



Chapter 21

Historic heritage

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Chapter 21 Historic heritage

The Secretary's environmental assessment requirements for the Narrabri Gas Project include a requirement to assess potential impacts on historic heritage. A detailed assessment was undertaken in response to this requirement and a Statement of Heritage Impact prepared in accordance with the Burra Charter (ICOMOS 2013), the *NSW Heritage Manual* (NSW Heritage Office and DUAP 1996) and the *Statements of Heritage Impact* (NSW Heritage Office 2002). The Statement of Heritage Impact is provided in Appendix O. This chapter draws on that assessment to provide an overall assessment of the potential impacts of the project on historical heritage.

The key findings of the impact assessment in relation to historical heritage were:

- 53 sites of heritage potential were identified in the project area. Of these, eight were identified as having heritage significance in their own right.
- Impacts to sites identified as having heritage significance would be avoided through a surface development exclusion zone, ensuring that the heritage significance of these sites is not affected.
- No impacts on items of heritage significance occur at the proposed location of the major facilities being Leewood, Bibblewindi, the two proposed infrastructure corridors, or Westport.
- The identified heritage value of the Pilliga East Logging Cultural Landscape would not be impacted by the project.

The project area was initially part of squatters' runs legitimately granted to various individuals, before largely being resumed for the purposes of State forests. The forests were logged by individual contractors from the mid-19th century.

Items within the project area with heritage significance were identified through a search of heritage registers, a review of available literature and field investigation. Where archaeological items were identified, they were analysed in light of each site's historical context in order to assess heritage significance. The process of linking this assessment with a site's historical context was developed in accordance with the NSW Heritage Management System as outlined in the guideline *Assessing Heritage Significance* (NSW Heritage Office 2001).

As noted above, a total of 53 sites of heritage potential were identified in the project area. The collection of these sites were identified as being of local heritage significance as part of a collection demonstrating the pattern and course of the development of logging in the forest area. There are six types of sites: timber extraction areas, sawmill sites, habitation and camping sites, timber loading ramps, logging tracks and other sites. These logging related sites were identified as forming the Pilliga East Logging Cultural Landscape. A small number of sites unrelated to logging activities were also identified as holding heritage significance including an oil well understood to have been installed in 1964 and ground pits that were used in the late 1960s to 1970s by the Sydney University physics community for the recording of giant cosmic ray air showers.

No direct impacts were identified as arising from the location of the major facilities proposed at Leewood, Bibblewindi, the proposed infrastructure corridors, or Westport. Through the implementation of the Field Development Protocol, the proponent has committed to avoiding impacts on all 21 sites that were identified as having heritage significance. This will ensure that the heritage significance of these sites is not affected. By avoiding these sites, the heritage value of the Pilliga East Cultural Landscape would be also preserved.

To manage residual risks in regards to historic heritage within the project area, a Historic Heritage Management Plan would be developed and implemented. The Plan would include details of induction protocols, a procedure to protect and manage unexpected finds and a system for recording the location of identified heritage items.

21.1 Methodology

21.1.1 Desktop assessment

Heritage register search

A search was undertaken of the following heritage schedules through the Australian Heritage Database, the New South Wales (NSW) State Heritage Inventory (maintained by the NSW Heritage Division) and the *Narrabri Local Environmental Plan 2012* Heritage Schedule:

- World Heritage List
- National Heritage List
- Commonwealth Heritage List
- Register of the National Estate (non-statutory)
- State Heritage Register
- Section 170 Registers of relevant government agencies including the NSW Forestry Corporation
- *Narrabri Local Environmental Plan 2012*.

The search included the project area and a two kilometre buffer zone surrounding the project area.

Historical information

Historical information prepared by Curby (2011) was updated where relevant. Early parish maps were reviewed for information on development within the area and to identify the location of former structures that may now be archaeological sites. These areas were subsequently targeted as part of the survey.

21.1.2 Field surveys

Field surveys were undertaken in 2011 and 2014 to determine the heritage potential of the project area. During the five-day survey in 2011, 15 sites of potential heritage value were identified. During the 2014 assessment, a greater understanding of site characteristics within the Pilliga area was developed. This led to a reassessment of the heritage significance of the sites within this report. With the exception of the Stock Loading Facility and Hardy's Hut, sites identified during the 2011 survey were not revisited during the 2014 survey. The information collected in the 2011 survey was considered sufficient to allow for a reassessment.

The 2014 survey comprised a five-day survey by vehicle along roads and access tracks in State forests within the project area. At each site identified on parish maps or as part of the survey, structures and / or features were identified, recorded and assessed for historical significance. Photographs were taken with details maintained in a photo log, and the position of each site was recorded using global positioning system technology. No subsurface testing was undertaken.

The 2014 survey methodology was determined to be appropriate because of the flexible nature of the project in relation to the siting of infrastructure and the implementation of the Historic Heritage Management Plan to mitigate and manage impacts to unknown historic heritage sites that may be identified during construction and operation of the project.

21.1.3 Impact assessment

Impacts were assessed using the environmental risk assessment methodology which considers the likelihood and consequence of a potential impact to assess its level of risk. The full description of the environmental risk assessment methodology is described in Chapter 10 (Approach to the impact assessment).

Where archaeological items were identified, they were analysed in light of each site's historical context in order to assess heritage significance. An assessment of significance is undertaken to explain why a particular site is important and to enable the appropriate site management and curtilage to be determined. Cultural significance is defined in the Burra Charter (ICOMOS 2013) as meaning 'aesthetic, historic, scientific or social value for past, present or future generations' (Article 1.2).

The process of linking this assessment with a site's historical context was developed in accordance with the NSW Heritage Management System as outlined in the guideline *Assessing Heritage Significance* (NSW Heritage Office 2001). The guideline establishes seven evaluation criteria under which a site can be evaluated in the context of State or local historical themes. A site is considered to be of State significance if it meets two or more of the assessment criteria at a State level. A site is assessed as being of local heritage significance if it meets one or more of the criteria at a local level.

A Statement of Heritage Impact was prepared in accordance with the *NSW Heritage Manual* (NSW Heritage Office, and Department of Urban Affairs and Planning 1996) and *Statements of Heritage Impact* (NSW Heritage Office 2002). The Statement of Heritage Impact is provided in Appendix O.

21.2 Existing environment

21.2.1 Heritage register search

A desktop assessment of heritage register databases was undertaken to determine listed sites within a two kilometre buffer of the project area. The results are listed in Table 21-1.

Table 21-1 Heritage register search results

Heritage Register Search	Result
World Heritage List	The heritage registers mandated by the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) were consulted and there are no sites within or adjacent to the project area on those registers.
National Heritage List	The heritage registers mandated by the EPBC Act were consulted and there are no sites within or adjacent to the project area on those registers.
Commonwealth Heritage List	The heritage registers mandated by the EPBC Act were consulted and there are no sites within or adjacent to the project area on those registers.
Register of the National Estate (non-statutory though retained as a reference archive)	No items listed on the Register of the National Estate were identified within or adjacent to the project area.

Heritage Register Search	Result
State Heritage Register	No items listed on the State Heritage Register were identified within or adjacent to the project area.
Section 170 Registers of relevant Government Agencies, particularly the Forestry Corporation of NSW	No items listed on an agency Section 170 Register were identified within or adjacent to the project area.
<i>Narrabri Local Environment Plan 2012</i>	Schedule 5 of the Narrabri Local Environment Plan 2012 contains a list of identified heritage items within the LGA. An examination of Schedule 5 indicated that no listed items are located in or within a two kilometre buffer of the project area.

21.2.2 Historical context and early structures

The project area was initially part of squatters' runs legitimately granted to various individuals, before largely being resumed for the purposes of State forests. There was sporadic grazing on the eastern side of the Newell Highway within the Pilliga East State Forest. The State forests were logged by individual contractors and are now managed by the Forestry Corporation of NSW. The north-western section of the project area was extensively cleared and used for grazing and cropping.

A Brigalow parish map published in 1883 indicates two areas of heritage interest within the project area:

- Johnston's Albion Sawmill, near the intersection of Bohena and Bibblewindi Creeks
- a house and hut on Bohena Creek.

