriginal object and, if so, what measures can be taken to avoid that harm” (DECCW 2010:18)
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
GDA	Geodetic Datum Australia
GIS	Geographic Information System
Harm	“destroy, deface, damage an object, move an object from the land on which it is situated, cause or permit an object to be harmed.” (DECCW 2010:18)
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
NPWS	National Parks and Wildlife Service
NPW Act	<i>National Parks and Wildlife Act 1974 (NSW)</i>
NPW Regulation	<i>National Parks and Wildlife Regulation 2009 (NSW)</i>
OEH	Office of Environment and Heritage (formerly DECCW)
PAD	Potential Archaeological Deposit
Project Area	Project Area is the area subject to the proposed activity
REP	Regional Environment Plan
REF	Review of Environmental Factors

Appendix I

Legislative Requirements

Summary of Statutory Controls

The following overview of the legal framework is provided solely for information purposes for the client, it should not be interpreted as legal advice. RPS will not be liable for any actions taken by any person, body or group as a result of this general overview, and recommend that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken as a result of the summary below.

COMMONWEALTH

Aboriginal & Torres Strait Islander Heritage Protection Act 1984 (ATSIHIP Act)

The purpose of this Act is to preserve and protect all heritage places of particular significance to Aboriginal and Torres Strait Islander people. This Act applies to all sites and objects across Australia and in Australian waters (s4).

It would appear that the intention of this Act is to provide national baseline protection for Aboriginal places and objects where State legislation is absent. It is not to exclude or limit State laws (s7(1)). Should State legislation cover a matter already covered in the Commonwealth legislation, and a person contravenes that matter, that person may be prosecuted under either Act, but not both (s7(3)).

The Act provides for the preservation and protection of all Aboriginal objects and places from injury and/or desecration. A place is construed to be injured or desecrated if it is not treated consistently with the manner of Aboriginal tradition or is or likely to be adversely affected (s3).

Australian Heritage Commission Act 1975

The *Australian Heritage Commission Act (1975)* established the Australian Heritage Commission which assesses places to be included in the National Estate and maintains a register of those places. Places maintained in the register are those which are significant in terms of their association with particular community or social groups and they may be included for social, cultural or spiritual reasons. The Act does not include specific protective clauses.

The *Australian Heritage Council Act 2003*, together with the *Environment Protection & Biodiversity Conservation Act 1999*, includes a National Heritage List of places of National heritage significance, maintains a Commonwealth Heritage List of heritage places owned or managed by the Commonwealth and ongoing management of the Register of the National Estate.

STATE

It is incumbent on any land manager to adhere to state legislative requirements that protect Aboriginal Cultural heritage. The relevant legislation in NSW includes but is not limited to the summary below.

National Parks and Wildlife Act 1974 (NPW Act)

The NPW Act provides statutory protection for all Aboriginal heritage, places and objects (not being a handicraft made for sale), with penalties levied for breaches of the Act. This legislation is overseen by the Office of Environment and Heritage (OEH), and specifically the Chief Executive (formerly the Director-General) of OEH. Part 6 of this Act is the relevant part concerned with Aboriginal objects and places, with Section 86 and Section 90 being the most pertinent. In 2010, this Act was substantially amended, particularly with respect to Aboriginal cultural heritage requirements. Relevant sections include:

Section 86

This section now lists four major offences:

- (4) A person must not harm an object that the person knows is an Aboriginal object;
- (5) A person must not harm an Aboriginal object;
- (6) For the purposes of s86, “circumstances of aggravation” include:
 - (g) The offence being committed during the course of a commercial activity; or
 - (h) That the offence was the second or subsequent offence committed by the person; and
- (7) A person must not harm or desecrate an Aboriginal place.

Offences under s86 (2) and (4) are now strict liability offences, i.e. knowledge that the object or place harmed was an Aboriginal object or place needs to be proven. Penalties for all offences under Part 6 of this Act have also been substantially increased, depending on the nature and severity of the offence.

Section 87

This section now provides defences to the offences of s86. These offences chiefly consist of having an appropriate Aboriginal Heritage Impact Permit (AHIP), not contravening the conditions of the AHIP or demonstrating that due diligence was exercised prior to the alleged offence.

Section 87A & 87B

These sections provide exemptions from the operation of s86; Section 87A for authorities such as the Rural Fire Service, State Emergency Services and officers of the National Parks & Wildlife Service in the performance of their duties, and s87B for Aboriginal people performing traditional activities.

Section 89A

If a person knows of the location of an Aboriginal object or place that has not been previously registered and does not advise the Director-General (now Chief Executive) of that object or place within a reasonable period of time, then that person is guilty of an offence under this Section of the Act.

Section 90

This section authorises the Director-General (now Chief Executive) to issue an AHIP.

Section 90A-90R

These sections govern the requirements relating to applying for an AHIP. In addition to the amendments to the Act, OEHS have issued three new policy documents clarifying OEHS’s requirements with regards to Aboriginal archaeological investigations: *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* and *Code of Practice for Archaeological Investigations in NSW*. The Consultation Requirements formalise the consultation with Aboriginal community groups into four main stages, and includes details regarding the parties required to be consulted, advertisements inviting Aboriginal community groups to participate in the consultation process, requirements regarding the provision of methodologies, draft and final reports to the Aboriginal stakeholders and timetables for the four stages. The Due Diligence Code of Practice sets out the minimum requirements for investigation, with particular regard as to whether an AHIP is required. The Code of Practice for Archaeological Investigation sets out the minimum requirements for archaeological investigation of Aboriginal sites.

Aboriginal Heritage Impact Permits (AHIP)

OEH encourages consultation with relevant Aboriginal stakeholders for all Aboriginal Heritage Assessments. However, if an Aboriginal Heritage Impact Permit (AHIP) is required for an Aboriginal site, then specific OEH guidelines are triggered for Aboriginal consultation.

Aboriginal Cultural Heritage Consultation Requirements for Proponents

In 2010, the Aboriginal Cultural Heritage Consultation Requirements for Proponents (ACHCR's) were issued by OEH (12th April 2010). These consultation requirements replace the previously issued Interim Community Consultation Requirements (ICCR) for Applicants (Dec 2004). These guidelines apply to all AHIP applications prepared after 12th April 2010; for projects commenced prior to 12th April 2010, transitional arrangements have been stipulated in a supporting document, Questions and Answers 2: Transitional Arrangements.

The ACHCR's 2010 include a four stage Aboriginal consultation process and stipulate specific timeframes for each state. Stage 1 requires that Aboriginal people who hold cultural information are identified, notified and invited to register an expression of interest in the assessment. Stage 1 includes the identification of Aboriginal people who may have an interest in the Project Area and hold information relevant to determining the cultural significance of Aboriginal objects or places. This identification process should draw on reasonable sources of information including: the relevant OEH EPRG regional office, the relevant Local Aboriginal Land Council(s), the Registrar of Aboriginal Owners, Aboriginal Land Rights Act (1983), the Native Title Tribunal, Native Title Services Corporation Limited, the relevant local council(s), and the relevant catchment management authority. The identification process should also include an advertisement placed in a local newspaper circulating in the general location of the Project Area. Aboriginal organisations and/or individuals identified should be notified of the project and invited to register an expression of interest (Eoi) for Aboriginal consultation. Once a list of Aboriginal stakeholders has been compiled from the Eoi's, they need to be consulted in accordance with ACHCR's Stages 2, 3 and 4.

Environmental Planning & Assessment Act 1979 (EP&A Act)

This Act regulates a system of environmental planning and assessment for New South Wales. Land use planning requires that environmental impacts are considered, including the impact on cultural heritage and specifically Aboriginal heritage. Within the EP&A Act, Parts 3, 4 and 5 relate to Aboriginal heritage.

Part 3 regulates the preparation of planning policies and plans. Part 4 governs the manner in which consent authorities determine development applications and outlines those that require an environmental impact statement. Part 5 regulates government agencies that act as determining authorities for activities conducted by that agency or by authority from the agency. The National Parks & Wildlife Service is a Part 5 authority under the EP&A Act.

In brief, the NPW Act provides protection for Aboriginal objects or places, while the EP&A Act ensures that Aboriginal cultural heritage is properly assessed in land use planning and development.

Heritage Act 1977

This Act protects the natural and cultural history of NSW with emphasis on non-indigenous cultural heritage through protection provisions and the establishment of a Heritage Council. Although Aboriginal heritage sites and objects are primarily protected by the *National Parks & Wildlife Act 1974*, if an Aboriginal site, object or place is of great significance, it may be protected by a heritage order issued by the Minister subject to advice by the Heritage Council.

Other legislation of relevance to Aboriginal cultural heritage in NSW includes the *NSW Local Government Act 1993*. Local planning instruments also contain provisions relating to indigenous heritage and development conditions of consent.

Appendix 2

AHIMS Search Results

RPS Australia East Pty Ltd Sydney CBD
Level 12 92 Pitt Street
Sydney New South Wales 2000

Date: 21 August 2012

Attention: Sarah Ward

Email: sarah.ward@rpsgroup.com.au

Dear Sir or Madam:

**AHIMS Web Service search for the following area at Lot : 241, DP:DP1120041 with a Buffer of 200 meters.
conducted by Sarah Ward on 21 August 2012**

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette](http://www.nsw.gov.au/gazette) (<http://www.nsw.gov.au/gazette>) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

RPS Australia East Pty Ltd Sydney CBD
Level 12 92 Pitt Street
Sydney New South Wales 2000

Date: 21 August 2012

Attention: Sarah Ward

Email: sarah.ward@rpsgroup.com.au

Dear Sir or Madam:

**AHIMS Web Service search for the following area at Lot : 241, DP:DP1120041 with a Buffer of 1000 meters.
conducted by Sarah Ward on 21 August 2012**

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette](http://www.nsw.gov.au/gazette) (<http://www.nsw.gov.au/gazette>) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

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- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Appendix)

Fluid Waste Management Plan

Waste Management Plan

Santos



Energy NSW

Drilling and Completions

Revision 2

08/08/2012

DOCUMENT CONTROL

This Waste Management Plan (WMP) for Santos' activities conducted by Energy NSW Drilling and Completions is a "controlled document". Should the recipient (user) become aware of any changes or corrections that are required please photocopy this page with relevant page(s) to be changed, note the corrections and send them to:

ENSW D&C EHS Team Leader
Santos Limited
Level 12, 40 Creek Street
Brisbane Qld 4000

DOCUMENT REVISIONS

The Manager Drilling & Completions ENSW is responsible for controlling and ensuring any revision of this WMP. Responsibility for managing change in this document is detailed within the Santos EHSMSo8 Document and Records Management.

