Australia Pacific LNG Project

Volume 2: Gas Fields

Chapter 7: Landscape and Visual Amenity

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7. Landscape and visual amenity

7.1 Introduction

7.1.1 Purpose

The visual assessment outlined in this chapter considers the potential landscape and visual impacts associated with the proposed development of the coal seam gas (CSG) fields (the gas fields) and associated infrastructure as part of the Australia Pacific LNG Project (the Project).

The assessment evaluated the existing condition and values of the landscape within the study area and the potential visual effects of the proposed construction and operation of the gas fields. Visual sensitivity was considered in terms of general land uses and separation distances of potential sensitive receptors, notably residences. An assessment of visual sensitivity and effect formed the basis for predicting levels of visual impact and developing suitable mitigation measures.

Australia Pacific LNG has a strong commitment to sustainability and has developed a set of 12 sustainability principles that will be applied across all phases of the Project. Sustainability principles which relate to landscape and visual amenity include:

- Minimising adverse environmental impacts and enhancing environmental benefits associated with Australia Pacific LNG's activities, products or services; conserving, protecting, and enhancing where the opportunity exists, the biodiversity values and water resources in its operational areas
- Respecting the rights, interests and diverse cultures of the communities in which Australia Pacific LNG operates
- Identifying, assessing, managing, monitoring and reviewing risks to Australia Pacific LNG's workforce, its property, the environment and the communities affected by its activities.

The landscape and visual assessment was conducted by Integral, landscape architecture and visual planning, and their full report is presented in Volume 5 Attachment 12.

7.1.2 Scope of work

The assessment of potential impacts on landscape character and the visual environment included:

- A baseline study of the study area and its local and regional context
- An examination of the potential impact on the landscape and visual amenity of the study area from the proposed gas fields
- A field assessment of existing gas fields and sensitive receptors within the study area
- Development of mitigation measures considered necessary to mitigate potentially adverse visual impacts.

7.2 Methodology

To assess the visual significance and magnitude of the proposed gas fields on the landscape, a baseline study was completed to record and analyse the existing character, quality and sensitivity of the landscape and any significant visual features within the study area.

A phased assessment approach was undertaken as follows:

- **Stage 1:** A desktop review of relevant background reports, other data and mapped information to determine topography, land-use, landscape and settlement patterns. This allowed the landscape to be divided into landscape character zones for further field investigation
- **Stage 2:** A field survey was undertaken, and photographic records obtained, to assess the visual character of existing CSG activities in the Fairview and Spring Gully gas fields, and the visual impacts these activities have on the landscape. Given that this existing infrastructure is of a similar character to the proposed gas fields project, this survey provided a basis for assessing potential impacts of Australia Pacific LNG's proposed development within the Walloons gas fields. Further field studies were undertaken to assess the existing landscape character in the gas fields, focusing on viewpoints from public roads
- **Stage 3:** The landscape was divided into 'landscape character zones' and 'visual character units'. The extent of the landscape character zones have been defined by the boundaries of the proposed development areas within the gas fields, together with consideration of land use patterns, topography and vegetation types. The visual character units have been defined by the topography and vegetation which create a particular visual character within each unit
- **Stage 4:** Visual assessment of the effects of the proposed gas fields on the existing character of the study area was completed in two steps. First, the visual impact of both the construction and operational phases, measuring both 'visual effect' and 'visual sensitivity' were assessed to determine the overall visual impact. Secondly, strategies were developed to mitigate the identified impacts.

The visual effects have been determined by measuring the contrast and integration of the components of the proposed gas fields within the existing landscape. The colour, shape and form of these components and the topography, vegetation and surrounding landscape features all influence the degree of visual effect. The proportion of a view that includes the components of the proposed gas fields will also influence the level of visual effect.

The visual sensitivity has been determined by assessing the views (or sensitive receptors) from which the components of the proposed gas fields would be seen. For the purposes of the landscape and visual assessment, a sensitive receptor was defined as a view from residences or work, public places, major roads and townships that are within the line-of-sight of the Project. There are three levels of sensitivity:

- Low visual sensitivity – components are visible from rural lands and minor roads but may be partially obscured.
- Moderate visual sensitivity – components are visible from main roads and infrequently accessed state forests and national parks.
- High visual sensitivity – components are visible from urban and rural residences, recreational areas and highways.

Once the visual effect and visual sensitivity of each component of the proposed gas fields had been identified, the overall visual impact of each component was determined using the matrix shown in Table 7.1.

Table 7.1 Visual impact matrix

Visual effect	Visual sensitivity		
	High	**Moderate**	**Low**
High	High visual impact	High/moderate visual impact	Moderate/low visual impact
Moderate	High/moderate visual impact	Moderate visual impact	Moderate/low visual impact
Low	Moderate/low visual impact	Moderate/low visual impact	Low visual impact

Mitigation strategies have subsequently been developed to reduce the visual effect and/or visual sensitivity to reduce the overall visual impact of the proposed gas fields.

7.3 Existing environment

7.3.1 Regional context

The broader regional landscape is characterised by gently undulating rural lands broken by localised forest covered ranges and mountains. These features provide visual variety to the landscape, with a mosaic of agricultural crops and pastures throughout the region. Networks of tracks, both sealed and gravel public roads, provide access to residences distributed throughout the area. Many road reserves throughout the study area frequently include roadside vegetation, often remnant, which provides visual screening to distant landscapes. Townships and rural settlements are dispersed throughout this landscape. Although the regional landscape is dominated by agricultural land uses, well-vegetated areas of closed and open forest are present throughout, particularly within state forest areas. Other common structures in the landscape include water tanks, sheds, silos and stockyards.

7.3.2 Local context

The existing visual character of the gas fields' development area reflects the general character of the broader region. Like the region, visual character in this area varies due to differences in the land use, topography and vegetation cover, creating a range of unique visual settings.

The terrain ranges from moderately flat with broad, gently sloping hills to forest covered ranges with elevations up to 450m above the surrounding landscape where the study area intersects the Great Dividing Range. A high proportion of the study area is open, exposed landscape with scattered pockets of remnant woodland often along creek and drainage lines, managed farmland, and large residences and townships, all of which combine to contribute positively to the rural setting of the area.

Grazing on native and improved pasture is the dominant agricultural activity in the Western Downs region. Historical land use patterns within the study area have resulted in significant clearing of native vegetation, which has opened up mid and long distance views. As such, some rural residences within these agricultural areas will have views of the proposed gas fields and some development components that are proposed within cropping and grazing land.