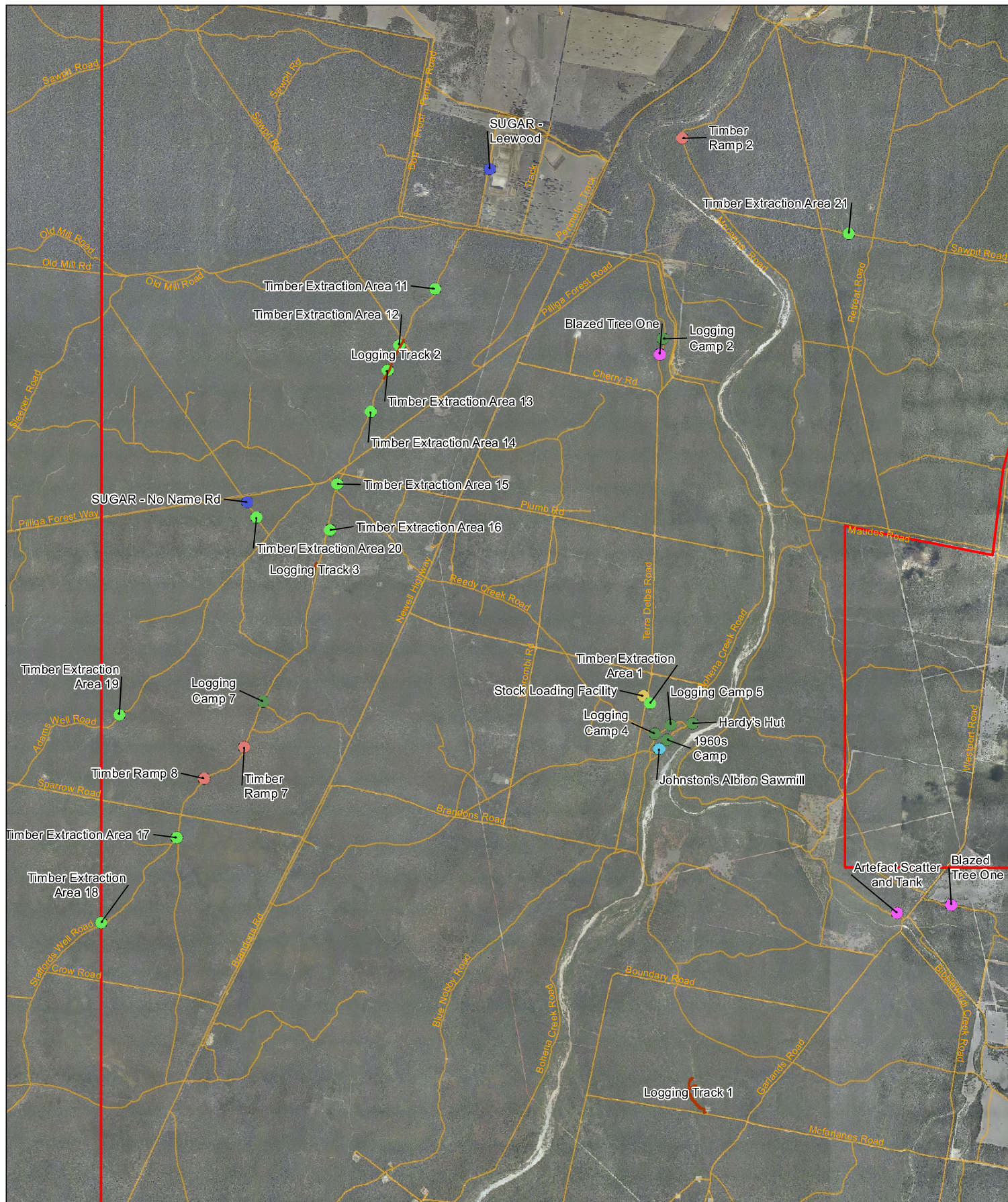
The 1883 parish map for Crowie indicates the location of Robert Hardy's hut and other improvements, including a cultivated paddock, a horse paddock, a log fence and a four-wire and net fence. The 1883 Cowallah parish map indicates the location of two huts, a garden and house and yard to the north-east of the intersection of Bohena and Sandy Creeks. These improvements are not indicated on the 1898 parish map, but a sawmill is indicated in the same position. The features identified at these locations are discussed in Section 21.2.3.

Between 1968 and 1979, the Sydney University Physics Department constructed and operated the Sydney University Giant Air-shower Recorder in the Pilliga Forest. The objective of the array was to locate the sources of high-energy cosmic rays in the Southern Hemisphere (Haynes *et al.* 1996). The installation covered an area of approximately 100 square kilometres.

21.2.3 Site characterisation

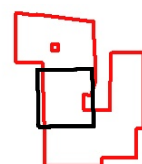
Overview

A total of 53 sites were identified through the 2011 and 2014 surveys. These sites were characterised into six types: timber extraction areas, sawmill sites, habitation and camping sites, timber loading ramps, logging tracks and other sites. The location of identified sites is shown in Figure 21-1. Each site is described and assessed for heritage significance in the following sections.



LEGEND

- ▬ Project area
- ▬ Roads/tracks
- Historic Heritage Sites
 - Habitation Site
 - Other Site
 - Other Sites
- Sawmill Site
- Sydney University Giant Air-Shower Recorder
- Timber Extraction Area
- Timber Loading Ramps
- ▬ Logging tracks



0 0.5 1 2
Kilometers



Narrabri Gas Project
Environmental Impact Statement

Job Number 21-22463
Revision A
Date 11 Mar 2015

Location of Identified Sites (1 of 3)

Figure 21-1

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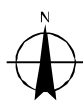
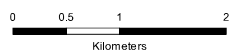
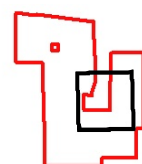
Data source: NSW Department of Lands: DTDB and DCDB - 2012-13; Santos: Operational and Base Data - 2013; Heritage data from AEDOM 2013 Created by: affody

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LEGEND

- Project area
- Roads/tracks
- Historic Heritage Sites
- Habitation Site
- Other Site
- Other Sites
- Sawmill Site
- Sydney University Giant Air-Shower Recorder
- Timber Extraction Area
- Timber Loading Ramps
- Logging tracks



Narrabri Gas Project
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Revision A
Date 11 Mar 2015

Location of Identified Sites (2 of 3)