It is proposed that the WMP is a living document, which can be revised on an ongoing basis. It is proposed that the entire document is reviewed and if required updated annually as a minimum or in the following circumstances:

- › following a serious incident or near miss;
- › following significant changes to the applicable legislation;
- › significant change in the drilling, completions program or operations.

Note: Changes to the WMP are to be undertaken by using the feedback form located in EHSMS o8 - Appendix C.

DOCUMENT HISTORY

Document Reference	Revision No.	Revision Date	Compiled	Reviewed	Approved	Comment
Energy NSW D&C WMP	1	July 2012	Corey Beggs	Scott Atkins		Initial Draft
Energy NSW D&C WMP	2	8 August 2012	SA	Patrick Breene	Rohan Richardson	Insert S. 4.3 Drilled Cuttings Management

ENDORSEMENT AND APPROVALS

This WMP has been reviewed and endorsed by Santos and is approved for use by Energy NSW D&C operations.

Reviewed by:

Scott Atkins	EHS Team Leader, Energy NSW Drilling & Completions	_____ Signature	_____ Date
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Patrick Breene	Drilling Superintendent, Energy NSW Drilling & Completions	_____ Signature	_____ Date
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Approved by:

Rohan Richardson	Manager, Drilling & Completions Energy NSW	_____ Signature	_____ Date
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1. Introduction

Santos is an Australian oil and gas exploration and production company with assets and projects throughout Australia and the Asia-Pacific region. Santos conducts its business activities in a manner that aims to prevent injury or illness and lightens our environmental footprint. Santos strives for the highest standard of environmental management and is committed to lightening the footprint of our activities.

Santos generates waste from drilling and completion activities in the ENSW Drilling and Completion (ENSW D&C) Operations. This waste management plan (WMP) has been developed to:

- › minimise the risk of causing harm to the environment that may arise due to waste management;
- › minimise waste volumes;
- › improve operational efficiency; and
- › improve environmental performance.

1.1 Purpose

The purpose of the WMP is to:

- › provide a framework for addressing relevant aspects of waste management including waste minimisation, waste management, recycling, and reporting; and
- › ensure waste management practices are supportive of sustainable development and comply with Santos policies, industry standards, legislative obligations and licence conditions. .

1.2 Scope

This plan is the ENSW Drilling and Completion Waste Management Plan (WMP) and is the overall coordination document for waste management at Santos' ENSW D&C operations

The scope of the WMP encompasses the management of wastes from generation to formally handing over the waste for collection, segregation, transport, treatment and/or disposal.

The WMP identifies:

- › types of waste generated
- › waste management processes and procedures
- › waste transport requirements
- › monitoring requirements
- › audit and inspection requirements
- › record keeping reporting requirements

1.3 Document Ownership

The ENSW D&C Manager is responsible for ensuring that the WMP is implemented appropriately via:

- › procedures (refer to Section 4 and Appendix C)
- › waste tracking (refer to Section o)

- › inspections and audits (refer to Section 6.2)

1.4 Document Review

The performance of the WMP shall be reviewed by the EHS Team Leader annually. The relevant Environmental Adviser shall be part of this review. Issues to be considered during this review include:

- › amendments to legislation and conditions of licence
- › review of the relevant SHRR/s
- › inspection and audit findings
- › waste related incidents, near misses or hazards

The ENSW D&C Manager shall ensure that any recommended changes to WMP are made after the review. Reviews and changes to the WMP will be:

- › listed at the front of this document
- › Communicated to relevant Santos personnel and contracts.

1.5 Legislation

Santos ENSW D&C will undertake the petroleum activities including exploration, appraisal, completion and abandonment of Coal Seam Gas wells within NSW.

Within NSW the *Petroleum (Onshore) Act 1991* covers onshore exploration and production of petroleum. It creates exploration and production titles and also addresses environmental protection, royalties and compensation. The *Petroleum (Onshore) Regulations 2007* requires all exploration or other activity carried out under the authority of a petroleum title is to be carried out in conformity with the *Schedule of Onshore Petroleum Exploration and Production Safety Requirements 1992* published by the Department.

Within NSW there are six waste classes:

- › Special waste;
- › Liquid waste;
- › Hazardous waste;
- › Restricted solid waste;
- › General solid waste (putrescible); and
- › General solid waste (non-putrescible).

The following legislation relating to minimising environmental impacts from waste management applies to ENSW D&C:

- › *Protection of Environment Operations Act 1997*
- › *Protection of Environment Operations (Waste) Regulation 2005*

Other Acts and Guidelines, include:

- › Environmental Planning and Assessment Act, 1979 and Regulations;
- › NSW Radiation Control Act, 1990 and Regulations;

- › APPEA (2008) Code of Environmental Practice.

This plan has been developed to demonstrate that Santos will ensure:

- › We comply with relevant legislation, Australian Standards, Codes of Practice and good oilfield practices;
- › We design, construct and operate equipment and facilities to safe standards which meet accepted standards of the hydrocarbon, exploration, production and processing industries;
- › We consult with employees and their representatives, as appropriate, on matters that may affect their health, safety and wellbeing;
- › We have identified potential major hazards and risks arising from intended operations and ensured that appropriate controls are in place; and
- › Effective emergency response plans are in place and periodically tested for appropriateness and effectiveness to enable response to foreseeable emergencies arising from our operations.

1.5.1 Protection of Environment Operations Act 1997

The objective of this Act is to protect the environment and reduce environmental degradation. Requirements applicable to NSW D&C operations include:

- › Do not carry out a waste-related activity, or perform development work for the purpose of allowing such an activity, unless in accordance with an EPA licence or exemption.

1.5.2 Protection of Environment Operations (Waste) Regulation 2005

Requirements applicable to NSW include:

- › If storing any waste on premises, do so in an environmentally safe manner.
- › As the consignor of waste to which waste-tracking obligations apply, obtain a consignment authorisation and complete the relevant parts of a transport certificate before consigning the waste. For further details, see the *Protection of the Environment Operations (Waste) Regulation 2005 clause 22*.
- › As a facility occupier, consignor, transporter or receiver of waste to which waste-tracking obligations apply, keep transport certificates for at least 4 years. For further details, see the *Protection of the Environment Operations (Waste) Regulation 2005 clauses 32 to 37*.

1.5.3 Commonwealth National Environment Protection (Movement of Controlled Waste between States and Territories) Measure.

The *National Environment Protection (Movement of Controlled Waste between States and Territories) Measure* (NEPM) aims to ensure that controlled wastes which are moved between States and Territories are properly identified, transported and handled in an environmentally sound manner, and that they reach licensed or approved facilities for treatment, recycling, storage and/or disposal. The NEPM provides a framework for developing and integrating systems for the movement of controlled waste between States and Territories which includes:

- › tracking systems, which provide information to assist agencies and emergency services and ensure that controlled wastes are directed to appropriate facilities
- › prior notification systems, which provide participating States and Territories with access to information to assess the appropriateness of proposed movements of controlled wastes in terms of transportation and facility selection

- › systems for licensing transporters and the regulating generators and facilities so that tracking and notification functions are compatible between States and Territories
- › Provision for mutual recognition by States and Territories of each other's transport licences.

1.5.4 Australian Code for the Transport of Dangerous Goods by Road and Rail (6th Ed)

The Australian Code for the Transport of Dangerous Goods Code by Road and Rail (6th Ed.) sets out technical requirements and guidelines for the transport of dangerous goods by road and rail and is implemented for roads in New South Wales by the *Transport Operations (Road Use Management - Dangerous Goods) Regulation 1998*. The requirements of the Code do not apply to waste products and other environmentally hazardous substances unless those products or substances are also Dangerous Goods within the meaning of the Code. Where wastes that constitute Dangerous Goods (e.g. flammable liquids/solids, corrosives, oxides, acute poisonous and toxic materials) are to be transported from site, the transporter must comply with all the requirements of the Code and Regulation, including the requirements for placarding.

1.6 Licenses

Santos does not currently hold any licences which refer to conditions regarding the management of waste within its ENSW D&C operations

1.7 Other references

Together with this WMP, ENSW D&C will utilise an number of of the reference documents, including:

- › ENSW D&C Emergency Response Plan
- › ENSW D&C Operational Environmental Management Plan
- › ENSW D&C Safety Management Plan
- › ENSW D&C Significant Hazard Risk Register
- › Santos [EHSMS Index](#)
- › Santos [EHSO₄ Waste Management](#)
- › Santos [EHSMS15 Incident & Non-Conformance Investigation, Corrective and Preventative Action](#)
- › Santos audit tool, [Audit and Inspection Manager \(AIM\)](#)
- › Advisory Committee on the Transport of Dangerous Goods / National Transport Commission publication, [Australian Code for the Transport of Dangerous Goods Code by Road and Rail \(6th Ed.\) \(Cwth\)](#)
- › [National Environment Protection \(Movement of Controlled Waste between States and Territories\) Measure \(Cwth\)](#)
- › The Guidelines on Resource Recovery Exemptions (Land Application)
<http://www.environment.nsw.gov.au/resources/waste/o8232resrecoverexempts.pdf>
- › The Waste Classification Guidelines Part1: Classifying Waste,
<http://www.environment.nsw.gov.au/resources/waste/o8202classifyingwaste.pdf>
- › The Waste Classification Guidelines Part 2: Immobilization of Waste
<http://www.environment.nsw.gov.au/resources/waste/o8203immobilisationwaste.pdf>

2. Responsibility

Site specific drilling and completion activities are detailed in each Well program prepared by the ENSW D&C team. Activities required to complete the well program are conducted by contract or service providers who are required to have a suitable environmental, health and safety management system to fulfil their obligations under NSW legislation.

Employees and contractors have specific responsibilities for protecting the environment, as detailed in Santos' Environmental Policy and Santos EHSMS. Feedback, discussion, hazard analysis, auditing and drills are used to continuously improve procedures and practices developed under these guidelines.