A network of existing major and minor public roads pass through the study area, from which many components of the proposed gas fields will be able to be viewed. There are three major roads dissecting the gas fields:

- Warrego Highway, which provides the main east-west route from Brisbane to Charleville, passing through Dalby, Miles, Chinchilla and Wallumbilla, as well as a number of smaller communities
- Leichhardt Highway, which runs north-south near the north-east of the tenements passing through Miles, Wandoan and Taroom
- Kogan-Condamine Road, running east-west passing through the southern gas fields from Kogan to Condamine.

Several smaller townships are also situated along these major roads and within the proposed gas fields' development area.

The study area includes the Gurulmundi State Forest (north of Miles), Yuleba State Forest (bordering the west portion along the Warrego Highway) and the Kumbarilla and Boondandilla State Forests to the south. The southern section of the proposed gas fields borders the Wondul Range National Park, south-west of Millmerran.

The Condamine River and Moonie River are regional rivers which traverse the study area.

7.3.3 Landscape character zones

The landscape character of the gas fields has been assessed in terms of three landscape character zones (LCZ), determined on the basis of geographical location and the boundaries of the proposed gas fields' development areas. Views across these areas from public places and roads were analysed within the three landscape zones – Roma, Chinchilla and Dalby gas fields.

The Roma gas fields comprise Combabula, Ramyard, Wolleebee and Carinya as shown on Figure 7.1. The area is predominantly flat to undulating with the central region becoming hilly through the Great Dividing Range. The LCZ is predominantly agricultural and open grassland with rural residences located throughout.

The Chinchilla gas fields encompass Condabri, Talinga, Orana, Dalwogan and Kainama as shown on Figure 7.1. The Condamine River runs east to west through the zone with agriculture being the dominant land use.

The Dalby gas fields contain the Gilbert Gully field, which is located east of Moonie as shown in Figure 7.1. The zone is predominantly undulating, consisting of approximately 60% state forest, with portions of agricultural and open grassland.

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Mundell State Forest
Mount Organ State Forest
Cooaga State Forest
Quandong State Forest
Cherwondah State Forest
Woodduck State Forest
Combabula State Forest
Yuleba State Forest
Condamine State Forest
Braemar State Forest
Kumbarilla State Forest
Lake Broadwater Conservation Park
Western Creek State Forest
Boondandilla State Forest
Bulli State Forest

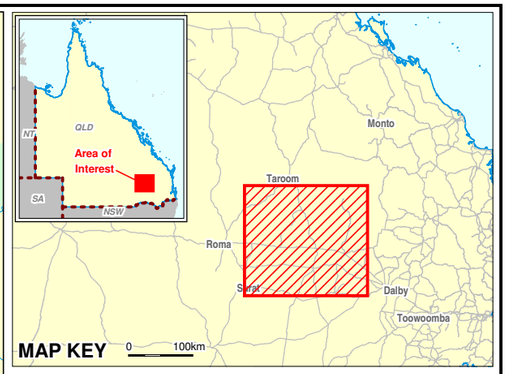
Wandoan
Miles
Chinchilla
Tara

B2 C2 D2 A1 B2 A1 D2 B2 C2 D2 B2 A1 B2 D2 B2 A1 C1 D2 C1 B1 B2 D1 D1 A1 D2 D1 A1 A1 C2 C2 D1 D1 C1

INSET ONE
B2 D3 A1 D2 A1 A1 D2
0 10km

SEE INSET ONE

0 10 20km
SCALE - 1 : 600,000 (at A3)
Latitude/Longitude
Geocentric Datum of Australia 1994
N



LEGEND

- Major towns
- Road
- Railway
- Major watercourses

Walloons Gas Fields Development Areas

- Talinga / Orana
- Dalwogan
- Kainama
- Gilbert Gully
- Combabula / Ramyard
- Woleebee
- Carinya
- Condabri

Protected Areas

- Conservation park
- Forest reserve
- National park recovery
- National park
- National park scientific
- Resources reserve
- State forest
- Timber reserve

Landscape Character Zones

- Landscape character unit
- A1 **Agricultural Land - typically flat**
- B2 **Open Grassland - undulating**
- C1 **Woodland - flat**
- C2 **Woodland - undulating**
- D1 **Enclosed Forest - flat**
- D2 **Enclosed Forest and State Forest - undulating**
- D3 **Enclosed Forest and State Forest - hilly / steep**

Source Information

Cadastre and Easements
Department of Natural Resources and Water, Queensland 2009

Protected Areas (Queensland_estates)
Environmental Protection Agency 2009

Landscape Character Zones
Integral Lanscape Architecture and Visual Planning (12/01/2010)

AUSTRALIA PACIFIC LNG PROJECT

Volume 2 Chapter 7
Figure 7.1 Landscape character zones - gas fields

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Within the three LCZs, four distinctive visual character units have been identified, each containing a consistent landscape character in terms of topography, vegetation and land use. The ability of an area to screen, or visually integrate, visual impact is referred to as 'visual absorption capacity'. In general, areas of flat terrain have low visual absorption capacity; however, remnant vegetation provides some limited screening.

The four visual character units applicable to the proposed gas fields' development area are:

- Agricultural land: exposed and open land from agricultural practices including crops and cattle grazing. Some remnant vegetation exists along drainage lines and road reserves (refer to Figure 7.2). Due to the large-scale agricultural practices and minimal vegetation cover, the visual absorption capacity is low
- Open grassland: flat and gently undulating land predominantly covered with long grasses and scattered with remnant trees (refer to Figure 7.3). The visual absorption capacity is classified as low to moderate
- Woodland: gently sloping and level topography with semi-enclosed forest interspersed with grassland and scrub (refer to Figure 7.4). The forests provide a visual barrier resulting in a moderate to high visual absorption capacity
- Enclosed forest: flat to moderately hilly dominated by forests with grass and scrubby understorey (refer to Figure 7.5). Accordingly, the visual absorption capacity is high.

Figure 7.2 Agricultural land

Figure 7.3 Open grassland

Figure 7.4 Woodland

Figure 7.5 Enclosed forest

7.4 Potential impacts

The visual character of the proposed gas fields is created by the various components of the proposed works. From a visual perspective, the gas fields will cause a range of major and minor visual intrusions on the landscape, each of which is discussed below.

The visual impacts of all components of the proposed gas fields are dependent on potential views from sensitive receptors such as residences and highways. Of these, views from residences are considered most significant, especially in relation to the local siting of gas wells.

7.4.1 Visual effects

Gas wells

The greatest visual effect created by the gas wells is the gas well pad and associated batters by virtue of the disturbed area created (Figure 7.6).

The gas well itself is much smaller than the pad and earthworks upon which it is sited. This component is industrial in character and contrasts with the surrounding rural setting. However, it is small in scale, representing a very small portion of the primary view zone and an even smaller part of the total view, and is therefore attributed a low visual effect status (Figure 7.7).