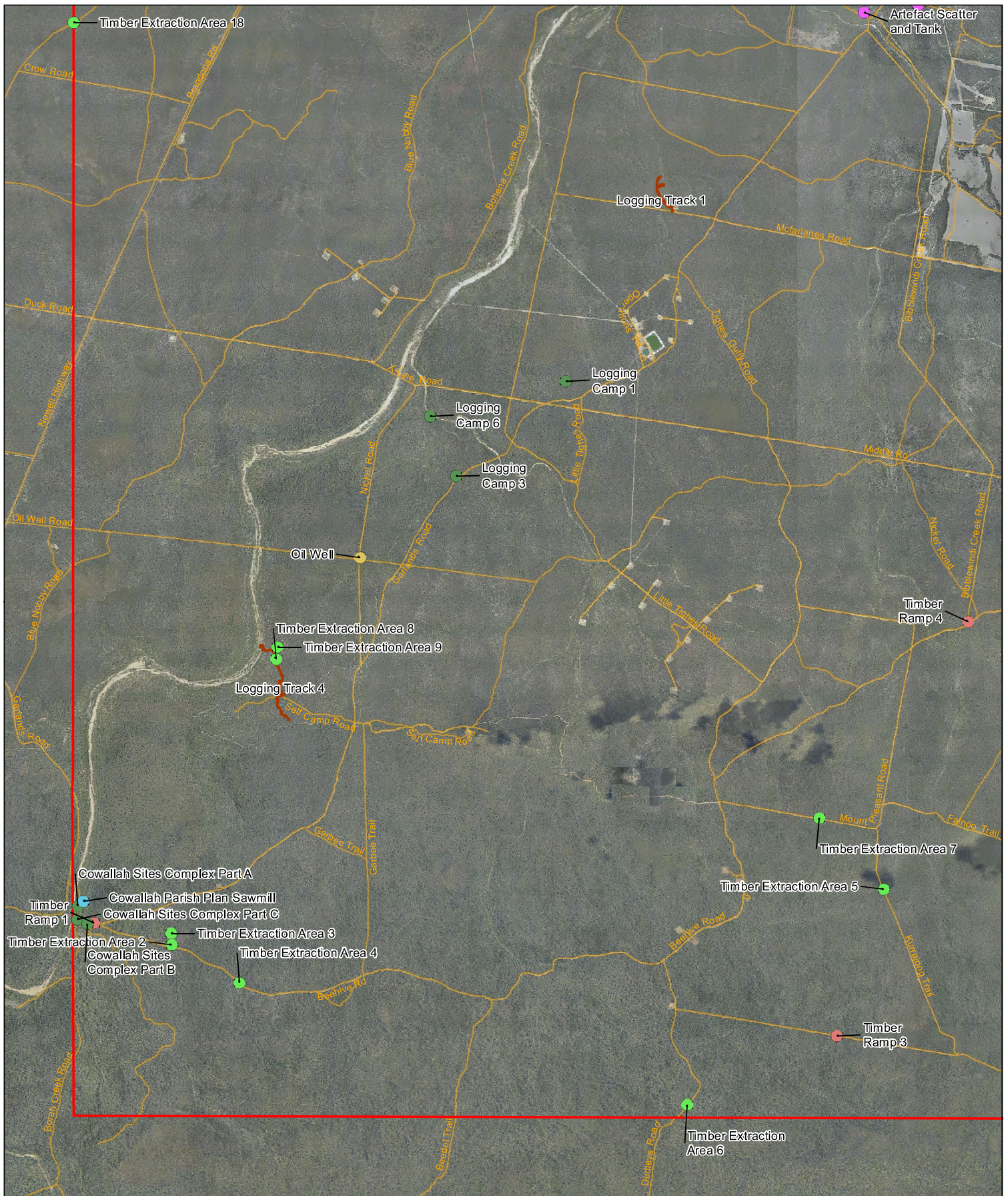
Figure 21-1

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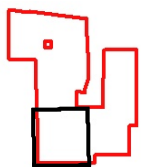
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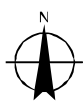


LEGEND

- Project area
- Roads/tracks
- Historic Heritage Sites
- Habitation Site
- Other Site
- Other Sites
- Sawmill Site
- Sydney University Giant Air-Shower Recorder
- Timber Extraction Area
- Timber Loading Ramps
- Logging tracks



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Kilometers



Narrabri Gas Project
Environmental Impact Statement

Job Number 21-22463
Revision A
Date 11 Mar 2015

Location of Identified Sites (3 of 3)

Figure 21-1

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Data source: NSW Department of Lands: DTDB and DCDB - 2012-13; Santos: Operational and Base Data - 2013; Heritage data from AECOM 2013 Created by: affody

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Timber extraction areas

Description







Timber extraction areas

The survey identified 21 timber extraction areas. These are cleared areas next to a road or track that contain timber off-cuts and possibly other artefacts. Typically, the other artefacts are predominately kerosene or petrol tins or food tins but can also include glass and ceramic. Timber off-cuts are generally slices that were sawn off four sides of a log to make a square or rectangular piece of timber. The resulting off-cut therefore has a flat side and a convex side. Separate cleared areas sometimes occur on the opposite side of the road or track that contain little or no off-cuts and material culture. It would appear that the timber processing occurred on one side, with the processed timber stored on the other side prior to being transported.

Timber Extraction Area 12

Of all the timber extraction areas, only Timber Extraction Area 12 was assessed as being of local heritage significance in its own right. The concentration of activity at Timber Extraction Area 12 was on the western side of the road. However, there is also a small crescent shaped clearing on the eastern side of the road. On the western side is a larger, rectangular clearing, although some re-growth is evident. Various items were found scattered across the clearing, with a concentration in the north-eastern corner adjacent to the road. Table 21-2 provides some details and images of items found at the site. An analysis of the artefacts indicates the site dates to the late 1910s or early 1920s.

Table 21-2 **Artefacts identified at Timber Extraction Area 12**

Item	Description	Item	Description
Bottle	 Post 1916 green wine-style bottle with words embossed in an oval shield.	Aerated water bottle	 Codd-style aerated drink bottle, with four dimples. Body has vertical embossed lettering (c.1885–c.1935).
Lamp glass	 Scalloped rim fragment from a liquid fuel lamp glass	Ceramic	 Green under-glaze transfer printed foliage design on an earthenware plate fragment.
Solarised amethyst glass bottle	 Embossed cylindrical flat-bottomed bottle of about 50 millimetres in diameter (c.1880–c.1920).	Kerosene tins	 At least two rectangular kerosene tins (post 1865). One was cut in half horizontally.

Significance assessment

With the exception of Timber Extraction Area 12, none of the timber extraction areas was assessed as being of State or local heritage significance. However, as a group of similar sites, they meet the criteria for local historical and research significance, as assessed in Table 21-3. Timber Extraction Area 12 is of heritage significance in its own right, although it also contributes to the group of timber extraction areas. Table 21-3 assesses the significance of the timber extraction areas against NSW significance criteria and is followed by a statement of significance as required by the heritage guidelines (NSW Heritage Office 2001).

Table 21-3 **Assessment of significance – timber extraction areas**

Criteria	Collection of timber extraction areas	Timber Extraction Area 12
Historical significance State Heritage Register criteria (a)	Local historical significance	Local historical significance
Historical association significance State Heritage Register criteria (b)	No	No
Aesthetic significance State Heritage Register criteria (c)	No	No
Social significance State Heritage Register criteria (d)	No	No
Technical/research significance State Heritage Register criteria (e)	Local technical / research significance	Local technical / research significance
Rarity State Heritage Register criteria (f)	No	No
Representativeness State Heritage Register criteria (g)	No	Local representative significance

Statement of significance – Timber Extraction Areas

As part of a collection, the timber extraction areas are of local historical and technical significance. The collection of timber extraction areas demonstrates the pattern of logging in the eastern Pilliga from the late 19th century to the present. The collection of timber extraction areas also shows the continuity of this process. The spatial mapping of these sites has the potential to provide insight into what areas were targeted during particular periods and how this varied over time with the introduction of new technology and improved transportation from the Pilliga.

Statement of significance – Timber Extraction Area 12

Timber Extraction Area 12 is of local significance as it meets the threshold for the historical, research and representative criteria. It is representative of a transient logging camp in the Pilliga forest as it demonstrates the principal characteristics. That is, it provides evidence of logging activities together with material culture relating to daily life. With regard to its research significance, the artefacts associated with the site have the ability to provide an insight into daily life in a logging camp and access to goods.

The historical significance of Timber Extraction Area 12 is as part of a larger collection as described above. Timber Extraction Area 12 is of particular importance in this regard as the associated material culture enables a decade to be associated with the logging activities.

As part of a collection of sites that spans the period of European exploitation of the region for timber, Timber Extraction Area 12 can demonstrate the course of domestic occupation of the Pilliga in association with the logging industry. Timber Extraction Area 12 is in contrast to the larger-scale operation evident at the Cowallah Habitation Complex (c. 1898) and is comparable to the Loggers Camp (c.1960s).

Sawmill sites

Description

Johnston's Albion Sawmill

Johnston's Albion Sawmill, used during the 1890s, is depicted on the Brigalow parish map as being located on the western side of Bohena Creek, just to the north of its intersection with Bibblewindi Creek.

The sawmill has been heavily impacted by later use and modification. A substantial amount of material has been removed from the area, possibly for use in road building activities. The resultant embankments were used by trail bike riders and as protection by campers. These activities have severely impacted the visibility and preservation of the Johnston's Albion Sawmill site.

An intensive survey of the area identified a partial concrete foundation (Figure 21-2). The remains were out of context, appearing to have been moved by a grader or bulldozer and are currently located within a depression. The concrete foundation has been damaged, making its original size and shape difficult to determine. The surrounding area is scattered with material from the 1960s to the present, but no material culture of the Johnston's Albion Sawmill period was found.