All Santos personnel and contractors must handle the waste correctly and in accordance with the relevant process (refer to Appendix B). The processes cover when waste is:

- › generated;
- › stored/segregated;
- › transported;
- › treated; and / or
- › disposed.

Drilling fluid wastes will be handled in accordance with the ENSW D&C Fluids Management Plan.

Santos through the Environmental Advisor will liaise with the local Council(s) regarding Shire/Regional Waste Management Plans and the opportunities for synergy with Santos' waste management procedures.

A summary of EHS responsibilities relevant to ENSW D&C:

Position	Responsibility
Drilling and Completions Manager	<ul style="list-style-type: none">› Has overall responsibility for the management of the environment during wellsite operations. Ensure the development, implementation and maintenance of the WMP and associated procedures. <ul style="list-style-type: none">› Ensure required monitoring is undertaken.› Oversee any updates of the WMP and communicate changes.› Ensure waste contractors are made aware of WMP requirements.
EHS Team Leader	<ul style="list-style-type: none">› Provide EHS leadership, guidance and support to ENSW D&C personnel in respect to implementing and complying with the EHSMS.› Coordinate the review the WMP annually.
Engineers	<ul style="list-style-type: none">› Primarily responsible for specific well design and writing the well program so that the Wellsite activities can be achieved safely and efficiently in compliance with this WMP, Santos EHSMS and sound engineering practice.
Environmental Adviser / Field EHS Coaches	<ul style="list-style-type: none">› Undertake site waste inspections of site activities› Provide awareness training to ENSW D&C personnel and contractors.› Liaise with the local Council(s) regarding Shire/Regional

Position	Responsibility
	<p>Waste Management Plans and the opportunities for synergy with Santos' waste management procedures.</p> <ul style="list-style-type: none"> › Engage consultant upon completion of the well to have sampling done and once waste classification is decided, work with relevant disposal facility. › Report regulated waste transfers to EPA. › Be part of WMP review.
Onsite Company Representative	<ul style="list-style-type: none"> › Oversee wellsite activities including providing onsite guidance, monitoring, coordinating and auditing of operations. › Ensure wellsite activities are completed and documented through adherence to good oilfield practice, EHSMS and the implementation of the WMP on site. › To advise when rig will be released and site handed over to Development and Operations Team.
Santos personnel and contractors	› Undertake all activities in accordance with the WMP.
Superintendent	› Responsible for coordinating operational and wellsite activities in a manner that complies with this WMP and the Santos EHSMS.

2.1 ENSW D&C Contact List

The contacts for sites covered by the WMP are:

Title	Phone Number
ENSW Incident Management Plan – Duty Manager	0400 847 126
Manager Drilling & Completions	0427 500 017
Drilling Superintendent	0400 834 096
EHS Team Leader	0448 011 237
Environmental Advisor	(07) 3838 5417
Field EHS Advisor	0418 546 490
Completions Superintendent	0419 520 137
Senior Drilling Engineer	0408 961 379
Drilling Engineer	0427 199 543
Logistics Coordinator	0419 963 259
Narrabri Field Supervisor	(02) 6792 3400
Santos Crisis Management Team	0419 169 254
Narrabri Operations Centre	(02) 6792 3400
Gunnedah Office	(02) 6741 5100

3. Environment Health and Safety Management System

The Santos Environment Health and Safety Management System (EHSMS) provides the framework within which all aspects of the Santos' environmental, health and safety responsibilities are managed¹.

[EHSo4 Waste Management](#) is the standard that specifically manages waste. This standard requires that any Santos operation or activity that generates, handles, stores, transports or disposes of

¹ More information about the EHSMS can be found via the link to the EHSMS Index found on the front page of The Well.

waste is required to have a WMP. This WMP has been developed following the guidance provided in this standard.

The waste management hierarchy has been considered whilst developing this WMP and related procedures. The waste management hierarchy comprises the following steps (with avoid being most preferable through to disposal being least preferable):

- › **Avoid** Choose a process so as to avoid the production of the waste
- › **Reduce** Review the process and raw materials to reduce the production of the waste
- › **Reuse** Reuse as much as possible in the process to minimise the waste
- › **Recycle** Use the waste stream as a raw material in a different process or as an alternative source of energy/fuel
- › **Treatment** Destruction, detoxification, and/or neutralisation of residues
- › **Disposal** Responsible disposal of wastes using appropriate methods.

4. Waste Management Processes

The flowchart in Appendix A provides an overview waste types and sources and lists the specific management requirements for wastes generated by activities undertaken by ENSW D&C.

4.1 Waste Types & Inventory

In accordance with the NSW Waste Classification Guidelines Part 1: Classifying Waste² and in line with [EHS04 Waste Management](#), Santos D&C activities generate a wide range of wastes, however they can be classified into two general areas:

- › **Regulated Waste:** wastes that require specific controls or actions as defined by legislation. Special, Liquid, Hazardous, Restricted wastes typically have unique handling and disposal requirements in order to manage specific hazards associated with them.
- › Regulated waste generated by ENSW D&C may include:
 - Waste drilling fluids and drilled cuttings;
 - Waste oil;
 - Oil & water mixtures or emulsions;
 - Formation water (if not transported by a pipeline); and
 - Sewage sludge & septic tank sludge.
- › **General Solid Waste:** wastes not defined as regulated waste under legislation. General wastes comprise two main waste streams: putrescibles (easily decomposed) and non-putrescibles (not easily decomposed).

A full description of waste types and sources is included in Appendix B.

4.2 Waste Facilities

Santos does not operate waste disposal facilities within ENSW D&C operations.

² Department of Environment and Climate Change NSW (2009), Waste Classification Guidelines Part 1: Classifying Waste.

Wastes requiring on-site storage are placed within the Waste Transfer Station (WTS) located at each well site prior to transportation for disposal.

Regulated waste is collected by licensed contractors for off-site disposal.

General and recyclable waste is transported to local council landfill and recycling facilities.

4.3 Drilled Cuttings Management

Drilled cuttings are produced during the drilling process. The drilling fluid (drilling mud) transports the drilled cuttings from the well bore. The drilled cuttings are screened over shale shakers (mechanical vibrating screens) to separate the solid cuttings from the drilling mud. The drilled cuttings will be collected in metal bins or a cuttings sump. The drilling fluid is recycled back through the well bore.

Drilled cuttings are to be managed as an excavated natural material*. The Screening process will ensure that the cuttings are at least 90% (by weight) dry. Sampling of the cuttings will be undertaken in accordance with Australian Standard 1141 Methods of Sampling and Testing Aggregates.

The cuttings will be appropriately stored until characterisation test results for mix-cover-reuse have been validated.

Where drill cuttings have been suitably characterised for mix-cover-reuse, the process will be documented, will follow Santos EHSMS procedures and meet all land holder approvals. If the sampling of the drilled cuttings shows they do not meet designated chemical and other material properties; (see Table 2 – Protection of the Environment Operations (Waste) Regulation 2005. General Exemption under Part 6, Clause 51 and 51A) they will be transported to a designated Licenced Disposal Facility. Transport of the drilled cuttings to the designated Licensed Disposal Facility will be managed as a regulated waste via the requirements set out in the ENSW D&C Waste Management Plan.

<http://www.environment.nsw.gov.au/resources/waste/exo8ENM.pdf>

***Excavated material is naturally occurring rock and soil (included but not limited to materials such as Sandstone, Shale, Clay and Soils) that has**

- a. Been excavated from the ground and**
- b. Contains at least 98% (by weight) natural materials and**
- c. Does not meet the definition of Virgin Excavated Natural Material**

4.4 Monitoring

The following is monitored within ENSW D&C:

- › General waste volumes and type;
- › Recycle waste volumes and type; and
- › Regulated waste volume and type (via waste tracking certificates, Section o)

The OCR shall ensure that monitoring is undertaken in accordance with Section 5.1 and 5.3.

Monitoring and inventory data is reported in accordance with the requirements in Section 5.1.1.

4.5 Weed Control

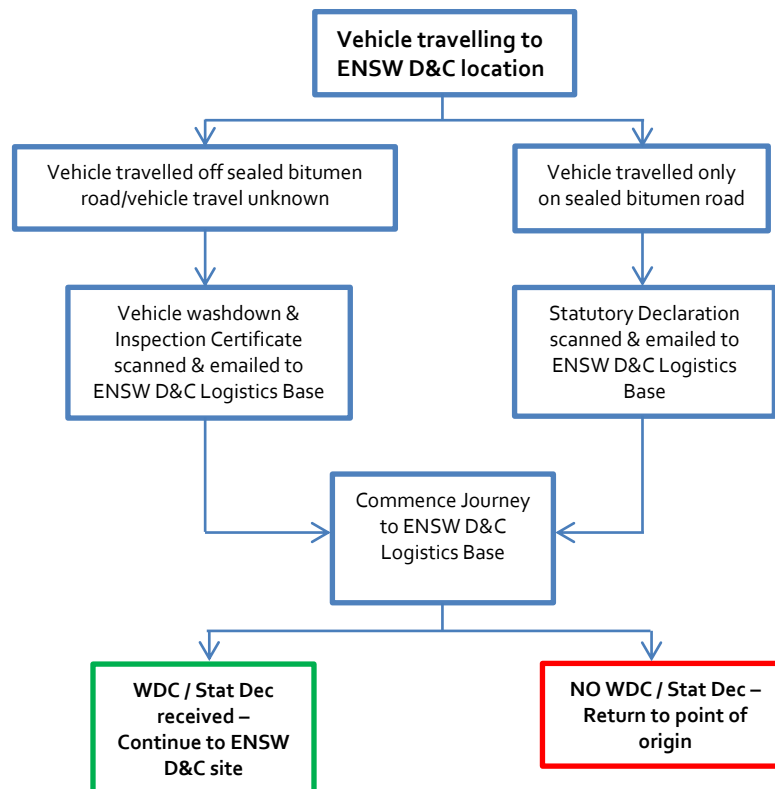


Figure 1 – Weed Control Flow Chart

5. Waste Transport and Tracking

5.1 Regulated waste

The transport of regulated wastes shall be recorded via waste transport certificates (WTCs). Waste tracking ensures that all parties involved in the management of the regulated wastes take responsibility for its transportation and disposal to prevent or minimise environmental impact.