Establishment of the gas well will result in an increase in vehicle movements on rural roads that normally would support few vehicle movements a day. However the visual effect of this is not considered significant.

There will be night lighting effects during construction of the gas wells. During construction, a phase that can last two to four days, night lighting of construction areas is bright and intense to allow for safe night working conditions. The visual effect of this would be high if direct line of sight is available. Indirect lighting effects could include a glow of soft light in the dark night sky, low to the screening element such as a ridge or treetops. This would only create a low visual effect.

The evaluation of a gas fields as part of the view zone (Volume 5 Attachment 12 Section 4.3.3) illustrates that low to very low visual effects are achieved beyond the closest gas well, and that the visual effect of a field is best determined by reference to the visual effect of the closest well. Even if one well was within 100m of a residence, and therefore four wells were in the critical view zone of the residence given typical spacing patterns, collectively these wells would still only occupy less than 0.25% of the primary view zone.

By definition, a project component is considered to have high visual effect if it occupies more than 0.25% of the primary view shed and the form, shape, line, colour or scale of the component strongly contrasts with the existing landscape.

Figure 7.6 Typical gas well pad – recently constructed

Figure 7.7 Rehabilitated well head from 200m

Gas processing facilities

The gas processing facility (GPF) is an industrial component that could create a strong contrast to the visual shape, form, colour and line values of the surrounding rural landscape (refer to Figure 7.8).

GPFs could result in a large form and shape, with a significant horizontal scale and less significant vertical scale.

GPF establishment

In the first instance, it is necessary to remove vegetation and topsoil, subsoil and potentially rock stratum to create a platform for the GPF (1x0.5km). This has the potential to create a temporary colour contrast with the surrounding landscape. Pad areas normally have surface areas of gravel or are left as bare earth for fire safety reasons.

GPF operation

GPFs would typically be light in colour, creating higher colour contrast with the landscape. The fact that the GPF must be on one pad ensures that the development sits well into the landscape. Components, such as GPF water containment structures will have a negligible visual effect due to the limited vertical projection into the visual view shed. Where practicable, they will be located away from sensitive receptors such as residences, major roads and townships. They will generally be located low in the landscape. Skyline effects will therefore be limited, with topography providing some visual integration, reducing the overall visual effect.

As with gas wells, but on a much larger scale, GPFs may have a different visual effect depending on where the facility is located. For instance, the placement of a GPF within a forest will provide good visual screening while creating a greater visual effect due to tree clearing. In woodland, tree clearing would be less than for forested areas, but the visual effect would be low. Given a distance of around 500m, good visual screening and integration would be achieved. However, any benefits (from a visual perspective) associated with siting GPFs in wooded areas would be considered within the broader sustainability context of the gas fields, being to minimise vegetation removal and conserve habitat. In addition, the use of locations within forested or woodland areas is likely to be constrained by safety considerations. Grassland would have a lower screening capability, but the folds of topography and scattered vegetation can provide moderate screening and integration capacities. The steeper the topography, the greater the initial visual effect is likely to be, due to the need to establish an extensive pad. However, upon establishment, the buildings and facilities will integrate with the landscape more than on flat land.

Night lighting

Once established, GPFs will be predominantly lit to allow for safe pedestrian circulation around the site only (refer to Figure 7.9). High intensity lighting will not be required at night, except when required to carry out an emergency maintenance or repair task.

However, some direct light will be created from the plant flare, which is operated primarily as a field safety measure. The amount of gas flared is dependent upon how efficiently the GPF is operating. Flaring is greater when the gas supply from the field exceeds the processing and transmission capabilities of the GPF. The stronger yellow light apparent in Figure 7.9 illustrates the occasional gas flare that is experienced periodically and does not represent a typical night lighting situation.

Figure 7.8 Gas processing facility

Figure 7.9 Gas processing facility at night

Water treatment facilities

Although covering a sizeable land area (significant horizontal dimension) (refer to Figure 7.10), the water treatment facility (WTF) ponds have limited vertical dimension (refer to Figure 7.11). Consequently, they are not likely to project significantly into the visual view shed of the proposed gas fields. The ponds are therefore not visually significant. However, associated facilities such as buildings have a vertical dimension creating visual change in form, shape, line and colour in the landscape, and therefore may have a stronger visual effect. The visual effect is considered to be moderate up to 0.5km, and low when viewed from distances greater than 1km.