Figure 21-2 Johnston's Albion Sawmill – partial concrete foundation

Cowallah parish map sawmill

The sawmilling area is located to the east of Bohena Creek and to the north of Garlands Road. It presents as a rectangular cleared area, about 20 metres wide and about 140 metres long. The cleared area is oriented roughly north–south along Garlands Road. The survey discovered a scattering of material culture throughout the clearing, which is more concentrated in the south and becomes less so towards the northern portion. The northern extent of the site is devoid of material. This, together with the compacted











nature of the ground, suggests the area was used either as a yard for livestock or as a storage area for processed timber.

A stone foundation was located in an approximately central alignment along the length of the site. The foundation was similar to that identified at Johnston's Albion Sawmill. Unlike the latter example, the stone foundation was subject to fewer disturbances, although there was some degradation along the western edge. Dressed local stone was arranged in an 'L-shape', the void was filled with smaller, undressed stones and compacted earth. The entire foundation is about 1.2 metres square. Associated with the foundation are a metal box and a broken concrete object that looks like a drain. A second similar object was located to the east, in association with a depression.

A scatter of concrete fragments occurs along a 15 metre section of Garlands Road, between the sawmill and the Cowallah Habitation Complex site. The concrete appears to have been poured into an *in situ* mould. It was made with coarse-grained sand with a high quartz component, which has similar characteristics to the sands of Bohena Creek. The location of the concrete within the road and associated grader mounds suggests part of the site may have been damaged by the construction of Garlands Road. As well as the concrete, there is a scatter of artefacts along Garlands Road between Part A and a point opposite the sandstone foundation (refer to Appendix O).

Some of the artefacts associated with the site are shown in Table 21-4. None of the items provides a specific date for the occupation of the Sawmill site. However, the material culture appears to indicate the site may still have been in use during the 1920s.

Table 21-4 Artefacts identified at Cowallah parish map sawmill artefacts

Item	Description	Item	Description
Vehicle part		Part of a vehicle.	Enamel Cup
			
Fry pan		Corroded fry pan.	Concrete drain
			
Billy can		Corroded billy can.	Bottle
			
Earthenware fragments		Fragments. No decorative elements evident.	Tins
			
Kerosene tin		Kerosene tin with an embossed 'spider web' design on base.	Kerosene Can
			

Significance assessment

Table 21-5 provides a summary of the heritage significance of the two sawmill sites against NSW significance criteria and is followed by a statement of significance for each site as required by the heritage guidelines (NSW Heritage Office 2001).

Table 21-5 Assessment of significance – sawmill sites

Criteria	Johnston's Albion Sawmill	Cowallah parish map sawmill
Historical significance State Heritage Register criteria (a)	No	Local historical significance
Historical association significance State Heritage Register criteria (b)	No	No
Aesthetic significance State Heritage Register criteria (c)	No	No
Social significance State Heritage Register criteria (d)	No	No
Technical/research significance State Heritage Register criteria (e)	No	Local research significance
Rarity State Heritage Register criteria (f)	No	Potentially rare within the Eastern Pilliga
Representativeness State Heritage Register criteria (g)	No	No

Statement of significance – Johnston's Albion Sawmill

The Johnston's Albion Sawmill site is of not of State or local significance. Disturbance of the site by other users of the area has removed its ability to contribute to an understanding of forestry activities in the Pilliga.

Statement of significance – Cowallah parish map sawmill

The Cowallah parish map sawmill site is of local historical and technical significance. Historically, it demonstrates the utilisation of the Pilliga forest for logging purposes. The site is indicative of the larger scale operators who worked in the forest, in contrast to the smaller logging teams at sites such as Timber Extraction Area 12. The site has the potential to yield significant new information not available from other sources regarding the extent of the operations at the site.

Habitation and camping sites

Description

Cowallah Habitation Complex

Associated with the Cowallah parish map sawmill (described above) are three distinct areas that are indicative of European habitation. However, these sites could not be directly correlated with the items marked on the 1883 Cowallah parish map ('hut and garden', 'hut' and 'house and yard') with any level of confidence. The areas are discussed below as Part A (hut and garden), Part B (hut) and Part C (house and yard). No archaeological evidence was found in the area marked as 'hut'. Part C contains two rubbish

pits with no evidence of an associated structure. The parish map does not indicate a feature in the vicinity of Part C.

Part A is a cleared area on the bank of Bohena Creek, being located to the north of Garlands Road (Figure 21-3). The site has been used in more recent years by campers as evidenced by campfire sites, modern bottles and cans at the site. The historic elements of the site are a depression of about three by two metres, with a mound of sandstone stones. There is sufficient material to have formed a small fireplace. Associated with the depression and sandstone mound are some flat metal panels with attached flanges. The panels may have been from an oven similar to that found at Timber Extraction Area 17. Fragments of heat-affected blue and clear glass were also identified adjacent to the mound. There are a limited number of artefacts visible on the surface about 10 metres north of the mound. Artefacts included a small fragment of fine-grained refined earthenware from a tea cup or saucer, an unrefined earthenware fragment with two underglazed blue rim bands, a tea cup fragment of unrefined earthenware with no decoration and fragments of amethyst glass.

Part B of the site has a number of components, being two stone mounds with associated artefact scatter, non-indigenous plantings, and a depression that was interpreted as a well. There is no apparent order to the first stone mound but it may have once formed a fireplace. The second mound is a smaller scatter located about 10 metres north of the first mound. It is considered insufficient to have been a fireplace. The purpose of the stones is unclear. The artefacts associated with this area indicate it may have been a workshop, as the items are mechanical and industrial in nature. Scattered between the two areas are numerous glass, ceramic and metal artefacts. The glass fragments contain a range of colours and shapes; indicative of the period prior to the 1930s (Figure 21-4). The ceramic is largely unrefined earthenware with no decoration.



Figure 21-3 Cowallah Habitation Complex – Part A



Figure 21-4 Cowallah Habitation Complex – Part B (glass fragments)

Part C sits within the triangle of roads formed by Garlands, Beehive and Creighs roads. It presents as two depressions with a dense artefact scatter in and between the depressions. The depressions were interpreted as the rubbish dump for the Cowallah Habitation Complex. The range and extent of the artefacts visible on the surface are indicative of a well-preserved and extensive archaeological rubbish dump. The volume of material indicates the complex and sawmill may have been occupied by a large number of people or over an extended period of time.

Hardy's Hut

A large stand of *Aloe sp.* plants was identified in the area between Bohena Creek Road and Bohena Creek. A large permanent billabong is present immediately to the west of this stand of *Aloe sp.* plants. The plants are located in the vicinity of where the Crowie parish map of 1883 places Hardy's Hut. A number of glass and metal artefacts were identified near the vicinity of this stand of plants during the

2011 survey. However, the previously identified artefacts could not be relocated during the 2014 survey. No indication of the fences indicated on the Crowie parish map could be located.

1960s camp

This 1960s camp is located in the embankment adjacent to Johnston's Albion Sawmill. Based on the stratigraphic evidence visible during the site inspection, it appears as though a car was dumped during the use of the camp and this has later been impacted by the removal of earth from the area. Evidence of a small campfire was located beside the remains of the car, together with a ladies' vinyl purse, brown glass beer bottles, metal cans and tins, and glass soft-drink bottles (Figure 21-5).



Figure 21-5 1960s camp site

Logging camps one to six

Logging camps one to six are described as follows:






- Logging camp one – a semi-cleared area scattered with worked timber and some tins.
- Logging camp two – a small scatter of kerosene tins was located during the survey. No other evidence of activity was noted.
- Logging camp three – a small collection of artefacts was located during the survey, potentially related to logging activities.
- Logging camp four – a formed wooden sleeper with two more wooden sleepers scattered across the site were located during the survey. Artefacts included a fragment of undecorated plate / refined earthenware, a fragment of clear glass, a handle fragment and tin.
- Logging camp five – material located during the survey was more recent than the other camps, as evidenced by brown beer bottles and an Ovaltine tin. Other artefacts included a metal bucket, metal food-style tins, kerosene tins, soft-drink bottle and wine-style bottle.
- Logging camp six – material located during the survey included two kerosene tins. No cut timbers were found.