WTC information is reported to the EPA in accordance with the requirements in Section 5.1.1.

Transport of regulated waste shall be undertaken only by licensed transporters.

The Onsite Company Representative (OCR) shall ensure that the waste transporter is aware of the waste management requirements contained in the plan and the waste management procedures.

5.1.1 WTC Records

Waste Tracking Certificates (WTCs) are used to report to the EPA on the quantities of regulated waste leaving the site. The OCR shall ensure that the waste transporter has the appropriate consignment authorisation (CA) from the waste receiver before the waste leaves the site. Completed WTCs are to be forwarded to the Energy NSW D&C Field EHS Coach who will scan and upload the documents to "The Well" at the end of each well site activity. The EHS Team Leader for D&C shall use these WTCs to ensure that the annual waste returns are completed.

Regulation requires that documents generated as part of the waste tracking system are kept for at least 4 years³.

5.2 When regulated waste tracking is not required

The waste tracking provisions do not apply in the following circumstances:

- › if waste is transported within a site area (i.e. from pond to pond, well site to batching facility);
- › if waste is transported in a pipeline;
- › if given an exemption given by the EPA; and
- › if waste is being transported to a registered laboratory for analysis.

5.3 General waste

All general waste from ENSW D&C operations will be collected from the well sites by the waste contractor and disposed of in the appropriate licenced facility.

General waste tracking will be recorded by the waste contractor upon collection and will include volume of waste and type of waste. This information will be reported to Santos quarterly.

6. Incident Management, Audits and Inspections

6.1 Incident Notification

Section 9 of the ENSW D&C Emergency Response Plan (Doc. No.: 7009-0500-650-PRO-0002) outlines the notification process both internally and externally to the regulator upon becoming aware that an incident has occurred.

6.1.1 Incident Investigation, Corrective and Preventive Action

Incidents related to ENSW D&C operations, shall be managed in accordance with [EHSMS15 Incident & Non-Conformance Investigation, Corrective and Preventative Action](#). EHSMS15 defines the requirements for the management of EHS incidents, hazards, near misses, property damage, process safety hazards, exceptions and incidents, non-conformance and third party complaints with the aim of preventing reoccurrence.

6.2 Audits and Inspections

Santos establishes an annual internal audit schedule for determining the degree of conformance by various departments with the requirements of the EHSMS.

Within ENSW D&C the responsibility for conducting audits and assessments is shared between Santos field and office positions. The ENSW D&C master audit schedule determines what hazard hunts, inspections, assessments and audits are conducted in relation to wellsite activities and by whom.

Audits and inspections will take place to ensure compliance with the overall strategy of a healthy and safe work environment, in addition to audits of compliance with the Santos and contractor management plans. Any areas where deficiencies are noted will be reported and passed on to those

³ Protection of the Environment Operations (Waste) Regulation 2005 Division 7 - Record keeping and returns, clause 33.

concerned for correction. The intent is to create and maintain a high standard of environmental management, health and safety performance and prevent loss from injury or damage. The Contractor will be involved in these audits.

The D&C Environmental Advisor shall ensure that inspections are undertaken to ensure correct procedures and reporting is occurring and general tidiness of the site is being maintained.

Audits of the WMP shall be conducted by Santos personnel or by third parties acting on behalf of Santos. These audits shall be scheduled and managed through the [Audit and Inspection Manager \(AIM\)](#) via the EHS Toolbox.

The Regulator may also audit any aspect of the WMP at any time.

7. Emergency Preparedness

As required by section 43 of the *Work Health and Safety Regulation 2011*, the Santos Management Standard EHSMS 13 – Emergency Preparedness requires that operating activities have an appropriate emergency response plan.

The ENSW ERP (7009-0500-650-PRO-0002) identifies the specific emergency response requirements with NSW Wellsite activities and forms part of the organisation's holistic emergency response, by providing information to address emergencies at site and business unit level.

The ENSW ERP (7009-0500-650-PRO-0002) is located on the Energy NSW Server within the Drilling and Completions folder and in hard copy at D&C wellsites.

DEFINITIONS

Dangerous goods	Goods specified as Dangerous Goods under the Australian Dangerous Goods Code (6th addition)
Drilling Fluid	Used while drilling oil & gas wells. The main functions of drilling fluids include providing hydrostatic pressures (Primary Well Control), keeping the drill bit cool, assist with the suspension and transport of drilled cuttings out of the well bore, minimising formation damage and corrosion. Drilling Fluids are often referred to as Drilling Mud.
Drilled Cuttings	The rock/formation removed from the well bore by the drilling fluid during the drilling process.
EHSMS	Santos Environment Health and Safety Management System
Excavated Material	Naturally occurring rock and soil (included but not limited to materials such as Sandstone, Shale, Clay and Soils) that has: <ul style="list-style-type: none">a. Been excavated from the ground andb. Contains at least 98% (by weight) natural materials andc. Does not meet the definition of Virgin Excavated Natural Material
General Waste	Wastes other than regulated wastes
NEPM	National Environment Protection Measure A policy made by the National Environment Protection Council with the objective of protecting Australia's environment from inappropriate management practices
Putrescible Waste	Wastes that can be readily decomposed through the action of micro-organisms, such as food wastes
Recyclable Waste	Wastes that can practicably be recycled
Regulated waste	Wastes that have specific handling and disposal requirements in order to manage hazards associated with them. Referred to in various jurisdictions as Special, Liquid, Controlled, Hazardous, Listed, Prescribed Industrial, Regulated and Trackable Waste

Segregation	Separation of wastes into non-recyclable and at least one recyclable waste streams e.g. segregate waste metal, plastic, glass, cardboard and paper from other general waste
Third party	Non-Santos organisation For the purposes of this standard, third parties may be other oil and gas companies who seek to utilise Santos waste management facilities
Waste	Includes any solid, liquid or gas (or combination thereof) that is left over, surplus or an unwanted by-product (whether of value or not)
Waste management facility	A facility for the recycling, reprocessing, treatment, storage, incineration, conversion to energy or disposal of waste.
Waste generator	Any activity or operation that produces or stores waste and arranges for this waste to be sent for storage, recycling, treatment or disposal at another location
Waste receiver	A waste management facility that receives waste for recycling, treatment, storage or disposal
Waste Transfer Station	Location controlled by a waste generator where waste is stored before collection by a waste transporter
Waste transporter	Anyone who transports waste from its place of production or storage to another location.
WMP	Waste Management Plan Provides details on the management of waste from the time of generation to the time of ultimate treatment and/or disposal. A WMP should provide the framework for addressing aspects of waste management, including but not limited to waste collection, transport, reuse, recycling, treatment and disposal (in line with the principles of the waste hierarchy)

APPENDICES

Appendix A - Waste Types, Sources And Management Process Flowchart

Appendix B – Fluid Management Process Flowchart

Appendix C – ENSW NSW D&C Waste Inventory

Waste Name	Regulated / Trackable Y/N	Generator Responsibility	On-site storage and collection	Off-site Disposal (in order of preference)			Waste Contractor	HSE Issues
				1. Re-use	2. Recycle	3. Landfill		
Chemicals								
Chemical wastes	Y	Return to supplier wherever possible. Triple rinse containers and empty for recycling.			✓		Veolia	WTC Required.
Contaminated soils								
Contaminated soils – hydrocarbons	Y	Contact Environmental Advisor for advice					Case dependent	WTC Required.
Contaminated soil – other	Y	Contact Environmental Advisor for advice					Case dependent	WTC Required.
Drilling Wastes								
Drill Cuttings	N/Y ⁴	Store onsite, sample and classify for disposal options.	Store in sump/metal bin for mix and reuse and/or licenced disposal.			✓		Sampled prior to disposal. Appropriate Farm Management Agreement required for onsite beneficial reuse.
Drill Fluids – K ₂ SO ₄ Based	Y	Store onsite and transfer to mud batching facility for re-use on the Drill Rig.	Stored in 80m ³ Tanks for transport to batching facility for re-use and/or licenced disposal	✓	✓			WTC Required. Sampled prior to disposal for classification.
Drill Fluids – KCl Based	Y	Store onsite and transfer to mud batching facility for re-use on the Drill Rig.	Stored in 80m ³ Tanks for transport to batching facility for re-use or licenced disposal	✓	✓			WTC Required. Sampled prior to disposal for classification.
Electrical and Electronic								
Electrical - batteries - dry	Y		Place in recycling container at WTS		✓			WTC Required. Batteries need to be stored in a secure location due to the dangers of lead and any potential leaking of battery acid. Batteries need to be properly cleaned and sealed for their collection.
Electrical – batteries – wet	Y		Place in recycling container at WTS		✓			WTC Required. Batteries need to be stored in a secure

⁴ If KCL based mud system used during the drilling program.