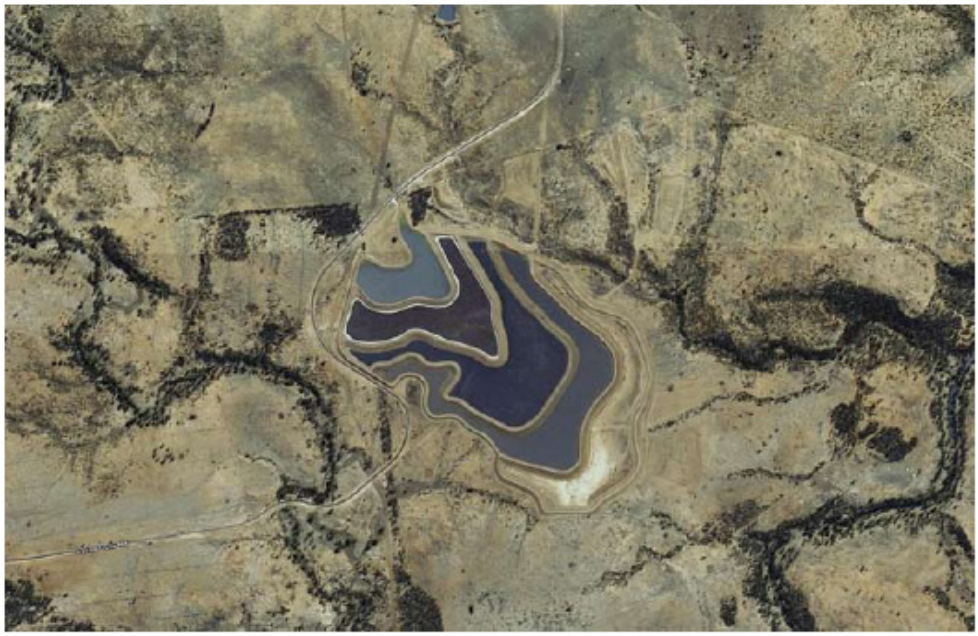

Figure 7.10 Typical water treatment facility – aerial view

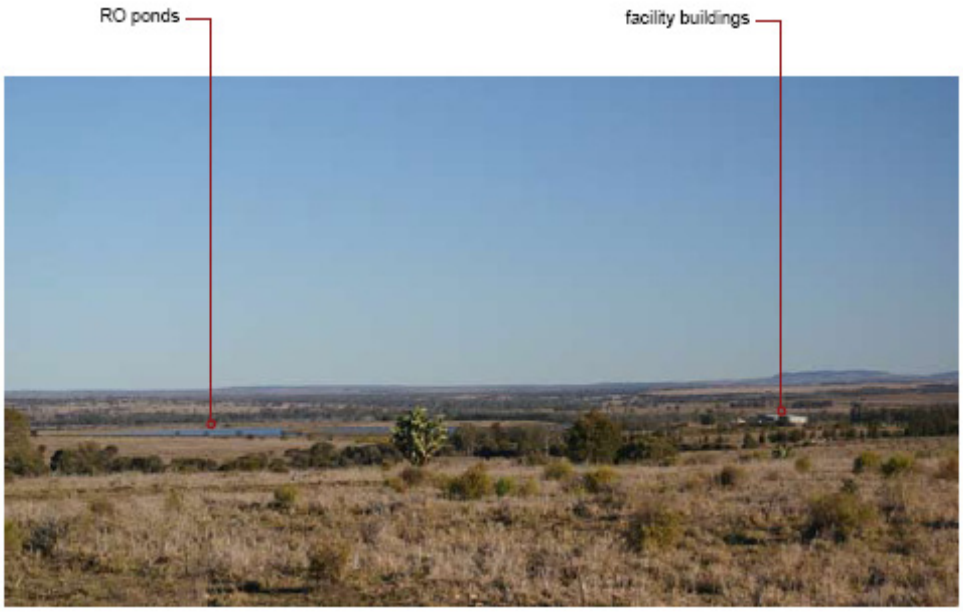

Figure 7.11 Water treatment facility

Accommodation facilities

The proposed accommodation facilities are expected to be a cluster of single storey buildings. Initially, there would be strong contrast due to the shape and grouping of buildings within the existing landscape. However, low building heights and the tight clustering of buildings will assist in minimising the scale of building mass and bulk, and help integrate these structures with the existing landscape (refer to Figure 7.12). Temporary accommodation facilities will be placed, where practicable, in areas that require minimal earthworks.

Figure 7.12 Accommodation facilities

Microwave towers

Nine 50m high microwave communication towers are proposed as part of the gas fields. These will include two towers in the Combabula/Ramyard gas fields, one each in the Woleebee and Dalwogan gas fields, two in the Talinga/Orana gas fields, one between the Kainama and Gilbert Gully gas fields and two to the east of the Gilbert Gully gas fields.

Removal of vegetation and topsoil, and the cut and fill batters required to create a level pad (70mx70m) for the tower and components, will create a colour contrast with the adjoining undisturbed landscape.

The microwave towers create a simple, vertical element in the landscape with a strong linear form that supports one or more microwave dishes (refer to Figure 7.13). Dependent on sun and cloud cover conditions, the materials used to construct the towers could be highly reflective when new, causing strong visual contrast between the towers and the background landscape. This contrast will soften as the galvanised steel weathers.

The visual effect of the microwave tower will, for the greater part, be created by the contrast of the mast and, to a lesser extent, the microwave dishes attached to the poles against the landscape. Therefore, the visual effect created by the contrast of line and shape of the tower against the low rolling hills on which they are placed will remain.

The visual effect of a tower with microwave dishes would be high up to a distance of approximately 200m. Beyond this, the visual effect of the guy wires would be minimised and only the pole and dish would be visible. Therefore, the visual effect of towers beyond 200m is low as they become a minor element in the landscape.

Figure 7.13 Microwave tower

Gas and water gathering network, including main line valves

The visual effect of the gas and water gathering network that connect to the gas processing facilities, will only be high during the construction phase as the pipelines will be buried (refer to Figure 7.14). As with other components of the gas fields, the removal of vegetation and topsoil will create a perceivable contrast to the colour and textural values of the surrounding landscape.

This visual effect will be greater at locations that look down over the construction works as they provide longer views of easements than flatter locations. Valves will generally only be visible from local roads and residences and will have low visual significance, appearing similar to farm infrastructure (refer to Figure 7.15).

Figure 7.14 Typical gas and water gathering network – construction

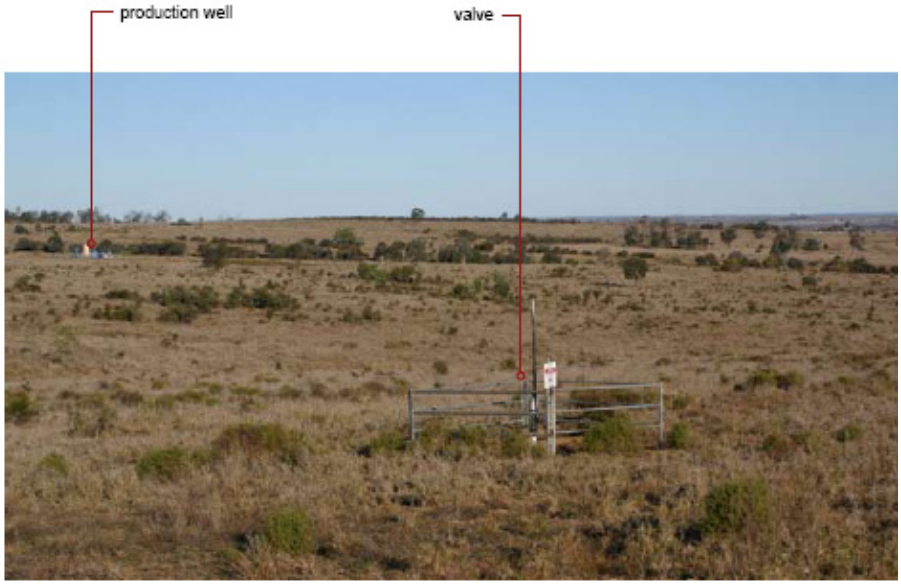

Figure 7.15 Typical gas and water gathering network

Water transfer stations

The visual significance and effect of the water transfer stations will be similar to that of WTFs, but at a much reduced scale because of the smaller surface areas involved.

Access roads

Vegetation clearing and earth works associated with access roads will create colour contrast within the existing landscape. Although the road network will be a visual element in the landscape, it is generally not considered visually significant due to its narrow horizontal dimension and lack of vertical projection (refer to Figure 7.16). However, its visual effect can greatly increase if the alignment is straight for significant distances parallel to critical view lines.