Logging camp seven

Logging camp seven is located on the eastern side of Staffords Well Road, presenting as an irregularly shaped cleared area of about 15 by 20 metres. A feature associated with the camp is a rectangle of boards that have been laid on the ground. The rectangle covers an area of about three by 1.5 metres. Both ends of the boards are held in place with a metal bracket, which was nailed to the ground. This was interpreted as a type of outdoor patio area.

Table 21-6 contains images and information regarding a selection of the artefacts located at the site. Other material culture included the springs from a sofa, the metal mesh base of a bed, a metal laundry tub, food tins and cylindrical petrol / kerosene tins. There was a scatter of unrefined and refined earthenware, some of which had a yellow or green body. There was also some gilt-edge banded ware and plate marleys with moulded designs and scalloped rims. There were very few transfer-printed pieces which are indicative of the period after the 1910s. The forms covered the range of domestic necessities—plates, bowls, cups and saucers. However, the largest proportion of fragments appeared to come from tea cups. The artefacts at the site indicate this was a family group—the presence of a pram frame and a cats-eye marble are indicative of children, while the make-up bottle suggests a woman also lived there. The diagnostic artefacts seem to indicate the site was occupied during the 1960s.

Table 21-6 Artefacts identified at Logging Camp Seven

Item	Description	Item	Description
Pram		Glass bottle	
Bottle	Image not available	Ceramic	
Tea pot		Glass make up bottle	

Significance assessment

Table 21-7 provides a summary of the heritage significance of the habitation and camping sites against NSW significance criteria and is followed by a statement of significance for each site as required by the heritage guidelines (NSW Heritage Office 2001).

Table 21-7 Assessment of significance – habitation and camping sites

Criteria	Cowallah Habitation Complex	Hardy's Hut	1960s camp	Logging camps 1 to 6	Logging camp 7
Historical significance State Heritage Register criteria (a)	Local historical significance	No	No	Local historical significance	Local historical significance
Historical association significance State Heritage Register criteria (b)	No	No	No	No	No
Aesthetic significance State Heritage Register criteria (c)	No	No	No	No	No
Social significance State Heritage Register criteria (d)	No	No	No	No	No
Technical/Research significance State Heritage Register criteria (e)	Local research significance	Local research significance	No	Local research significance	Local technical significance
Rarity State Heritage Register criteria (f)	Potentially rare	No	No	No	No
Representativeness State Heritage Register criteria (g)	Local representative significance	No	No	No	No

Statement of significance – Cowallah Habitation Complex

The Cowallah Habitation Complex is of local historical, research and representative significance. In association with the other logging camps in the Pilliga forest, the Cowallah Habitation Complex is of local historical significance. As part of a collection of sites that spans part of the period of European settlement, the Cowallah Habitation Complex can demonstrate the course of domestic occupation of the forest in association with its logging history. The logging camp is in contrast to the small-scale operation evident at the c.1920s Timber Extraction Area 12 and the 1960s logging camp.

Detailed mapping and archaeological investigation of the complex has the potential to yield significant new information that is not available from other sources regarding sawmill life in the Pilliga from the 1890s through to about the 1920s. The Part C dump in particular has the potential to yield information regarding domestic life, camp arrangements and access to goods and services. The Complex is representative of large habitation sites in the Pilliga forest occupied between the 1890s and the 1920s.

Statement of significance – Hardy's Hut

The site of Hardy's Hut is of research significance at a local level. Archaeological investigation of the area thought to have been the location of Hardy's Hut may provide insight into some of the earliest European occupiers of the Pilliga. Hardy's occupation was different from that of the logging camps as the Crowie parish map suggests Hardy was attempting to farm the land. Evidence of attempts to farm the Pilliga is not available from other sources and is of significance to the historical understanding of the local area.

Statement of significance – 1960s logging camp

The 1960s logging camp is not of State or local significance under any of the seven criteria.

Statement of significance – Logging camps one to six

In isolation, no single logging camp is of State or local significance. However, as part of a collection of similar sites, they are of local historical and technical significance. The group of logging camps demonstrates the pattern of logging in the eastern Pilliga from the late 19th century to the present and also shows the continuity of this process. The spatial mapping of these sites has the potential to provide insight into what areas were targeted during particular periods and how this varied over time with the introduction of new technology and improved transportation from the Pilliga.

Statement of significance – Logging camp seven









Logging camp seven is of local historical, technical and representative significance. As part of a collection of logger's habitation sites (the Cowallah Habitation Complex and Timber Extraction Area 12, for example) it is able to demonstrate the course of historical domestic occupation in the Pilliga from the 1890s through to the 1960s. The archaeological investigation of the site may contribute to an understanding of domestic life in the Pilliga during the 1960s. It is also representative of a 1960s logging camp occupied by a family unit as demonstrated by the cats-eye marble and foundation bottle.

Timber loading ramps

Description

The loading ramps identified in the project area follow a standard pattern. They are usually located at the intersection of two roads or tracks. Two suitably spaced trees are selected and horizontal logs are stacked behind the trees to hold the earthen ramp that is then built behind it. Across the project area, the number of horizontal logs shows minimal variation—between two and four logs. The loading ramps were not usually associated with timber extraction areas with the exception of timber extraction areas 11 and 19 as described above. Table 21-8 contains images and information regarding loading ramps identified in the project area.

Table 21-8 Timber loading ramps

Item	Description/location		Item	Description/location	
1		Near intersection of Garlands, Beehive and Creigh's roads.	6		Intersection Dusky Road and Duschke Link.
2	No image available	McCains Road, north of intersection with Sawpit Road.	7		On Stafford Well Road. Only one standing tree was used in the construction and the earthen ramp has collapsed.
3		Whirley Brook Trail. Appears to have been used in the last several years as one of the logs has been replaced and saw marks are fresh.	8		On Stafford Well Road.
4		Intersection of Beehive and Bibblewindi Creek roads.	9		On Chromite Road. Top log appears to have been recently replaced – the unweathered cut edge is evident in the adjacent image.
5		Intersection of Monument Road and Duschke Link			

Significance assessment

Table 21-9 provides a summary of the heritage significance of timber loading ramps against NSW significance criteria and is followed by a statement of significance for each site as required by the heritage guidelines (NSW Heritage Office 2001).

Table 21-9 Assessment of significance – timber loading ramps

Criteria	Collection of timber loading ramps
Historical significance State Heritage Register criteria (a)	Local historical significance
Historical association significance State Heritage Register criteria (b)	No
Aesthetic significance State Heritage Register criteria (c)	No
Social significance State Heritage Register criteria (d)	No
Technical/Research significance State Heritage Register criteria (e)	Local research significance
Rarity State Heritage Register criteria (f)	No
Representativeness State Heritage Register criteria (g)	Local representative significance as they demonstrate the principal characteristics of timber loading ramps.

Statement of significance – Timber loading ramps

The group of nine timber loading ramps is of local historical and technical significance. In association with the timber extraction areas, the timber loading ramps demonstrate the pattern of logging in the eastern Pilliga from the late 19th century to the present and the continuity of this process. The spatial mapping of these sites has the potential to provide insight into what areas were targeted during particular periods and how this varied over time with the introduction of new technology and improved transportation from the Pilliga.

Logging tracks

Description

The project area within the State forest is criss-crossed with unmapped logging tracks. The number and complexity of these features made it impracticable to identify and map all the tracks encountered during the survey. The following is a description of several that were of particular note:

- Track one – On the northern side of McFarlanes Road is a track that runs roughly north–south. The forest to the east of the track has been cleared, but there was no material culture evident.
- Track two – On the eastern side of Staffords Well Road is a bulldozer track, probably associated with the 2009 thinning works.
- Track three – On the western side of Staffords Well Road is a track that is too narrow to have been created by a vehicle. It was interpreted as being created by a horse pulling logs continuously along the same line. The track has resulted in the formation of a depression that has been subject to water erosion. The track follows a linear alignment, indicating it is of human origin, rather than a natural phenomenon.
- Track four – Off the end of Self Camp Road is a track running parallel to Bohena Creek. The track forms access for timber extraction areas eight and nine.