Waste Name	Regulated / Trackable Y/N	Generator Responsibility	On-site storage and collection	Off-site Disposal (in order of preference)			Waste Contractor	HSE Issues
				1. Re-use	2. Recycle	3. Landfill		
								location due to the dangers of lead and any potential leaking of battery acid. Batteries need to be properly cleaned and sealed for their collection.
Electrical – electronic and electrical equipment	N	Ensure waste electrical equipment is collected from site.	Place in recycling container at WTS	✓	✓			
Electrical – toner and print cartridges	N	Place toner into original cardboard box for transport to Planet Ark accredited toner cartridge collector.			✓			
General								
General – cardboard	N	Ensure cardboard is clean and has no plastic or other contaminants.	Blue Caged Container at WTS		✓		Namoi WasteCorp.	Ensure all recyclable items are contained within the bin and that the bin is not overfull.
General – litter	N	Ensure item is placed in bin, appropriate to the waste items size.	Green Skip bins at WTS			✓	Namoi WasteCorp.	Ensure disposal area is clean and all litter is contained to avoid attracting pest and vermin.
General – paper	N	Ensure paper is segregated disposed into recycling bins.	240L Sulo Bin (Blue Lid)		✓		Narrabri Shire Council (rates)	
General – paper food packaging	N	Ensure packaging is disposed into General Waste Bins. If packaging is labelled with recycling symbol, segregate into recycling bins. All bins on site to have a lid that is closed at all times.	General: Green Skip Bins at WTS Recycling: 240L Sulo Bin (Blue Lid)		✓	✓	Namoi Waste Corp. Narrabri Shire Council (rates)	Recyclable food packaging will be labelled with the appropriate recycling symbol. If this is not present, the item must be assumed non-recyclable unless circumstances permit otherwise.
General – food scraps	N	Food scraps are to be disposed of into the designated bin on site. All bins on site to have a lid that is closed at all times.	Designated food scraps are to be emptied into the worm farm for the NOC, located adjacent to the Operations Centre.		✓			
Glass								
Glass – general	N	Ensure glass jars/bottles are rinsed of contents.	240L Sulo Bin (Yellow Lid)		✓		Narrabri Shire Council (rates)	Due to sharp edges for broken glass, correct PPE should be worn when handling glass wastes.
Glass – fluorescent tubes	N	Place intact tubes in old tube boxes where available prior to	Fluorescent tube box located within		✓			

Waste Name	Regulated / Trackable Y/N	Generator Responsibility	On-site storage and collection	Off-site Disposal (in order of preference)			Waste Contractor	HSE Issues
				1. Re-use	2. Recycle	3. Landfill		
		delivery to the facility.	the Operations Centre.					
Hazardous								
Hazardous – filters – activated carbon	Y							WTC Required.
Hazardous – filters – air, dust, paper	Y	Air filters vehicles are to be cleaned out using an air pressure hose so that they may be re-oiled and refitted to the vehicle.	Return directly to supplier where possible.	✓				WTC Required. Ensure that air filters are properly cleaned by the appropriate personnel before re-using them. Ensure that only the appropriate filters (brands) are re-used.
Metals								
Metals – aerosol cans	N	Ensure aerosol cans are empty. Do not crush.	240L Sulo Bin (Yellow Lid)		✓		Narrabri Shire Council (rates)	Due to the pressurised nature of the aerosol cans, care shall be taken to prevent damage to the can.
Metals – aluminium cans	N	Cans may be crushed and are to be empty of fluids.	240L Sulo Bin (Yellow Lid)		✓		Narrabri Shire Council (rates)	
Metals – copper and aluminium (other than cans)	Y	Place in metal bin at the Waste Transfer Station (WTS)	Metal Bin at WTS		✓			WTC Required.
Metals – steel drums – empty - damaged	N	Ensure all steel drums are empty (<1% product), clearly labelled and accompanied with an MSDS.	Return directly to supplier where possible or place on pallet at WTS		✓			
Metals – steel drums – empty – good condition	N	Ensure all steel drums are empty (<1% product), clearly labelled and accompanied with an MSDS if appropriate.	Return directly to supplier where possible or place on pallet at WTS	✓	✓			
Metals – steel – scrap	N	Small off-cuts are to be cleaned of any oils/lubricants before being placed in bin, ensure large scrap metal items are removed from any site.	Metal Bin at WTS		✓			Due to sharp edges, correct PPE should be worn when handling metal wastes. When larger items are stored, they should be flagged for any potential Health and Safety hazards. Machinery should be used to move larger items to avoid personal injuries.
Oils								
Oils – oil filters	Y	Drain filters of excess oil prior to disposal.	Place in oily waste bins.		✓			WTC Required. Ensure the waste bin is not exposed to any ignition sources. Ensure all appropriate safety signage is displayed around the disposal drum's position.

Waste Name	Regulated / Trackable Y/N	Generator Responsibility	On-site storage and collection	Off-site Disposal (in order of preference)			Waste Contractor	HSE Issues
				1. Re-use	2. Recycle	3. Landfill		
Oils – oily absorbents	Y							WTC Required. Ensure the waste bin is not exposed to any ignition sources. Ensure all appropriate safety signage is displayed around the disposal drum's position.
Oils – oily rags	Y	Ensure oily rags are not mixed with clean rags.	Place in oily waste bins.		✓			WTC Required. Ensure the waste bin is not exposed to any ignition sources. Ensure all appropriate safety signage is displayed around the disposal drum's position.
Oils – oily sludges	Y							WTC Required.
Oils – sump wastes and grease traps wastes	Y							WTC Required.
Oils – waste oil	Y	Ensure waste oil is contained before placing into designated storage tank.	Place in Bulk Oil Waste Tank.		✓		Transpacific (Northern Lubequip)	WTC Required. Ensure there are no leaks in all hoses used to pump any waste oil into the designated container. Ensure any spills around the oil container bin are cleaned up appropriately.
Plastics								
Plastics – drums (empty)	N	Ensure drums are cleaned appropriately and chemical labels are removed for re-use	Return directly to supplier where possible. Ensure remaining drums are empty, place on pallets at WTS.	✓	✓			
Plastics – packaging	N	Ensure plastic item is able to be recycled. Recycle symbol will be displayed on item if it is able to be recycled.	General: Green Skip Bins at WTS Recyclables: 240L Sulo Bin (Yellow Lid)					
Plastics – PET containers	N	Ensure plastic item is able to be recycled. Recycle symbol will be displayed on item if it is able to be recycled.	240L Sulo Bin (Yellow Lid)		✓		Narrabri Shire Council (rates)	Ensure all recyclable items are contained within the bin and that the bin is not overfull.
Rubber								
Rubber – other	N		Return directly to supplier where possible. Ensure					

Waste Name	Regulated / Trackable Y/N	Generator Responsibility	On-site storage and collection	Off-site Disposal (in order of preference)			Waste Contractor	HSE Issues
				1. Re-use	2. Recycle	3. Landfill		
			remaining rubber items are placed in container at WTS.					
Rubber – tyres and tubes	Y	Ensure that un-usable tyres are taken to retailer who will then look after the disposal of the tyres.	Return directly to supplier where possible. Ensure remaining tyres are placed on pallets at WTS.		✓	✓	Namoi Valley Tyres	WTC Required.
Sewerage								
Septic waste	Y	Ensure effluent is stored in sealed and appropriate tanks.	Solids and grey water removed by licenced contractor.	✓			Narrabri Septic Services	WTC Required. Monitoring should be conducted to ensure there are no leaks in any septic tanks.
Wood and Garden Waste								
Wood/garden – garden waste	N							
Wood/garden – wood – general	N		Place in recycling area at WTS		✓			
Wood/garden – wood – pallets	N		Return directly to supplier where possible. Ensure remaining pallets are stored at WTS.		✓			
Other								
Other – concrete and ceramics	N							
Other – personal protective equipment	N		Place in general waste bins on site.					



Evidence of native or endemic species recovery at the Bibblewindi Salinity Rehabilitation Site.

Petroleum title and approvals

This stage involves companies submitting applications to the relevant approving agency. These applications are subject to assessment. Approval includes conditions for rehabilitation of disturbed areas.

The EPA ensures wells are constructed and operated in accordance with legal requirements set by the NSW Government.

Security bond

A titleholder must lodge a rehabilitation security bond with DRE which represents the cost of rehabilitation for each well site. The security bond is lodged prior to the commencement of any exploration or production and is continually adjusted to reflect the actual rehabilitation liability throughout the life of a gas site. A release of the security bond is contingent on the title holder demonstrating that the required rehabilitation objectives and completion conditions have been met.

Environment Protection Licence

Titleholders are required to hold an Environment Protection Licence (EPL) for gas activities. EPLs are issued by the EPA and contain conditions that relate to pollution prevention, monitoring, collection of site specific data. The EPA implements regulatory actions in relation to EPLs. EPLs remain in place until after the decommissioning is confirmed to be compliant with legal requirements by the EPA.

Ongoing reporting and compliance

Titleholders are required to provide annual and final reports which include details of rehabilitation progress and outlook. These reports are assessed by the EPA to ensure statutory requirements are being met. Titleholders are also subject to inspections by government agencies to ensure they are compliant with statutory requirements and the conditions attached to their title, approval documents, EPL and other relevant documents.



Reference: 11/3542

Ms Tanya Cooney
Santos Ltd
Level 16
40 Creek Street
BRISBANE QLD 4000

Dear Tanya

PETROLEUM EXPLORATION LICENCE NO 238 (ACT 1955)

Action on your application for renewal has reached the stage where the licence may be renewed. The proposed Instrument of Renewal is therefore enclosed for execution.

The proposed renewal period is for five (5) years. Accordingly, pursuant to Section 93 of the *Petroleum (Onshore) Act 1991* and Schedule 1 of the *Petroleum (Onshore) Regulation 2007*, a renewal fee of **\$15,000** is payable on renewal.

Please sign the Instrument in the place indicated and return it **(including the conditions)** to the Department within the next 21 days. The document must be signed by the relevant officer/s of the companies in accordance with the *Corporations Act 2001*.

Upon return of the executed Instrument of Renewal and renewal fee the approval of the Minister to renew the licence will be sought.

For further information, please contact the undersigned on (02) 4931 6613.

Yours faithfully

Peta Johannessen
for Director General

28 November 2012

Summary of Comments on Lic. renewal ESG_PEL238_Document 13 SN.pdf

Page: 1

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Document 13

	Number: 2	Author: Tony	Subject: Sticky Note	Date: 13/05/2017 8:07:11 AM
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Sticky noted at "Roads" clause

PETROLEUM (ONSHORE) ACT 1991

INSTRUMENT OF RENEWAL OF PETROLEUM EXPLORATION LICENCE NO. 238

**HELD BY EASTERN STAR GAS LIMITED (ACN 094 269 780)
AND ENERGYAUSTRALIA NARRABRI GAS PTY LTD (ACN 147 609 729)**

I, **CHRIS HARTCHER, MP**, Minister for Resources and Energy for the State of New South Wales **HEREBY RENEW THE LICENCE** subject to the terms and conditions set out below:-

1. The licence is renewed for a further term until **02 August 2016**.
2. The licence is renewed over the land described in the **First Schedule** attached hereto.
3. The conditions of the licence are amended by deleting all the conditions contained in the licence prior to this renewal and by including the attached Second Schedule - Conditions of Petroleum Exploration Licence 2012 numbered: **1 to 4** (inclusive) and **6 to 57** (inclusive) as amended.
4. The Licence is renewed on the basis of a fixed term program as set out in the Third Schedule attached hereto.