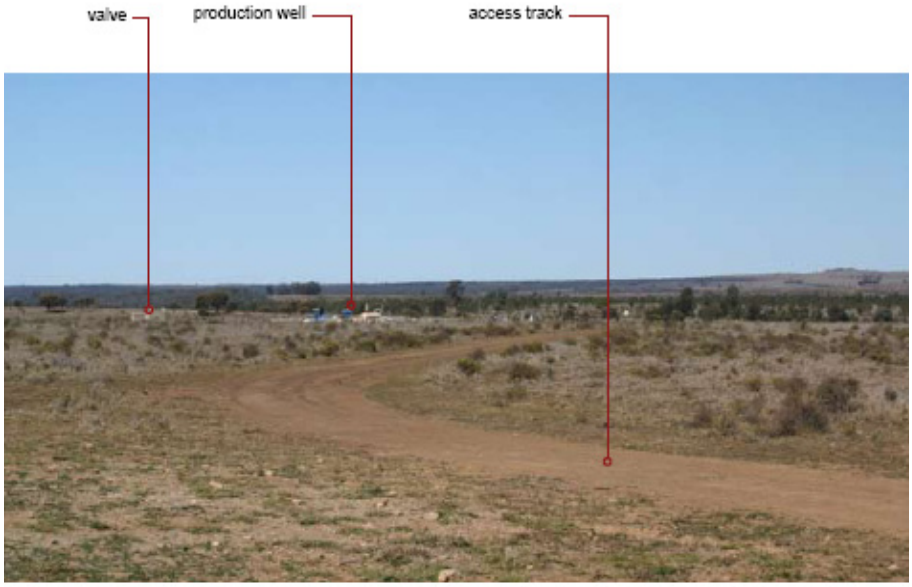

Figure 7.16 Typical access track

Storage and lay-down areas

The visual effect of short-term storage and lay-down areas will be high during the construction and operational phase. However, once the facilities have been installed in a particular section, rehabilitation will reduce the visual effect in the longer term (refer to Figure 7.17). The timeframe for construction and operational phases is not likely to extend beyond eight weeks in any one location.

The visual significance of long-term storage and lay-down areas, however, will be dependent on location. If these areas are adjacent to other infrastructure, such as GPFs, the visual effect will be minimal as there will be potential for visual absorption by the other infrastructure.

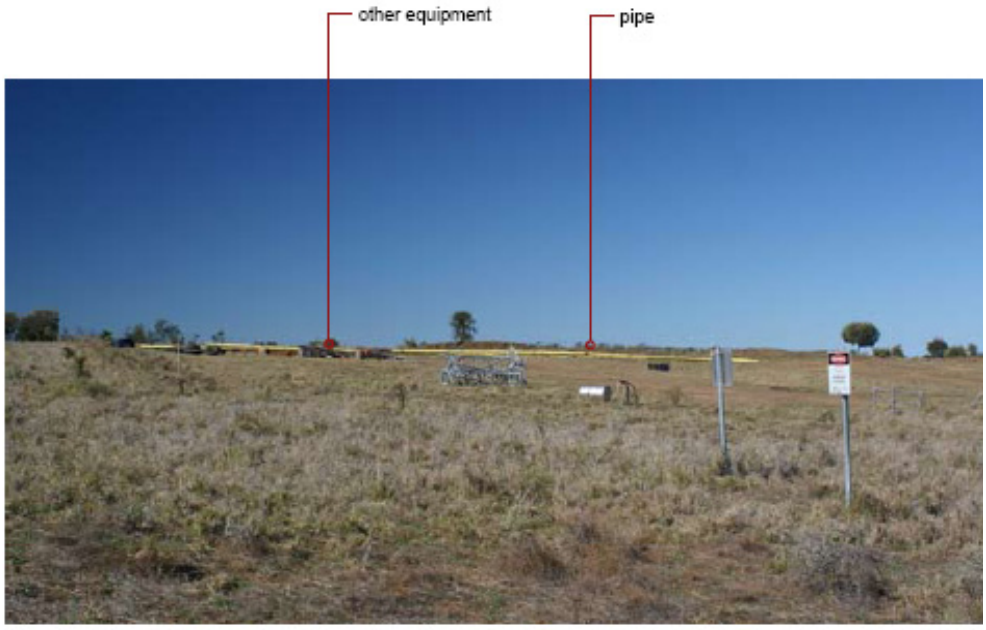

Figure 7.17 Storage and lay-down area

Summary of visual effect levels

The identified visual effect levels (e.g. low, moderate and high) and associated setback distances are based on assessments of both quantitative and qualitative factors. For example, a project component is considered to have a high visual effect if it occupies more than 0.25% of the primary view shed and the form, shape, line, colour or scale of the component strongly contrasts with the existing landscape. A project component is considered to have a low visual effect if it occupies less than 1% of the primary view shed and there is minimal contrast with the existing setting in terms of form, shape, line, colour and scale.

For example, in terms of sensitivity, a particular house will have a high sensitivity if the nearest visible project component is less than 2.5km away. It would have a low sensitivity if the nearest visible project component is more than 12.5km away. A summary of the visual effect levels for each infrastructure type are presented below in Table 7.2.

Table 7.2 Summary of visual effect levels

Gas field component	High visual effect *	Low visual effect	Comment
Gas wells	Up to 100m	Greater than 300m	Referenced distances relate to views from sensitive receptors, particularly houses and locations on tourist highways.
Gas processing facility	Up to 500m	Greater than 1500m	
Water treatment pond	Up to 200m	Greater than 400m	
Water treatment facility	Up to 400m	Greater than 1000m	
Water transfer stations	Up to 400m	Greater than 1000m	
Accommodation facilities	Up to 400m	Greater than 800m	
Microwave towers	Up to 200m	Greater than 200m	
Gas and water gathering networks including valves	N/A	N/A	Low visual significance due to underground nature and resemblance of aboveground values with farm infrastructure.
Access roads	N/A	N/A	Low visual significance due to resemblance to existing local roads.
Storage and lay-down areas	N/A	N/A	Low visual significance due to absorption into view of other gas field structures.

*Without mitigation, such as using existing or planted vegetation to screen the view

7.4.2 Visibility and sensitivity

All parts of the proposed gas fields and some adjacent areas have been assigned a visual sensitivity rating based on what locations those areas are viewed from. Three levels of visual sensitivity (low, moderate and high) have been applied to views of gas fields components, as discussed in Section 7.2.

Landscape Character Zone 1 – Roma gas fields

There are extensive open views across grassland and agricultural land for a large portion of the Roma gas fields. However, some screening is created by woodland, forested areas and roadside vegetation. Significantly, the large and relatively flat crop and grassland areas adjacent to the Warrego Highway are more difficult to visually screen.