Significance assessment

Statement of significance – Logging tracks

In association with the timber extraction areas, logging camps and timber ramps, the logging tracks have the potential to provide insight into the way in which loggers moved through the forest and are therefore of local research significance. Mapping the tracks would capture this research potential.

Other sites

Description

Sydney University Giant Air-shower Recorder array

The Sydney University Giant Air-shower Recorder array consisted of 54 stations. Each station consisted of pairs of liquid scintillation detectors (for detecting air showers) separated by 50 metres. The entire Sydney University Giant Air-shower Recorder covered an area of 100 square kilometres (Sydney University Physics Department 2008) although the precise locations of the stations throughout the Pilliga are not available. The installation also originally included a base station to record data, and transmission tower; however, these are understood to have been demolished.

Two of the liquid scintillation detectors were located during the survey. The first was adjacent to the existing produced water ponds on Leewood, while the second was located off No Name Road, near the intersection with Plumb Road. The liquid scintillation detectors consist of what presents as a 44 gallon drum half buried in the ground. The shaft of the liquid scintillation detector reaches approximately 1.5 metres below the ground, before opening into a wider chamber underneath.

Artefact scatter and tank

This site is located on the northern side of Bibblewindi Creek, about 100 metres north-west of the intersection of Garlands and Bibblewindi Creek roads. Spread over an area of approximately one hectare is an assortment of rusted metal items, including car bodies and 44 gallon drums. A concrete tank and a small but deep dam are located in the north-western corner of the scatter. There is evidence, in the form of vertical supports, of a structure around the tank. Adjacent to the tank is a stack of cut sleepers. A gum tree has fallen over the sleepers, thereby, making their removal too difficult to effect. Several of the sleepers had dog spikes attached, indicating they were stacked for reuse. Associated with the site was a large stand of unidentified introduced vegetation.

Stock loading facility

A stock loading facility of pine timbers cut from the area is located adjacent to an unnamed track running parallel to Bohena Creek and Bohena Creek Road. The central section of the facility is roughly rectangular with a chute to herd animals through running towards the road. There was no other cultural evidence in the surrounding area.

Blazed trees

Two blazed trees were encountered during the site survey. One tree is located adjacent to a logging track that runs parallel to, and west of, Terra Delba Road. The blazed tree (an ironbark tree) had an area of bark removed. The letters 'F & I' had been blazed into the exposed hardwood. It is assumed that these initials likely stand for Forestry / ies Industry. The second blazed tree is located on the southern side of

Monument Road. An oval area of bark around 300 by 120 millimetres in size was removed with an axe; the axe marks are evident in the exposed hardwood. No letters or symbols were blazed in the hardwood.

Oil well

An oil well is located on the north-eastern corner of the intersection of Oil Well and Nickel roads. It is the site of an oil exploration pit and an associated windmill base. All that remains of the windmill are four legs. The legs have been sawn off about 10 centimetres from ground level. In addition, some other artefact material including brown beer-bottle glass, metal bolts and other metal fragments was located. The oil well pit is a concrete lined pit approximately two metres by two metres in size and around 70 centimetres deep with a sign erected within the pit.

Significance assessment

Table 21-10 provides a summary of the heritage significance of the other identified sites against NSW significance criteria and is followed by a statement of significance for each site as required by the heritage guidelines (NSW Heritage Office 2001).

Table 21-10 Assessment of significance – other sites

Criteria	Giant Air-shower Recorders	Artefact scatter and tank	Stock loading facility	Blazed trees	Oil well
Historical significance State Heritage Register criteria (a)	No	No	No	No	Local significance
Historical association significance State Heritage Register criteria (b)	No	No	No	No	No
Aesthetic significance State Heritage Register criteria (c)	Local significance	No	No	No	No
Social significance State Heritage Register criteria (d)	State significance	No	No	No	No
Technical/Research significance State Heritage Register criteria (e)	No	No	No	No	No
Rarity State Heritage Register criteria (f)	Local significance	No	No	No	No
Representativeness State Heritage Register criteria (g)	No	No	No	No	No

Statement of significance – Sydney University Giant Air-shower Recorders

The Sydney University Giant Air-shower Recorder array is of State social significance, being held in high regard by the physics community. The research undertaken using the array provided important information regarding the size and direction of incoming giant cosmic ray air-showers. The array demonstrates a high degree of technical achievement, being both pioneering in the field of giant air-shower recording and also for the timing signal system developed to allow larger portions of the array to be interrogated at any one time.

The two liquid scintillation detectors from the Giant Air-shower Recorder array are of State social significance, of technical significance and also rare at a local level. The loss of integrity of the base station where data was recorded has degraded its technical and rarity significance to local, rather than State.

Statement of significance – Artefact scatter and tank, stock loading facility and blazed trees

The artefact scatter and tank, stock loading facility and blazed trees are not of State or local significance under any of the seven criteria.

Statement of significance – Oil well

The oil well is of local historical significance. It demonstrates the course and pattern of resource exploration in the local area.

Pilliga East logging cultural landscape

Description

A cultural landscape can be defined as an area where the patterns of settlement or use are visible in that landscape, together with a cultural awareness of the contribution of the settlement or use to cultural values, norms or attitudes towards the land (NSW Department of Environment, Climate Change and Water 2010a). A landscape is a continually changing unit, being the product of evolving relationships between nature, people, the past and present and the values that people place on these.

As discussed above, individually the majority of the timber extraction areas, logging camps, timber loading ramps and logging tracks are not of heritage significance. It is only when they are considered collectively that a sense of the scale and intensity of logging activities in the Pilliga can be appreciated. The timber extraction areas, sawmill sites, habitation sites, timber loading ramps and logging tracks clearly demonstrate a pattern of use within the east Pilliga for logging purposes. Further research regarding the spatial arrangement of the sites, together with the material culture contained within them, has the potential to yield information regarding the evolution of attitudes towards the Pilliga and the logging activities undertaken within it.

For the purposes of this assessment, the cultural landscape boundary is defined as the State forests within the project area. The timber extraction areas, sawmills, habitation and camping site, timber loading ramps and logging tracks are elements that contribute to the cultural landscape.

Significance assessment

Table 21-11 provides a summary of the heritage significance of the Pilliga East logging cultural landscape against NSW significance criteria and is followed by a statement of significance for each site as required by the heritage guidelines (NSW Heritage Office 2001).

Table 21-11 Assessment of significance – Pilliga East logging cultural landscape

Criteria	Pilliga East logging cultural landscape
Historical significance State Heritage Register criteria (a)	Local historical significance
Historical association significance State Heritage Register criteria (b)	No
Aesthetic significance State Heritage Register criteria (c)	No
Social significance State Heritage Register criteria (d)	No
Technical/Research significance State Heritage Register criteria (e)	Local research significance
Rarity State Heritage Register criteria (f)	No
Representativeness State Heritage Register criteria (g)	Local representative significance

Statement of significance – Pilliga East logging cultural landscape

The Pilliga East cultural landscape is of historical, research and representative significance. The landscape demonstrates the patterns of logging activities in the Pilliga East forest and the different intensities and methods of logging from the 1890s to the present. The timber extraction areas, sawmill sites, logging camps, timber loading ramps, logging tracks and other sites associated with logging activities that are scattered across the landscape, can tell the story of logging in the Pilliga East. Further research may indicate the variations in methods and areas of extraction between the early operations and the later State operated activities.

The Pilliga East cultural landscape is of local research significance. The creation of a cultural landscape map of the timber extraction areas, sawmill sites, logging camps, timber loading ramps and logging tracks could provide insights into the pattern of logging in the forest.

The Pilliga East cultural landscape is of local representative significance as it contains all the sites characteristic of logging activities (timber extraction areas, sawmill sites, logging camps, timber loading ramps and logging tracks).

Siding Spring Observatory

The Siding Spring Observatory is one of the foremost international optical observatories in the world and is a principal location of Australian astronomical research (Christison 2006). The observatory is located approximately 80 kilometres south-west of the southernmost point of the project area, approximately 20 kilometres to the west of Coonabarabran in north east NSW. A description of the heritage values of the Siding Spring Observatory is provided in response to Commonwealth assessment requirements as the observatory is located on Commonwealth land.