We, Eastern Star Gas Limited (ACN 094 269 780) and EnergyAustralia Narrabri Gas Pty Ltd (ACN 147 609 729) hereby accept the renewal of this Exploration Licence and agree to be bound by the conditions specified.

.....
EASTERN STAR GAS LIMITED
(ACN 094 269 780)

.....
WITNESS

.....
ENERGYAUSTRALIA NARRABRI GAS PTY LTD
(ACN 147 609 729)

.....
WITNESS

Renewed this day of 20

.....
MINISTER FOR RESOURCES AND ENERGY

FIRST SCHEDULE

EXPLORATION AREA

Defined by

GRATICULAR BLOCKS

Bourke 1:1,000,000 Sheet

1863 - 1871	1933 - 1943
2005 - 2015	2077 - 2088
2149 - 2160	2222 - 2227
2229 - 2232	2293 - 2299
2301 - 2304	2365 - 2366
2368 - 2376	2437 - 2438
2441 - 2448	2509 - 2510
2518 - 2520	2581 - 2582
2588 - 2592	

TOTAL: 109 BLOCKS

Exclusive of:-

- The surface and lands below, within or overlying the external boundaries of mining leases for coal and associated mining leases for purposes and colliery holdings as recorded pursuant to Section 163 of the *Mining Act 1992*, as at the date of the grant of this licence and as at the date of any subsequent renewals of this licence.
- Land subject to any national park, regional park, historic site, nature reserve, karst conservation reserve or Aboriginal area, as at the date of grant of this licence.

Note: This exclusion includes national parks and Aboriginal areas contained within Community Conservation Area Zones 1 and 2 established under the *Brigalow and Nandewar Community Conservation Area Act 2005*.

- Land subject to any State forest or flora reserve excluded from the operations of the *Petroleum (Onshore) Act 1991*, under the provisions of the *Forestry Act 1916*, as at the date of grant of this licence and any such areas subsequently and mutually agreed to between the licence holder and the Department of Trade and Investment; Regional Infrastructure and Services
- Lands vested in the Commonwealth of Australia.

SCHEDULE 2

PETROLEUM EXPLORATION LICENCE CONDITIONS 2012

DEFINITIONS

Words used in this exploration licence have the same meaning as in the *Petroleum (Onshore) Act 1991* except where otherwise defined below:

Act means the *Petroleum (Onshore) Act 1991*.

Borehole means a hole made by drilling or boring, but excludes:

- a) sampling and coring using hand held equipment; and
- b) petroleum wells.

Category 1 prospecting operations means the development to which clauses 10(1) and 10(2) of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* apply.

Category 2 prospecting operations means:

- a) development to which clause 10(2) of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* applies that is not on land to which clause 10(1) applies;
- b) construction of an access way such as a track or road;
- c) construction and use of boreholes; and
- d) seismic surveys.

Category 3 prospecting operations means:

- a) construction and use of petroleum wells;
- b) prospecting operations and water management infrastructure required to be carried out in accordance with an approved Produced Water Management Plan under condition ~~14~~ 14;
- c) fracture stimulation;
- d) installation of gas gathering and pipeline infrastructure;
- e) any prospecting operation resulting in a cumulative surface disturbance exceeding a total of five (5) hectares within the exploration licence area; and
- f) any other prospecting operations not listed in Category 1 prospecting operations or Category 2 prospecting operations.

Controlling body in relation to an exempted area means:

- a) in the case of land referred to in paragraph (a) or (c) of the definition of exempted area - the person having the control and management of the land;
- b) in the case of land referred to in paragraph (b) of that definition - the holder of the lease referred to in that paragraph; or
- c) in the case of land referred to in paragraph (d) of that definition - the person prescribed by the regulations as the controlling body for that land for the purposes of this definition.

Department means the Division of Resources & Energy within the Department of Trade and Investment, Regional Infrastructure and Services.

Director-General means the Director-General of the Department of Trade and Investment, Regional Infrastructure and Services.

Environment has the same meaning as in the *Protection of the Environment Operations Act 1997*.

Exempted area has the same meaning as in section 70 of the Act.

Exploration licence area means the land and water which is subject to this exploration licence.

Fracture stimulation means the process by which a well is “stimulated” when fluids are forced at high pressure into hydrocarbon-bearing formations to create a conductive flow path into the target formation resulting in enhanced flow of hydrocarbons to the wellhead. Also known as “hydraulic fracturing”, “fracking” or “fracking”.

Harm to the environment includes any direct or indirect alteration of the environment that has the effect of degrading the environment and, without limiting the generality of the above, includes any act or omission that results in pollution, contributes to the extinction or degradation of any threatened species, populations or ecological communities and their habitats and causes impacts to places, objects and features of significance to Aboriginal people.

Landholder for the purposes of these conditions does not include a secondary landholder and includes, in the case of exempted areas, the controlling body for the exempted area.

Material harm to the environment has the same meaning as in the *Protection of the Environment Operations Act 1997*.

Minister means the Minister administering the Act.

Petroleum well means a hole made by drilling or boring in connection with prospecting for petroleum or operations for the recovery of petroleum, but excludes:

- (a) sampling and coring using hand held equipment;
- (b) a hole constructed and operated for the following purposes:
 - (i) stratigraphic definition;
 - (ii) seismic or microseismic testing;
 - (iii) water monitoring; or
 - (iv) environmental assessment

where the operation of that hole does not involve fracture stimulation or the recovery of petroleum.

Petroleum wells include petroleum appraisal wells, pilot wells, test wells and gas injection wells.

Pollution incident has the same meaning as in the *Protection of the Environment Operations Act 1997*.

Produced water means water that is taken in the course of a prospecting operation that is part of or incidental to that prospecting operation, including water that is encountered within and extracted from boreholes, petroleum wells or excavations.

River has the same meaning as in the *Water Management Act 2000*.

Standard working hours means:

- a) Monday to Friday 7am to 6pm;
- b) Saturday 8am to 1pm; and
- c) No work on Sundays or Public Holidays.

Waste has the same meaning as in the *Protection of the Environment Operations Act 1997*.

Water land has the same meaning as in section 198A of the *Fisheries Management Act 1994*.

Wetland has the same meaning as in section 198A of the *Fisheries Management Act 1994*.

CONDITIONS

Conditions 1-3, 6-7, 9-23, 25-27, 29-37, 47-54 and 56 of this exploration licence are identified as conditions relating to environmental management.

Prospecting operations permitted under this exploration licence

1. The licence holder may conduct Category 1 prospecting operations on the exploration licence area subject to the conditions of this licence.

Note. The licence holder must comply with the requirements of the Act and other relevant legislation.

Category 1 prospecting operations:

- (a) must be of minimal environmental impact;*
- (b) cannot be carried out in critical habitat of an endangered species, population or ecological community (identified under the Threatened Species Conservation Act 1995 or the Fisheries Management Act 1994); and*
- (c) cannot be carried out in a wilderness area (identified under the Wilderness Act 1987).*

Prospecting operations requiring further approval

2. The licence holder must obtain approval from the Minister prior to carrying out any of the following prospecting operations on the exploration licence area:
 - a) Category 2 prospecting operations; and
 - b) Category 3 prospecting operations.

3. The licence holder must comply with the conditions of an approval under condition 2 when carrying out those prospecting operations.

Note: In the case of prospecting operations identified in condition 2 as requiring approval by the Minister, the application for approval must be accompanied by a Surface Disturbance Notice (SDN). A Review of Environmental Factors and Agricultural Impact Statement may be required for Category 2 prospecting operations if the Minister is of the opinion that the prospecting operations may result in more than minimal environmental impact.

A Surface Disturbance Notice, Review of Environmental Factors and Agricultural Impact Statement are required for all Category 3 prospecting operations.

If the impact of prospecting operations on the environment is determined as likely to be significant in terms of Part 5 of the Environmental Planning and Assessment Act 1979, then the Minister will require the licence holder to submit an Environmental Impact Statement (EIS).

Applications may also require a Groundwater Monitoring and Modelling Plan (see condition 13) and/or a Produced Water Management Plan (see condition 14).

Aboriginal Land Council notification

4. The licence holder must inform the relevant Local Aboriginal Land Council of the grant or renewal of this exploration licence within 28 days of the grant or renewal.

Exempted Areas

Note: a) Under section 70 of the Act, the licence holder must not commence prospecting operations in an exempted area without the prior written consent of the Minister. The Minister's consent may be granted subject to conditions. "Exempted areas" are lands set aside for public purposes. They include travelling stock reserves, road reserves, water supply reserves, State forests, public reserves and permanent commons. Under section 70 of the Act, the "exercise of rights" under an exploration licence is subject to the consent of the Minister. The "exercise of rights" includes the right to conduct prospecting operations.

- b) Applications for the Minister's consent to exercise rights under this exploration licence in an exempted area must:*

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- (i) include formal confirmation of any requirements of the controlling body for the exempted area; and
- (ii) be submitted to the Titles Unit.

Codes of Practice

6. Unless otherwise approved by the Minister, the licence holder must comply with the requirements set out in the following Codes, as amended or replaced from time to time:
- a) the *NSW Code of Practice for Coal Seam Gas Exploration* (NSW Trade & Investment, 2012);
 - b) the *NSW Code of Practice for Coal Seam Gas Well Integrity* (NSW Trade & Investment, 2012); and
 - c) the *NSW Code of Practice for Coal Seam Gas Fracture Stimulation* (NSW Trade & Investment, 2012).

Note: Copies of the Codes are available from www.resources.nsw.gov.au.

7. In the event of any inconsistency between the Codes identified in condition 6 and the conditions of this exploration licence, the Codes prevail except where an approval has been given by the Minister under condition 2 and the conditions of that approval are complied with.

Community consultation

8. The licence holder must engage with the community in relation to the planning for and conduct of prospecting operations authorised under this exploration licence.

The consultation must be undertaken in accordance with the *Guideline for community consultation requirements for the exploration of coal and petroleum, including coal seam gas* (NSW Trade & Investment, 2012) as amended or replaced from time to time.

An annual report on Community Consultation must be submitted to the Department within 28 days of the anniversary of this licence being granted, together with evidence that community consultation has been undertaken in accordance with the Guideline.