Residences (including rural, village and town homes)

The visual sensitivity of residences depends on visibility to the various gas fields components. Visual amenity is a functional component of the enjoyment of a view from recreational and relaxation areas in and around a home. If gas fields infrastructure is seen from such areas, a high visual sensitivity has been ascribed up to a distance of 2.5km, beyond which a moderate sensitivity rating is assigned.

Visibility depends on the position of residences in the landscape, with residences on hills having the greatest potential for long views. Other residences have an inward view towards garden elements, or

a combination of both with limited views to areas external to the residence's garden in one or more directions.

It will not be possible to keep all components of the proposed gas fields' development outside the viewshed of all residences. Rather, it is important to attempt to keep larger scale components, such as GPFs and WTFs, out of the primary view areas of residences and taking account of such views when selecting sites for smaller components, such as gas wells. Potential impacts need to be considered in relation to each residence to minimise interaction with the most sensitive view zones.

Mitigation measures to minimise visual impacts on sensitive receptors are outlined in Section 7.5.

Designated state forests

These areas are generally production forests, rather than recreation forests, with the broad-acre and work roads through them having a low sensitivity.

Designated tourist roads and highways

The major corridors include the Warrego Highway which runs east-west through Dalby, Miles and Roma and the Leichardt Highway that runs south to north from Condamine through Miles, Wandoan and Taroom. These travel routes have state and regional significance. Their sensitivity ratings range from high (for the immediate foreground up to 500m) to moderate (beyond 500m).

Other main roads

In terms of community values, these roads retain a moderate visual sensitivity to visual change in foreground areas. The only road in this category is the Jackson to Wandoan road, which has been assigned a moderate sensitivity up to 500m and low beyond that.

Local roads

There are numerous local roads in all landscape zones. Dulacca North Road, Yuleba Taroom Road and Wallumbulla North Road are the main north-south local roads. East-west linkage is provided by Cattle Creek Road and Myranga, Homebush, Mantovas roads and Clarks and Crossroads roads, with numerous minor roads providing links between them. These local roads will have moderate sensitivity in the immediate foreground up to 200m, beyond which sensitivity will be low.

Broad-acre land uses

Broad-acre land uses are common and would generally have a low sensitivity to gas fields components. This includes minor roads that service properties within the landscape zone.

Landscape Character Zone 2 – Chinchilla gas fields

The Chinchilla gas fields comprise the Condabri, Talinga/Orana, Dalwogan and Kainama gas fields which are located from Miles to Chinchilla, predominantly south of the Warrego Highway.

Although similar to the Roma gas fields in that this zone consists of large areas of agricultural land use, the Condamine River and its associated floodplain differentiate this zone.

The Condamine River runs east-west through the central portion of the gas fields with a wide belt of cleared agricultural plantings to the north and south, creating a distinctive patchwork pattern of improved pasture and cropping fields. Unlike the Roma Landscape Zone, this zone contains few treed areas, allowing extensive views from residences and roads in and around the zone.

Forest areas are restricted to small areas around Miles, small sections of the Condamine State Forest within the Condabri Field and forest areas south of the Kogan Condamine Road in the Orana Field. Views in these areas would be more restrictive as they would be screened by forest.

Settlement in this zone reflects the large rural holdings and is scattered throughout, with the towns of Miles and Chinchilla at the north-west and north-east of the fields.

Residences (including rural, village and town homes)

A feature of this zone is the increased density of rural residences, reflecting the more intense farming that can be supported along the floodplain of the Condamine River. The flat terrain and cropping lands of the floodplain also create opportunities for long, open views to gas fields components. In the absence of any screening, residences have been assigned a high sensitivity of up to 2.5km, beyond which a moderate sensitivity rating is applied. Due to the topography and openness of much of the zone and the relatively dense spread of residences, much of this zone could have a high sensitivity, noting that high sensitivity applies if the nearest visible project component is less than 2.5km away.

Designated state forests

Only a small portion of Condamine State Forest is within the Condabri Field. This area would generally have low sensitivity because enclosed forests do not usually support sensitive land uses – which, in this context, essentially means they are not occupied by people. They have the potential to act as a visual barrier to views of project components from public roads or residences.

Designated tourist roads and highways

The major travel corridors include the Warrego Highway that runs east-west through the northern part of the Condabri and Talinga fields. Running south from Miles is the Leichardt Highway. Both of these highways have open views across crop lands and grasslands with only small parts of the highway near Miles within forest areas. The Western Railway Line also runs parallel to the highway from Chinchilla to Miles and will similarly have open views to the gas fields where it crosses the Condabri and Talinga Fields. These travel corridors would have a high to moderate rating, with immediate foreground areas up to 500m having a high sensitivity with moderate sensitivities beyond that.

Other main roads

In terms of community values, these roads retain a moderate visual sensitivity to visual changes within foreground areas. There are two regional roads in this location comprising the Kogan Condamine Road running east-west parallel and south of the Warrego Highway, and the Chinchilla Tara Road. These roads have been assigned a moderate sensitivity up to 500m and low beyond that.

Local roads

Between the Warrego Highway and Kogan Condamine Road, the Greenswamp/Fairymeadow Road is the main east-west road. Other roads with numerous smaller roads feeding from them include the Goonbri Fairymeadow, Freemans and Old Canaby Road, with a greater density of local roads in the north-west corner of the zone. These roads will have a moderate sensitivity in the immediate foreground up to 200m, beyond which sensitivity will be low.

Broad-acre land uses

Broad-acre land use in this zone is dominated by improved pastures along the floodplains of the Condamine River. Areas adjoining in the vicinity of Miles and in southern parts of the zone are

dominated by forests and wooded areas. All of these areas will have a low sensitivity, with forest cover limiting the extent of visibility.

Landscape Character Zone 3 – Dalby gas fields

The Dalby gas fields comprise the Gilbert Gully field which is generally located between the Moonie Highway and the Gore Highway west of Millmerran. Unlike the other landscape character zones, this zone is dominated by forested areas. There are some cleared areas in the central western part of the zone and in the south-western area adjacent to the Gore Highway.

The topography throughout is predominantly undulating with a small portion of typically flat agricultural land. Elevations range from approximately 300m near a tributary of the Weir River along the western field boundary, to 430m in the Western Creek State Forest to the south.

The topography and forest cover will limit long distance views within the zone and will also limit sensitivity levels.