The Siding Spring Observatory was established in the early 1960s and today is the largest observatory in Australia. The observatory is an operating research facility utilised by the local, Australian and international astronomy community. The site includes a number of telescopes operated by local and international organisations and has been the location of important scientific research (ANU 2009). The Australian National University controls the site and has recognised the heritage values of the observatory through its inclusion in the Australian National University Heritage Strategy 2010-2012 (ANU 2009). The observatory is also a popular tourist attraction in the Warrumbungle region; having a visitor centre and a

viewing gallery of the Anglo-Australian Telescope to cater for the tourists. As an operating research facility, public access to Siding Spring Observatory is restricted to day time visits.

The Siding Spring Observatory is not subject to heritage listing. However, a heritage study prepared for the Warrumbungle Shire Council recommends the Siding Spring Observatory be nominated for inclusion on the State Heritage Register as a place of State significance (Christison 2006). The study provides a statement of significance for the observatory based on an assessment against the NSW Heritage Council Criteria. The assessment concludes that the observatory has a high level of state historical, historical association, technical / research significance, rarity, representativeness and integrity and a moderate level of state aesthetic significance. It also has a high level of local significance (Christison 2006).

21.3 Potential impacts

21.3.1 Overview

Potential impacts associated with the project relevant to historical heritage are both direct disturbance due to construction and operation of project facilities and indirect impacts due to changes in the aesthetic environment of a site or impacts due to noise or vibration. However, the nature of gas field planning is such that there is some flexibility available regarding the placement of as field infrastructure including wells, gathering lines and access tracks. Based on the identification of siting constraints and subject to gas field operational requirements, it is possible to locate infrastructure to avoid or minimise impact on sensitive receiver and areas, including items of historic heritage or archaeological significance. The project would avoid impact at a number of the identified sites through the inclusion of surface development exclusion areas in the Field Development Protocol. Procedures would be implemented through the Historic Heritage Management Plan and Field Development Protocol to manage and protect unexpected finds of heritage significance over the life of the project.

21.3.2 Major infrastructure

Leewood

A pair of liquid scintillation detectors from the Sydney University Giant Air-shower Recorder array was previously identified on Leewood. The liquid scintillation detectors are located directly adjacent to the two produced water ponds constructed under a previous approval and are currently clearly marked by fencing. It is not anticipated that the Sydney University Giant Air-shower Recorder components would be impacted by the proposed works and they would continue to be protected by fencing.

No other items of historic heritage significance were identified on the Leewood property. It is therefore considered that the proposed works at Leewood are unlikely to impact items of heritage significance.

Bibblewindi

No historic sites were identified in the vicinity of the current Bibblewindi facility. However, it is possible that sites exist within the area to be cleared. Should sites be identified during construction, they can be managed, and impacts mitigated, under the Historic Heritage Management Plan (refer to Section 21.4).

Bibblewindi to Leewood infrastructure corridor

No historic sites were identified in the vicinity of the Bibblewindi to Leewood infrastructure corridor. However, the entire length of the corridor was not surveyed and there remains potential for sites to be located within the proposed 30 metre corridor. Should sites be identified during construction, they can be managed, and impacts mitigated, under the Historic Heritage Management Plan (refer to Section 21.4).

Leewood to Wilga Park underground power

A new underground power line to reticulate power from Wilga Park to Leewood is proposed to be installed within the existing infrastructure corridor. No historic sites were identified in the vicinity of the infrastructure corridor. However, the entire length of the corridor was not surveyed and there remains potential for sites to be located within the proposed 10 metre corridor. Should sites be identified during construction, they can be managed, and impacts mitigated, under the Historic Heritage Management Plan (refer to Section 21.4).

21.3.3 Gas field

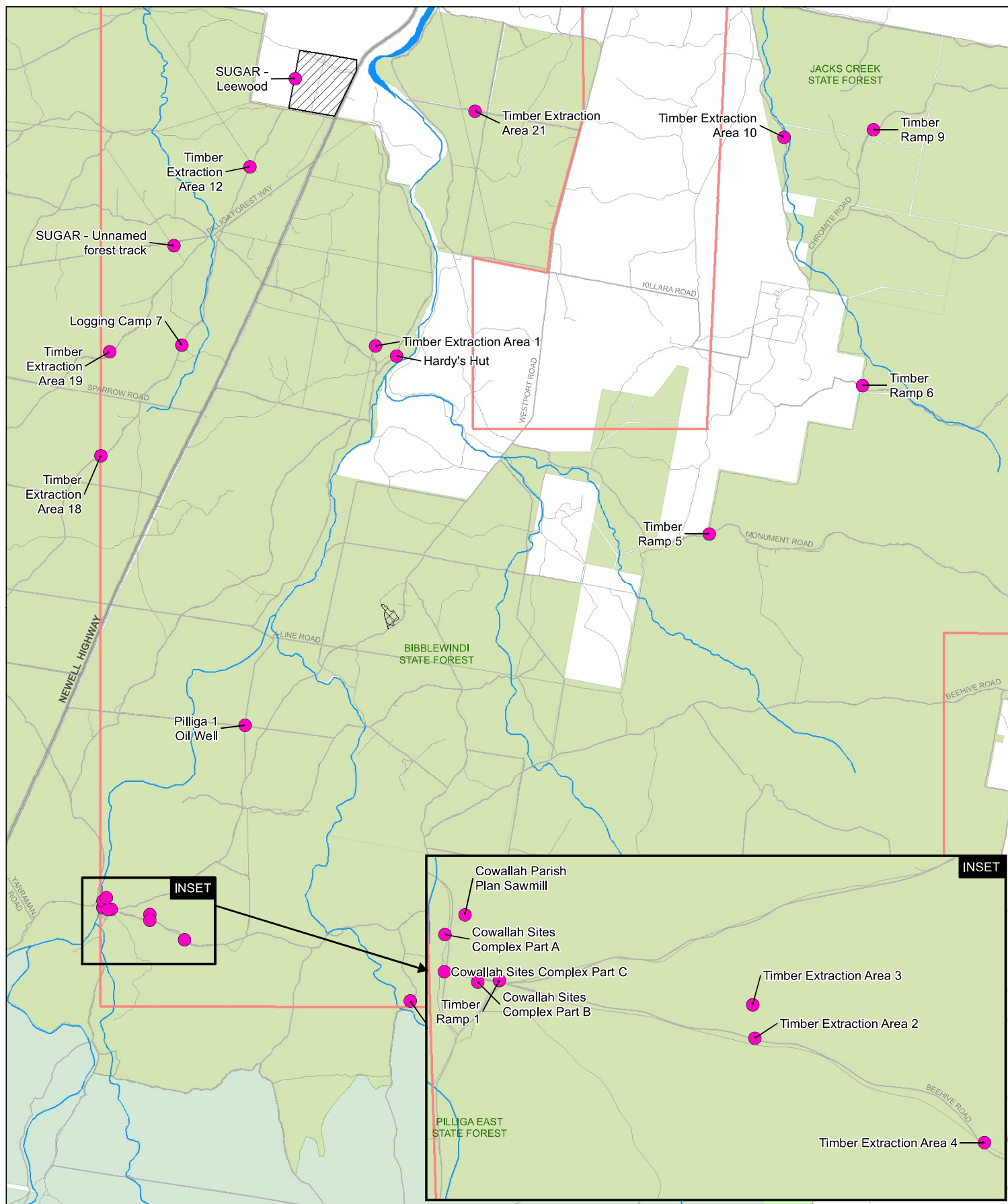
Infrastructure would be sited to avoid surface development at the following locations in order to preserve the assessed heritage significance of these sites (refer Figure 21-6):

- Cowallah Parish Plan Sawmill
- Logging camp seven
- Cowallah Sites Complex (includes Parts A, B and C)
- Hardys Hut
- Pilliga 1 Oil Well
- Sydney University Giant air-shower Recorder pits (two locations)

Infrastructure would be sited to avoid surface development at the following locations in order to preserve the Pilliga East Cultural Heritage landscape:

- Timber extraction areas 1, 2, 3, 4, 6, 10, 12, 18, 19 and 21. These specific extraction areas are nominally listed as suggested sites to avoid surface disturbance. However, due to the similarity of the timber extraction areas across the project area, if impacts were unavoidable at one of the timber extraction areas listed above, an alternate timber extraction area not listed may be substituted without impacting the heritage significance of the overall collection of timber extraction areas.
- Timber loading ramps 1, 5, 6, 9 and the ramp associated with Timber Extraction Area 19. These sites are nominally listed as suggested sites to avoid surface disturbance. However, as for the timber extraction areas, due to the similarity of the timber loading ramps across the project area, if impacts were unavoidable at a timber loading ramp site listed above, another timber loading ramp not listed may be substituted without impacting the heritage significance of the collection of timber loading ramps.