Note: Copies of the Guideline are available from www.resources.nsw.gov.au

Access to exploration licence and relevant documents

9. The licence holder must ensure that a copy of this exploration licence and any relevant documentation relating to the conduct of prospecting operations is:
- a) accessible on the site of active prospecting operations authorised by this exploration licence; and
 - b) made available to all supervisors or other persons concerned in the day to day management of prospecting operations authorised by this exploration licence.

Note: For the purposes of this condition, relevant documentation includes, but is not limited to:

- a) access arrangements required under Part 4A of the Act;*
- b) exempted area consents required under section 70 of the Act;*
- c) approvals under condition 2 of this exploration licence, and any document specified as forming part of that approval, such as a Review of Environmental Factors;*
- d) the approved Groundwater Monitoring and Modelling Plan under condition 13 of this exploration licence;*
- e) the approved Produced Water Management Plan under condition 14 of this exploration licence;*
- f) the approved Work Program under Schedule 3 of this exploration licence; and*

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g) any approval, plan, program or similar document required to comply with the Codes of Practice under condition 6 of this exploration licence.

Environmental harm

10. The licence holder must implement all reasonably practicable measures to prevent and/or minimise harm to the environment that may result from the conduct of prospecting operations under this exploration licence.

Erosion and sediment control

11. The licence holder must prevent erosion and pollution of watercourses resulting from the conduct of prospecting operations by implementing effective erosion and sediment control measures.
12. The planning, design and construction of erosion and sediment control measures must be conducted in accordance with *Managing Urban Stormwater: Soils and Construction* (DECC 2007), as amended or replaced from time to time.

Groundwater Monitoring and Modelling Plan¹

13. Prior to conducting prospecting operations involving the construction and use of boreholes or petroleum wells, the licence holder must:
 - a) Prepare a Groundwater Monitoring and Modelling Plan in consultation with the NSW Office of Water;
 - b) Ensure that the Groundwater Monitoring and Modelling Plan:
 - (i) describes methods for identifying aquifers, their depths, behaviour, containing layers and connectivity with surrounding aquifers or surface water systems²
 - (ii) describes methods for collection of data relevant to the type, quantity and quality of water contained within aquifer systems likely to be encountered during prospecting operations;
 - (iii) provides for the future development of a conceptual model of regional groundwater behaviour;
 - (iv) provides for the future development of a calibrated computer model of regional groundwater behaviour, to enable the impacts of any proposed production operations to be assessed;
 - (v) describes how records of all data collected will be maintained;
 - (vi) describes the staging process for implementation of the plan; and
 - (vii) is prepared in accordance with any additional requirements prescribed by the Director-General.
 - c) Have the Groundwater Monitoring and Modelling Plan approved by the Minister; and
 - d) Implement and comply with the approved Groundwater Monitoring and Modelling Plan.

Note. The Groundwater Monitoring and Modelling Plan is required to ensure:

- (a) there is sufficient groundwater data available to assess future operations against the *Aquifer Interference Policy* (NSW Office of Water, 2012), as amended or replaced from time to time; and
- (b) 2 years of baseline data is available prior to submitting an application for any future production operations.

The scope and level of detail required in the Groundwater Monitoring and Modelling Plan is intended to reflect the scale, timing and potential impact of proposed prospecting or any future production operations.

An application may be made to the Department at any time to vary an approved Groundwater Monitoring and Modelling Plan.

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I do believe that Santos never fully complied with this requirement.
There are more aquifers other than the one termed Pilliga Sandstone.

Produced Water Management Plan

14. Prior to conducting prospecting operations with the potential to generate more than 3 megalitres per year of produced water (as a result of cumulative prospecting operations within the exploration licence area), the licence holder must:

- a) Prepare a Produced Water Management Plan in consultation with the NSW Office of Water and the Environment Protection Authority;
- b) Ensure that the Produced Water Management Plan describes:
 - (i) the expected sources and estimated quantity of the produced water;
 - (ii) the proposed containment and treatment measures for the produced water;
 - (iii) the proposed beneficial reuse or disposal methods for the produced water;
 - (iv) the controls to be implemented to prevent and/or minimise pollution;
 - (v) how records of all relevant parameters for the quality, quantity, transport and disposal of all water will be maintained;
 - (vi) describes the staging process for implementation of the plan; and
 - (vii) is prepared in accordance with any additional requirements prescribed by the Director-General.
- c) Have the Produced Water Management Plan approved by the Minister; and
- d) Implement and comply with the approved Produced Water Management Plan.

Note: (a) Discharge to receiving waters may require licensing under the Protection of the Environment Operations Act 1997.

(b) A water access licence under the Water Management Act 2000 may be required for petroleum prospecting operations taking more than 3 megalitres of water from groundwater sources per year. A licence may be required under the Water Act 1912 where that Act applies.

15. Except where approved under condition 2 or a Produced Water Management Plan under condition 14, produced water must not be discharged to land.

Use of chemicals and fuel

16. The licence holder must comply with *Policy TI-O-120 - Ban on use of BTEX compounds in CSG activities policy* (NSW Trade & Investment, 2012), as amended or replaced from time to time.

Note. Additional conditions regulating chemical additives may be imposed on prospecting operations under approvals issued under condition 2 of this exploration licence. The NSW Code of Practice for Coal Seam Gas Fracture Stimulation also contains relevant requirements.

17. The licence holder must ensure that all chemicals, fuels and oils, excluding those contained within plant and equipment and those for personal use, are:

- a) stored and handled in accordance with the relevant Material Safety Data Sheet and Australian Standards for the material;
- b) stored in appropriate containers that are in good condition and labelled to clearly identify the stored product; and
- c) kept in a facility or area which is capable of containing at least 100% of the largest container capacity stored within that area;

unless otherwise approved by the Minister.

18. The licence holder must ensure that adequate spill prevention and oil absorbent materials required to manage spills and leaks for all chemicals, fuels and oils on site are readily available at all times where prospecting operations are being carried out. Equipment and/or

materials to capture drips and spills must be used during transfer of chemicals, fuels and oils, and when maintaining oil or fuel filled components.

Noise

19. The licence holder must carry out operations in accordance with the requirements of the *Interim Construction Noise Guidelines* (DECC, 2009), as amended or replaced from time to time. Unless otherwise approved by the Minister, the licence holder must ensure that:
- a) noise levels during standard working hours do not exceed the Rating Background Level (RBL) +10dB at any residence or other sensitive receiver (as defined in the *Interim Construction Noise Guidelines*).
 - b) noise levels outside of standard working hours do not exceed the RBL +5dB.
20. The noise limits identified in condition 19 will not apply where the licence holder has negotiated a written agreement with:
- a) the relevant landholder; or
 - b) in the case of a prospecting operation that will result in an exceedance of the criteria at a dwelling or other sensitive receiver, the resident of that dwelling or occupier of the sensitive receiver;

to allow different limits and the licence holder complies with those limits.

Vegetation clearing

21. The licence holder must not cut, destroy, ringbark or remove any timber or other vegetative cover on the exploration licence area except as authorised under condition 1 or approved under condition 2 of this exploration licence. Such clearing must be to the minimum extent necessary to facilitate the conduct of those prospecting operations.

Note: The Native Vegetation Act 2003 does not apply to clearing of native vegetation authorised under the Petroleum (Onshore) Act 1991.

Additional approvals may be required before using timber from Crown land.

Fire prevention

22. The licence holder must take all reasonably practicable precautions against causing an outbreak of fire.
23. The licence holder must not burn off any grass, foliage or herbage without the consent of the landholder and the local fire authority.

Infrastructure

24. The licence holder must ensure that prospecting operations do not interfere with or impair the stability or efficiency of any transmission line, communication line, pipeline or any other utility without the prior written approval of the infrastructure owner and subject to any conditions that may be stipulated by the infrastructure owner.

Passage of stock

25. The licence holder must permit the passage of stock through the exploration licence area and must conduct operations in a manner so as not to cause danger to travelling stock.
26. The licence holder must not interfere with or prevent the access of stock to any watering places or approaches to such watering places without the approval of the landholder.

Roads and tracks¹

27. Prospecting operations must not interfere with the use of any public road or prevent access along any other road or track without the prior written approval of the relevant roads authority (as defined under the *Roads Act 1993*) or, in the case of any other road or track, the landholders and/or residents relying on that road or track for access.

Note: A consent under section 138 of the Roads Act 1993 may be required for works on public roads.

28. The licence holder must pay to the relevant roads authority, the reasonable costs incurred in fixing any damage to any public roads resulting from prospecting operations carried out under the exploration licence. If no agreement on reasonable costs can be negotiated by the parties, the matter must be referred to the Director-General for resolution. ²



29. Except where approved under condition 2, the licence holder must ensure that:

- Existing roads and tracks must be used in preference to constructing new roads and tracks;
- The planning, design, construction and maintenance of roads must be conducted in accordance with *Managing Urban Stormwater: Soils and Construction, Volume 2C, Unsealed Roads* (DECC 2007), as amended or replaced from time to time;
- The planning, design, construction and maintenance of tracks must be conducted in accordance with *Managing Urban Stormwater: Soils and Construction, Volume 2C, Unsealed Roads* (DECC 2007), as amended or replaced from time to time;
- All river crossings must be constructed in accordance with requirements of the *Policy and Guidelines for Aquatic Habitat Management and Fish Conservation* (DPI 1999), as amended or replaced from time to time; and
- All crossings of permanent and intermittent water lands and wetlands must be constructed in accordance with requirements of the *Policy and Guidelines for Aquatic Habitat Management and Fish Conservation* (DPI 1999), as amended or replaced from time to time, and *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (NSW Fisheries 2003).

30. The licence holder must restrict the use of any road or track during wet weather to prevent damage to that road or track unless the road or track has been designed and constructed for use in wet weather. ⁴

Topsoil management

31. The licence holder must ensure that all topsoil removed in the course of prospecting operations is stockpiled for later use in rehabilitating those operations.

Drilling

32. The licence holder must:


- Notify the NSW Office of Water at least 28 days prior to commencement of drilling operations;

Note. Refer to the Department's website for the NSW Office of Water Drilling Notification form.

The notification can be made contemporaneously with the lodgement of an application for approval under condition 2 of this exploration licence.