Residences (including rural, village and town homes)

Residences in this zone are generally limited to open areas adjacent to Cattle Creek /Weir River Road, Cecil Plains Moonie Road and Dunmore Road and various roads of the Gore Highway. There are some houses in forest areas where forest is in freehold tenure and views from these homes would be limited. However, in general, houses in this zone retain a high visual sensitivity to project components up to 2.5km, beyond which a moderate sensitivity rating is appropriate given the scale of gas field components. Overall, this area would have low sensitivity due to the relatively low number of residences and noting that a particular house will have a high sensitivity if the nearest visible project component is less than 2.5km away and it would have a low sensitivity if the nearest visible project component is more than 12.5km away.

Designated tourist roads and highways

The major travel corridor in the Dalby Landscape Zone is the Gore Highway from Millmerran to Goondiwindi. Generally, within the vicinity of the gas fields, the highway is in forested lands that would potentially limit views. However, in the vicinity of the Condamine cropping lands, the highway is in open country, but this section has limited connection with the proposed gas fields. Travel corridors within this zone would generally have a high to moderate rating, with immediate foreground areas up to 500m having a high sensitivity with moderate sensitivities beyond that. Visibility would be very limited, enabling forest edges to screen gas fields' components.

Other main roads

There are no main roads in this zone that would have visual connection with the proposed gas fields.

Local roads

The main local roads are Cattle Creek/Weir River Road, Cecil Plains Moonie Road and Dunmore Road in the central western part of the zone and various roads of the Gore Highway in the south-western part of the zone. These roads will have a moderate sensitivity in the immediate foreground up to 200m, beyond which sensitivity will be low. Views would be moderately open in undulating character of sections of the road that are in grassland and restricted in forest areas.

Broad-acre land uses

As this zone is dominated by state forest and forests on private lands, there is limited grazing. Some improved pastures are evident in cleared lands within the zone. All of these areas will have a low sensitivity, with forest cover limiting the extent of visibility.

7.5 Mitigation and management

Rehabilitation strategies that emulate patterns, shapes, line and colour of the existing landscape will reduce the contrast between the components of the proposed gas fields' development and the existing landscape, reducing the visual impacts.

7.5.1 Gas wells

Gas wells are the most numerous components of the proposed gas fields, dotted across the landscape at approximately 750m intervals. Consideration of their placement, establishment, visual presentation and, in some locations, landscape treatment is important to the overall visual impression of the gas fields as a whole.

The visual effect of a gas well can be mitigated and significantly reduced by implementing a range of visual treatments. To a significant extent, implementation of visual management strategies is already being implemented by Origin. On the basis of experiences at Spring Gully, Origin has commissioned a separate facility/receptor colour co-ordination study. Rehabilitation of well sites reduces visibility of the gas fields' development, as illustrated in Figure 7.7.

Where practicable, the following mitigation measures will be implemented:

- Locate gas wells no closer than 300m from existing residences
- Plan the location of gas wells within the viewshed of any sensitive receptor
- Consider landscape works adjacent to the well or around the residence to achieve visual screening, where requested by a resident
- Minimise construction time close to sensitive receptors, notably residences
- Minimise the extent of vegetation clearing for well pads and access roads
- Minimise the amount of cut and fill required to establish the pad, consistent with achieving gentle batter slopes for rehabilitation and land use post construction
- Paint wellhead components in colours that minimise colour contrast within the varied landscape settings within which they are placed, taking into consideration seasonal and/or crop variations as well as predominant land cover
- Use existing tracks for vehicle access, or follow the contours in the landscape where new tracks are required
- Rehabilitate well site areas as soon as practicable following establishment of the well
- Recreate the pre-construction landscape characteristics of disturbed areas to maximise visual integration.

7.5.2 Gas processing facilities

GPFs are industrial complexes with administration buildings that can cover a substantial area. Implementation of mitigation strategies, outlined below, will assist in screening and integrating these facilities into the landscape, where practicable:

- Minimise the area of earthworks required to accommodate the GPF and associated facilities
- Create separate pads for auxiliary facilities on an as-needs basis
- Assess all lighting direction and lux to avoid direct light effects on residences
- Undertake a detailed analysis of the visual catchment of each GPF to establish if there are any sensitive receptors within 1000m of the facility. Where needed, establish and implement vegetation planting strategies to screen or integrate the GPF into the landscape
- Paint buildings and other GPF components in a colour to minimise colour contrast with the surrounding landscape, bearing in mind seasonal variation and consistent with operational and safety requirements
- Avoid, view sheds of sensitive receptors such as residences, highways and towns for storage and lay-down areas, where practicable.

7.5.3 Water treatment facilities

Water treatment facilities consist of two main components – a large scale building (200x200m) that houses the plant and a series of ponds, each covering up to 210 hectares. Where practicable, the following mitigation measures will be implemented:

- Locate water treatment facilities at least 500m from the nearest residence
- Minimise vegetation clearing beyond building footprints and retention ponds
- Minimise earth works consistent with achieving gentle batters for rehabilitation purposes
- Conduct detailed visual analysis of the visual catchments of the water treatment facilities to establish the presence of sensitive receptors within the visible area of the facility. If there are sensitive receptors within 500m, a detailed landscape strategy will be implemented to screen or integrate plant and pond components into the landscape.

7.5.4 Accommodation facilities

Construction and operation of the gas fields will require an onsite workforce, and accommodation facilities will be established in close proximity to the GPFs. Where practicable, the following mitigation measures will be implemented:

- Locate accommodation facilities more than 800m from sensitive receptors.
- Avoid colours on the external cladding of building modules that contrast strongly with the landscape, such as light colours and consider olive greens and grey colours that are compatible with the surrounding landscape
- Minimise earthworks and, if needed, create multiple terraces rather than one large cut and fill pad
- Undertake detailed analysis of the visual catchment of each accommodation facility to establish if there are any sensitive receptors within 800m of the facility and implement vegetation planting

strategies to screen or integrate the accommodation facility into the landscape where necessary.

- Remove all buildings on decommissioning of facilities , rehabilitate vacated terraces and retain landscape plantings, as appropriate.

7.5.5 Microwave towers

The 50m high microwave communication towers will create a simple, vertical element in the landscape. Where practicable, the following mitigation measures will be implemented in relation to microwave towers:

- Remove communication towers once they are no longer required for communication purposes
- Remove all hardware from the site upon decommissioning, if required
- Restore landforms, as required, to ensure they do not compromise ongoing land use activities
- Restore ground and vegetation cover similar to the existing surroundings.

7.5.6 Gas and water pipeline network

As pipelines will be buried for the gas and water pipeline network, the visual effect will only be high during the construction phase. Where practicable, the following mitigation measures will be implemented:

- Plan pipeline routes to avoid sensitive landscape areas and close proximity to sensitive receptors (i.e. residences)
- Minimise clearing of, and damage to, vegetation adjoining the pipeline easement
- Backfill the pipe trench following pipe installation using compaction techniques to ensure an even ground level is achieved and maintained without slumping
- Install drainage structures to avoid scour of pipeline trench and the easement as a whole
- Rehabilitate pipeline routes consistent with the surrounding vegetation cover or in the case of forest, appropriate grass and or shrub cover.