By preserving the sites suggested above as surface development exclusion areas, the project would also preserve the Pilliga East Cultural Landscape by continuing to provide a representative collection of sites that are able to demonstrate a pattern of use within the east Pilliga for logging purposes. The impacts on this Cultural Landscape would be mitigated further through the establishment and maintenance of a geographic information system (GIS) layer to record surface development exclusion areas and the implementation of a Historic Heritage Management Plan.

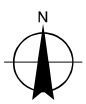


LEGEND

- Project area
- Leewood
- Bibblewindi
- Parks and reserves
- State forest
- Aboriginal areas
- Lakes and dams
- Watercourses
- Roads
- Historic heritage site (surface development exclusion zone)

0 0.5 1 2 3
Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



Narrabri Gas Project
Environmental Impact Statement

Historic heritage surface
exclusion areas

Job Number 21-22463
Revision A
Date 27 Jul 2016

Figure 21-6

N:\AU\Sydney\Projects\21\22463\GIS\Map\21_22463_2126.mxd

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NSW Department of Lands: DTDB and DCDB - 2012-13. Santos: Operational and Base Data - 2013.

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21.3.4 Other supporting infrastructure

A heritage assessment for the initial approval of the Westport workers' accommodation was completed in 2012 (RPS 2012). No historic heritage sites or material was identified within the site boundary. The extended boundary proposed for the capacity increase at Westport (see Chapter 6) was not surveyed at the time. The survey of the area would be managed under the Historic Heritage Management Plan, as discussed in Section 21.4.

21.3.5 Indirect impacts

Activities that do not result in surface disturbance at a site would not impact the heritage significance of the site. Monitoring and surveying activities (such as air, noise, water, and ecology) that do not result in disturbance to the surface of the site may be undertaken at sites without impacting the heritage significance.

Historical heritage sites have not been assessed as holding aesthetic heritage significance and, as such, views of project infrastructure would not impact on their significance. For an assessment of this nature, access was not considered necessary for the privately owned lands in the north-western portion of the project area. It is possible that some of the homesteads in that area are of aesthetic significance and may be impacted by the siting of a gas well pad within the visual catchment of the item.

The project would not result in the generation of vibrations that are likely to impact on the identified sites. Consideration should be given as to whether vibrational impacts may be relevant should sites with standing structures of heritage significance be identified in the northern portion of the project area. A vibration impact assessment was undertaken and mitigation measures are recommended for the project generally (refer to Chapter 19 - Noise and vibration).

The social, economic and cultural aspects of the Siding Spring Observatory would not be impacted by the project due its distance from the project area (it is approximately 80 kilometres south-west of the southernmost point of the project area). The project would not be visible from the observatory and therefore the associative, aesthetic significance would not be impacted. Under routine operating conditions for the project, the operation and use of the observatory (research facility and visitor centre) would not be affected by the project through sky glow or other mechanisms (refer to Chapter 23 – Landscape and visual) and therefore, the historic, rarity, representative and technical / research significance of the observatory would not be impacted.

21.4 Environmental risk assessment

An Historic Heritage Management Plan would be implemented to guide the management and protection of the historic heritage significance of sites within the project area. As a minimum, the plan would include:

- a list, plan and GIS layer showing the surface development exclusion areas
- a significance assessment and Statement of Significance for each site
- induction protocols for staff to ensure they understand their obligations under the *Heritage Act 1977*
- an unexpected finds procedure in the event that further sites are identified during micro-siting, which is likely to include:
 - adding the location of the site to the GIS layer that shows the surface development exclusion areas; the site should be coded as 'destroyed' or similar if necessary, with the location being retained within the layer in order to preserve the information for future historical research purposes
 - creation of an inventory sheet detailing the features and components of the site, including images, maps, plans as relevant and a significance assessment, where required
 - protocols for the mitigation of the sites, which might include avoidance or archival recording
- a separate procedure for the discovery of skeletal remains.

The Secretary's Environmental Assessment Requirements for the historical impact assessment require the effectiveness and reliability of the proposed management and mitigation measures to be evaluated. The management of the heritage assets within the project area during construction and operation would be undertaken through avoidance of a large number of identified sites, together with the development and implementation of an Historic Heritage Management Plan. Such management documents are commonly used as heritage management tools and their effectiveness and reliability is supported by Heritage Council of NSW. They set out management and mitigation measures relevant to the type and significance of the site.

The project would avoid impacts to sites identified for preservation through the inclusion of surface development exclusion areas in the Field Development Protocol.

As discussed in section 21.1.3, impacts were assessed using the risk assessment methodology. Table 21-12 summarises the assessment undertaken for the potential impacts of the project on historical heritage. For each identified potential impact, the assessment considered the:

- potential pre-mitigated impact, where only the potential impacts are uncontrolled
- mitigation measures that would be used to manage the potential impacts to reduce the likelihood of the potential impacts
- residual risk of the potential impact after the implementation of mitigation measures. The residual risk takes into account the potential for impact that remains after the mitigation measures are applied.

Table 21-12 Environmental risk assessment

Potential Impact	Phase	Pre mitigated impact			Mitigation and management measures	Residual risk		
		Likelihood	Consequence	Risk		Likelihood	Consequence	Risk
Disturbance of identified historic heritage site	Construction	Unlikely	Moderate	Medium	A Historic Heritage Management Plan will be implemented. Infrastructure will be sited in accordance with the Field Development Protocol to avoid or minimise potential impacts.	Remote	Moderate	Low
	Operation	Remote	Moderate	Low		Remote	Moderate	Low
	Decommissioning	Remote	Moderate	Low		Remote	Moderate	Low
Disturbance of unknown historic heritage site	Construction	Possible	Moderate	Medium	A Historic Heritage Management Plan will be implemented.	Unlikely	Moderate	Medium
	Operation	Remote	Moderate	Low		Remote	Moderate	Low
	Decommissioning	Remote	Moderate	Low		Remote	Moderate	Low
Impact to Pilliga East Logging Cultural Landscape	Construction	Unlikely	Moderate	Medium	A Historic Heritage Management Plan will be implemented. Infrastructure will be sited in accordance with the Field Development Protocol to avoid or minimise potential impacts.	Remote	Moderate	Low
	Operation	Remote	Moderate	Low		Remote	Moderate	Low
	Decommissioning	Remote	Moderate	Low		Remote	Moderate	Low

21.5 Conclusion

A total of 53 sites of heritage potential were identified in the project area, of which eight sites were identified as having heritage significance in their own right.

Activities that do not result in surface disturbance at a site would not impact the heritage significance of the site. No direct impacts were identified as arising from the location of the major facilities proposed at Leewood, Bibblewindi, the proposed infrastructure corridors, or Westport.

Through the implementation of the Field Development Protocol, the proponent has committed to avoiding impacts on all 21 sites that were identified as having collective heritage significance, which includes the eight sites that were identified as having heritage significance in their own right (refer to Section 21.3.3). As a collection of sites, the historic timber industry sites form the Pilliga East Logging Cultural Landscape. This avoidance will ensure that the heritage significance of these sites is not affected. By avoiding these sites, the heritage value of the Pilliga East Cultural Landscape would be also preserved. To manage residual risks (Table 21-13) in regards to historic heritage within the project, a Historic Heritage Management Plan would also be developed and used in conjunction with the Field Development Protocol.

Table 21-13 Historic heritage residual risks

Potential Impact	Construction	Operations	Decommissioning
Disturbance of identified historic heritage site	Low	Low	Low
Disturbance of unknown historic heritage site	Medium	Low	Low
Impact to Pilliga East Logging Cultural Landscape	Low	Low	Low