- Construct, maintain and decommission all boreholes and petroleum wells in accordance with standards equivalent to or exceeding the *Minimum Construction Requirements for Water Bores in Australia* (NUDLC 2012), as amended or replaced from time to time.
- Ensure that the construction, operation, maintenance and decommissioning of boreholes and petroleum wells does not significantly cause or enhance:

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This requirement should be carried over into the Production licence.

I suggest that all read Chapter 22 Traffic and transport page 22-13 Santos now wants to use the Regional Community Benefit Fund to repair the roads that they damage. That Fund is a bribe that was touted to be use to provide functional Benefits for the whole Community and road repair was not one of them.

Even Conrad Bolton does not want the money from the RCBF spent on any infrastructure that will require constant and ongoing, maintenance

I should also note that the Regional Community Benefit fund will not have any money until after the Construction and most of the initial well drilling period is finished, so who will be paying for the repairs of the roads caused by the Construction period, THE RATEPAYERS OF THE AFFECTED SHIRES.

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- (i) hydraulic connection between aquifers;
 - (ii) contamination or cross-contamination of aquifers;
 - (iii) the escape of natural or noxious gases;
 - (iv) the uncontrolled surface discharge of groundwater;
 - (v) collapse of the surrounding surface; or
 - (vi) hazards to persons, stock and wildlife;
- d) Install blowout prevention equipment in accordance with the *Schedule of Onshore Petroleum Exploration and Production Safety Requirements* (DMR 1992), as amended or replaced from time to time;
- e) Implement controls to manage any risks associated with natural or noxious gases, both during and after drilling;
- f) Contain all drill cuttings, fluids and groundwater returned to the surface as part of the drilling process in above-ground tanks or in-ground sumps pending re-circulation or disposal. In-ground sumps must be lined with an impermeable barrier where there is a potential risk of contamination from drill cuttings or fluids;
- g) Survey all cored boreholes and petroleum wells to 0.5 metre accuracy, with the survey to be carried out by a surveyor registered with the Board of Surveying and Spatial Information under the *Surveying and Spatial Information Act 2002*;
- h) Remove equipment and logging tools from the borehole or petroleum well prior to plugging and abandonment of the borehole or petroleum well, unless otherwise approved by the Minister; and
- i) Once a borehole or petroleum well ceases to be used, the borehole or petroleum well must be completely filled with cement grout during drill rod withdrawal and plugged, unless otherwise approved by the Minister.

Note: The Code of Practice for Coal Seam Gas Well Integrity also contains relevant drilling requirements for coal seam gas exploration wells.

If there is any inconsistency between these conditions and the Code, the Code will prevail.

33. At the completion of testing and prior to plug and abandonment of a borehole or petroleum well, the licence holder must ensure that steel casing is removed from the vertical interval(s) encompassing all coal seam(s) unless otherwise approved by the Minister. Downhole geophysical tools and/or cameras must be used to confirm the removal or absence of steel casing throughout the prescribed interval. All logs and information pertinent to the steel casing must be provided to the Department.

Note: Under the Code, a well cannot be abandoned or suspended without prior Departmental approval).

34. Within 3 months of the abandonment of any borehole or petroleum well, the licence holder must provide the Department with details of:
- a) the location details identified in condition 32(g);
 - b) the date grouting of the borehole or petroleum well was completed, the material used in the grouting process and the method of grouting used;
 - c) evidence of gas leak testing and results;
 - d) rehabilitation actions proposed to be undertaken on the site; and
 - e) details of any metallic equipment or material abandoned in the borehole or petroleum well.

Note. The Code of Practice for Coal Seam Gas Well Integrity also contains relevant drilling requirements for coal seam gas wells.

35. The licence holder must report any blowout associated with prospecting operations to the Department:

- a) immediately; and
- b) provide a written report within 24 hours.

Note. a) The licence holder should have regard to any Departmental guidelines related to the drilling, operation and abandonment of boreholes and petroleum wells.

- b) The Code of Practice for Coal Seam Gas Well Integrity applies to the drilling of coal seam gas wells. Where there is a conflict between the requirements set out in the Code of Practice for Coal Seam Gas Well Integrity and these conditions, the Code has precedence.*

Waste management

36. The licence holder must ensure that:

- a) the sites of prospecting operations are maintained in a clean and tidy condition at all times;
- b) all waste, including contaminated residues, must be collected, segregated and securely deposited in properly constructed containers and disposed lawfully;
- c) drilling by-products contaminated by chemicals, oils or fuels must be collected and remediated or disposed lawfully; and
- d) all drill cuttings and drilling fluids not being reused in drilling operations are disposed lawfully.

Note. Alternative reuse of drill cuttings and treated fluids may be approved by the Minister under condition 2 of this exploration licence.

37. The licence holder must maintain records of:

- a) all waste generated as a result of prospecting operations under this exploration licence; and
- b) the means of disposal of all waste.

Note. Waste is regulated under the Protection of the Environment Operations Act 1997 and the NSW Waste Regulations. Contact the Local Council or the Environment Protection Authority for details of those requirements.

Safety

38. The licence holder must notify the Department at least 28 days prior to the proposed commencement of any prospecting operation involving any drilling, blasting or other potentially hazardous operation. This notification must be made in the form approved by the Director-General.

39. The licence holder must carry out and supervise operations in a manner that ensures the safety of all employees and contractors.

40. The licence holder must carry out operations in a manner that ensures the safety of landholders and members of the public, stock and wildlife in the vicinity of the operations.

Note. Under section 128 of the Petroleum (Onshore) Act 1991, the licence holder must carry out all petroleum prospecting operations and operations for the recovery of petroleum in the title area in accordance with the provisions of the Work Health and Safety Act 2011.

For coal seam gas wells, the licence holder must also put in place measures to control hazards which comply with the Code of Practice for Coal Seam Gas Well Integrity. These measures include, but are not limited to, the development of a Safety Management Plan and the installation of specific well head infrastructure.

Technical Manager

41. The licence holder must ensure that prospecting operations are conducted, or directly supervised, by a Technical Manager, being:
- a) a person with tertiary qualifications in geoscience, petroleum or mining engineering; or
 - b) a person having other qualifications or exploration experience approved by the Minister.
42. The licence holder must advise the Minister of the name and contact details of the Technical Manager(s) prior to the commencement of any prospecting operations and within ten (10) working days of any changes to the nominated Technical Manager or their contact details.

Work Program

43. Unless otherwise approved by the Minister, the licence holder must implement and complete the work program specified in Schedule 3 of this exploration licence.

Note. Clause 9 of the Petroleum (Onshore) Regulation 2007 states that it is a condition of every petroleum title that the holder of the exploration licence will carry out the operations, and only the operations, described in the work program specified in Schedule 3 of this exploration licence. Under Clause 10 of the Petroleum (Onshore) Regulation 2007, the work program may be varied upon application to and approval of the Minister.

Cooperation with other title holders

44. The licence holder must make every reasonable attempt, and be able to demonstrate their attempts, to enter into a cooperation agreement with the holder(s) of any overlapping authorisations for Group 8 or 9 minerals under the *Mining Act 1992*. The cooperation agreement should address but not be limited to:

- a) access arrangements;
- b) operational interaction arrangements;
- c) dispute resolution;
- d) information exchange;
- e) location of prospecting operations;
- f) timing of drilling;
- g) potential resource extraction conflicts; and
- h) integrated rehabilitation activities.

*Note. Group 8 minerals are geothermal energy.
Group 9 minerals are coal and oil shale.*

Minister's approval of change in control

45. The Minister's prior written approval is required prior to:
- a) any change in the effective control of the licence holder; or,
 - b) any foreign acquisition of substantial control in the licence holder.
46. For the purposes of condition 45:
- a) There is a "change in effective control" where, after the imposition of this condition, any person:
 - (i) acquires the capacity to appoint or control at least 50% of the number of directors of the licence holder's board;
 - (ii) becomes entitled to exercise (directly or indirectly) greater than 50% of the votes entitled to be cast at any general meeting of the licence holder; or,

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- (iii) holds more than 50% of the issued share capital (other than shares issued with no rights other than to receive a specified amount in distribution) of the licence holder.
- b) There is a "foreign acquisition of substantial control" where, after the imposition of this condition, a person:
 - (i) acquires the capacity to appoint or control at least 15% of the number of directors of the licence holder's board;
 - (ii) becomes entitled to exercise (directly or indirectly) greater than 15% of the votes entitled to be cast at any general meeting of the licence holder;
 - (iii) holds more than 15% of the issued share capital (other than shares issued with no rights other than to receive a specified amount in distribution) of the licence holder;

AND the person is:

- (i) a natural person not ordinarily resident in Australia;
- (ii) a corporation in which a natural person not ordinarily resident in Australia or a "foreign corporation" (meaning one that is incorporated outside Australia) holds a total interest of 15% or more;
- (iii) a corporation in which 2 or more persons, each of whom is either a natural person not ordinarily resident in Australia or a foreign corporation, hold a total interest of 40% or more;
- (iv) the trustee of a trust estate, in which a natural person not ordinarily resident in Australia or a foreign corporation, holds a total interest of 15% or more; or,
- (v) the trustee of a trust estate in which 2 or more persons, each of whom is either a natural person not ordinarily resident in Australia or a foreign corporation, holds a total interest of 40% or more.

Rehabilitation

47. All disturbance resulting from prospecting operations carried out under this exploration licence must be rehabilitated by the licence holder to the satisfaction of the Minister.
48. In rehabilitating the disturbance, the licence holder must ensure that:
 - a) all machinery, buildings and other infrastructure are removed from the area;
 - b) the area is left in a clean, tidy and stable condition;
 - c) there is no adverse environmental effect outside the disturbed area;
 - d) the land is properly drained and protected from soil erosion;
 - e) the land is not a potential source of pollution;
 - f) the land is compatible with the surrounding land and land use requirements;
 - g) the landforms, soils, hydrology and flora require no greater maintenance than that in, or on, the surrounding land;
 - h) the land does not pose a threat to public safety; and
 - i) in cases where vegetation has been removed or damaged:
 - (i) where the previous vegetation was native, species used for revegetation are endemic to the area; or
 - (ii) where the previous vegetation was not native, species used for revegetation are appropriate to the area; and
 - (iii) any revegetation is of an appropriate density and diversity.