7.5.7 Access roads

Access roads and tracks are one of the most visible signs of the gas fields, but generally have limited visual effect as they are part of the rural landscape. Where practicable, the following mitigation measures will be implemented:

- Align sealed major roads to follow natural terrain contours to minimise earthworks, and achieve better visual integration outcomes
- Use appropriate surfacing materials in major road construction to reduce contrast and improve integration
- Utilise access via existing roads and farm tracks, rather than develop new access infrastructure
- Retain tracks developed for installation of gathering systems as access roads for well sites
- Avoid sensitive landscape areas, including prominent ridges and other highly visible landscape areas, for placement of roads

- Establish routes, grids and gates in consultation with the land owner
- Avoid excessive clearing for access roads and trails
- Avoid damage to adjoining vegetation
- Store topsoil and mulch cleared vegetation for use in rehabilitation for the edges of roads and tracks
- Avoid use of non-gravelled trails in wet weather
- Rehabilitate edges of roads and trails to be consistent with the surrounding vegetation cover where possible
- Remove the road or track if it is no longer required.

7.6 Conclusion

7.6.1 Assessment outcomes

There is a high proportion of open exposed landscape within the gas fields' development area, with scattered pockets of remnant woodlands and vegetation strips along roadways and waterways throughout. Agriculture is the predominant land use of the area, with grazing being the dominant agricultural activity in the region. Historical land use patterns within the study area have resulted in significant clearance of vegetation. While the area is in general sparsely populated, some rural residences within these agricultural lands will have views to the gas fields and project infrastructure.

All gas fields infrastructure is industrial in nature and therefore may present as a strong visual contrast to the surrounding rural landscape. A high visual effect will be created during the construction phase. These effects reduce at the completion of the construction phase; however, the extent of high or moderate visual effects depends on the scale of the component and the sensitivity of the surrounding landscape and receptors.

Some components, such as the microwave tower and gas wells, are relatively small-scale, occupying only small parts of the view. Therefore, their visual effects decrease over shorter distances than larger components such as GPFs.

In addition to scale considerations, some components borrow visual character from the existing landscape, drastically reducing contrast and visual effect. This is the case for the proposed gathering networks, except for those to be constructed in forested areas.

The visual impacts of all proposed components are dependent on potential views from sensitive receptors such as residences and highways. Of these, views from residences are considered the most significant. This is especially the case for views of individual or, more significantly, multiple gas wells where these are proposed. In most cases, these impacts can be readily mitigated through site planning, landscape treatment and rehabilitation.

An analysis of a typical gas field indicated that the level of visual effect and impact is defined by the closest gas well. More distant wells are so reduced in scale by distance that their cover in a field of view is very small and of minimal significance. Nonetheless, if such a view is considered to be significant, treatments at the wells and/or the homestead should be designed and mitigation actions implemented.

It is possible to visually integrate the gas fields' infrastructure into the landscape, with colour and placement of gas wells being significant tools to mitigate impacts. Larger facilities should ideally be

situated outside the viewsheds of residences. But again, if they are within viewsheds of these sensitive receptors, visual effects can be reduced by screening with vegetation and/or visual integration landscape treatments at the facility and/or at the point of viewing. Therefore, it is expected that visual impacts will be substantially reduced to a minimum or low level with the implementation of the mitigation strategies described in Section 7.5.

A summary of the environmental values, sustainability principles, potential impacts and mitigation measures in relation to landscape and visual amenity associated with the LNG facility is presented in Table 7.3. Additionally, Table 7.3 includes the residual risk levels for landscape and visual amenity. Further details on the risk assessment process are presented in Volume 2 Chapter 4.

Table 7.3 Summary of environmental values, sustainability principles, potential impacts and mitigation measures

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
Rural landscape values	Minimising adverse environmental impacts and enhancing environmental benefits associated with Australia Pacific LNG's activities, products or services; conserving, protecting, and enhancing where the opportunity exists, the biodiversity values and water resources in its operational areas Respecting the rights, interests and diverse cultures of the communities in which Australia Pacific LNG operates	Creation of an adverse visual impact on areas surrounding the gas fields facilities and infrastructure, especially on sensitive visual receptors	Inappropriate design and construction methods that are not sensitive to the exiting environment Uncontrolled clearing activities	Avoid, view sheds of sensitive receptors such as residences, highways and towns as far as practicable Locate gas fields infrastructure at appropriate minimum separation distances from existing residences Reduce, as far as practical, the cleared areas needed to support the construction and operation of the gas fields facilities and infrastructure Where practicable, retain vegetation Minimise earthworks and, if needed, create multiple terraces rather than one large cut and fill pad Utilise access via existing roads and farm tracks as far as possible and retain for operational purposes where appropriate Paint buildings , consistent with operational and safety requirements, to lessen the contrast between these elements and the adjoining bushland Use a sensitive lighting approach to reduce light spill Remove communication towers once they are no longer required for	Low
Cultural heritage values		Impacts to culturally significant vistas or areas	Implementation of design which is not culturally sensitive		Low
Outdoor recreation values		Impacts to outdoor recreational areas	Implementation of design which is not sensitive to areas used for outdoor recreation		Low
Biodiversity values and fauna habitat	Identifying, assessing, managing, monitoring and reviewing risks to Australia Pacific LNG's workforce, its property, the environment and the communities affected by its activities	Habitat impact to fauna species	Introduction of night lighting into a fauna habitat		Low

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
				communication purposes Rehabilitate pipeline routes, access tracks and other infrastructure as soon as practicable with appropriate vegetation	

7.6.2 Commitments

To manage the potential visual impacts associated with the construction and operation of the gas fields, Australia Pacific LNG will, where practicable:

- Complete a detailed analysis of the visual catchment of each gas processing facility located within 1,000m, each water treatment facility within 400m, and each gas well within 300m from the nearest sensitive receptors, and where required, implement (in consultation with the land holder) strategies to screen or integrate the gas processing facility, water treatment facility or gas well into the landscape
- Undertake a detailed analysis of the visual catchment of each accommodation facility to establish if there are any sensitive receptors within 800m of the facility. Where needed, establish and implement vegetation planting strategies to screen or integrate the accommodation facility into the landscape
- Consider colours of infrastructure to minimise the contrast with the surrounding landscape
- Remove surface infrastructure, where no longer required, during decommissioning and rehabilitate to a condition as close to its original state as possible.